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

by

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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. For 1994 flounders will be divided into 4VW and 4X stock components with a reduced TAC of 10,000 t. Discussions are underway to establish fleet shares in light of the new management units, the reduced TAC and the inclusion of winter flounder under quota management. ITQs should be implemented during 1994. Landings data continues to be unreliable with unspecified flounder making up 42 % of the total flounder landings in 4VW and 80% in 4X. Due to an absence of commercial fishery information a full analytical assessment was not undertaken and assessment results are based on survey information as well as industry discussions. In 4VW both American plaice and yellowtail show a significant decline in survey abundance especially in the 4V area. Survey average weights have also declined indicating a shift of the population to a predominance of small fish. Survey abundance of witch flounder indicates a decline in 4W while remaining relatively stable in 4V. The mean weight of witch flounder in the survey has been declining since the mid 1970s again indicating the lack of larger fish. Winter flounder abundance has increased in the 4W area. In the 4X area both mean numbers and weights per tow for 1993 are among the lowest observed. Survey data also suggests that the average weight of witch flounder in the population has declined to its lowest levels in 1992 and 1993. Survey abundance for 4X winter flounder has remained at a high level although the survey does not cover the very inshore areas where traditional fisheries have taken place. Anecdotal information indicates declines in abundance in these inshore areas. American plaice and yellowtail resources appear to be stable at low abundance levels. Overall industry concerns in both areas coupled with declining survey abundance for the more commercially important stocks indicates that a substantial reduction in effort is required to reverse the trends in abundance as TACs have not been restrictive. As well care should be given to developing a management plan for winter flounder that recognizes the existance of several population units.

Résumé

Jusqu'en 1993, la plie de 4VWX a été gérée comme un seul stock pour lequel le TPA était fixé à 14 000 t. En 1994, toutefois, elle sera divisée en deux stocks, soit celui de 4VW et celui de 4X, et le TPA sera réduit à 10 000 t. Des discussions sont en cours pour établir des parts par flottilles, compte tenu des nouvelles unités de gestion, de la baisse du TPA et de l'inclusion de la plie rouge dans la gestion par quota. Les QIT devraient être adoptés dans le courant de 1994. Les données sur les débarquements restent peu fiables, les plies non spécifiées représentant 42 % des débarquements totaux de plie dans 4VW et 80 % dans 4 X. En raison de l'absence de renseignements sur la pêche commerciale, on n'a pu effectuer d'évaluation analytique complète; les résultats de l'évaluation sont fondées sur le relevé de recherche et sur des discussions avec l'industrie. D'après le relevé de recherche, l'abondance de la plie canadienne et de la limande à queue jaune sont en recul net dans 4VW, en particulier dans le secteur 4V. Le relevé révèle aussi une baisse des poids moyens, indiquant une prédominance des petits poissons dans la population. Pour ce qui est de la plie grise, les résultats du relevé indiquent qu'elle est en diminution dans 4W tandis qu'elle reste relativement stable dans 4V. Ils dénotent aussi une baisse du poids moyen de la plie grise depuis le milieu des années 1970, ce qui reflète là encore une pénurie de gros poissons. L'abondance de la plie rouge a augmenté dans 4W, tandis que dans 4X, le nombre et le poids moyens par trait en 1993 étaient parmi les plus bas jamais observés. Les données du relevé de recherche permettent également de croire que le poids moyen de la plie grise est tombé à son plus bas en 1992 et en 1993, et que l'abondance de la plie rouge dans 4X est restée forte, quoique les secteurs proches des côtes, où se déroule la pêche traditionnelle, ne soient pas compris dans le relevé. Aux dires de certains, l'abondance aurait diminué dans ces secteurs côtiers. La plie canadienne et la limande à queue jaune semblent stabilisées à des niveaux faibles. Compte tenu des préoccupations de l'ensemble de l'industrie en ce qui concerne les deux zones et de la baisse de l'abondance des stocks commerciaux les plus importants révélée par le relevé de recherche, une importante réduction de l'effort est nécessaire pour renverser la tendance de l'abondance, les TPA n'ayant pas été restrictifs. De plus, il conviendrait d'élaborer un plan de gestion de la plie rouge 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 (4VWX). 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 TAC of 32,000 t 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 complex through to 1985 were not able to advise a modification to the TAC. However during 1993, discussions with most fleet sectors indicated that a 14,000 t TAC for 4VWX flounder was too high as the quota has never been reached, even if all the unspecified and winter flounder were included with the plaice, witch and yellowtail. A reduced TAC of 10,000 t, including winter flounder, was recommended for 1994.

Based on biological parameters examined by Neilson *et al.* (unpublished) it was recommended that the flatfish stock be divided into a 4X and a 4VW stock component. Industry was in agreement with new stock components, especially with the imminent implementation of ITQs. In general the majority of winter flounder is found in 4X while the majority of plaice and yellowtail are located in 4VW.

The reduction in TAC, the inclusion of winter flounder and the new stock boundaries, resulted in a review of all fleet sector shares including fixed gear and the offshore fleet. In the past, new allocations, resulting from redefined stock areas (i.e. redfish) have been determined using catch history rather than with traditional allocations. The mobile fleet less than 65' has been responsible for the majority of the landings in recent years (1986-1993) while the offshore landed only small amounts of flounder during the same period. Thus, the approach of using catch history may prove to be controversial especially for the offshore sector who would face an estimated quota reduction from 7,150 t to something in the order of 1,000 t. This method was considered in order to preserve the flatfish stock by capping the quota at recent longterm catch levels, thus preventing increased effort.

Flounder ITQs for mobile gear less than 65' should be implemented during 1994. Catch history, as well as individual percentage share has been distributed to all ITQ licence holders. Each licence holder will have two separate quotas (4X and 4VW). Licence holders with a homeport in Eastern Nova Scotia (Sambro and East) will be required to indicate on a ballot, their choice of an ITQ or competitive fishery for the 4VW quota. For licence holders in 4X, an ITQ will be established for both the 4X and 4VW stock areas. Final agreement has not been reached on the

outcome of the ballot, possibly both a competitive and an ITQ fishery may result. If flatfish remains competitive for Eastern Nova, all fishing for any groundfish species will be prohibited once the flatfish quota has been reached regardless of any remaining quota in other 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 should address some of the problems, landings data by flatfish species, are still considered to be unreliable. However several initiatives are currently underway to address these problems. Flatfish ID kits were prepared and given to fishermen, or sent to fisheries offices for distribution to fishermen when they pick up their licences. Weighmasters have also been sent ID kits.

An ongoing examination of log records indicated that many fishermen are recording estimates of catch by species, however the weighout slip information is the only information entered into the ZIF data base. As the actual flatfish catch is not weighed out by species, the weighmaster cannot use the estimates and thus records only the actual weighout of mixed flounder. Even if the catch is all one species, it is often incorrectly identified by the weighmaster, i.e. flounder rather than the actual name. Plaice are often recorded as flounder in 4VW and winter flounder as flounder in 4X while any combinations are most often called mixed flounder. Any of the above designations are entered into the statistics system as unspecified flounder. Plant purchase slips can also provide correct species identification (marketing purposes), however this information is presently not used for identification.

With the planned implementation of ITQs for flatfish, and the fact that the mobile gear sectors are under some form of dockside monitoring, letters were sent to Generalists, ITQ and EA licence holders requesting them to identify flatfish by species during the weighout procedure. From industry consultations, most fishermen agree with the concept of species identification, however they feel that for the most part it is not practical to keep separate bins for flatfish species or to separate them at dockside. They would like to see the use of log estimates or plant information. An initiative is underway by one plant to send both Science and Statistics plant weighouts by species. For 5 trips (several vessels) between March 14 and April 19, 1994, the breakdown is provided in Appendix 1 for flatfish caught in the 4X area.

From the position information provided with the weighout, one can surmise that the species mix is dependent on the area fished, with deeper water yielding more witch flounder and shoaler areas more winter flounder. Temperature also appears to be a significant factor. This type of initiative may provide an alternative to weighouts by species, if dockside weighouts are not feasible, especially if it gains wide industry support.

Description of the Fishery

Total landings of Scotian Shelf flatfish increased from 11,000 t in 1961 to 55,000 in 1968 and ranged from 20,000 - 33,000 t in the 1969 to 1976 period (Table 1, Fig. 1) with Canada and the USSR the major exploiters of the resource. Since 1977 only Canada has exploited the resource

in a significant way, with 1980 the only year in which the TAC of 14,000 t was taken (Fig. 2). Since then landings of flatfish species under quota management have declined to a low of 2738 t. Total flounder landings, including winter and unspecified flounder, have also declined to a low of 7970 t in 1993. The proportion of unspecified flounder has increased steadily to over 60% of the reported landings.

The continuing increase in unspecificed flounder landings seen in 1993 is again related to the way landing statistics are collected. If the weighout slip does not identify the species, the landed weight is recorded as unspecified flounder. Any log information recording species breakdown is not used because it is an estimated rather than a true weight.

Table 2 gives a breakdown of landings for each species by country. For all identified species landings have been declining since 1990 with the exception of yellowtail in 1993. Table 3 gives the breakdown by division for each species and Figure 3 shows the total flounder landings, as well as landing by species, for the new management units (4VW, 4X).

Figures 4 to 8 give the recorded landings by area, species and, gear and Tables 4 and 5 the recorded landings by season gear and tonnage class. However, because the species breakdown is not considered reliable this information will be discussed in terms of total flounder landings by area.

4VW flatfish

Total landings of flatfish in 4VW for 1993 amounted to 3,959 t, a decrease from 4,740 t taken in 1992. Unspecified flounder made up 42% of the total landings. Landings have increased for the <65' mobile gear fleet to 3,477 t in 1993 from 2,679 t in 1992. This increase may be due to more ITQ vessels directing for flatfish given the declining cod stocks. Discussions with industry indicated concern for the yellowtail resource in particular and flatfish in general: commenting that the resource couldn't stand any increased effort. Industry also commented on the discarding of small yellowtail. The number of vessels directing for flatfish may decline once ITQs, as well as the reduced quotas are in place, allocations will generally be based on the 1986-1989 catch history, with only 10% set aside for appeals based on the 1990-1992 catch history.

For the offshore fleet, flatfish landings declined dramatically, dropping from 1893 t in 1992 to 323 t in 1993. Because of problems with bycatch of small cod and reduced cod quotas the offshore generally concentrated on a directed redfish fishery .

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

4X flatfish

Total landings of flatfish in 4X for 1993 amounted to 4,011 t, a decrease from 5,859 t taken in the 1992 fishery. Unspecified flounder made up In 4X overall flatfish landings by the mobile

gear <65' fleet declined by about 30% from 5549 t in 1992 to 3831 t in 1993. Discussions with industry participants indicated that this shortfall was due to the midseason reductions in quota which prevented many vessels from participating in their usual fall fishery. However, industry also indicated that it was requiring more effort to catch the same amount of fish as in previous years. Witch flounder was of some concern to the ITQ fleet with larger concentrations harder to find, perhaps due to Georges Bank and Browns Bank closures which caused more fishermen to fish in smaller areas. The generalists indicated particular concern for the winter flounder stock and some ITQ fishermen noted difficulties finding winter flounder in deep water this winter. As well the spring 1994 catch of winter flounder appeared to be smaller in size, even using a 140 mm square codend.

Offshore landings have been insignificant in 4X since the early 1980s. Fixed gear landings in 4X although only 358 t in 1992 dropped to 166 t in 1993. Landings by both longline and gillnets dropped about the same amount. The loss of the haddock bycatch, once the quota was taken and reduced trip limits throughout the year may have influenced the flounder landings.

Looking at the average flatfish landings for two time periods 1986-1989 (pre ITQ) and 1990-1992 (post ITQ) it is interesting to note changes in the percentage share of the landings between areas. Landings by all fleets in the 1986-1989 period indicated a 61 to 39 percent split between 4VW and 4X respectively. The 1990-1992 split was 46 to 54 percent. For the <65' mobile fleet, the 1986-1989 split was 46 to 54 percent while for 1990 -1992 the split was 37 to 63 percent. This may indicate that the ITQ fleet has increased their flounder effort in the 4X area. 1993 was closer to a 50/50 split probably due to reduced quotas in 4X and the fact that flatfish was one of the few species that could be directed for in 4VW.

Landings to April 6, 1994 from quota reports, show a preliminary catch of 722 t most of which was taken by the <65' mobile fleet. The ITQ fleet over ran their interim quota of 675 t by 35 t while all other gear sectors were well below their allocations. For 1993, total landings to April 31, amounted to 643 t.

Management

The flatfish fishery is currently a competitive fishery regulated by quotas on six gear sectors: 1) fixed gear <45'; 2) fixed gear 45-65;' 3) mobile gear <45'; 4) mobile gear 45-65'; 5) mobile gear 65-100', and 6) vessels >100'. Because the flatfish fishery has been generally a bycatch fishery, trip limits and specific licence conditions have not been required (Table 6). Flatfish will be put under the ITQ program in May of 1994, details of fleet allocations % shares etc. are in the process of being finalized. Interim quotas were put in place for January 1 to March 31, 1994 based on recent catch history and are as follows :

FG <65'	10 t
MG<65'	675 t
MG 65'-100'	10 t

Vessels>100'	300 t
Generalist	25 t

and includes American plaice, witch, yellowtail, winter flounder and unspecified flounder. Any landing after April 1 will be counted against an individuals future ITQ.

Catch at Age

Catch at age information for flatfish is 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 has been put in place, based on recent fishery information. Individual survey length/weight information for yellowtail, witch and winter flounder is currently not available, but will be collected in the future. Length/weight information is collected for American plaice.

Research Surveys

Research Survey Data 4VW

American Plaice

The summer RV survey (1970-1993) stratified mean numbers per tow for 4VW American plaice were relatively stable through the early 1980s, then declined to a series low in 1988 (Table 7a, Fig. 9a). Since then, abundance increased to 1991 but declined significantly since. 4V numbers per tow have generally been declining since the late 1970s, while 4W numbers remained stable or increased over the same period. The stratified mean weights per tow in 4V have declined since 1980 and in 4W declined from high levels in the 1970s, then remained stable at lower levels to the present (Table 7b, Fig. 10a). 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) an estimate of the average weight of plaice in 4V was examined by dividing the mean weight per tow by the mean numbers per tow. Results indicate that the average weight of an American plaice in the survey has declined since the late 1980s to a low of 220 gm in 1993. Average weight was generally between 300 and 400 gm prior to that time (Fig . 11a)

1993 summer survey distribution maps for American plaice catches show a similar distribution to earlier years (Annand *et al. 1993*), with major concentrations in the 4V area, although abundance is down compared to earlier years (Fig. 12).

The spring 4VW survey (1986-1994) mean numbers per tow have declined since 1990 (Table 8,

Fig. 13a). The magnitude of the numbers per tow is lower in the spring survey by about half than that noted for the summer survey. Distribution maps show spring concentrations are generally in the gully area and in the deeper waters of the Laurentian channel (Fig. 14).

Length frequencies from the 1993 summer RV survey indicated a continuing decrease in numbers of large fish caught (>50 cm) noted last year (Fig. 15).

Yellowtail

The summer RV survey (1970-1993) stratified mean numbers per tow for 4VW yellowtail flounder declined in the late 1970s, remaining stable through the 1980s with an increasing trend through 1991. The 1993 survey point is the lowest in the 23 year time series (Table 7a, Fig. 9b). Mean numbers per tow have been declining since the early 1980s in 4V and have remained stable or increased in 4W. The stratified mean weights per tow in 4V declined since 1982 and in 4W declined from high levels in the 1970s remained stable during the 1980s and have declined since 1991 (Table 7b, Fig. 10b) . Because the majority of the commercial fishery is in 4V, an estimate of the average weight of yellowtail in that area was examined by dividing the mean weight per tow by the mean numbers per tow. Results indicate that the average weight of yellowtail flounder from the survey increased since the late 1970s to a high of 420 gm in 1990 then decreased to 290 gm in 1993. Average weight was generally above 350 gm during the 1980s (Fig. 11b).

The yellowtail summer 1993 survey distribution continues to indicate a change in distribution between 4V and 4W. Major concentrations were noted in 4W, with relatively few yellowtail caught in 4V, although most fishing activity takes place there (Fig. 12).

The 4VW spring survey abundance decreased between 1988 and 1992; however, the 1992 point may be anomalously low with large catches of yellowtail being caught in very deep water. Abundance increased for 1993 but returned to a more average level in 1994 (Table 8, Fig. 13b). The spring survey distributions show very few yellowtail caught east of Sable Island (Fig. 14).

Survey length frequencies were similar in size distribution to last year (Fig. 15); however, the length frequencies in stratum 455 and 456 (4W) indicate that yellowtail peak at 25-26 cm while in stratum 447 and 448 (4VSc) they peak at 35-36 cm (Fig. 16). This apparent size difference may be one reason that fishermen catch yellowtail almost entirely in 4V rather than 4W. Tagging information shows movement of yellowtail between the two areas. Possibly small yellowtail in 4W may provide recruits to the commercial fishery in 4VSc.

Witch Flounder

The summer RV survey mean numbers per tow for 4VW witch flounder were low but relatively stable over the time series (Table 7a, Fig 9c). However, mean weight per tow in 4W have

declined slowly since the mid 1970s, while weights per tow in 4V have remained more stable over most of the time series (Table 7b, Fig. 10c). 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. The summer survey does not cover the deep waters of the Laurentian Channel and therefore may not cover the entire species distribution (Fig. 12).

The 4VW spring survey abundance declined from 1987 to a low level in 1990 and has remained stable to 1994 (Table 8, Fig. 13c). Spring distributions show very little witch flounder on the shelf, although larger catches were made in the deep waters of the Laurentian Channel (Fig. 14).

Survey length frequencies did not indicate any significant change in size composition from last year (Fig. 15). However, examining the average weight of witch estimated from the survey weights and numbers per tow indicate a steady decline in the average weight in 4VW since the late 1970s (Fig. 11c).

Winter Flounder

Winter flounder stratified mean numbers per tow in 4VW were low to 1983 and have been stable or increasing since (Table 7a, Fig. 9d). The summer survey distributions continue to show increased concentrations to the west of Sable Island in 4W, Sable Island and Middle and Western banks. It should be noted that a large portion of the survey abundance is contained within the 4W closed area (Fig. 12).

In the spring survey, numbers per tow are very low and variable but have been increasing in the last two years (Table 8, Fig. 13d). The survey distributions found no winter flounder east of Sable Island (Fig. 14).

1993 survey length distributions did not indicate any significant change in size composition from previous years (Fig. 15) .

<u>Research Survey Data 4X</u>

Witch Flounder

The summer RV survey (1970-1993) 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. 17a). The stratified mean weights per tow in 4X also show a declining trend since 1980 and both the numbers and weights in recent years are well below the longterm mean (Table 7b, Fig.18a). To provide a view of the abundance of larger and smaller fish in the 4X area, an estimate of the average weight of witch flounder was examined by dividing the mean

weight per tow by the mean numbers per tow. Results indicate that the average weight has been generally between 600 and 800 gm; however, for the last two years average weight dropped below 500 gm, the lowest values in the series (Fig. 19a)

Summer survey distribution maps (1970-1992) for witch flounder catches indicate that witch are widely distributed in 4X, but in low concentrations. The 1993 distribution is similar, although the number of witch caught was very low (Fig. 12). Survey length frequency distributions did not indicate any significant change in size composition from previous years (Fig. 20a).

Winter Flounder

The summer RV survey (1970-1973) stratified mean numbers per tow for 4X winter flounder have shown an increasing trend since the late 1970s with a stable period through the 1980s and an increasing trend to the present, although the 1993 point is approximately half the 1992 value (Table 7a, Fig. 17b). Mean weights per tow exhibit a similar trend (Table 7b, Fig.18b). 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, e.g. 650,000 lbs of winter flounder were caught over a 3-4 day period in Scots Bay in August of 1993. Industry indicated that these fish were feeding on early herring roe and had moved from the Minas Basin as the water temperatures increased.

Examining the survey mean weight per tow divided by the mean number per tow , suggests that the average weight of a winter flounder in 4X has been declining since the late 1970s (Fig. 19b).

The mean number/tow within the strata at the head of the Bay of Fundy and the mouth of St. Marys Bay has been increasing since the early 1980s. In the offshore strata (Browns) there appears to be a decrease in abundance since 1991.

The summer survey distribution of winter flounder appears to be restricted to the Browns Bank area and the Bay of Fundy (Fig. 12). It is uncertain whether there is mixing between these two areas. Winter flounder did not appear consistently on Browns Bank until the mid to late 1980s.

Survey length frequencies indicated that small winter flounder were not caught in the Browns Bank area. Length frequencies did not indicate any significant change in size composition from previous years (Fig. 20b).

Yellowtail

The summer RV survey mean numbers per tow for 4X yellowtail flounder have been very low and have shown little change in recent years (Table 7a, Fig. 17c). Mean weights per tow have increased since the early 1980s (Table 7b, Fig. 18c). Yellowtail survey distribution in 4X is generally limited to the Browns Bank area and the mouth of the Bay of Fundy (Fig. 12).

Survey length frequencies did not indicate any significant change in size composition from previous years (Fig. 20c).

American Plaice

American plaice stratified mean numbers and mean weights per tow per tow in 4X were low, but relatively stable over the entire time series (Tables 7a and 7b, Figs 17d and 18d). 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. 12).

1993 survey length distributions did not indicate any significant change in size composition from previous years (Fig. 20d).

Commercial Catch Rates

Directed catches for all stocks comprising the 4VW and 4X flatfish complex are variable and often at very low levels. The landings with effort, for each species were examined for the 1989 to 1993 time period. Total directed landings by mobile gear vessels 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 flatfish stocks is probably of limited value. Catch rates (mobile gear <65') were derived for the individual flatfish species including unspecified flounder, as well as a series for flounder as a whole in each stock area. This approach was used to try and get around the problems with species identification. Effort hours seemed unusually high in 4X; however, fishermen felt it was due to fishing to make a trip pay rather than directing for any one species. Results presented in Table 9, Fig. 21 indicate that catch rates for flounders are increasing in 4VW and declining in 4X.

Fishery Distribution

4VW

Fleet distribution was examined using available log information, i.e. lat, long and catch (Fig. 22). Unfortunately, most of this information pertains to unspecified flounder and only a small subset to individual species. If this subset can be considered representative of the commercial distribution, it would suggest that American plaice is only fished in 4Vn. However, unspecified flounder distributions, corroborated by industry sources, indicate that American plaice is fished throughout 4V and to a limited extent in 4W.

Yellowtail commercial distributions indicate that the fishery is carried out almost entirely in 4VSc. Industry agreed that the yellowtail fishery is centered in 4VSc, somewhat in 4V as a

whole, and very little in 4W.

The distribution of witch flounder appears 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.

4X

Distribution was examined using available log information, i.e. lat, long and catch (Fig. 22). 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 appear to be 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.

Commercial Length Frequencies

4VW

Commercial length frequencies for American plaice, yellowtail and witch flounder were examined. for 1991 and 1993. These years were chosen to look at possible changes in size distribution related to increased effort since ITQ implementation. Yellowtail samples were taken from 4VSc, plaice from 4Vn and 4VS and witch samples from 4Vn. Both plaice and yellowtail indicated far fewer large fish (>35 cm) in the 1993 samples. This trend toward smaller fish was also noted for witch flounder (Fig. 23).

4X

Commercial length frequencies for winter and witch flounder were examined for 1991 and 1993. These years were also chosen to look at possible changes in size distribution related to increased effort since ITQ implementation. Witch samples came primarily from 4Xn and 4Xo, while winter flounder samples were more widespread. Witch flounder data indicated far fewer large fish in the 1993 samples. The absence of smaller length groups may be the result of the change to 140 mm square mesh for much of the fleet and the fact that the choice market size (USA) for witch is about 14 inches. This trend toward smaller fish in the 1993 fishery was also noted for male winter flounder (Fig. 24). Because of the bycatch nature of the yellowtail and American plaice fishery, samples were not available to look at the length frequency information of these stocks.

A joint industry-DFO initiative coordinated by J. Kearney was carried out in the upper Bay of Fundy Area. The objectives of the initial pilot project were to collect length frequency information, otoliths and logbook information from participating fishermen. The observations of these fishermen who fish further inshore than the area covered by the surveys, is that the winter flounder resource has declined notably. Funding for a second phase of the study is being pursued. The second phase, if funded, will focus on stock definition and the collection of maturity data.

Conclusions

4VW

American Plaice

Both mean numbers and weights per tow for 1993 are the lowest on record in 4V. The numbers per tow are at about half the long term average (1970-1992) and weights per tow less than half the longterm average. This is cause for concern because most of the fishery takes place in 4V. If 4W mean numbers per tow are included the 1993 value is still well below the long-term average.

The average weight of American plaice in the population has been declining since the late 1980s and is currently the lowest value in the time series (1970-1993). Commercial and survey length frequencies support this observation, that the average weight of American plaice is declining, showing a significant decline in the number of large fish caught in recent years.

Yellowtail

Yellowtail presents a similar picture; 4V mean numbers are the second lowest on record and mean weights are the lowest. They are both less than 25% of the long-term average. Most of the fishery takes place in 4VSc. 4W abundance has been more stable over the time series but has declined in the last two years. 1993 mean numbers per tow in 4VW are well below the long-term average.

The average weight of yellowtail in the population has been declining since late 1990 and is currently one of the lowest values in the time series (1970- 1993). Average weights were only lower during the mid 1970s when the stock was heavily exploited by foreign fleets. Commercial length frequencies also show a decline in the number of large fish between 1991 and 1993.

On a more positive note, small yellowtail, present in 4W may provide recruitment to the 4VSc fishery.

Witch Flounder

Witch flounder abundance in 4VW has been relatively stable; however, the survey is quite variable due to the localized concentrations of witch flounder and the lack of survey coverage in the deep waters of the Laurentian Channel. Landings of witch flounder declined in 1993, despite an increase in overall flounder landings. Indications from industry are that effort has increased on all flounders. As well, the average weight of a witch flounder in the survey has declined from over 500 gm in the mid 1970s to about 200 gm in 1993.

4X

Witch Flounder

Landings of witch flounder in 4X are less than half the recorded 1992 landings. The fishery is generally not a fall fishery, thus the reduced quotas in other stocks should not have affected it significantly. Both mean numbers and weights per tow for 1993 are among the lowest observed, and well below the longterm mean. Industry reports that catches have been scarce, large concentrations more difficult to find, and that new areas are being fished.

The average weight of witch flounder in the population was relatively stable during most of the time series, but has declined to its lowest levels in 1992 and 1993. Commercial length frequencies support this observation, showing a significant decline in the number of large fish in recent years (1991 vs 1993).

Winter Flounder

The general knowledge on winter flounder shows that in other areas genetically identifiable stocks are numerous, with individual bays and estuaries providing winter spawning grounds with stock groups consisting of several adjacent estuarian spawning units (Pierce 1977, Schenck 1982). There is no reason to doubt a similar situation in 4X. Adult winter flounder seasonal movements consist of two phases an autumn estuarian immigration prior to spawning and a late spring/summer movement to either deeper cooler portions of estuaries or to more offshore areas. Data from the flounder fishery in the upper Bay of Fundy indicate that flounder leave shoal areas in winter for deeper water; however, flounder in the Pubnico Harbour regions migrate from warm shoal areas to cooler deeper water in summer (McCracken 1963). Various tagging studies have indicated limited movement of winter flounder, i.e. 10-30 km. McCracken (1963) suggested that summer distribution was related to a temperature preference of 12-15^{0}C. Generally, spawning is thought to take place in the spring in the shallow inshore areas.

Most of the concern for this stock is based on anecdotal information from industry and the general biology of the species. Although survey mean numbers and weights per tow have been increasing in recent years, these patterns are not consistent with fishermen's reports of increased effort on this resource as well as reduced catch. The lack of agreement between industry reports

of declining abundance, and the survey increased abundance may be because the survey does not cover the inshore areas where traditional fisheries have taken place. If indeed the winter flounder population is made up of several localized spawning groups there may be a danger of fishing out individual populations, especially with increased effort and the directed type of fishing noted in Scots Bay last August.

Commercial length frequencies showed a change in the length composition of male winter flounder between 1991 and 1993, coincident with fishermen's reports of declining flounder abundances. Survey length frequencies indicated that small flounder have generally not been caught in the Browns Bank region. Browns Bank may be a separate population or perhaps older fish associated with the adjacent inshore population(s).

American plaice and yellowtail flounder

American plaice and yellowtail resources appear to be stable at low abundance levels.

Prognosis

4VW

For the past number of years the flatfish TAC has not been restrictive in terms of fishing mortality, with landings far below the TAC. A substantial reduction in effort is required (in the order of 50% of the 1993 catches) in order to restrict fishing mortality and reverse the declining trends in abundance and fish size.

4X

Witch flounder is a directed fishery in the 4X area. Witch flounder requires a substantial reduction in fishing effort to reverse the declining trend in abundance and size. TACs in the past (total flounder) have not been restrictive and may have to be reduced substantially in order to reduce fishing mortality.

For winter flounder the evidence is less compelling. A large portion of the winter flounder abundance is in the unsurveyed area. However, anecdotal information indicates declines in abundance in these inshore areas. If winter flounder populations are highly localized, with the extent of mixing unclear, the catch should be broadly distributed. Consideration should be given to developing a management plan that recognizes the distinct possibility of several population units. Seasonal and geographical restrictions could be used to manage the fishery. Management on a smaller scale than 4X as a whole may be required. Discussions should be held with industry to develop a mechanism to deal with a series of relatively small populations within a larger flatfish resource.

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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	681	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	532	1647	2	1655	3959	9	373	54	343	3232	4011

Table 2. Total Landings for 4VW and 4X 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	237	-	113	28	378	980	4	-	4	988
1992	493	-	14	71	578	414	3	1	5	423
1993[1]	123	-[1]	-[1]	-[1]	123	9	-[1]	-[1]	-[1]	9

[1] Foreign catch not available.

Table 2 (continued) . Total Landings for 4VW and 4X 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	43	-	-	-	43	602	1	-	-	603
1992	5	-	-	-	5	564	-	-	-	564
1993[1]	2	-[1]	-[1]	-[1]	2	343	-[1]	-[1]	-[1]	343

[1] Foreign catch not available.

Table 2 (continued). Total Landings for 4VW and 4X 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	-	-	257
1965	7654	45	4823	-	12522	56	49	316	-	421
1966	6966	-	7322	-	14288	80	20	124	-	224
1967	7205	-	227	1	7433	291	92	-	-	383
1968	8078	-	12817	52	20947	694	29	12	-	735
1969	5915	-	7338	48	13301	756	28	7	1	792
1970	4160	8	1059	14	5241	760	47	-	-	807
1971	6041	15	10661	6	16723	775	49	317	-	1141
1972	5346	80	5112	115	10653	563	40	95	-	698
1973	5471	13	7900	50	13434	383	32	120	-	535
1974	5457	27	1344	89	6917	373	28	97	-	498
1975	3125	-	5419	47	8591	281	33	13	4	331
1976	2181	1	3210	9	5401	285	29	27	-	341
1977	1905	-	98	7	2010	402	13	6	-	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	-	-	-	1765	524	3	-	-	527
1990	1304	-	-	-	1304	638	7	-	-	645
1991	1323	-	1	2	1326	602	3	-	-	605
1992	1025	-	4	2	1031	828	1	-	-	829
1993[1]	532	-[1]	-[1]	-[1]	532	373	-[1]	-[1]	-[1]	373

[1] Foreign catch not available.

Table 2 (continued). Total Landings for 4VW and 4X 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	3356	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	2931	78	1	-	-	79
1991	1328	-	3	-	1331	144	-	-	-	144
1992	1373	-	-	-	1373	118	-	-	-	118
1993[1]	1648	-[1]	-[1]	-[1]	1648	53	-[1]	-[1]	-[1]	53

[1] Foreign catch not available.

Table 3a. American Plaice landings for divisions 4VWX.

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

Table 3b. Witch Flounder landings for divisions 4VWX.

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

[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

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

[1] Data from DFO Statistics Branch; provisional data for countries other than Canada.

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

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

[1] Data from DFO Statistics Branch; provisional data for countries other than Canada.

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

Canada (Maritimes and Quebec)

	4V					4W					4X					
Year	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	Canadian 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	-	9	132

[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)

	4V					4W					4X					
Year	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	Canadian 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

[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)

	4V					4W					4X					
Year	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	Canadian 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

[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)

	4V					4W					4X					
Year	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	Total	Canadian 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

[1] Data from DFO Statistics Branch; provisional data for countries other than Canada.

Table 4e. Unspecified Flounder landings by quarter of year and division for Canada.

Canada (Maritimes and Quebec)

	4V						4W						4X						
Year	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	UK	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	UK	Total	1st Quart.	2nd Quart.	3rd Quart.	4th Quart.	UK	Total	Canadian Total
1970	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1971	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1972	3	30	0	0	-	33	-	-	-	-	-	-	9	239	300	133	-	681	714
1973	0	1	0	0	-	1	-	-	-	-	-	-	12	237	373	182	-	804	805
1974	0	8	0	0	-	8	-	-	-	-	-	-	9	274	272	161	-	716	724
1975	-	1	-	-	-	1	-	5	-	2	-	7	7	328	379	120	-	834	842
1976	0	1	60	0	-	61	1	0	0	0	-	1	18	193	241	44	-	496	558
1977	0	0	27	0	-	27	0	2	5	1	-	8	22	380	387	109	-	898	933
1978	0	5	0	0	-	5	0	14	6	5	-	25	7	522	461	35	-	1025	1055
1979	2	34	4	0	-	40	0	27	16	7	-	50	37	413	387	375	-	1212	1302
1980	4	15	4	0	-	23	-	-	-	-	-	-	75	817	823	143	-	1858	1881
1981	0	4	13	0	-	17	1	2	0	0	-	3	86	392	854	224	-	1556	1576
1982	3	0	1	0	-	4	3	0	1	0	-	4	39	652	687	385	-	1763	1771
1983	1	21	8	0	-	30	1	2	0	-	-	3	63	614	788	556	-	2021	2054
1984	0	0	0	6	-	6	1	1	0	0	-	2	74	480	1127	312	-	1993	2001
1985	0	2	1	0	-	3	0	0	0	1	-	1	124	784	858	434	-	2200	2204
1986	3	25	13	3	-	44	0	9	0	5	-	14	209	742	1694	580	-	3225	3283
1987	0	25	7	1	-	33	0	6	0	1	-	7	164	585	1007	619	-	2375	2415
1988	18	41	9	2	-	70	11	0	3	5	-	19	323	842	610	430	-	2205	2294
1989	1	5	9	-	-	15	-	22	29	27	-	78	319	483	127	47	-	976	1069
1990	-	1	9	-	-	10	8	2	3	2	-	15	375	496	1298	843	-	3012	3037
1991[1]	341	447	306	181	-	1275	3	35	80	21	-	139	826	1043	1004	569	-	3442	4856
1992[1]	187	603	531	476	-	1797	5	38	27	16	-	86	432	1108	1590	828	-	3958	5841
1993[1]	24	776	703	115	-	1618	-	6	26	5	-	37	379	922	1360	571	-	3232	4887

[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).

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

[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).

	OTB TC 0 - 3						OTB TC 4+						Scottish & Danish Seine[2]					
Year	Plaice	Witch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total	Plaice	Witch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total	Plaice	Witch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total
1970	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

[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).

	4VW												4X											
	LL, LHP[2]						GN AND OTHER[2]						LL, LHP[2]						GN AND OTHER[2]					
Year	Plaice	Witch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total	Plaice	Witch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total	Plaice	Witch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total	Plaice	Witch Flounder	Yellow Tail	Winter Flounder	Unspec. Flounder	Total
1970	245	3	2	-	-	250	39	9	-	-	-	48	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	348	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

(1) Data from DFO Statistics Branch.
(2) All tonnage classes combined.

Table 6. Management table for 4VWX flatfish [1] 1993 (Allocations and Catch).

Year	Fleet	Allocations (t)	(Quota Reports) Reported catch (t)	Percent Taken (%)
1993	Fixed Gear <45'	790	21	3
	Fixed Gear 45-65'	135	10	2
	Mobile Gear <45'	3330	2706	81
	Mobile Gear 45-65'	2395	945	39
	Mobile Gear 65-100'	200	140	70
	All vessels >100'	7150	257	4

[1] Only plaice, yellowtail and witch flounder are under quota management - winter and unspecified flounder catch is not reported against the quota, except for <45' mobile vessels in 4VW.

Table 7a. Mean numbers/tow and standard errors for 4VW and 4X flatfish for 1970 - 1993 (Summer Survey).

	Mean #/Tow								Standard Error							
	4VW				4X				4VW				4X			
Year	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	0.54	13.07	.40	2.10	.31	6.69	9.69	0.82	1.03	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	3.04	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	19.27	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	5.33	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	3.28	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	3.15	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	.95	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	3.91	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	2.69	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	4.56	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	5.68	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	6.08	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	2.03	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	3.27	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

* No 4V data

Table 7b. Mean weights/tow* and standard errors for 4V, 4W and 4X flatfish for 1970 - 1993 (Summer Survey).

Mean Weight/Tow

	4V				4W				4X			
Year	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	1.50	0.21
1971	26.96	5.79	4.45	0	5.72	5.70	0.84	0.46	1.85	0.15	0.56	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	0.69	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	1.90	0.30
1979	31.21	6.77	0.50	0	9.58	9.68	0.80	0.08	1.37	0.50	0.92	2.34
1980	44.93	7.72	1.55	0	2.01	4.54	1.39	0.37	2.79	0.99	1.22	1.28
1981	33.66	8.10	2.08	0	7.05	7.99	1.17	0.25	1.42	0.85	2.24	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

Standard Error

	4V				4W				4X			
Year	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	2.99	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	0.19	2.32
1991	2.42	1.48	0.48	0.04	1.15	3.67	0.13	0.60	0.47	0.24	0.47	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	0.39	1.67

* Stratum

Table 8. Mean numbers/tow* and standard errors for flatfish for 1986 - 1994 (Spring Survey).

	Mean #'s/tow				Standard Error			
Year	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

* Stratum

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)
4VW						
1989	.174	.203	.178	.443	.181	.245
1990	.137	.368	.138	.899	-	.342
1991	.099	.329	.167	.136	.142	.232
1992	.124	.344	.171	.130	.148	.246
1993	.075	.451	.165	.199	.214	.299
4X						
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	.112	.041	.064	.066	.060	.061

Appendix 1. Flatfish weight-outs by species for one plant (March-April, 1994 - 4X).

Trip/ species	1	2	3	4	5	**Total caught**	**Percent caught**
Plaice	463	2454	2441	1000	493	6851	7.9
Witch	2744	22799	25324	3324	0	54101	62.75
Yeltail	0	0	200	354	1665	2219	2.6
Winter	640	819	235	2957	18397	23048	26.73
Total	3847	26072	28200	7635	20555	86219	100

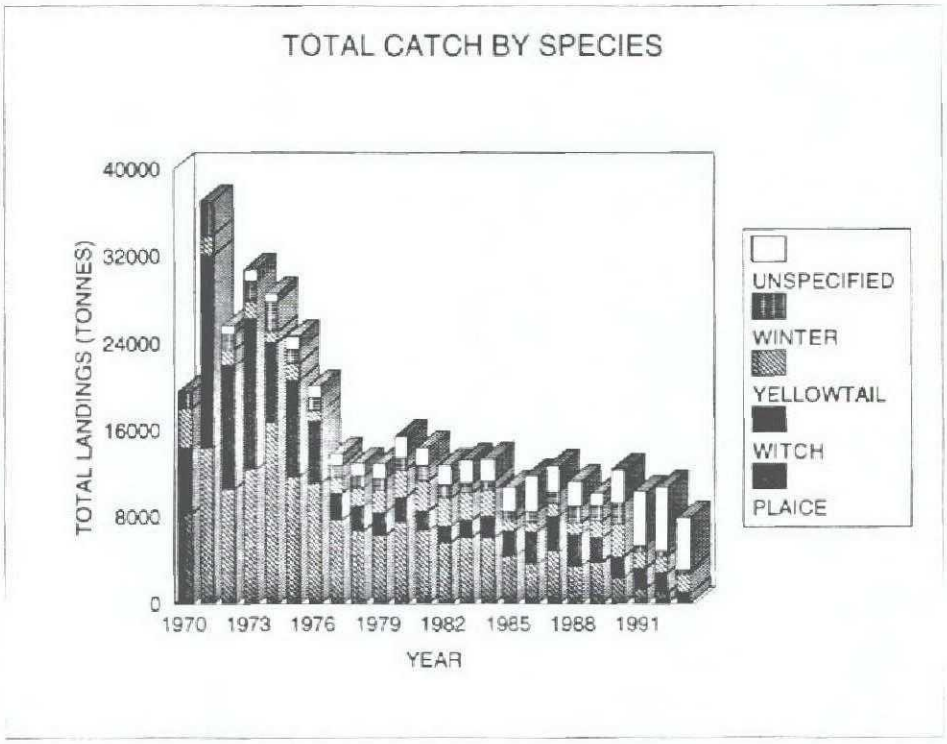

TOTAL CATCH BY SPECIES
TOTAL LANDINGS (TONNES)
40000
32000
24000
16000
8000
0
1970 1973 1976 1979 1982 1985 1988 1991
YEAR
UNSPECIFIED
WINTER
YELLOWTAIL
WITCH
PLAICE

Fig. 1

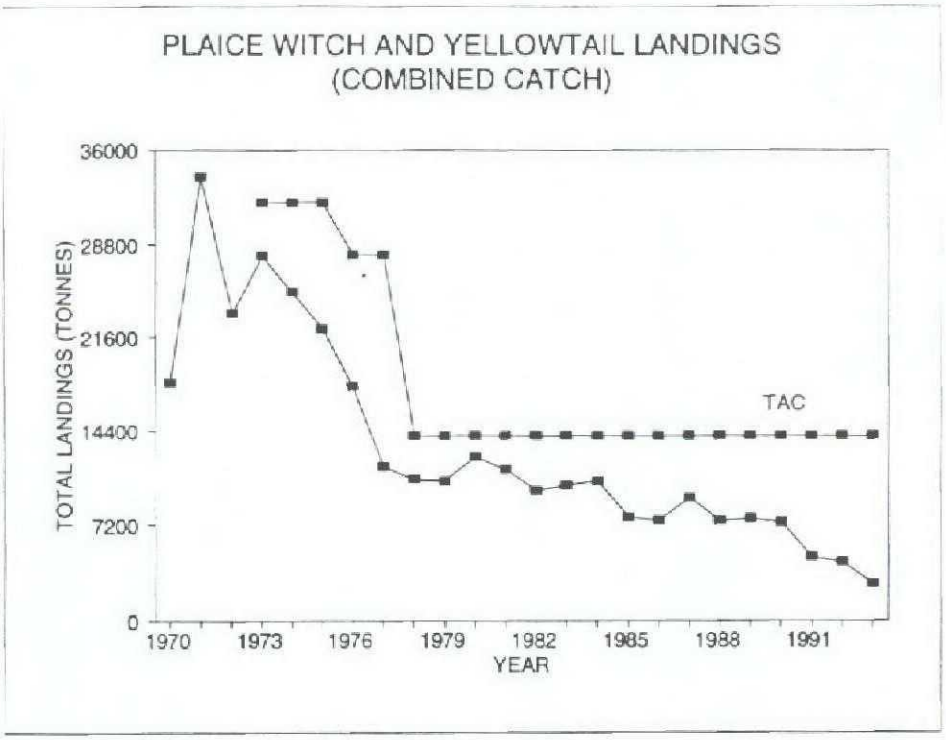
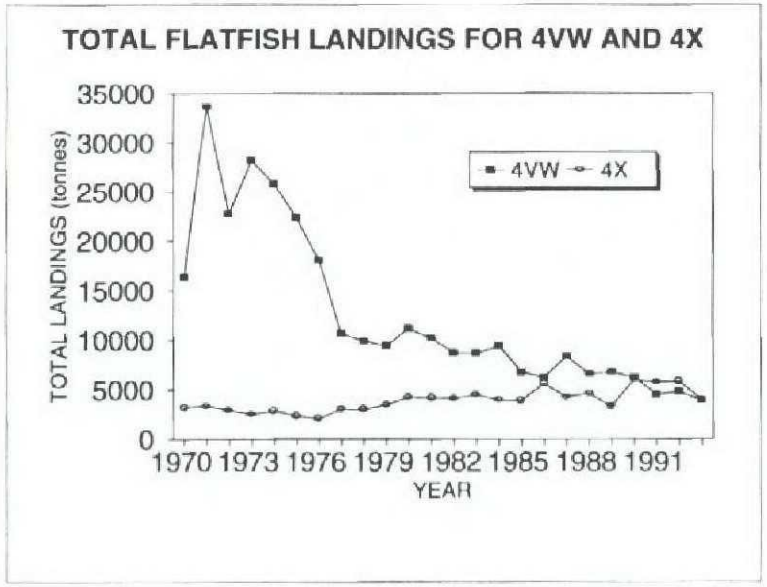
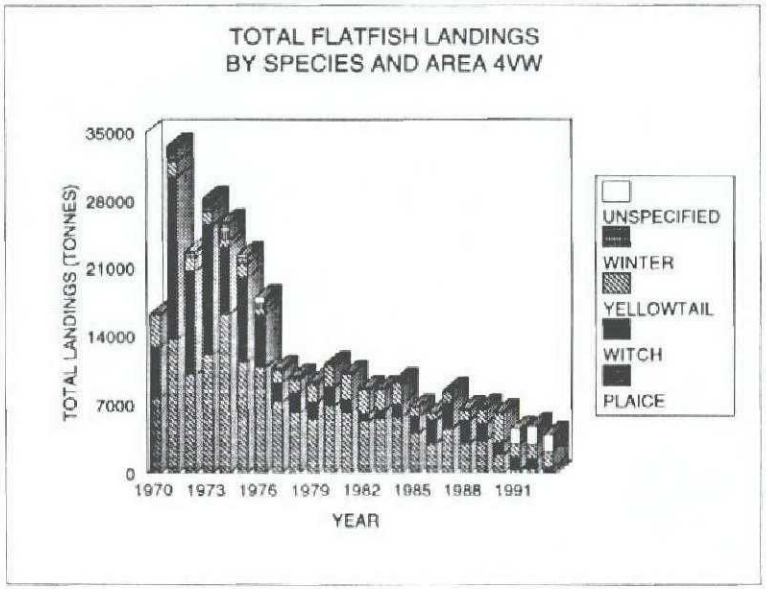

PLAICE WITCH AND YELLOWTAIL LANDINGS
(COMBINED CATCH)
TOTAL LANDINGS (TONNES)
36000
28800
21600
14400
7200
0
1970 1973 1976 1979 1982 1985 1988 1991
YEAR
TAC

Fig. 2


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


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

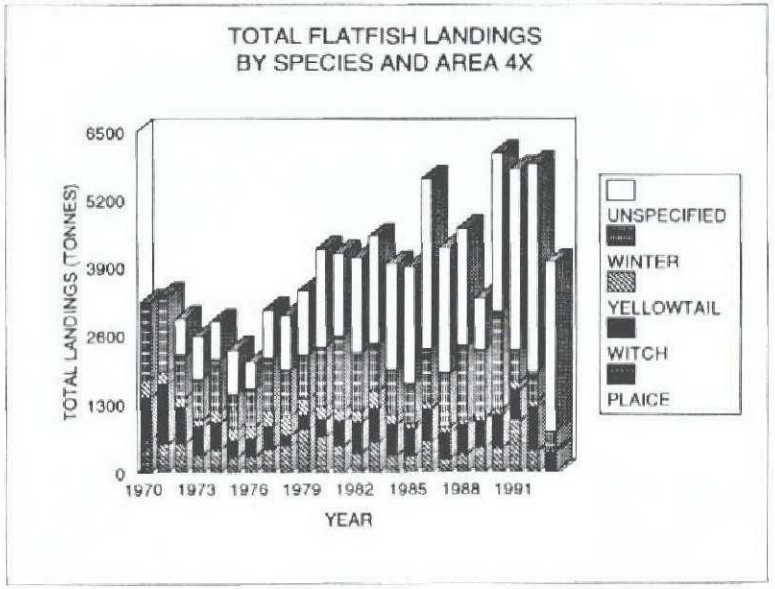
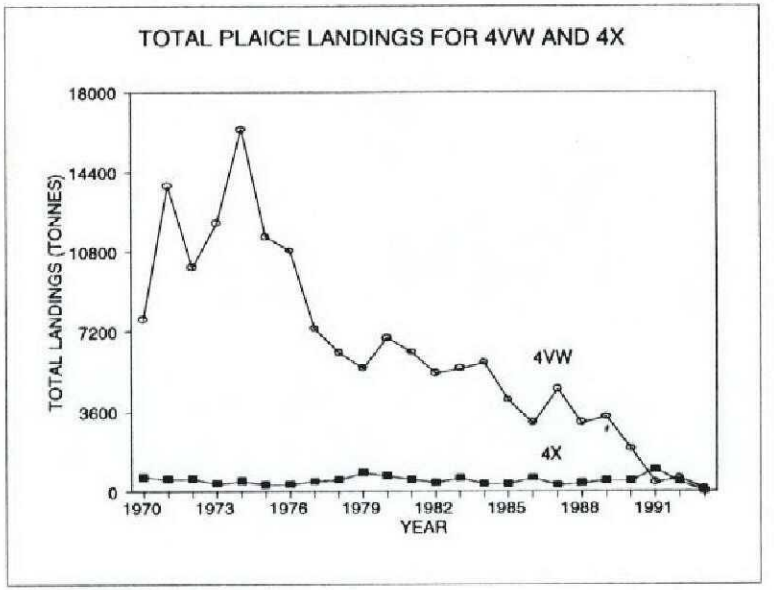
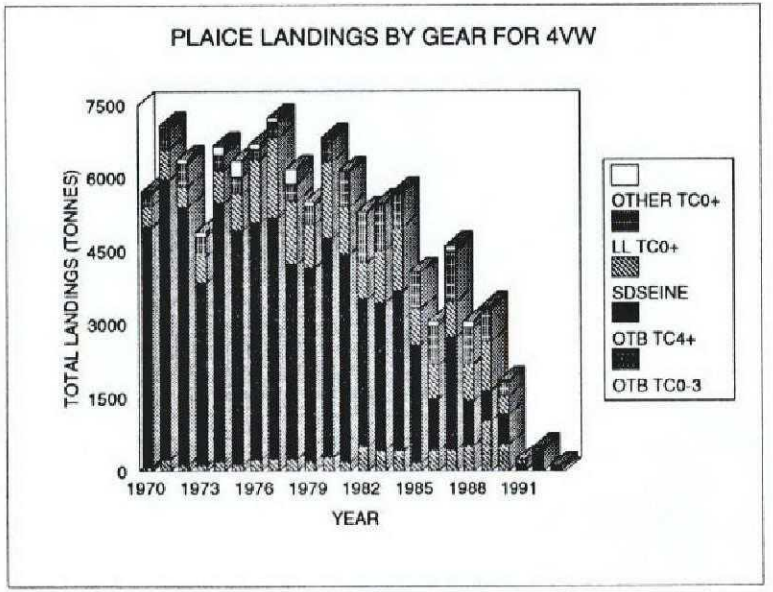

TOTAL FLATFISH LANDINGS
BY SPECIES AND AREA 4X
TOTAL LANDINGS (TONNES)
6500
5200
3900
2600
1300
0
1970 1973 1976 1979 1982 1985 1988 1991
YEAR
UNSPECIFIED
WINTER
YELLOWTAIL
WITCH
PLAICE

Fig. 3


TOTAL PLAICE LANDINGS FOR 4VW AND 4X
TOTAL LANDINGS (TONNES)
18000
14400
10800
7200
3600
0
4VW
4X
1970 1973 1976 1979 1982 1985 1988 1991
YEAR


PLAICE LANDINGS BY GEAR FOR 4VW
TOTAL LANDINGS (TONNES)
7500
6000
4500
3000
1500
0
1970 1973 1976 1979 1982 1985 1988 1991
YEAR
OTHER TC0+
LL TC0+
SDSEINE
OTB TC4+
OTB TC0-3

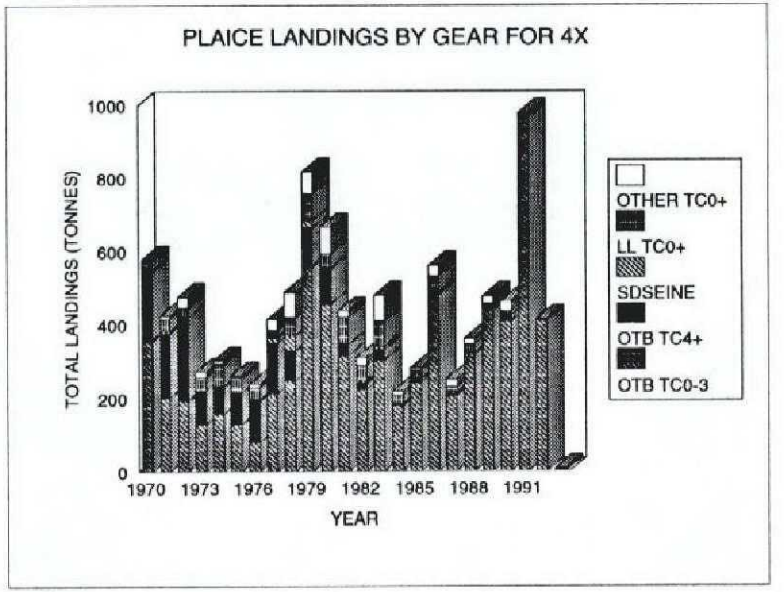
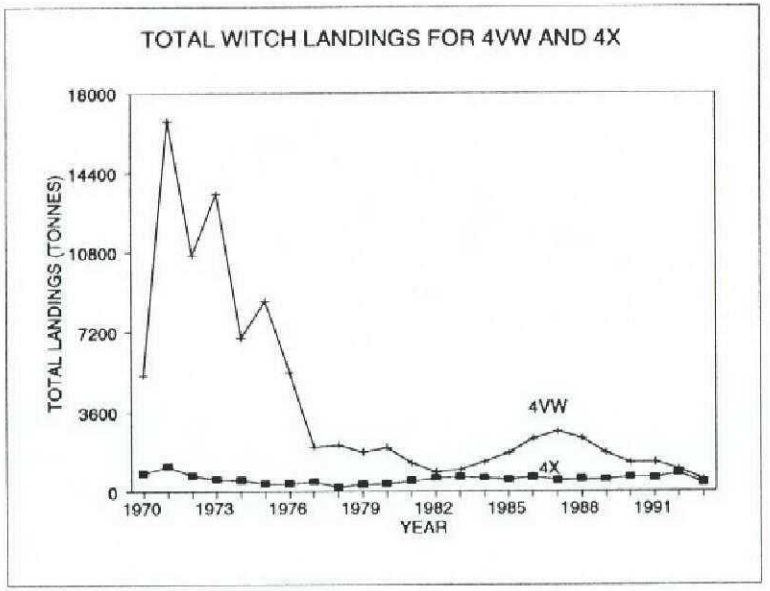
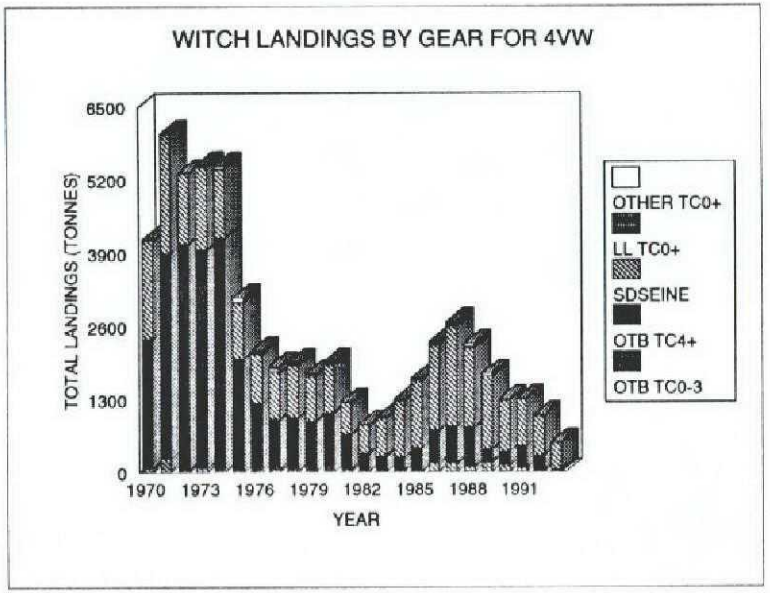

PLAICE LANDINGS BY GEAR FOR 4X
TOTAL LANDINGS (TONNES)
1000
800
600
400
200
0
1970 1973 1976 1979 1982 1985 1988 1991
YEAR
OTHER TC0+
LL TC0+
SDSEINE
OTB TC4+
OTB TC0-3

Fig. 4


TOTAL WITCH LANDINGS FOR 4VW AND 4X
TOTAL LANDINGS (TONNES)
18000
14400
10800
7200
3600
0
1970
1973
1976
1979
1982
1985
1988
1991
YEAR
4VW
4X


WITCH LANDINGS BY GEAR FOR 4VW
TOTAL LANDINGS (TONNES)
6500
5200
3900
2600
1300
0
1970
1973
1976
1979
1982
1985
1988
1991
YEAR
OTHER TC0+
LL TC0+
SDSEINE
OTB TC4+
OTB TC0-3

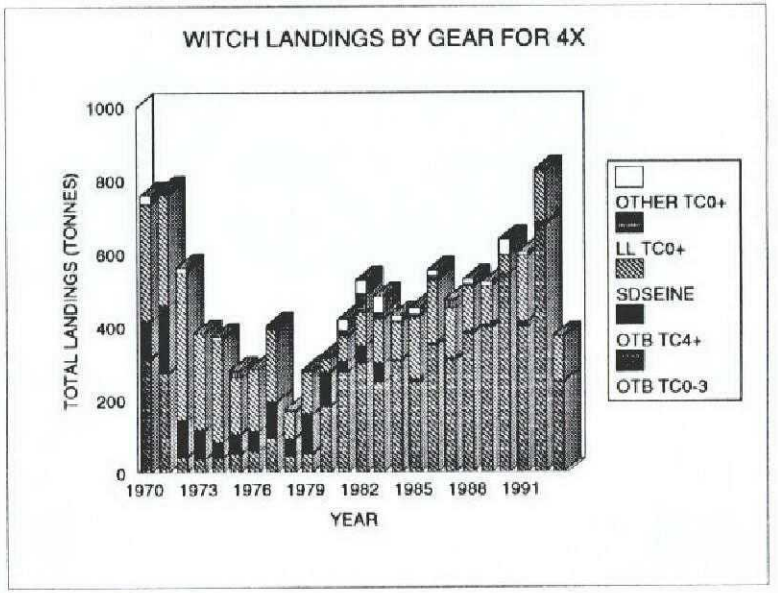
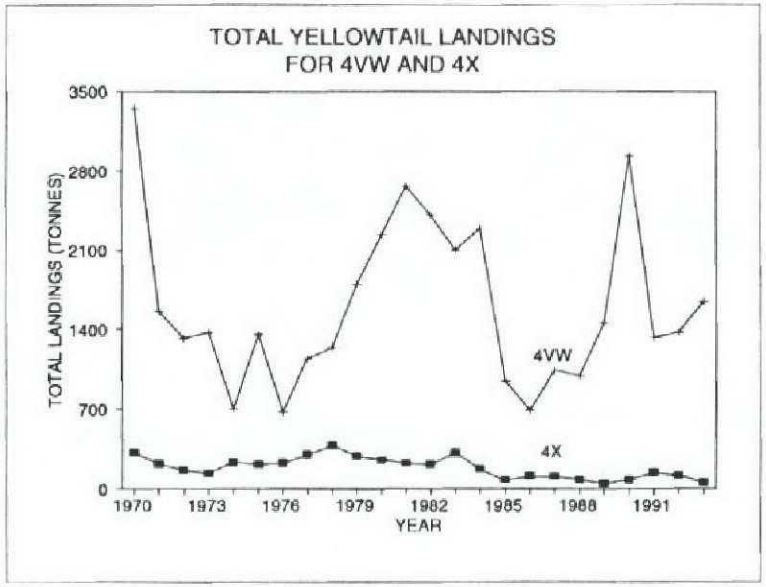
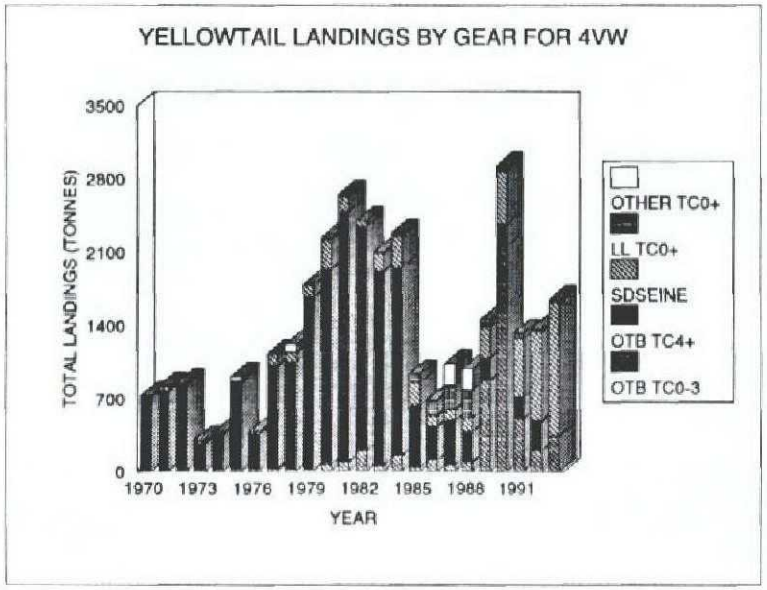

WITCH LANDINGS BY GEAR FOR 4X
TOTAL LANDINGS (TONNES)
1000
800
600
400
200
0
1970
1973
1976
1979
1982
1985
1988
1991
YEAR
OTHER TC0+
LL TC0+
SDSEINE
OTB TC4+
OTB TC0-3

Fig. 5


TOTAL YELLOWTAIL LANDINGS
FOR 4VW AND 4X
TOTAL LANDINGS (TONNES)
3500
2800
2100
1400
700
0
4VW
4X
1970
1973
1976
1979
1982
1985
1988
1991
YEAR


YELLOWTAIL LANDINGS BY GEAR FOR 4VW
TOTAL LANDINGS (TONNES)
3500
2800
2100
1400
700
0
1970
1973
1976
1979
1982
1985
1988
1991
YEAR
OTHER TC0+
LL TC0+
SDSEINE
OTB TC4+
OTB TC0-3

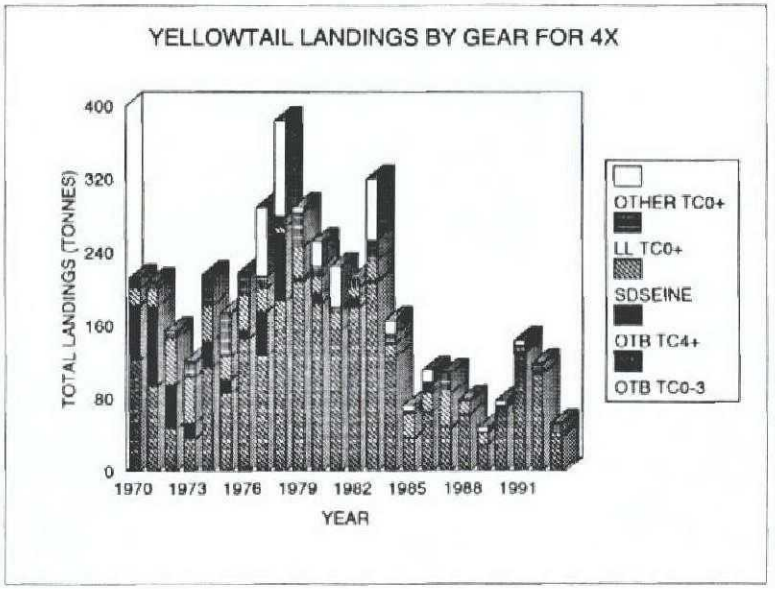
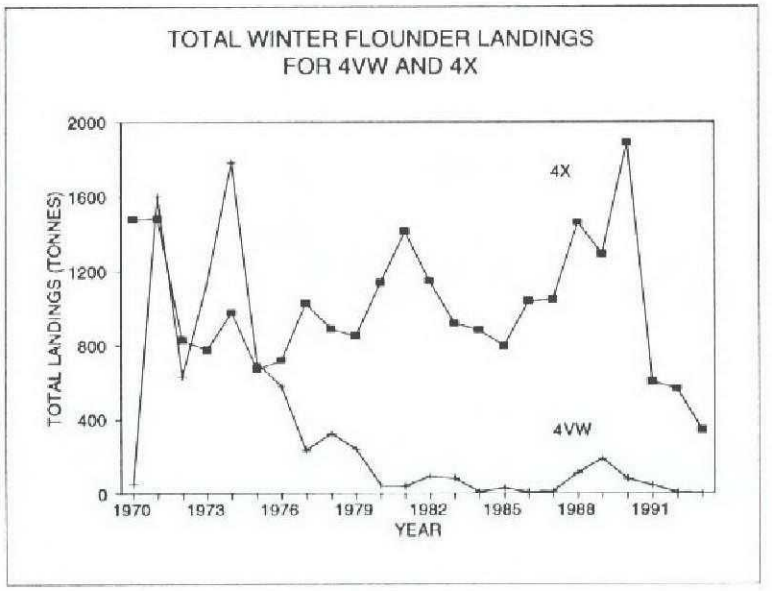
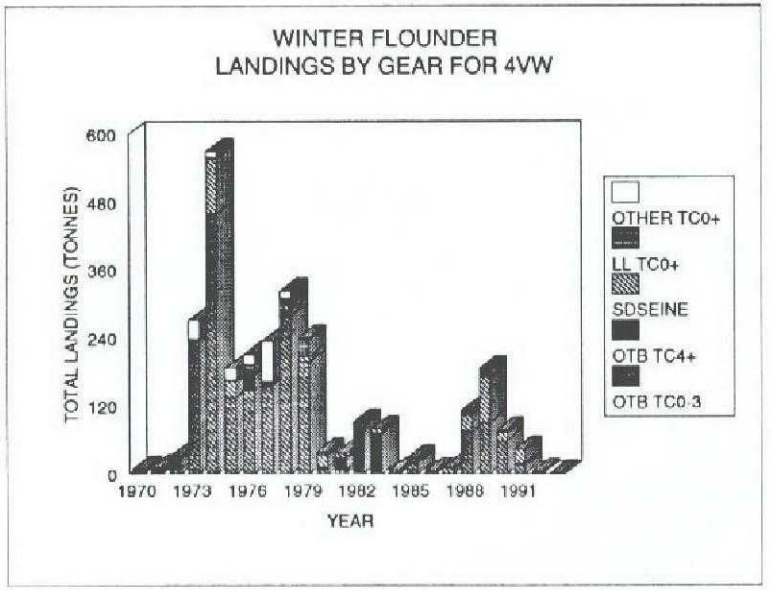

YELLOWTAIL LANDINGS BY GEAR FOR 4X
TOTAL LANDINGS (TONNES)
400
320
240
160
80
0
1970
1973
1976
1979
1982
1985
1988
1991
YEAR
OTHER TC0+
LL TC0+
SDSEINE
OTB TC4+
OTB TC0-3

Fig. 6


TOTAL WINTER FLOUNDER LANDINGS
FOR 4VW AND 4X
TOTAL LANDINGS (TONNES)
2000
1600
1200
800
400
0
4X
4VW
1970
1973
1976
1979
1982
1985
1988
1991
YEAR


WINTER FLOUNDER
LANDINGS BY GEAR FOR 4VW
TOTAL LANDINGS (TONNES)
600
480
360
240
120
0
1970
1973
1976
1979
1982
1985
1988
1991
YEAR
OTHER TC0+
LL TC0+
SDSEINE
OTB TC4+
OTB TC0-3

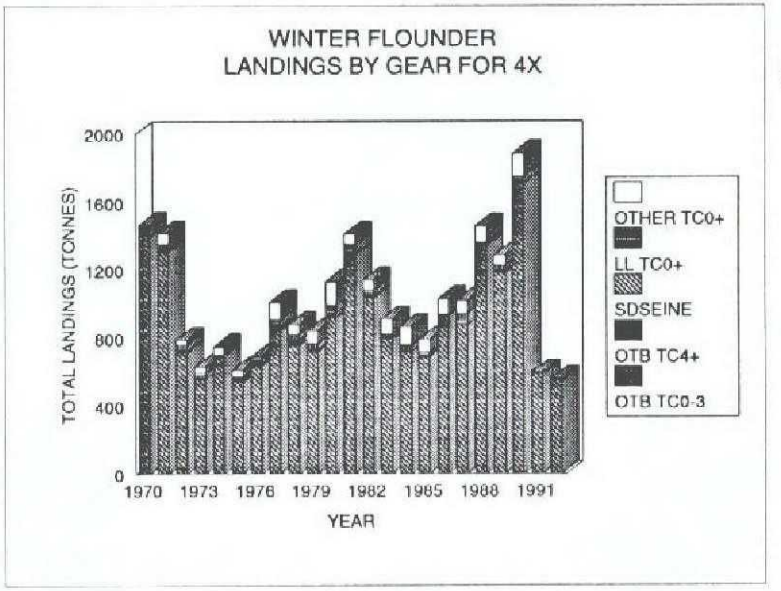
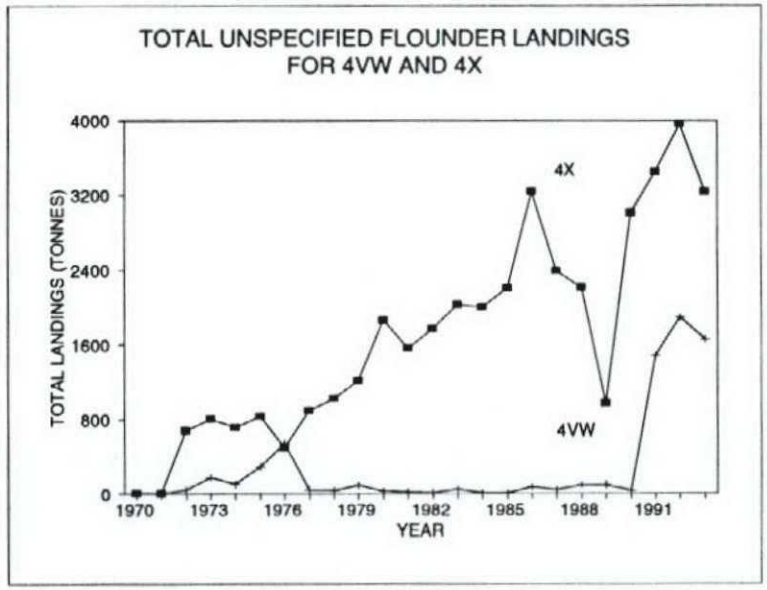
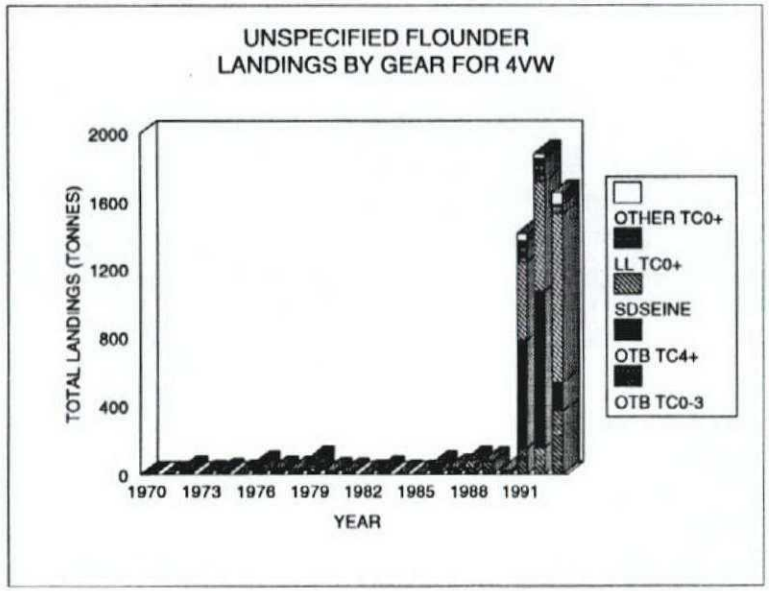

WINTER FLOUNDER
LANDINGS BY GEAR FOR 4X
TOTAL LANDINGS (TONNES)
2000
1600
1200
800
400
0
1970
1973
1976
1979
1982
1985
1988
1991
YEAR
OTHER TC0+
LL TC0+
SDSEINE
OTB TC4+
OTB TC0-3

Fig. 7


TOTAL UNSPECIFIED FLOUNDER LANDINGS
FOR 4VW AND 4X
TOTAL LANDINGS (TONNES)
4000
3200
2400
1600
800
0
4X
4VW
1970
1973
1976
1979
1982
1985
1988
1991
YEAR


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

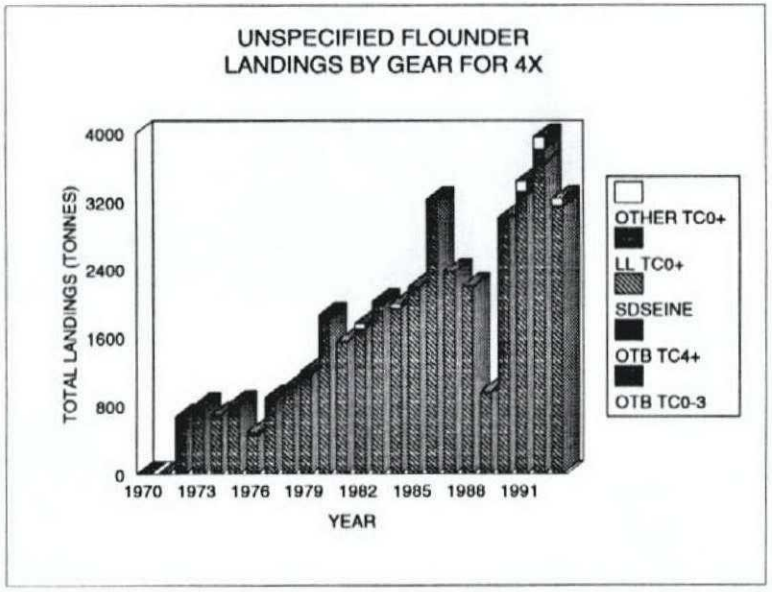

UNSPECIFIED FLOUNDER
LANDINGS BY GEAR FOR 4X
TOTAL LANDINGS (TONNES)
4000
3200
2400
1600
800
0
1970
1973
1976
1979
1982
1985
1988
1991
YEAR
OTHER TC0+
LL TC0+
SDSEINE
OTB TC4+
OTB TC0-3

Fig. 8

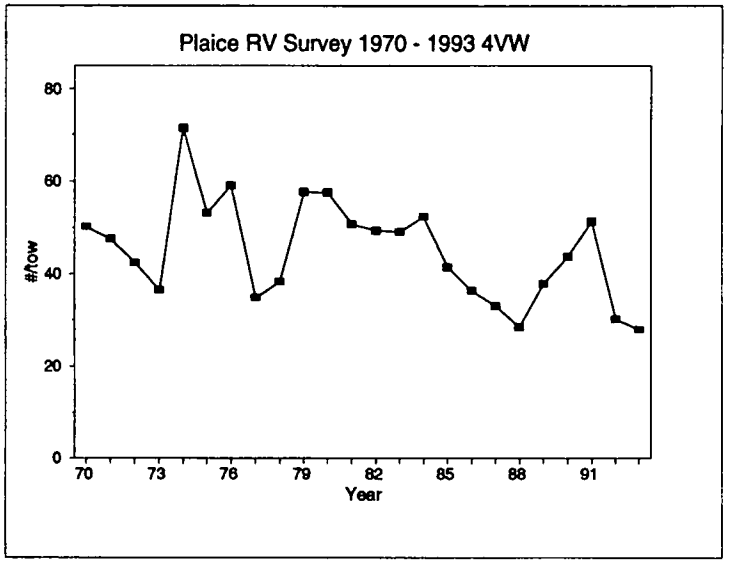


Fig. 9a.

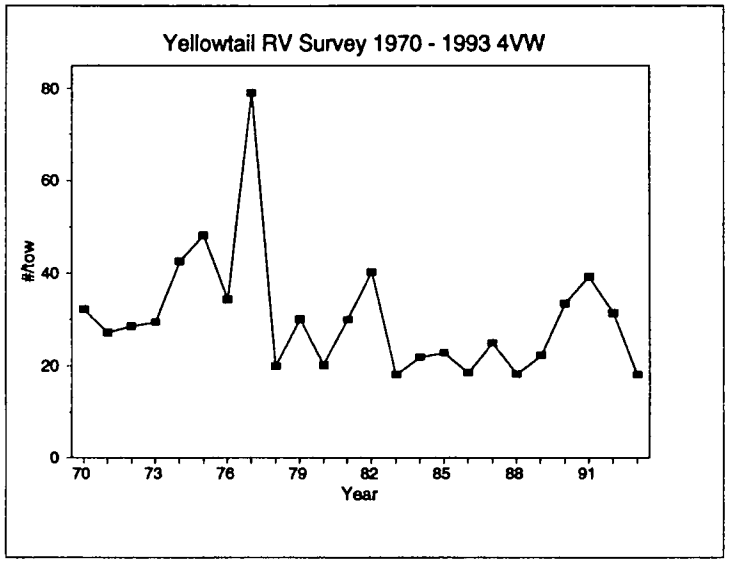


Fig. 9b.

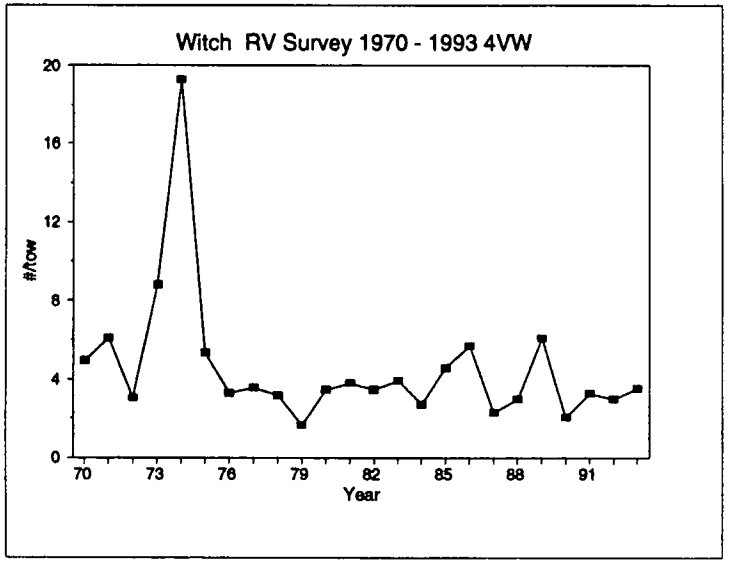


Fig. 9c.

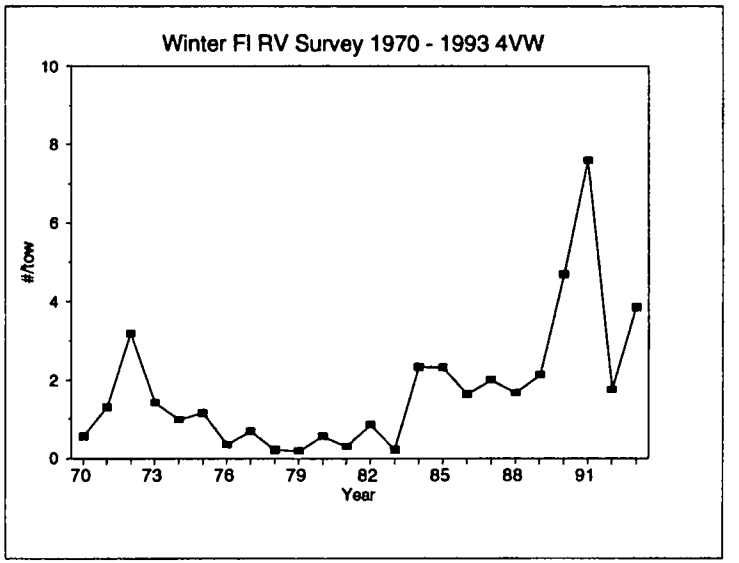


Fig. 9d.

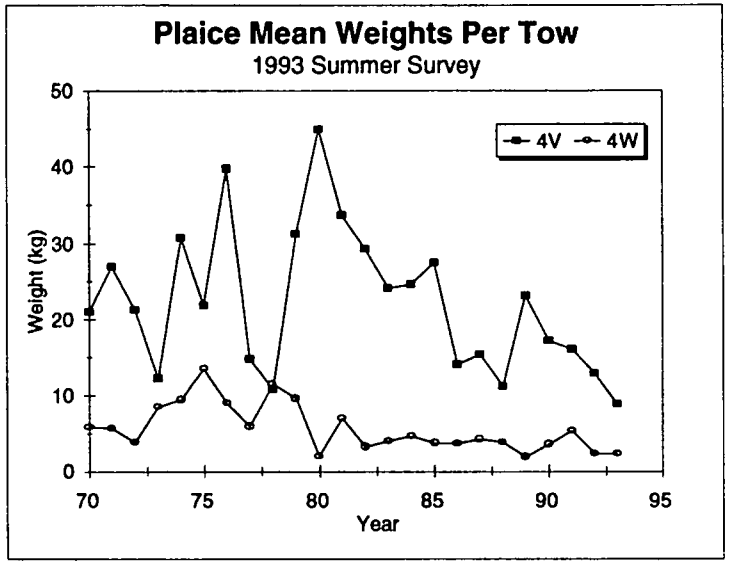


Fig. 10a

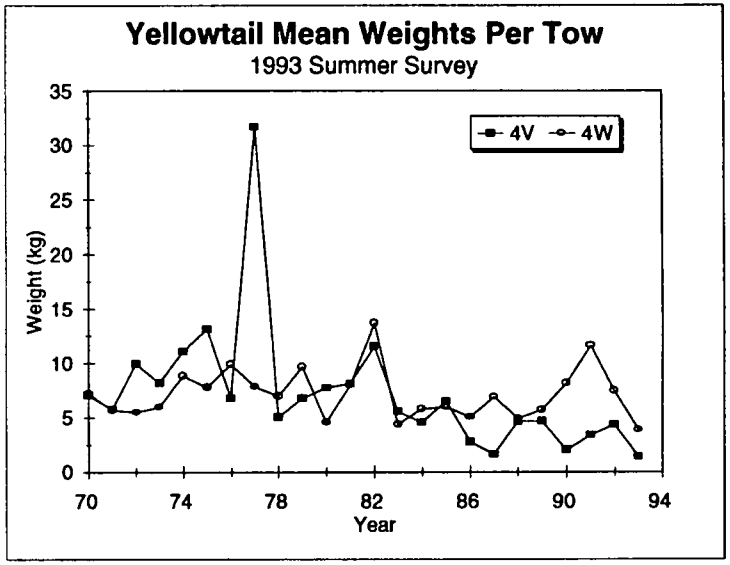


Fig. 10b

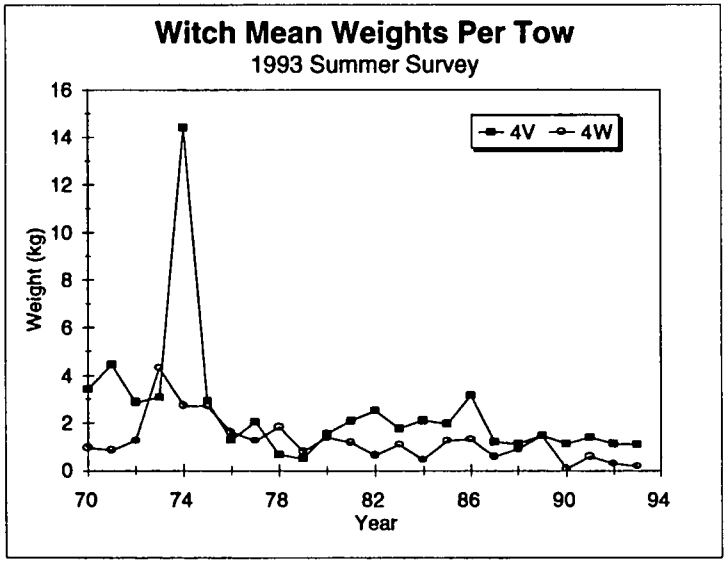


Fig. 10c

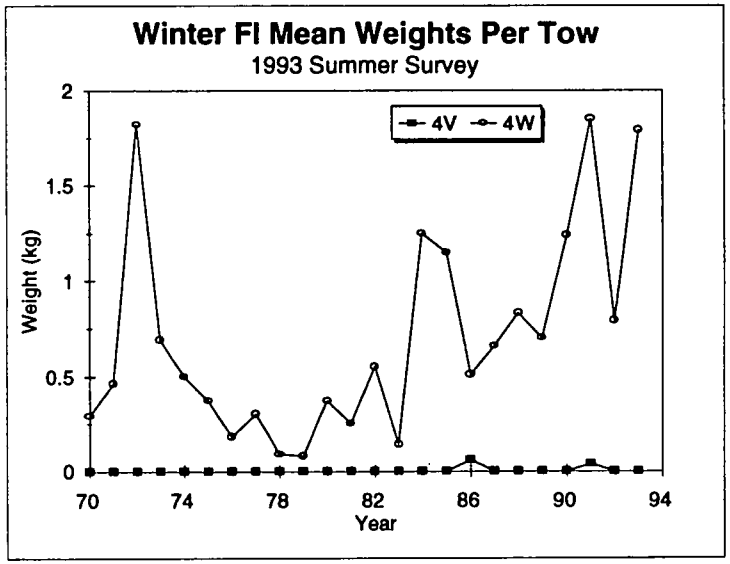


Fig. 10d

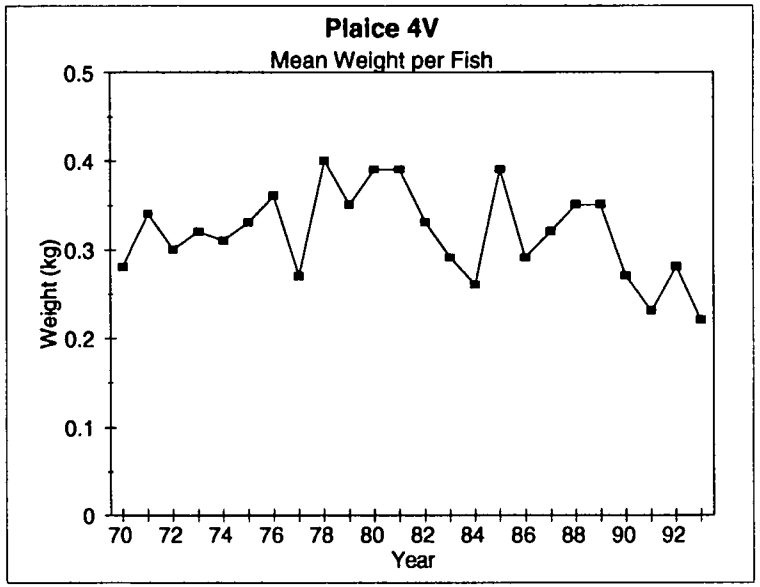


Fig. 11a

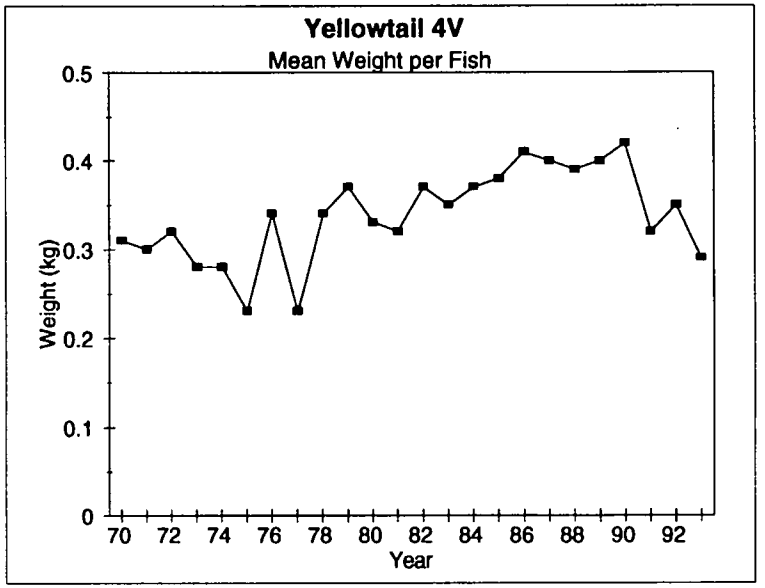


Fig. 11b

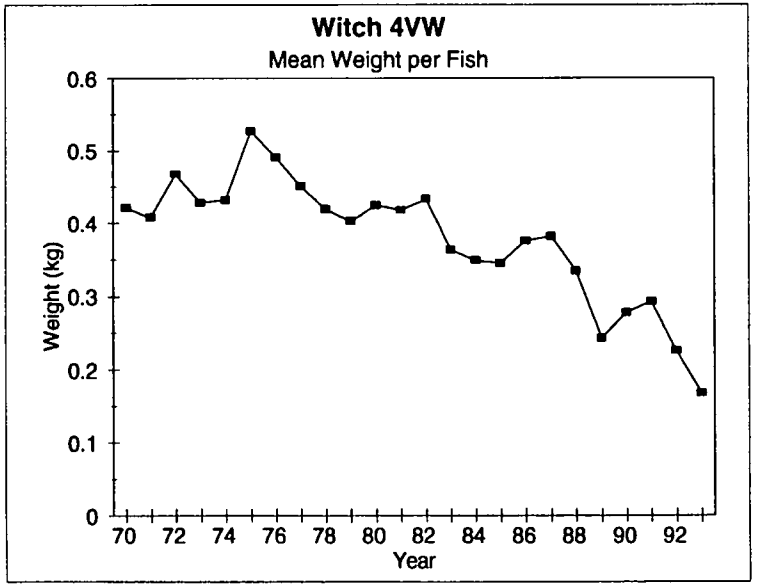
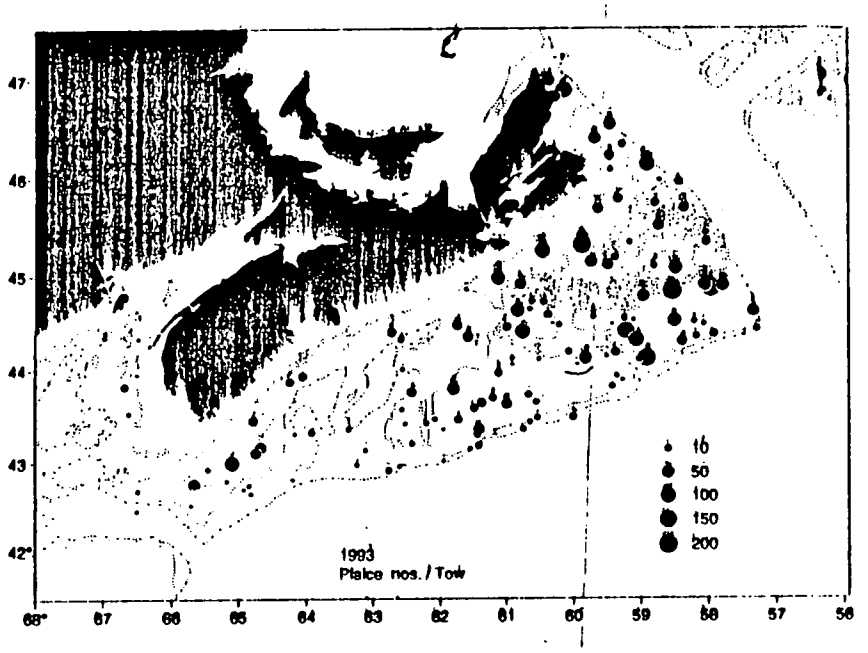
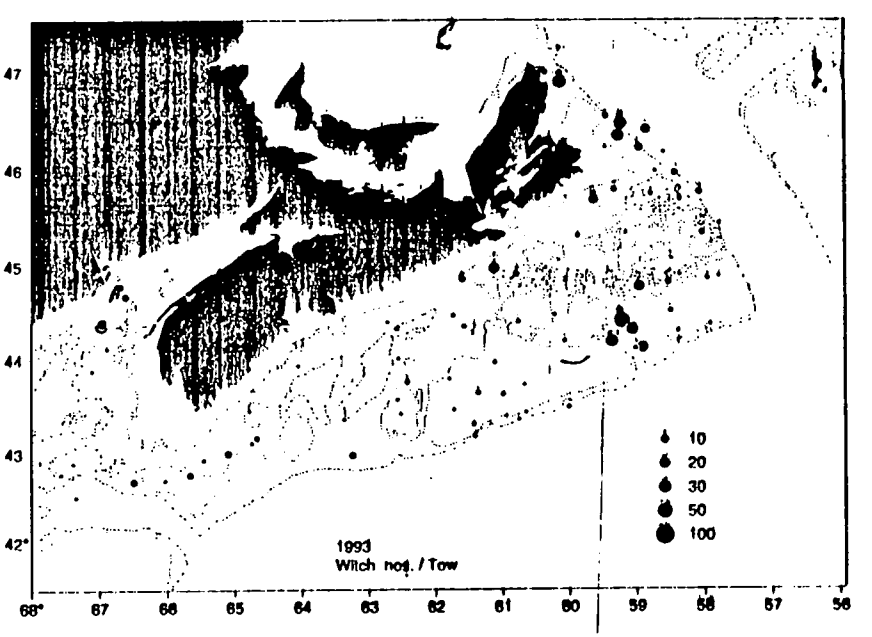
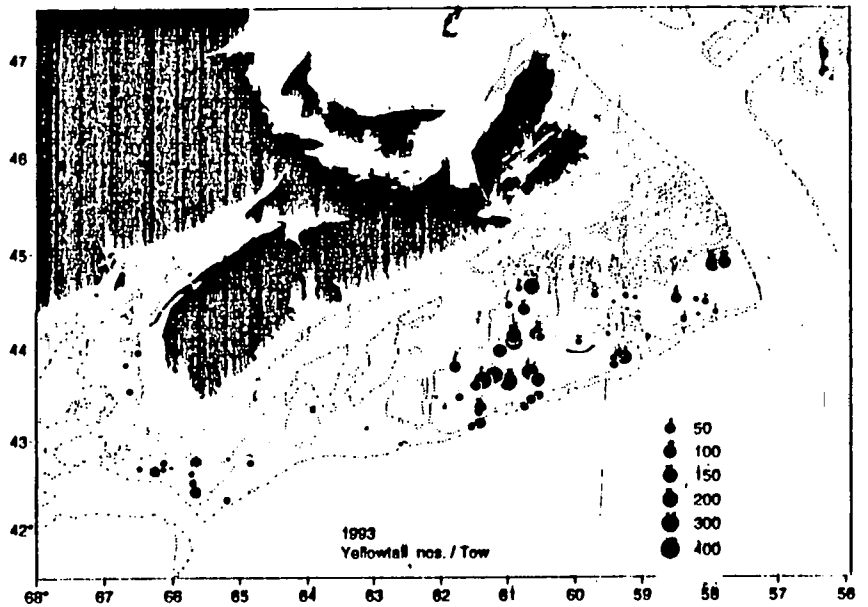


Fig. 11c







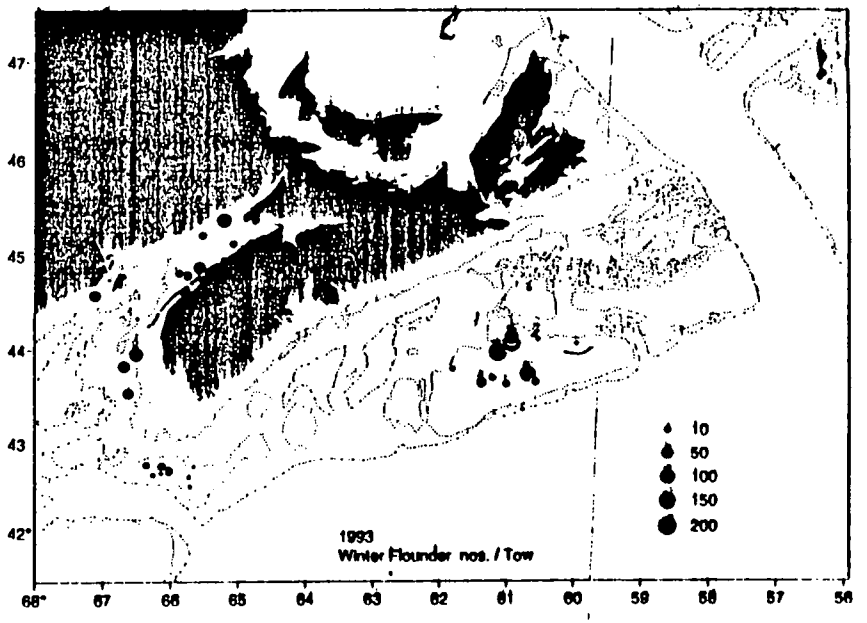


Fig. 12 Flatfish nos. per tow by species from 1993 summer survey.

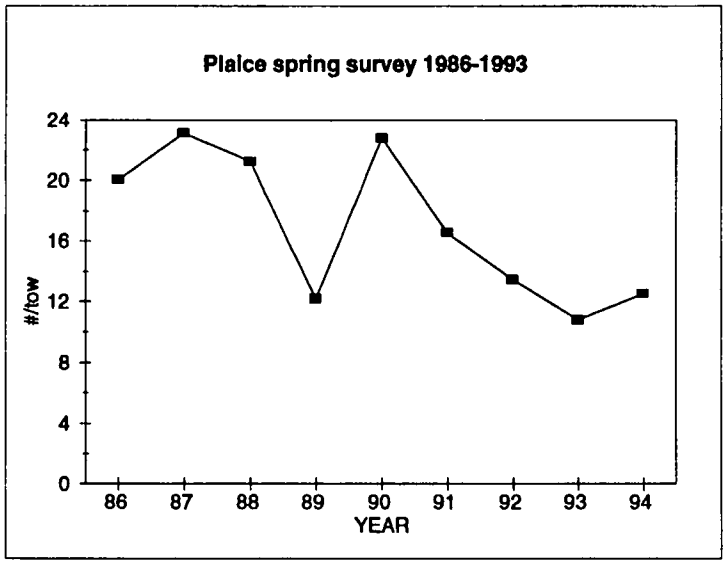


Fig. 13a

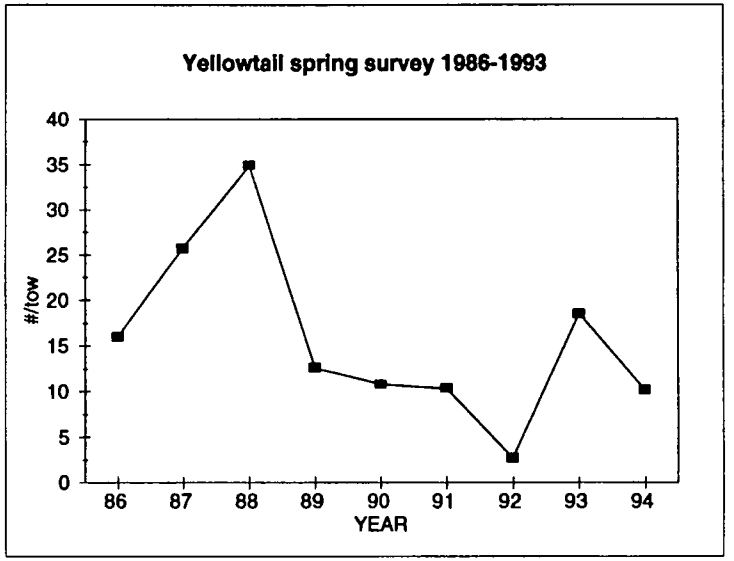


Fig. 13b

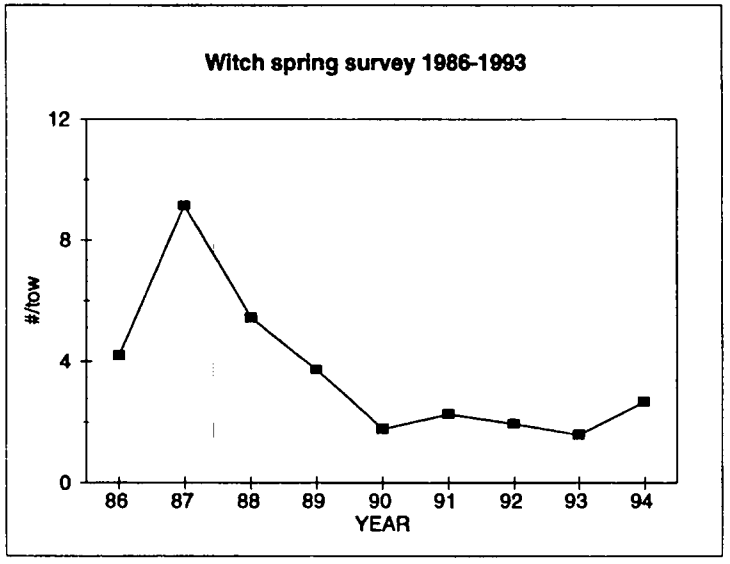


Fig. 13c

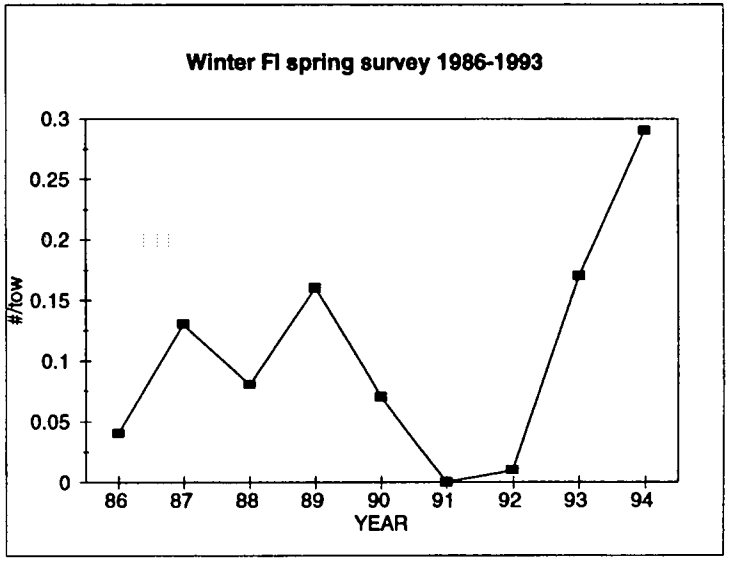
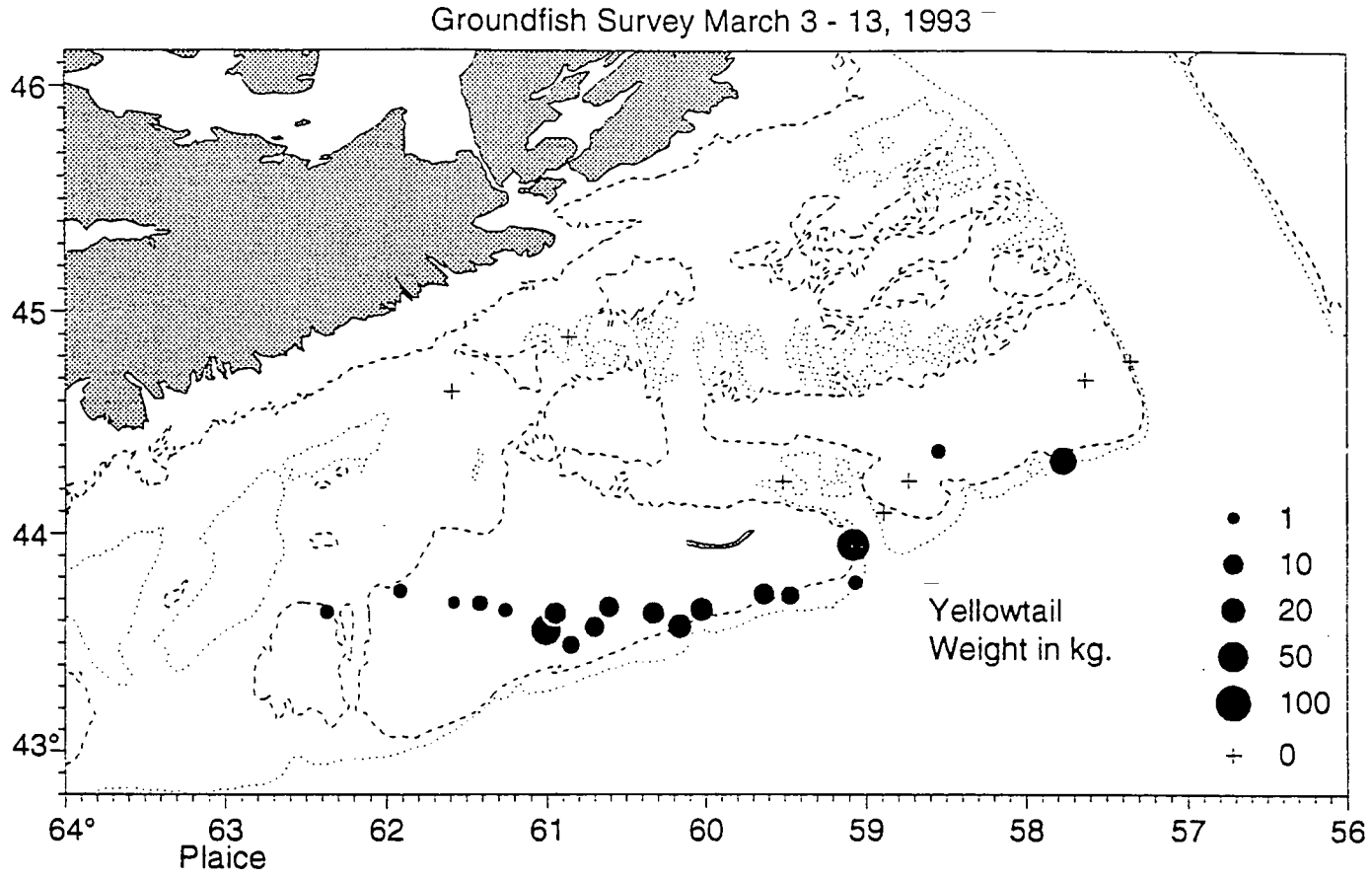


Fig. 13d


Groundfish Survey March 3 - 13, 1993
46
45
44
43°
64°
63
62
61
60
59
58
57
56
Plaice
Yellowtail
Weight in kg.
1
10
20
50
100
0

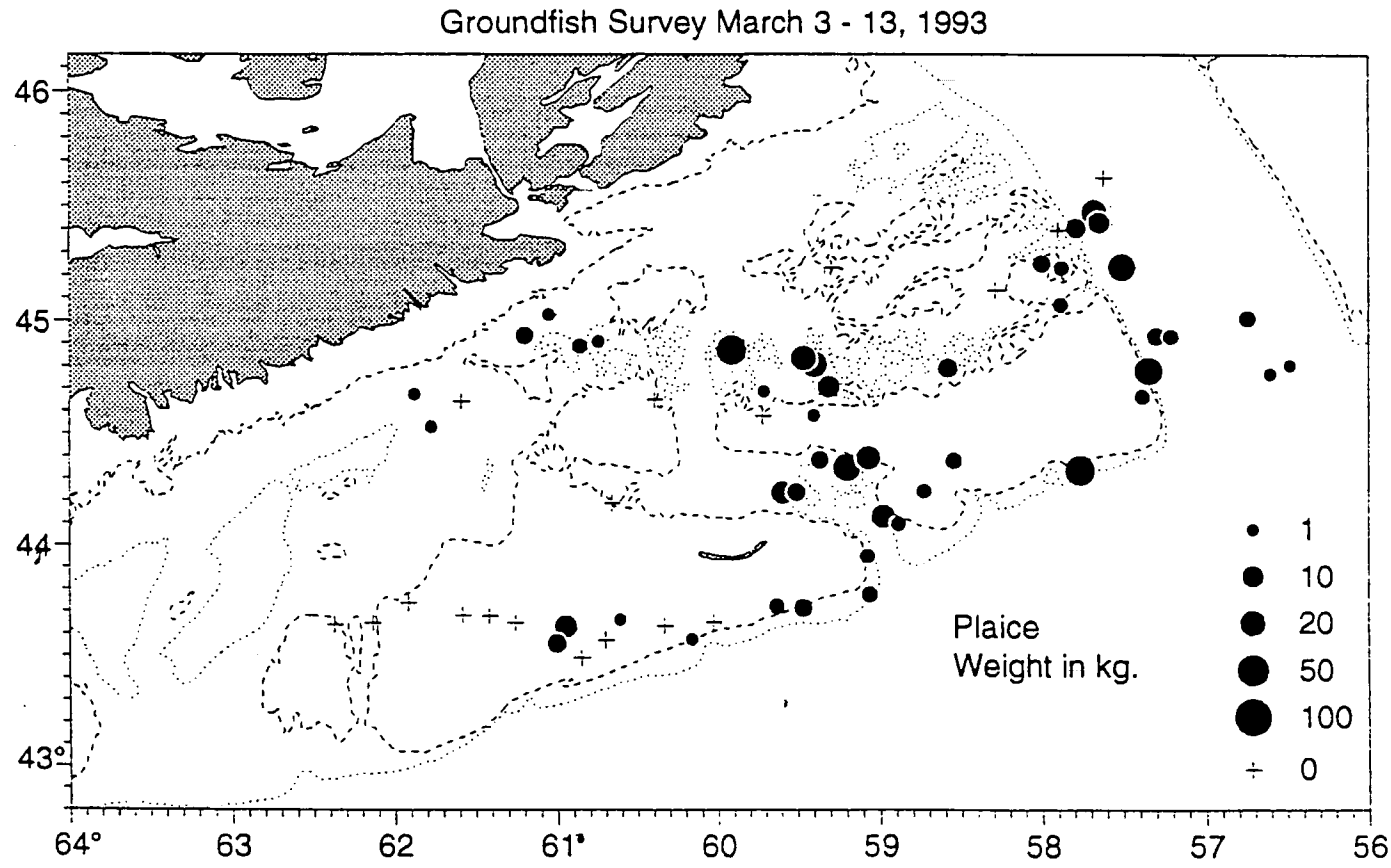
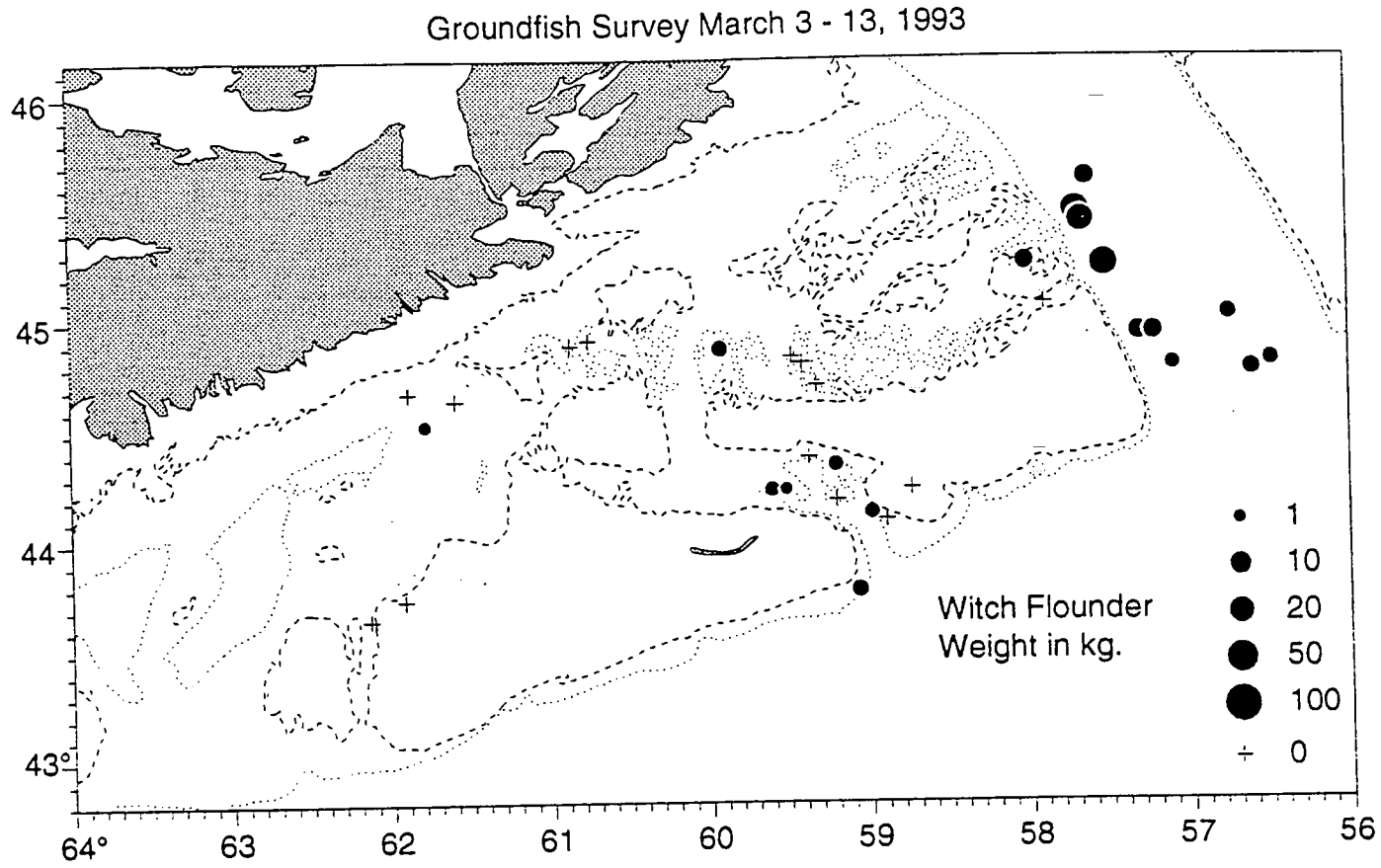

Groundfish Survey March 3 - 13, 1993
46
45
44
43°
64°
63
62
61
60
59
58
57
56
Plaice
Weight in kg.
1
10
20
50
100
0

Fig. 14


Groundfish Survey March 3 - 13, 1993
46
45
44
43°
64°
63
62
61
60
59
58
57
56
Witch Flounder
Weight in kg.
1
10
20
50
100
0

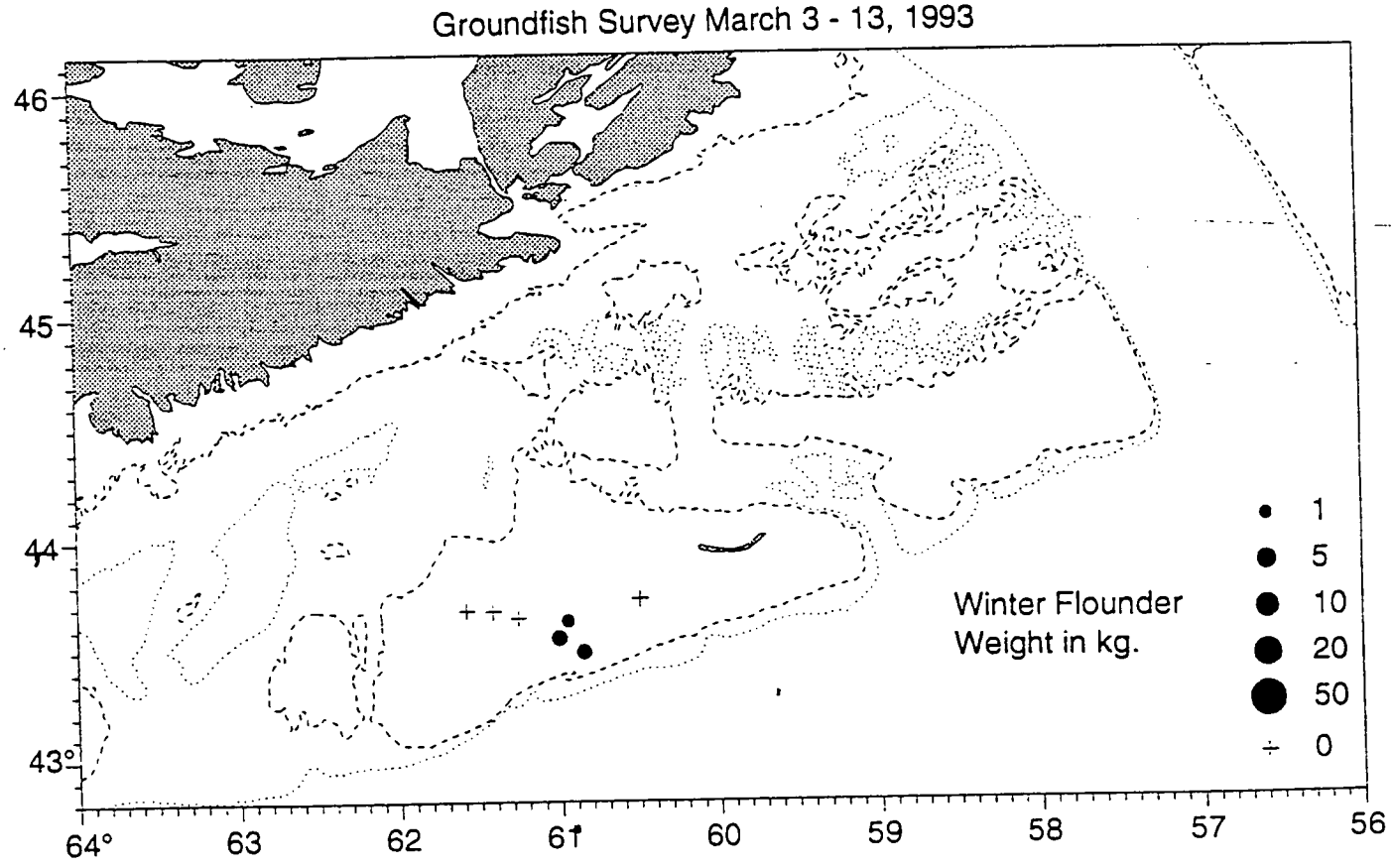
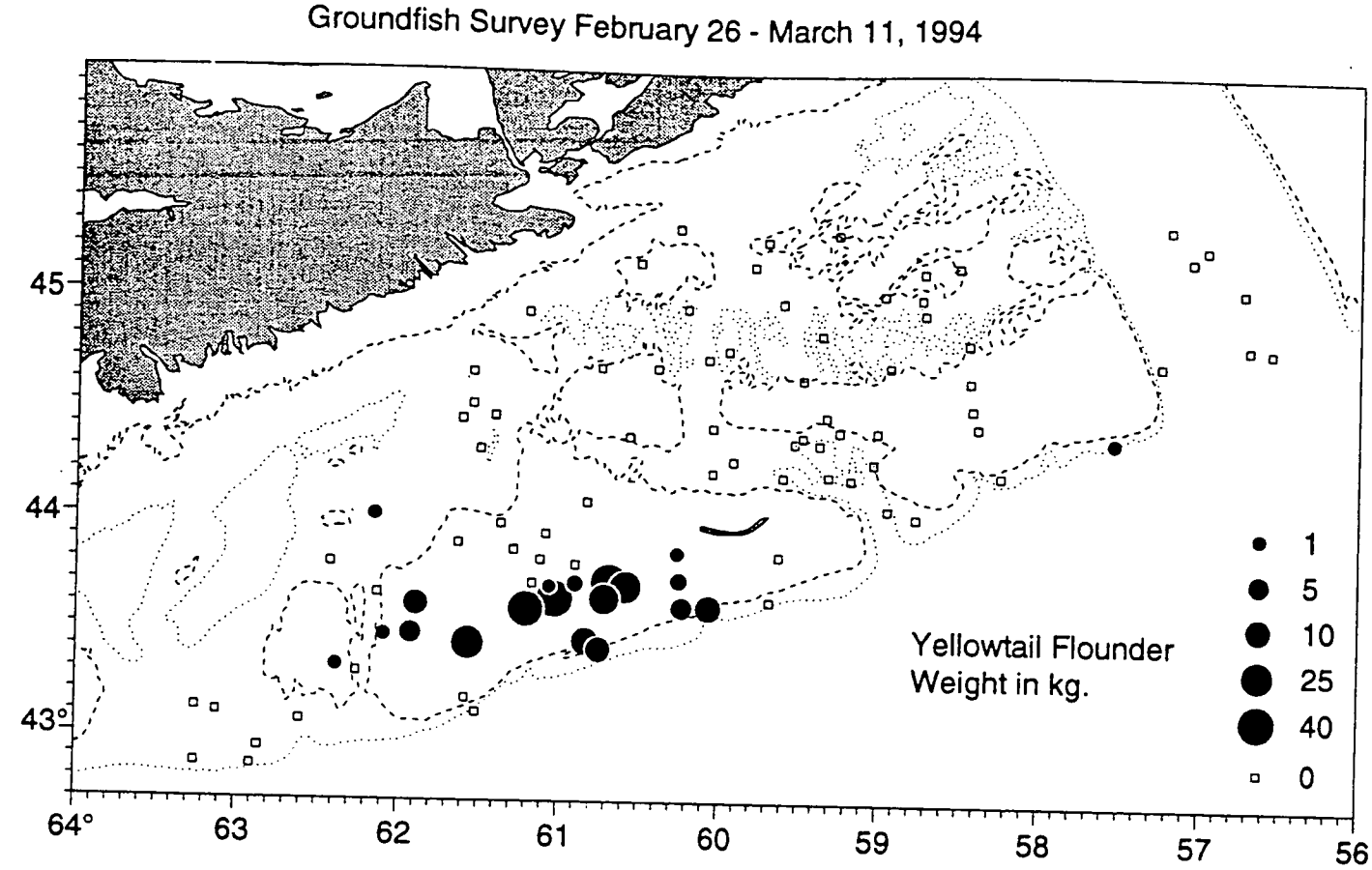

Groundfish Survey March 3 - 13, 1993
46
45
44
43°
64°
63
62
61
60
59
58
57
56
Winter Flounder
Weight in kg.
1
5
10
20
50
0

Fig. 14 (cont.)


Groundfish Survey February 26 - March 11, 1994
45
44
43°
64°
63
62
61
60
59
58
57
56
Yellowtail Flounder
Weight in kg.
1
5
10
25
40
0

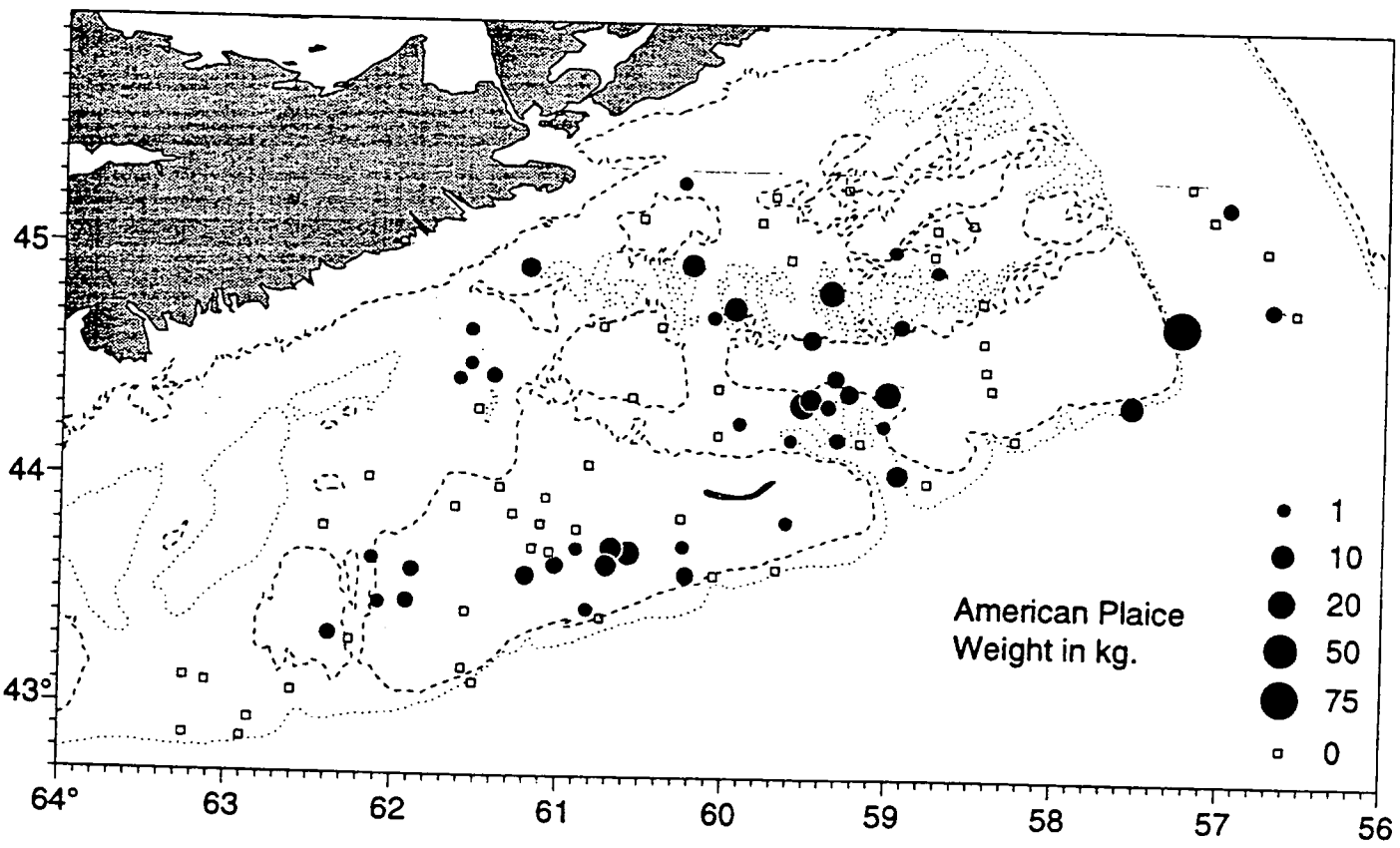
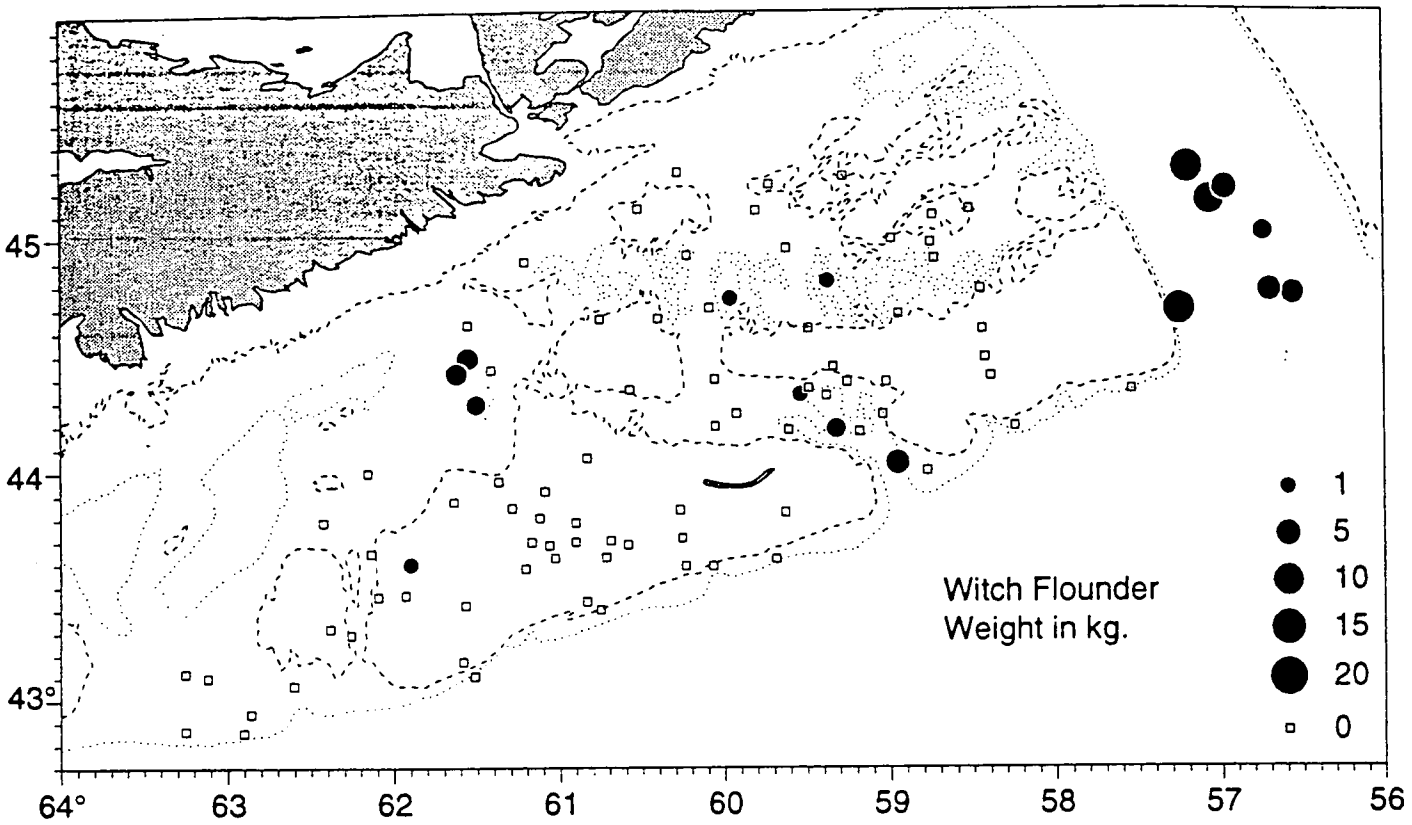

45
44
43°
64°
63
62
61
60
59
58
57
56
American Plaice
Weight in kg.
1
10
20
50
75
0

Fig. 14 (cont.)

Groundfish Survey February 26 - March 11, 1994



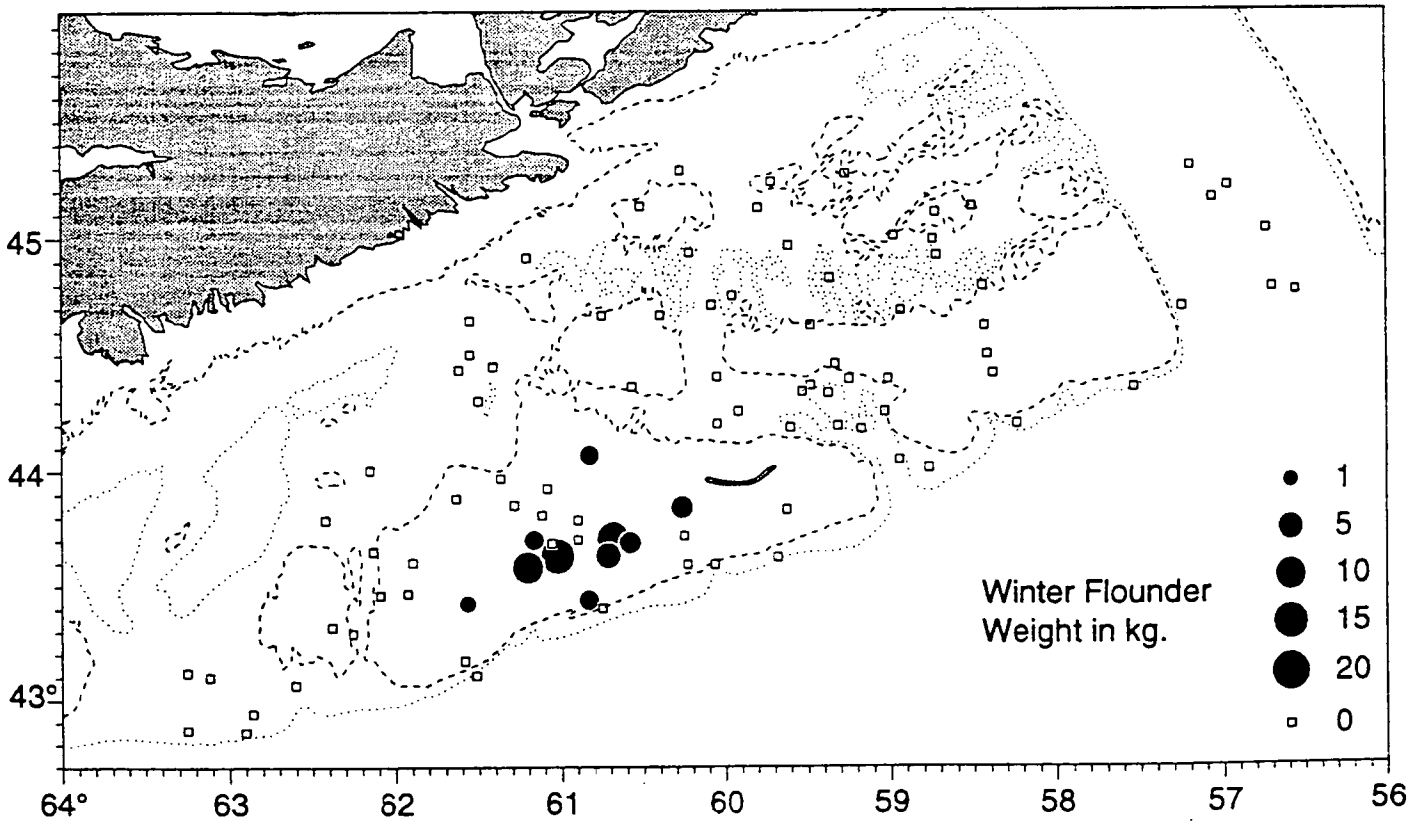
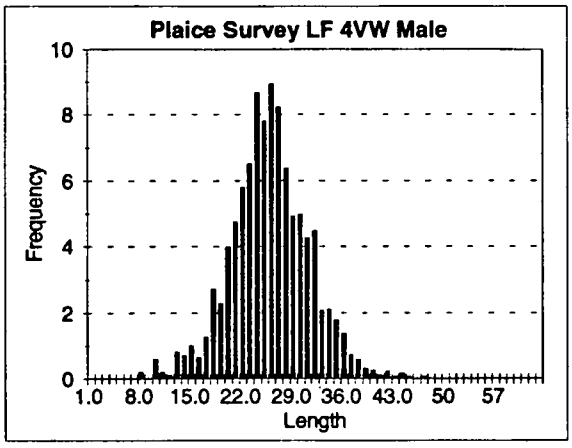


Fig. 14 (cont.)



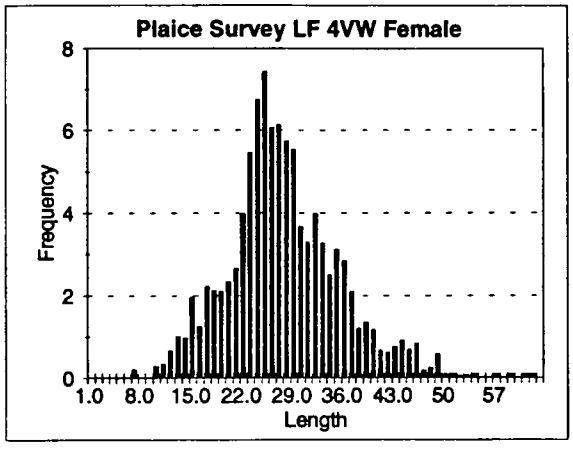
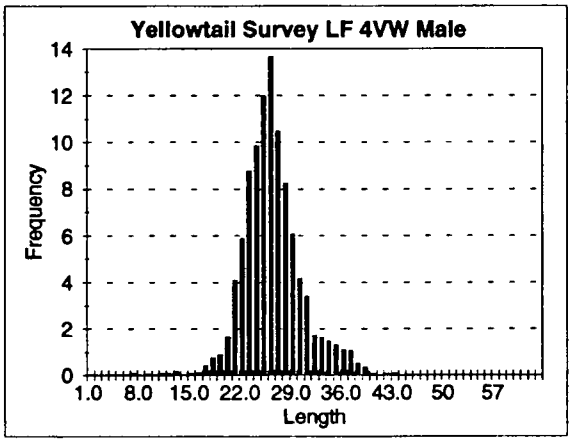


Fig. 15a



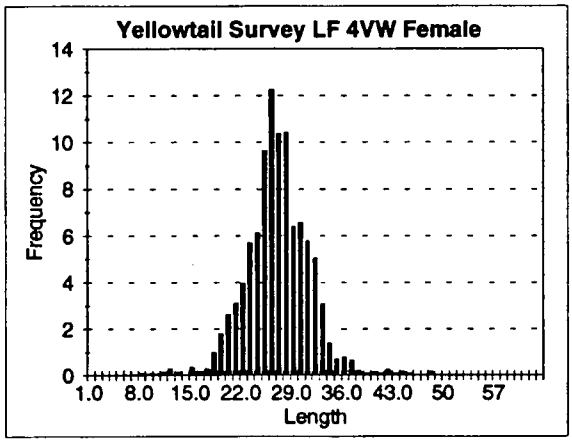
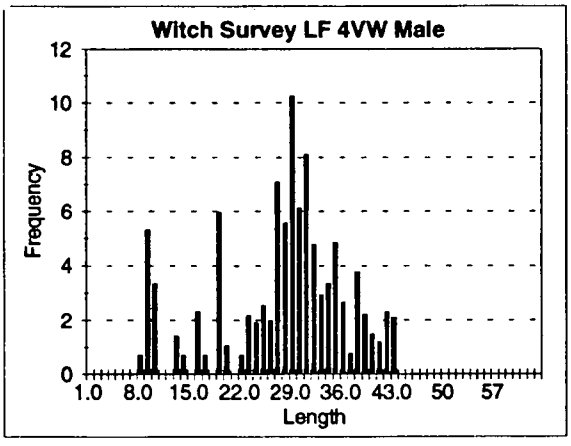


Fig. 15b



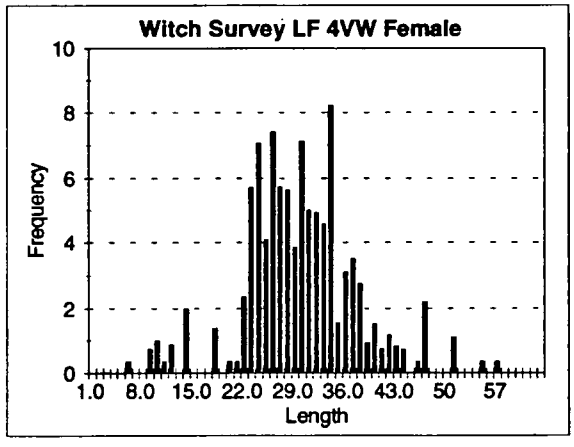
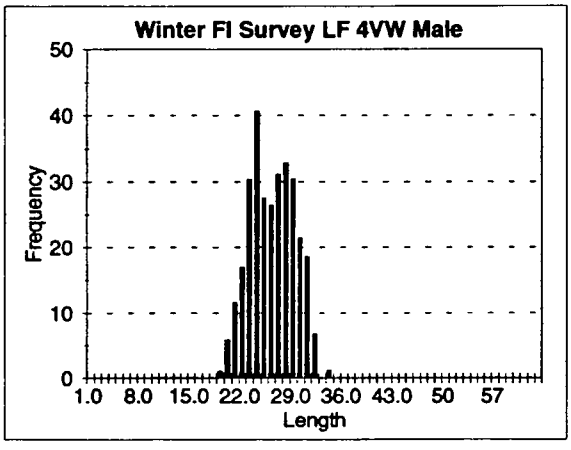


Fig. 15c



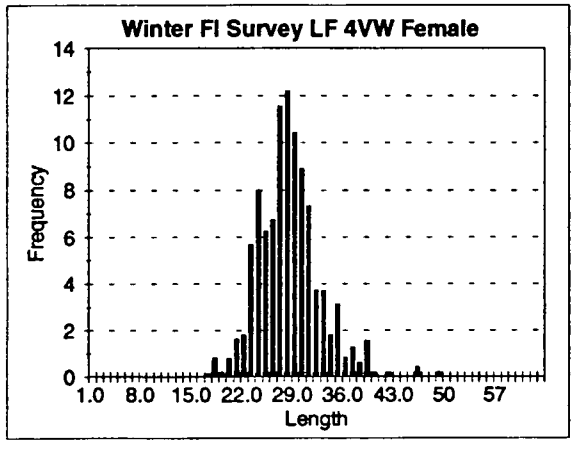
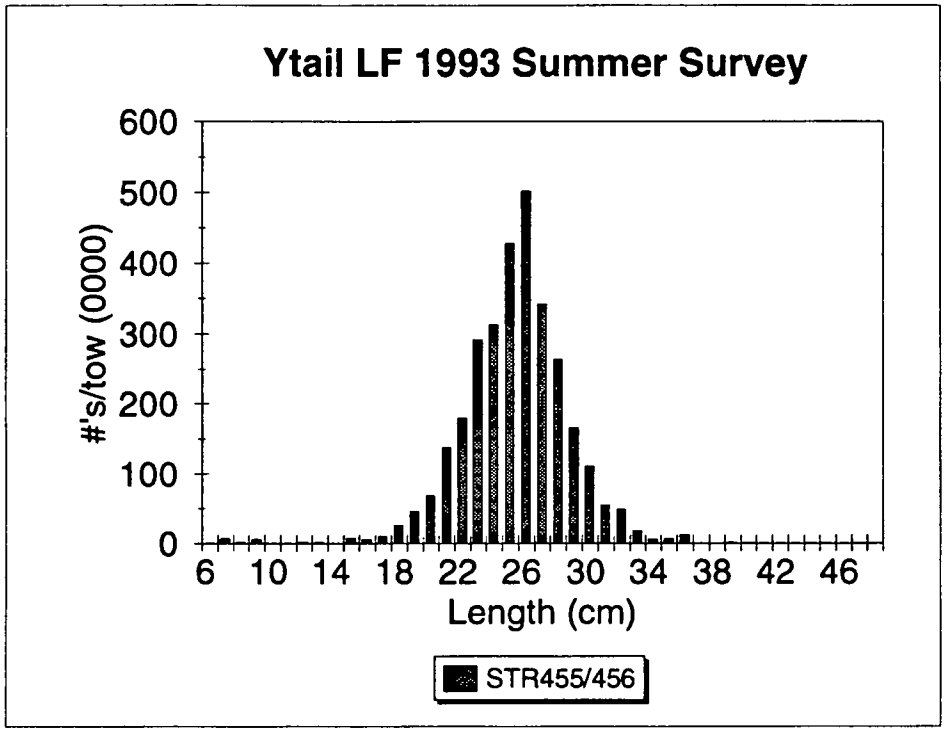


Fig. 15d

Figs. 15a-d. Length frequencies from 1993 summer research vessel surveys for 4VW flatfish.


Ytail LF 1993 Summer Survey
#'s/tow (0000)
600
500
400
300
200
100
0
6 10 14 18 22 26 30 34 38 42 46
Length (cm)
STR455/456

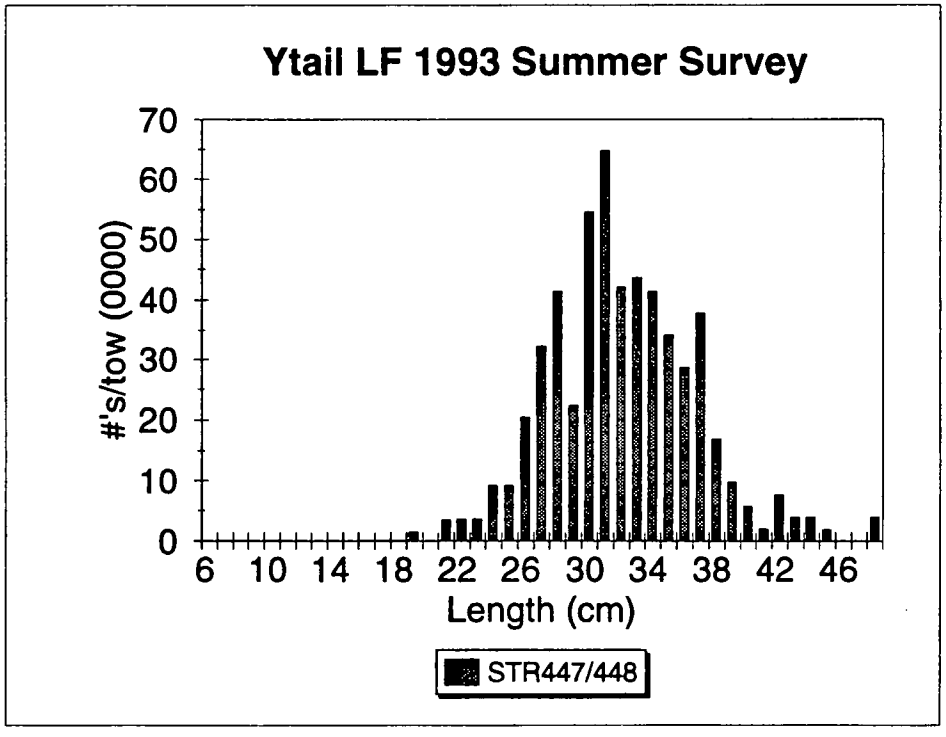

Ytail LF 1993 Summer Survey
#'s/tow (0000)
70
60
50
40
30
20
10
0
6 10 14 18 22 26 30 34 38 42 46
Length (cm)
STR447/448

Fig. 16

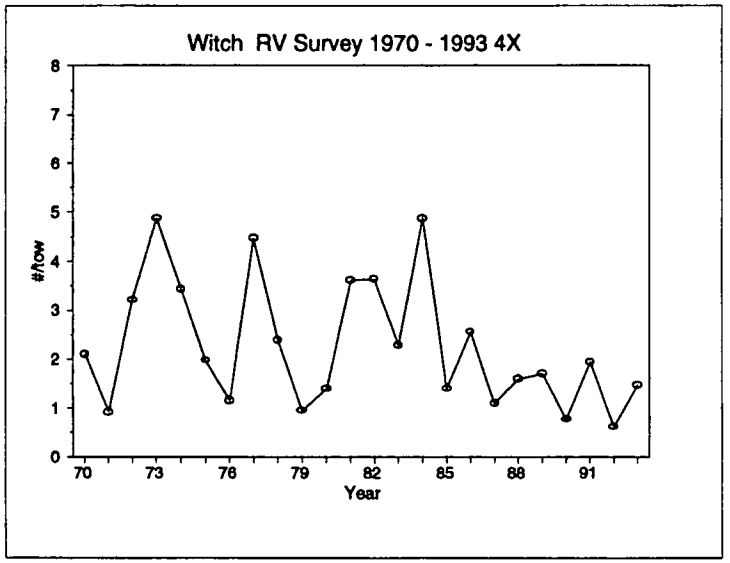


Fig. 17a

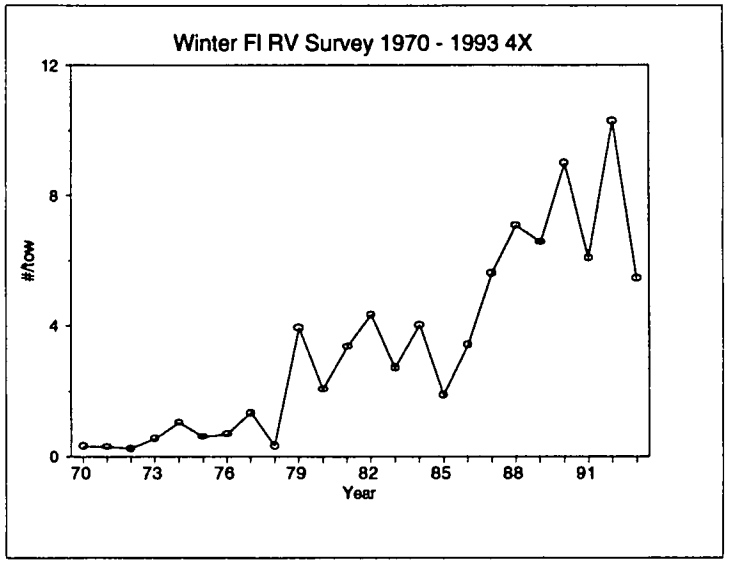


Fig. 17b

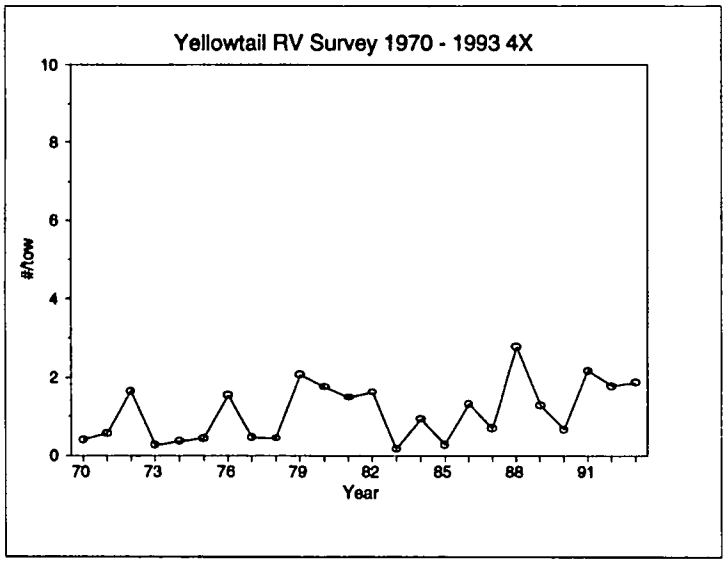


Fig. 17c

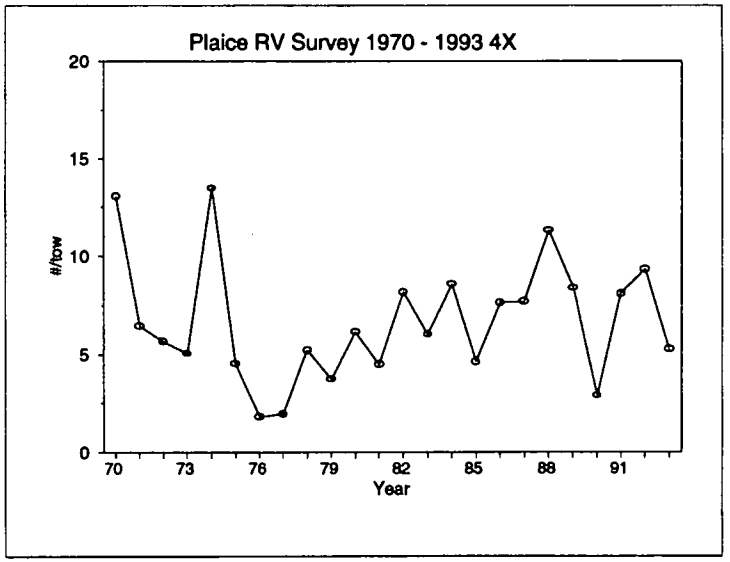


Fig. 17d

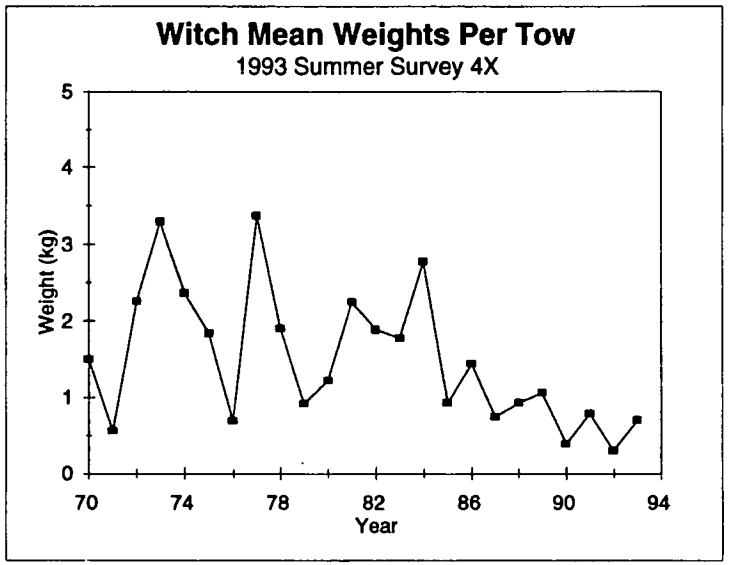


Fig. 18a

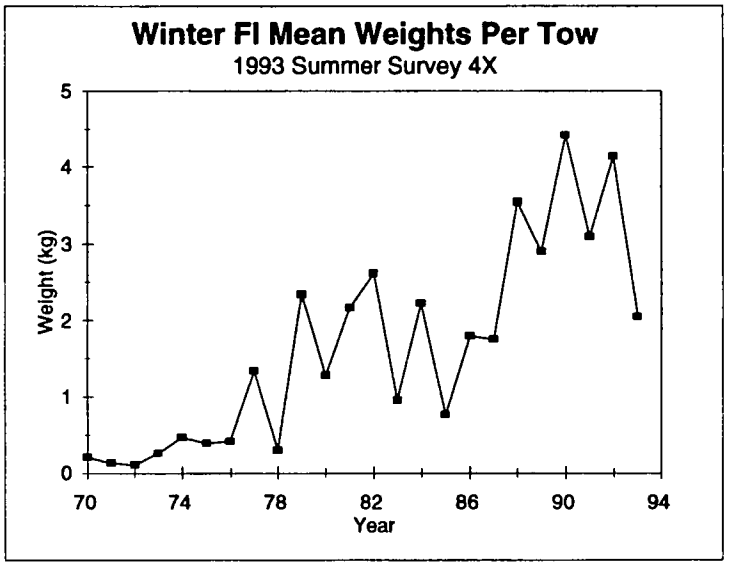


Fig. 18b

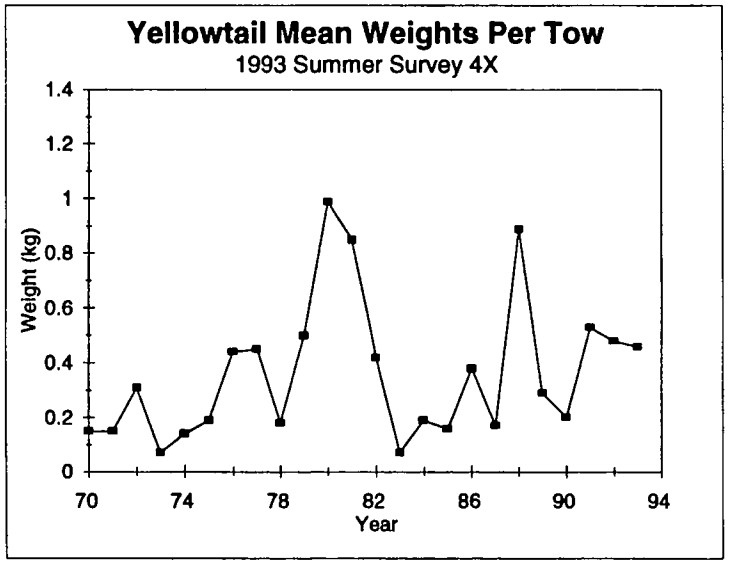


Fig. 18c

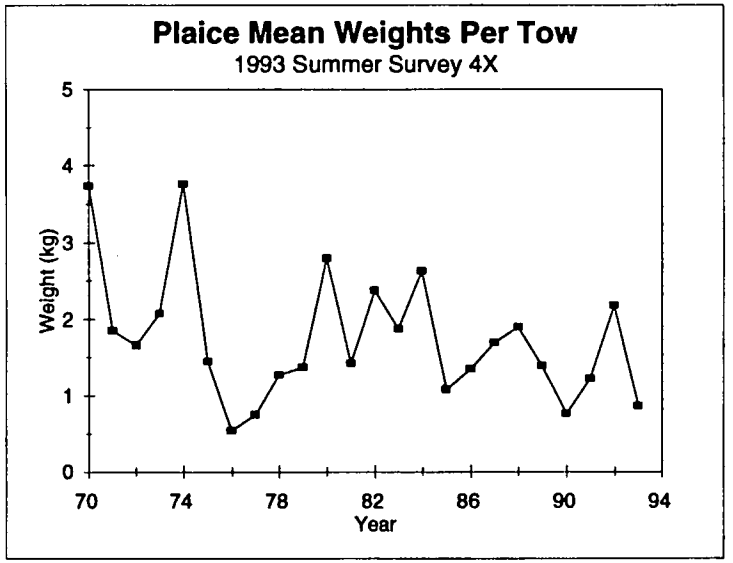


Fig. 18d

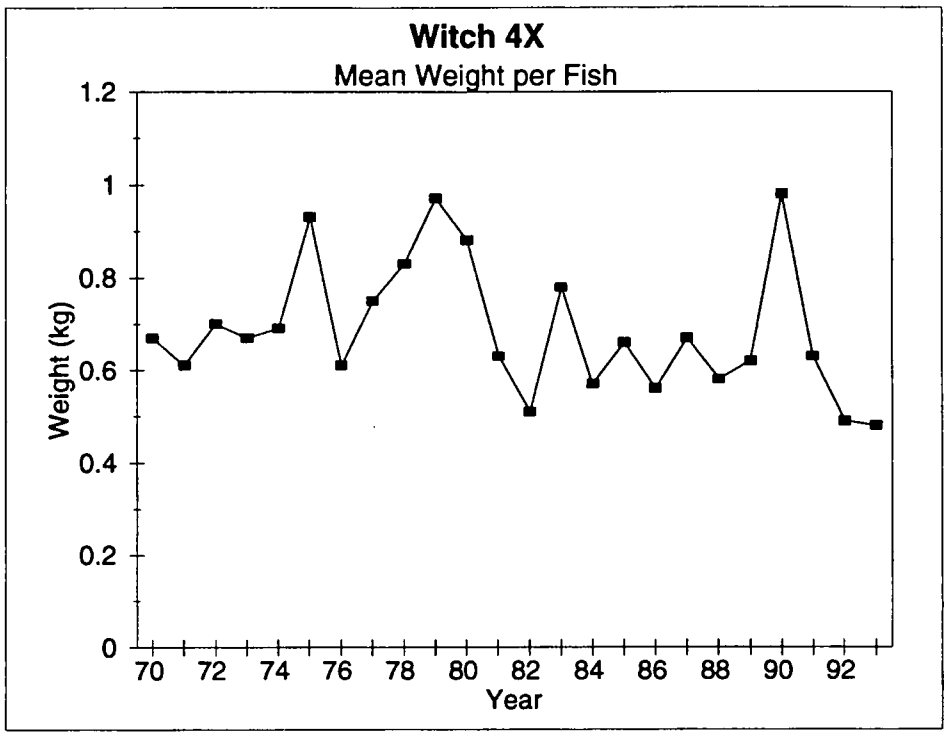


Fig. 19a

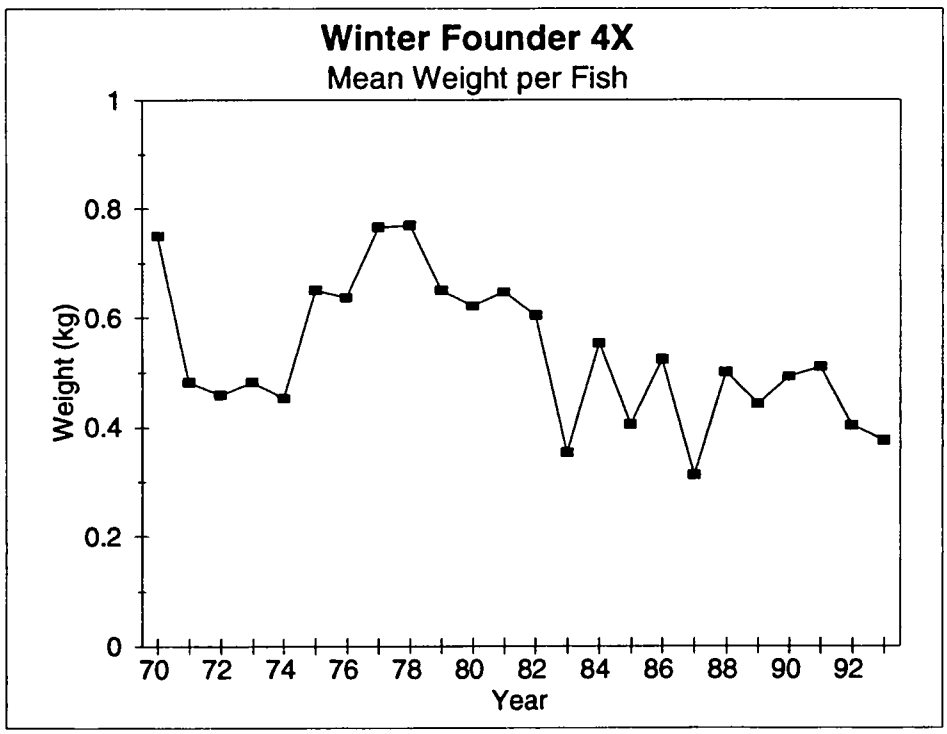
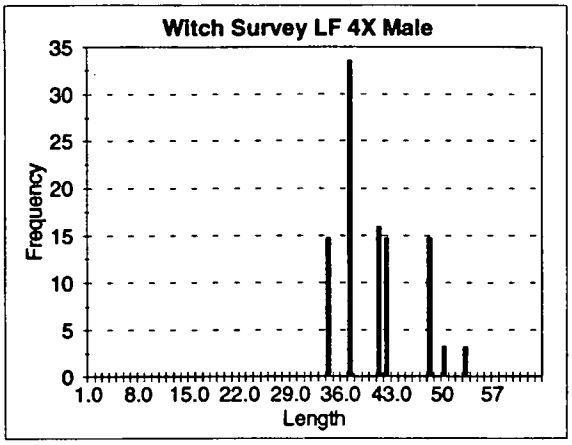
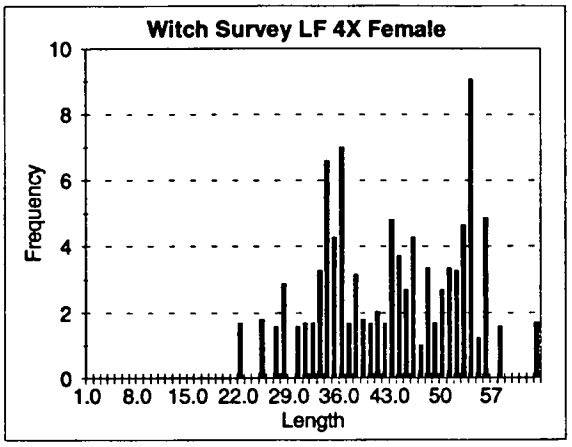
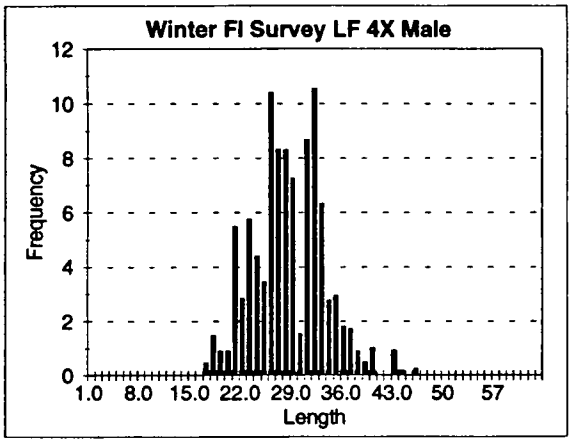
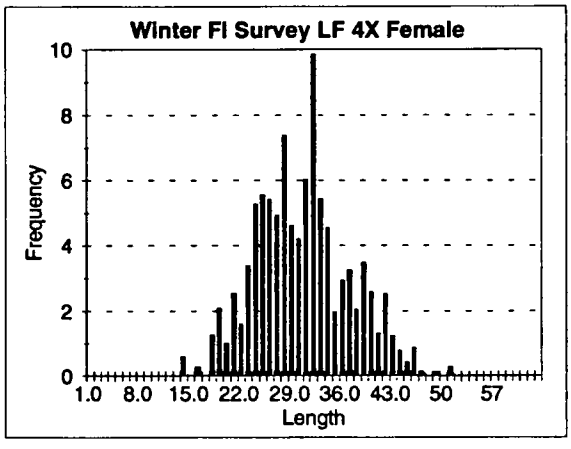


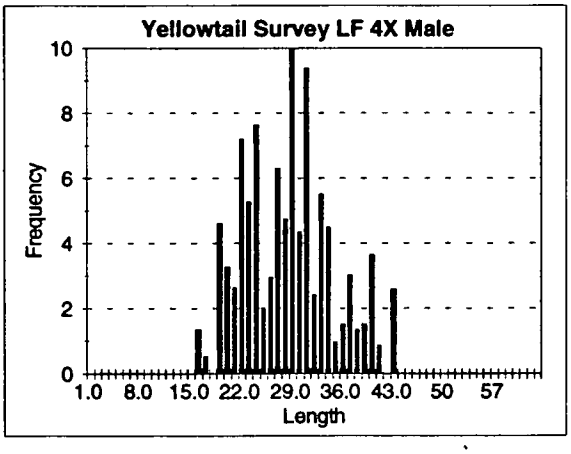
Fig. 19b

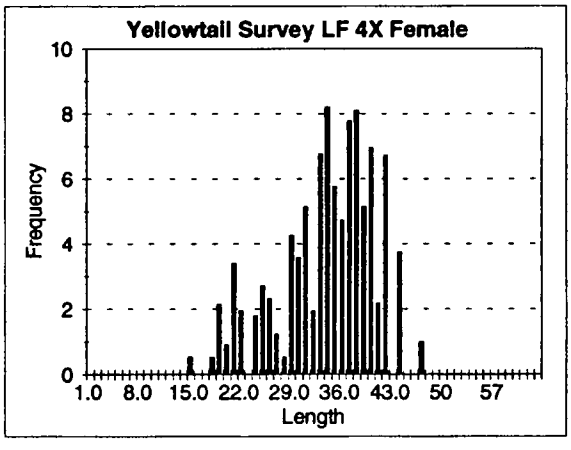


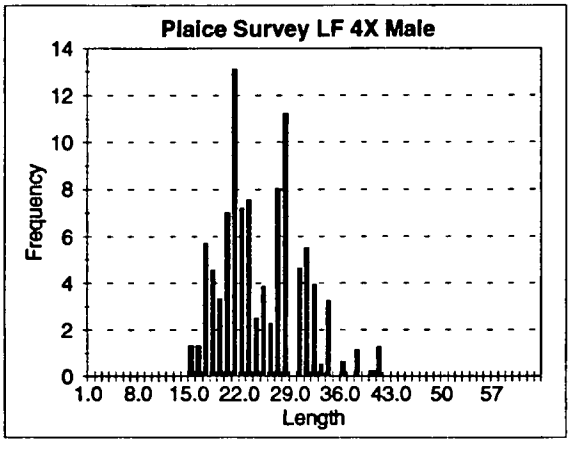












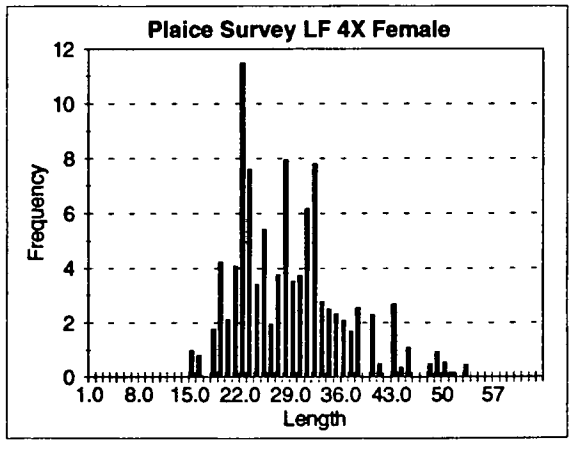
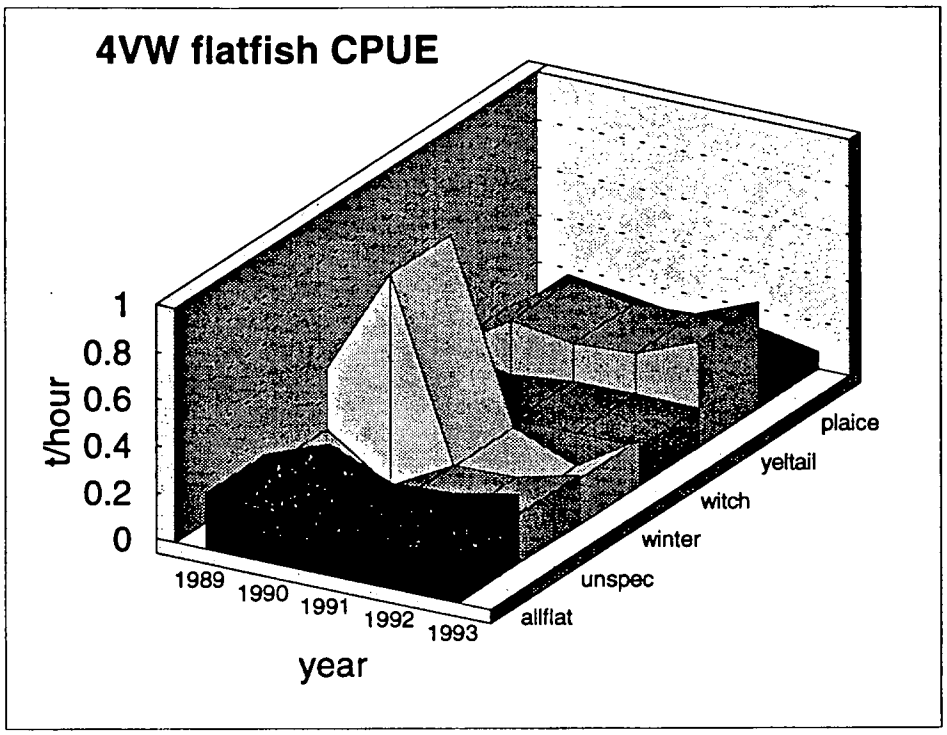


Fig. 20. Length frequencies from the 1993 summer survey for flatfish in 4X.


4VW flatfish CPUE
t/hour
1
0.8
0.6
0.4
0.2
0
1989
1990
1991
1992
1993
year
plaice
yeltail
witch
winter
unspec
allflat

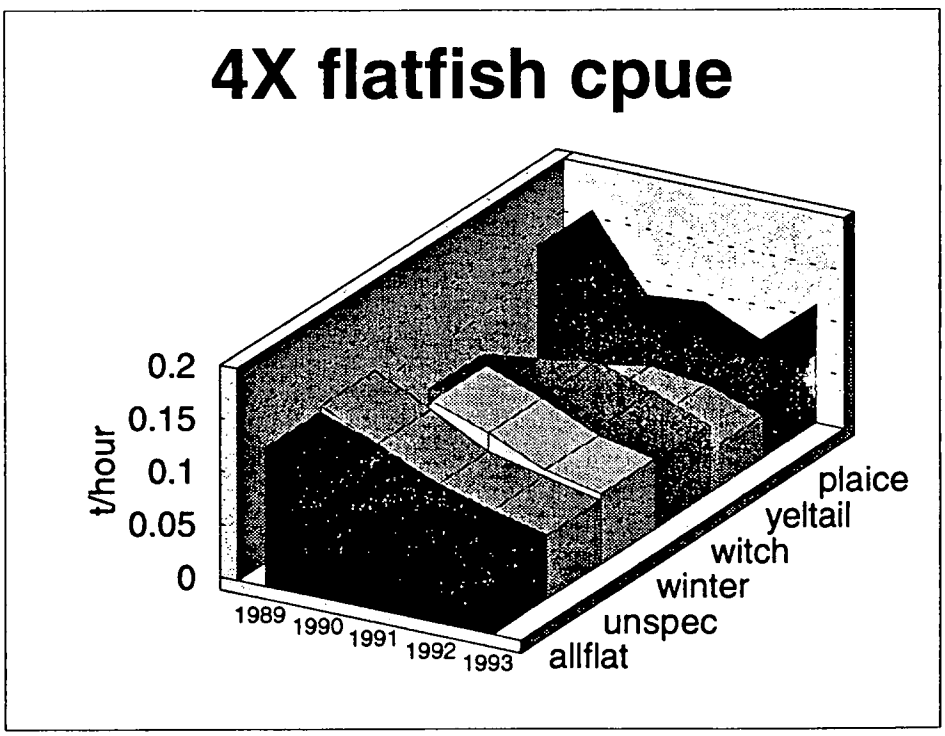

4X flatfish cpue
t/hour
0.2
0.15
0.1
0.05
0
1989
1990
1991
1992
1993
plaice
yeltail
witch
winter
unspec
allflat

Fig. 21

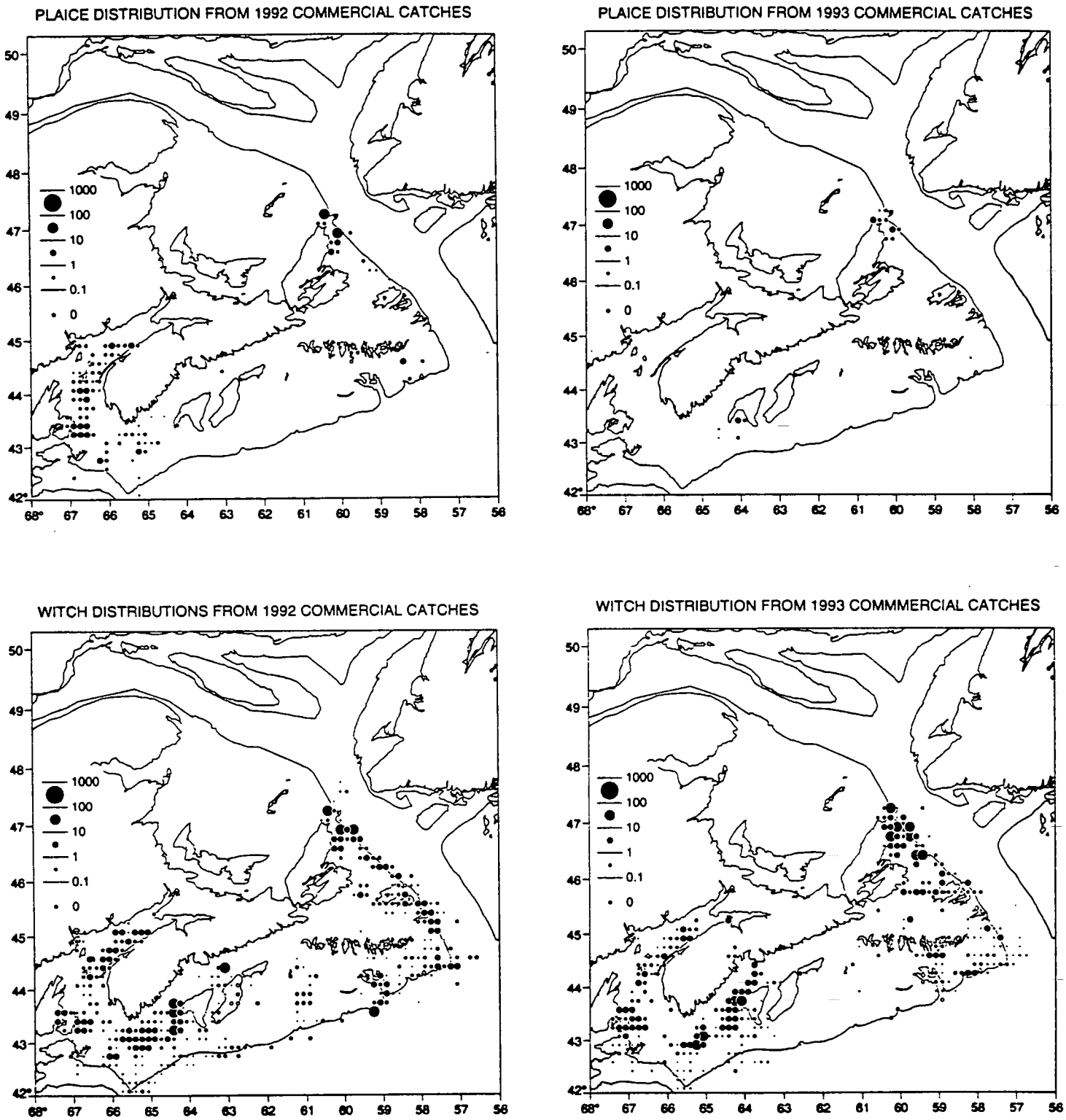
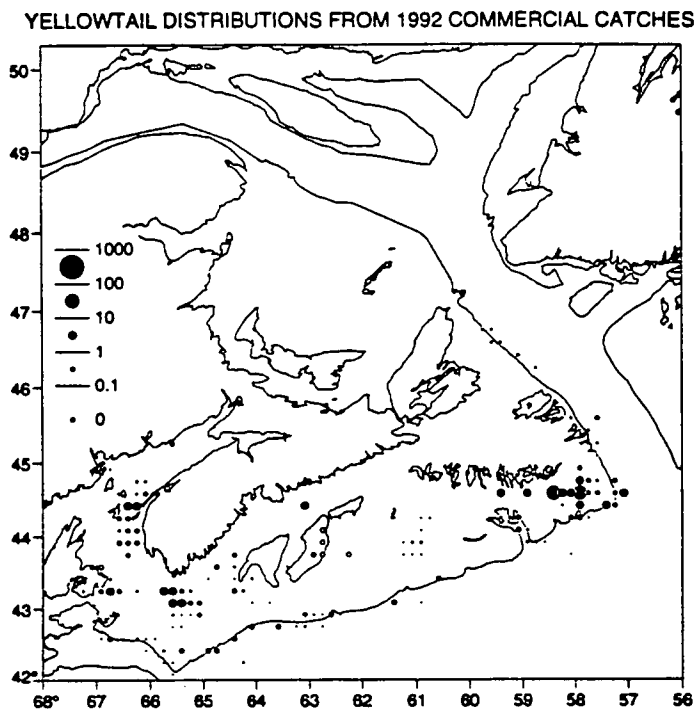
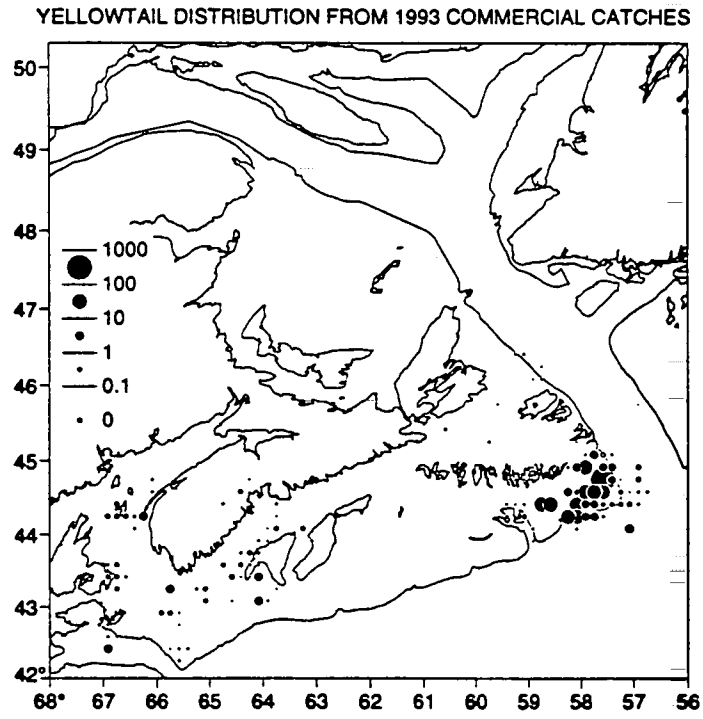


Fig. 22 Flatfish distributions by species from the commercial fishery.


YELLOWTAIL DISTRIBUTIONS FROM 1992 COMMERCIAL CATCHES
1000
100
10
1
0.1
0
50
49
48
47
46
45
44
43
42
68° 67 66 65 64 63 62 61 60 59 58 57 56


YELLOWTAIL DISTRIBUTION FROM 1993 COMMERCIAL CATCHES
1000
100
10
1
0.1
0
50
49
48
47
46
45
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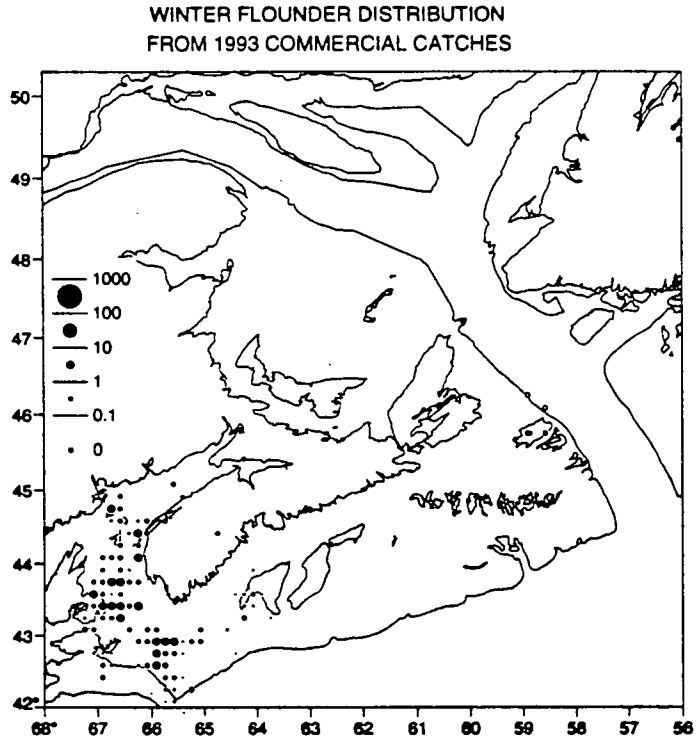
42
68° 67 66 65 64 63 62 61 60 59 58 57 56


WINTER FLOUNDER DISTRIBUTION
FROM 1993 COMMERCIAL CATCHES
1000
100
10
1
0.1
0
50
49
48
47
46
45
44
43
42
68° 67 66 65 64 63 62 61 60 59 58 57 56

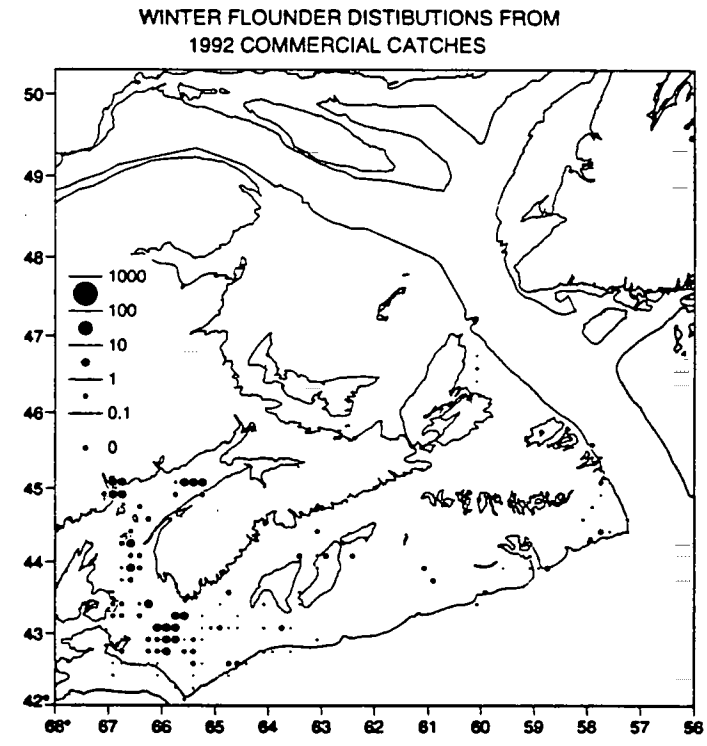
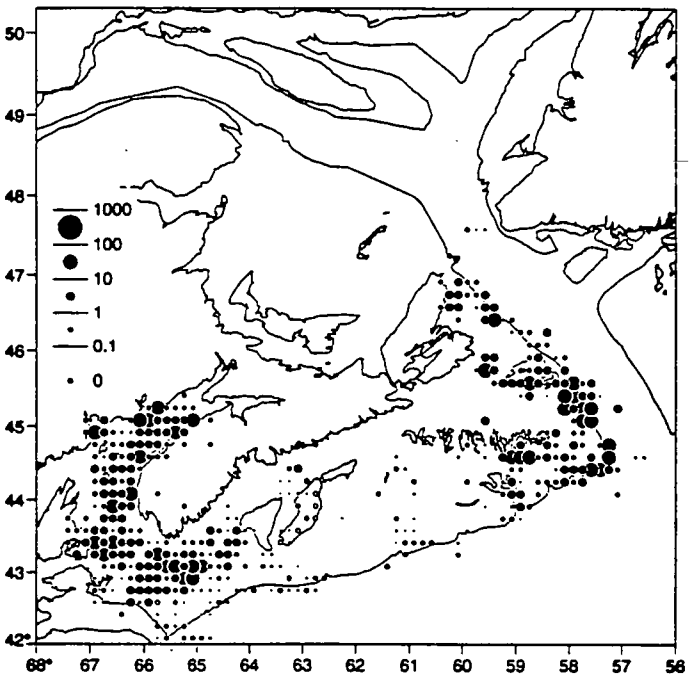

WINTER FLOUNDER DISTIBUTIONS FROM
1992 COMMERCIAL CATCHES
1000
100
10
1
0.1
0
50
49
48
47
46
45
44
43
42
68° 67 66 65 64 63 62 61 60 59 58 57 56

Fig. 22 (cont.)

UNSPECIFIED FLOUNDER DISTRIBUTION
FROM 1992 COMMERCIAL CATCHES



UNSPECIFIED FLOUNDER DISTRIBUTION
FROM 1993 COMMERCIAL CATCHES

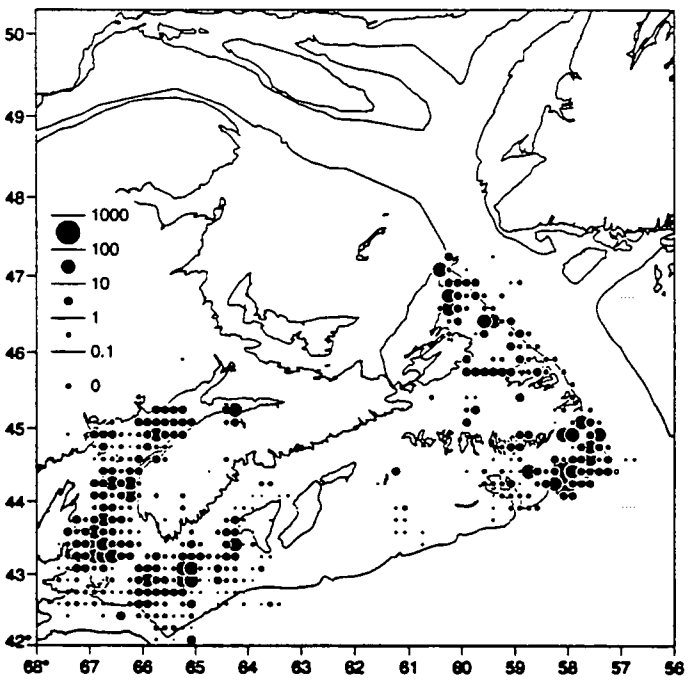
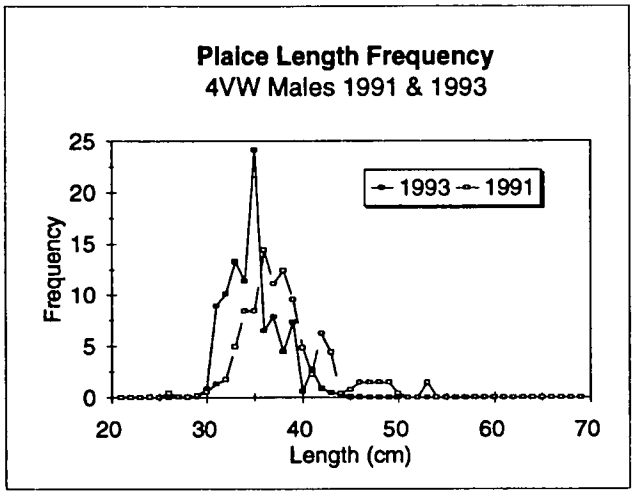
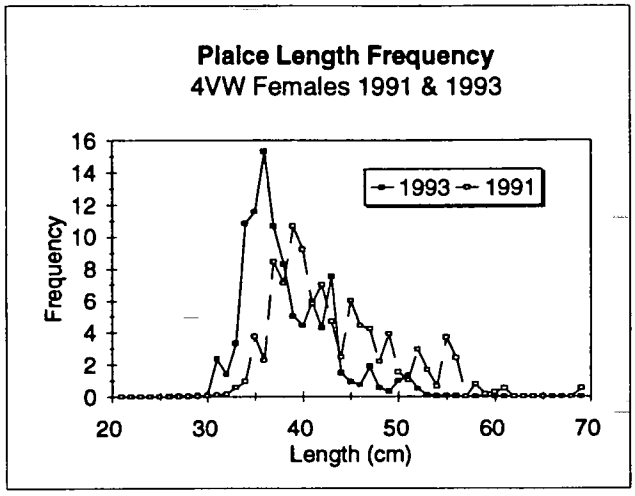
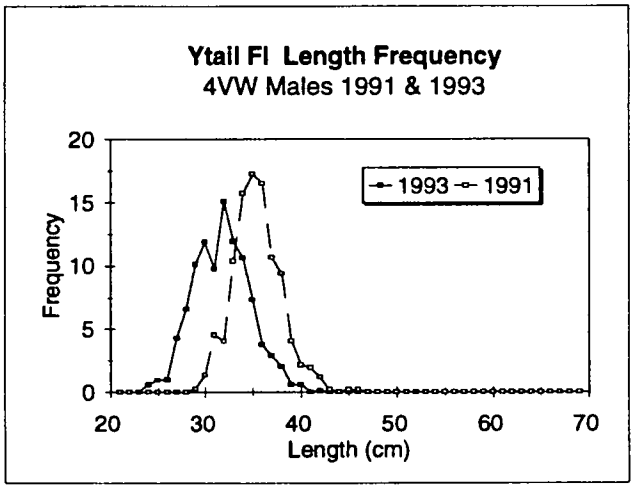
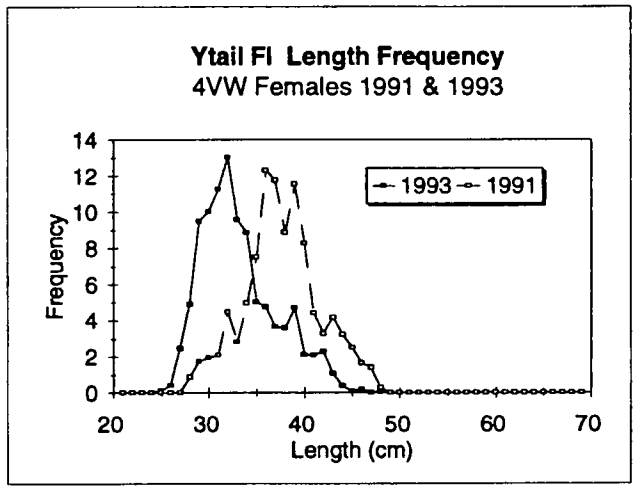


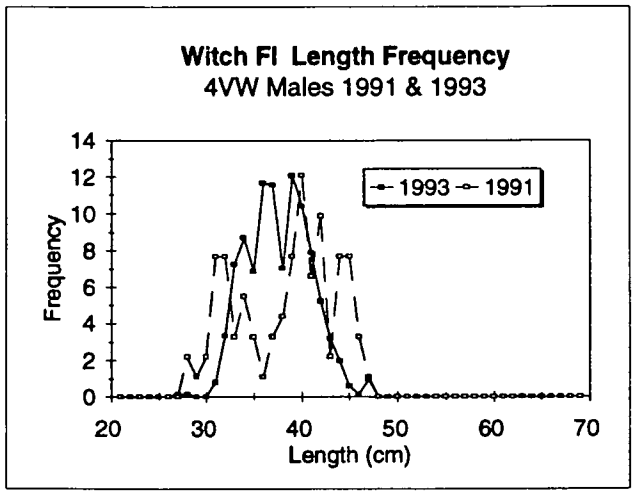
Fig. 22 (cont.)











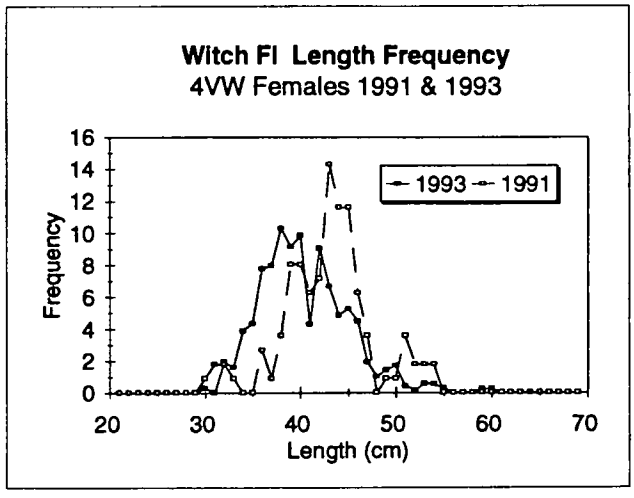
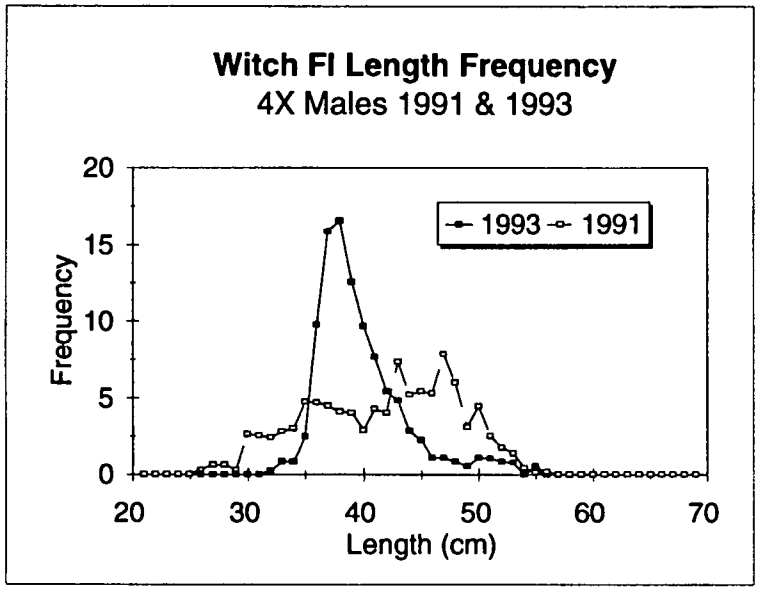
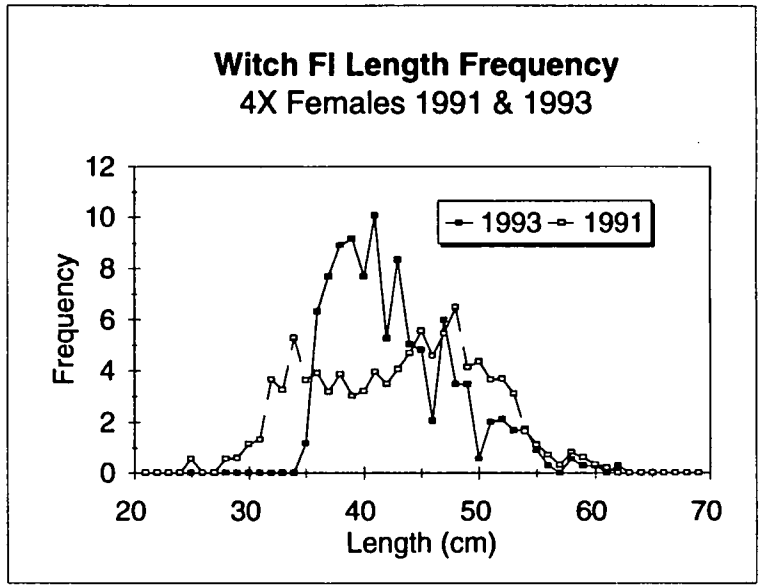
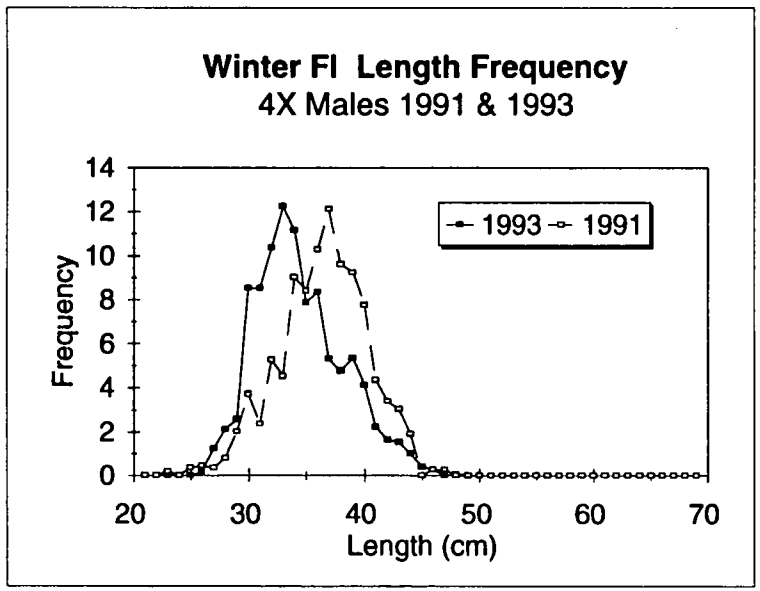


Fig. 23. Commercial length frequencies (1991 vs 1993 for flatfish sampled in 4VW.







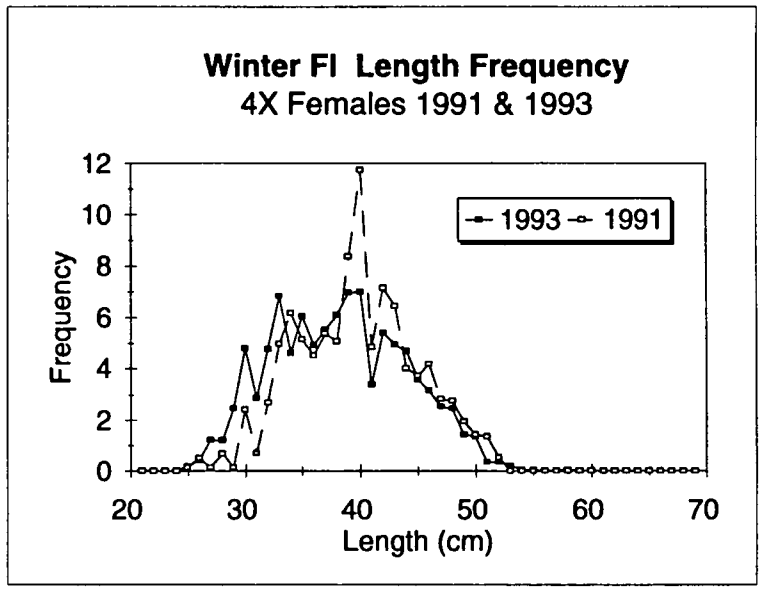


Fig. 24. Commercial length frequencies (1991-1993) for flatfish sampled in 4X.