DFO Atlantic Fisheries
Research Document 96/79

MPO Pêches de l'Atlantique
Document de recherche 96/79

ASSESSMENT OF THE NAFO DIVISION 4T SOUTHERN GULF OF ST. LAWRENCE HERRING STOCK, 1995

by R. Claytor[1], C. LeBlanc[1], J. Dale[1], G. Nielsen[1], L. Paulin[2], C. MacDougall[1], C. Bourque[1]

[1]Science Branch
[2]Resoucrce Allocations
Department of Fisheries and Oceans
P.O. Box 5030
Moncton, New Brunswick E1C 9B6

ISSN 1480-4883
Ottawa, 1998

Canada

Abstract

For the fall spawning 4T herring stock, fishing mortalities were slightly above target levels in 1995. Fall spawning stock $F_{0.1}$ fishing levels are projected at 56,000 tonnes for 1996. Estimated biomass of 4+ fall spawners has declined from the peak in 1992 and is about 280,000 tonnes. This level is similar to levels in 1985 and 1986. The principal reason for the biomass decline is the passing of the large 1987 year-class through the population and fishery with only below average recruitments being observed since 1988.

For the spring spawning 4T herring stock, fishing mortalities were slightly above target levels in 1995. Spring spawning stock $F_{0.1}$ levels are projected at 17,000 tonnes for 1996. Estimated biomass of 4+ spring spawners has declined from 1992 levels but is similar to 1994 at about 80,000 tonnes. Similar to the fall spawners, the large 1988 year-class which supported this fishery for the last four years has decreased and not been replaced by another above average year-class.

Résumé

En ce qui concerne les géniteurs d'automne du stock de hareng de 4T, les mortalités par pêche ont été légèrement supérieures aux niveaux cibles en 1995. Le niveau d'exploitation à $F_{0,1}$ de ce stock devrait se situer à 56 000 tonnes en 1996. La biomasse estimée des géniteurs d'automne d'âge 4+, qui avait atteint un pic en 1992, est maintenant d'environ 280 000 tonnes. C'est un niveau comparable à ceux de 1985 et 1986. Ce déclin de la biomasse est surtout dû au fait que la forte classe de 1987 n'est plus disponible à la pêcherie, et au fait que depuis 1988 on n'a observé que des recrutements inférieurs à la moyenne.

En ce qui concerne les géniteurs de printemps du stock de hareng de 4T, les mortalités par pêche ont été légèrement supérieures aux niveaux cibles en 1995. Le niveau d'exploitation à $F_{0,1}$ de ce stock devrait se situer à 17 000 tonnes en 1996. La biomasse estimée des géniteurs de printemps d'âge 4+ a baissé par rapport au niveau de 1992, mais, avec 80 000 tonnes, est comparable à celle de 1994. Comme dans le cas des géniteurs d'automne, la forte classe de 1988, qui a alimenté la pêche ces quatre dernières années, a diminuée en importance et n'a pas été remplacée par une autre classe supérieure à la moyenne.

Introduction

The purpose of this assessment is to provide estimates of Southern Gulf of St. Lawrence (4T) fall and spring spawning herring biomass in 1995, provide projections for the 1996 and 1997 fisheries, and provide biological advice on various management issues that pertain to the 1996 fishery.

Sections of this document which discuss fall and spring spawners together are **Description of the Fishery, Target, Fishery Data, Research Data, Ecological Considerations,** and **Research Recommendations**. Separate sections for fall and spring spawners are provided for **Estimation of Stock Parameters, Assessment Results, Future Prospects, and Management Considerations.**

Research Recommendations from the assessment of the 1994 fishery were:

1) Improve sampling of the spring purse seine fishery.
2) Simulations to determine the data requirements for detecting gear saturation effects on catch rate in the gillnet fisheries.
3) Update yield per recruit analysis.
4) Correspondence analysis to see if mesh size has an influence on the size distribution.
5) Examine changes in length and condition over time and initiate a program to examine fat content. Ensure that fishery effects are not part of the change.
6) Examine the spawning group and length frequency composition of herring caught in mackerel traps in Dingwall during the spring to improve information on stock composition in 4Vn during this time of year.

These recommendations were dealt with in the following manner:

1) The spring purse seine fishery was very small and landed only 2,000 t of a 4,000 t quota. 142 fish were examined from a catch of 1842 tonnes providing a sampling rate of 0.08 fish per tonne compared to 0.07 per tonne in 1994 and 0.22 per tonne in 1992.
2) Simulations were not done but a more detailed analysis of gear saturation on the catch data was started. Last years analysis of gear saturation consisted of data aggregated by boat-night. The analysis this year examined nightly catches from individual boats. This analysis provides a more accurate presentation of the effects of possible gear saturation and cessation of fishing when the nightly boat quota was caught. See **Fall - Management Considerations**.
3) Yield per recruit analysis was updated using the Thompson-Bell method. See **Target**.
4) Correspondence analysis was examined to determine the effects of differing mesh sizes on the ability to distinguish between samples and areas. See **Ecological Considerations**.
5) A fat content program was started using samples collected during the groundfish September survey, the December juvenile survey, the January groundfish survey, and the spring gillnet and purse seine fisheries. See **Ecological Considerations**.
6) Spawning group and length-frequency composition of herring caught in the Dingwall mackerel traps were not examined.

The principal issue arising during the fishery centered on the fall Chaleur Bay fishery. Purse seiners started fishing on Aug. 21, two days after the gillnet fishery started. As for the 1994 fishery, when the purse seiners started fishing in Chaleur Bay on September 13, 1994, the issue was whether or not purse seiners would catch fish in spawning condition and reduce gillnet catches on the spawning beds or whether purse seiners would catch small herring. In this case, small herring were defined as those ≤26 cm total length. This length is the dividing line between 2 and 3 year old herring as determined by the December juvenile survey. Regulations require that the catch on any day of herring ≤24.5 cm fork length not exceed 10% of the total catch by number. This issue was dealt with by sampling every purse seine catch in the fall Chaleur Bay fishery and reporting daily to industry on the size composition and the percentage of mature females in the catch. See **Fall - Management Considerations.**

The principal issue arising from the assessment of the 1994 fishery was a recommendation for a 25% reduction in the spring and fall spawner TAC for 1996. This reduction required an analysis of the relative stock sizes among the management areas of 4T herring. This analysis was required

because some groups felt their stock was in good condition and did not warrant a reduction, while others felt the situation in their area was more critical. Guidance on this issue has been provided by examining catch rates by area and the acoustic survey undertaken in Chaleur Bay, NB and the egg deposition survey conducted at Fisherman's Bank, PEI.

Future area assessments are likely to depend on additional involvement of the fleet in data collection. Two possibilities for how this collection might be achieved were investigated in 1995. One involved collecting acoustic data during regular fishing activity by a purse seiner in Chaleur Bay and 4Vn during the fall season. The second, consisted of a qualitative survey of western PEI by three gillnetters.

Description of the Fishery

General

Southern Gulf of St. Lawrence (Fig. 1) herring are harvested by an inshore, primarily gillnet fleet, fishing in 4T and a purse seine fleet (>65') in 4T and 4Vn. Two stocks of herring are harvested in these fisheries. The spring spawning stock spawns before July 1 and the fall spawning stock after July 1.

Prior to 1967, Southern Gulf of St. Lawrence herring were exploited mainly by gillnets and average landings from 1935 to 1966 were 34,000 tonnes. In the mid 60s, a purse seine fishery was introduced and average landings were 166,000 tonnes from 1967 to 1972. Quotas were introduced in 1972 at 166,000 tonnes and reduced to 40,000 tonnes in 1973 (Fig. 2). Catches have been below the TAC since 1988 (Fig. 2).

The TAC for fall spawning herring was 65,900 tonnes from 1990 to 1992 and was raised to 80,800 tonnes from 1993 to 1995. An additional TAC in 4Vn has been allocated to the purse seine fleet. This TAC has been 4,200 tonnes since 1986 (Table 1). In 1995, catch of the total southern Gulf fall spawner stock was 63,000 tonnes, with 83% of this catch being caught by the inshore fleet considering only catches in 4T (Table 2). When the southern Gulf fall spawner stock catches in 4Vn are included, the total catch of fall spawners was 66,000 tonnes with 79% of the this catch being caught by the inshore fleet (Table 3). Since 1981, over 80% of the catch during the spring season and over 70% of the fall catch has been by the inshore fleet (Table 4). From 1990-1994, including catches in 4Vn the inshore has averaged 79% of the catch in spring and fall seasons combined (Table 4).

The inshore fleet accounted for 68% of the catch of spring spawners in 1995 (Table 3) compared to 78% in the 1990-1994 period. In 4Vn, spring spawners were 4% of the landings by purse seiners in 1995 compared to 11% in 1990-1994 (Table 2).

Spring Fishery

Inshore landings in the spring were about 80% of their allocation, approximately 14,000 tonnes in 1995 compared to 19,000 tonnes in 1994 (Table 1, Table 5). Landings were down in every area except 16D (Iles de la Madeleine) although total landings were very similar to the 1990-1994 average (Table 6). Inshore fishers in most areas, with the exception of Chaleur Bay, felt abundance of spring spawners was similar to previous years (Fig. 3).

There are 11 large seiners with access to herring in 4T. Six of these are from Northeastern New Brunswick and five are from Western Newfoundland. Only the six New Brunswick based seiners fished in 4T in 1995 as has been the case since the early 80s. Purse seine landings in the spring were about 40% of their spring allocation (Table 5). The large seiner captains indicated that the fish were too deep to fish with a purse seine during the spring of 1995.

Fall Fishery

Inshore landings in 1995 were similar to 1994 (Table 6). Landings were up in every area except 16B (Chaleur Bay) (Table 6). In Chaleur Bay, 90% of the allocation was landed (Table 5) and it accounted for 54% of the inshore landings in 4T (Table 6). Good market conditions (Table 7) and increased effort (see **Fishery Data**) were the principal reasons for increased catches in most areas. In Chaleur Bay, inshore fishers felt the decline in catches was the result of lower

abundance and fishing by large seiners during the same season as the inshore fleet. During the workshops several Chaleur Bay inshore fishers noted the difficulty in finding fish in 1995 and the necessity to fish them in deeper water (up to 10 fathoms) compared to 5 fathoms in previous years. Many other areas also felt abundance was down in 1995 (Fig. 4).

Purse seine landings in 4T and 4Vn in the fall were 95% of their allocation (Table 5). Landings in 4T during the fall were double those of 1994 (Table 1). Their total fall landings, including 4Vn, were 19,409 tonnes the highest since 1988 (Table 1). Much of this increase was the result of the early start to the fishing season in Chaleur Bay (mid-August compared to mid-September in 1994).

The major issue in the fall fishery was the tension between the two fleets concerning the fishing by purse seiners during the inshore season. The concerns of the inshore fleet were that the seiners would catch spawning fish and lower their catches and that seiners would catch a large percentage of small herring. A comprehensive sampling program was initiated to investigate and detect the occurrence of these concerns during the fall fishery. At-sea observer coverage occurred on half the purse seine vessels. These observers recorded location of catches, estimated tonnes in the catch, and took biological samples which included length-frequencies, spawning condition, and a sample for detailed aging and biological analysis by DFO. Each night, samples were collected from the first set. Subsequent sets were sampled if they were more than 10 km from a previous set. Length-frequencies were collected from all sets. Dockside monitors estimated all purse seine landings. After the first week of the season, dockside monitors also took biological samples from vessels that did not have observers. They collected the same information that the observers collected except that the entire catch was sampled, rather than each set. Information on this sampling was distributed daily to industry along with catches and a comparison of catches to 1994 (Tables 8, 9, 10) Results from this sampling are discussed in **Fall - Management Considerations.** Weekly conference calls were used to discuss concerns regarding the sampling and their results. A principal concern that developed during the fishery was that the herring being caught were too small. The size regulation was the same as in 1994 and 1993. No more than 10% of the catch could be <24.5 cm fork length.

Inshore fishers in Chaleur Bay have concerns over the state of the resource in Chaleur Bay. They feel the decline in the stock is the result of the large seiners concentrating their fall fishing activity in Chaleur Bay. The large seiners feel that fishing on spawning beds is hurting the stock and that fishing on spawning beds should not occur.

Target

The target fishing mortality used for fall spawners since 1992 has been $F_{0.1} = 0.3$ or an exploitation rate of 26% for the fully recruited age. The target used for spring spawners last year was a weighted $F_{0.1} = 0.3$. At the 1995 peer review meeting it was recommended that these targets be re-evaluated as a result of changing weights-at-age for these stocks. This analysis was begun this year using a yield per recruit analysis following the method of Thompson and Bell (Ricker 1975). Formulae and methods provided by Rivard (1982) and Mohn (1988) were used to implement this procedure. Mean weights for two time periods were used to determine the effect of changing mean weights on the target. The first time period was 1981 to 1994 and the second from 1992 to 1994 (Appendix 1). Ages 1-20 were assumed to be present in the population. Weights-at-age for fish older than age 11 were assumed to be equal to age 11 weights. Similarly, partial recruitments for fish older than age 11 were assumed to be equal to age 11 partial recruitments (Table 11).

These different mean weights had no effect on $F_{0.1}$. For fall spawners, fully recruited $F_{0.1}$ was 0.37 with a 4+ weighted $F_{0.1}$ of 0.28 (Fig. 5). For spring spawners, the fully recruited $F_{0.1}$ was 0.49, with a 4+ weighted $F_{0.1}$ of 0.33 (Fig. 5). These $F_{0.1}$ values are slightly higher than those currently being used. Before a change is made, additional analysis is required because analyses on other marine species indicate that target fishing mortalities should be less than natural mortality (Walters and Parma 1996). Natural mortality is assumed to be 0.2 for 4T herring and is less than currently used targets

Fishery Data

Catch and weight-at-age matrices were derived from commercial sampling as in previous years (Claytor et al. 1995). The combined 4TVn matrices were used in the estimation of stock parameters. These matrices were constructed by dividing catches into NAFO Divisions 4Vn, 4Tmno, 4Tl, and 4Tfghjk (Fig. 1, Table 12, Appendix 1).

The fall abundance index used to tune the ADAPT formulation was derived from fall purchase slip catch rates calculated as catch(kg)/net-trip as in previous years. A multiplicative model was used to estimate these catch rates using year, district, and week effects. This model was identical to those used in past assessments (Claytor et al. 1995) A purchase slip equals one trip and the average number of nets is determined from a phone survey of gillnetters in 4T (LeBlanc and LeBlanc 1996) (Tables 13, 14).

For the fall fishery, dockside monitoring was also done for the inshore Chaleur Bay fishery. For other areas in the fall, daily reports of vessel landings were compiled by Resource Management. These reports were made by contacting processors in each area. These data, and purchase slip data from 1993 to 1995 were used to examine the percentage of vessels that caught their nightly limit in each area.

Spring abundance indices were derived using volunteer index gillnetters and daily catches monitored by the New Brunswick provincial government in Escuminac and Southeast New Brunswick. Index gillnetters kept daily records of total catch, catch sold, amount dumped, and catch kept for private use, local sale, or transfers to other boats. Catch rates using these data were catch(kg)/net. The New Brunswick provincial government hires a dockside co-ordinator to record catch and effort in Escuminac (Statistical Districts 73-75) and Southeast New Brunswick (Statistical Districts 76-80) (Fig. 1) during the spring season. From 1990 to 1995 catches and number of fishers have been recorded daily. Catch rates using these data are catch(kg)/fisher-day.

Acoustic data was also collected by a purse seiner during regular fishing activity in the fall in Chaleur Bay and 4Vn (Figs. 6, 7, 8). These data were collected using an automated recorder of the same type used during the regular research Acoustic survey. Information on the distribution of fish in Chaleur Bay, as well as, searching and fishing time and location of catches by this vessel were recorded from Aug. 24 to Nov. 19, 1995 (Fig. 9, 10).

Fishing tracks were collected from an inshore vessel during the fall season in Chaleur Bay for 9 days in September. Position was located using a portable GPS unit. Fishing trips recorded included those off Port Daniel and Miscou Bank (Fig. 11).

Research Data

Data on the relative abundance and distribution of 4T herring come from acoustic surveys during September and October (LeBlanc et al. 1996), juvenile herring surveys in December, a spawning bed survey at Fisherman's Bank, PEI in August and September (Cairns et al. 1996), groundfish surveys in September and January (Sinclair et al. 1996), and a qualitative acoustic survey using inshore vessels off the west coast of PEI.

A historical review of herring caught in the bottom trawl survey indicates that herring are much more widely dispersed throughout the southern Gulf of St. Lawrence in recent years than in the 70s and early 80s when stock size was much lower than it is now (Figs. 12-15). In 1995, the distribution of herring in the September groundfish survey showed concentrations in Shediac Valley, North of PEI, and St. Georges Bay (Fig. 15). Juveniles were found in Chaleur Bay and Northumberland Strait (Fig. 16). January distribution of herring in 1996 was slightly different from 1995 (Figs. 17, 18). Fewer herring were seen on the west coast of PEI during the qualitative survey in 1995 compared to 1994 (Fig. 19).

The Fisherman's Bank survey was restricted exclusively to the bank in 1995 because of time constraints. In previous years, 1991-1993 an area known as the ridge has also been covered (Fig. 20). In 1995, the lowest volume of eggs observed during the survey period on the bank was estimated (Fig. 21). The previous lowest value was for the bank was 1991. In that year, most of

the spawning occurred on the ridge (Fig. 21). The progeniteur biomass estimate in 1995 was 7,500 tonnes, well below the average of 61,000 tonnes (Table 15).

The acoustic survey covered Chaleur Bay (Fig. 22), the east coast of PEI, and 4Vn (Fig. 23). The biomass estimate from the survey was the lowest observed since 1991 (Fig. 24). East Miscou strata, which had accounted for up to 75% of the biomass in Chaleur Bay have been only a small portion of the biomass in 1994 and 1995 (Fig. 24). The total biomass estimate for Chaleur Bay (Inshore and Offshore) was 71,000 tonnes in 1995 compared to 179,000 tonnes in 1994 (Table 16). Similar transect lengths were surveyed in both years (Table 17). Herring were seen on about 10% of the transect length in 1995 compared to 16% in 1994 (Table 17). The distribution of biomass was somewhat different in 1995 compared to 1994. The Miscou and Grande Rivière strata increased, while all other decreased (Table 17).

Information from the acoustics on board the seiner indicated that few or no herring were observed in the middle of the bay but fishable concentrations were observed in the Gaspe off Rivière-au-Renard (Figs. 8, 10). Thus it is unlikely that large concentrations of fish were missed in the bay, but there may be some fish that were not observed to the north. Seiner fishing activity coincided with the acoustic survey in one strata. The Newport strata was surveyed on Oct. 2 and seiners fished in this area on Oct. 3. Overlays of fish seen by the seiners and the survey indicate that the herring observed by the perpendicular transects of the survey were a continuous distribution along the shore (Fig. 25).

Five year-olds, from the 1990 year-class, were the dominant group of fall spawners observed during the survey. Four year-olds were few in number compared to previous years (Fig. 26) and were the fewest in number since 1990 (Table 18). Ages 2-3, fall spawners in the survey were somewhat smaller at age than in previous years, while older ages were similar to previous years (Table 19). The total biomass estimate of fall spawners in Chaleur Bay was 43,000 tonnes in 1995 compared to 122,000 tonnes in 1994 (Table 20).

The 1991 year-class has been important for spring spawners in the acoustic survey since 1993 when they first appeared as two year-olds (Fig. 27). Two year-olds were again the dominant age group in 1995 (Fig. 27). Numbers were much reduced in 1995 compared to 1994 and age 10 and 11 spring spawners were not observed in 1995 (Table 21). Spring spawners were somewhat smaller at age in 1995 compared to earlier years (Table 22). Total biomass estimate for spring spawners in 1995 was 20,000 tonnes compared to 57,000 tonnes in 1994 (Table 23).

Fall - Estimation of Stock Parameters

The multiplicative model was significant (Table 24) and residual and DFFITS analyses indicated there were no residual patterns or heavily influential data points (Fig. 28). Catch rates were significantly lower in 1995 than 1994 (Fig. 29). These catch rates were the lowest since 1988 but were still significantly greater than all years from 1978 to 1984 (Fig. 29).

The age-disaggregated abundance index for fall spawners indicates the importance of the 1987 year-class in the fishery (Table 25, Fig. 30). Paloheimo Zs indicate a decline in total mortality since the late 70s (Fig. 30).

Fall biomass was estimated using the ADAPT formulation used in past assessments (Claytor et al. 1995) (Table 26). Parameter estimates were significant ($t>2.0$) and correlations and bias percentages were low (Table 27). Residuals were generally well distributed and close to observed values. There were some indications of positive trends for ages 5 and 6 in recent years, but the majority of residuals were between ± 1 (Fig. 31). These patterns are similar to those seen in previous years (Claytor et al. 1995).

Retrospective values for 1993 and 1994 were similar to values estimated for 5+ and 7+ biomass in 1995 (Fig. 32). Estimates of stock size made prior to 1992 were generally over-estimates (Fig. 32). Age by age retrospective plots indicate that the 1983 year-class was consistently over-estimated in these years (Fig. 33). There has been no annual retrospective pattern and over- and under-estimates have alternated each year since 1990 (Fig. 34). This analysis indicates that the error is usually greater when the stock is over-estimated compared to under-estimates. Over-

estimates are usually about 15% to 25% over the next years biomass estimate while under-estimates are within 5% to 10% of the next years estimate (Fig. 34). A comparison of estimates for each year using the 1995 analysis, compared to the estimate made in each year, indicates a considerable drop in the retrospective error in the last two years (Fig. 34). This retrospective analysis provides confidence in the conclusions regarding the biomass estimate of 4T herring in 1995.

Fall 4+ biomass is about 280,000 tonnes and 7+ biomass is about 200,000 tonnes (Fig. 35). While 7+ biomass is still among the highest estimates, the estimate for 4+ biomass is the lowest since 1984 when the stock was re-building (Fig. 35). Recruitment patterns indicate that 1987 and 1988 year-classes were the most important in recent years for determining population trends (Fig. 36).

Fall - Assessment Results

ADAPT results indicate that weighted 4+ fishing mortalities since 1981 have been below the weighted 4+ target of 0.21, each year except 1990 and 1995 (Tables 11, 28). Fishing mortality on age 5 fall spawning herring was the highest since 1980 (Table 28).

In spite of fishing mortalities below target, the 4+ biomass is now in its third year of decline (Fig. 35) Numbers of four year-olds estimated in 1995 are the lowest in the time series which begins in 1978 (Table 29). Biomass of 4+ is the lowest since 1984 (Table 30).

There are major differences in fishing success in terms of percent of nightly boat quotas caught between Chaleur Bay (16B) and the other areas of 4T (Fig. 37). In Chaleur, effort has nearly tripled since 1993 (Table 31) and the percent of trips in which the nightly boat quota was caught declined appreciably in 1995 (Fig. 37, Table 31). In other areas the percent of nightly trips caught remained stable in spite of increasing effort (Table 31). Catch rate indices, however, for Chaleur Bay and Southern Areas estimated separately indicate an overall decline since 1992 in Chaluer and since 1990 in the Southern Areas (Fig. 38). These abundance indices indicate that stocks in general are declining in each of the two major areas of the southern Gulf of St. Lawrence.

Congruence between the acoustic survey index, fishery catch rates, and the gillnetter opinion of abundance obtained from the phone survey each support a general decline since 1992 (Fig. 39). The biomass estimated from the acoustic survey (Table 20) and the spawning bed survey on Fisherman's Bank (Fig. 21) were the lowest estimates in recent years.

The principal reason for this decline is the passing of the 1987 year-class through the population and the fishery. When this year-class came into the population it reversed a downward trend in population size (Fig. 36). This upward trend continued as the 1988 year-class came into the fishery (Fig. 36). Similar upward trends in population size occurred as the 1980 and 1983 year-classes moved through the population (Fig. 36). Thus far, there have been no above average year-classes since 1987-1988 to reverse this trend. Recruitment trends for this stock are difficult to predict as, over the range of stock sizes observed since 1978, there is no predictive relationship that performs better than the mean (Fig. 36, Claytor et al. 1995). The effect of below average year-classes since 1988 on future prospects is discussed below.

Fall - Future Prospects

Four year-classes, 1980, 1983, 1987, and 1988 have supported the 4T fall spawner fishery since 1984 (Fig. 40). The 1987 year-class was the strongest of these three and supported the fishery for five years, compared to four each for the 1980 and 1983 year-classes (Fig. 40). That the 1987 year-class is diminished and will no longer support this fishery is indicated by the catch-at-age matrix for the acoustic survey (Table 18) and by comparing 1994 and 1995 length-frequency distributions from the September groundfish survey (Fig. 41). Fish lengths associated with those eight years of age and older (32 cm) (Table 31) are a much smaller proportion of the population in 1995 than in 1994 (Fig. 41). Strong year-classes have been first observed in the fishery as four year-olds. That no new strong year-classes are coming into the fishery is indicated by the small numbers and proportions of four year-olds in the fishery since 1992. These numbers were low for both the gillnet and seiner fleets in 1995 (Fig. 40). Low numbers of four year-olds were also

observed in the acoustic survey in 1995 (Fig. 26). Since 1991, the size of fish captured by the seiners and the acoustic survey have overlapped (Fig. 42). Thus, it is unlikely that the small numbers of four year-olds observed during the survey were because of gear selectivity. It was largely for these reasons that the advice provided in 1995 concerning the 1996 fishery was to reduce the TAC by 25% from 80,000 tonnes to 66,000 tonnes. The advice from this assessment is that an additional reduction to 56,000 tonnes is necessary.

Projections for 1996 and 1997 were made by taking the beginning of the year biomass by age and subtracting losses from natural mortality and fishing to determine expected beginning of the year numbers for each of these years as in previous assessments (Claytor et al. 1995). The target fishing mortality of F0.1=0.3 (fully recruited) was applied to these numbers to determine the advised TAC.

Input parameters were partial recruitment by age, average weights-at-age, and recruitments at ages 2 and 3. Partial recruitment values were derived from average fishing mortalities from 1993 to 1995. Age 2 and age 3 recruitment were the geometric mean for 1978 to 1992 for age 2 and to 1993 for age 3. The higher than average 1987 year-class was omitted.

Advised TAC for 1996 is 55,535 and for 1997 is 49,376 tonnes (Table 33). The major cause for this decline in advised TACs are the much lower than average recruitment of age 4 fall herring estimated for 1995 (Table 34).

Fall - Management Considerations

The major issues in the fall herring fishery centered on 1) catches of immature herring, 2) the impact the inshore and purse seine fisheries have on the stock, and for the inshore, the concentration of purse seine activity in Chaleur Bay, 3) opening date for the seiner fishery, and 4) the use of mid-water trawl for seiners in a combined herring/mackerel fishery.

Immature fish have been defined as fish with gonad stages 1 or 2. These fish are usually two years old and less and information from the December juvenile survey indicates they are usually less than 26 cm total length. Regulations are applied in fork length and no more than 10% of the catch is permitted to be less than 24.5 cm fork length. This length corresponds to about 27 cm total length (Table 35). With this regulation in effect, purse seiners catch a very small proportion of immature fish (Fig. 43). There were no immature fish observed that were greater than 29 cm total length (Fig. 43). Purse seiners also catch a small proportion of spawning fish, with the majority of their catch either maturing or spent fish (Fig. 43).

In 1994, purse seiners started fishing in mid September. The percentage of spring spawners in the catch was 27% by numbers (Table 36). In 1995, purse seiner fishing began in mid-August and the percentage of spring spawners in their catch was 35% by number (Table 36). This increase in spring spawners was largely due to this early start as the ratio of spring and fall spawners from mid-August to mid-September in 1995 was 50:50 (Table 37). Thus, an early start by the seiners seems to indicate an increase in spring spawners may be expected.

With the current regulations, less than 10% of the fall seiner catch on average has been less than 27 cm total length (Table 38).

The spring purse seine fishery in contrast catches primarily spring spawners, and 1995 is a good example of this trend (Table 39). Smaller fish are caught in the spring purse seine fishery with 10% of the catch occurring at 25.5 cm (Table 40).

As expected, the inshore fishery catches primarily spawning fish in both the fall and spring seasons (Table 41). The percentages of maturity stage caught by these two gears are quite different and there seems to be little support for the contention that these gears interfere with one another.

The inshore fishery catches larger fish than the seiners in both the spring and fall seasons (Tables 38, 40). In the spring, 10% of the catch occurs at about 28 cm and in the fall at about 29 cm (Table 40).

The inshore caught 7 times as many tonnes of fall spawners in Chaleur Bay as the seiners in 1994 and about 3 times as many tonnes in 1995. Seiners caught about 4 times as many spring spawners as inshore fishers during the fall season but when the inshore spring season is added their catches of spring spawners in the Bay were similar to purse seine spring spawner catches in 1994 (Table 42). In 1995, the seiners caught about 3 times as many tonnes of spring spawners in the Bay as the inshore fleet, even when the inshore spring and fall seasons are combined (Table 42). A starting date prior to mid-September by the seiners can be expected to increase the catch of spring spawners.

With this information it is possible to investigate the expected catches of spring and fall spawners under various starting dates and proportion of their TAC that would be taken in Chaleur Bay (Table 43).

Of general concern with respect to the decline in the TAC is whether or not to reduce all areas equally. As indicated above, there may be some differences between Chaleur Bay and the remainder of 4T. In addition, Fisherman's Bank (16G) has not caught its quota in several years (Table 6) although catch of nightly quotas has remained high the last three years (Fig. 37). Greater effort, however, has been required to make these catches and catch rates for the southern area of 4T have declined since 1990 (Fig. 38). At the same time, results of the spawning bed survey at Fisherman's Bank in 1995 indicate a low spawning success. Inshore fishers have explained this by the fish spawning off the bank in deeper waters and later than usual. A method for providing quantitative area assessments is an important research priority for the 4T stocks.

Spring - Estimation of Stock Parameters

The index gillnetter and provincial co-ordinator catch rate models were both significant (Tables 44, 45). Residual and DFFITS analyses for these models indicated no outstanding outliers or influential points (Figs. 44). Index gillnetter catch rates have indicated no change in spring spawners since 1988 (Fig. 45) while the provincial data has indicated a general increase from 1990 to 1994 but a decrease in 1995, although the differences are not significant (Fig. 45).

Abundance indices by age indicate similar trends for each of these indices (Fig. 46).

An ADAPT formulation similar to the one used in the fall was attempted using the index gillnetter abundance index to tune the model but it was not significant.

As an alternative approach, a simple VPA was applied to the catch at age matrix using a range of terminal Fs from 0.2 to 0.7 as was done last year (Claytor et al. 1995). A partial recruitment vector was estimated from gillnet and acoustic survey matrices (Table 46). This analysis produced 4+ biomass estimates ranging from 70,000 to 110,000 tonnes (Fig. 47). Terminal Fs of 0.6 and 0.7 indicate a declining stock, an F of 0.5 indicates a slight decline, and an F of 0.4 indicates a slight increase (Fig. 47).

As was done previously (Claytor et al. 1995), an attempt to narrow the bounds of these estimates to a more likely range was made using the percentage of spring and fall spawners observed in the acoustic survey since 1990. These data indicate that on average about 20% of the stock is spring spawners (Table 47). This would correspond to the biomass estimate of 4+ spring spawners near that obtained using a Terminal F of 0.5 (Table 48).

The VPA was repeated using the average partial recruitment determined from the original VPA and this biomass estimate was used to make the projections (Fig. 48).

Spring - Assessment Results

Using this technique, the weighted 4+ fishing mortality has been below the target each year since 1984, except 1994 and 1995 (Table 49). Estimates of 4+ biomass are still above those made during the late 80s (Table 50). Gillnetters from the three major spring spawning areas, Acadian Peninsula, Escuminac, and Southeast New Brunswick, indicated during the phone survey that abundance had declined in each of these areas (Fig. 3). The decline in spring spawners as

indicated by the acoustic survey is more severe than that suggested by this analysis (Table 23), although the acoustic survey is restricted to Chaleur Bay.

As for the fall stock, large incoming year-classes have reversed downward population trends for spring spawners (Fig. 49). The 1991 year-class is about average and similar to the 1982 year-class (Fig. 49). Also, similar to the fall spawners, there is no predictive relationship, that performs better than the mean, between recruitment and spawning stock over the range observed since 1978 (Fig. 49, Claytor et al. 1995). As for the fall, strong year-classes first appear in the catch as four year-olds (Fig. 50).

Trends in population estimates of both spring and fall spawners from ADAPT-VPAs are supported by their correlation with the herring estimates in the September bottom trawl survey (Fig. 51).

Spring - Future Prospects

As with the fall spawners the spring spawner stock is very dependent on strong year-classes.The 1982 and 1988 were the strongest year-classes in the spring stock and dominated the fishery for about 4 years (Fig. 50). As with the fall stock, these strong year-classes first appear as four year-olds. Four year-olds were prominent in the catch at age for spring spawners (Fig. 50) and in the acoustic survey (Table 21). Population estimates of 4 year-olds were average (Table 50). These results indicate, that recruitment of four year-olds to the spring stock was as expected when the projections for 1996 were made after the assessment of the 1994 fishery.

Projections for the spring stock were done in the same manner as for fall spawners. In 1995, the advised TAC for spring spawners was 16,000 tonnes and the revised advice based on the 1995 fishery is for 17,000 tonnes (Table 51). The advice for 1997 would be 15,000 tonnes (Table 51).

Ecological Considerations

Fat Content - Fat content analysis was started using the acid digestion method employed in Blue Cove processing plants. Samples were examined from the September groundfish survey, the December juvenile survey, the spring fishery, and the January survey in 4Vn. Fat contents were highest in September (Fig. 52). Samples from Shediac Valley (4Tl) had the highest average fat content (11.1%). Samples from 4Vn were the lowest in fat content during September with an average of 5.1%. Fat content of juveniles during the December survey varied from an average of 1.7% during the first week, to 6.0% in the second week of the survey. Samples collected during the January survey in 4Vn were the lowest of those examined (1.6%). Spring fishery samples were also lower than September or December samples (2.3% to 3.0%) (Fig. 52).

Length differences - In last years assessment, differences in length distributions using correspondence analysis were found among areas (Claytor et al. 1995). These analyses were done for 1990, 1992, and 1993. The major differences were between the Acadian Peninsula, and Nova Scotia-East PEI, and Magdalen Islands. In 1990, most of the gillnetters in these areas were using 2 5/8" mesh but in 1992 and 1993 a change to larger mesh sizes began to occur (Fig. 53). Therefore, it was important to test whether or not the differences observed were the result of changing mesh size rather than differences in size of herring among the regions. In general, it is expected that a greater variance in the distribution and lower average size would be observed in catches using 2 5/8" mesh compared to 2 3/4" mesh and larger (Fig. 54). Thus, if similar separations and sorting along the correspondence analysis axes were observed for herring caught in different mesh sizes as between these areas, then it would be concluded that mesh size rather than area differences in length were repsonsible for the separations observed in last years analysis.

To test whether correspondence analysis would separate herring samples on the basis of the various mesh sizes used for fishing, data from a gillnet selectivity study in 1990 and 1991 were analyzed. The study was conducted on Fisherman's Bank using 5 mesh sizes (sizes (2", 2 1/4", 2 1/2", 2 3/4", and 3") from August 18, 1990 to September 8, 1990, and 6 mesh sizes (2 ", 2 1/4", 2 1/2", 2 5/8", 2 3/4", 3") from August 17, 1991 to September 24, 1991. During the first few trials in 1990, the nets were always strung together in the same order of mesh size, but this was changed to a random ordering of the nets for the remainder of the study.

The length frequencies were tranformed to proportions at length for equal weighting of all samples before a correspondence analysis was run (using SAS PROC CORRESP). Herring were grouped into half centimetre intervals and samples with fewer than 50 fish measured were discarded because they were not considered representative of the selectivity of the nets.

The 1990 data consist of 24 useable length frequency samples collected on 6 different nights of fishing. The samples caught with 2" mesh and 2 1/4" mesh were well separated from each other and from the samples caught by the larger meshes, while samples caught with 2 3/4" mesh overlap those of both 2 1/2" and 3" mesh. There is a progression of samples caught with small to larger mesh along the first axis. In total, 72% of the variation in the samples is explained by the first (58.5%) and second (14.5%) axes (Fig. 55).

The 1991 data consist of 24 useable samples caught on 8 different nights. The first two axes of the correspondence analysis of these samples explains 64% of the variation in the samples, 55% by the first axis, and 9% by the second. Using all samples, mesh size did not explain the separation of the samples plotted on the first and second axes (Fig. 56). However, all 4 samples collected on August 17 are located together on the graph, and were associated with small herring. When these samples were excluded from the analysis, the smaller mesh sizes ($\leq$ 2 1/4") were clearly distinguishable from those > 2 1/2" mesh (Fig. 57).

The first dimension of the correspondence analysis was most highly correlated with the mean, mode, and median of the length frequency distribution, while the second dimension is most highly correlated with factors describing the shape of the distribution, skewness and kurtosis (Table 52).

Thus, even though there were noticeable differences in length frequency distributions between 2 5/8" mesh and 2 3/4" mesh they do not lead to separation of samples based on confidence ellipses and any differences observed among the different areas was not the result of using different mesh sizes.

Mean Weight - Mean weights for fall spawners were highest during the 1980s and since 1990 have been below average for all ages using commercial catch at age matrices for all gears (Fig. 58). Spring spawners have also declined in mean weight since peaks in the 80s but the decline started about one year sooner for this group (Fig. 58). Two possible reasons for these declines are: declining weight-at-age due to increasing population size in the late 1980s and early 1990s and declining weight-at-age due to cold conditions in the 1990s.

References

Cairns, D.K., C. LeBlanc, and C. MacDougall. 1996. Herring spawn volume and progenitor biomass at Fisherman's Bank, Prince Edward Island, in 1995. DFO Atlantic Research Document 96/MS.

Claytor, R., H. Dupuis, F. Mowbray, G. Nielsen, C. LeBlanc, L. Paulin, C. Bourque, and C. MacDougall. 1995. Assessment of the NAFO Division 4T Southern Gulf of St. Lawrence herring stock, 1994. DFO Atlantic Research Document 96/69.

LeBlanc, C. and L. LeBlanc. 1996a. The 1995 NAFO Division 4T herring Gillnet Telephone Survey. DFO Atlantic Research Document 96/77.

LeBlanc, C. and J. Dale. 1996b. Distribution and acoustic backscatter of herring in NAFO Division 4T and 4Vn, Sept. 23-Oct. 8, 1995. DFO Atlantic Research Document 96/MS.

Mohn, R.K. 1988. Yield per recruit analysis. *In.* Collected papers on stock assessment, pg. 147-164, *ed.* D. Rivard. CAFSAC Research Document 88/61.

Ricker, W.E. 1975. Computation and Interpretation of Biological Statistics of Fish Populations. Bull. FRB Canada 191.

Rivard, D. 1982. APL programs for stock assessment (revised). Can. Tech. Rep. Fish. Aquat. Sci. No. 1091.

SAS Institute Inc. 1990. SAS User's Guide: Statistics, Version 6, 4th Edition, Cary, N.C., USA.

Sinclair, A., G. Chouinard, and L. Currie. 1996. Assessment of the southern Gulf of St. Lawrence cod stock, March 1996. DFO Atl. Fish. Res. Doc. 96/52

Walters, C. and A.M. Parma. 1996. Fixed exploitation rate strategies for coping with effects of climate change. Can. J. Fish. Aquat. Sci. 53:148-158

Table 1. Catch (t) of 4T herring caught in spring and fall, by gear (fixed and mobile) and spawning group (as calculated by the GSI method). Catch (t) in 4Vn from the purse seine fishery (Nov-Mar) is assigned to a spawning group according to otolith characteristics up to 1991 inclusive. Catches are derived from purchase slips, and are provisional from 1992-1994; mobile gear landings for 1992 and 1993 are based on quota-monitoring reports. Totals for tables 1,2, and 3 differ from 4,5, and 6 because of rounding and estimation differences in deriving spawning groups by area.

YEAR ANNÉE	SPAWNING GROUP a/ GROUPE DE FRAI a	4T SPRING / PRINTEMPS		4T FALL / AUTOMNE		4T CATCH PRISES	4T TAC TPA	4Vn CATCH PRISES	4Vn TAC TPA	BIOMASS BIOMASSE
		Fixed Fixes	Mobile Mobiles	Fixed Fixes	Mobile Mobiles					
1978	P	8.098	6.277	109	8.047	22.531		1.168		
	A	449	1,770	5,032	23,708	30,959		1,681		60,228
	Total	**8,547**	**8,047**	**5,141**	**31,755**	**53,490**	**55,000**	**2,849**	**8,000**	
1979	P	7,089	6,951	282	5,821	20,143		1,426		
	A	535	6,951	5,793	14,798	28,077		1,484		41,311
	Total	**7,624**	**13,902**	**6,075**	**20,619**	**48,220**	**55,000**	**2,910**	**3,000**	
1980	P	7,216	6,123	306	4,519	18,164		1,348		
	A	56	7,794	6,239	10,293	24,382		2,503		30,123
	Total	**7,272**	**13,917**	**6,545**	**14,812**	**42,546**	**55,000**	**3,851**	**4,500**	
1981	P	7,028	10	665	938	8,641		1,374		
	A	473	11	10,560	2,250	13,294		2,060		29,722
	Total	**7,501**	**21**	**11,225**	**3,188**	**21,935**	**16,000**	**3,434**	**3,000**	
1982	P	5,872	29	332	335	6,568		1,549		
	A	51	33	12,650	2,243	14,977		1,971		64,070
	Total	**5,923**	**62**	**12,982**	**2,578**	**21,545**	**15,000**	**3,520**	**3,000**	
1983	P	8,211	9	425	1,047	9,692		1,154		
	A	312	10	13,415	2,442	16,179		2,826		90,130
	Total	**8,523**	**19**	**13,840**	**3,489**	**25,871**	**20,000**	**3,980**	**5,000**	
1984	P	5,001	2	481	387	5,871		1,138		
	A	281	2	15,493	1,891	17,667		2,787		146,102
	Total	**5,282**	**4**	**15,974**	**2,278**	**23,538**	**19,000**	**3,925**	**3,500**	
1985	P	6,535	0	4,018	2,036	12,589	6,000	1,006		
	A	682	0	19,689	4,986	25,357	26,500	2,464		246,100
	Total	**7,217**	**0**	**23,707**	**7,022**	**37,946**	**32,500**	**3,470**	**3,500**	
1986	P	8,015	0	3,249	4,026	15,290	7,200	1,262		
	A	535	0	36,642	6,889	44,066	36,200	3,090		267,869
	Total	**8,550**	**0**	**39,891**	**10,915**	**59,356**	**43,400**	**4,352**	**4,200**	
1987	P	10,789	0	2,417	4,393	17,599	8,200	332		
	A	970	0	49,711	9,341	60,022	64,600	2,040		274,409
	Total	**11,759**	**0**	**52,128**	**13,734**	**77,621**	**72,800**	**2,372**	**4,200**	

a P: Spring/Printemps; A: Fall/Automne

Table 1 (cont'd). Catch (t) of 4T herring caught in spring and fall, by gear and spawning group.

YEAR ANNÉE	SPAWNING GROUP [a]/ GROUPE DE FRAI [a]	4T SPRING / PRINTEMPS		4T FALL / AUTOMNE		4T CATCH PRISES	4T TAC TPA	4Vn CATCH PRISES	4Vn TAC TPA	BIOMASS BIOMASSE
		Fixed Fixes	Mobile Mobiles	Fixed Fixes	Mobile Mobiles					
1988	P	11,541	0	3,278	6,644	21,463	12,800	257		
	A	1,346	1	37,933	10,887	50,167	66,100	2,315		316,397
	Total	**12,887**	**1**	**41,211**	**17,531**	**71,630**	**78,900**	**2,572**	**4,200**	
1989	P	10,441	0	1,564	4,138	16,143	16,800	212		
	A	652	0	32,285	10,131	43,068	70,100	1,905		315,459
	Total	**11,093**	**0**	**33,849**	**14,269**	**59,211**	**86,900**	**2,117**	**4,200**	
1990	P	8,520	1	1,331	3,815	13,667	21,000	706		
	A	540	0	55,790	6,494	62,824	65,900	4,005		297,942
	Total	**9,060**	**1**	**57,121**	**10,309**	**76,491**	**86,900**	**4,711**	**4,200**	
1991	P	12,586	17	178	2,095	14,876	21,000	957		
	A	306	1	26,966	5,964	33,237	65,900	3,832		250,690
	Total	**12,892**	**18**	**27,144**	**8,059**	**48,113**	**86,900**	**4,789**	**4,200**	
1992	P	12,438	952	239	1,850	15,479	21,000	296		
	A	37	168	32,840	5,265	38,310	65,900	3,932		426,667
	Total	**12,475**	**1,121**	**33,079**	**7,115**	**53,790**	**86,900**	**4,228**	**4,200**	
1993	P	14,584	2,175	917	1,388	19,064	21,000	219		
	A	598	541	22,181	4,840	28,160	80,800	3,736		424,287
	Total	**15,182**	**2,716**	**23,098**	**6,228**	**47,224**	**101,800**	**3,955**	**4,200**	
1994	P	18,754	2,910	1,422	1,879	24,965	21,000	324		
	A	260	1,023	52,390	5,081	58,754	80,800	2,920		376,563
	Total	**19,014**	**3,933**	**53,812**	**6,960**	**83,719**	**101,800**	**3,244**	**4,200**	
1995	P	13,970	1,406	1,798	5,775	22,950	21,000	153		
	A	31	436	52,937	9,567	62,982	80,800	3,990	4,200	286,294
	Total	14,001	1,842	54,735	15,342	85,932	101,800	4,143		

a P: Spring/Printemps; A: Fall/Automne

Table 2. Landings (t) of spring and fall spawners in 4T Southern Gulf of St. Lawrence fishery from 1978 to 1995 showing percent of spring and fall spawners caught by each gear type.

By Spawning Group

	Spring 4T				Fall 4T				4Vn - Landings (t)			
	Landings (t)			Percent	Landings (t)			Percent	Spring	Fall		Percent
Year	Inshore	L. Seiner	Total	Inshore	Inshore	L. Seiner	Total	Inshore	L. Seiner	L. Seiner	Total	Spring
1978	8,207	14,324	22,531	36	5,481	25,478	30,959	18	1,168	1,681	2,849	41
1979	7,371	12,772	20,143	37	6,328	21,749	28,077	23	1,426	1,484	2,910	49
1980	7,522	10,642	18,164	41	6,295	18,087	24,382	26	1,348	2,503	3,851	35
1981	7,693	948	8,641	89	11,033	2,261	13,294	83	1,374	2,060	3,434	40
1982	6,204	364	6,568	94	12,701	2,276	14,977	85	1,549	1,971	3,520	44
1983	8,636	1,056	9,692	89	13,727	2,452	16,179	85	1,154	2,826	3,980	29
1984	5,482	389	5,871	93	15,774	1,893	17,667	89	1,138	2,787	3,925	29
1985	10,553	2,036	12,589	84	20,371	4,986	25,357	80	1,006	2,464	3,470	29
1986	11,264	4,026	15,290	74	37,177	6,889	44,066	84	1,262	3,090	4,352	29
1987	13,206	4,393	17,599	75	50,681	9,341	60,022	84	332	2,040	2,372	14
1988	14,819	6,644	21,463	69	39,279	10,888	50,167	78	257	2,315	2,572	10
1989	12,005	4,138	16,143	74	32,937	10,131	43,068	76	212	1,905	2,117	10
1990	9,851	3,816	13,667	72	56,330	6,494	62,824	90	706	4,005	4,711	15
1991	12,764	2,112	14,876	86	27,272	5,965	33,237	82	957	3,832	4,789	20
1992	12,677	2,802	15,479	82	32,877	5,433	38,310	86	296	3,932	4,228	7
1993	15,501	3,563	19,064	81	22,779	5,381	28,160	81	219	3,736	3,955	6
1994	20,176	4,789	24,965	81	52,650	6,104	58,754	90	324	2,920	3,244	10
1995	15,768	7,180	22,948	69	52,968	10,003	62,971	83	153	3,990	4,143	4
Mean 90-94	14,194	3,416	17,610	80	38,382	5,875	44,257	86	500	3,685	4,185	11

Table 3. Landings and percentage of each spawning group caught by gear type for 4T + 4Vn.

By Spawning Group

	Spring				Fall			
Year	Inshore	L. Seiner	Total	Percent Inshore	Inshore	L. Seiner	Total	Percent Inshore
1978	8,207	15,492	23,699	35	5,481	27,159	32,640	17
1979	7,371	14,198	21,569	34	6,328	23,233	29,561	21
1980	7,522	11,990	19,512	39	6,295	20,590	26,885	23
1981	7,693	2,322	10,015	77	11,033	4,321	15,354	72
1982	6,204	1,913	8,117	76	12,701	4,247	16,948	75
1983	8,636	2,210	10,846	80	13,727	5,278	19,005	72
1984	5,482	1,527	7,009	78	15,774	4,680	20,454	77
1985	10,553	3,042	13,595	78	20,371	7,450	27,821	73
1986	11,264	5,288	16,552	68	37,177	9,979	47,156	79
1987	13,206	4,725	17,931	74	50,681	11,381	62,062	82
1988	14,819	6,901	21,720	68	39,279	13,203	52,482	75
1989	12,005	4,350	16,355	73	32,937	12,036	44,973	73
1990	9,851	4,522	14,373	69	56,330	10,499	66,829	84
1991	12,764	3,069	15,833	81	27,272	9,797	37,069	74
1992	12,677	3,098	15,775	80	32,877	9,365	42,242	78
1993	15,501	3,782	19,283	80	22,779	9,117	31,896	71
1994	20,176	5,113	25,289	80	52,650	9,024	61,674	85
1995	15,768	7,333	23,101	68	52,968	13,992	66,960	79
Mean 90-94	14,194	3,917	18,111	78	38,382	9,560	47,942	78

Table 4. Landings by inshore and large seiners by fishing season.

By Fishing Season

	Spring				Fall				4Vn	Spring + Fall (including 4Vn)			
Year	Inshore	L. Seiner	Total	Percent Inshore	Inshore	L. Seiner	Total	Percent Inshore	L. Seiner	Fixed	L. Seiner	Total	Percent Inshore
1978	8,547	8,047	16,594	52	5,141	31,755	36,896	14	2,849	13,688	42,651	56,339	24
1979	7,624	13,902	21,526	35	6,075	20,619	26,694	23	2,910	13,699	37,431	51,130	27
1980	7,272	13,917	21,189	34	6,545	17,812	24,357	27	3,851	13,817	35,580	49,397	28
1981	7,501	21	7,522	100	11,225	3,188	14,413	78	3,434	18,726	6,643	25,369	74
1982	5,923	62	5,985	99	12,982	2,578	15,560	83	3,520	18,905	6,160	25,065	75
1983	8,523	19	8,542	100	13,840	3,489	17,329	80	3,980	22,363	7,488	29,851	75
1984	5,282	4	5,286	100	15,974	2,278	18,252	88	3,925	21,256	6,207	27,463	77
1985	7,217	0	7,217	100	23,707	7,022	30,729	77	3,470	30,924	10,492	41,416	75
1986	8,550	0	8,550	100	39,891	10,915	50,806	79	4,352	48,441	15,267	63,708	76
1987	11,759	0	11,759	100	52128	13,734	65,862	79	2,372	63,887	16,106	79,993	80
1988	12,887	1	12,888	100	41,211	17,531	58,742	70	2,572	54,098	20,104	74,202	73
1989	11,093	0	11,093	100	33,849	14,269	48,118	70	2,117	44,942	16,386	61,328	73
1990	9,060	1	9,061	100	57121	10,309	67,430	85	4,711	66,181	15,021	81,202	82
1991	12,892	18	12,910	100	27,144	8,059	35,203	77	4,789	40,036	12,866	52,902	76
1992	12,475	1,121	13,596	92	33,079	7,115	40,194	82	4,228	45,554	12,464	58,018	79
1993	15,182	2,716	17,898	85	23,098	6,228	29,326	79	3,955	38,280	12,899	51,179	75
1994	19,014	3,933	22,947	83	53,812	6,960	60,772	89	3,244	72,826	14,137	86,963	84
1995	13,995	1,825	15,820	88	54,735	15,266	70,001	78	4,143	68,730	21,234	89,964	76
Mean 90-94	13,725	1,558	15,282	92	38,851	7,734	46,858	82	4,185	52,575	13,477	66,053	79

Table 5. Catch (tonnes) by season in fixed gear for 4T Southern Gulf of St. Lawrence herring. Catches compiled using ZIF raw data files for 1986, and 1988-1995. For 1987, catches purchase slip files were used. Exceptions were the use of quota monitoring reports for all purse seine catches and 16B fall bait fishery. New Brunswick Provincial Co-ordinator data was used for 16C and 16E New Brunswick spring inshore fisheries.

SOUTHERN GULF OF ST. LAWRENCE TACs and QUOTA ALLOCATIONS

Fishing Area	TAC (t)	Sharing TAC		Allocation (t)		Catch (t)	
		Inshore	Seiners	Inshore	Seiners	Inshore	Seiners
Spring 4T	21,000	80%	20%	16,800	4,200	13,995	1,825
Fall 4T	80,800	80%	20%	64,640	16,160	54,735	15,266
4Vn	4,200		100%		4,200		4,143
Total	106,000			81,440	24,560	68,730	21,234

SPRING FISHERY

Area/Zone	Season/Saison	TAC (t)/ Initial)	Final TAC	Catch (t)/ Prises (t)
INSHORE				
Escuminac 16C	Jan 1-May 31	5,900	5,900	3,169
Remainder of 4T	Jan 1-May 31	8,300	6,150	5,968
Bait and Roe Fisheries all 4T	June 1-June 30	2,000	3,550	4,859
Quebec Small Seiners	Jan. 1 - June 30	600	600	
Total Inshore		16,800	16,800	13,996
LARGE SEINERS				
All 4T	Ap 1 - June 30	4,200	4,200	1,825
Grand Total		21,000		15,820

FALL FISHERY

Area/Zone	Season/Saison	Consistent Weekend Closure	Vessel Limit/ Limite par bateau (lb)	Initial TAC (t)/ TPA (t)	Final TAC	Catch (t)/ Prises (t)
INSHORE						
Isle Verte 16A	July 1-Dec 31	no	20,000	1,000	400	77
Baie des Chaleurs 16B	Aug 1-Dec 31	no	20,000	30,350	31,000	29,267
Baie des Chaleurs 16B	Jul 1-Dec 31 Bait Fishery	no	20,000	950	300	57
Escuminac 16C & West PEI 16E	Aug 1-Dec 31	no	20,000	8,000	9,000	9,380
Magdalen 16D	Aug 1-Dec 31	no	15,000	1,000	1,600	1,901
Pictou 16F	Jul 1-Dec 31	yes	20,000	11,070	11,070	10,113
Fisherman's Bank 16G	Aug 1-Dec 31	no	15,000	11,070	10,070	3,816
Quebec Small Seiners	Aug 1-Dec 31			1,200	1,200	124
Total Inshore				64,640		54,735
LARGE SEINERS						
All 4T	Sept - Dec			16,160	16,160	15,266
4Vn	Nov - Mar			4,200	4,200	4,143
Total L. Seiners				20,360	20,360	19,409
Grand Total				85,000	85,000	74,144

Table 6. Catch (tonnes) by season in fixed gear for 4T Southern Gulf of St. Lawrence herring. Catches compiled using ZIF raw data files for 1986, and 1988-1994. For 1987, catches purchase slip files were used.

SPRING SEASON - FIXED GEAR

	Area							
Year	16A	16B	16C	16D	16E	16F	16G	Total
86	234	1439	2282	328	3731	66	266	8347
87	206	4089	3082	106	3841	134	38	11496
88	78	6616	3560	108	2041	158	122	12682
89	88	3827	1556	74	5080	134	62	10822
90	62	1715	2232	167	4285	141	17	8618
91	26	2139	5159	193	5018	127	16	12678
92	26	2856	4348	243	4699	146	54	12372
93	34	2377	4533	885	6893	200	124	15047
94	129	1550	6187	218	10499	154	71	18809
95	13	1029	4799	1039	6993	95	27	13995
Mean 90-94	55	2127	4492	341	6279	154	56	13505

FALL SEASON - FIXED GEAR

	Area							
Year	16A	16B	16C	16D	16E	16F	16G	Total
86	124	25959	93	0	1570	5816	6638	40199
87	208	31653	902	1	1090	9495	8660	52009
88	68	22111	1254	9	2591	9141	6102	41276
89	95	26431	1015	0	517	3160	2905	34123
90	110	31926	753	2	2405	10343	10957	56496
91	34	17181	1559	1	3242	1906	3122	27044
92	35	23559	1789	18	2540	1919	3160	33019
93	87	14597	3062	618	1977	935	1786	23062
94	74	34473	4086	1460	2118	8095	3483	53789
95	77	29448	5164	1901	4216	10113	3816	54735
Mean 90-94	68	24347	2250	420	2456	4640	4502	38682

Table 7. Average price paid per pound to purse seiners and gillnetters in the Gulf Region. na = not available.

Year	Purse Seine (cents/lb)	Gillnets (cents/lb)
83	9.44	na/nd
84	8.08	na/nd
85	9.10	na/nd
86	8.07	na/nd
87	9.04	12.00
88	7.15	8.00
89	5.00	3.00-4.00
90	6.21	5.00-6.00
91	5.65	3.00-4.00
92	5.60	3.00-4.00
93	5.00	3.00-4.00
94	5.50	6.00-8.00
95	6.50	10.00-12.00

Table 8 Daily sampling report on large seiner activity in Chaleur Bay during the fall season

Date Landed	Total Length (cm)			% females spawning in two weeks
	% ≤ 26	% 26-30	% > 30	
21 Aug				
22 Aug	0	28	72	
23 Aug				
24 Aug	0	23	77	
25 Aug				
26 Aug				
27 Aug	1	72	27	1
28 Aug	0	66	34	1
29 Aug	0	63	37	2
30 Aug	2	53	45	1
31 Aug	3	51	46	1
1 Sep	0	61	39	1
2 Sep	1	68	31	0
3 Sep	1	50	49	1
4 Sep	0	52	48	1
5 Sep	1	41	58	2
6 Sep				
7 Sep	0	66	34	1
8 Sep	1	80	19	2
9 Sep	3	85	12	0
10 Sep				
11 Sep				
12 Sep	4	67	12	5
13 Sep	5	56	39	0
14 Sep	5	74	21	0
15 Sep	11	67	22	0
16 Sep	6	69	25	0
17 Sep				
18 Sep				
19 Sep	4	66	30	0
20 Sep	5	56	39	1
21 Sep	3	74	23	1
22 Sep	6	66	28	0
23 Sep				
24 Sep	5	60	35	0
25 Sep	3	82	16	0
26 Sep	1	72	27	0
27 Sep	3	72	25	0
28 Sep	4	74	22	0
29 Sep				
30 Sep	5	78	17	0
1 Oct				
2 Oct	5	59	36	0
3 Oct	2	55	43	0
4 Oct	1	64	34	0
5 Oct	4	74	23	0
6 Oct	5	83	12	0
7 Oct				
8 Oct				
9 Oct				
10 Oct	8	74	18	0
11 Oct	0	73	26	0
12 Oct	9	76	15	0
13 Oct	2	76	21	0
14 Oct	0	63	37	0
15 Oct	0	84	16	0
16 Oct	0	64	36	0
17 Oct				
18 Oct	9	86	5	0

Table 9. Inshore landings in 16B during the 1995 Fall Fishery from dockside monitoring. Cumulative daily landings are compared to 1994 daily landings.

		Provincial Landings		Port Landings		Total Landings		
Date Landed	No. of Vessels	NB	Qué	Miscou	Other	1995	Cumul. 1995	Cumul. 1994
15-Aug	43	0	155	110	45	155	155	1134
16-Aug	55	45	8	45	8	53	208	1498
17-Aug	61	164	14	164	14	178	386	1758
18-Aug	251	1219	13	1216	16	1232	1618	2061
19-Aug	96	159	22	159	22	181	1799	2397
20-Aug	78	324	0	324	0	324	2123	3327
21-Aug	27	98	3	98	3	101	2224	3541
22-Aug	158	568	64	568	64	632	2856	3950
23-Aug	38	35	11	0	46	46	2902	4449
24-Aug	220	900	153	886	167	1053	3955	5348
25-Aug	0	0	0	0	0	0	3955	6212
26-Aug	44	75	29	75	29	104	4059	6904
27-Aug	94	137	6	134	9	143	4202	8913
28-Aug	260	1322	122	1297	147	1444	5646	9212
29-Aug	329	2086	162	2088	160	2248	7894	9407
30-Aug	208	1302	96	1242	156	1398	9292	9677
31-Aug	263	1024	176	205	995	1200	10492	9998
1-Sep	266	1022	36	850	208	1058	11550	10589
2-Sep	213	628	55	529	154	683	12233	11780
3-Sep	22	68	5	0	73	73	12306	14400
4-Sep	272	2064	15	1935	144	2079	14385	15086
5-Sep	253	1343	19	1343	19	1362	15747	16176
6-Sep	144	385	126	372	139	511	16258	16487
7-Sep	187	656	185	516	325	841	17099	16857
8-Sep	6	5	2	0	7	7	17106	17895
9-Sep	258	1203	23	1086	140	1226	18332	18792
10-Sep	182	964	22	944	42	986	19318	21923
11-Sep	47	90	84	0	174	174	19492	22870
12-Sep	282	1402	41	1236	207	1443	20935	23376
13-Sep	280	1243	36	1054	225	1279	22214	23796
14-Sep	153	563	85	140	508	648	22862	24583
15-Sep	128	559	21	386	194	580	23442	25366
16-Sep	331	2435	31	2321	145	2466	25908	26286
17-Sep	29	49	11	15	45	60	25968	28628
18-Sep	14	53	21	7	67	74	26042	29015
19-Sep	57	122	51	19	154	173	26215	29805
20-Sep	198	1148	38	1058	128	1186	27401	30059
21-Sep	285	1240	11	1148	103	1251	28652	30059
22-Sep	50	67	14	10	71	81	28733	31054
23-Sep	0	0	0	0	0	0	28733	31750
24-Sep	0	0	0	0	0	0	28733	33478
25-Sep	39	62	13	0	75	75	28808	33881
26-Sep	56	118	50	6	162	168	28976	33930
27-Sep	17	17	2	11	8	19	28995	34301
28-Sep	5	5	0	5	0	5	29000	3305
29-Sep	0	0	0	0	0	0	29000	34311

Table 9. (Continued)

Date Landed	No. of Vessels	Provincial Landings NB	Qué	Port Landings Miscou	Other	Total Landings 1995	Cumul. 1995	Cumul. 1994
30-Sep	1	2	0	0	2	2	29002	34407
1-Oct	0	0	0	0	0	0	29002	34425
2-Oct	8	31	5	0	36	36	29038	34425
3-Oct	7	7	13	0	20	20	29058	34426
4-Oct	0	0	0	0	0	0	29058	34426
5-Oct	1	7	0	0	7	7	29065	34426
6-Oct	0	0	0	0	0	0	29065	34426
7-Oct	0	0	0	0	0	0	29065	34426
8-Oct	0	0	0	0	0	0	29065	34426
9-Oct	0	0	0	0	0	0	29065	34426
10-Oct	1	1	0	0	1	1	29066	34426
11-Oct	2	22	0	0	22	22	29088	34426
12-Oct	8	26	0	0	26	26	29114	34426
13-Oct	0	0	0	0	0	0	29114	34426
14-Oct	5	9	0	7	2	9	29123	34426

Table 10. Daily large seiner landings in Chaleur Bay during the fall 1995 fishery.

Date Landed	No. of Vessels	Landed	Cumul 1995
15-Aug	0	0	0
16-Aug	0	0	0
17-Aug	0	0	0
18-Aug	3	0	0
19-Aug	2	0	0
20-Aug	1	0	0
21-Aug	3	0	0
22-Aug	2	144	144
23-Aug	0	0	144
24-Aug	2	56	200
25-Aug	0	0	200
26-Aug	0	0	200
27-Aug	2	224	424
28-Aug	3	87	511
29-Aug	5	351	862
30-Aug	1	30	892
31-Aug	6	329	1221
1-Sep	6	349	1571
2-Sep	6	428	1998
3-Sep	4	148	2147
4-Sep	2	99	2245
5-Sep	6	170	2415
6-Sep	5	0	2415
7-Sep	6	477	2892
8-Sep	4	213	3105
9-Sep	5	557	3661
10-Sep	2	0	3661
11-Sep	0	0	3661
12-Sep	5	304	3965
13-Sep	6	313	4278
14-Sep	5	24	4302
15-Sep	5	328	4630
16-Sep	5	313	4942
17-Sep	4	0	4942
18-Sep	0	0	4942
19-Sep	4	490	5432
20-Sep	6	657	6089
21-Sep	5	476	6565
22-Sep	5	519	7084
23-Sep	0	0	7084
24-Sep	3	111	7195
25-Sep	5	568	7763
26-Sep	5	404	8167
27-Sep	6	397	8565
28-Sep	5	429	8994
29-Sep	0	0	8994
30-Sep	6	205	9199
1-Oct	3	0	9199

Table 10. (Continued)

Date Landed	No. of Vessels	Landed	Cumul 1995
2-Oct	4	309	9507
3-Oct	6	613	10120
4-Oct	3	392	10512
5-Oct	5	586	11098
6-Oct	4	315	11413
7-Oct	0	0	11413
8-Oct	0	0	11413
9-Oct	0	0	11413
10-Oct	6	811	12225
11-Oct	6	775	12999
12-Oct	6	792	13792
13-Oct	5	729	14521
14-Oct	2	285	14805
15-Oct	1	23	14828
16-Oct	2	19	14847
17-Oct	0	0	14847
18-Oct	5	419	15266

Table 11. Yield per recruit results for fall and spring spawners at current targets and from yield per recruit analysis using mean weights from 1981 to 1994. Analysis was done to age 20 but after age 15 all catches were zero.

Fall Spawners

Current Target	F	Exploitation Rate
Fully Recruited F	0.30	26%
Weighted 4+ F	0.21	21%

	Mean	Partial	Initial		Catch	
Age	Weight	Recruitment	Population	F	Numbers	Biomass
2	0.10	0.0001	1.000	0.000	0.000	0.000
3	0.18	0.03	0.819	0.009	0.007	0.001
4	0.23	0.54	0.664	0.162	0.090	0.021
5	0.27	0.85	0.463	0.255	0.095	0.025
6	0.30	0.88	0.293	0.264	0.062	0.019
7	0.33	0.95	0.185	0.285	0.042	0.014
8	0.35	1	0.114	0.300	0.027	0.009
9	0.37	1	0.069	0.300	0.016	0.006
10	0.38	1	0.042	0.300	0.010	0.004
11	0.41	1	0.025	0.300	0.006	0.002
12	0.41	1	0.015	0.300	0.004	0.001
13	0.41	1	0.009	0.300	0.002	0.001
14	0.41	1	0.006	0.300	0.001	0.001
15	0.41	1	0.003	0.300	0.001	0.000

Yield per recruit	F	Exploitation Rate
Fully Recruited F	0.37	31%
Weighted 4+ F	0.28	24%

	Mean	Partial	Initial		Catch	
Age	Weight	Recruitment	Population	F	Numbers	Biomass
2	0.10	0.0001	1.000	0.000	0.000	0.000
3	0.18	0.03	0.819	0.011	0.008	0.001
4	0.23	0.54	0.663	0.200	0.109	0.025
5	0.27	0.85	0.444	0.315	0.109	0.029
6	0.30	0.88	0.266	0.326	0.067	0.021
7	0.33	0.95	0.157	0.352	0.042	0.014
8	0.35	1	0.090	0.370	0.026	0.009
9	0.37	1	0.051	0.370	0.014	0.005
10	0.38	1	0.029	0.370	0.008	0.003
11	0.41	1	0.016	0.370	0.005	0.002
12	0.41	1	0.009	0.370	0.003	0.001
13	0.41	1	0.005	0.370	0.001	0.001
14	0.41	1	0.003	0.370	0.001	0.000
15	0.41	1	0.002	0.370	0.000	0.000

Table 11 (continued).

Spring Spawners

Current Target	F	Exploitation Rate
Fully Recruited F	0.44	36%
Weighted 4+ F	0.30	26%

Age	Mean Weight	Partial Recruitment	Initial Population	F	Catch Numbers	Catch Biomass
2	0.15	0.0001	1.000	0.000	0.000	0.000
3	0.17	0.06	0.819	0.026	0.019	0.003
4	0.20	0.34	0.653	0.150	0.082	0.016
5	0.23	1.00	0.460	0.440	0.150	0.035
6	0.27	0.96	0.243	0.422	0.076	0.020
7	0.30	0.78	0.130	0.343	0.034	0.010
8	0.31	0.63	0.076	0.277	0.017	0.005
9	0.35	0.50	0.047	0.220	0.008	0.003
10	0.33	0.79	0.031	0.348	0.008	0.003
11	0.36	0.43	0.018	0.189	0.003	0.001
12	0.36	0.43	0.012	0.189	0.002	0.001
13	0.36	0.43	0.008	0.189	0.001	0.000
14	0.36	0.43	0.006	0.189	0.001	0.000
15	0.36	0.43	0.004	0.189	0.001	0.000

Yield per recruit	F	Exploitation Rate
Fully Recruited F	0.49	39%
Weighted 4+ F	0.33	28%

Age	Mean Weight	Partial Recruitment	Initial Population	F	Catch Numbers	Catch Biomass
2	0.15	0.0001	1.000	0.000	0.000	0.000
3	0.17	0.06	0.819	0.029	0.022	0.003
4	0.20	0.34	0.653	0.167	0.091	0.016
5	0.23	1	0.460	0.490	0.160	0.035
6	0.27	0.96	0.243	0.470	0.078	0.020
7	0.30	0.78	0.130	0.382	0.034	0.010
8	0.31	0.63	0.076	0.309	0.016	0.005
9	0.35	0.5	0.047	0.245	0.008	0.003
10	0.33	0.79	0.031	0.387	0.007	0.003
11	0.36	0.43	0.018	0.211	0.002	0.001
12	0.36	0.43	0.012	0.211	0.002	0.001
13	0.36	0.43	0.008	0.211	0.001	0.000
14	0.36	0.43	0.006	0.211	0.001	0.000
15	0.36	0.43	0.004	0.211	0.000	0.000

Table 12. Landings (t) for NAFO Division 4T by area, fishing season and gear type. Landings from 1992-1995 are provisional. Spring fishing: January-June, Fall fishing: July-December. %P: Percentage by numbers of spring spawners (P) in biological samples; N: sample size; NS: no sample available (*), or inadequate for one of the spawning groups (fall (A) or spring (P)).

	South/Sud (4Tf-4Tk)				Middle/Milieu (4Tl)				North/Nord (4Tm-4To)			
	Spring/Printemps		Fall/Automne		Spring/Printemps		Fall/Automne		Spring/Printemps		Fall/Automne	
	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles
1978 T	1,114	4,648	933	4,885	6,261	0	630	3,491	1,172	3,399	3,578	23,379
%P	99	78	0	32	93	--	6	25	100	78	2	24
N	4275	1090	121	516	489	--	*	292	89	*	945	1487
NS							*			*		
1979 T	1,241	13,901	2,305	78	5,246	0	1,069	5,738	1,137	0	2,701	14,803
%P	98	50	1	30	92	--	4	3	92	--	8	38
N	6081	1246	1311	*	499	--	193	345	*	--	287	3522
NS				*			P		*			
1980 T	1,994	13,897	2,786	320	3,604	20	1,826	793	1,674	0	1,933	13,699
%P	99	44	3	30	99	44	9	5	100	--	3	32
N	4780	1487	*	*	1100	*	186	97	298	--	297	2346
NS			*	*	A	*		P				
1981 T	2,386	21	3,272	3,081	4,028	0	2,381	14	1,087	0	5,572	93
%P	97	47	14	30	93	--	4	13	89	--	2	13
N	3157	*	399	*	494	--	694	*	1053	--	2291	759
NS		*		*				*				
1982 T	2,015	0	5,241	0	2,836	0	1,105	9	1,072	62	6,636	2,569
%P	98	--	0	--	100	--	0	13	99	47	5	13
N	4070	--	298	--	396	--	75	*	772	*	1867	798
NS								*	A	*		
1983 T	1,911	0	5,177	85	5,097	19	1,572	3,256	1,515	0	7,091	148
%P	97	--	0	30	95	47	9	30	100	--	4	30
N	*	--	812	*	683	*	175	*	114	--	1151	1200
NS	*			*		*		*				
1984 T	663	3	7,939	0	4,192	1	1,338	114	427	0	6,697	2,164
%P	88	47	1	--	96	47	0	17	92	--	6	17
N	157	*	459	--	*	*	405	*	143	--	1049	993
NS		*	P		*	*		*				
1985 T	2,352	0	9,362	0	3,902	0	1,413	0	963	0	12,932	7,022
%P	80	--	7	--	100	--	0	--	78	--	26	29
N	240	--	449	--	70	--	*	--	77	--	336	429
NS							*					
1986 T	3,336	0	12,265	44	3,389	0	1,570	0	1,825	0	26,056	10,871
%P	97	--	1	8	92	--	0	--	91	--	12	37
N	192	--	664	36	204	--	*	--	281	--	577	693
NS	A		P	P			*					
1987 T	3,611	0	18,232	78	3,749	0	1,974	13	4,399	0	31,922	13,643
%P	78	--	1	30	100	--	0	32	96	--	7	32
N	268	--	1724	*	230	--	32	*	328	--	1316	450
NS			P	*				*				
1988 T	2,091	0	15,080	224	4,047	0	3,797	1	6,749	0	22,334	17,306
%P	95	--	1	30	96	--	0	38	84	--	14	38
N	572	--	685	*	425		94	*	527	--	763	530
NS			P	*				*				

Table 12 (Cont'd). Landings (t) for NAFO Division 4T by area, fishing season and gear type.

	South/Sud (4Tf-4Tk)				Middle/Milieu (4Tl)				North/Nord (4Tm-4To)			
	Spring/Printemps		Fall/Automne		Spring/Printemps		Fall/Automne		Spring/Printemps		Fall/Automne	
	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles
1989 T	5,134	0	6,219	0	2,138	0	1,560	0	3,821	0	26,071	14,269
%P	96	--	0	--	97	--	0	--	90	--	6	29
N	445	--	447	--	1027	--	*	--	517	--	1407	801
NS							*					
1990 T	4,326	0	23,088	0	2,760	0	2,990	0	1,974	1	31,043	10,309
%P	97	--	0	--	98	--	3	--	82	82	4	37
N	446	--	2612	--	338	--	153	--	367	*	2026	406
NS					A		P					
1991 T	4,386	0	4,993	0	6,267	0	4,372	0	2,239	18	17,779	8,059
%P	96	--	0	--	99	--	0	--	97	97	1	26
N	340	--	1579	--	629	--	261	--	737	*	1403	671
NS					A					*		
1992 T	3,683	1,121	5,244	0	5,827	0	3,892	7	2,965		23,943	7,108
%P	99	85	0	--	100	--	0	26	100	--	1	26
N	586	247	566	--	542	--	63	*	242	--	1250	895
NS	A							*				
1993 T	5,528	2,148	2,148	0	6,305	0	4,820	0	3,349	--	15,330	6,228
%P	95	87	4	--	96	--	0	--	98	--	5	22
N	546	*	725	--	766	--	366	--	525	--	1012	309
NS		*										
1994 T	8,754	3,933	13,457	307	8,508	0	5,822	1	1,752	0	34,533	6,652
%P	98	74	8	27	99	--	0	27	100	--	1	27
N	655	262	463	*	855	--	97	*	368	--	610	720
NS	A			*	A			*			p	
1995 T	5,869	1,841	14,069	--	7,091	--	9,257	--	1,042	--	27,286	15,275
%P	100	72	8	--	100	--	100	--	87	--	3	41
N	345	142	450	--	224	--	145	--	318	--	891	646
NS	A				*		*					

Table 13. The number of nets per gillnetter used in each statistical district for the spring and fall fisheries.

Fall Fishery

Statistical District/ District statistique	86	87	88	89	90	91	92	93	94	95
11	10	10	9	6	7	10	9	5	6	7
13	12	9	8	7	8	5	4	8	6	6
65	9	5	9	6	6	5	7	7	10	7
66	5	5	6	6	6	5	5	6	5	5
67	8	6	7	7	6	6	7	6	5	5
87	10	8	10	8	10	12	7	7	7	8
92	10	8	10	11	7	7	9	9	12	8

Spring Fishery

Statistical District/ District statistique	87	88	89	90	91	86	92	93	94	95
11	5	2	2	2	4	2	3	3	2	2
13	5	5	6	5	6	5	5	5	5	5
65	18	15	14	16	14	9	12	8	8	10
66	3	5	4	5	5	5	6	4	5	5
67	10	24	15	5	8	7	8	9	5	5
73	20	17	16	18	11	23	9	14	10	19
75	21	23	22	23	24	26	25	26	20	24
78	43	26	30	36	40	27	23	28	28	34
80	39	38	31	35	35	29	36	32	32	30
82	37	26	29	24	29	16	22	22	27	18
92	23	13	13	12	10	19	11	10	9	8

Table 14. Average number of nets used in 4T during fall and spring gillnet fisheries.

Year	Fall	Spring
78	11.4	29.4
79	11.9	34.4
80	10.4	20.2
81	9.6	18.6
82	9.0	20.4
83	7.3	22.5
84	5.3	26.5
85	5.2	37.2
86	5.2	26.6
87	4.7	23.9
88	5.0	19.9
89	5.3	26.6
90	5.2	29.4
91	5.0	27.6
92	5.0	22.7
93	5.4	24.0
94	5.4	22.9
95	5.5	21.7

Table 15. Egg volume and progeniteur biomass from Fisheman's Bank spawning bed survey (Cairns et al. 1996).

	Fisherman's Bank			Ridge			Total		
Year	Volume (m3)	Weighted Mean CV	Progeniteur Biomass	Volume (m3)	Weighted Mean CV	Progeniteur Biomass	Volume (m3)	Weighted Mean CV	Progeniteur Biomass
85	11417		67977						
86	10837		64523						
87	11814		70341						
88									
89	17189	0.21	102343						
90	13504	0.19	80403						
91	1661	0.41	9887	4431	0.32	26383	6092	0.34	36270
92	12849	0.20	76500	959	0.31	5710	13808	0.21	82210
93	8241	0.20	49069	1294	0.18	7705	9535	0.2	56774
94	11619	0.10	69180	0		0	11619		
95	1262	0.40	7514						
Mean	10039		59774	1671		9950	10264		58418

Table 16. Total biomass and density estimates in the Southern Gulf of St. Lawrence from acoustic surveys.

Year and Date	Area	Number of Transects	Mean Density (kg/m2)	Estimated Area Biomass (t)	CV	Proportion at night	
						Transects Surveyed	Biomass Observed
1995	CHALEUR INSHORE	98	0.0181	62229	0.22	1.0	1.0
Sept 23- Oct 08	CHALEUR OFFSHORE	18	0.0058	9156	0.20	1.0	1.0
	MILNE - GEORGES	21	0.0083	10564		1.0	1.0
	CAPE BRETON INSHORE	35	0.0066	7295	0.50	1.0	1.0
	1995 TOTAL	**172**	**0.0121**	**89244**	**0.16**	**1.0**	**1.0**
1994	CHALEUR INSHORE	106	0.0415	162585	0.11	1.0	1.0
Oct 16-28	CHALEUR OFFSHORE	27	0.0063	16838	0.34	1.0	1.0
	1994 TOTAL	**133**	**0.0272**	**179423**	**0.10**	**1.0**	**1.0**
1993	CHALEUR INSHORE	163	0.0202	114052	0.35	0.71	0.93
Oct12-20	CHALEUR OFFSHORE	45	0.001	4284	0.41	0.02	0
	CAPE BRETON INSHORE	91	0.0039	7945	0.23	0.84	0.68
	CAPE BRETON OFFSHORE	39	0.0019	4567	0.41	0.18	0.09
	1993 TOTAL	**338**	**--**	**130848**	**0.31**	**0.58**	**0.85**
				0			
1992	CHALEUR INSHORE	216	0.0207	48258	0.10	0.57	0.65
Oct 01-22	CHALEUR OFFSHORE	102	0.0078	96582	0.52	0.48	0.75
	CAPE BRETON INSHORE	78	0.0227	44762	0.25	0.58	0.85
	CAPE BRETON OFFSHORE	22	0.0008	83	0.69	0.14	0
	1992 TOTAL	**418**	**--**	**189685**	**0.29**	**0.53**	**0.75**
1991	CHALEUR INSHORE	158	0.0054	16724	0.46	0.59	0.87
Oct 10-24	CHALEUR OFFSHORE	50	0.0015	23214	0.55	0.32	0.65
	CAPE BRETON INSHORE	49	0.0026	4418	0.32	0.61	0.98
	CAPE BRETON OFFSHORE	0	0	0	0.00	0	0
	1991 TOTAL	**257**		**44356**	**0.33**	**0.54**	**0.75**

Table 17. Acoustic survey comparison of transect distance with backscatter detected and resulting biomass estimates.

Stratum	Distance (km) with backscatter	Transect Length(km)	Proportion of total distance with backscatter	Biomass per stratum tons
CHALEUR 1995 SURVEY				
Grande Riviere	4.10	64.54	0.064	1803
Shigawake	12.95	122.99	0.105	6959
Newport	7.81	72.52	0.108	5970
New Carlilse	15.10	57.10	0.264	3042
New Richmond	0.60	41.97	0.014	1465
Belledune	3.40	40.05	0.085	3923
Maisonnette	5.55	73.94	0.075	7936
Nepisiguit	20.10	79.37	0.253	9440
E Miscou SE	4.20	50.60	0.083	2598
E Miscou SW	0.60	91.29	0.007	2537
E Miscou NW	14.60	88.19	0.166	16234
E Miscou NE	3.90	75.74	0.051	1769
1995 CHALEUR TOTAL	**92.91**	**858.28**	**0.108**	**63676**
CHALEUR 1994 SURVEY				
Grande_Riviere	0.40	61.39	0.007	895
Shigawake	33.60	100.20	0.335	55252
Newport	5.40	85.63	0.063	9497
New_Carlilse	27.80	68.52	0.406	14533
New_Richmond	1.30	84.54	0.015	3524
Belledune	17.10	53.42	0.320	23978
Maisonnette	15.90	69.60	0.228	22003
Nepisiguit	35.10	66.32	0.529	30301
East_Miscou_NW	0.00	75.96	0	0
East_Miscou_NE	0.00	78.32	0	0
East_Miscou_SW	0.00	61.73	0	0
East_Miscou_SE	0.00	50.47	0	0
1994 CHALEUR TOTAL	136.60	856.10	0.160	159983

Table 18. Fall 4T herring spawners catch-at-age (numbers) matrices from acoustic surveys.

4T	Age	1990	1991	1992	1993	1994	1995
	0						
	1	428444	943			4023	59
	2	1484657	5478	29832	8461	2995	16977
	3	633917	46376	19596	108416	9135	22111
	4	166696	64120	138894	52489	338873	12927
	5		14433	242378	44657	106755	91421
	6		4793	48766	181170	103504	17178
	7		3128	16274	35855	106099	36164
	8		4705	15498		13468	35111
	9		2707	5866	2050	7204	4557
	10		1078	10754			956
	11+		3572	11918		4534	487
	Total	**2713713**	**151335**	**539775**	**433099**	**696590**	**237949**

4Vn	Age	1990	1991	1992	1993	1994	1995
	0						
	1						
	2		11	2127	701		
	3	22636	346	3258	5617		
	4	87570	4064	16272	5091		
	5	65477	1534	23641	23654		
	6	74906	2066	12677	9796		
	7	63303	1338	8657	4747		
	8	31359	3109	18830	1743		
	9	17351	1151	15545	1761		
	10	29416	527	12682	1430		
	11+	66849	2039	43215	2168		
	Total	**458867**	**16182**	**156904**	**56708**		

4TVn	Age	1990	1991	1992	1993	1994	1995
	0						
	1	428444	943				
	2	1484657	5489	31959	9162		
	3	656553	46722	22854	114034		
	4	254265	68183	155166	57580		
	5	65477	15967	266018	68311		
	6	74906	6858	61443	190966		
	7	63303	4466	24931	40602		
	8	31359	7814	34328	1743		
	9	17351	3858	21411	3811		
	10	29416	1605	23436	1430		
	11+	66849	5610	55134	2168		
	Total	**3172580**	**167517**	**696679**	**489806**		

Table 19. Fall 4T herring spawners average weight-at-age (kg) from acoustic survey.

4T	Age	1990	1991	1992	1993	1994	1995
	0						
	1	0.038	0.028			0.013	0.040
	2	0.085	0.088	0.070	0.070	0.079	0.063
	3	0.136	0.138	0.131	0.120	0.135	0.114
	4	0.162	0.177	0.170	0.140	0.155	0.171
	5		0.203	0.192	0.190	0.170	0.178
	6		0.241	0.222	0.200	0.196	0.186
	7		0.272	0.244	0.230	0.214	0.223
	8		0.305	0.287		0.238	0.235
	9		0.307	0.264	0.310	0.275	0.281
	10		0.336	0.303			0.317
	11		0.374	0.334		0.379	0.297
	Total	**0.094**	**0.179**	**0.191**	**0.172**	**0.175**	**0.182**
4Vn	Age	1990	1991	1992	1993	1994	1995
	0						
	1						
	2		0.114	0.069	0.080		
	3	0.173	0.166	0.131	0.130		
	4	0.208	0.202	0.180	0.160		
	5	0.225	0.228	0.210	0.190		
	6	0.271	0.244	0.241	0.210		
	7	0.292	0.285	0.238	0.250		
	8	0.300	0.310	0.292	0.260		
	9	0.333	0.342	0.305	0.310		
	10	0.349	0.331	0.327	0.320		
	11	0.349	0.357	0.349	0.330		
	Total	**0.271**	**0.270**	**0.274**	**0.203**		
4TVn	Age	1990	1991	1992	1993	1994	1995
	0						
	1	0.038	0.028				
	2	0.085	0.088	0.070	0.071		
	3	0.137	0.138	0.131	0.120		
	4	0.178	0.178	0.171	0.142		
	5	0.225	0.205	0.194	0.190		
	6	0.271	0.242	0.226	0.201		
	7	0.292	0.276	0.242	0.232		
	8	0.300	0.307	0.290	0.260		
	9	0.333	0.317	0.294	0.310		
	10	0.349	0.334	0.316	0.320		
	11	0.349	0.368	0.346	0.330		
	Total	**0.120**	**0.188**	**0.209**	**0.176**		

Table 20. Fall 4T herring spawners biomass (t) estimates from acoustic survey.

4T	Age	1990	1991	1992	1993	1994	1995
	0	0	0	0	0	0	0
	1	16281	26	0	0	54	2
	2	126196	482	2088	592	238	1075
	3	86213	6400	2567	13010	1230	2510
	4	27005	11349	23612	7349	52424	2208
	5	0	2930	46537	8485	18106	16291
	6	0	1155	10826	36234	20328	3199
	7	0	851	3971	8247	22716	8054
	8	0	1435	4448	0	3212	8234
	9	0	831	1549	636	1980	1280
	10	0	362	3258	0	0	303
	11	0	1336	3981	0	1721	145
	Total	**255694**	**27158**	**102836**	**74552**	**122008**	**43300**
4Vn	Age	1990	1991	1992	1993	1994	1995
	0						
	1						
	2		1	147	56		
	3	3916	57	427	730		
	4	18215	821	2929	815		
	5	14732	350	4965	4494		
	6	20300	504	3055	2057		
	7	18484	381	2060	1187		
	8	9408	964	5498	453		
	9	5778	394	4741	546		
	10	10266	174	4147	458		
	11	23330	728	15082	716		
	Total	**124429**	**4374**	**43051**	**11511**		
4TVn	Age	1990	1991	1992	1993	1994	1995
	0						
	1	16281	26				
	2	126196	483	2235	648		
	3	90129	6457	2994	13740		
	4	45219	12170	26541	8163		
	5	14732	3280	51501	12979		
	6	20300	1659	13881	38291		
	7	18484	1232	6031	9433		
	8	9408	2399	9946	453		
	9	5778	1225	6290	1181		
	10	10266	537	7405	458		
	11	23330	2064	19063	716		
	Total	**380123**	**31532**	**145888**	**86063**		

Table 21. Spring 4T herring spawners catch-at-age (numbers) from acoustic survey.

4T	Age	1990	1991	1992	1993	1994	1995
	0	29335	0	0	0	28994	186
	1	2875986	15299	91349	23362	748	17561
	2	3112748	37000	59770	234348	3987	57445
	3	182087	17476	33459	21532	143019	6338
	4	12150	6386	81373	39138	56129	34369
	5	5595	1753	18129	31446	47865	2623
	6	15907	824	9172	0	41505	13666
	7	0	1329	3316	0	10199	8205
	8	0	945	3617	0	564	2884
	9	5595	1267	2024	0	3592	1242
	10	0	431	2455	0	1698	0
	11+	0	863	0	0	1764	0
	Total	**6239404**	**83575**	**304664**	**349826**	**340063**	**144520**
4Vn	Age	1990	1991	1992	1993	1994	1995
	0						
	1	582		2850	837		
	2	8051	64	2894	2871		
	3	1333	44	3230	745		
	4	14756		1277	332		
	5	5838					
	6	1670	96	622	1434		
	7	8142					
	8						
	9	2382		1293			
	10	1734					
	11+						
	Total	**44488**	**204**	**12166**	**6219**		
4TVn	Age	1990	1991	1992	1993	1994	1995
	0	29335					
	1	2876569	15299	94199	24199		
	2	3120799	37064	62664	237218		
	3	183420	17520	36689	22277		
	4	26906	6386	82649	39470		
	5	11433	1753	18129	31446		
	6	17576	920	9794	1434		
	7	8142	1329	3316			
	8		945	3617			
	9	7977	1267	3317			
	10	1734	431	2455			
	11+		863				
	Total	**6283892**	**83778**	**316830**	**356044**		

Table 22. Spring 4T herring spawners weight-at-age from acoustic surveys.

4T	Age	1990	1991	1992	1993	1994	1995
	0	0.023				0.012	0.012
	1	0.064	0.082	0.061	0.070	0.049	0.057
	2	0.104	0.132	0.087	0.110	0.109	0.101
	3	0.138	0.167	0.157	0.130	0.160	0.132
	4	0.233	0.210	0.195	0.170	0.174	0.184
	5	0.253	0.237	0.225	0.220	0.194	0.203
	6	0.235	0.297	0.249		0.231	0.206
	7		0.294	0.238		0.253	0.228
	8		0.376	0.403		0.273	0.264
	9	0.317	0.357	0.317		0.321	0.321
	10		0.319	0.350		0.304	
	11		0.447			0.392	
	Total	**0.087**	**0.153**	**0.138**	**0.125**	**0.169**	**0.141**
4Vn	Age	1990	1991	1992	1993	1994	1995
	0						
	1	0.070		0.065	0.070		
	2	0.137	0.156	0.099	0.130		
	3	0.156	0.174	0.144	0.130		
	4	0.244		0.237	0.170		
	5	0.225					
	6	0.207	0.276	0.249	0.290		
	7	0.325					
	8						
	9	0.372		0.309			
	10	0.390					
	11						
	Total	**0.243**	**0.217**	**0.147**	**0.161**		
4TVn	Age	1990	1991	1992	1993	1994	1995
	0	0.023					
	1	0.064	0.082	0.061	0.070		
	2	0.104	0.132	0.088	0.110		
	3	0.138	0.167	0.156	0.130		
	4	0.239	0.210	0.196	0.170		
	5	0.239	0.237	0.225	0.220		
	6	0.232	0.295	0.249	0.290		
	7	0.325	0.294	0.238			
	8		0.376	0.403			
	9	0.333	0.357	0.314			
	10	0.390	0.319	0.350			
	11		0.447				
	Total	**0.088**	**0.153**	**0.138**	**0.126**		

Table 23 Spring 4T herring spawners biomass (t) estimates from acoustic survey.

4T	Age	1990	1991	1992	1993	1994	1995
	0	675				351	2
	1	184063	1255	5572	1635	37	1006
	2	323726	4884	5200	25778	433	5819
	3	25128	2919	5253	2799	22840	833
	4	2831	1341	15868	6654	9778	6334
	5	1416	416	4079	6918	9286	534
	6	3738	245	2284		9596	2815
	7		391	789		2581	1873
	8		355	1458		154	761
	9	1774	452	642		1152	398
	10		138	859		517	
	11		386			691	
	Total	**543350**	**12780**	**42004**	**43784**	**57415**	**20376**
4Vn	Age	1990	1991	1992	1993	1994	1995
	0						
	1	41		185	59		
	2	1103	10	287	373		
	3	208	8	465	97		
	4	3601		303	57		
	5	1314					
	6	346	26	155	416		
	7	2646					
	8						
	9	886		400			
	10	677					
	11						
	Total	**10820**	**44**	**1794**	**1001**		
4TVn	Age	1990	1991	1992	1993	1994	1995
	0	675					
	1	184104	1255	5758	1694		
	2	324829	4894	5487	26151		
	3	25336	2926	5718	2896		
	4	6431	1341	16170	6710		
	5	2729	416	4079	6918		
	6	4084	271	2439	416		
	7	2646	391	789			
	8		355	1458			
	9	2660	452	1041			
	10	677	138	859			
	11		386				
	Total	**554170**	**12824**	**43797**	**44785**		

Table 24. Results of multiplicative model using purchase slip data from fall gillnet fishery.

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	28	4025.79589	143.77842	184.841	0.0001
Error	2833	2203.64474	0.77785		
C Total	2861	6229.44063			

Root MSE	0.88196	R-square	0.6463
Dep Mean	5.99789	Adj R-sq	0.6428
C.V.	14.70445		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	7.423436	0.08320950	89.214	0.0001
YY78	1	-1.436200	0.14174988	-10.132	0.0001
YY79	1	-2.218400	0.11065350	-20.048	0.0001
YY80	1	-2.363573	0.10861086	-21.762	0.0001
YY81	1	-1.660737	0.09103959	-18.242	0.0001
YY82	1	-1.670549	0.09269775	-18.021	0.0001
YY83	1	-1.300514	0.09236890	-14.080	0.0001
YY84	1	-0.773105	0.09654491	-8.008	0.0001
YY85	1	-0.165123	0.09990797	-1.653	0.0985
YY86	1	-0.045161	0.10139524	-0.445	0.6561
YY88	1	-0.034642	0.10178959	-0.340	0.7336
YY89	1	0.160791	0.10662728	1.508	0.1317
YY90	1	0.168378	0.09693757	1.737	0.0825
YY91	1	0.274256	0.10433270	2.629	0.0086
YY92	1	0.292742	0.09951500	2.942	0.0033
YY93	1	0.085063	0.10233167	0.831	0.4059
YY94	1	0.194753	0.09013746	2.161	0.0308
YY95	1	-0.143020	0.09176855	-1.558	0.1192
D11	1	-0.717403	0.05752489	-12.471	0.0001
D13	1	-0.922972	0.08965789	-10.294	0.0001
D65	1	-0.978235	0.05256382	-18.610	0.0001
D67	1	-0.153673	0.05900758	-2.604	0.0093
D87	1	-0.220393	0.05851452	-3.766	0.0002
D92	1	-0.782533	0.06514916	-12.011	0.0001
W1	1	-1.169078	0.05579314	-20.954	0.0001
W2	1	-0.276768	0.05639944	-4.907	0.0001
W3	1	-0.092588	0.05269645	-1.757	0.0790
W5	1	-0.058189	0.05682572	-1.024	0.3059
W6	1	-0.534656	0.07625022	-7.012	0.0001

Table 25. Abundance index for fall spawners used to tune ADAPT-VPA, units are kg/net/trip.

	Year																	
Age	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
1	0	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	11	0	3	16	0	0	0	0	19	1	0	0	1	0	6	0	0	0
3	469	23	351	283	90	41	80	133	121	453	83	30	223	22	38	11	0	3
4	724	487	230	1188	629	1143	2080	1049	2453	2161	1452	1442	1360	5530	1498	336	591	175
5	455	250	269	311	708	541	1124	2908	1231	1711	2981	2253	1194	1434	6316	4093	791	1920
6	106	143	44	122	207	744	694	1768	2570	1172	1440	3029	1700	1024	1419	5026	3122	729
7	97	42	76	51	106	122	500	1130	1437	2055	941	1435	3268	1511	855	831	4500	2380
8	510	52	16	29	44	92	112	535	613	878	1014	729	1025	1863	1040	436	788	2118
9	15	43	10	13	16	27	38	144	348	531	494	922	552	678	1087	504	623	402
10	20	14	13	12	5	7	17	87	25	258	195	339	600	338	530	269	622	284
11	248	27	4	5	3	9	8	19	52	106	115	265	326	636	780	384	910	707

Table 26. ADAPT input summary for fall herring Division 4T, 1995.

Parameters:	
- year-class estimates: N_i	i=4-10
- calibration contants: K_i	i=4-10
Strucuture:	
- F for oldest age group (11+) assumed equal to F at age 10 (CALC-F-OLD)	
- model did not include an intercept term (tested and found to be non-significant)	
Input:	
- $catch_{i,t}$ and $weight_{i,t}$	i=2-11+, t=1978-1995
- log $CPUE_{i,t}$ (kg/net-trip)	i=2-11+, t=1978-1995
- natural mortality=0.2	
Objective function:	
- minimize $\sum\sum(\text{observed log CPUE}_{i,t}) - (\text{predicted log CPUE}_{i,t})$	
Summary:	
- number of parameters:	14
- number of observations:	126

Table 27. Diagnostic statistics for fall spawner ADAPT-VPA.

approximate statistics assuming linearity near solution

orthogonality offset 0.00584

mean square residuals 0.17401

	par est	std err	cv	t-stat	% bias
4	31943.6012	14358.6781	0.449501	2.224690	9.984291
5	123678.025	46620.7117	0.376952	2.652856	6.245696
6	48788.3392	16206.5475	0.332181	3.010409	4.568679
7	171330.613	49785.0908	0.290579	3.441404	3.431280
8	222915.235	58941.5513	0.264412	3.781971	2.797518
9	37547.1303	9788.42427	0.260697	3.835871	2.579592
10	22379.1326	5923.58172	0.264692	3.777973	2.516366
4	0.004972	0.000521	0.104782	9.543609	0.336617
5	0.008235	0.000849	0.103087	9.700502	0.432974
6	0.008957	0.000915	0.102114	9.792950	0.487614
7	0.010768	0.001090	0.101264	9.875219	0.513614
8	0.011871	0.001193	0.100529	9.947340	0.527007
9	0.011550	0.001155	0.099963	10.003748	0.542608
10	0.012637	0.001255	0.099306	10.069862	0.539329

parameter correltion matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1.00	0.04	0.03	0.03	0.03	0.02	0.02	-0.24	-0.02	-0.01	-0.01	-0.01	-0.01	-0.00
2	0.04	1.00	0.05	0.04	0.04	0.03	0.03	-0.16	-0.20	-0.02	-0.02	-0.01	-0.01	-0.00
3	0.03	0.05	1.00	0.05	0.05	0.04	0.03	-0.13	-0.14	-0.18	-0.02	-0.01	-0.01	-0.00
4	0.03	0.04	0.05	1.00	0.06	0.05	0.04	-0.12	-0.12	-0.14	-0.16	-0.02	-0.01	-0.01
5	0.03	0.04	0.05	0.06	1.00	0.06	0.05	-0.10	-0.11	-0.12	-0.13	-0.15	-0.01	-0.01
6	0.02	0.03	0.04	0.05	0.06	1.00	0.05	-0.09	-0.10	-0.10	-0.11	-0.12	-0.14	-0.01
7	0.02	0.03	0.03	0.04	0.05	0.05	1.00	-0.07	-0.08	-0.09	-0.09	-0.10	-0.12	-0.14
8	-0.24	-0.16	-0.13	-0.12	-0.10	-0.09	-0.07	1.00	0.08	0.06	0.04	0.03	0.02	0.01
9	-0.02	-0.20	-0.14	-0.12	-0.11	-0.10	-0.08	0.08	1.00	0.06	0.05	0.03	0.02	0.01
10	-0.01	-0.02	-0.18	-0.14	-0.12	-0.10	-0.09	0.06	0.06	1.00	0.05	0.04	0.02	0.01
11	-0.01	-0.02	-0.02	-0.16	-0.13	-0.11	-0.09	0.04	0.05	0.05	1.00	0.04	0.03	0.01
12	-0.01	-0.01	-0.01	-0.02	-0.15	-0.12	-0.10	0.03	0.03	0.04	0.04	1.00	0.03	0.01
13	-0.01	-0.01	-0.01	-0.01	-0.01	-0.14	-0.12	0.02	0.02	0.02	0.03	0.03	1.00	0.02
14	-0.00	-0.00	-0.00	-0.01	-0.01	-0.01	-0.14	0.01	0.01	0.01	0.01	0.01	0.02	1.00

Table 28. Fall spawner fishing mortalities as estimated by ADAPT-VPA.

	Year																	
Age	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
2	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
3	0.21	0.17	0.18	0.04	0.03	0.01	0.01	0.01	0.01	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
4	0.48	0.43	0.38	0.20	0.11	0.09	0.07	0.06	0.13	0.10	0.07	0.08	0.12	0.06	0.03	0.04	0.08	0.23
5	0.49	0.66	0.51	0.21	0.17	0.10	0.08	0.09	0.11	0.16	0.15	0.11	0.17	0.09	0.09	0.08	0.16	0.41
6	0.25	0.79	0.62	0.14	0.23	0.18	0.11	0.12	0.16	0.19	0.17	0.15	0.18	0.08	0.12	0.09	0.18	0.37
7	0.32	0.43	1.37	0.17	0.18	0.16	0.12	0.17	0.24	0.26	0.22	0.17	0.41	0.10	0.12	0.10	0.21	0.27
8	0.81	0.50	1.46	0.39	0.23	0.16	0.13	0.15	0.25	0.31	0.20	0.20	0.28	0.17	0.12	0.09	0.22	0.20
9	0.67	0.99	1.36	0.62	0.41	0.17	0.07	0.25	0.21	0.41	0.26	0.17	0.31	0.14	0.18	0.08	0.25	0.22
10	0.71	1.90	1.89	0.32	0.24	0.20	0.08	0.21	0.16	0.27	0.25	0.19	0.26	0.12	0.20	0.13	0.23	0.25
11	0.71	1.90	1.89	0.32	0.24	0.20	0.08	0.21	0.16	0.27	0.25	0.19	0.26	0.12	0.20	0.13	0.23	0.25
Wt 7+	0.64	0.94	1.47	0.28	0.21	0.16	0.11	0.17	0.23	0.28	0.22	0.18	0.33	0.13	0.15	0.10	0.21	0.23
Wt 5+	0.52	0.80	0.84	0.20	0.19	0.14	0.10	0.11	0.17	0.22	0.18	0.15	0.26	0.11	0.11	0.09	0.20	0.28
Wt 4+	0.51	0.65	0.65	0.20	0.15	0.11	0.08	0.10	0.16	0.17	0.15	0.13	0.22	0.08	0.09	0.08	0.18	0.28
Target 4+	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**	**0.21**

Table 29. Fall spawning 4T herring population numbers from ADAPT-VPA.

	Year																	
Age	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
2	144168	395965	341627	542922	836223	510755	554196	796542	586999	389573	434159	1680570	966882	223291	418775	65710	410320	3097
3	150081	116636	316441	276909	443804	682752	416833	452804	651176	479677	318160	351584	1375283	791559	182815	342761	53756	335928
4	99817	99718	80673	215639	216930	354014	551105	336888	366073	528492	383193	256281	286367	1118902	642097	148871	278688	43732
5	79263	50423	53312	45239	144534	158984	263978	422604	260403	263277	392917	291600	193625	209079	859820	508910	117134	211592
6	28154	39857	21327	26342	30135	99536	117711	198800	316568	190376	184535	278239	213663	133871	156360	640527	384325	81730
7	22751	17877	14798	9385	18694	19603	68092	86698	144047	220722	128950	127630	195656	146325	101237	113124	481844	263654
8	29559	13477	9571	3082	6467	12779	13726	49488	60091	93186	140057	85086	88487	106597	108282	73607	83843	321360
9	4575	10807	6722	1814	1714	4222	8900	9882	34798	38304	56026	94316	57086	54888	73467	78976	54921	55335
10	2515	1922	3278	1410	795	933	2919	6792	6333	23046	20767	35506	65322	34435	38942	50132	59536	34930
11	29649	13103	1893	663	1237	1315	1514	3347	6756	9170	20307	26388	42286	68517	75384	77428	92130	81113
4+	296283	247184	191574	303574	420506	651386	1027945	1114499	1195069	1366573	1326752	1195046	1142492	1872614	2055589	1691575	1552421	1093446
5+	196466	147466	110901	87935	203576	297372	476840	777611	828996	838081	943559	938765	856125	753712	1413492	1542704	1273733	1049714
7+	89049	57186	36262	16354	28907	38852	95151	156207	252025	384428	366107	368926	448837	410762	397312	393267	772274	756392

Table 30. Fall spawning 4T herring beginning of year biomass from ADAPT-VPA.

Age	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
3	20146	14681	41263	40551	62145	99408	69964	73153	88390	75720	38160	45142	195897	122513	23813	33196	4551	35178
4	18022	17507	14145	41134	48131	75832	116796	74915	81559	105441	90778	54266	58335	229106	114088	23907	45203	6908
5	18638	11609	12347	11019	38079	42008	68325	111341	67037	67434	102996	78769	50366	51322	198821	110770	23820	41576
6	7617	10411	5289	7966	9535	30181	34328	59170	94653	55172	54489	83526	64388	37730	40508	158621	92125	18518
7	6607	5065	4046	2951	6788	6624	22333	28650	47833	71871	41925	41807	64472	47276	29480	30112	127182	68689
8	9126	4193	2631	1048	2464	4704	5042	17472	21462	32595	48694	29099	31027	36834	35634	21253	23675	90805
9	1500	3796	2108	578	669	1596	3420	3896	13070	14106	21026	34183	20206	19690	25260	26105	17008	17244
10	878	673	1130	497	301	368	1099	2751	2426	8916	8085	13877	24584	12724	13613	16048	20206	11960
11+	10953	4759	699	249	524	534	671	1380	2815	3637	8183	10557	16664	26711	27877	26362	30895	29328
4+	73340	58013	42397	65444	106491	161847	252014	299574	330856	359173	376177	346084	330043	461391	485281	413179	380113	285027
5+	55318	40506	28252	24309	58360	86015	135218	224659	249297	253732	285399	291817	271708	232285	371193	389272	334911	278120
7+	29064	18486	10616	5324	10746	13826	32565	54148	87607	131125	127914	129523	156954	143234	131864	119881	218966	218026

Table 31. Effort as boat-nights and percentage of trips that were equal to or exceeded the nightly quota in four areas of the fall inshore 4T herring fishery.

	Effort (Boat-Nights)				Percentage ≥ Nightly Limit		
Area	93	94	95	Nightly Limit (t)	93	94	95
16B	1815	3791	5105	9	45	46	25
16CE	589	834	1524	9	44	44	36
16F	120	1152	1799	9	25	30	27
16G	367	573	482	5 (93), 7 (94,95)	60	23	37

Table 32. Mean total lengths (cm) of herring caught in all gear in the fall and spring 4T herring fisheries in 1994 and 1995.

	Fall		Spring	
Age	95	94	95	94
3	25.2	26.8	27.5	25.2
4	28.3	28.6	28.2	28.1
5	29.4	30.0	29.4	29.1
6	30.5	31.2	30.4	30.1
7	32.0	32.4	31.6	30.8
8	32.7	33.4	32.9	31.7
9	34.0	34.6	34.2	33.3
10	35.2	35.1	34.5	33.9
11	35.9	36.1	35.4	34.4

Table 33. Fall spawner projected catches at $F_{0.1}$ for 1996 and 1997

Age	Weights			Beginning of year population numbers			Beginning of year biomass (t)			Projections Catch biomass (t)		
	Beginning of year	Catch	Average PR (93-95)	1995	1996	1997	1995	1996	1997	1995	1996	1997
3	0.095	0.133	0.063	351125	371860	371693	33500	35479	35463	678	837	837
4	0.160	0.184	0.541	43732	282382	298777	7008	45251	47878	1032	7092	7504
5	0.206	0.219	1.000	211592	30688	196552	43554	6317	40458	9951	1590	10185
6	0.238	0.244	1.000	81730	130277	18613	19449	31002	4429	4266	7513	1073
7	0.264	0.271	1.000	263654	50321	79017	69487	13262	20825	16043	3215	5048
8	0.285	0.292	1.000	321360	162331	30521	91446	46193	8685	20776	11185	2103
9	0.317	0.328	1.000	55335	197860	98459	17557	62778	31239	4010	15328	7627
10	0.334	0.334	1.000	34930	34070	120008	11666	11378	40079	2765	2686	9463
11	0.346	0.361	1.000	81113	71447	64966	28048	24706	22465	6840	6089	5536
4+				1093446	959376	906914	288215	240887	216060	**65683**	**54698**	**48540**

Table 34. Comparison of population biomass (t) projections made after the assessment of the 1994 fishery for 1995 and 1966 with results from the assessment of the 1995 fishery and projections for 1996.

Age	1994		1995		1996	
	1994 Assessment Results	1995 Assessment Results	1994 Assessment Projection	1995 Assessment Results	1994 Assessment Projection	1995 Assessment Projection
4	22618	45203	50689	6908	50120	45251
5	18585	23820	22231	41576	46194	6317
6	88556	92125	15596	18518	16160	31002
7	148186	127182	69561	68689	10945	13262
8	26043	23675	114473	90805	47805	46193
9	17929	17008	20083	17244	75896	62778
10	21718	20206	12927	11960	12491	11378
11	33208	30895	37713	29328	33917	24706
4+	376842	380113	343275	285027	293527	240887

Table 35. Comparison of total length and fork length (cm).

Length		
Total	Fork	Difference
19.0	17.06	1.94
19.5	17.51	1.99
20.0	17.95	2.05
20.5	18.40	2.10
21.0	18.85	2.15
21.5	19.30	2.20
22.0	19.75	2.25
22.5	20.20	2.30
23.0	20.64	2.36
23.5	21.09	2.41
24.0	21.54	2.46
24.5	21.99	2.51
25.0	22.44	2.56
25.5	22.89	2.61
26.0	23.33	2.67
26.5	23.78	2.72
27.0	24.23	2.77
27.5	24.68	2.82
28.0	25.13	2.87
28.5	25.57	2.93
29.0	26.02	2.98
29.5	26.47	3.03
30.0	26.92	3.08
30.5	27.37	3.13
31.0	27.82	3.18
31.5	28.26	3.24
32.0	28.71	3.29
32.5	29.16	3.34
33.0	29.61	3.39
33.5	30.06	3.44
34.0	30.51	3.49
34.5	30.95	3.55
35.0	31.40	3.60

Table 36. Comparison of numbers and biomass of spring and fall 4T herring spawners caught in fall purse fishery in Chaleur Bay in 1994 and 1995 by maturity stage.

	Numbers x 1000		Biomass (t)		Percent Numbers		Percent Biomass	
	1994	1995	1994	1995	1994	1995	1994	1995
Fall Spawners								
Immature	386	2029	62	313	1	3	1	2
Maturing	5243	13632	1083	2639	17	18	16	17
Stage 5	2109	4986	421	943	7	7	6	6
Spawning	407	185	68	46	1	0	1	0
Spent	14774	28935	3173	5627	47	38	48	37
Total	**22919**	**49767**	**4807**	**9567**	**73**	**65**	**72**	**62**
Spring Spawners								
Immature	277	1832	43	243	1	2	1	2
Maturing	8128	22549	1804	5011	26	30	27	33
Spent		2205		520		3		3
Total	**8405**	**26586**	**1847**	**5775**	**27**	**35**	**28**	**38**
Grand Total	**31324**	**76353**	**6653**	**15342**	**100**	**100**	**100**	**100**

Table 37. Comparison of spring and fall 4T herring spawners caught in the fall 1995 purse seine fishery in Chaleur Bay before and after September 14.

	Numbers x 1000		Biomiass (t)		Percent Numbers		Percent Biomass	
	To 14 Sep	15 Sep - 30 Oct.	To 14 Sep	15 Sep - 30 Oct	To 14 Sep	15 Sep - 30 Oct	To 14 Sep	15 Sep - 30 Oct
Fall Spawners								
Immature	391	1638	56	257	2	3	1	2
Maturing	1180	12452	228	2411	6	22	6	21
Stage 5	1743	3243	344	598	9	6	8	5
Spawning	185		46		1	0	1	0
Spent	6924	22011	1374	4253	35	39	34	38
Total	**10423**	**39344**	**2049**	**7518**	**53**	**69**	**50**	**67**
Spring Spawners								
Immature	538	1294	79	165	3	2	2	1
Maturing	6501	16048	1437	3574	33	28	35	32
Spent	2205		520		11		13	
Total	**9244**	**17342**	**2036**	**3739**	**47**	**31**	**50**	**33**
Grand Total	**19667**	**56686**	**4085**	**11257**	**100**	**100**	**100**	**100**

Table 38. Comparison of numbers caught by length class (cm) of all herring caught in the 1994 and 1995 fall purse seine fisheries in Chaleur Bay.

	1994			1995		
Length	Number	Cumulative	Cumulative	Numbers	Cumulative	Cumulative
18.5	0	0	0	18	18	0
19	0	0	0	0	18	0
19.5	0	0	0	38	56	0
20	0	0	0	50	106	0
20.5	0	0	0	61	167	0
21	0	0	0	131	298	0
21.5	0	0	0	85	383	0
22	0	0	0	35	418	1
22.5	0	0	0	50	468	1
23	0	0	0	83	551	1
23.5	2	2	0	62	613	1
24	10	12	0	326	939	1
24.5	8	20	0	329	1268	2
25	12	32	0	611	1879	2
25.5	31	63	0	656	2535	3
26	132	195	1	1087	3622	5
26.5	577	772	2	1263	4885	6
27	845	1617	5	2732	7617	10
27.5	1852	3469	11	5032	12649	16
28	2120	5589	18	10259	22908	29
28.5	2127	7716	25	10392	33300	43
29	2172	9888	32	11277	44577	57
29.5	2730	12618	40	7301	51878	67
30	2558	15176	48	6753	58631	75
30.5	2058	17234	55	4384	63015	81
31	3086	20320	65	4126	67141	86
31.5	2768	23088	74	2872	70013	90
32	2406	25494	81	2665	72678	93
32.5	1669	27163	87	1721	74399	96
33	1360	28523	91	1376	75775	97
33.5	936	29459	94	791	76566	98
34	677	30136	96	511	77077	99
34.5	400	30536	97	240	77317	99
35	211	30747	98	196	77513	100
35.5	247	30994	99	53	77754	100

Table 39. Catch of spring and fall 4T herring spawners in spring purse seine fishery in 4T during 1995.

	Numbers x 1000	Biomass (t)	Percent Numbers	Percent Biomass
Fall Spawners				
Immature	481	38	5	2
Maturing	1743	397	19	22
Stage 5				
Spawning				
Spent				
Total	**2224**	**436**	**24**	**24**
Spring Spawners				
Immature	227	11	2	1
Maturing	960	216	11	12
Stage 5	86	17	1	1
Spawning	114	28	1	2
Spent	5523	1134	60	62
Total	**6910**	**1406**	**76**	**76**
Grand Total	**9134**	**1842**	**100**	**100**

Table 40. Comparison of length classes (cm) caught in spring and fall inshore herring fisheries in 1995 and spring purse seine fishery in 1995 in 4T.

	Spring Inshore			Fall Inshore			Spring Purse Seine		
LTH	Number	Cumulative Number	Cumulative Percent	Number	Cumulative Number	Cumulative Percent	Number	Cumulative Number	Cumulative Percent
17	0	0	0	0	0	0	0	0	0
17.5	0	0	0	0	0	0	19	19	0
18	0	0	0	0	0	0	19	38	0
18.5	0	0	0	0	0	0	0	38	0
19	0	0	0	0	0	0	0	38	0
19.5	0	0	0	0	0	0	135	173	2
20	0	0	0	0	0	0	19	192	2
20.5	0	0	0	0	0	0	19	211	2
21	0	0	0	0	0	0	19	230	3
21.5	10	10	0	0	0	0	135	365	4
22	0	10	0	0	0	0	0	365	4
22.5	8	18	0	0	0	0	116	481	5
23	5	23	0	0	0	0	116	597	7
23.5	1	24	0	0	0	0	20	617	7
24	5	29	1	0	0	0	59	676	7
24.5	2	31	1	0	0	0	39	715	8
25	2	33	1	6	6	0	20	735	8
25.5	18	51	1	0	6	0	118	853	9
26	10	61	1	3	9	0	142	995	11
26.5	38	99	2	27	36	0	178	1173	13
27	84	183	4	118	154	0	341	1514	17
27.5	82	265	5	505	659	1	302	1816	20
28	141	406	8	638	1297	1	307	2123	23
28.5	166	572	12	2159	3456	3	613	2736	30
29	258	830	17	3596	7052	7	798	3534	39
29.5	409	1239	25	5613	12665	13	608	4142	45
30	443	1682	34	9686	22351	23	449	4591	50
30.5	536	2218	45	8528	30879	31	443	5034	55
31	607	2825	57	8403	39282	40	519	5553	61
31.5	688	3513	71	7861	47143	48	579	6132	67
32	465	3978	81	7709	54852	55	518	6650	73
32.5	335	4313	88	8949	63801	64	553	7203	79
33	260	4573	93	10391	74192	75	258	7461	82
33.5	113	4686	95	8286	82478	83	237	7698	84
34	77	4763	97	4969	87447	88	177	7875	86
34.5	74	4837	98	4199	91646	92	196	8071	88
35	6	4843	99	2065	93711	94	315	8386	92

Table 41. Comparison of maturity stages caught by inshore during Chaleur Bay spring and fall herring fisheries.

	Fall Fishery		Spring Fishery	
	Numbers x 1000	Biomass (t)	Numbers x 1000	Biomass (t)
Fall Spawners				
Immature			34	3
Maturing	194	38	123	28
Stage 5	3740	999		
Spawning	87598	24142		
Spent	4594	1340		
Total	**96126**	**26518**	**157**	**31**
Spring Spawners				
Immature				
Maturing	1871	384	391	83
Stage 5			649	132
Spawning			2594	544
Spent	1487	381	1128	252
Total	**3358**	**765**	**4762**	**1011**
Grand Total	**99484**	**27283**	**4919**	**1042**

Table 42. Comparison of spring and fall 4T herring spawners caught by inshore and purse seine fleets in 1994 and 1995 herring fisheries in Chaleur Bay.

		Fall Fishery		Spring	
		Purse Seine	Inshore	Inshore	Total
1994	Fall Spawners	4807	34108		38915
	Spring Spawners	1847	425	1550	3822
	Total	**6654**	**34533**	**1550**	**42737**
1995	Fall Spawners	9568	26519		36087
	Spring Spawners	5774	765	1029	7568
	Total	**15342**	**27284**	**1029**	**43655**

Table 43. Expected catches of spring and fall spawners if the start of the fall purse seine fishery in Chaleur Bay is early (Aug. 15) or late (Sept. 15) in 1996 if the initial TAC is 12,000 tonnes and various proportions of the catch are taken in Chaleur Bay.

Purse Seine Fishery Starting Aug. 15

		Early			Late				
		Proportion of Total	Proportion of Spring Spawners	Proportion of Fall Spawners	Proportion of Total	Proportion of Spring Spawners	Proportion of Fall Spawners	Total	
Chaleur		0.25	0.5	0.5	0.75	0.3	0.7		
Proportion	Tonnes	Total	Spring	Fall	Total	Spring	Fall	Spring	Fall
0.5	6000	1500	750	750	4500	1350	3150	2100	3900
0.6	7200	1800	900	900	5400	1620	3780	2520	4680
0.7	8400	2100	1050	1050	6300	1890	4410	2940	5460
0.8	9600	2400	1200	1200	7200	2160	5040	3360	6240
0.9	10800	2700	1350	1350	8100	2430	5670	3780	7020
1.0	12000	3000	1500	1500	9000	2700	6300	4200	7800

Purse Seine Fishery Starting Sept. 15

					Total	
Proportion	Tonnes	Total	Spring	Fall	Spring	Fall
0.5	6000	6000	1800	4200	1800	4200
0.6	7200	7200	2160	5040	2160	5040
0.7	8400	8400	2520	5880	2520	5880
0.8	9600	9600	2880	6720	2880	6720
0.9	10800	10800	3240	7560	3240	7560
1.0	12000	12000	3600	8400	3600	8400

Table 44. Results of multiplicative model using index gillnetter data for spring inshore fishery.

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	22	577.14864	26.23403	11.557	0.0001
Error	1547	3511.67731	2.26999		
C Total	1569	4088.82595			

Root MSE	1.50665	R-square	0.1412
Dep Mean	3.88708	Adj R-sq	0.1289
C.V.	38.76041		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	5.049389	0.14122088	35.755	0.0001
YY87	1	0.677810	0.23024867	2.944	0.0033
YY89	1	-0.225652	0.17489086	-1.290	0.1972
YY90	1	0.229159	0.18405039	1.245	0.2133
YY91	1	-0.034016	0.15802373	-0.215	0.8296
YY92	1	-0.166468	0.15282506	-1.089	0.2762
YY93	1	0.010587	0.15468473	0.068	0.9454
YY94	1	-0.316304	0.15584128	-2.030	0.0426
YY95	1	-0.314905	0.18601966	-1.693	0.0907
D13	1	-0.925429	0.17972276	-5.149	0.0001
D63	1	-0.991137	0.11358331	-8.726	0.0001
D65	1	-1.442794	0.17023120	-8.475	0.0001
D66	1	0.337247	0.33594590	1.004	0.3156
D70	1	-1.122671	0.28028801	-4.005	0.0001
D75	1	0.826212	0.36515334	2.263	0.0238
D78	1	-1.179690	0.22460245	-5.252	0.0001
D80	1	-0.888684	0.12122944	-7.331	0.0001
D92	1	-1.502010	0.16080320	-9.341	0.0001
W2	1	-0.683593	0.21162511	-3.230	0.0013
W3	1	-0.627014	0.10908888	-5.748	0.0001
W5	1	-0.243587	0.10522626	-2.315	0.0207
W6	1	-0.418157	0.13145589	-3.181	0.0015
W7	1	-0.168534	0.17680682	-0.953	0.3406

Table 45. Results of multiplicative model using NB Provincial Co-ordinator data for spring inshore fishery.

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	11	202.34078	18.39462	16.866	0.0001
Error	305	332.65067	1.09066		
C Total	316	534.99145			

Root MSE	1.04435	R-square	0.3782
Dep Mean	4.60581	Adj R-sq	0.3558
C.V.	22.67455		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	5.741734	0.17327287	33.137	0.0001
YY90	1	-0.862275	0.25691159	-3.356	0.0009
YY91	1	-0.453941	0.20138519	-2.254	0.0249
YY92	1	-0.412407	0.18831136	-2.190	0.0293
YY93	1	-0.155345	0.18656867	-0.833	0.4057
YY95	1	-0.522598	0.20026941	-2.609	0.0095
A2	1	-1.450655	0.11974514	-12.115	0.0001
W2	1	-0.585570	0.31463064	-1.861	0.0637
W3	1	-0.370157	0.18316416	-2.021	0.0442
W5	1	-0.225584	0.16216688	-1.391	0.1652
W6	1	-0.073834	0.18773413	-0.393	0.6944
W7	1	0.418964	0.33779398	1.240	0.2158

Table 46. Spring spawner partial recruitment vectors by year as estimated by comparing gillnet catch-at-age to acoustic survey catch-at-age.

Age	1990	1991	1992	1993	1994	1995	Average PR	Scaled PR
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
3	0.12	0.04	0.05	0.01	0.01	0.01	0.04	0.05
4	0.55	0.22	0.33	0.08	0.08	0.09	0.22	0.29
5	1.00	1.00	0.62	0.59	0.48	1.00	0.78	1.00
6	0.73	0.24	0.56	1.00	1.00	0.29	0.64	0.81
7	0.23	0.31	1.00		0.78	0.71	0.60	0.77
8		0.40	0.46		1.00	0.40	0.57	0.72
9	0.57	0.44	0.17		0.29	0.38	0.37	0.48
10	0.35	0.62	0.73		0.63		0.59	0.75
11		0.16			0.80		0.48	0.61

Table 47. Percentage of 4+ spring spawners of 4T population using sampling from the acoustic survey.

Numbers

	Spawning Group		
Year	Spring	Fall	Percent
90	39247	166696	19
91	13799	98536	12
92	120086	490348	20
93	70584	316221	18
94	163315	680437	19
95	62991	198802	24
Average			19

Biomass

	Spawning Group		
Year	Spring	Fall	Percent
90	9758	27005	27
91	3723	20249	16
92	25978	98181	21
93	13572	60950	18
94	33755	120486	22
95	12715	39713	24
Average			21

Table 48. Percentage of 4+ spring spawners of total 4T herring 4+ population (Spring + Fall biomass (t)) at various Terminal Fs.

		4+ Spring Estimates Biomass (t)						Percentage Spring					
		Terminal Fs						Terminal Fs					
Year	Fall 4+	0.7	0.6	0.5	0.4	0.3	0.2	0.7	0.6	0.5	0.4	0.3	0.2
78	73340	44988	44993	44999	45008	45024	45055	38	38	38	38	38	38
79	58013	30774	30779	30785	30794	30810	30842	35	35	35	35	35	35
80	42397	19947	19952	19960	19972	19992	20032	32	32	32	32	32	32
81	65444	10354	10366	10383	10409	10453	10541	14	14	14	14	14	14
82	106491	8342	8355	8374	8402	8449	8543	7	7	7	7	7	7
83	161847	23134	23178	23240	23334	23490	23802	13	13	13	13	13	13
84	252014	40539	40679	40876	41172	41666	42656	14	14	14	14	14	14
85	299574	64771	65124	65620	66365	67607	70096	18	18	18	18	18	19
86	330856	87693	88328	89218	90557	92793	97266	21	21	21	21	22	23
87	359173	82667	83589	84882	86827	90073	96572	19	19	19	19	20	21
88	376177	74678	75992	77837	80612	85244	94520	17	17	17	18	18	20
89	346084	67649	69276	71561	74998	80738	92240	16	17	17	18	19	21
90	330043	68175	70351	73405	77999	85669	101032	17	18	18	19	21	23
91	461391	73137	76247	80613	87181	98147	120111	14	14	15	16	18	21
92	485281	106616	112559	120915	133494	154517	196654	18	19	20	22	24	29
93	413179	100860	107705	117331	131827	156061	204643	20	21	22	24	27	33
94	380113	78296	85052	94558	108878	132827	180849	17	18	20	22	26	32
95	285027	68881	78201	91295	110996	143912	209865	19	22	24	28	34	42

Table 49. Spring spawning 4T herring weighted fishing mortalities using Terminal F = 0.5 and averge partial recruitment from VPA.

	Year																	
Age	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
2	0.20	0.22	0.23	0.03	0.02	0.02	0.01	0.02	0.02	0.01	0.03	0.00	0.01	0.01	0.02	0.00	0.00	0.00
3	0.29	0.54	0.70	0.62	0.23	0.13	0.04	0.04	0.08	0.04	0.05	0.05	0.04	0.03	0.03	0.01	0.03	0.03
4	0.46	0.77	1.30	0.59	0.41	0.40	0.13	0.14	0.16	0.12	0.16	0.24	0.18	0.13	0.11	0.07	0.13	0.16
5	0.23	0.71	1.32	0.75	0.18	0.37	0.22	0.18	0.18	0.27	0.22	0.17	0.25	0.27	0.17	0.18	0.39	0.44
6	0.57	0.42	0.98	1.64	0.24	0.08	0.09	0.21	0.25	0.27	0.33	0.23	0.16	0.33	0.24	0.39	0.40	0.50
7	0.68	0.55	1.60	0.68	2.02	0.08	0.01	0.48	0.20	0.35	0.36	0.31	0.15	0.21	0.21	0.32	0.39	0.42
8	0.44	0.44	1.61	1.56	0.13	2.12	0.06	0.22	0.74	0.45	0.53	0.31	0.31	0.27	0.15	0.29	0.48	0.43
9	1.07	0.27	1.32	1.68	8.86	0.00	8.09	0.22	0.10	1.33	0.62	0.45	0.30	0.40	0.22	0.37	0.25	0.35
10	0.95	0.87	0.73	1.15	10.12	0.01	0.00	0.10	0.26	0.21	0.86	0.56	0.28	0.37	0.30	0.47	0.30	0.45
11	0.95	0.87	0.73	1.15	10.12	0.01	0.00	0.10	0.26	0.21	0.86	0.56	0.28	0.37	0.30	0.47	0.30	0.45
Wt F 7+	0.80	0.57	1.37	0.90	2.15	0.06	0.02	0.30	0.23	0.38	0.45	0.34	0.25	0.30	0.22	0.36	0.38	0.42
Wt F 5+	0.59	0.64	1.18	0.95	0.74	0.21	0.18	0.20	0.21	0.29	0.34	0.26	0.23	0.29	0.20	0.25	0.39	0.44
Wt F 4+	0.51	0.67	1.22	0.77	0.58	0.37	0.14	0.17	0.19	0.25	0.30	0.26	0.21	0.22	0.14	0.20	0.35	0.33
Target 4+	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**

Table 50. Spring spawning 4T herring population numbers estimated using a Terminal F = 0.5 average partial recruitment from VPA.

	Year																	
Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
2	92829	79036	59506	179074	244491	234194	284841	159422	114793	150236	181299	213112	573065	224704	104320	264495	76438	1098345
3	51284	62074	51820	38747	142020	196596	187789	231458	128449	91838	122387	143469	174123	465959	182672	84070	215875	62547
4	125786	31534	29617	21016	17039	92263	141619	147843	181695	97192	72559	95201	112266	136753	371564	144612	68037	172308
5	21152	65177	12017	6587	9524	9224	50696	101946	104816	127363	70511	50692	61174	76650	98770	272282	110757	48875
6	17157	13764	26368	2630	2560	6497	5236	33490	69576	71459	80025	46139	35098	38863	48109	68127	185624	61499
7	14635	7930	7407	8073	417	1644	4902	3929	22254	44191	44841	46979	30147	24592	22814	30852	37896	101775
8	4853	6083	3766	1224	3360	45	1240	3961	1984	14916	25488	25738	28303	21254	16368	15176	18281	21032
9	2986	2560	3220	617	210	2429	4	957	2613	775	7778	12342	15409	17029	13279	11524	9313	9246
10	4386	839	1601	708	94	0	1988	0	626	1935	167	3411	6442	9320	9327	8753	6506	5961
11	12589	5448	2197	1527	590	0	0	1626	1204	1163	2070	785	1994	5262	8315	10725	10110	10112
4+	203544	133335	86193	42382	33794	112102	205685	293752	384768	358994	303439	281287	290833	329723	588546	562051	446524	430808
5+	77758	101801	56576	21366	16755	19839	64066	145909	203073	261802	230880	186086	178567	192970	216982	417439	378487	258500
7+	39449	22860	18191	12149	4671	4118	8134	10473	28681	62980	80344	89255	82295	77457	70103	77030	82106	148126

Table 51. Spring spawner 4T herring projected catches at $F_{0.1}$ for 1996 and 1997.

	Weights			Beginning of year population numbers			Beginning of year bioimass (t)			Projections Catch biomass (t)		
Age	Begin	Catch	Average PR (93-95)	1995	1996	1997	1995	1996	1997	1995	1996	1997
3	0.132	0.139	0.06	110207	123425	122038	15136	16284	16101	355	352	356
4	0.155	0.166	0.31	172308	87756	98775	27343	13580	15285	3786	1588	1829
5	0.176	0.185	0.87	48875	120676	63212	8500	21278	11146	2951	6107	3264
6	0.199	0.207	1.00	61499	25885	69126	11941	5148	13748	4619	1642	4472
7	0.224	0.232	0.85	101775	30539	14065	21785	6849	3154	7281	1899	892
8	0.250	0.258	0.85	21032	54533	17661	4982	13618	4410	1651	3782	1250
9	0.279	0.296	0.71	9246	11236	31461	2479	3139	8790	702	760	2172
10	0.301	0.302	0.89	5961	5319	6888	1798	1604	2077	603	449	593
11	0.309	0.316	0.89	10112	8421	7199	3113	2601	2223	1046	744	649
4+				430808	344367	308387	81943	67816	60833	22994	17322	15477

Table 52. Correlations between dimensions 1 and 2 of Correspondence Analysis of length frequencies at various mesh sizes in 1990 and 1991 and descriptive statistics.

	1990		1991	
Statistic	Dim 1	Dim 2	Dim 1	Dim 2
Mean	-0.99	0.15	-1.00	0.11
Mode	-0.89	-0.12	-0.77	-0.05
Median	-1.00	-0.03	-0.98	-0.01
Range	0.62	-0.21	0.56	-0.14
Variance	0.80	-0.40	0.71	-0.24
StdMean	0.83	-0.42	0.73	-0.30
Kurt	-0.25	0.49	-0.39	0.63
Skew	0.47	0.61	0.64	0.26
Mesh	-0.81	0.42	-0.88	0.02
Date	-0.23	-0.01	-0.37	0.42

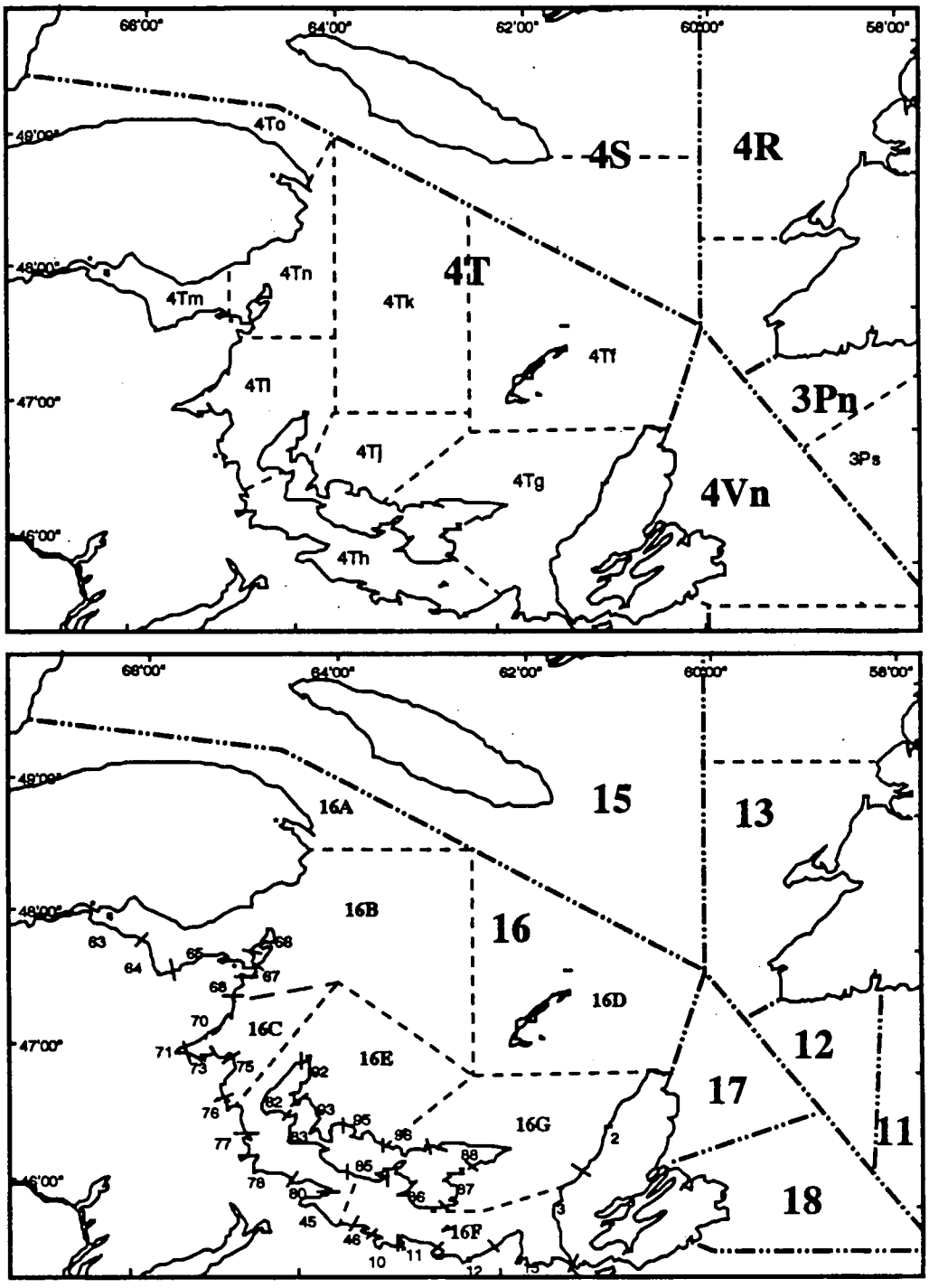


Fig. 1. Northwest Atlantic Fisheries Organization (NAFO) districts (upper), and Herring management zones (lower) in the Southern Gulf of St. Lawrence.

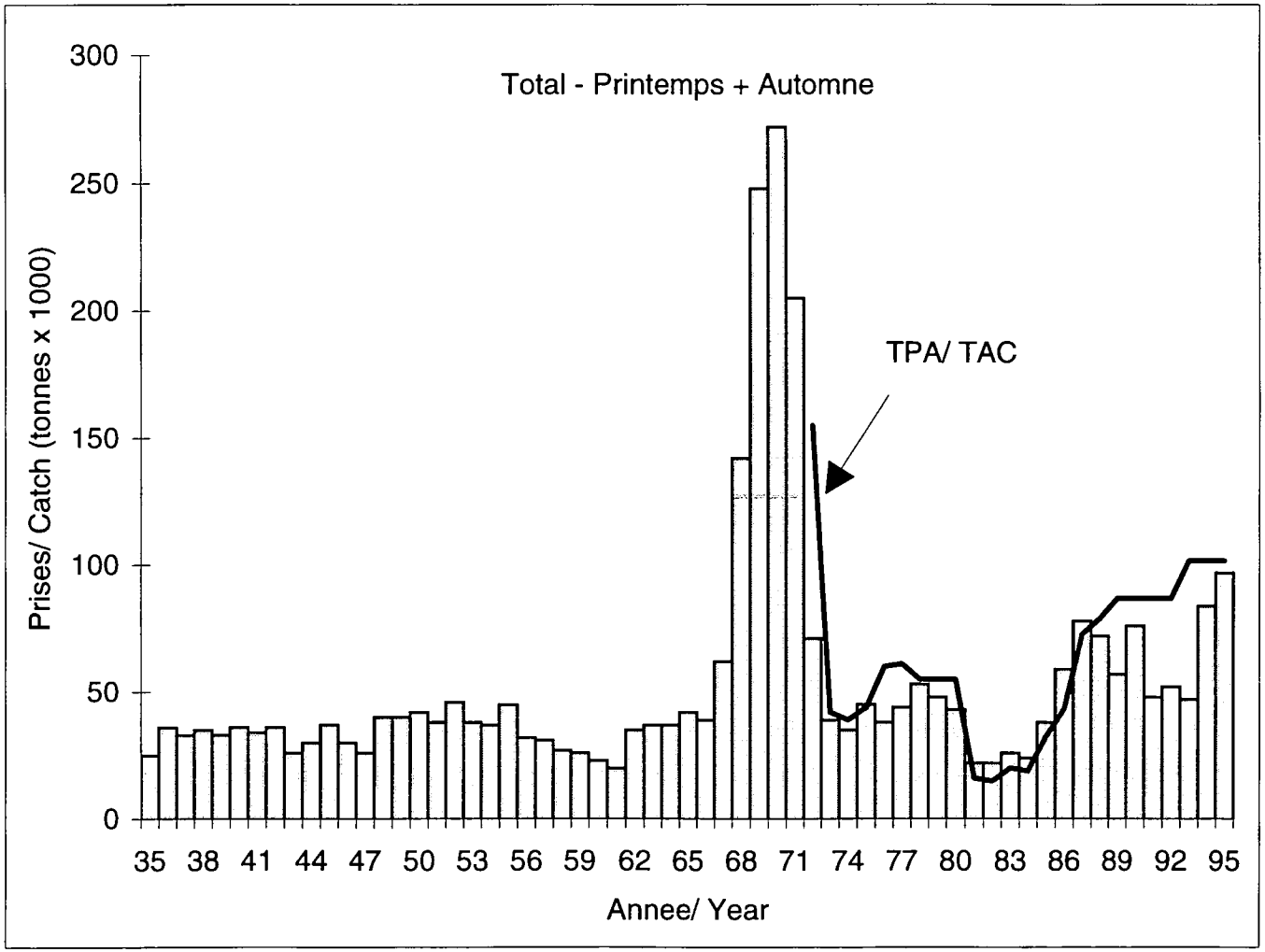


Fig. 2. Historical catch of 4T herring spring and fall spawners combined, excluding 4Vn, compared to TACs.

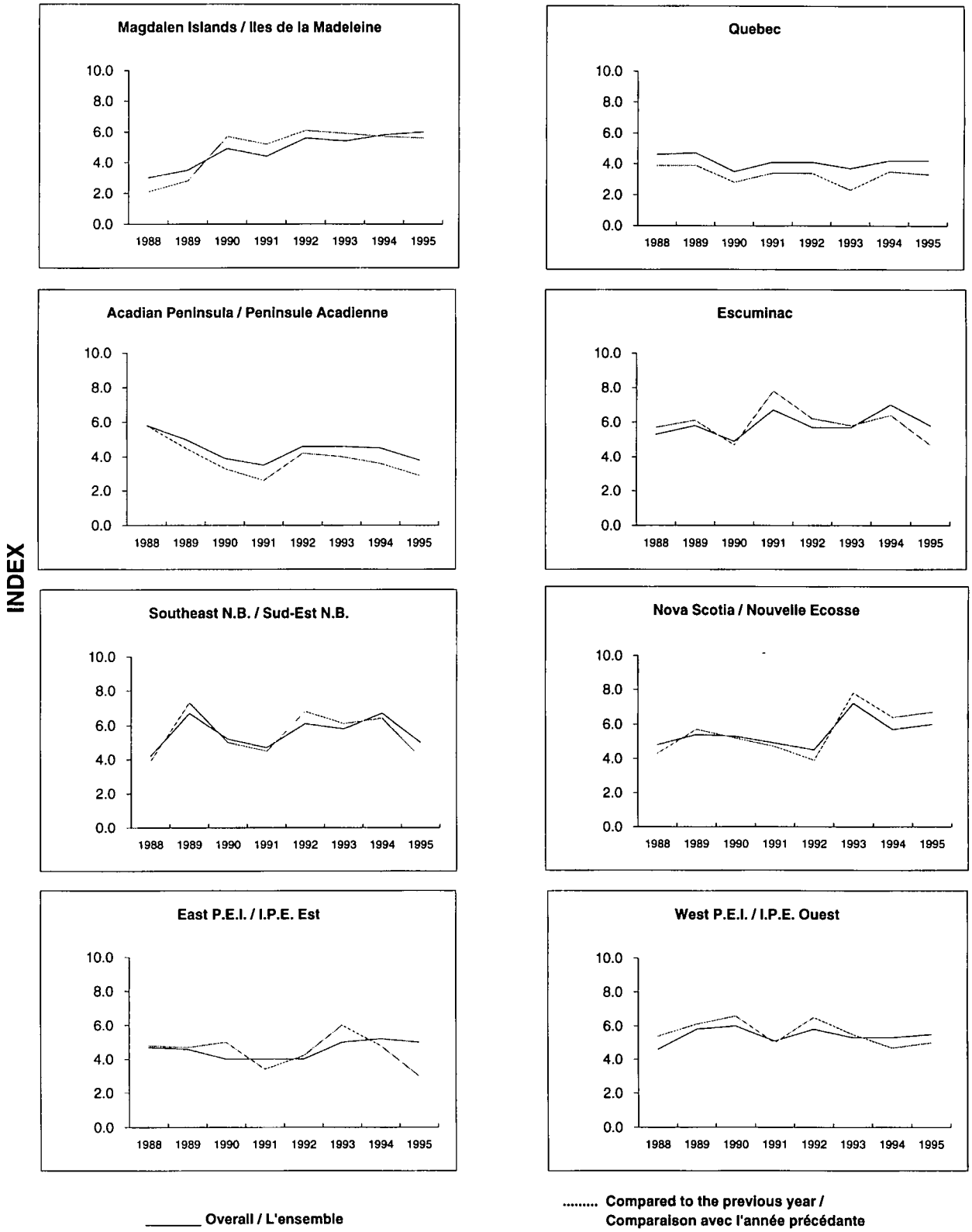


Fig. 3. Spring indices of abundance by area from phone survey

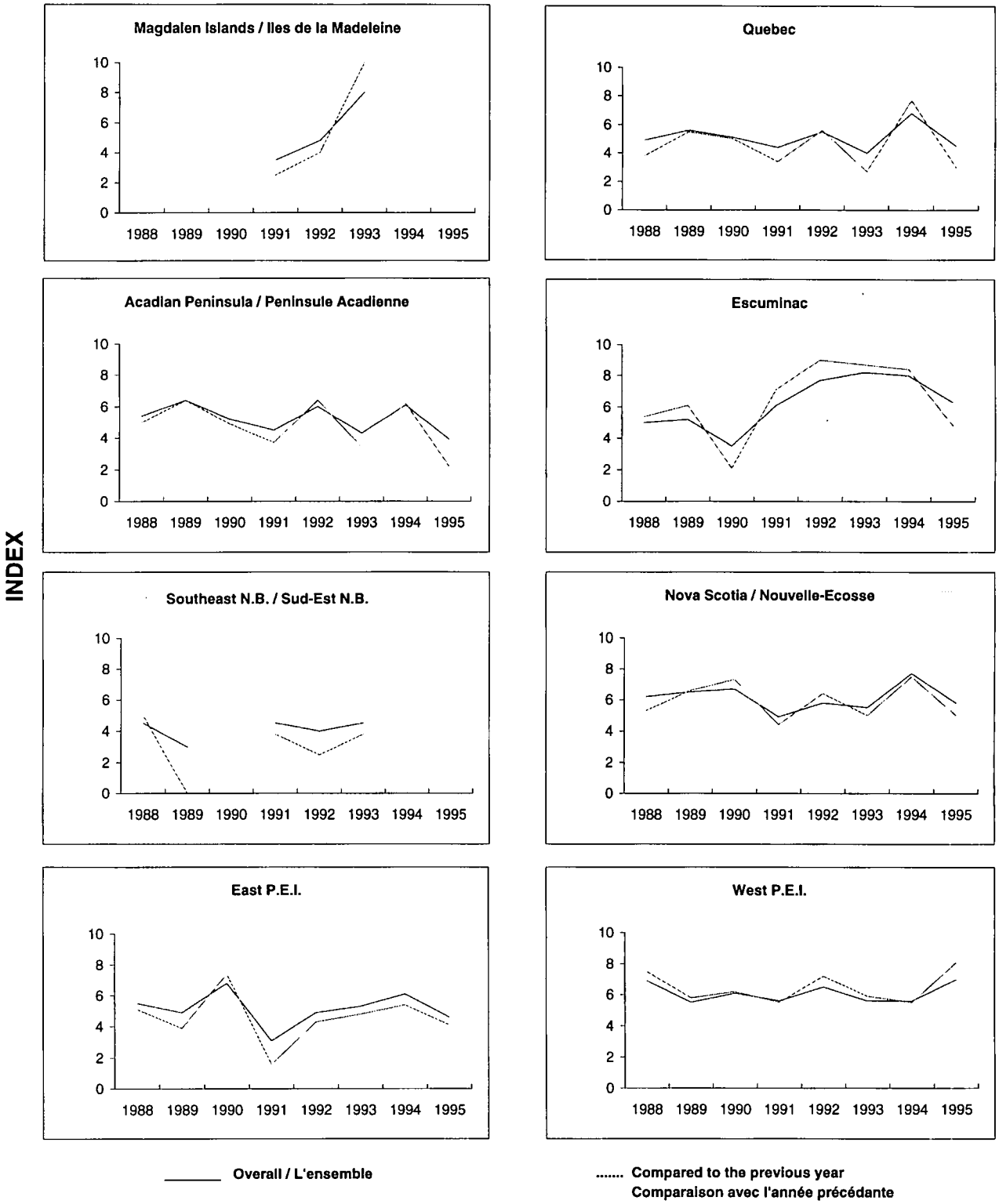
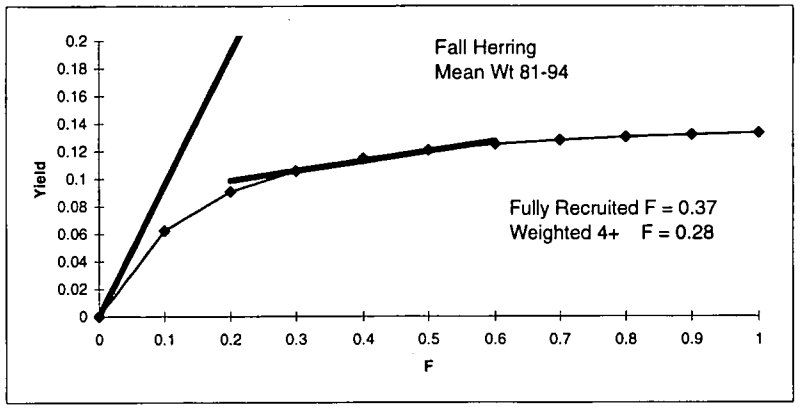
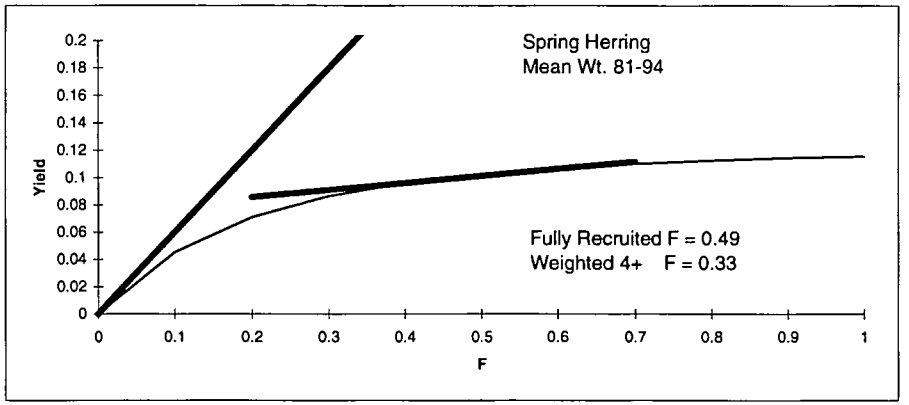
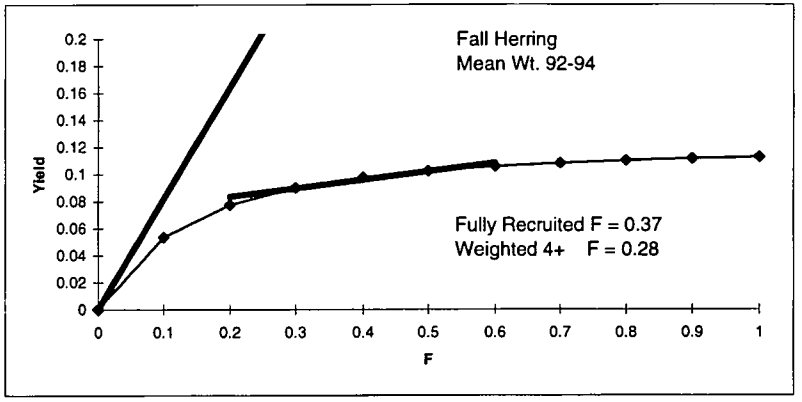


Fig. 4. Fall indices of abundance by area from phone survey







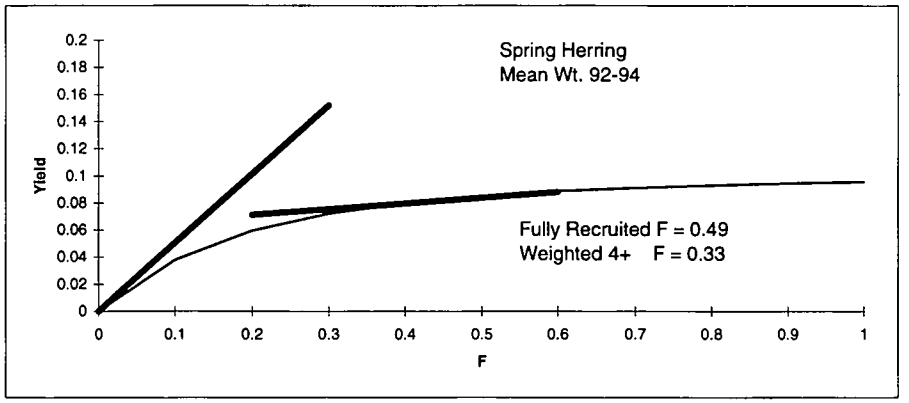


Fig. 5. Yield per recruit results using mean weights from 1981 to 1994 and 1992 to 1994 for spring and fall 4T herring spawners.

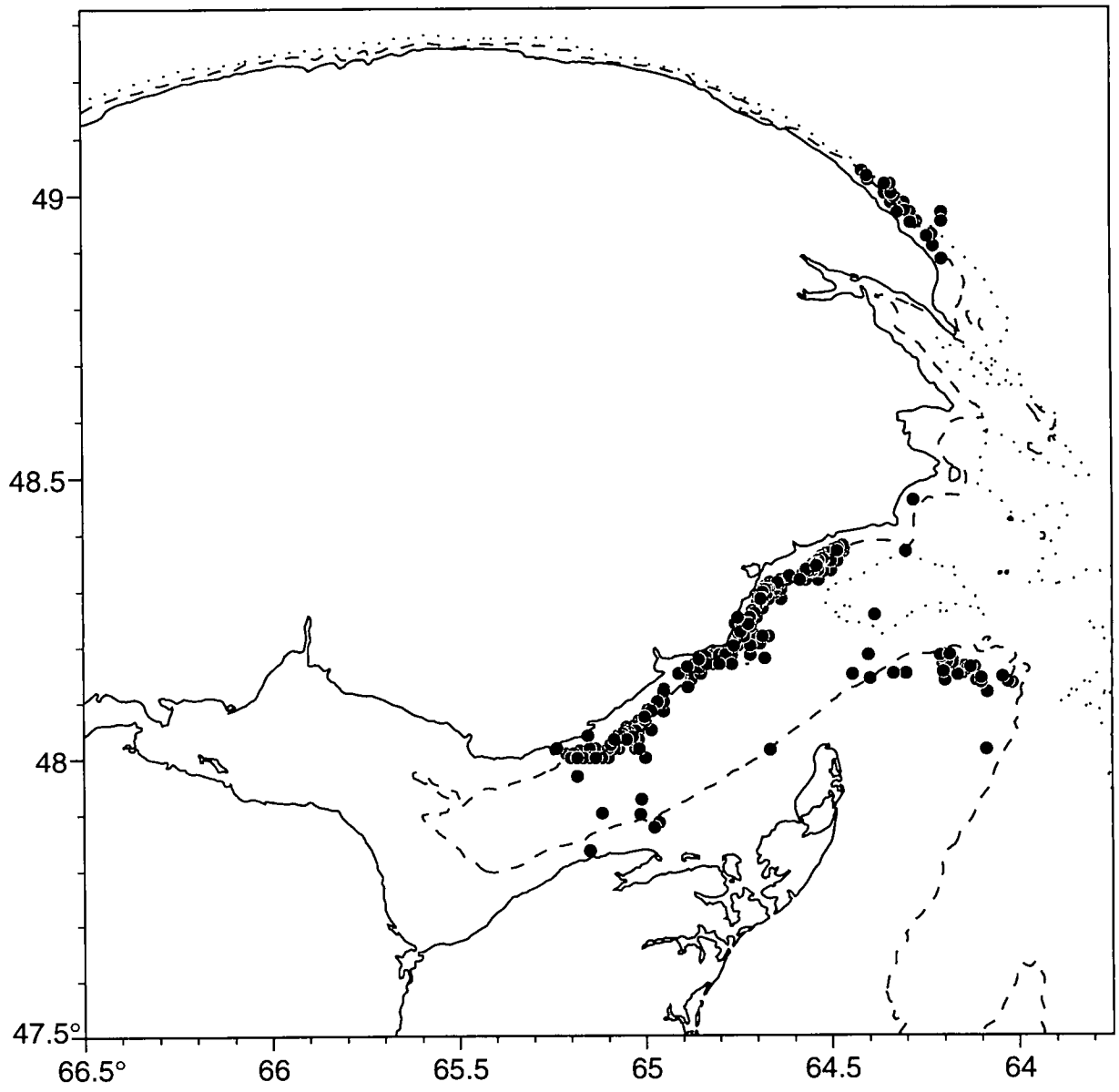


Fig. 6. Location of purse seine catches, Fall 1995

_ _ _ _ _ 50 m

..... 100 m

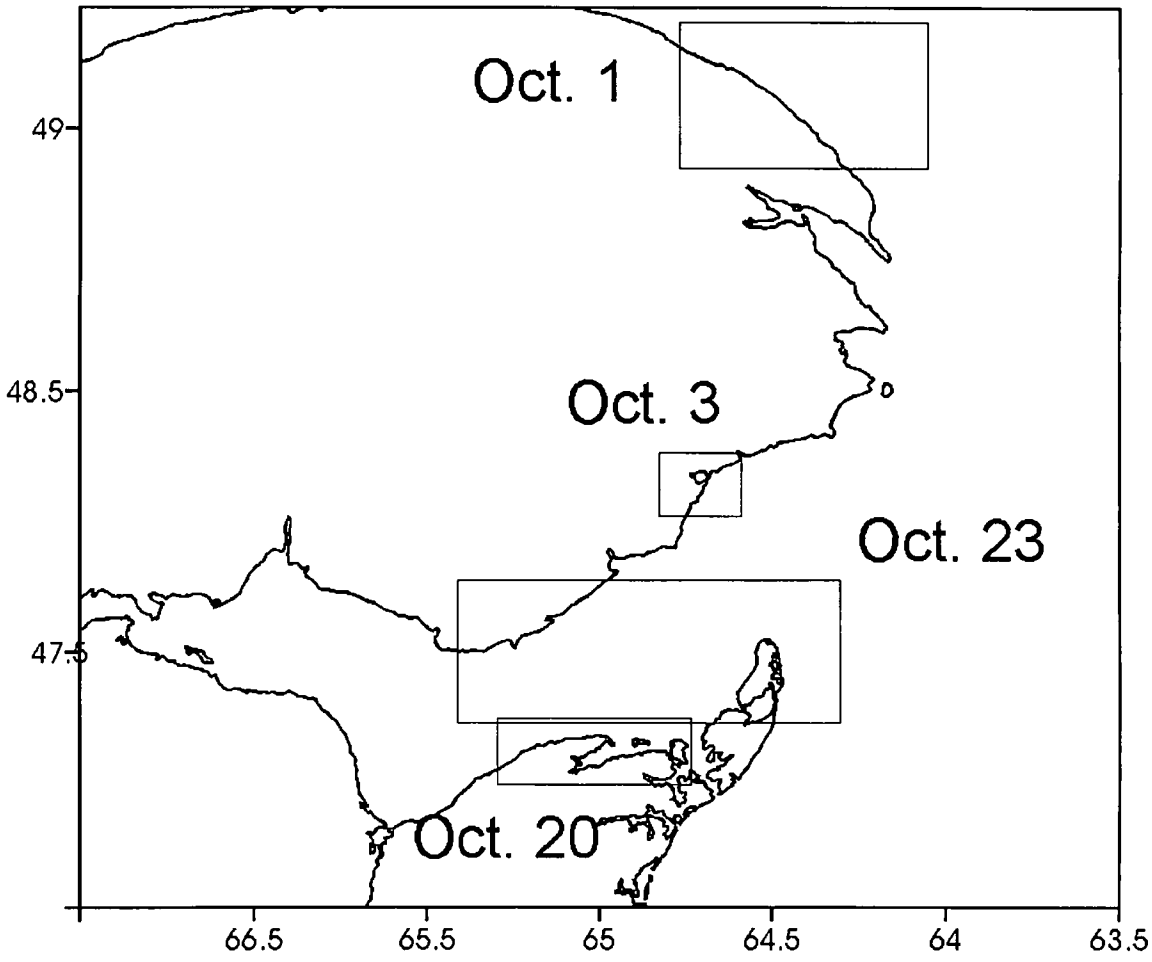


Figure 7. Areas of major fishing concentration for herring purse seiners in Chaleur Bay. Boxes show areas with detailed fishing tracks in Fig. 8.

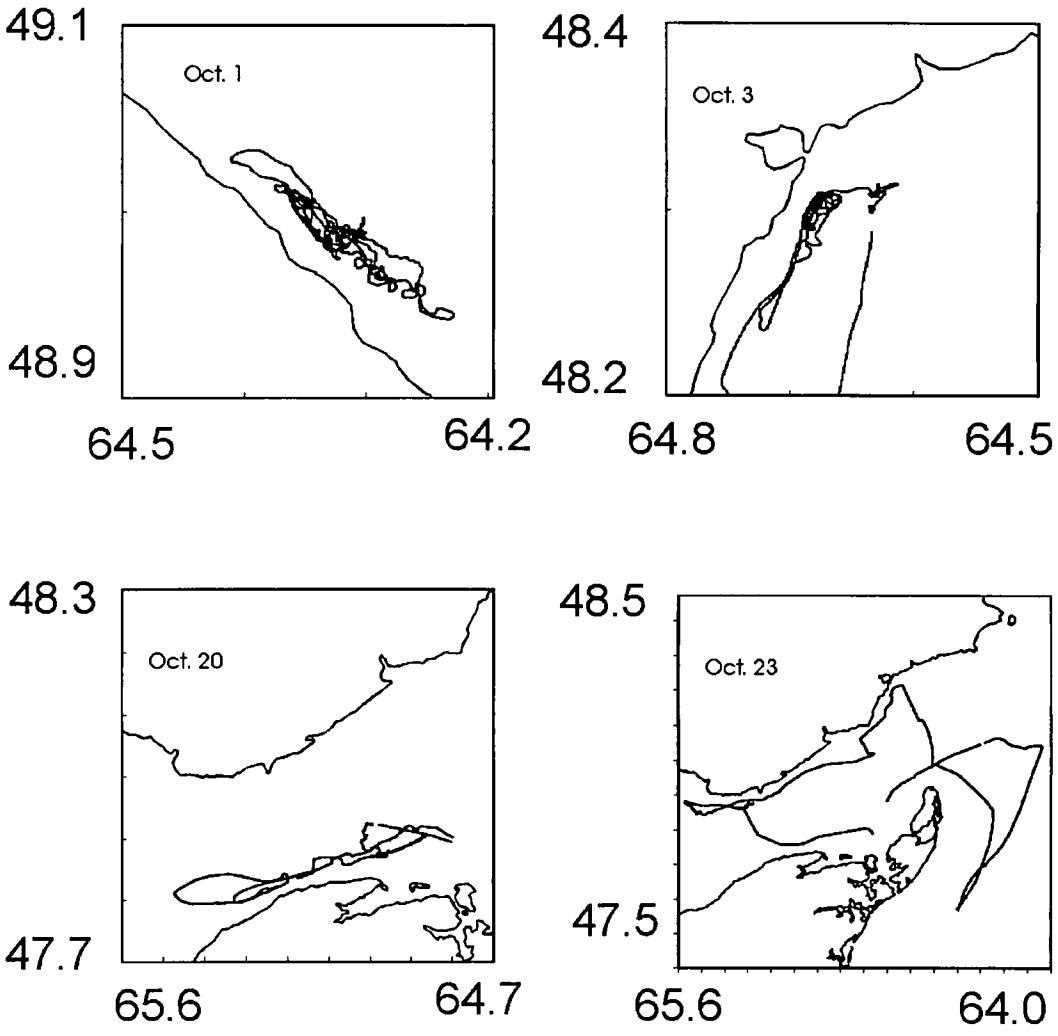


Figure 8. Examples of purse seiner fishing tracks in Chaleur Bay for days indicated. Areas for each day are outlined in Fig. 7.

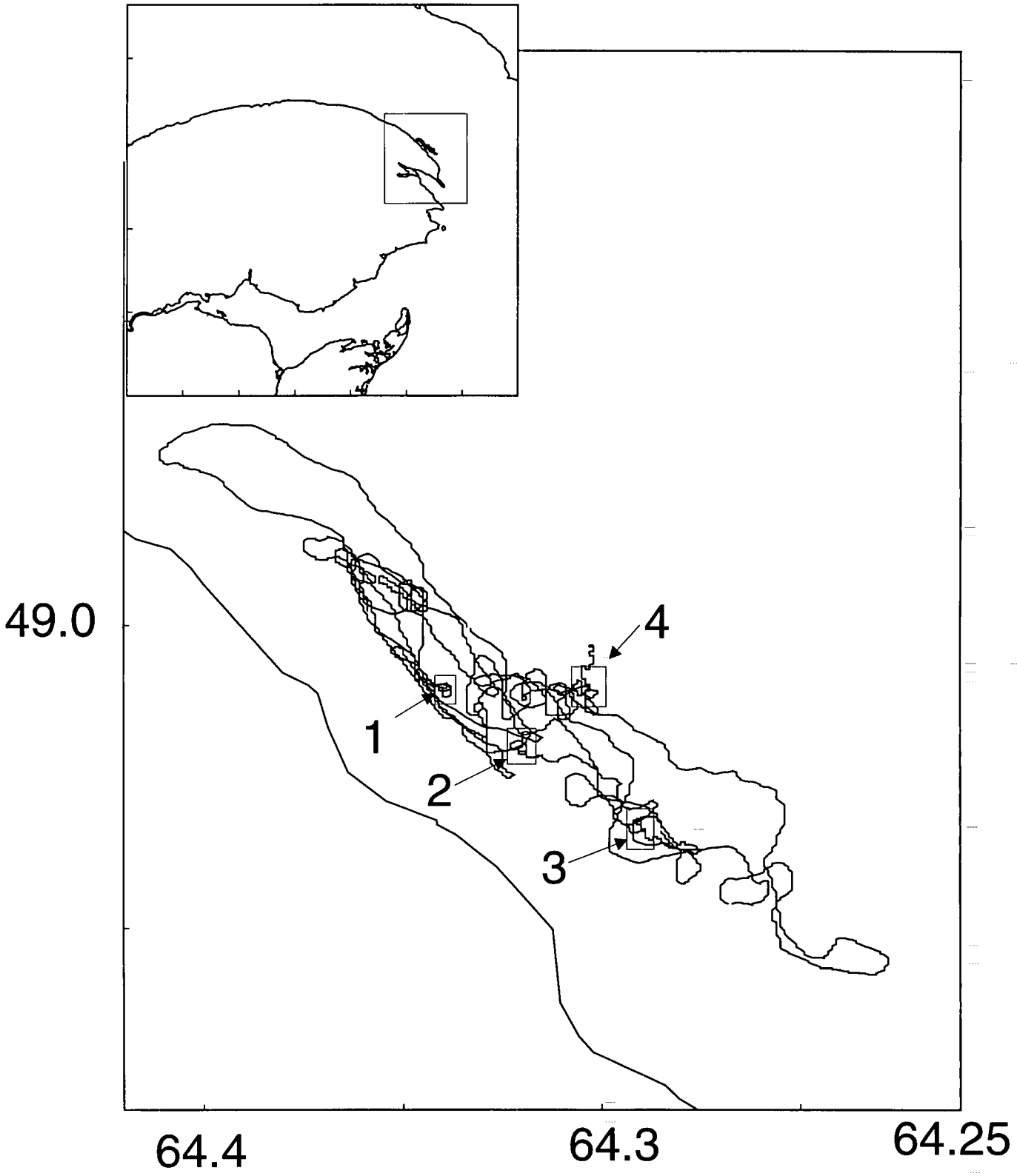


Fig. 9. Four set locations for purse seiner on Oct. 1, 1995.

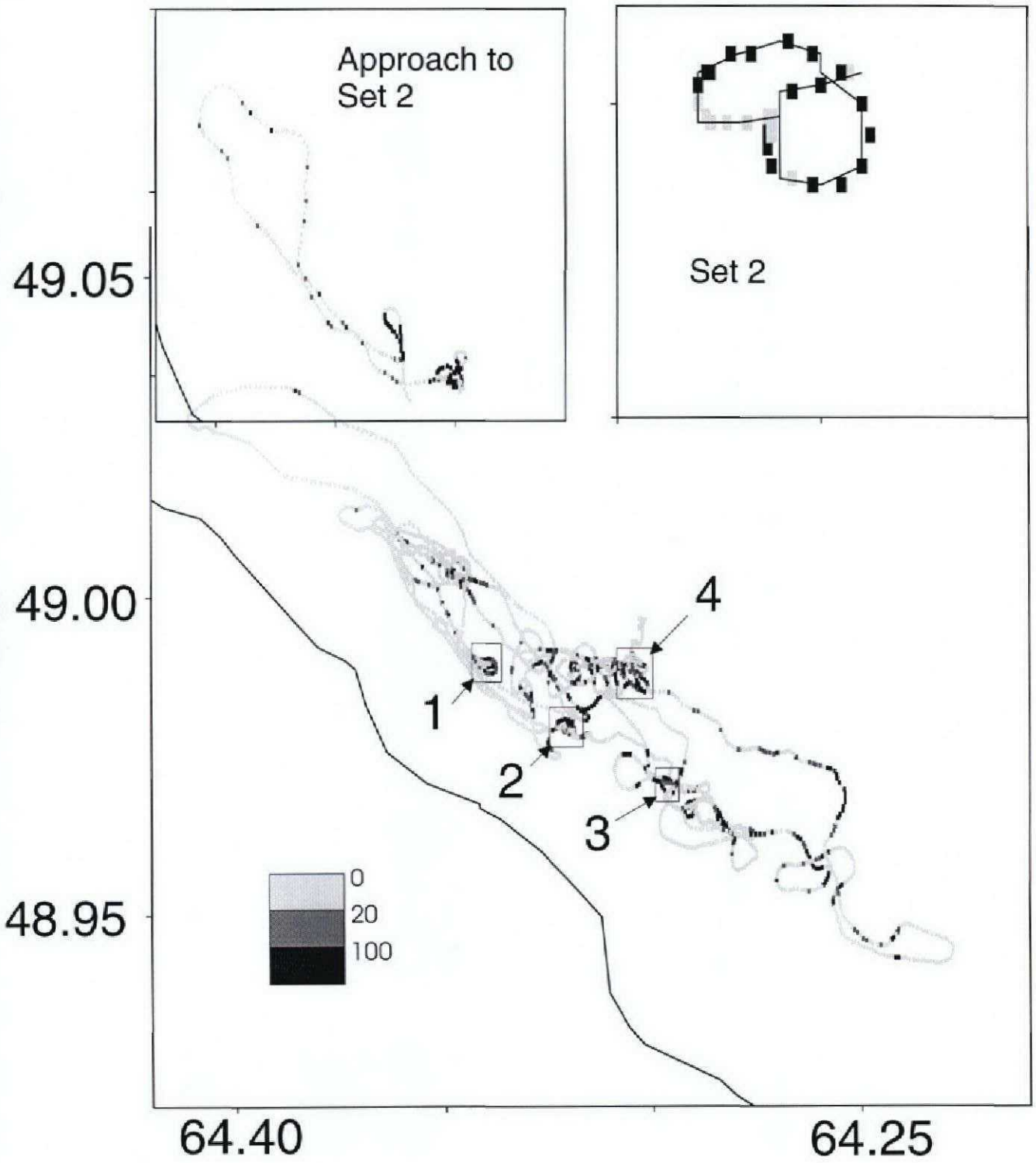


Fig. 10. Relative herring densities during 12 hours of fishing, during approach to set 2, and during set 2. Scale is linearized backscatter.

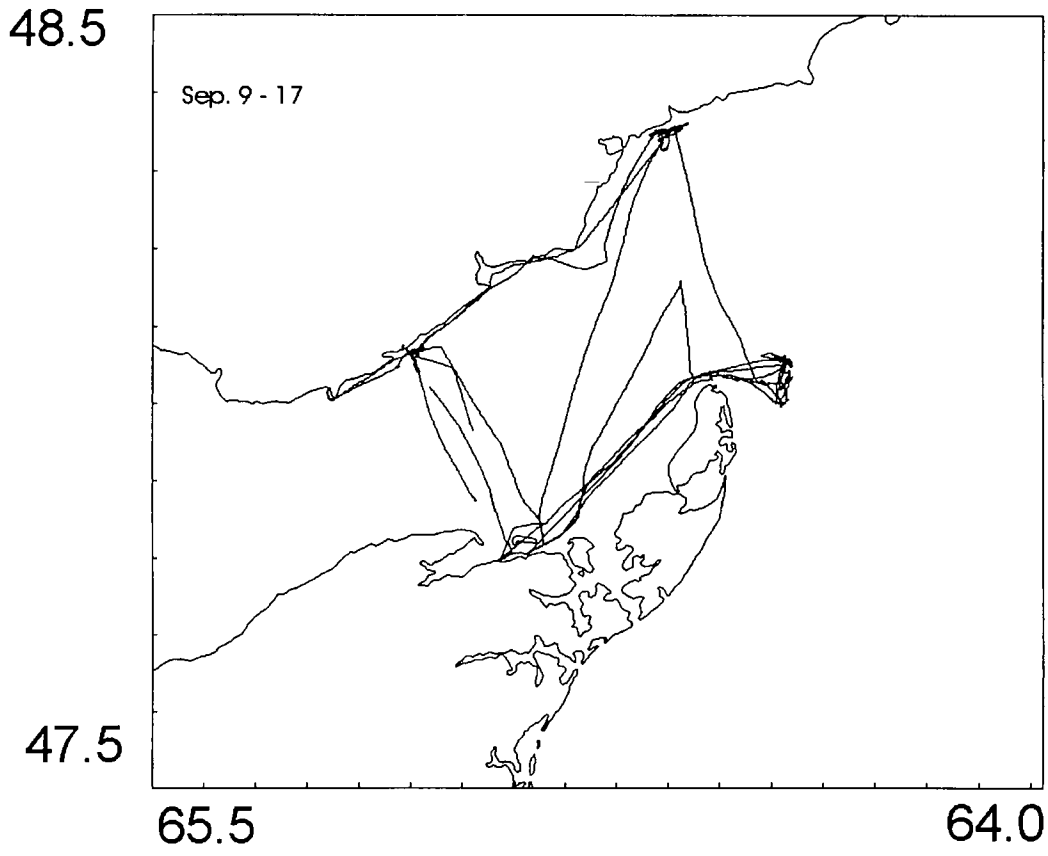


Figure 11. Fishing tracts for herring gillnetter in Chaleur Bay from Sept. 9 - 17, 1995.

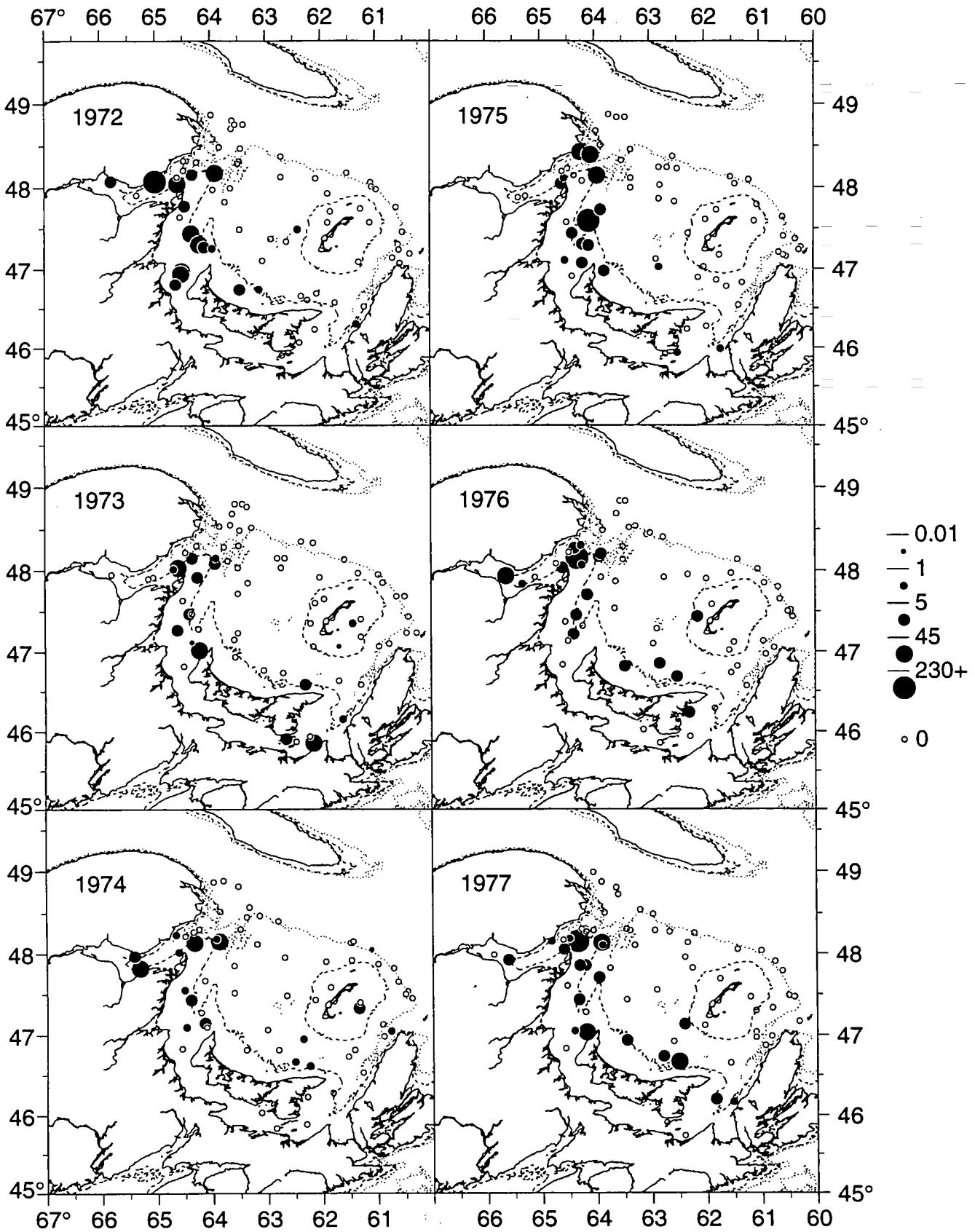


Fig. 12. Herring catches (kg/standard tow) in southern Gulf of St. Lawrence September bottom trawl surveys from 1972 to 1977. Open circles indicate set locations with no herring. Short dashed line is 100m contour, long dashed line is 50m contour.

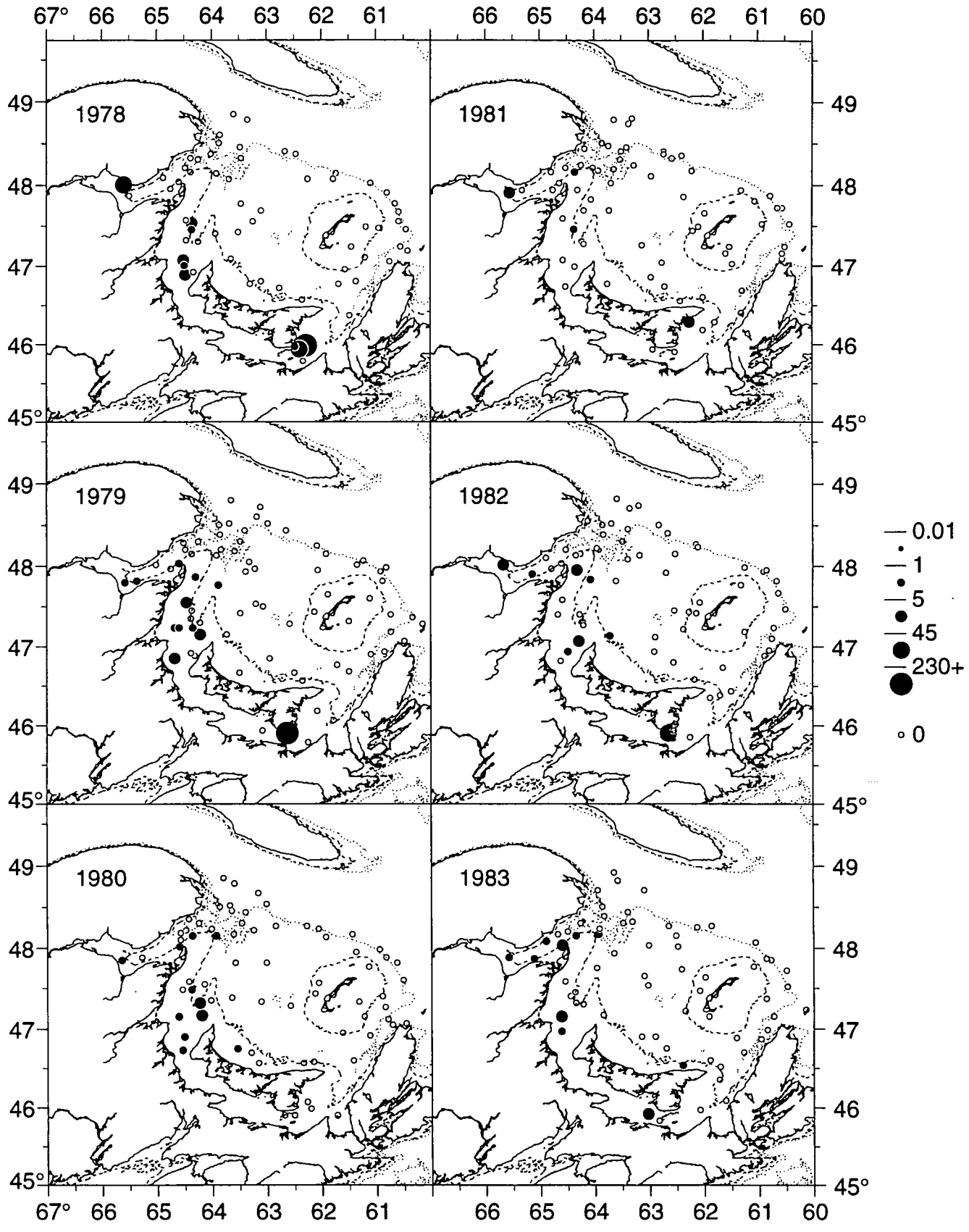


Fig. 13. Herring catches (kg/standard tow) in southern Gulf of St. Lawrence September bottom trawl surveys from 1978 to 1983. Open circles indicate set locations with no herring. Short dashed line is 100m contour, long dashed line is 50m contour

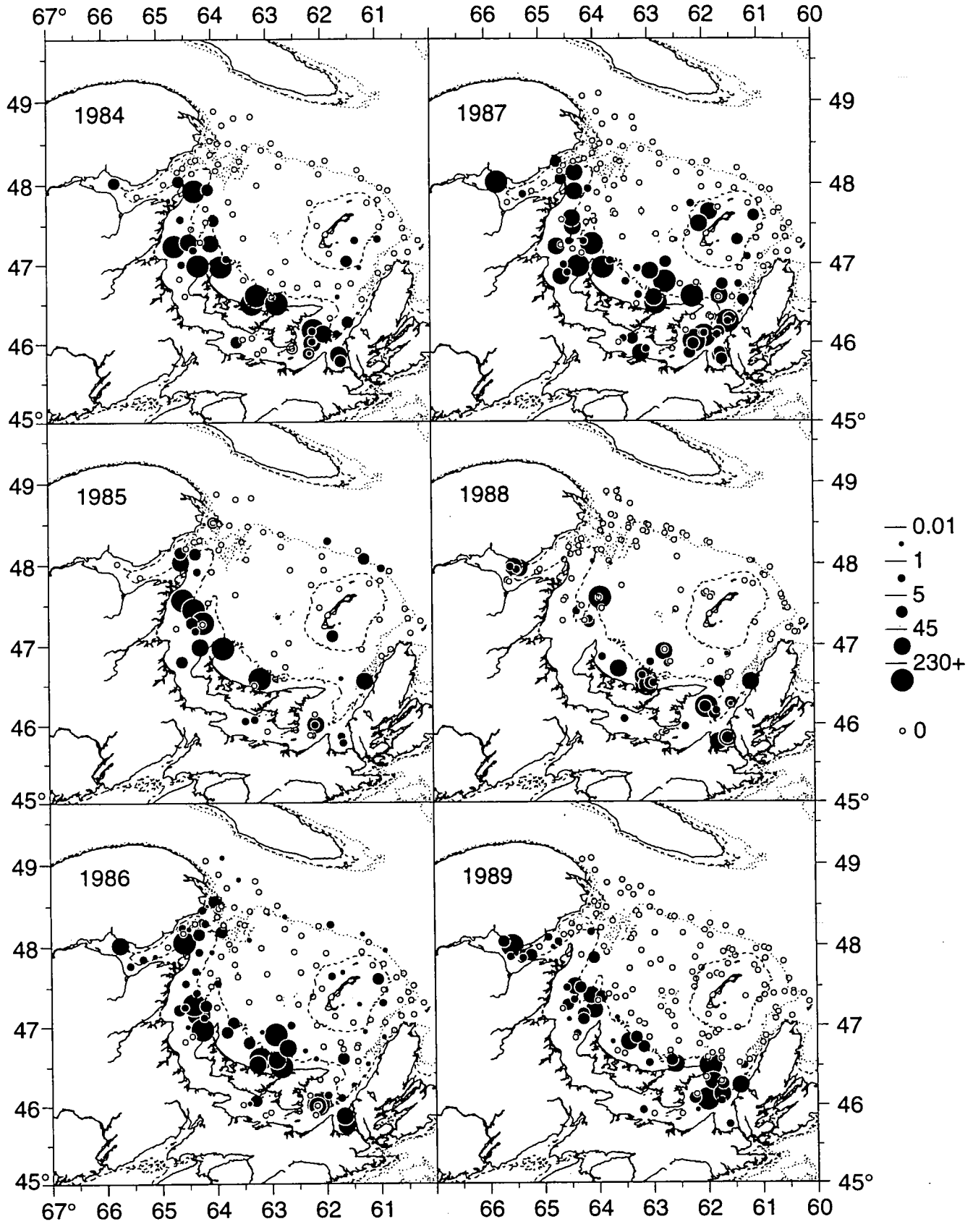


Fig. 14. Herring catches (kg/standard tow) in southern Gulf of St. Lawrence September bottom trawl surveys from 1984 to 1989. Open circles indicate set locations with no herring. Short dashed line is 100m contour, long dashed line is 50m contour

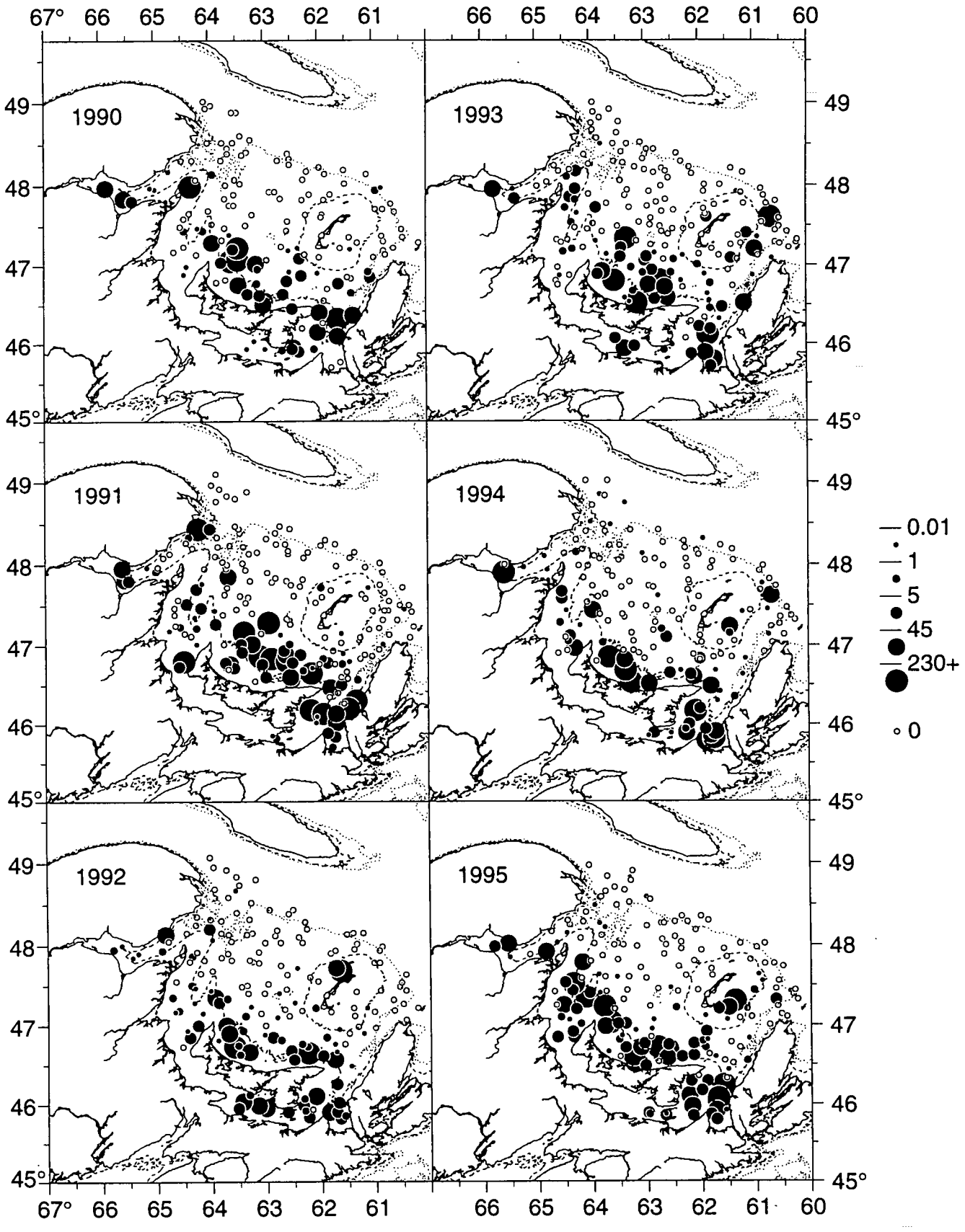


Fig. 15. Herring catches (kg/standard tow) in southern Gulf of St. Lawrence September bottom trawl surveys from 1990 to 1995. Open circles indicate set locations with no herring. Short dashed line is 100m contour, long dashed line is 50m contour

Dec. 1995 Juvenile Herring (< 25 cm) Survey.

Relevé de Hareng (< 25 cm) Déc. 1995.

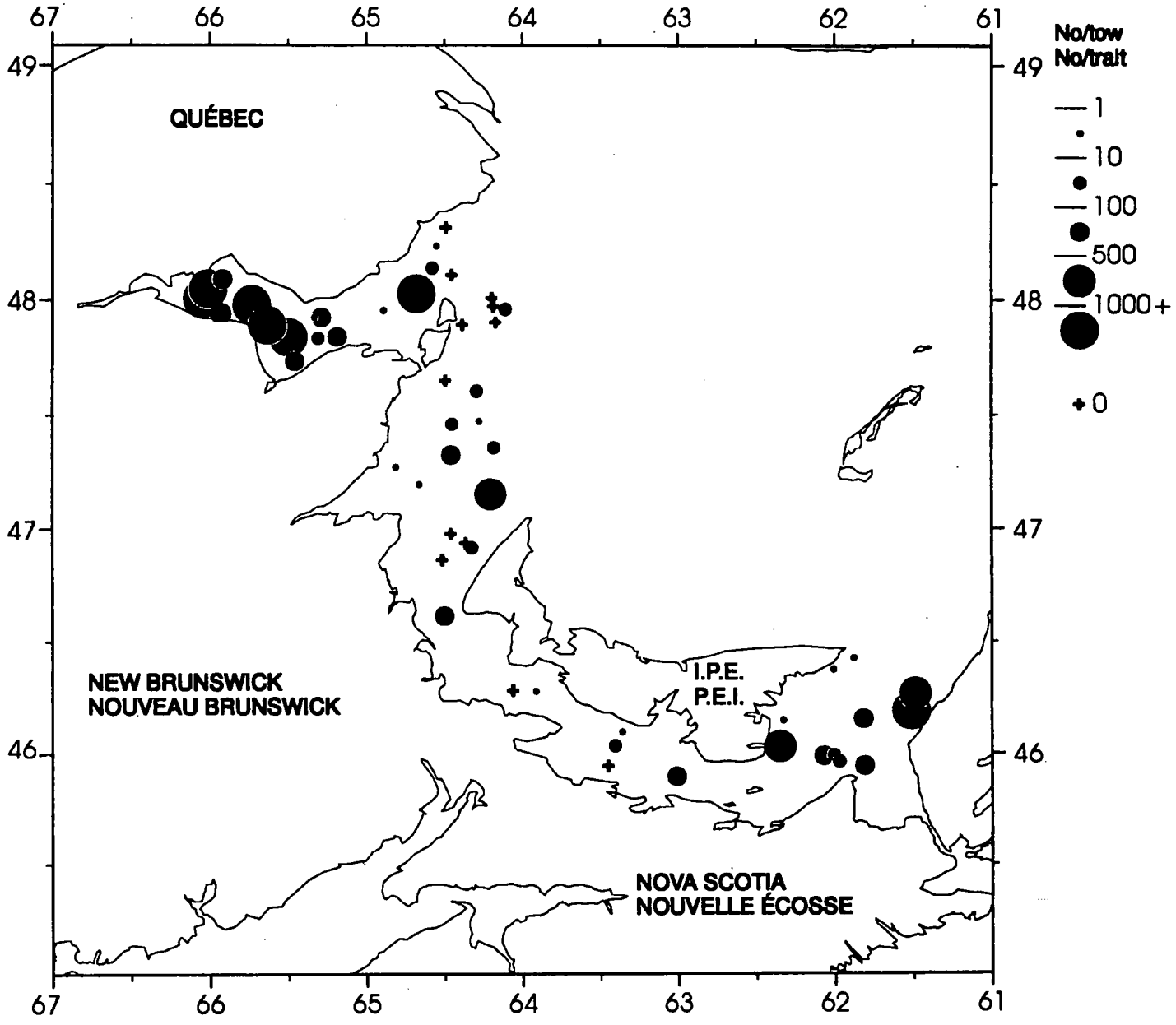


Fig. 16. Catches (number per tow) of herring < 25 cm in December, 1995 bottom trawl survey.

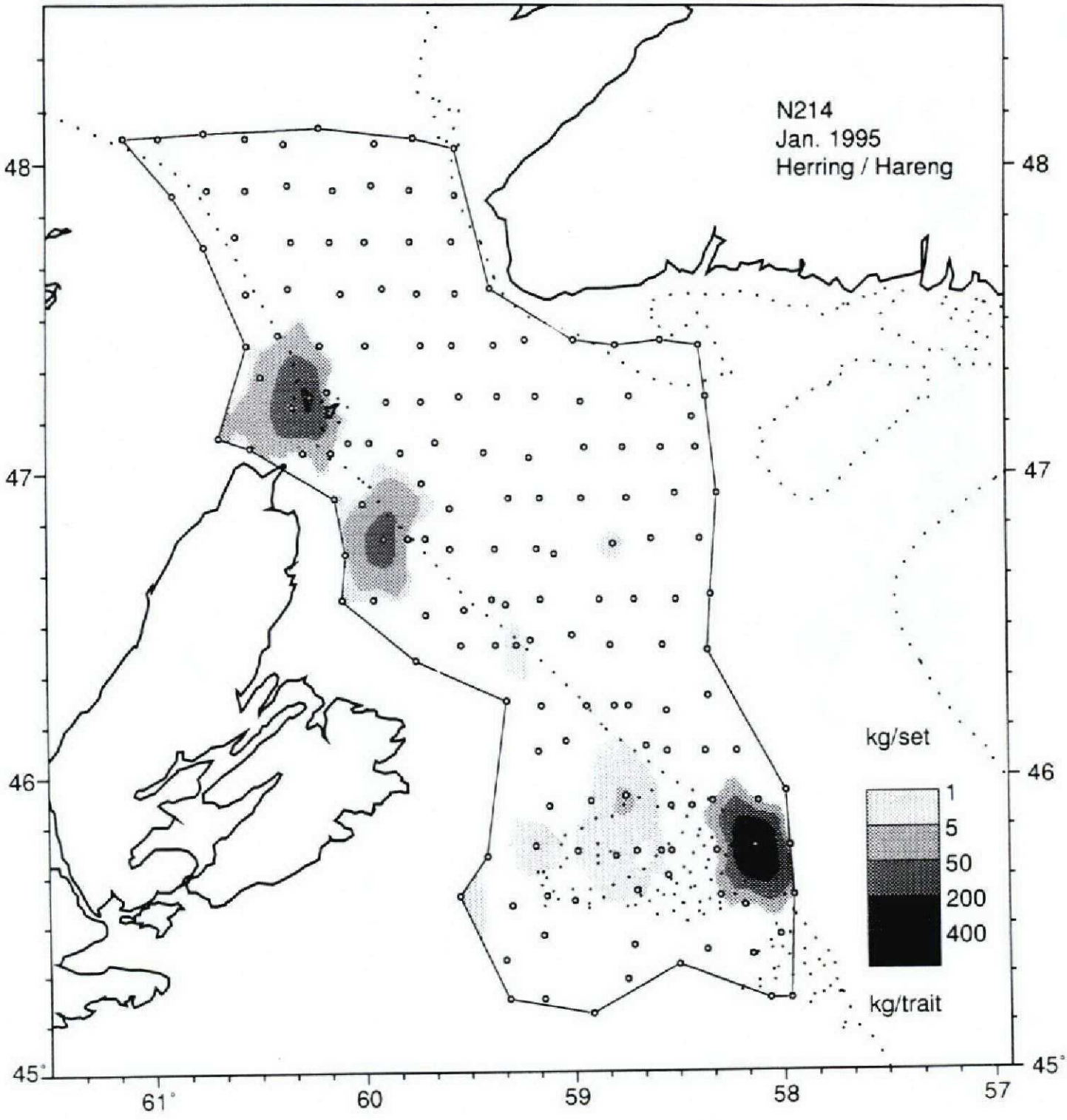


Fig. 17. Catches of herring (kg/standard tow) during the January 10-29, 1995 bottom trawl survey in Cabot Strait (open circles indicate set locations, dotted line is 200 m contour).

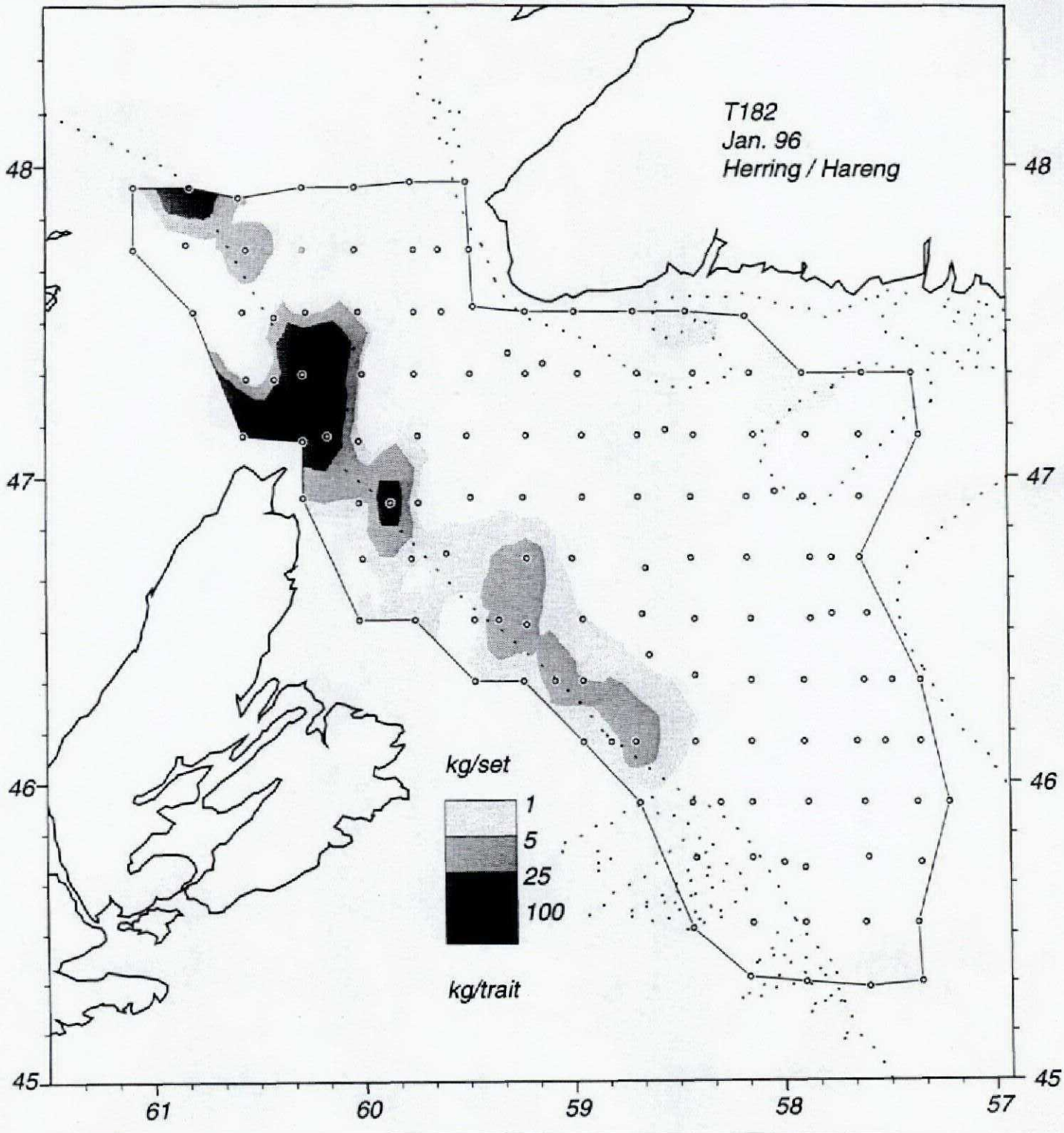


Fig. 18. Catches of herring (kg/standard tow) during the January 1996 bottom trawl survey in Cabot Strait (open circles indicate set locations, dotted line is 200 m contour).

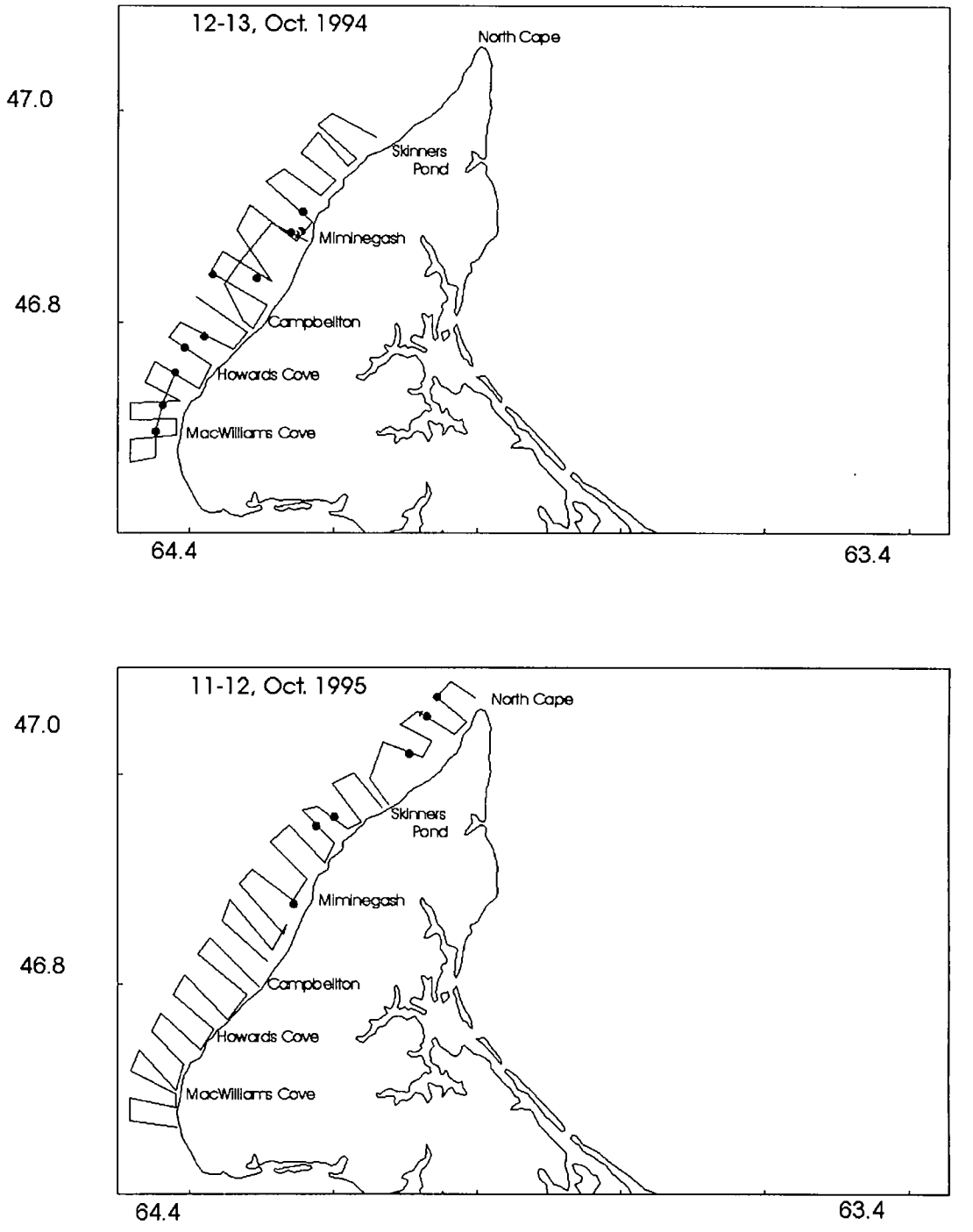


Figure 19. Location of herring schools observed during presence-absence survey on Western Prince Edward Island using gillnetter vessels.

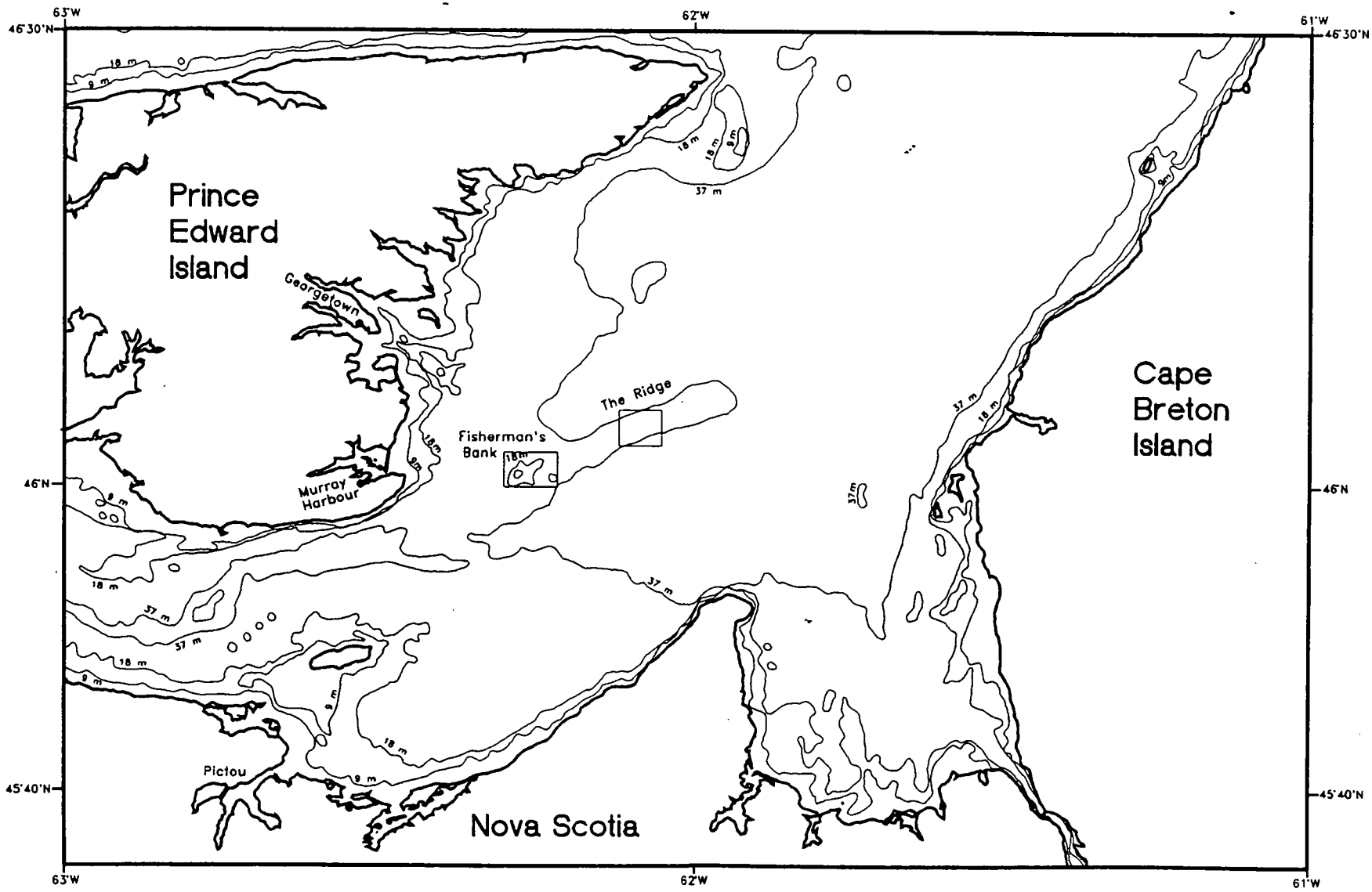


Fig. 20. Eastern Northumberland Strait, showing the locations of Fisherman's Bank and the Ridge.

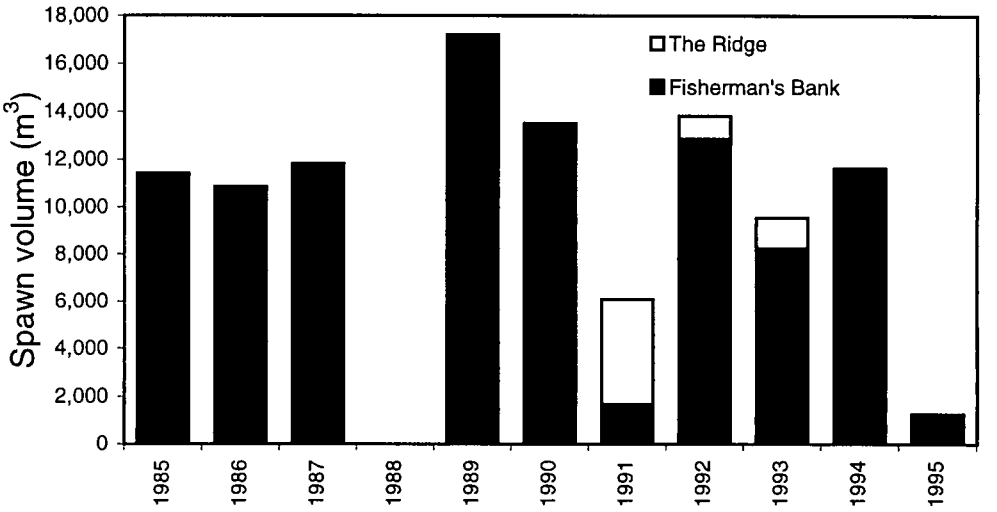


Fig. 21. Egg deposition volume at Fisherman's Bank and the Ridge as estimated by spawning bed survey (Cairns et al. 1996).

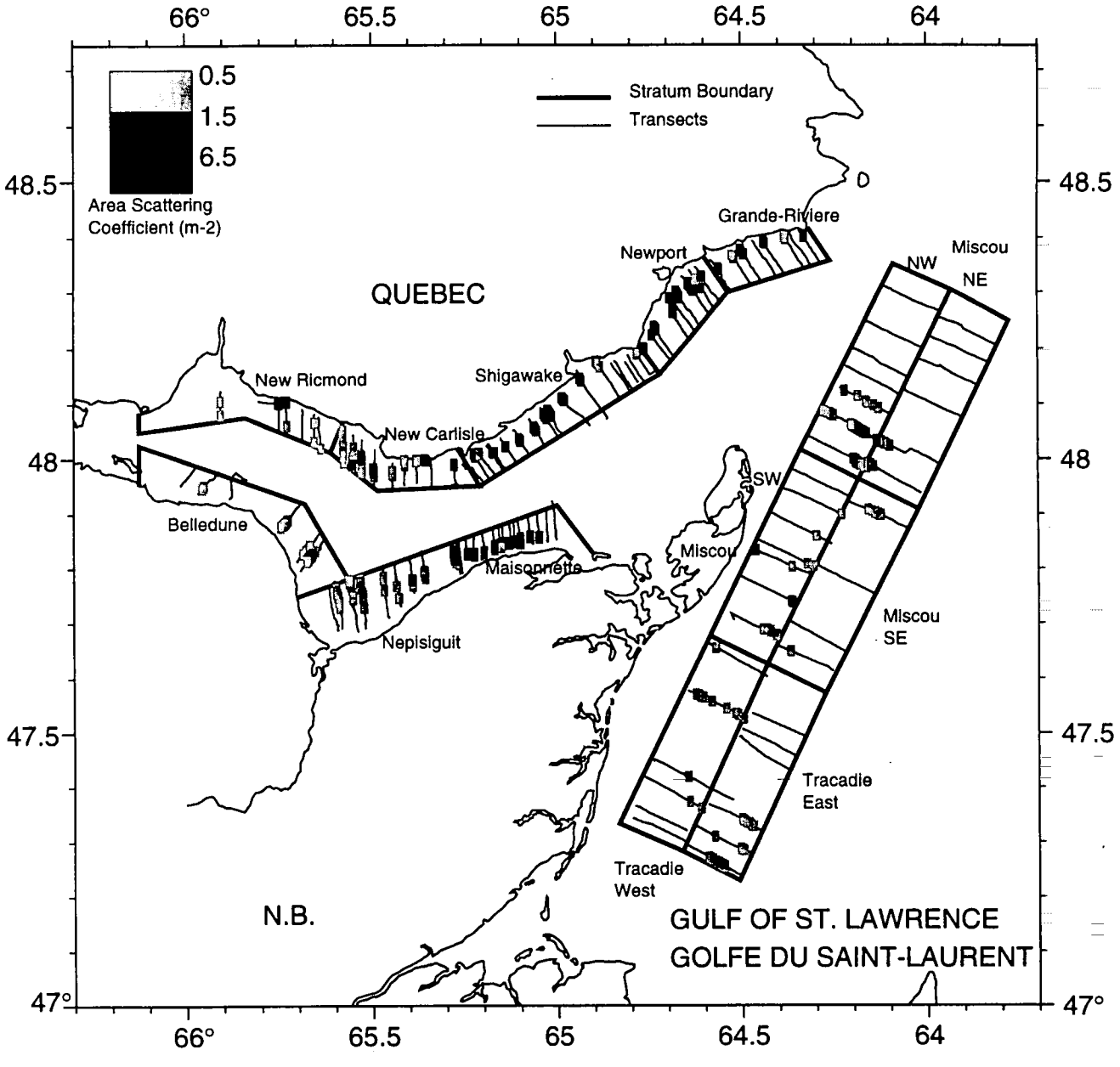


Fig. 22. Chaleur-Miscou area 1995 stratum and acoustic transect locations, with relative backscatter detected.

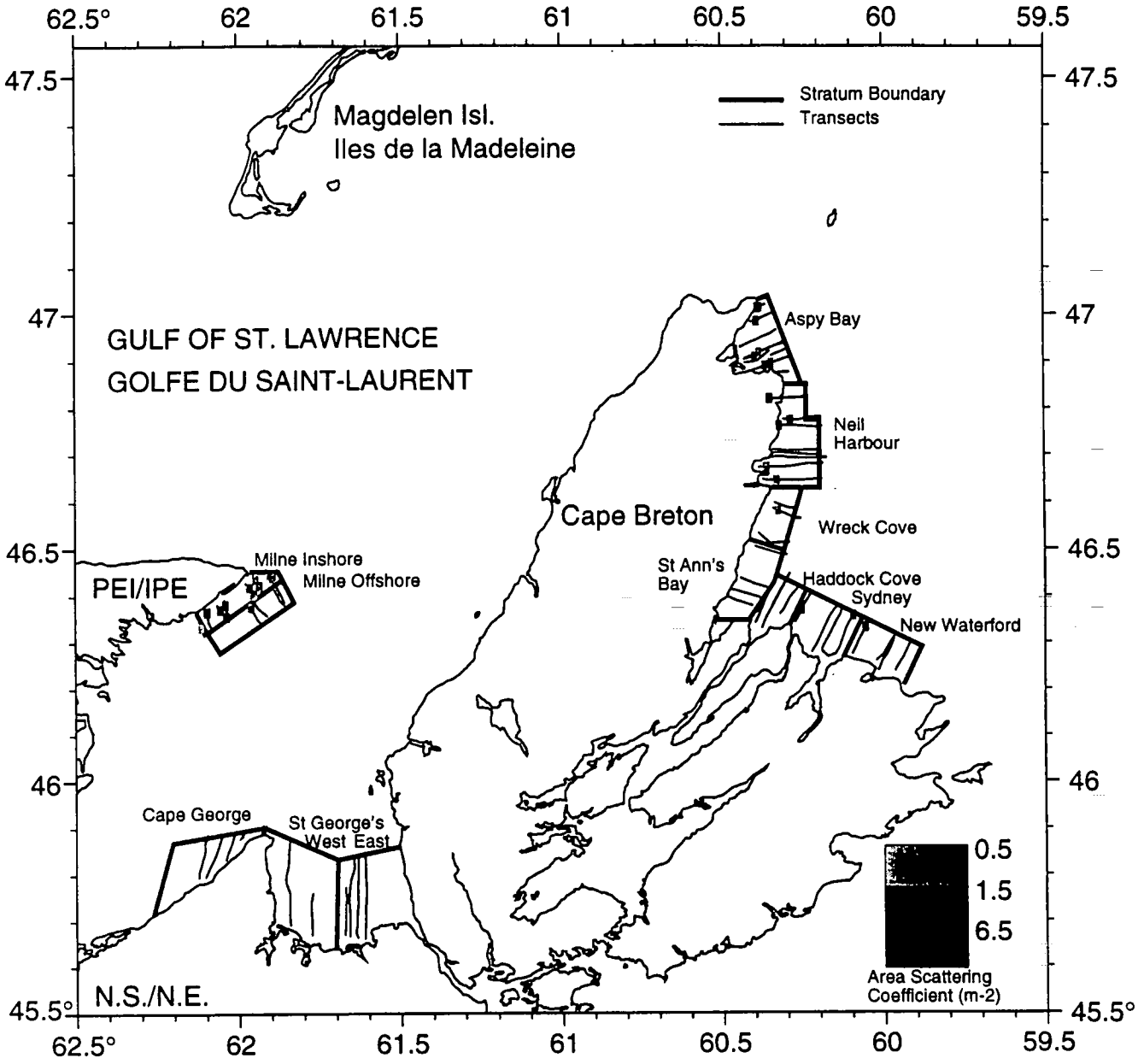


Fig. 23. Milne-George's and Cape Breton area 1995 stratum and acoustic transect locations, with relative backscatter detected.

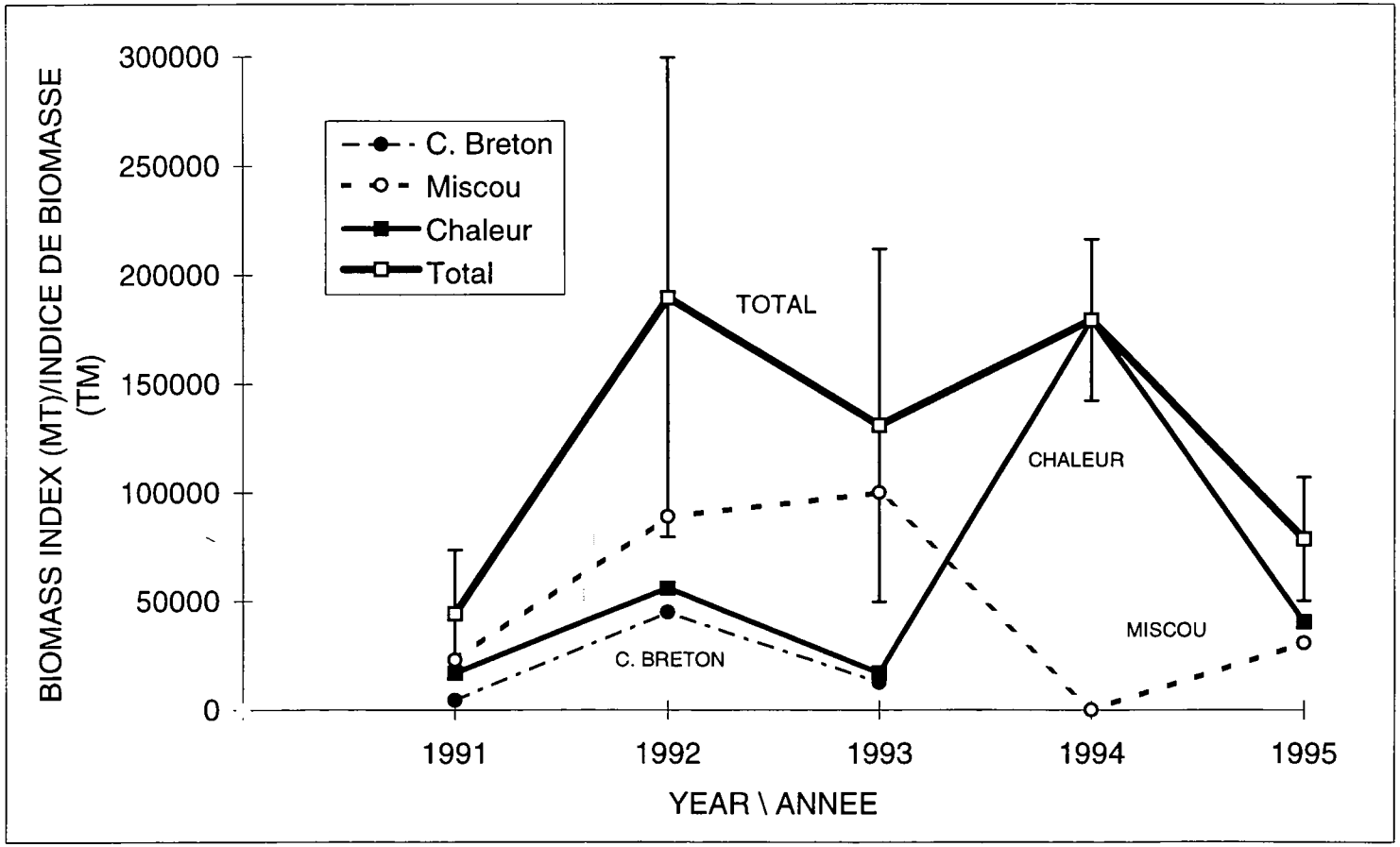


Figure 24. Total and by area biomass estimates, acoustic surveys, 1991 - 1995.

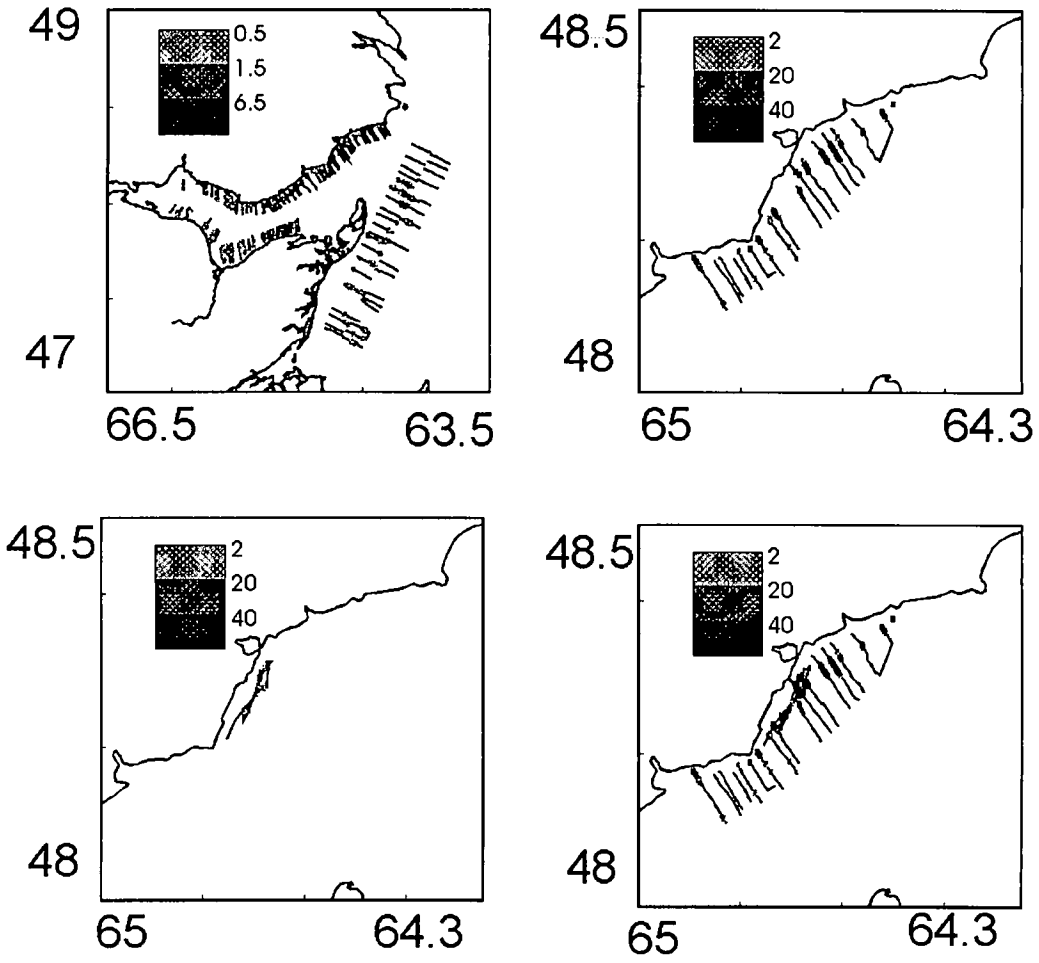


Fig. 25. Top left panel shows transects and relative amounts of herring observed along transects during the annual acoustic survey in Chaleur Bay. Scale represents backscatter observed along transect scaled to the highest levels during the survey. Top right panel shows transects and relative amounts of herring observed along transects on the night of Oct. 2, 1995. Scale for upper right panel and lower left and right panels has been defined so that the backscatter from the purse seiner and the research vessel are on the same scale. Lower left panel shows relative amounts of herring seen by purse seiner in two hours of fishing on Oct. 3, 1995. Lower right panel shows combined purse seine and research vessel observations of herring.

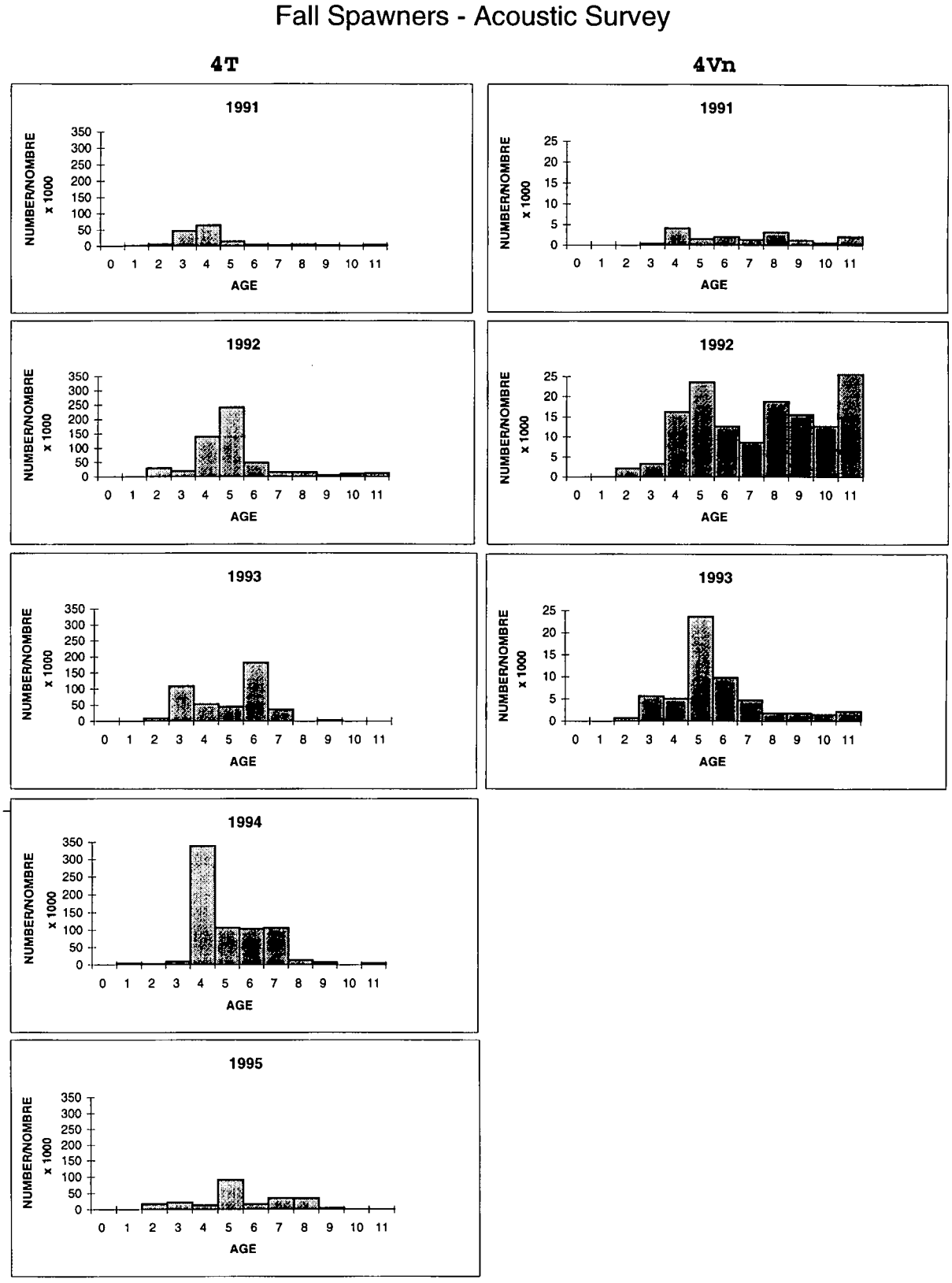


Figure 26. Numbers at age of FALL spawners, by area, in herring acoustic surveys.

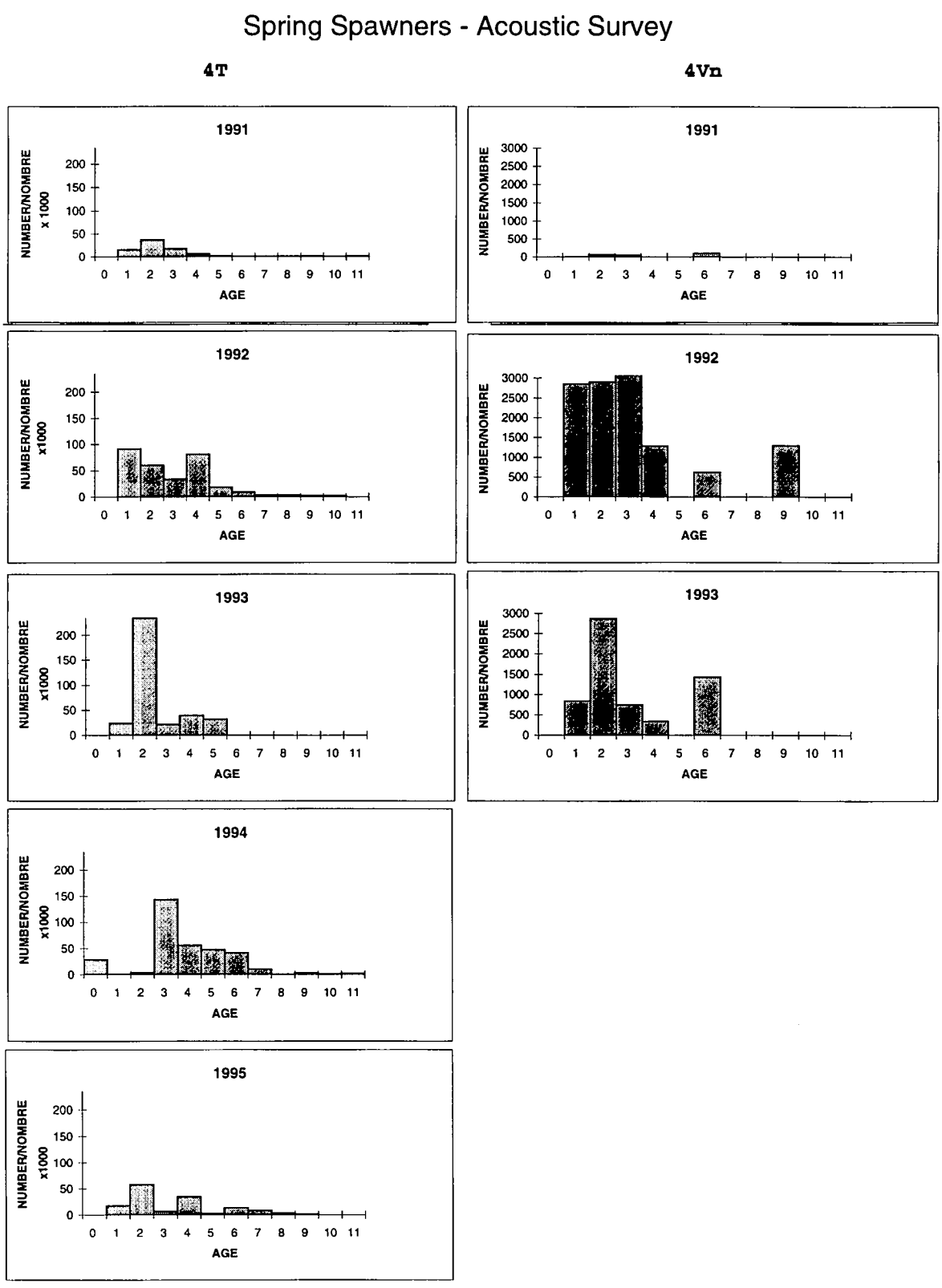


Figure 27. Numbers at age of SPRING spawners, by area, in herring acoustic surveys.

Fall 4T Herring Catch Rate Analysis

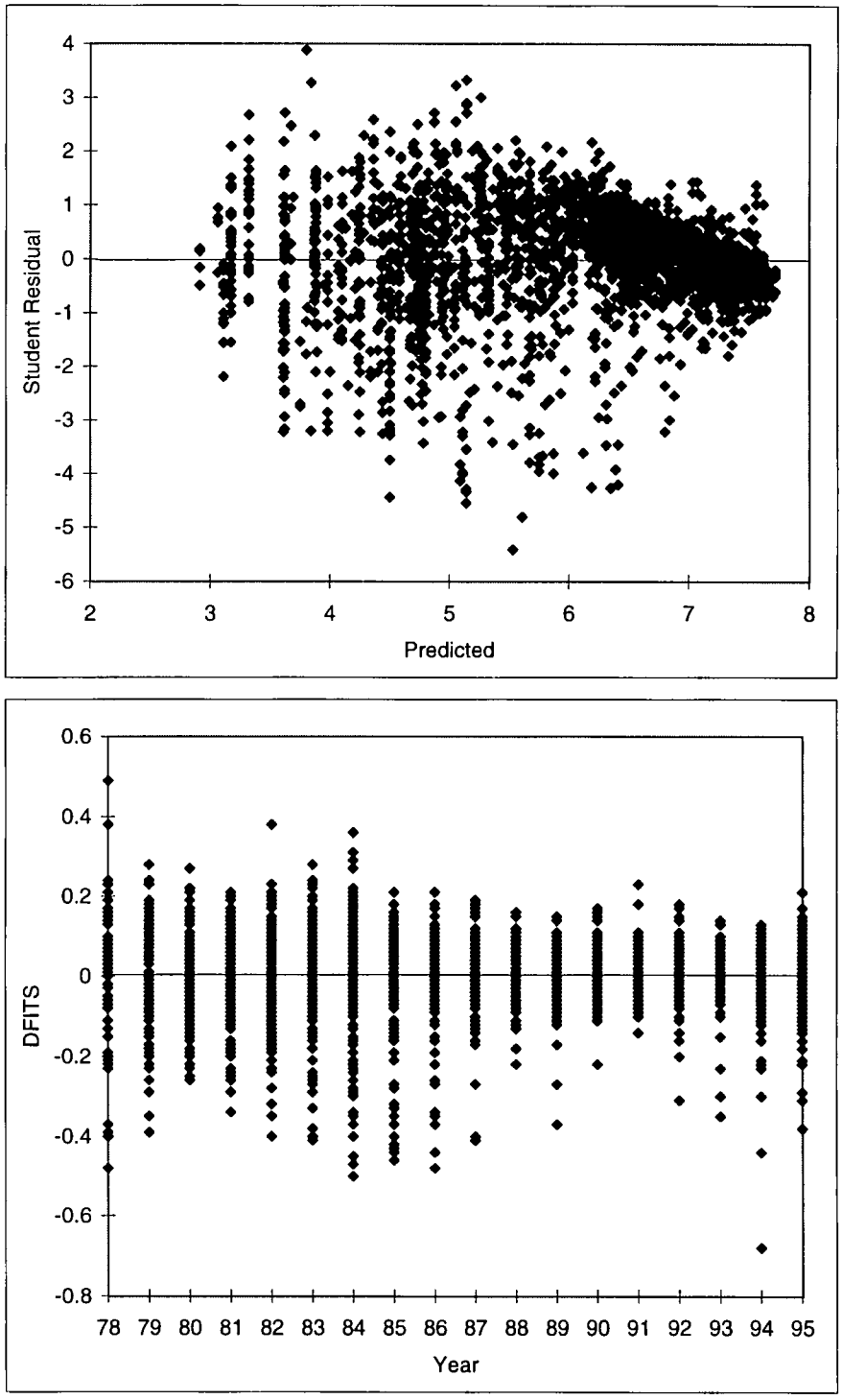


Fig. 28. Residuals and DFITS from multiplicative analysis of 4T fall spawners catch rates in the inshore fishery.

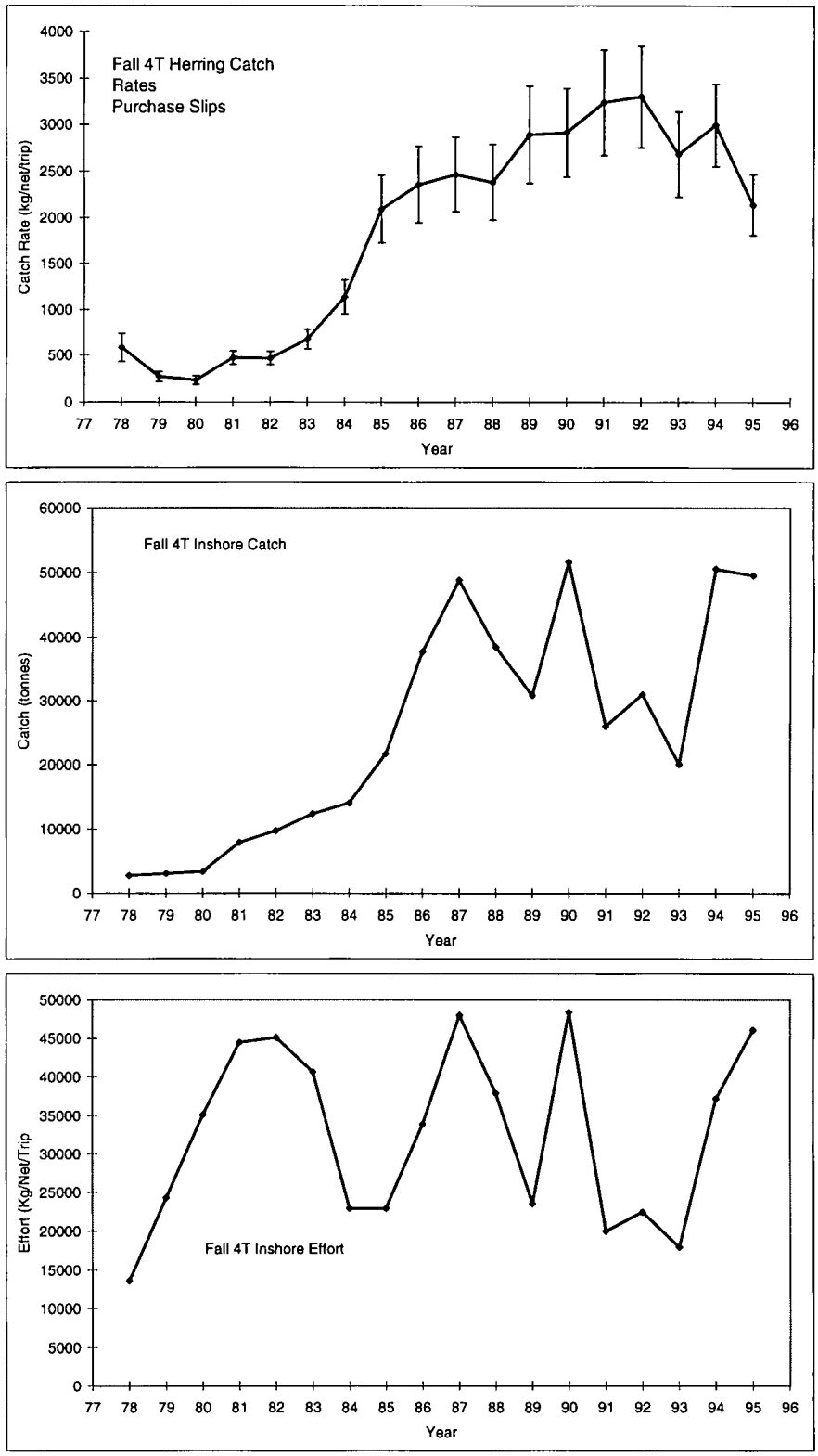


Fig. 29. Catch per unit effort (kg/net/trip), catch (tonnes), and effort (net-trips) in 4T fall inshore fishery.

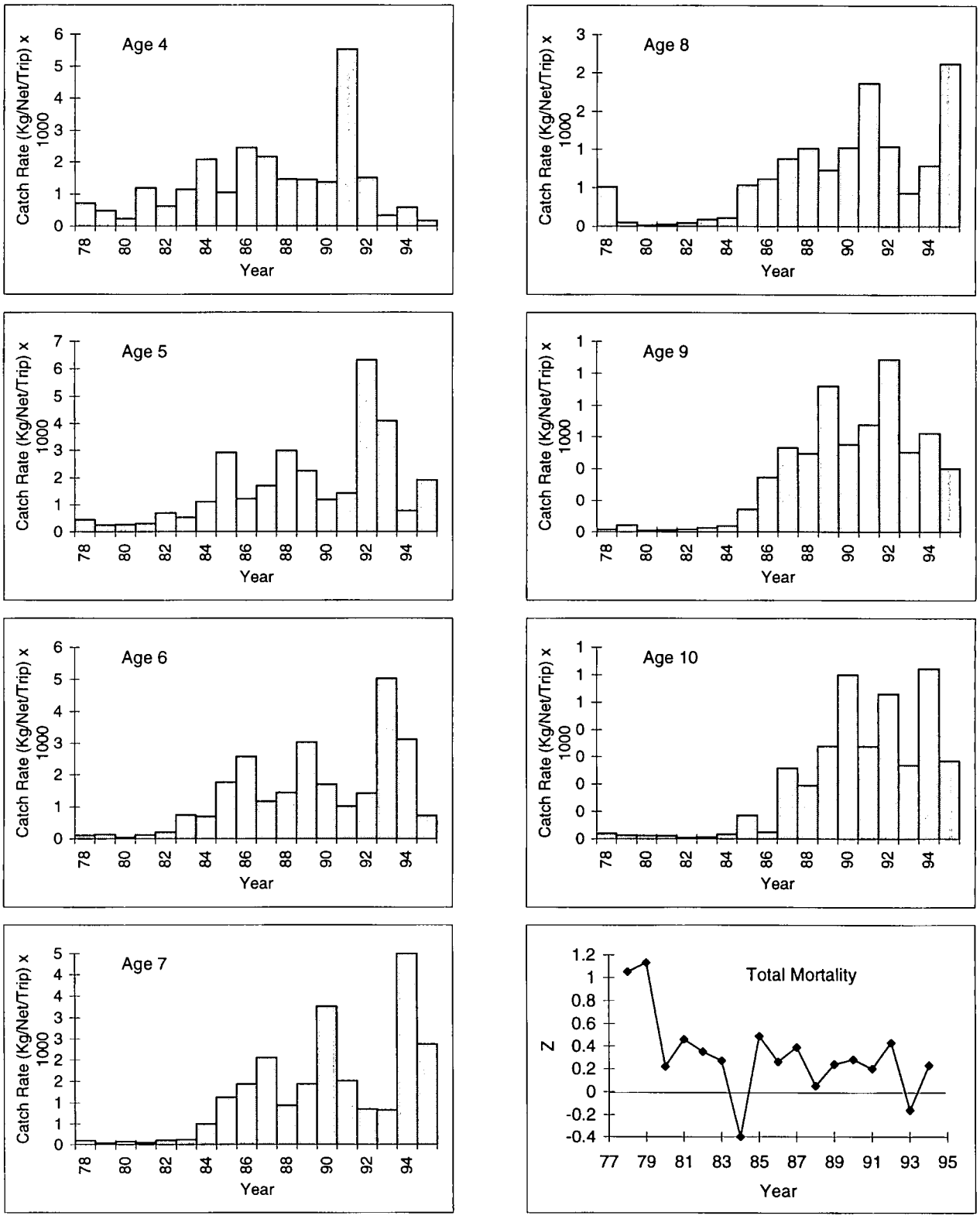


Fig. 30. Abundance indices by age for fall spawners (kg/net/trip).

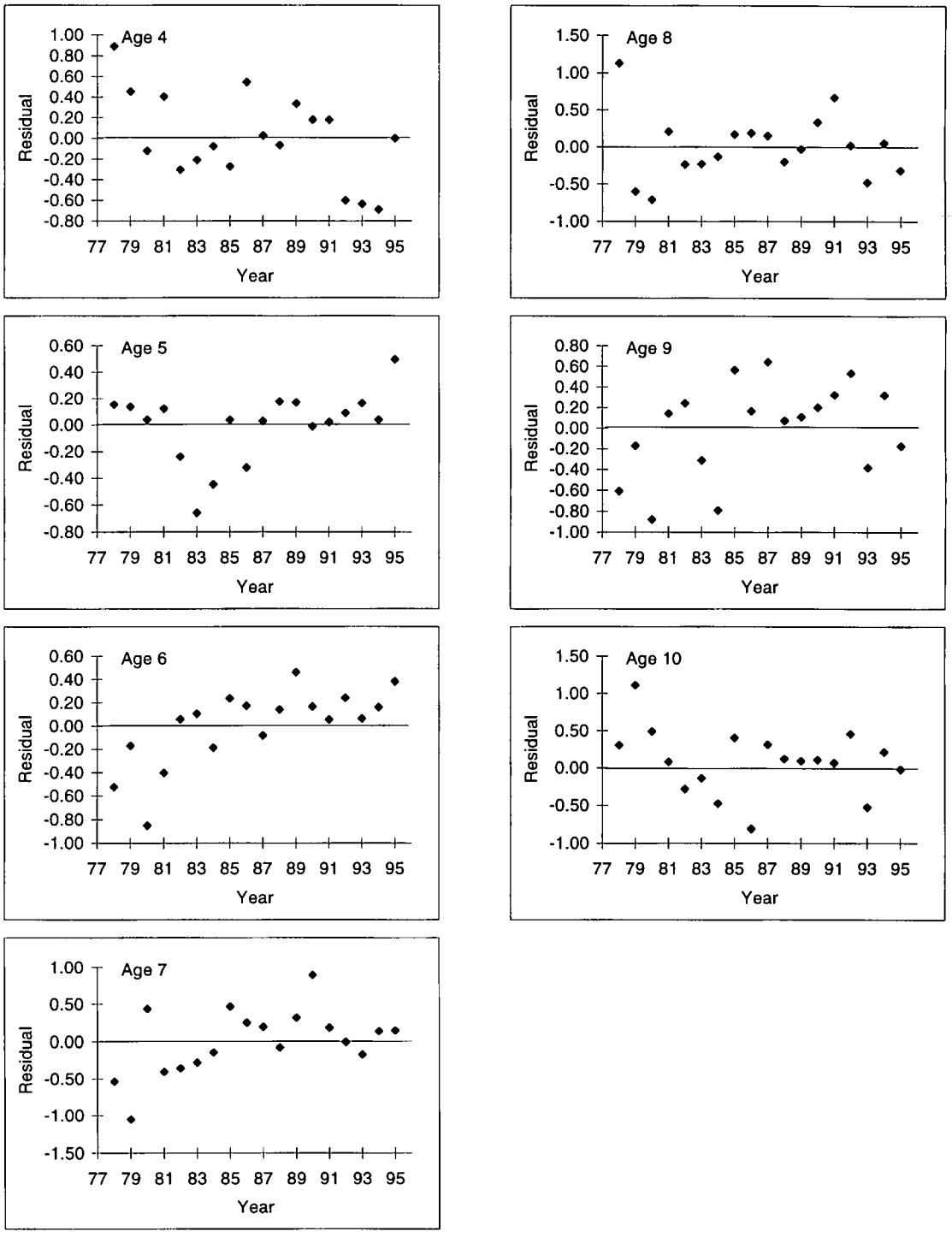


Fig. 31. Log residuals by age from ADAPT-VPA of fall spawners.

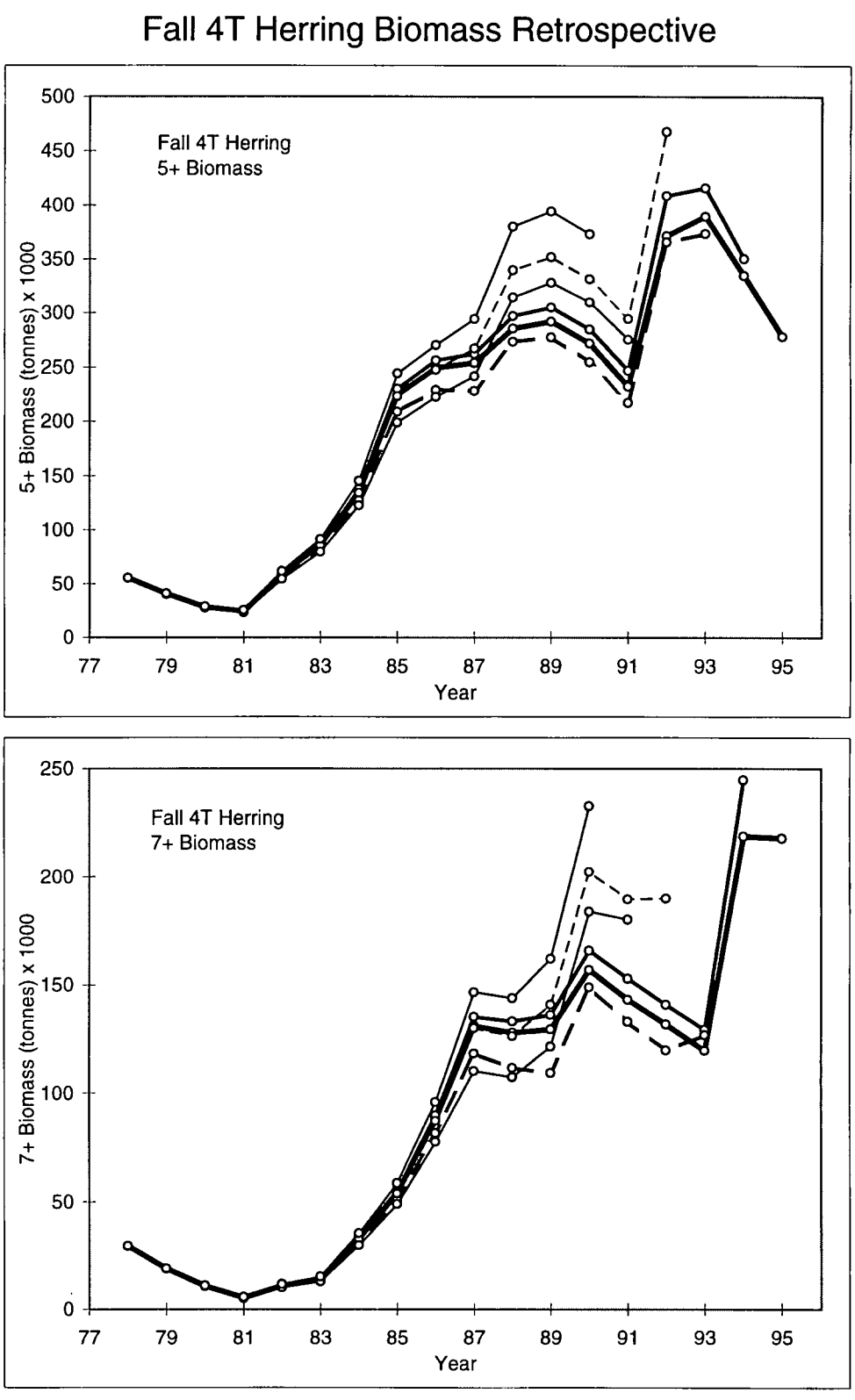


Fig. 32. Retrospective analysis of fall 4T herring spawners using ADAPT-VPA.

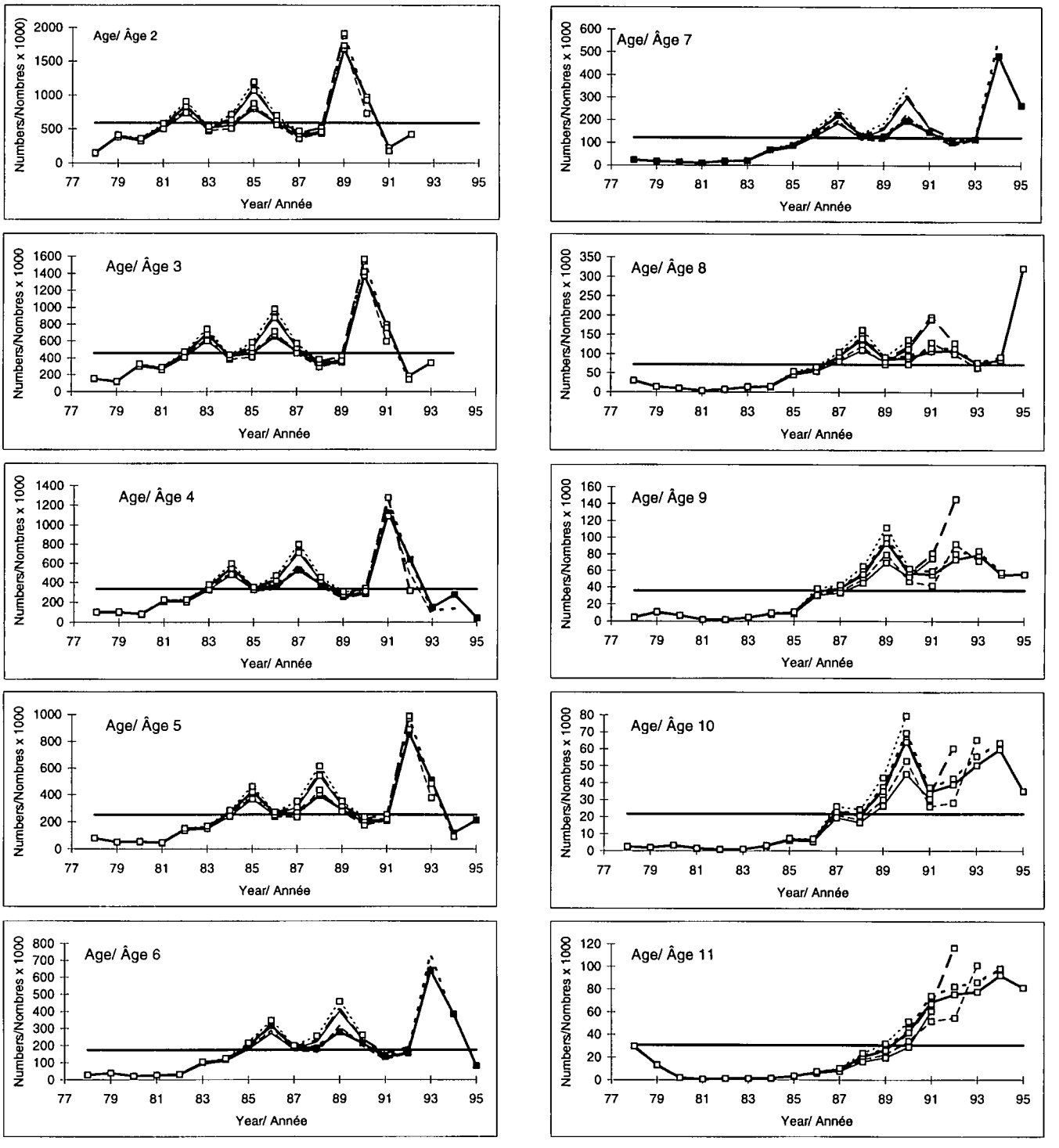


Fig. 33. Retrospective analysis by age from ADAPT analysis of fall spawners.

4T Herring Fall Spawners - ADAPT Errors

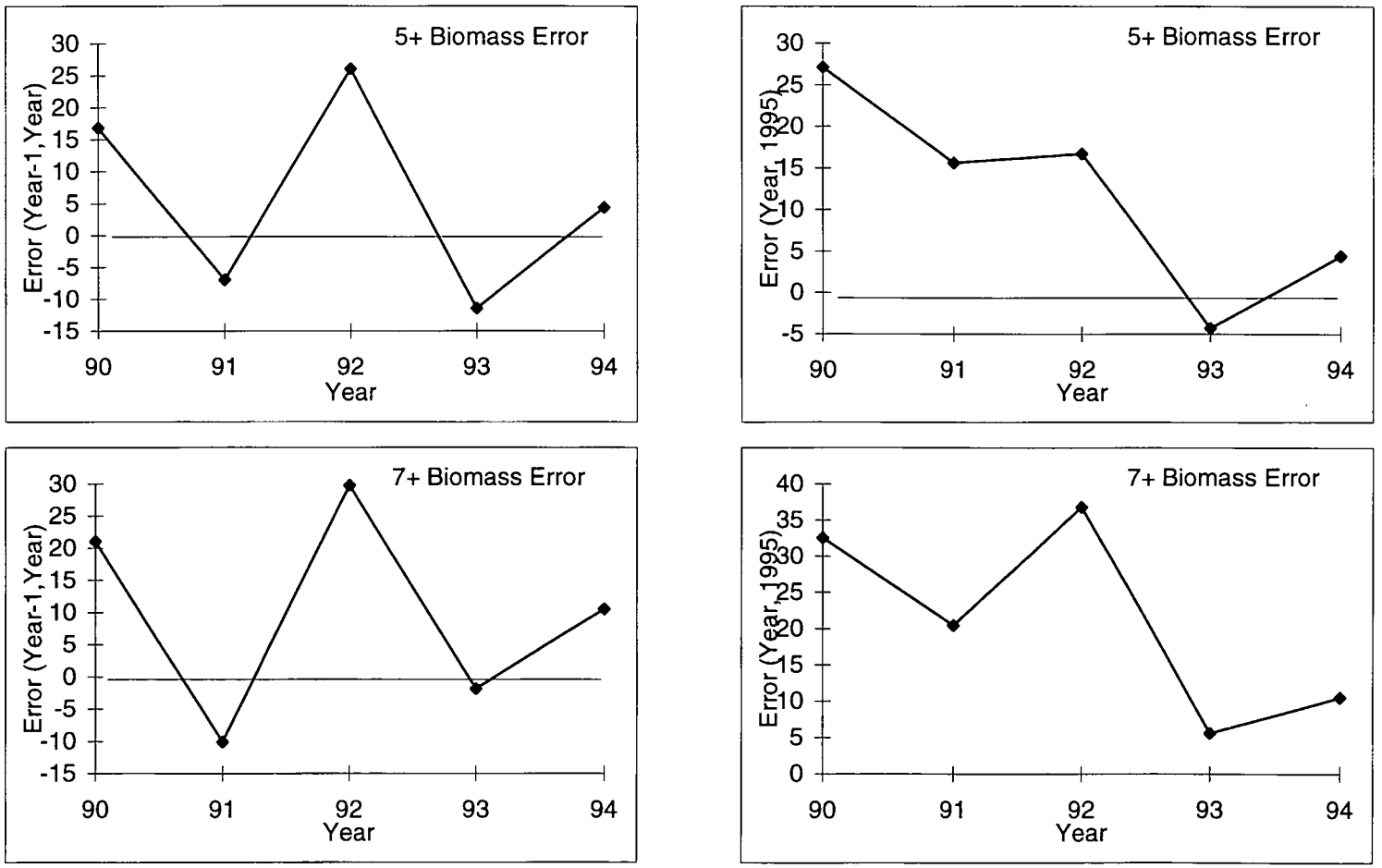


Fig. 34. Percentage difference between biomass estimated using ADAPT-VPA in the year indicated and year+1 (Left side). Percentage difference between biomass estimated using ADAPT-VPA in the year indicated and 1995 (Right side).

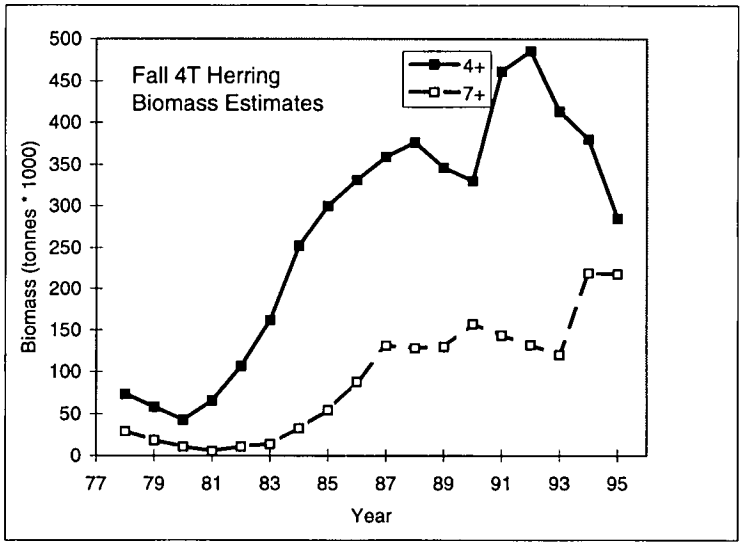


Fig. 35. 4+ and 7+ biomass estimates for fall 4T herring spawners using ADAPT-VPA.

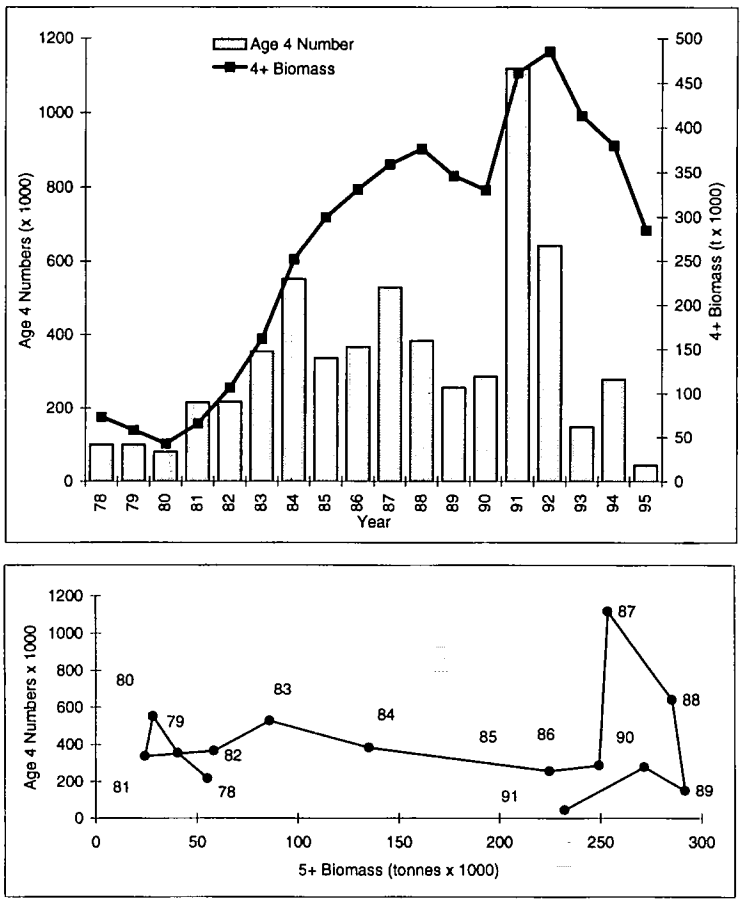


Fig. 36. Recruits as age 4 numbers compared to 4+ and 5+ biomass (tonnes) for fall 4T herring spawners.

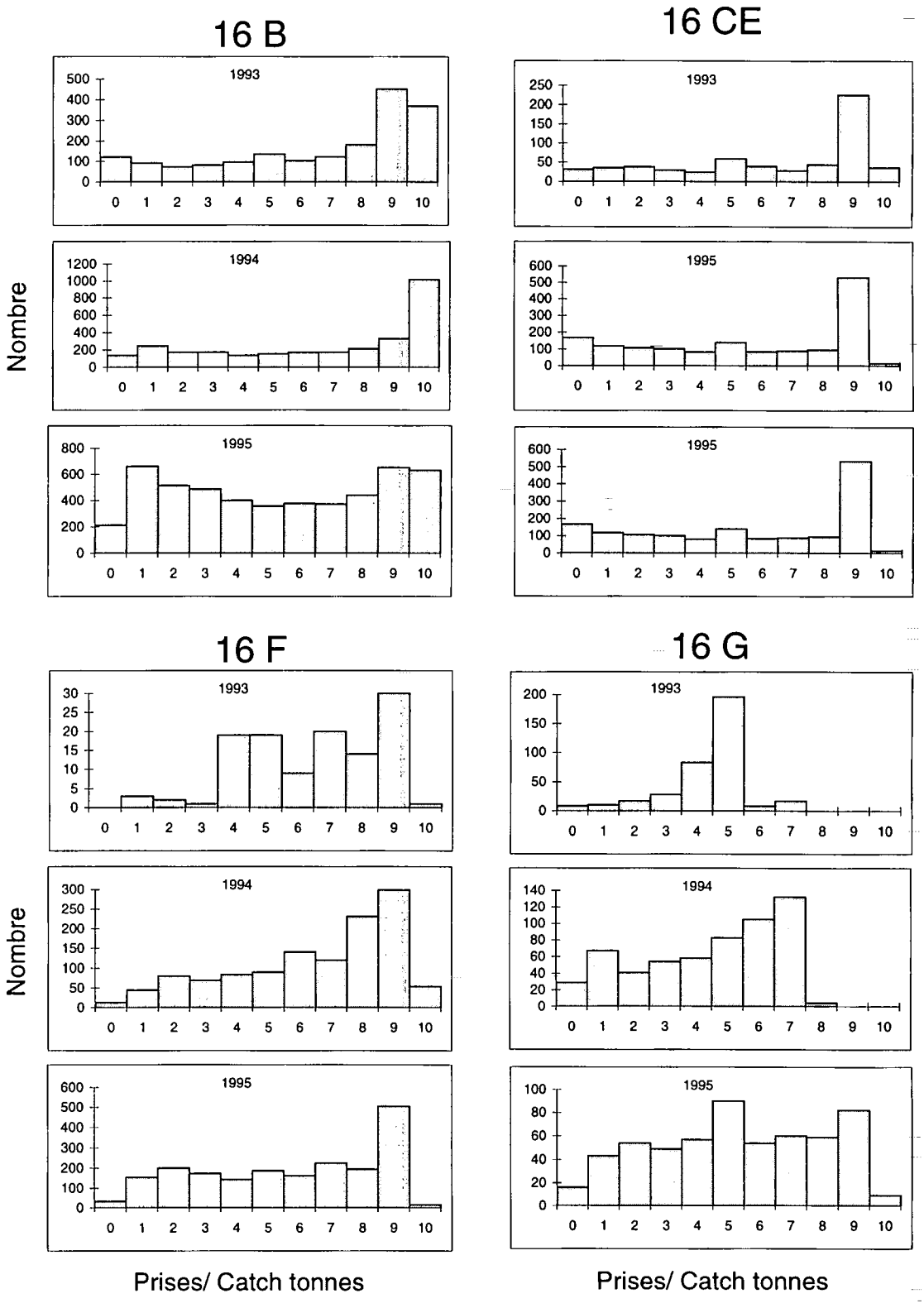


Fig. 37. Frequency distibutions of tonnes during each nights fishing from 1993 to 1995 in four areas of the 4T fall hering inshore fishey.

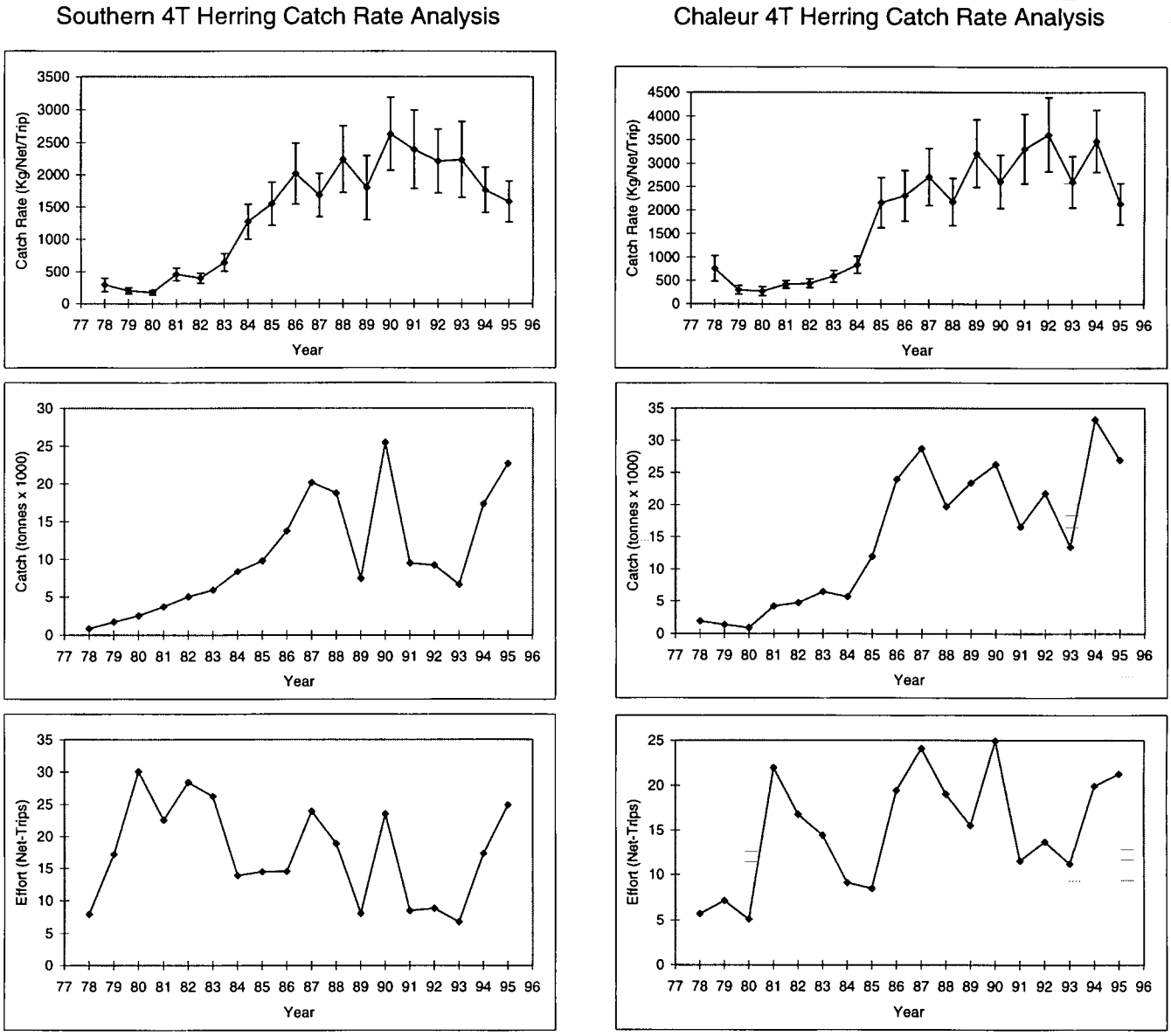
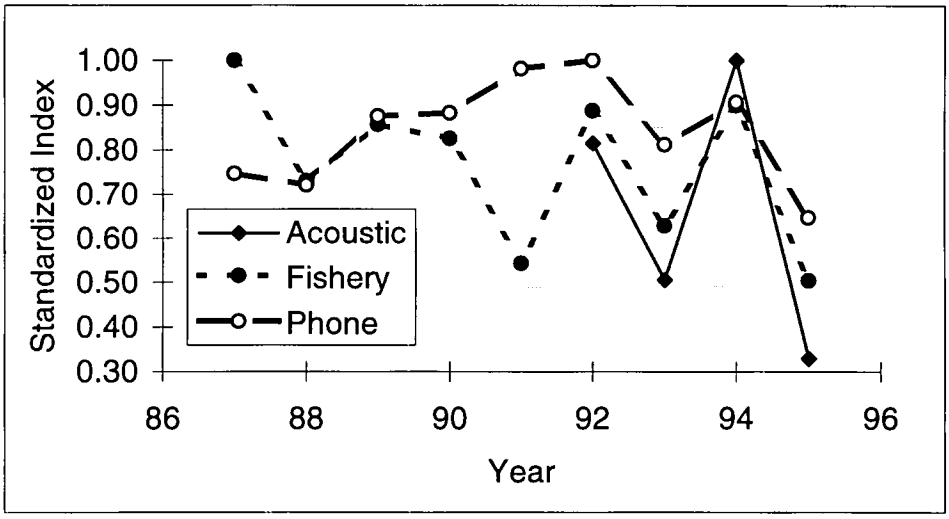


Fig. 38. Catch per unit effort (kg/net/trip), catch (tonnes), and effort (net-trips) for the southern and Chaleur portions of 4T during the fall inshore herring fishery.

4T



Chaleur

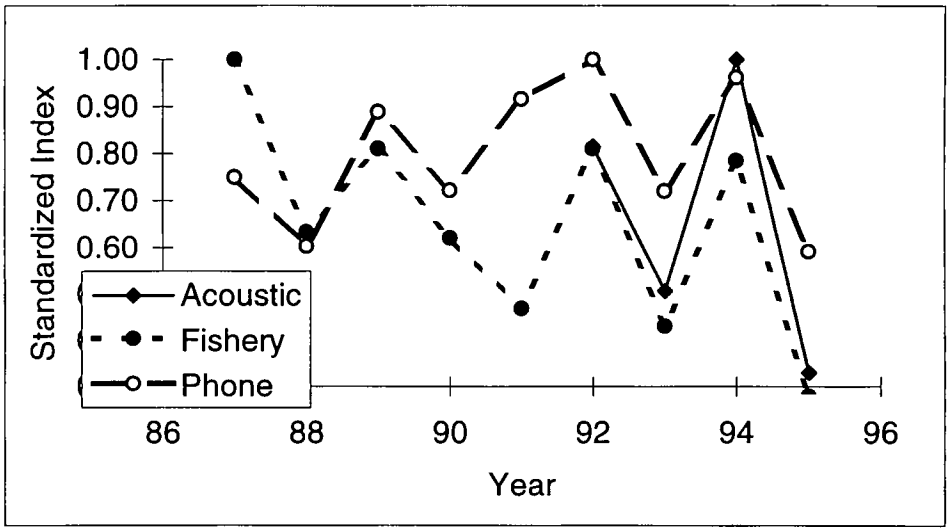


Fig. 39. Comparison of acoustic, fishery (catch rates), and phone survey abundance indices for fall spawners.

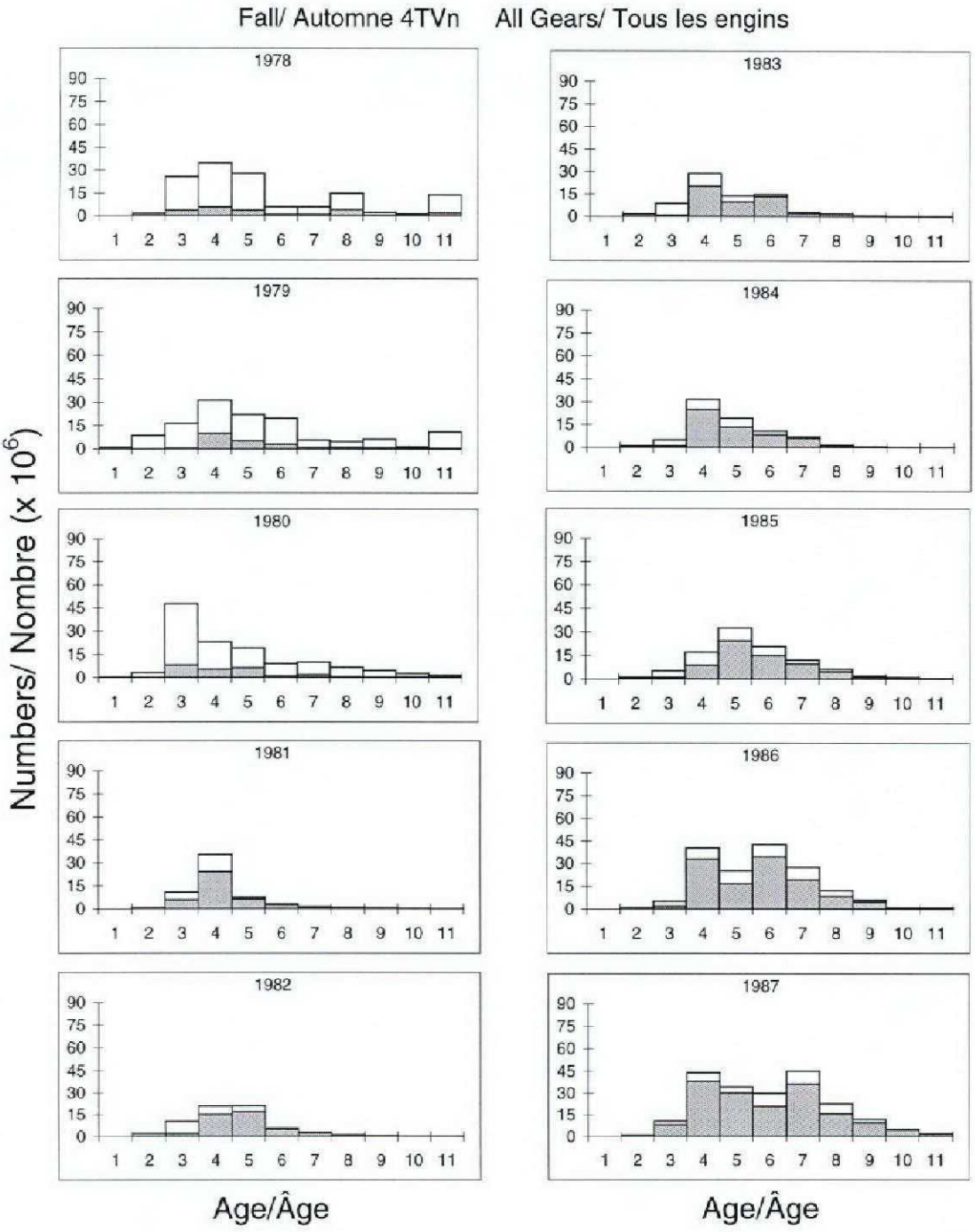


Fig. 40. Fall spawners catch-at-age all gears. Open bars are mobile gear catches, closed bars are fixed gear catches.

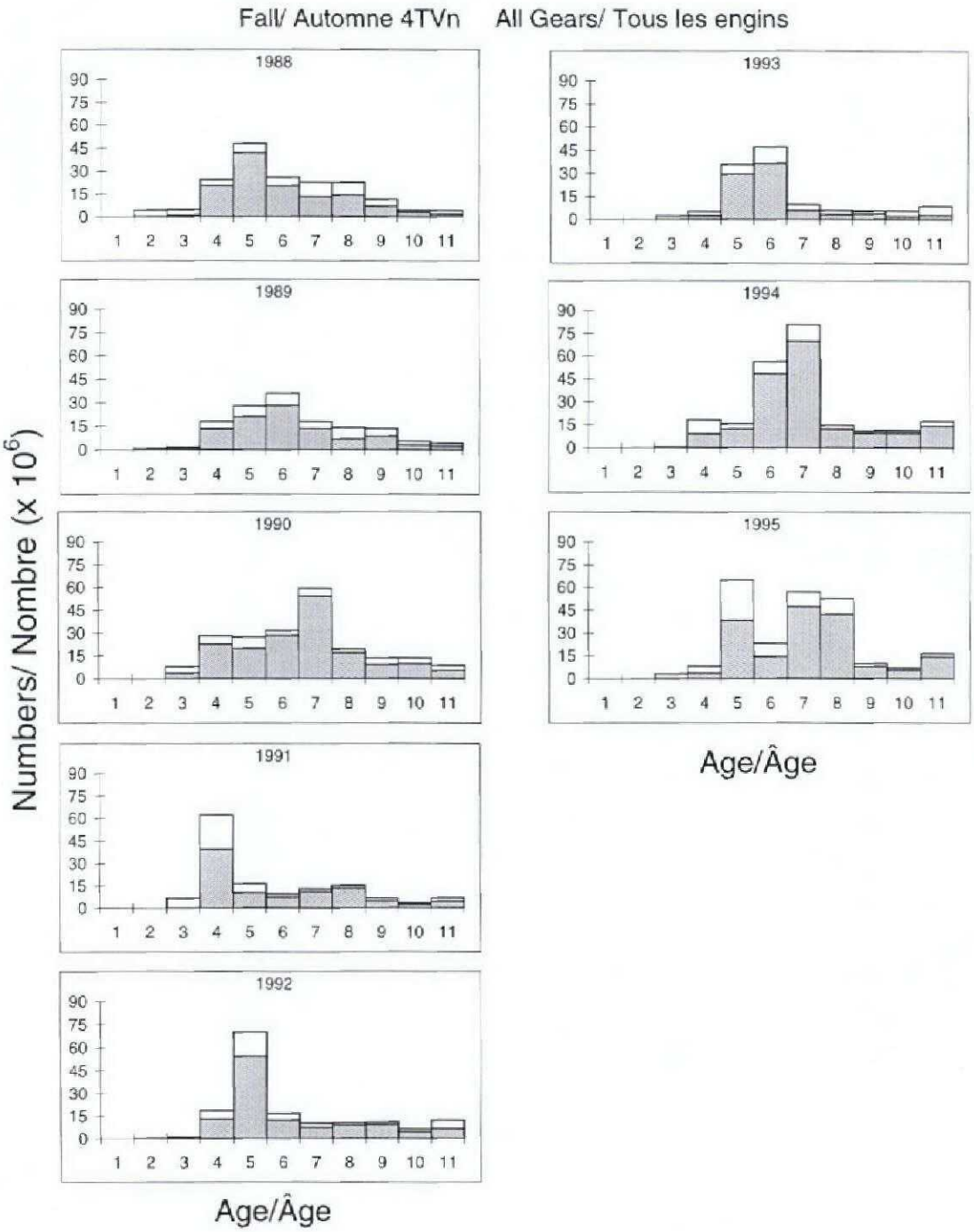


Fig. 40. (continued) Fall spawners catch-at-age all gears. Open bars are mobile gear catches, closed bars are fixed gear catches.

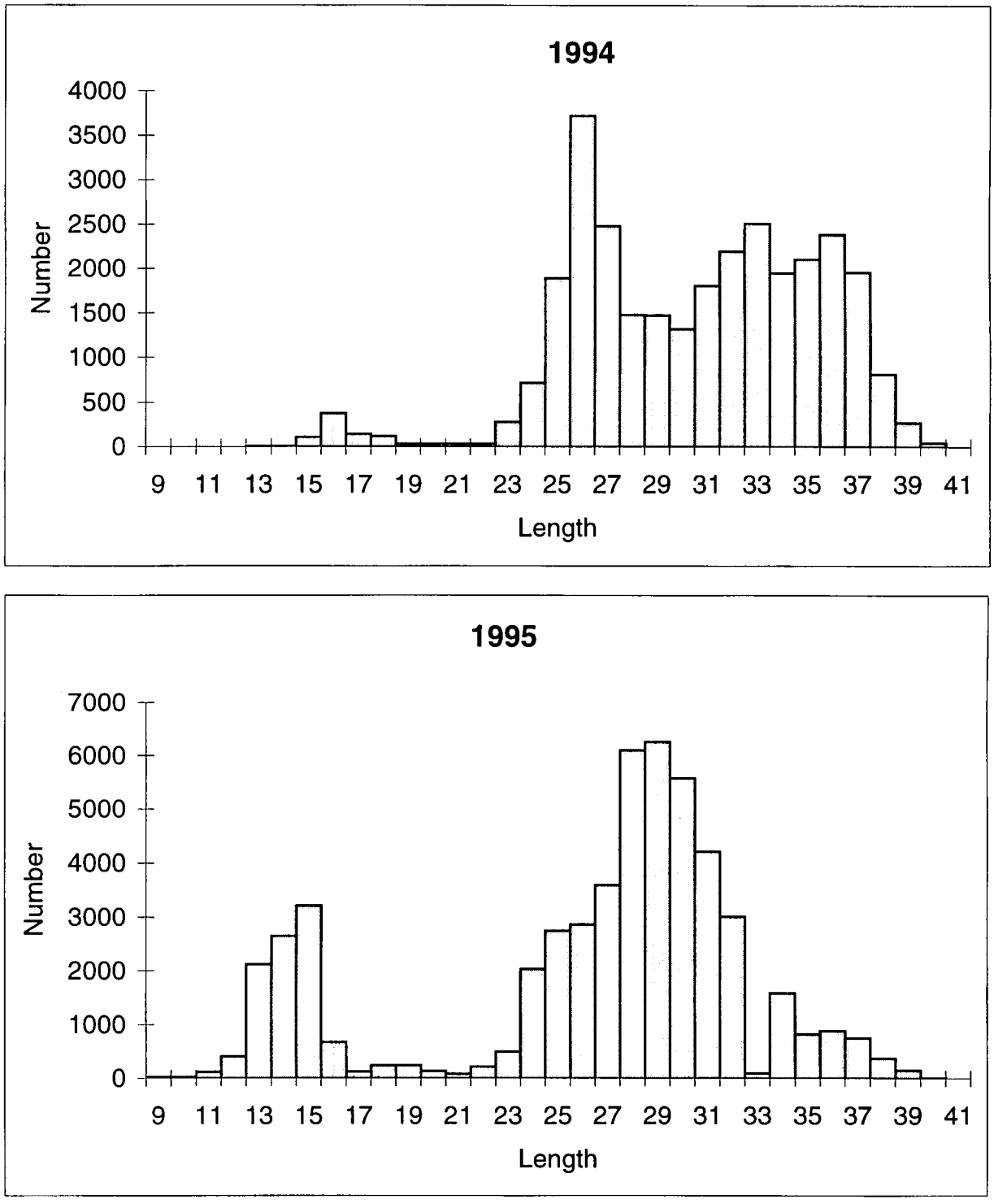


Fig. 41. Number of herring by length (cm) group sampled during September bottom trawl survey in 4T in 1994 and 1995.

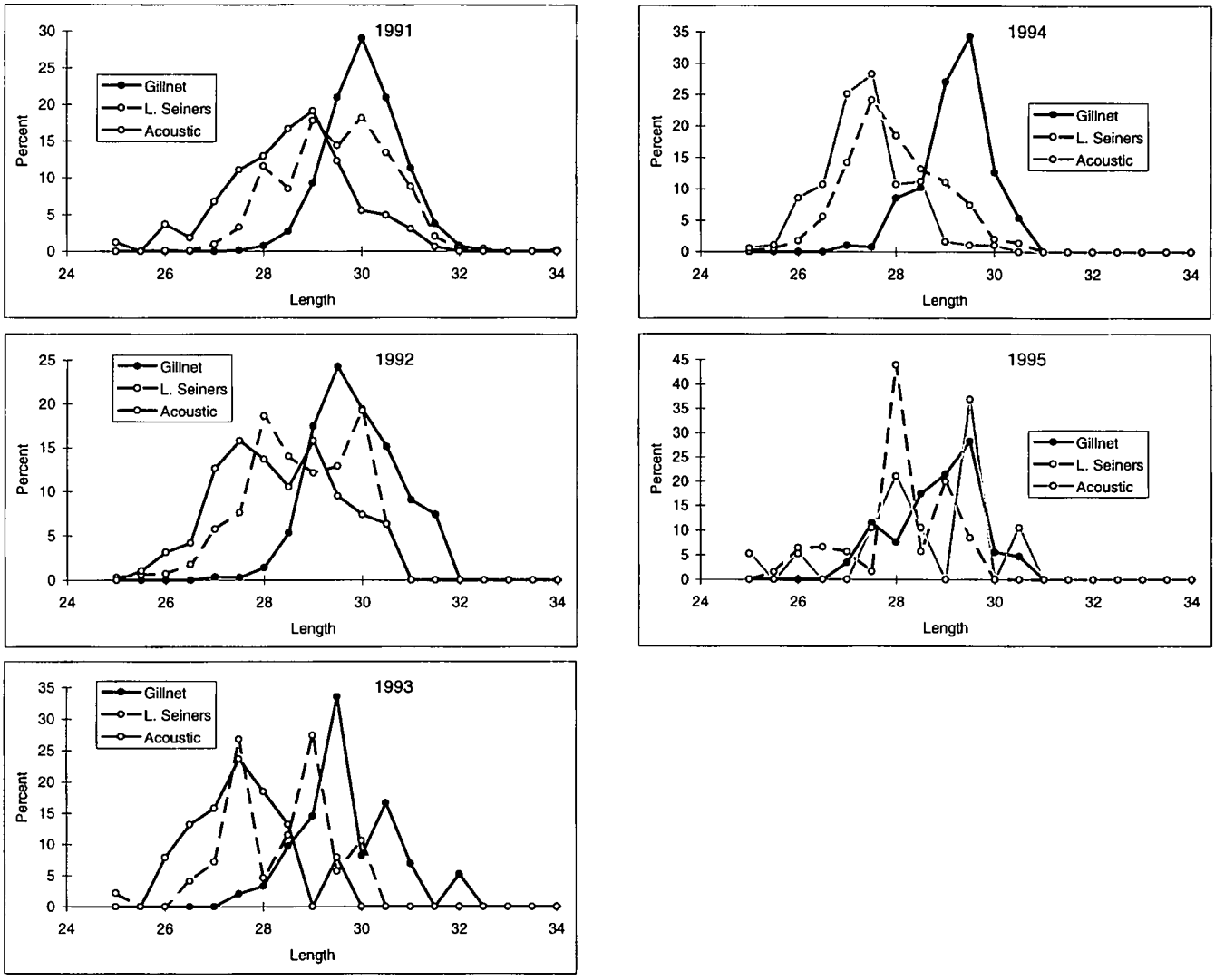


Fig. 42. Length frequency distributions for inshore, purse seiners, and acoustic survey samples in Chaleur Bay for 1991 to 1995.

Maturity Stage by Length

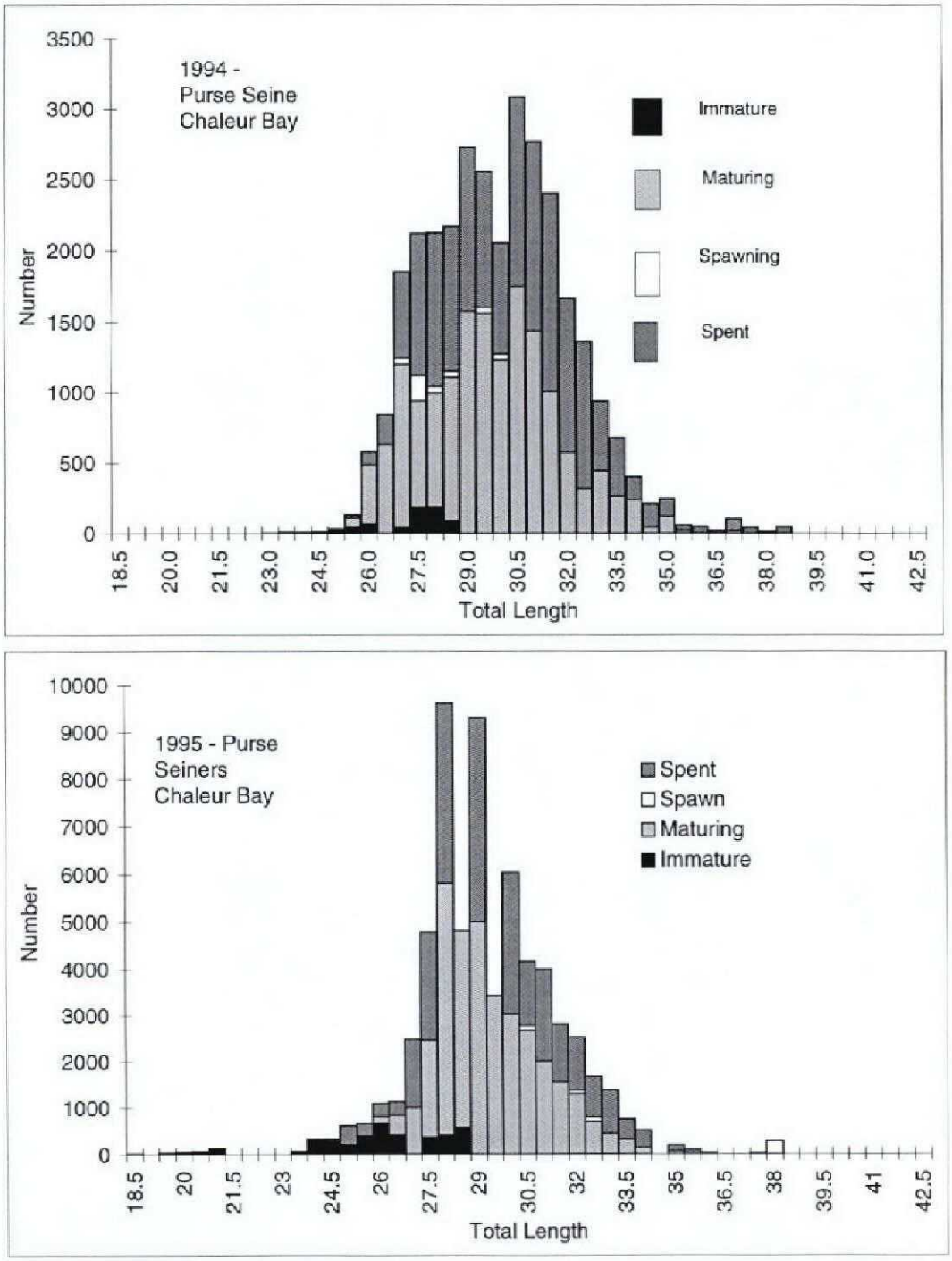


Fig. 43. Numbers at various maturity stages in 1994 and 1995 fall purse seine fishery in Chaleur Bay.

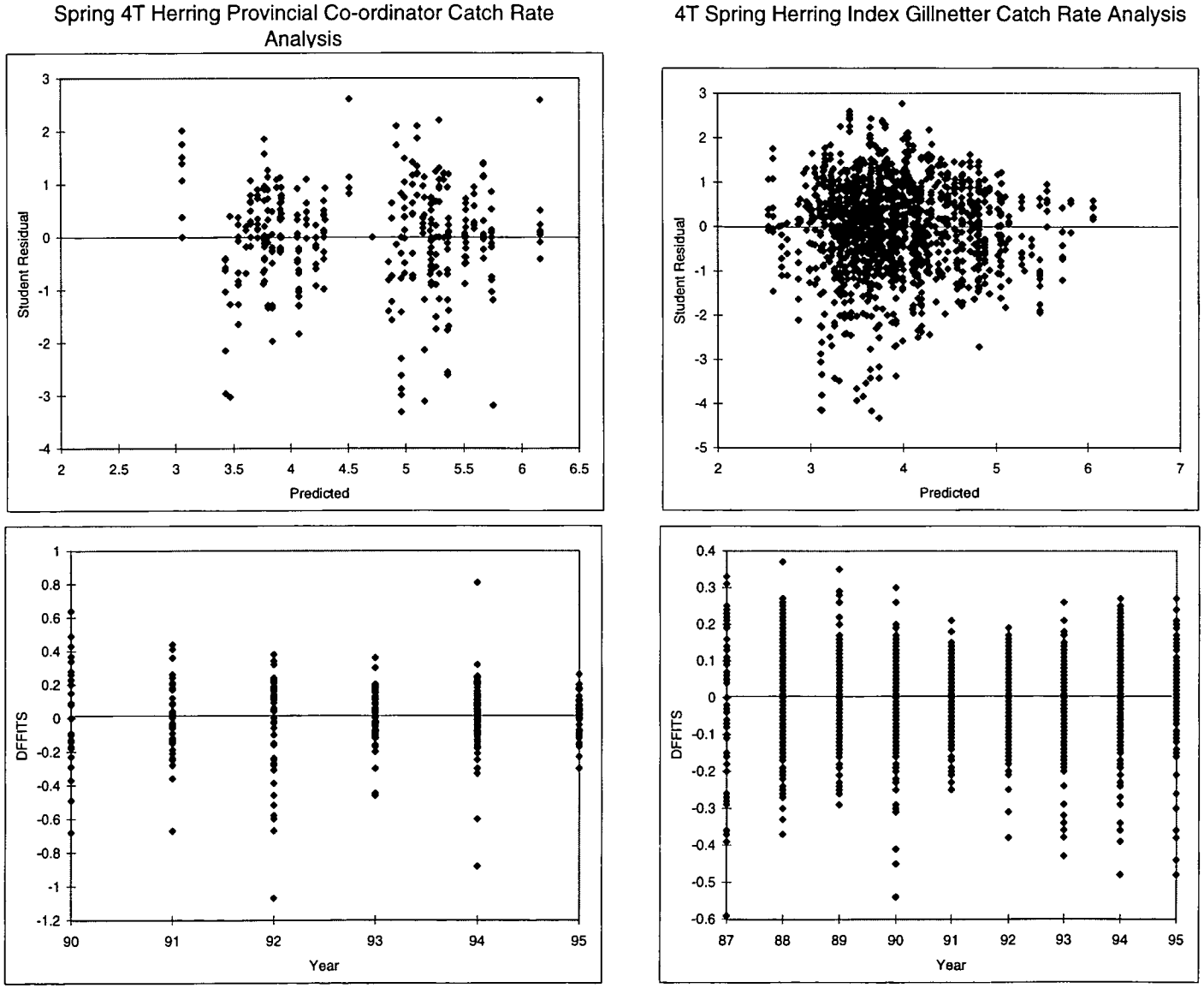


Fig. 44. Residuals and DFITS from multiplicative analysis of spring 4T catch rates using NB Provincial Co-ordinator data and volunteer index gillnetters.

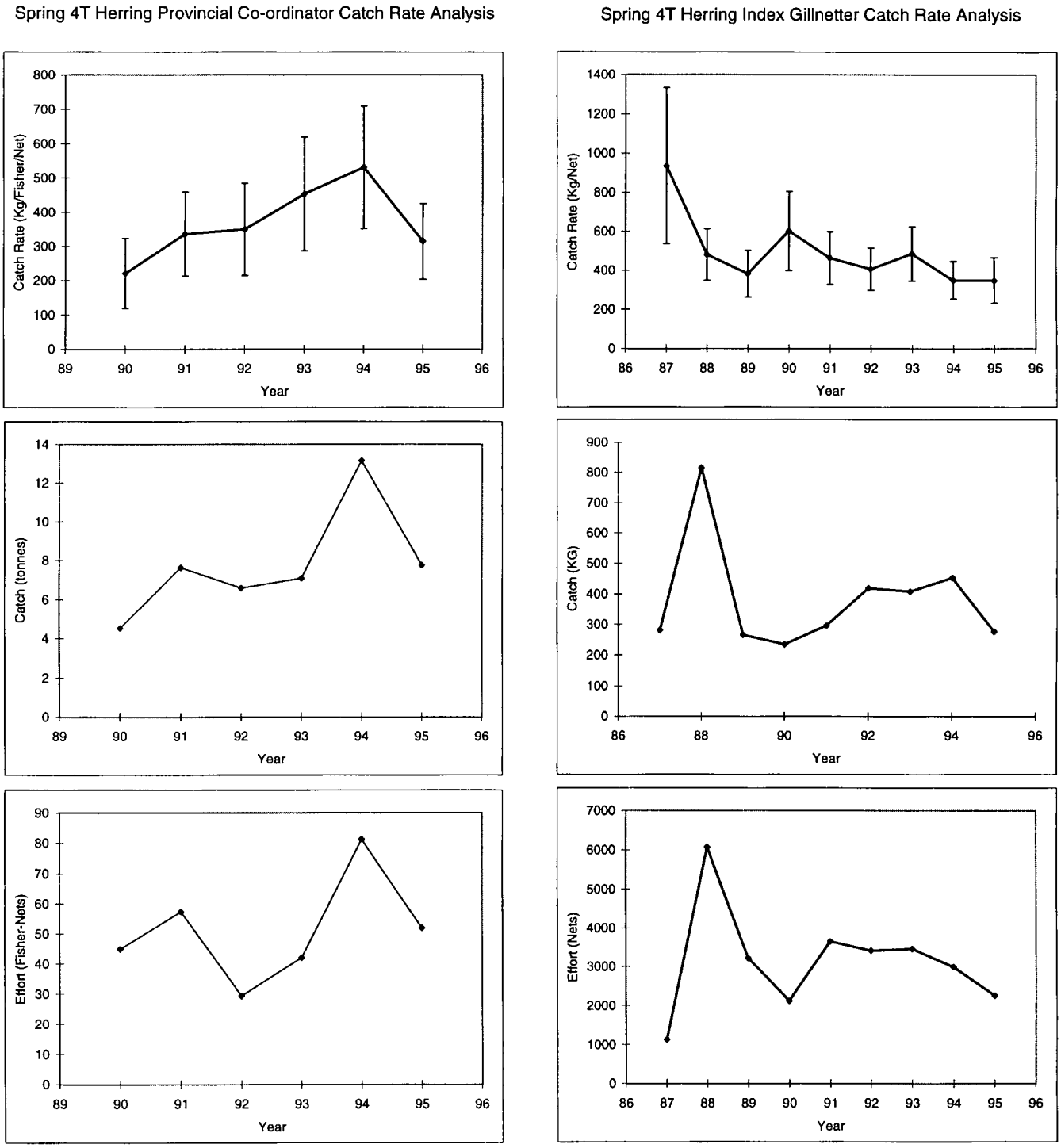


Fig. 45. Catch rates, catch, and effort for spring gillnet fishery from NB Provincial Co-ordinator and Index Gillnetter data.

Abundance Indices Index Gillnetter and Provincial Co-ordinator
Spring 4T Herring

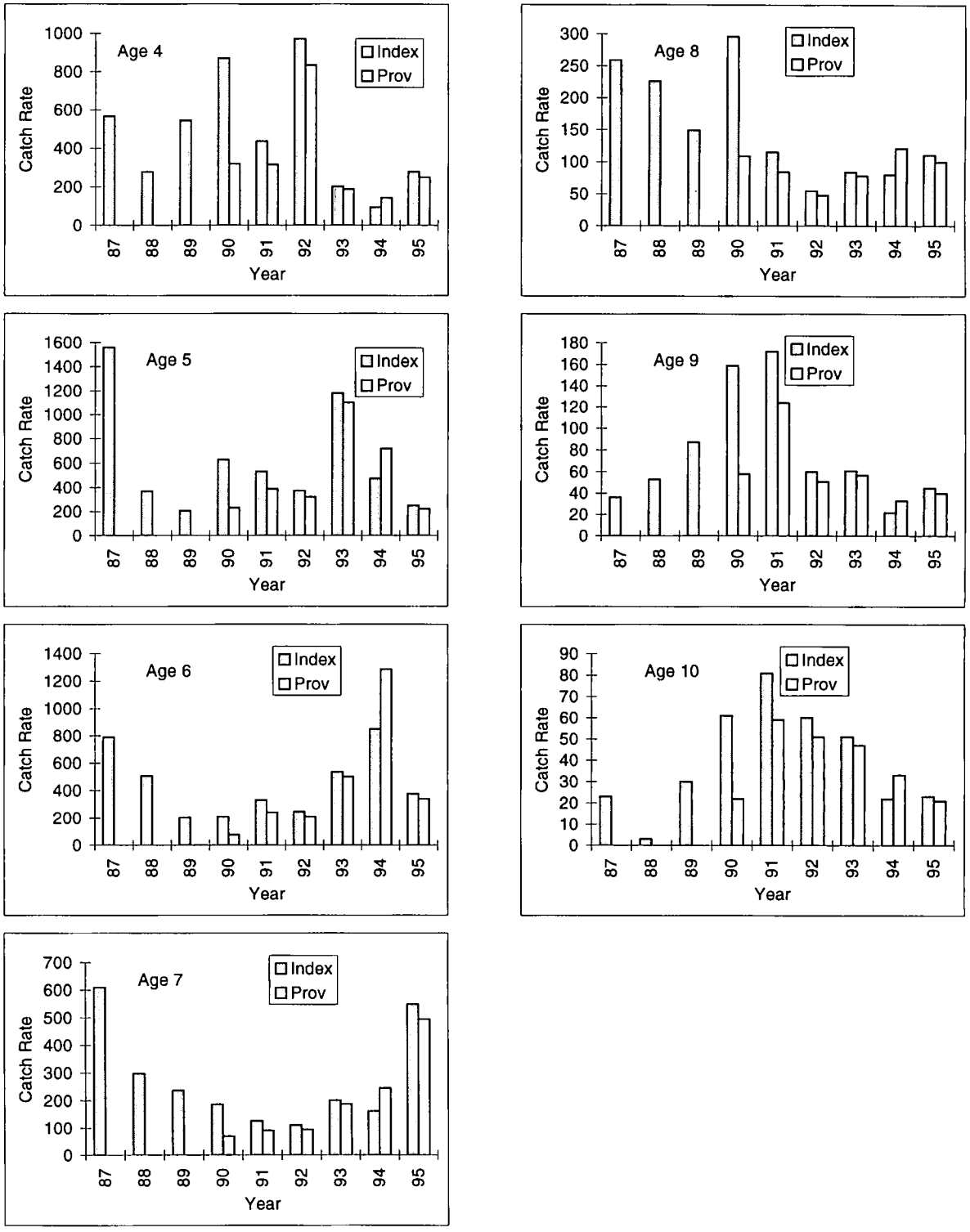


Fig. 46. Age abundance indices for spring 4T herring spawners using NB Provincial Co-ordinator and Index Gillnetter data.

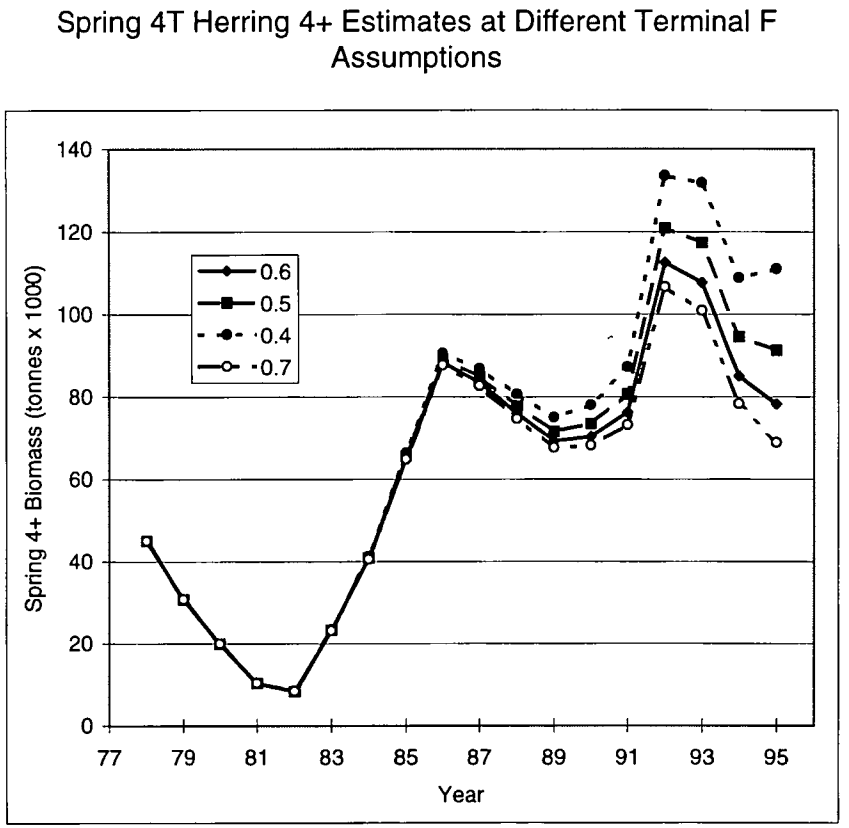


Fig. 47. Spring 4T herring spawners biomass estimates at different terminal F assumptions.

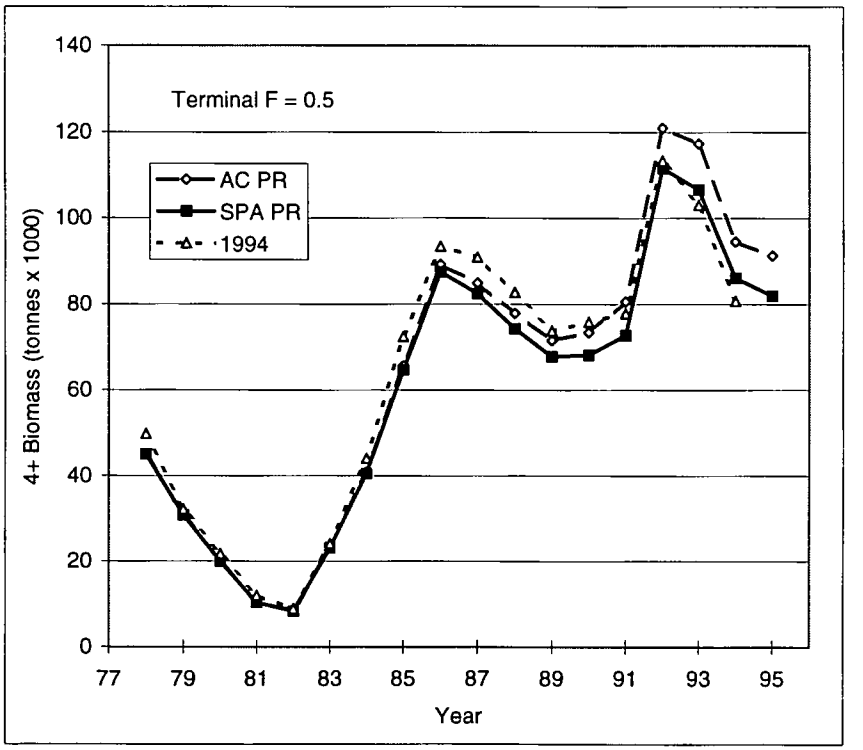
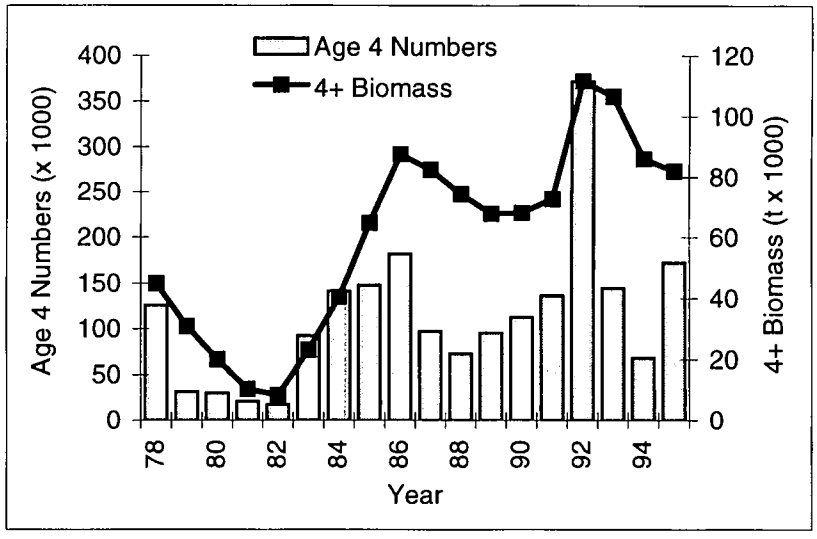


Fig. 48. Comparison of spring 4T herring spawner biomass estimates at different PRs and terminal F = 0.5.

Spring Spawners



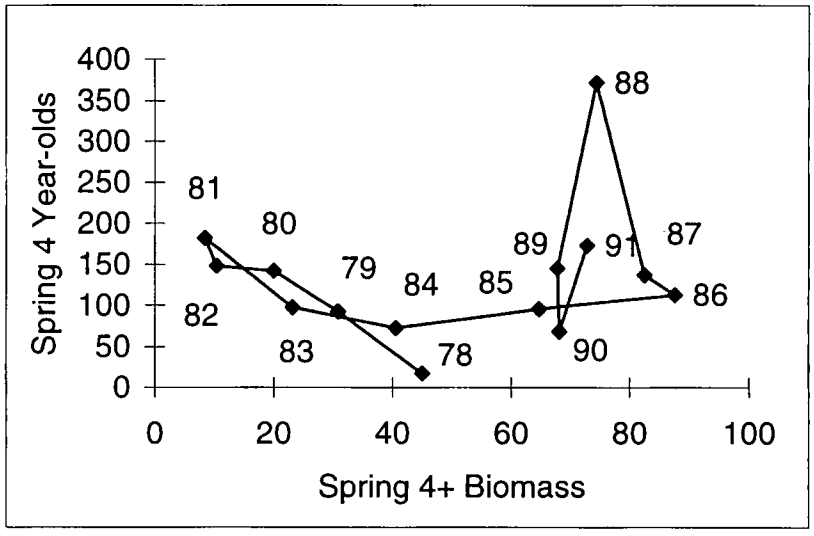


Fig. 49. Spring 4T herring spawners 4+ biomass and recruits.

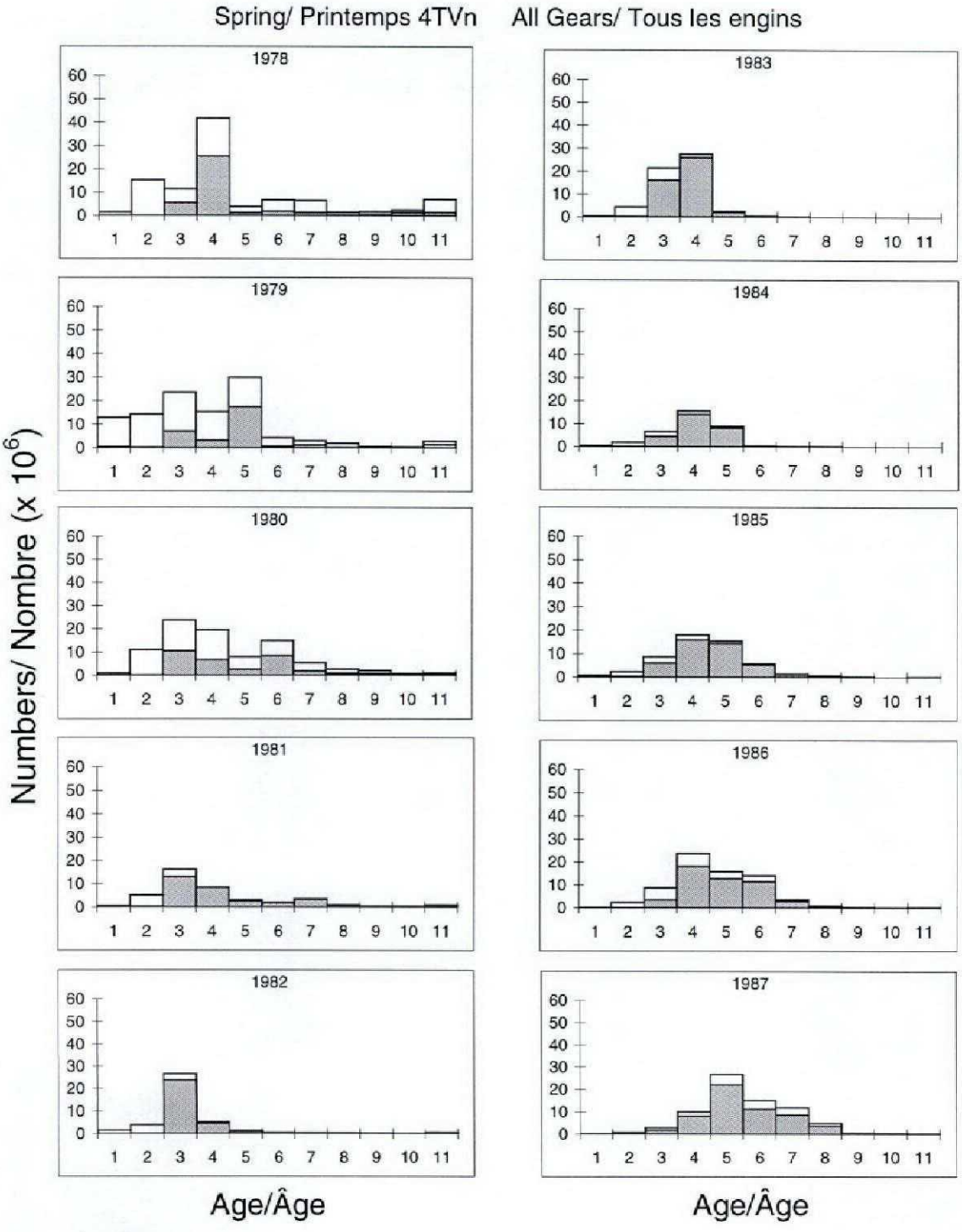


Fig. 50. Fall spawners catch-at-age all gears. Open bars are mobile gear catches, closed bars are fixed gear catches.

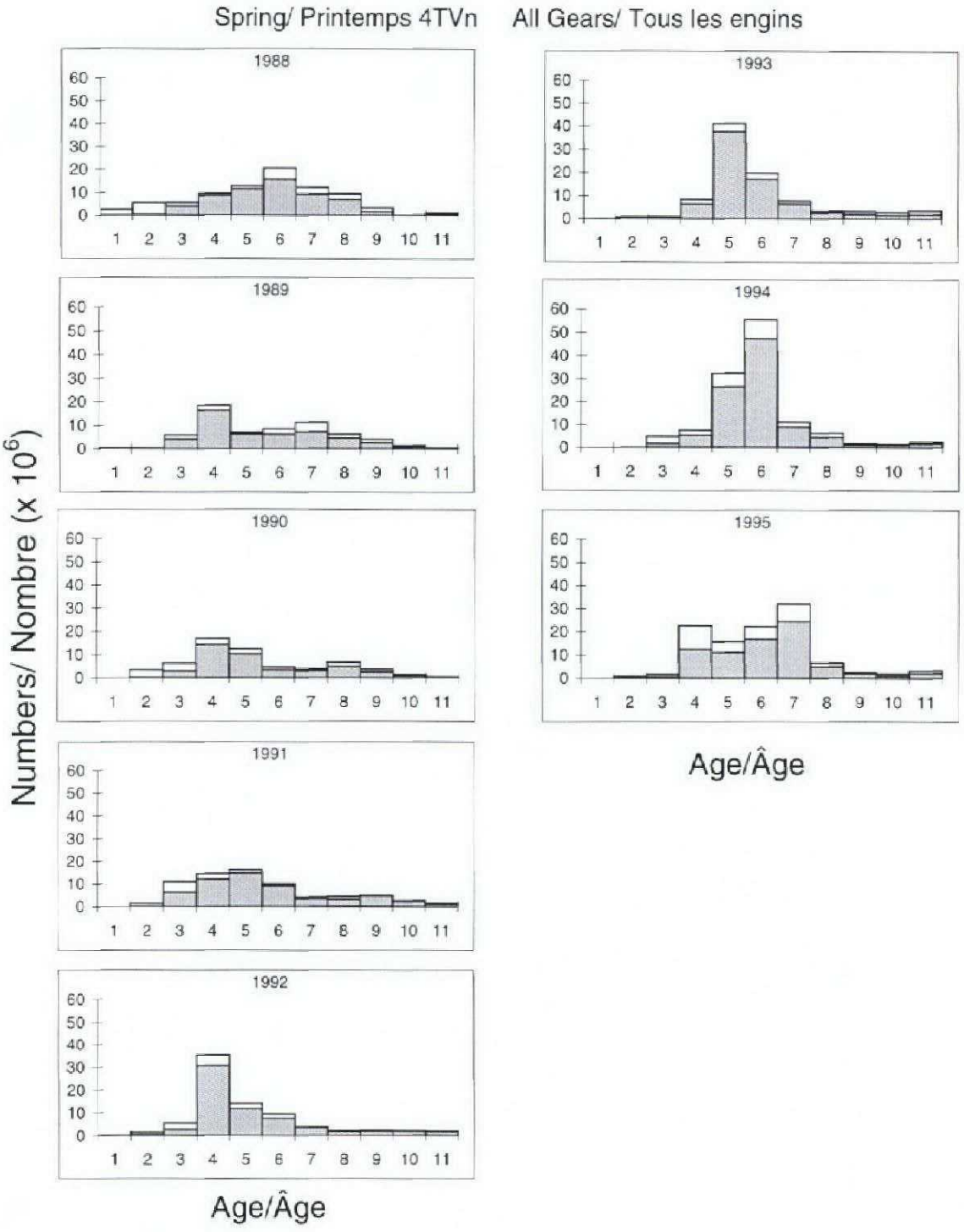


Fig. 50. (continued) Fall spawners catch-at-age all gears. Open bars are mobile gear catches, closed bars are fixed gear catches.

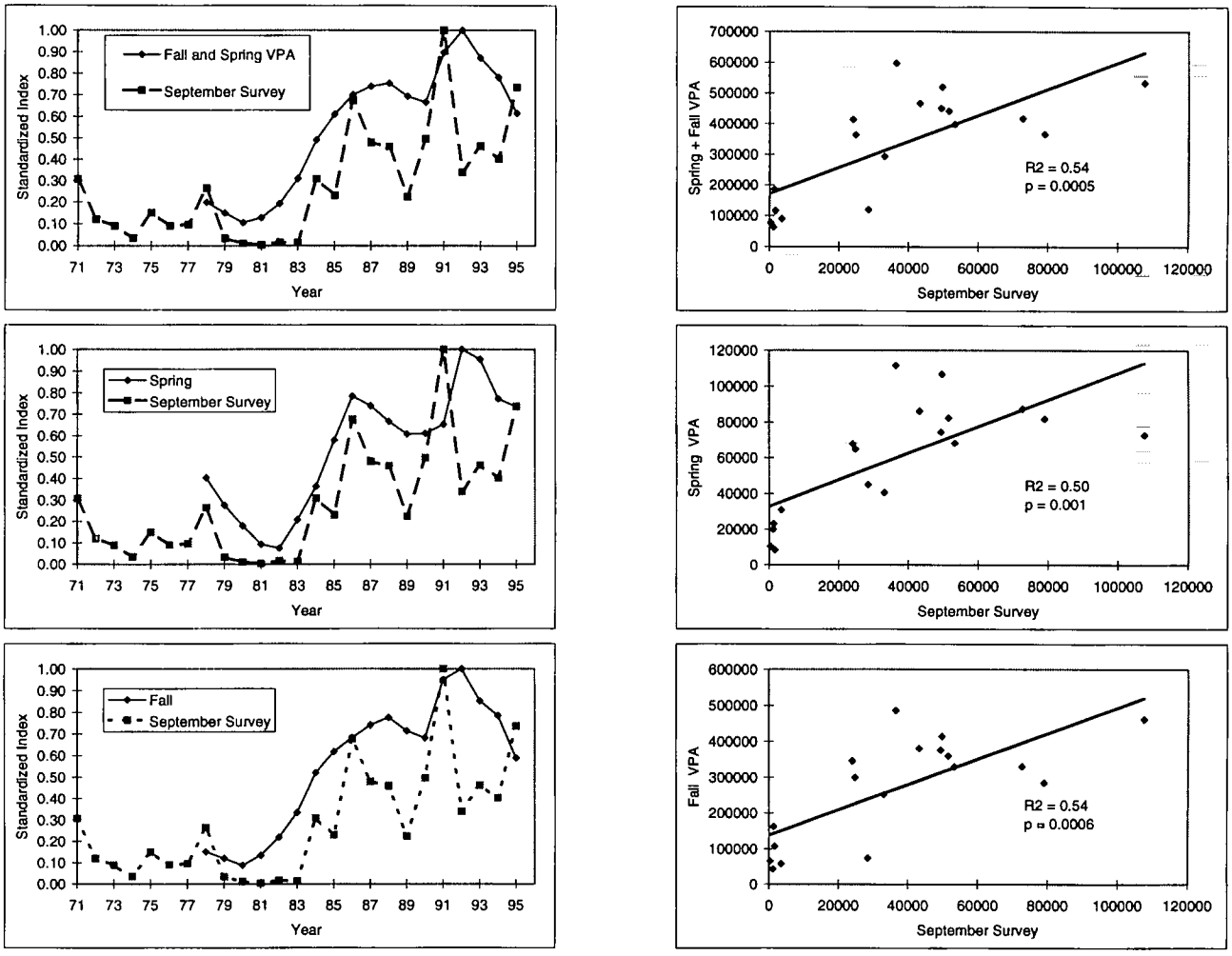


Fig. 51. Comparison of September bottom trawl index for herring with ADAPT-VPAs for spring and fall 4T herring spawners.

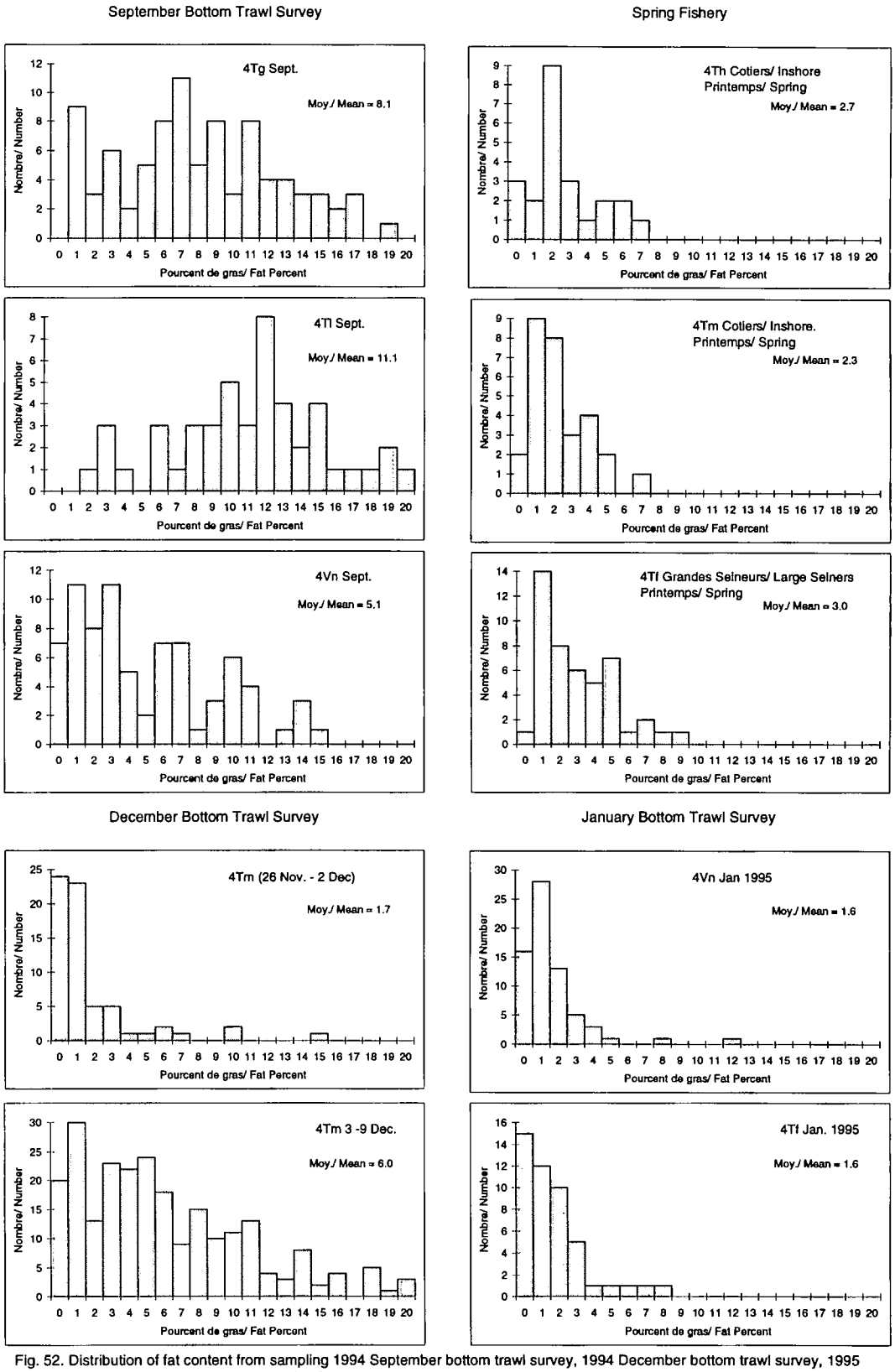


Fig. 52. Distribution of fat content from sampling 1994 September bottom trawl survey, 1994 December bottom trawl survey, 1995 January bottom trawl survey, and 1995 spring fishery.

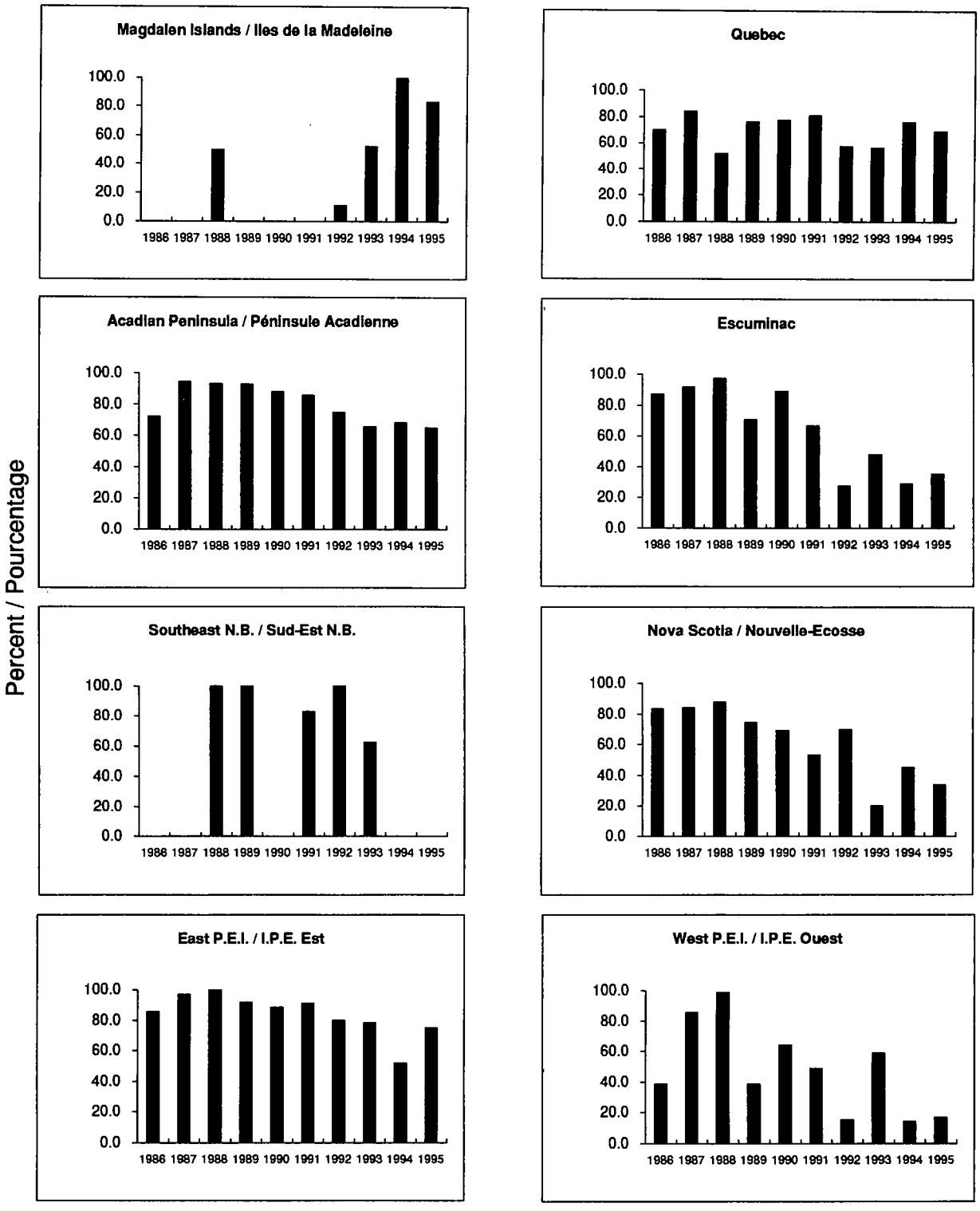


Fig. 53. Percent of nets fished that are 2 5/8" mesh in the 4T fall inshore fishery.

Length Frequencies at Various Mesh Sizes
Fall Fishery - Fisherman's Bank 1990 - 1991

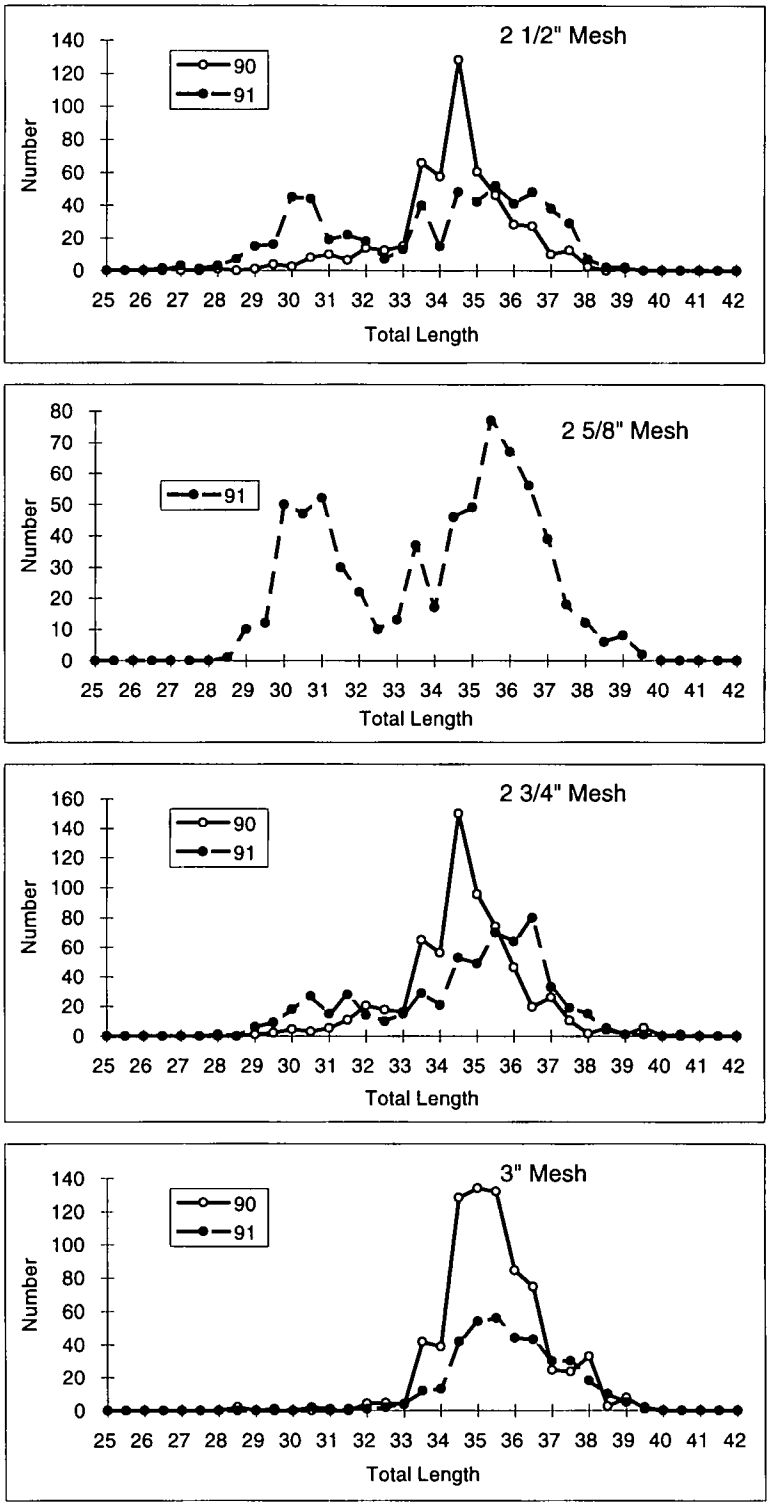


Fig. 54. Length distributions at various mesh sizes in experimental gillnets at Fisherman's Bank, 1990 and 1991.

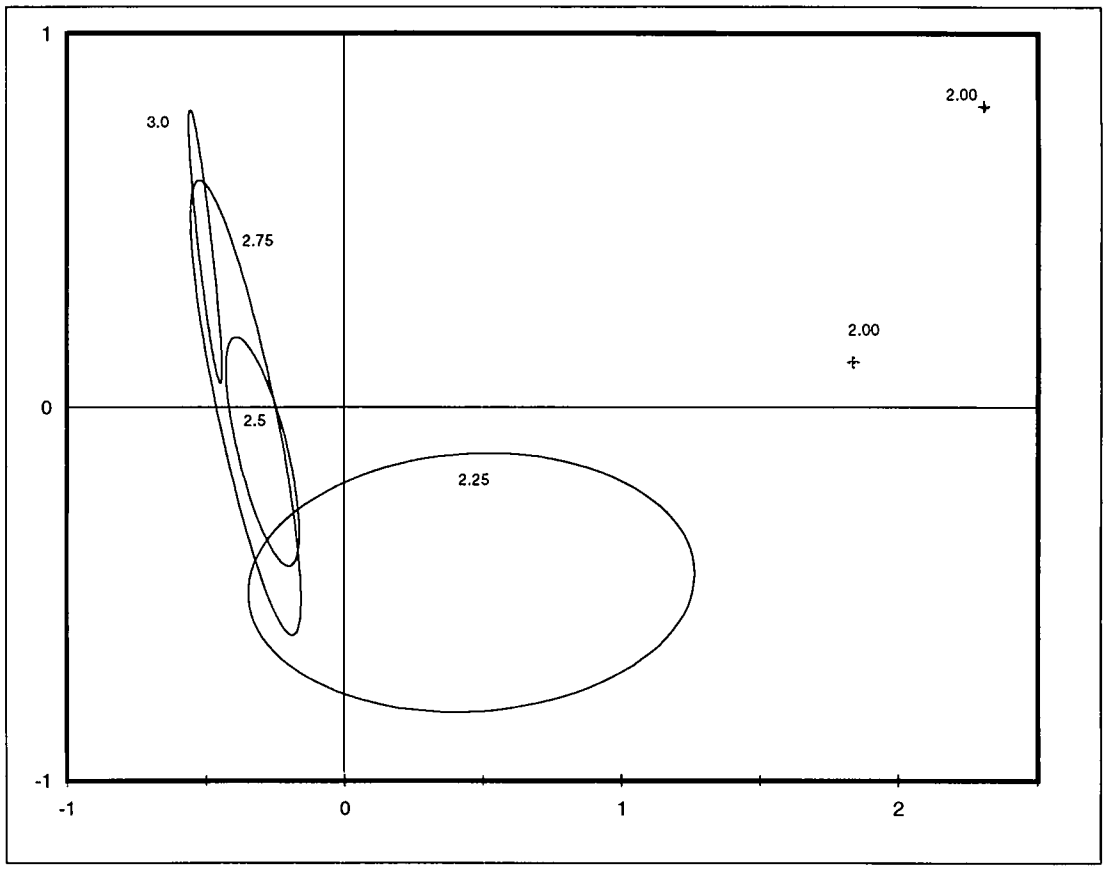


Fig. 55. 95% confidence ellipses for samples by size of mesh from correspondence analysis of length frequency samples collected in the 1990 herring mesh study. (the confidence ellipse for 2 inch mesh is missing because only 2 samples were useable).

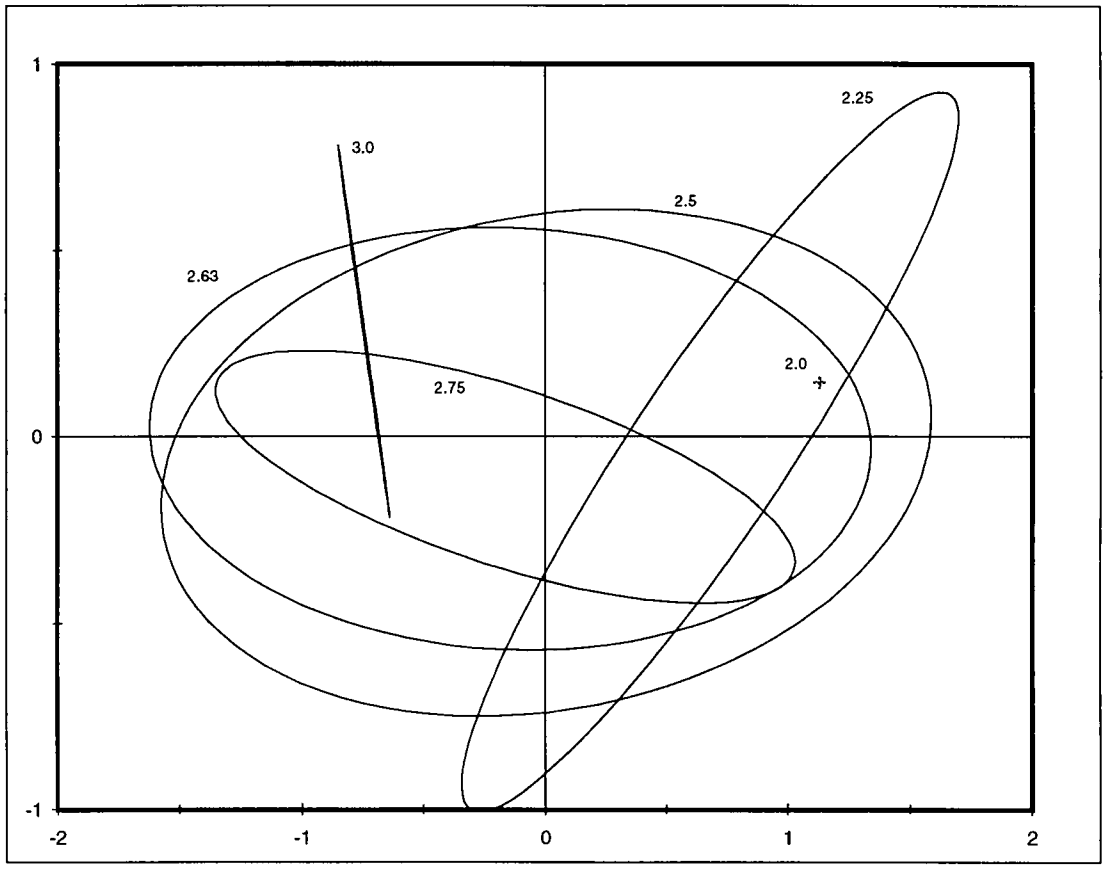


Fig. 56. 95% confidence ellipses for samples by size of mesh from correspondence analysis of length frequency samples collected in the 1991 herring mesh study. (the confidence ellipse for 2 inch mesh is missing because only 1 sample was useable).

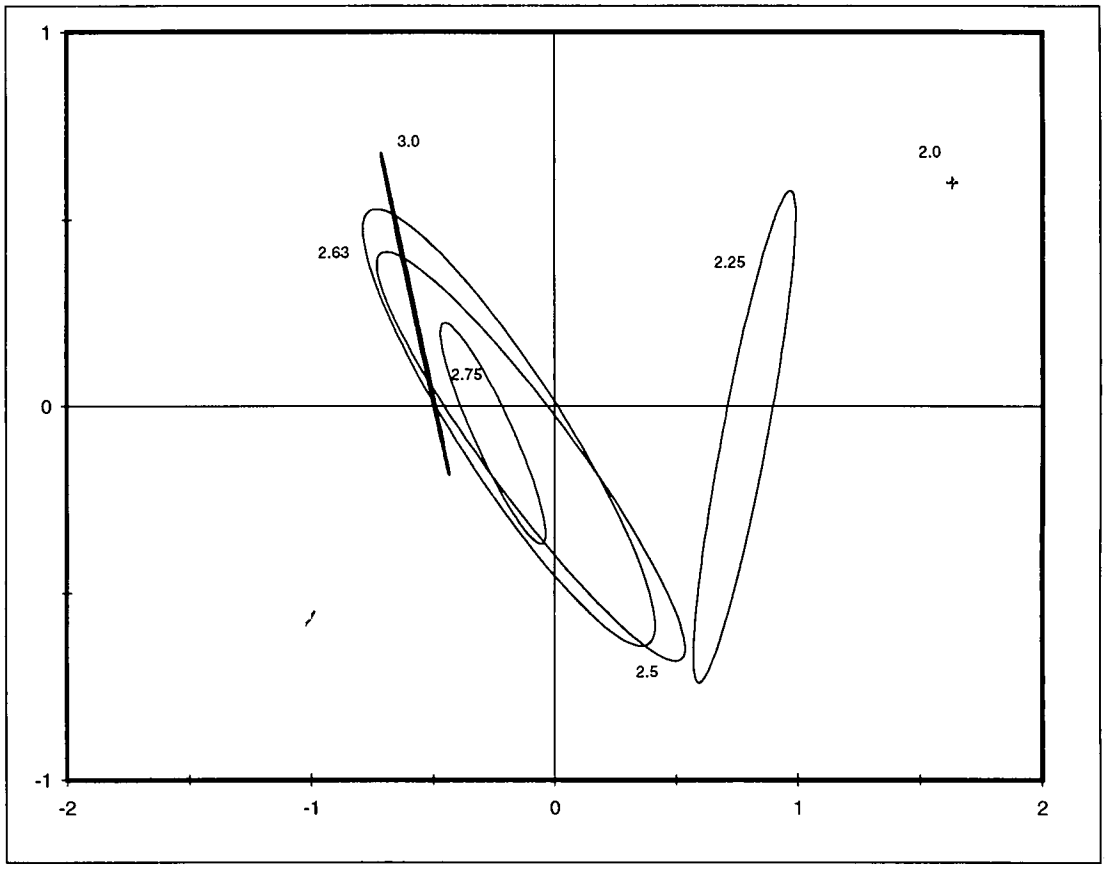


Fig. 57. 95% confidence ellipses for samples by size of mesh from correspondence analysis of length frequency samples collected in the 1991 herring mesh study (without the sample from Aug. 17). The confidence ellipse for 2 inch mesh is missing because only 1 sample was useable.

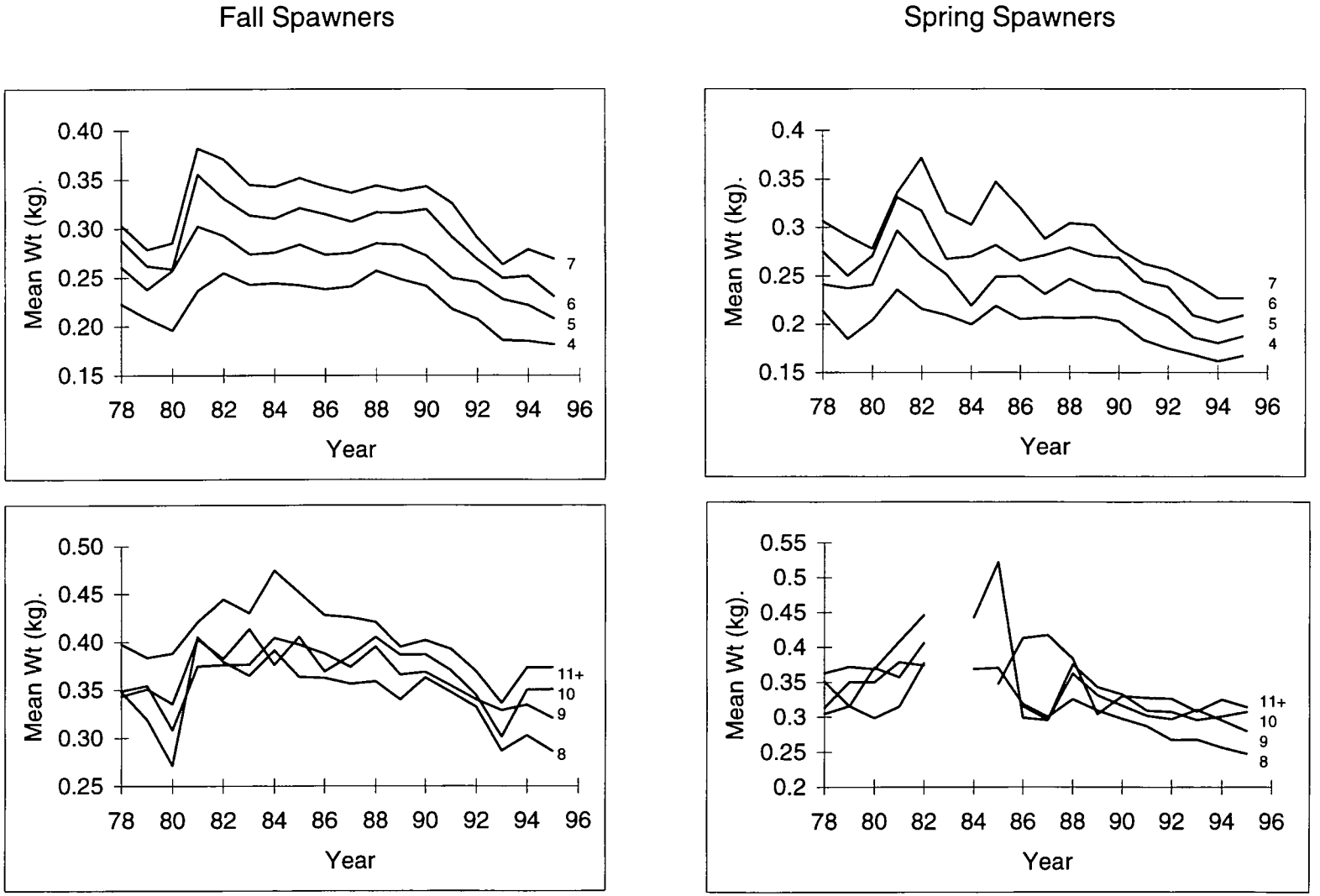


Fig. 58. Mean weights by age for fall and spring 4T herring spawners.

Table A. Catch-at-age for 4T herring fall spawners, including those caught by purse seines in 4Vn, 1978-1995. Numbers are in thousands of fish.

Tableau A. Prises selon l'âge pour les géniteurs d'automne dans 4T, y compris ceux capturés à la senne coulissante dans 4Vn, 1978-1995. En milliers de poissons.

FIXED GEAR - FALL SPAWNERS 4TVn
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	904	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	82	8	64	322	0	0	0	0	253	15	0	0	19	0	52	0	0	0
3	3592	474	7965	5753	2154	720	963	1117	1627	8010	1165	280	3706	158	325	78	0	53
4	5548	9986	5224	24124	14985	20231	24882	8816	32871	38205	20432	13451	22572	39459	12879	2440	9158	3483
5	3484	5132	6097	6313	16883	9570	13445	24441	16497	30249	41943	21013	19815	10235	54288	29704	12264	38155
6	816	2924	994	2477	4922	13180	8308	14860	34428	20712	20253	28252	28214	7309	12201	36482	48412	14500
7	745	865	1733	1027	2523	2168	5978	9498	19251	36337	13240	13385	54225	10784	7345	6034	69790	47315
8	3911	1065	373	597	1050	1632	1335	4495	8212	15518	14266	6804	17002	13296	8943	3168	12224	42105
9	117	879	232	258	371	486	456	1212	4666	9382	6953	8600	9163	4840	9347	3661	9658	7986
10	157	278	304	239	117	124	200	727	341	4563	2738	3165	9958	2409	4554	1949	9640	5643
11+	1903	545	96	102	62	160	91	159	692	1878	1623	2468	5404	4538	6705	2785	14115	14055
	20355	23060	23082	41212	43067	48271	55656	65325	118838	164869	122613	97418	170079	93028	116639	86301	185262	173295

MOBILE GEAR - FALL SPAWNERS 4TVn
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	240	140	0	0	0	0	0	5	20	77	0	0	0	0	0	0	0
2	1464	8555	2970	455	2088	1479	1031	1080	761	863	4283	752	43	0	61	47	15	14
3	22001	15905	39638	5059	8169	7995	3883	4024	3507	2526	3483	1399	4123	6448	565	2066	310	2977
4	29044	21322	17650	11260	5597	8339	6727	8223	7400	5754	4028	4592	5475	22717	5682	2810	9164	4524
5	24187	16923	12979	1315	3891	4192	5704	8085	8729	4032	6081	6959	7433	6142	15818	6033	3398	26780
6	4902	16786	7906	699	681	1629	2387	5824	8079	9035	5667	7497	3402	1939	4258	10570	7957	8576
7	4947	4734	8118	317	268	400	941	2540	8102	8593	9403	4483	5003	1947	2909	3667	11043	9877
8	10893	3702	6168	297	135	95	163	1826	3828	6883	8227	7390	2404	1964	1753	2738	2485	10657
9	1898	5277	4233	503	149	108	91	731	1352	2326	4500	4737	4434	1788	1724	2002	1433	1924
10	1017	1249	2259	116	38	30	14	449	510	364	1417	2407	3534	995	1708	3571	1389	1415
11+	11937	10464	1389	64	178	57	20	420	217	82	2441	1658	3330	2235	5417	5739	2951	2335
	112290	105157	103450	20085	21194	24324	20961	33202	42490	40478	49607	41874	39181	46175	39895	39243	40145	69077

ALL GEARS - FALL SPAWNERS 4TVn
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	1144	143	0	0	0	0	0	5	20	77	0	0	0	0	0	0	0
2	1546	8563	3085	777	2088	1478	1031	1080	1014	879	4283	720	63	0	113	48	15	14
3	25594	16379	48009	10813	10324	8715	4847	5141	5134	10536	4649	1642	7830	6605	890	2145	309	3030
4	34592	31309	23000	35384	20582	28585	31610	17039	40271	43959	24460	17904	28047	62176	18561	5251	18322	8006
5	27672	22055	19127	7629	20775	13764	19149	32527	25225	34280	48025	27716	27248	16378	70106	35736	15662	64935
6	5718	19709	8926	3175	5603	14811	10693	20685	42507	29747	25921	35527	31616	9248	16459	47052	56369	23076
7	5692	5598	9984	1344	2792	2568	6919	12037	27353	44930	22644	17691	59229	12730	10254	9698	80833	57192
8	14803	4766	6656	894	1186	1727	1498	6321	12040	22400	22494	13899	19406	15260	10696	5906	14710	52762
9	2015	6156	4524	762	520	594	547	1943	6017	11708	11454	13148	13597	6627	11071	5663	11091	9910
10	1174	1527	2595	355	155	154	214	1175	852	4926	4155	5471	13492	3404	6262	5519	11029	7058
11+	13840	10409	1499	167	241	217	111	579	909	1960	4063	4066	8734	6773	12122	8524	17067	16390
	132648	127615	127548	61300	64266	72613	76619	98527	161327	205345	172225	137784	209261	139202	156534	125542	225408	242372

Table B. Weights-at-age (kg) for 4T herring fall spawners, including those caught by purse seines in 4Vn, 1978-1995.

Tableau B. Poids selon l'âge (kg) pour les géniteurs d'automne dans 4T, y compris ceux capturés à l'aide de sennes coulissantes dans 4Vn, 1978-1995.

FIXED GEAR - FALL SPAWNERS 4TVn
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0231	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0.0787	0.1066	0.2115	0.1288	0	0	0	0	0.1793	0.1328	0	0	0.2675	0	0.0658	0	0	0
3	0.1344	0.2015	0.2068	0.2048	0.222	0.1908	0.2362	0.2573	0.1958	0.2347	0.2309	0.226	0.2102	0.1959	0.1421	0.1596	0	0.1247
4	0.2371	0.2554	0.2577	0.2468	0.266	0.2519	0.2484	0.2541	0.2485	0.247	0.2645	0.2602	0.2499	0.2339	0.2202	0.2127	0.2085	0.2023
5	0.2822	0.2934	0.3118	0.3101	0.3006	0.2853	0.2863	0.2917	0.2896	0.2789	0.2902	0.2955	0.2855	0.2675	0.2551	0.2349	0.2339	0.2296
6	0.3074	0.3201	0.3587	0.3679	0.337	0.3169	0.3219	0.3352	0.3248	0.3164	0.3252	0.3255	0.3248	0.3025	0.2818	0.2599	0.2583	0.25
7	0.3191	0.3553	0.349	0.395	0.3739	0.3493	0.348	0.3611	0.3672	0.3434	0.3538	0.3532	0.3478	0.336	0.3054	0.2822	0.2867	0.2799
8	0.3687	0.3982	0.3672	0.42	0.3825	0.3652	0.3974	0.3742	0.3848	0.3673	0.3794	0.3731	0.3684	0.3545	0.3423	0.33	0.315	0.2988
9	0.3711	0.4171	0.402	0.4585	0.3927	0.3724	0.4128	0.4102	0.4013	0.3818	0.4073	0.3847	0.3878	0.3732	0.3491	0.352	0.3426	0.3335
10	0.3479	0.4274	0.4354	0.4717	0.37	0.4495	0.3794	0.4055	0.4315	0.3855	0.4095	0.4062	0.4038	0.3917	0.364	0.3497	0.3589	0.3634
11+	0.4324	0.4366	0.431	0.5211	0.4674	0.4295	0.4896	0.4969	0.4337	0.4257	0.4381	0.4065	0.4319	0.4114	0.3987	0.3826	0.3837	0.3798
	0.277	0.2847	0.2718	0.2665	0.2963	0.2859	0.2848	0.3157	0.3117	0.3071	0.3196	0.3268	0.3309	0.292	0.2835	0.2639	0.2878	0.2826

MOBILE GEAR - FALL SPAWNERS 4TVn
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0692	0.0308	0	0	0	0	0	0.0378	0.0389	0.069	0	0	0	0	0	0	0.0000
2	0.1023	0.1107	0.1089	0.0861	0.1154	0.1381	0.1253	0.1116	0.0925	0.0787	0.0959	0.1054	0.1081	0	0.0661	0.0522	0.0912	0.0854
3	0.1501	0.1554	0.1426	0.1801	0.1802	0.1831	0.196	0.1948	0.1509	0.1658	0.1636	0.1608	0.1765	0.1509	0.1279	0.1413	0.1372	0.1202
4	0.2202	0.1865	0.1777	0.2155	0.2248	0.2211	0.2299	0.2299	0.193	0.2021	0.2205	0.2134	0.2062	0.1898	0.1738	0.1631	0.1624	0.1659
5	0.2574	0.2209	0.2317	0.2662	0.2594	0.2483	0.2508	0.2607	0.2428	0.2483	0.2489	0.2469	0.2375	0.2199	0.2112	0.1949	0.1793	0.1778
6	0.2848	0.2517	0.2459	0.3106	0.2883	0.2888	0.2704	0.2854	0.2728	0.2862	0.2862	0.2803	0.2811	0.2503	0.2307	0.2149	0.2131	0.1992
7	0.3009	0.2648	0.2723	0.341	0.3454	0.3214	0.3097	0.3169	0.2868	0.3082	0.3304	0.2942	0.2959	0.2715	0.2537	0.2327	0.2295	0.2194
8	0.3408	0.2965	0.2658	0.3758	0.3568	0.3637	0.3406	0.3375	0.315	0.3317	0.3236	0.3083	0.3244	0.3015	0.2803	0.2366	0.2416	0.2368
9	0.3476	0.344	0.3038	0.3325	0.3356	0.3954	0.3631	0.3761	0.3419	0.3425	0.3764	0.3307	0.329	0.3041	0.2905	0.287	0.28	0.2687
10	0.343	0.3343	0.3231	0.262	0.4223	0.2639	0.3278	0.4055	0.3276	0.3887	0.3975	0.3597	0.3401	0.3188	0.2928	0.275	0.2889	0.2990
11+	0.3919	0.3823	0.3857	0.2624	0.4364	0.4322	0.4086	0.4348	0.411	0.4306	0.4095	0.3774	0.3529	0.3543	0.3326	0.3139	0.3223	0.3350
	0.2525	0.2278	0.1979	0.218	0.2105	0.2163	0.2341	0.2598	0.2495	0.2753	0.2829	0.2808	0.2726	0.2143	0.2361	0.2308	0.2173	0.2026

ALL GEARS - FALL SPAWNERS 4TVn
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0328	0.0308	0	0	0	0	0	0.0378	0.0389	0.069	0	0	0	0	0	0	0.0000
2	0.1011	0.1107	0.111	0.1038	0.1154	0.1381	0.1253	0.1116	0.1142	0.0797	0.0959	0.1054	0.1576	0	0.0661	0.0522	0.0912	0.0854
3	0.1479	0.1567	0.1536	0.1932	0.1889	0.1837	0.204	0.2083	0.1651	0.2182	0.1805	0.1719	0.1925	0.152	0.1385	0.1419	0.1373	0.1202
4	0.2229	0.2084	0.1962	0.2369	0.2548	0.2429	0.2445	0.2424	0.2383	0.2411	0.2572	0.2484	0.2414	0.2178	0.2077	0.1862	0.1854	0.1817
5	0.2605	0.2378	0.2574	0.3024	0.293	0.274	0.2758	0.2839	0.2734	0.2753	0.285	0.2837	0.2724	0.2496	0.2455	0.2281	0.2221	0.2083
6	0.288	0.2619	0.2586	0.3553	0.3311	0.3138	0.3104	0.3212	0.3149	0.3072	0.3167	0.3162	0.3201	0.2916	0.2689	0.2498	0.2519	0.2311
7	0.3033	0.2787	0.2855	0.3823	0.3711	0.3449	0.3428	0.3518	0.3433	0.3367	0.3441	0.3388	0.3434	0.3261	0.2908	0.2635	0.2789	0.2694
8	0.3482	0.3192	0.2712	0.4052	0.3796	0.3651	0.3912	0.3636	0.3626	0.3564	0.359	0.3399	0.3629	0.3477	0.3321	0.2867	0.3026	0.2863
9	0.349	0.3544	0.3082	0.375	0.3763	0.3766	0.4045	0.3974	0.388	0.374	0.3952	0.3659	0.3686	0.3546	0.34	0.329	0.3345	0.3209
10	0.3436	0.3512	0.3356	0.4032	0.3827	0.4137	0.3762	0.4055	0.3693	0.3858	0.4053	0.3865	0.3871	0.3704	0.3446	0.3014	0.3501	0.3505
11+	0.3976	0.3839	0.3882	0.4208	0.4444	0.4302	0.4747	0.4518	0.4282	0.4259	0.4209	0.3949	0.4018	0.3926	0.3692	0.3364	0.3731	0.3734
	0.2563	0.2373	0.2114	0.2506	0.268	0.2625	0.2709	0.2968	0.2953	0.3008	0.3091	0.3132	0.32	0.2662	0.2724	0.2536	0.2753	0.2598

Table C. Catch-at-age for 4T herring fall spawners by gear type, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (

Tableau C. Prises selon l'âge pour les géniteurs d'automne dans 4T par type d'engin, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otol

FIXED GEAR - FALL SPAWNERS 4T
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	904	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	82	8	64	322	0	0	0	0	253	15	0	0	19	0	52	0	0	0
3	3592	474	7965	5753	2154	720	963	1117	1627	8010	1165	280	3706	158	325	78	0	53
4	5548	9986	5224	24124	14985	20231	24882	8816	32871	38205	20432	13451	22572	39459	12879	2440	9158	3483
5	3484	5132	6097	6313	16883	9570	13445	24441	16497	30249	41943	21013	19815	10235	54288	29704	12264	38155
6	816	2924	994	2477	4922	13180	8306	14860	34428	20712	20253	28252	28214	7309	12201	36482	48412	14500
7	745	865	1733	1027	2523	2168	5978	9498	19251	36337	13240	13385	54225	10784	7345	6034	69790	47315
8	3911	1065	373	597	1050	1632	1335	4495	8212	15518	14266	6804	17002	13296	8943	3168	12224	42105
9	117	879	232	258	371	486	456	1212	4666	9382	6953	8600	9163	4840	9347	3661	9658	7986
10	157	278	304	239	117	124	200	727	341	4563	2738	3165	9958	2409	4554	1949	9640	5643
11+	1903	545	96	102	62	160	91	159	692	1878	1623	2468	5404	4538	6705	2785	14115	14055
	20355	23060	23082	41212	43067	48271	55656	65325	118838	164869	122613	97418	170079	93028	116639	86301	185262	173295

MOBILE GEAR - FALL SPAWNERS 4T
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	240	140	0	0	0	0	0	0	0	65	0	0	0	0	0	0	0
2	1422	2728	2342	78	200	127	34	253	157	47	3842	726	43	0	61	22	0	0
3	21438	13283	36773	4518	5022	3343	332	2037	974	913	2650	840	3426	4343	545	1907	30	2841
4	27443	20666	15048	4460	2494	4688	2456	4303	2238	1616	2925	3184	3211	17311	4586	2354	7200	3973
5	23095	16756	12091	622	2463	2078	2914	5103	6335	2619	2753	5829	5909	3595	12545	4219	2676	22406
6	4060	16686	7251	108	322	1045	1612	4897	6704	8300	3273	5054	2989	1189	2831	6213	5531	7310
7	4319	4410	7455	317	110	182	564	1950	6332	7553	8828	4023	2287	1091	1435	1980	7850	6033
8	10527	3702	5532	91	95	45	97	1760	2861	6263	7493	6706	1762	698	763	1265	1501	7363
9	1449	5277	3328	267	102	25	33	601	1107	2161	4154	4308	3577	479	345	408	738	957
10	737	1249	1621	116	38	30	14	449	435	289	1234	2284	1848	456	725	2007	560	506
11+	11781	10464	896	64	121	19	1	372	210	60	2362	1366	297	536	1100	3152	1262	603
	106271	95461	92477	10641	10967	11582	8057	21725	27353	29821	39579	34320	25349	29698	24936	23527	27348	51991

ALL GEARS - FALL SPAWNERS 4T
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	1144	140	0	0	0	0	0	0	0	65	0	0	0	0	0	0	0
2	1504	2736	2406	400	200	127	34	253	410	62	3842	726	62	0	113	22	0	0
3	25030	13757	44738	10271	7176	4063	1295	3154	2601	8923	3815	1120	7132	4501	870	1985	30	2592
4	32991	30652	20272	28584	17479	24919	27338	13119	35109	39821	23357	16635	25783	56770	17465	4794	16358	7359
5	26579	21888	18188	6935	19346	11648	16359	29544	22832	32868	44696	26842	25724	13830	66833	33923	14940	60020
6	4876	19610	8245	2585	5244	14225	9918	19757	41132	29012	23526	33306	31203	8498	15032	42695	53943	20582
7	5064	5275	9188	1344	2633	2350	6542	11448	25583	43890	22068	17408	56512	11875	8780	8014	77640	52957
8	14438	4767	5905	688	1145	1677	1432	6255	11073	21781	21759	13510	18764	13994	9706	4433	13725	48960
9	1566	6156	3560	525	473	511	489	1813	5773	11543	11107	12908	12740	5319	9692	4069	10396	8926
10	894	1527	1925	355	155	154	214	1176	776	4852	3972	5449	11806	2865	5279	3956	10200	6169
11+	13684	11009	992	166	183	179	92	531	902	1938	3985	3834	5701	5074	7805	5937	15377	15063
	126626	118521	115559	51853	54034	59853	63713	87050	146191	194690	162192	131738	195427	122726	141575	109828	212609	222628

Table D. Weights-at-age (kg) for 4T herring fall spawners by gear type, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQu

Tableau D. Poids selon l'âge (kg) pour les géniteurs d'automne dans 4T par type d'engin, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des

FIXED GEAR - FALL SPAWNERS 4T
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0231	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0.0787	0.1066	0.2115	0.1288	0	0	0	0	0.1793	0.1328	0	0	0.2675	0	0.0658	0	0	0
3	0.1344	0.2015	0.2068	0.2048	0.222	0.1908	0.2362	0.2573	0.1958	0.2347	0.2309	0.226	0.2102	0.1959	0.1421	0.1596	0	0.1247
4	0.2371	0.2554	0.2577	0.2468	0.266	0.2519	0.2484	0.2541	0.2485	0.247	0.2645	0.2602	0.2499	0.2339	0.2202	0.2127	0.2085	0.2023
5	0.2822	0.2934	0.3118	0.3101	0.3006	0.2853	0.2863	0.2917	0.2896	0.2789	0.2902	0.2955	0.2855	0.2675	0.2551	0.2349	0.2339	0.2296
6	0.3074	0.3201	0.3587	0.3679	0.337	0.3169	0.3219	0.3352	0.3248	0.3164	0.3252	0.3255	0.3248	0.3025	0.2818	0.2599	0.2583	0.25
7	0.3191	0.3553	0.349	0.395	0.3739	0.3493	0.348	0.3611	0.3672	0.3434	0.3538	0.3532	0.3478	0.336	0.3054	0.2822	0.2867	0.2799
8	0.3687	0.3982	0.3672	0.42	0.3825	0.3652	0.3974	0.3742	0.3848	0.3673	0.3794	0.3731	0.3684	0.3545	0.3423	0.33	0.315	0.2988
9	0.3711	0.4171	0.402	0.4585	0.3927	0.3724	0.4128	0.4102	0.4013	0.3818	0.4073	0.3847	0.3878	0.3732	0.3491	0.352	0.3426	0.3335
10	0.3479	0.4274	0.4354	0.4717	0.37	0.4495	0.3794	0.4055	0.4315	0.3855	0.4095	0.4062	0.4038	0.3917	0.364	0.3497	0.3589	0.3634
11+	0.4324	0.4366	0.431	0.5211	0.4674	0.4295	0.4896	0.4969	0.4337	0.4257	0.4381	0.4065	0.4319	0.4114	0.3987	0.3826	0.3837	0.3798
	0.277	0.2847	0.2718	0.2665	0.2963	0.2859	0.2848	0.3157	0.3117	0.3071	0.3196	0.3268	0.3309	0.292	0.2835	0.2639	0.2878	0.2827

MOBILE GEAR - FALL SPAWNERS 4T
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0692	0.0308	0	0	0	0	0	0	0	0.0753	0	0	0	0	0	0	0.0000
2	0.0996	0.1191	0.1032	0.1144	0.096	0.1079	0.1109	0.1023	0.1065	0.1422	0.0959	0.1049	0.1081	0	0.0661	0.0797	0	0.0000
3	0.1492	0.1514	0.1409	0.1789	0.1709	0.1734	0.162	0.1886	0.1583	0.2033	0.1651	0.1585	0.1773	0.1541	0.1277	0.1432	0.118	0.1198
4	0.2186	0.1852	0.1682	0.2255	0.2109	0.2077	0.2116	0.2142	0.2143	0.2427	0.225	0.2159	0.2088	0.1893	0.1724	0.165	0.1628	0.1666
5	0.2552	0.2204	0.2264	0.25	0.2607	0.2343	0.2368	0.2556	0.2514	0.2683	0.2603	0.249	0.241	0.2178	0.2119	0.202	0.1791	0.1752
6	0.2749	0.2514	0.2376	0.2872	0.2817	0.285	0.2594	0.2829	0.2767	0.289	0.305	0.2832	0.2834	0.252	0.227	0.2223	0.2136	0.1968
7	0.2929	0.2588	0.264	0.341	0.3748	0.3185	0.3032	0.317	0.2943	0.3148	0.3328	0.2946	0.3	0.2784	0.2607	0.2375	0.2295	0.2189
8	0.3396	0.2965	0.2513	0.2568	0.3549	0.3675	0.3313	0.337	0.3224	0.3352	0.324	0.3082	0.3278	0.3093	0.2861	0.2262	0.2384	0.2313
9	0.3351	0.344	0.2776	0.2607	0.3079	0.3648	0.3701	0.3754	0.345	0.3435	0.38	0.3297	0.3273	0.2955	0.3103	0.3588	0.2779	0.2699
10	0.3217	0.3343	0.2875	0.262	0.4223	0.2639	0.3278	0.4055	0.3288	0.4071	0.4042	0.3609	0.3388	0.3166	0.303	0.269	0.2742	0.3157
11+	0.3914	0.3823	0.3587	0.2624	0.4439	0.4579	0.4236	0.4365	0.4098	0.4446	0.4108	0.3838	0.415	0.3539	0.3448	0.3167	0.32	0.3229
	0.2496	0.2361	0.1891	0.2122	0.2108	0.2117	0.2365	0.2671	0.274	0.3035	0.293	0.2856	0.2658	0.2028	0.2191	0.2269	0.2106	0.1924

ALL GEARS - FALL SPAWNERS 4T
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0328	0.0308	0	0	0	0	0	0	0	0.0753	0	0	0	0	0	0	0.0000
2	0.0985	0.1191	0.1061	0.126	0.096	0.1079	0.1109	0.1023	0.1514	0.1399	0.0959	0.1049	0.1569	0	0.066	0.0797	0	0.0000
3	0.1471	0.1531	0.1526	0.1934	0.1862	0.1765	0.2172	0.2129	0.1818	0.2315	0.1852	0.1754	0.1944	0.1556	0.1331	0.1438	0.118	0.1199
4	0.2217	0.2081	0.1913	0.2435	0.2581	0.2436	0.2451	0.241	0.2463	0.2468	0.2596	0.2517	0.2448	0.2203	0.2076	0.1893	0.1884	0.1833
5	0.2587	0.2375	0.255	0.3047	0.2955	0.2762	0.2775	0.2855	0.279	0.2781	0.2884	0.2854	0.2753	0.2546	0.247	0.2308	0.2241	0.2095
6	0.2803	0.2616	0.2522	0.3645	0.3336	0.3146	0.3117	0.3222	0.317	0.3086	0.3224	0.3191	0.3208	0.2954	0.2715	0.2544	0.2537	0.2322
7	0.2968	0.2746	0.28	0.3823	0.3739	0.3469	0.3441	0.3536	0.3492	0.3385	0.3454	0.3397	0.3459	0.3307	0.2981	0.2712	0.2809	0.2730
8	0.3475	0.3192	0.2586	0.3984	0.3802	0.3653	0.3929	0.3637	0.3687	0.3581	0.3603	0.3409	0.3646	0.3522	0.3379	0.3004	0.3066	0.2888
9	0.3378	0.3544	0.2857	0.3579	0.3744	0.372	0.4099	0.3987	0.3905	0.3746	0.3971	0.3663	0.3708	0.3662	0.3477	0.3527	0.338	0.3267
10	0.3263	0.3512	0.3109	0.4032	0.3828	0.4133	0.376	0.4055	0.3739	0.3868	0.4079	0.3872	0.3936	0.3797	0.3556	0.3088	0.3542	0.3595
11+	0.3971	0.385	0.3657	0.4214	0.4519	0.4325	0.4889	0.4546	0.4281	0.4263	0.4219	0.3984	0.431	0.4053	0.3911	0.3476	0.3785	0.3775
	0.254	0.2456	0.2056	0.2554	0.279	0.2715	0.2787	0.3035	0.3046	0.3065	0.3131	0.316	0.3224	0.2704	0.2722	0.256	0.2779	0.2619

Table E. Catch-at-age for fall-spawning herring caught in NAFO unit areas 4Tm, 4Tn, and 4To, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stage

Tableau E. Prises selon l'âge pour les géniteurs d'automne capturés dans les sous-divisions de l'OPANO 4Tm, 4Tn et 4To, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épulsés (stades 6 et 7),

FIXED GEAR - FALL SPAWNERS 4Tm,n,o
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	51	316	0	0	0	0	0	15	0	0	12	0	0	0	0	0
3	174	206	6356	4154	1773	7514	465	477	612	6652	144	266	2734	129	69	78	0	53
4	3421	3386	2151	12990	6040	11226	7388	3916	10839	25007	13441	11894	14849	28509	6044	2000	6671	2955
5	2392	1368	2004	2735	11775	3995	6306	8758	10233	14716	22754	19054	12627	7159	37239	21146	10589	21690
6	495	1605	3186	608	1643	8854	3264	7914	21638	13854	7813	20563	19767	5343	11045	24660	31682	10721
7	414	281	852	285	283	920	3030	5641	15446	19049	7549	9916	20067	7945	6149	3741	47512	25709
8	2627	635	159	146	186	382	615	2712	6322	8677	6330	5192	7888	7622	7191	1968	9532	25449
9	57	541	185	73	71	103	78	693	3936	4922	3328	6244	5163	2398	5853	1730	7100	4317
10	77	194	100	49	28	67	73	273	207	2471	1755	2673	5779	1123	3145	522	3194	2473
11+	1205	230	0	37	53	73	56	108	496	639	1176	2232	3603	2177	5106	784	5264	2915
	10862	8446	15044	21393	21852	33134	21275	30492	69729	96002	64290	78034	92489	62408	81841	56629	121546	96283

MOBILE GEAR - FALL SPAWNERS 4Tm,n,o
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	239	0	0	0	0	0	0	0	0	64	0	0	0	0	0	0	0
2	96	2533	0	3	199	6	32	253	134	47	3790	726	43	0	61	16	0	0
3	3914	9020	0	157	5005	148	315	2037	860	906	2614	840	3426	4343	545	1899	30	2449
4	16052	6394	0	155	2486	206	2333	4303	2155	1604	2885	3184	3211	17311	4424	2292	6396	3918
5	20196	4508	0	21	2455	91	2762	5103	6324	2600	2716	5829	5909	3595	12412	3873	2368	22149
6	3517	7102	0	3	321	46	1531	4897	6699	8242	3229	5054	2989	1189	2685	6129	4658	7189
7	3936	1651	0	11	110	8	536	1950	6331	7500	8709	4023	2287	1091	1336	1870	6359	5599
8	9137	1373	0	3	95	2	92	1760	2858	6219	7392	6706	1762	698	727	1152	1163	6579
9	1294	1931	0	9	102	1	31	601	1106	2146	4098	4308	3577	479	306	293	584	957
10	225	329	0	4	38	1	13	449	435	287	1217	2284	1848	456	676	1800	433	389
11+	10609	3296	0	2	121	1	1	372	210	60	2330	1366	297	538	1084	2678	928	537
	68976	38376	0	368	10932	510	7646	21725	27112	29611	39044	34320	25349	29696	24256	22002	22919	49767

ALL GEARS - FALL SPAWNERS 4Tm,n,o
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1195
1	0	239	0	0	0	0	0	0	0	0	64	0	0	0	0	0	0	0
2	96	2533	51	319	199	6	32	253	134	62	3790	726	55	0	61	16	0	0
3	4088	9226	6356	4311	6778	7662	780	2514	1472	7558	2758	1106	6160	4472	614	1977	30	2502
4	19473	9780	2151	13145	8526	11432	9721	8219	12994	26611	16326	15078	18060	45820	10468	4292	13067	6873
5	22588	5876	2004	2756	14230	4086	9068	13861	16557	17316	25470	24883	18536	10754	49651	25019	12957	43840
6	4012	8707	3186	611	1964	8900	4795	12811	28337	22096	11042	25617	22756	6532	13730	30789	36340	17910
7	4350	1932	852	296	393	928	3566	7591	21777	26549	16258	13939	22354	9036	7485	5611	53871	31309
8	11764	2008	159	149	281	384	707	4472	9180	14896	13722	11898	9650	8320	7918	3120	10695	32028
9	1351	2472	185	82	173	104	109	1294	5042	7068	7426	10552	8740	2877	6159	2023	7684	5274
10	302	523	100	53	66	68	86	722	642	2758	2972	4957	7627	1579	3821	2322	3627	2862
11+	11814	3526	0	39	174	74	57	480	706	699	3506	3598	3900	2713	6190	3462	6192	3452
	79838	46822	15044	21781	32784	33644	28921	52217	96841	125613	103334	112354	117838	92103	106097	78631	144463	146050

Table F. Weights-at-age (kg) for fall-spawning herring caught in NAFO unit areas 4Tm, 4Tn, and 4To, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish

Tableau F. Poids selon l'âge (kg) pour les géniteurs d'automne capturés dans les sous-divisions de l'OPANO 4Tm, 4Tn et 4To, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et

FIXED GEAR - FALL SPAWNERS 4Tm,n,o
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0.1766	0.1305	0	0	0	0	0	0.1328	0	0	0.1492	0	0	0	0	0
3	0.2026	0.2065	0.1838	0.2047	0.2239	0.1355	0.2425	0.2799	0.2214	0.2354	0.2113	0.2257	0.2165	0.1991	0.2267	0.1596	0	0.1247
4	0.2598	0.264	0.2374	0.2565	0.2692	0.2486	0.2581	0.2551	0.2631	0.2512	0.2611	0.2609	0.254	0.233	0.2285	0.2122	0.208	0.2004
5	0.2954	0.3081	0.2908	0.3091	0.3	0.287	0.2983	0.3051	0.2939	0.2869	0.287	0.2973	0.2891	0.2667	0.2576	0.2332	0.2328	0.2254
6	0.3349	0.3277	0.2618	0.3622	0.3408	0.3222	0.3407	0.3479	0.3304	0.3217	0.3178	0.3277	0.3245	0.3021	0.2826	0.261	0.2554	0.2468
7	0.3446	0.3738	0.3279	0.4279	0.3748	0.3567	0.3553	0.3664	0.37	0.3553	0.3486	0.3539	0.3492	0.3325	0.3095	0.2884	0.2844	0.2821
8	0.3773	0.3969	0.323	0.4634	0.4133	0.3939	0.3961	0.3795	0.3903	0.3804	0.3762	0.3716	0.3657	0.3527	0.3435	0.3348	0.3111	0.3018
9	0.4221	0.4114	0.3694	0.4586	0.4194	0.3993	0.4537	0.421	0.4031	0.3929	0.4069	0.3848	0.3828	0.3713	0.3535	0.3552	0.347	0.3324
10	0.392	0.428	0.436	0.5027	0.4208	0.4965	0.3612	0.4377	0.4511	0.4085	0.4123	0.4062	0.401	0.3832	0.3619	0.3265	0.352	0.3709
11+	0.4447	0.4363	0	0.5208	0.4782	0.4527	0.4895	0.5081	0.4562	0.4387	0.4333	0.4042	0.4331	0.4078	0.4035	0.3687	0.3983	0.3882
	0.3241	0.3134	0.2358	0.2597	0.2913	0.2533	0.3019	0.3319	0.3332	0.3106	0.3135	0.3254	0.3263	0.2841	0.2902	0.2581	0.2806	0.2758

MOBILE GEAR - FALL SPAWNERS 4Tm,n,o
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0692	0	0	0	0	0	0	0	0	0.0753	0	0	0	0	0	0	0.0000
2	0.1957	0.1257	0	0.1154	0.096	0.1079	0.1109	0.1023	0.1053	0.1422	0.0959	0.1049	0.1081	0	0.0661	0.0849	0	0.0000
3	0.1954	0.1853	0	0.1789	0.1709	0.1734	0.1621	0.1886	0.1609	0.2033	0.1651	0.1585	0.1773	0.1541	0.1277	0.1432	0.118	0.1275
4	0.2322	0.2455	0	0.2256	0.2109	0.2079	0.2116	0.2142	0.2161	0.2427	0.225	0.2159	0.2088	0.1893	0.1733	0.1639	0.1644	0.1673
5	0.2567	0.2854	0	0.2498	0.2607	0.2345	0.2369	0.2556	0.2515	0.2683	0.2603	0.249	0.241	0.2178	0.2119	0.1961	0.1809	0.1755
6	0.278	0.2799	0	0.2863	0.2817	0.2854	0.2594	0.2829	0.2767	0.289	0.305	0.2832	0.2834	0.252	0.2245	0.2214	0.218	0.1968
7	0.2936	0.2691	0	0.3408	0.3748	0.3185	0.3032	0.317	0.2943	0.3148	0.3328	0.2946	0.3	0.2784	0.2584	0.2318	0.2284	0.2181
8	0.3413	0.2974	0	0.2547	0.3549	0.3675	0.3313	0.337	0.3224	0.3352	0.324	0.3082	0.3278	0.3093	0.2841	0.2116	0.2432	0.2315
9	0.34	0.3621	0	0.2603	0.3079	0.3648	0.3701	0.3754	0.3451	0.3435	0.38	0.3297	0.3273	0.2955	0.3089	0.3457	0.2851	0.2699
10	0.3268	0.3477	0	0.262	0.4223	0.2639	0.3278	0.4055	0.3288	0.4071	0.4042	0.3609	0.3388	0.3166	0.303	0.2539	0.2565	0.3078
11+	0.3942	0.4044	0	0.2566	0.4439	0.4579	0.4236	0.4365	0.4098	0.4446	0.4108	0.3838	0.415	0.3539	0.3443	0.2972	0.3173	0.3257
	0.2848	0.2567	0	0.2117	0.2109	0.2117	0.2366	0.2671	0.2751	0.3035	0.293	0.2856	0.2658	0.2028	0.2184	0.218	0.2097	0.1922

ALL GEARS - FALL SPAWNERS 4Tm,n,o
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0692	0	0	0	0	0	0	0	0	0.0753	0	0	0	0	0	0	0.0000
2	0.1957	0.1257	0.1766	0.1304	0.096	0.1079	0.1109	0.1023	0.1053	0.1399	0.0959	0.1049	0.1171	0	0.0661	0.0849	0	0.0000
3	0.1957	0.1858	0.1838	0.2038	0.1848	0.1362	0.21	0.2059	0.1861	0.2316	0.1675	0.1747	0.1947	0.1554	0.1388	0.1438	0.118	0.1275
4	0.237	0.2519	0.2374	0.2561	0.2522	0.2479	0.2469	0.2337	0.2553	0.2507	0.2547	0.2514	0.246	0.2165	0.2052	0.1864	0.1867	0.1815
5	0.2608	0.2907	0.2908	0.3086	0.2932	0.2858	0.2796	0.2869	0.2777	0.2841	0.2842	0.286	0.2738	0.2504	0.2462	0.2275	0.2233	0.2002
6	0.285	0.2887	0.2618	0.3618	0.3311	0.322	0.3147	0.3231	0.3177	0.3095	0.3141	0.3189	0.3191	0.293	0.2712	0.2531	0.2506	0.2267
7	0.2985	0.2843	0.3279	0.4247	0.3748	0.3564	0.3475	0.3537	0.348	0.3439	0.3401	0.3368	0.3442	0.326	0.3004	0.2695	0.2778	0.2707
8	0.3493	0.3289	0.323	0.4592	0.3936	0.3938	0.3877	0.3628	0.3692	0.3615	0.3481	0.3359	0.3588	0.3491	0.338	0.2893	0.3037	0.2874
9	0.3435	0.3729	0.3694	0.4368	0.3537	0.399	0.4299	0.3998	0.3904	0.3779	0.3921	0.3623	0.3601	0.3587	0.3513	0.3538	0.3423	0.3211
10	0.3434	0.3775	0.436	0.4845	0.4217	0.4931	0.3562	0.4177	0.3682	0.4084	0.409	0.3853	0.3859	0.364	0.3515	0.2702	0.3406	0.3623
11+	0.3994	0.4065	0	0.5073	0.4543	0.4528	0.4883	0.4526	0.4424	0.4392	0.4183	0.3965	0.4317	0.3972	0.3931	0.3134	0.3862	0.3785
	0.2901	0.2669	0.2358	0.2589	0.2645	0.2527	0.2846	0.3049	0.3169	0.3089	0.3057	0.3133	0.3133	0.2579	0.2738	0.2469	0.2694	0.2473

Table G. Catch-at-age for fall-spawning herring caught in NAFO unit area 4Tl, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and

Tableau G. Prises selon l'âge pour les géniteurs d'automne capturés dans la sous-division de l'OPANO 4Tl, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les cara

FIXED GEAR - FALL SPAWNERS 4Tl
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4Tl

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	29	70	288	1650	30	235	100	68	39	204	723	17	201	17	0	0	0	0
4	628	2212	1342	4362	1689	3406	1602	467	733	1184	2701	759	1899	5946	5026	325	931	158
5	520	1553	2103	1752	1475	1173	1755	1231	676	1669	2923	1348	1377	1386	9319	6654	1369	8512
6	156	604	635	839	211	1373	789	1098	1455	335	2832	1326	1766	751	0	8626	7000	1993
7	253	306	350	286	120	344	638	781	1050	2511	1092	646	2787	1637	595	1459	8657	10465
8	1165	151	148	183	120	0	126	385	430	148	1159	332	630	1743	260	556	920	6617
9	10	186	71	52	0	0	16	99	268	399	582	386	372	1208	122	362	269	1138
10	81	35	54	118	0	0	15	39	14	204	29	172	363	517	215	504	437	494
11+	694	266	81	52	0	0	15	15	34	55	0	142	58	1210	237	681	707	2795
	3536	5383	5072	9294	3645	6531	5056	4183	4699	6709	12041	5128	9452	14414	15774	19167	20290	32172

MOBILE GEAR - FALL SPAWNERS 4Tl
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4Tl

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	1	118	2	0	0	0	0	0	0	0	0	0	0	0
3	1665	231	284	24	17	3114	16	0	0	1	0	0	0	0	0	0	0	0
4	6494	1267	702	24	8	4368	122	0	0	2	0	0	0	0	0	0	0	0
5	1963	1917	744	3	8	1937	146	0	0	3	0	0	0	0	0	0	0	0
6	256	3262	661	1	1	974	81	0	0	8	0	0	0	0	0	0	0	0
7	0	863	115	2	0	170	28	0	0	7	0	0	0	0	0	0	0	0
8	727	851	70	0	0	42	5	0	0	6	0	0	0	0	0	0	0	0
9	0	2396	144	1	0	23	2	0	0	2	0	0	0	0	0	0	0	0
10	315	580	59	1	0	28	1	0	0	0	0	0	0	0	0	0	0	0
11+	92	5667	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0
	11512	17034	2779	56	35	10792	403	0	0	29	0	0	0	0	0	0	0	0

ALL GEARS - FALL SPAWNERS 4Tl
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4Tl

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	1	118	2	0	0	0	0	0	0	0	0	0	0	0
3	1694	301	572	1674	47	3349	116	68	39	205	723	17	201	17	0	0	0	0
4	7122	3479	2044	4386	1697	7774	1724	467	733	1186	2701	759	1899	5946	5026	325	931	158
5	2483	3470	2847	1755	1483	3110	1901	1231	676	1672	2923	1348	1377	1386	9319	6654	1369	8512
6	412	3866	1296	840	212	2347	870	1098	1455	343	2832	1326	1766	751	0	8626	7000	1993
7	253	1169	465	288	120	514	666	781	1050	2518	1092	646	2787	1637	595	1459	8657	10465
8	1892	1002	218	183	120	42	131	385	430	154	1159	332	630	1743	260	556	920	6617
9	10	2582	215	53	0	23	18	99	268	401	582	386	372	1208	122	362	269	1138
10	396	615	113	119	0	28	16	39	14	204	29	172	363	517	215	504	437	494
11+	786	5933	81	52	0	18	15	15	34	55	0	142	58	1210	237	681	707	2795
	15048	22417	7851	9350	3680	17323	5459	4183	4699	6738	12041	5128	9453	14415	15774	19167	20290	32172

Table H. Weights-at-age (kg) for fall-spawning herring caught in NAFO unit area 4Tl, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2

Tableau H. Poids selon l'âge (kg) pour les géniteurs d'automne capturés dans la sous-division de l'OPANO 4Tl, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les

FIXED GEAR - FALL SPAWNERS 4Tl
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4Tl

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0.2026	0.2395	0.2217	0.2233	0.2446	0.1805	0.2422	0.2806	0.225	0.248	0.2334	0.2257	0.1917	0.1864	0	0	0	0
4	0.2567	0.2602	0.2802	0.2503	0.2721	0.2242	0.2557	0.2743	0.2635	0.2327	0.2768	0.2589	0.238	0.2363	0.2178	0.2157	0.2084	0.2152
5	0.297	0.2966	0.3378	0.3133	0.3071	0.2789	0.2729	0.3068	0.296	0.2617	0.3047	0.2919	0.2877	0.2781	0.2494	0.2413	0.2443	0.244
6	0.3148	0.2952	0.3768	0.3621	0.3706	0.3103	0.325	0.3517	0.3313	0.3109	0.3566	0.3268	0.3252	0.3122	0	0.2602	0.2693	0.2659
7	0.2935	0.3305	0.3845	0.397	0.4464	0.369	0.3518	0.3699	0.3701	0.3338	0.392	0.3524	0.3425	0.354	0.2805	0.2657	0.3016	0.2854
8	0.3587	0.3958	0.4093	0.4141	0.4464	0	0.3952	0.3798	0.3903	0.333	0.3957	0.3736	0.3685	0.3602	0.3398	0.3265	0.3345	0.2936
9	0.4221	0.4242	0.4658	0.4984	0	0	0.4513	0.421	0.4031	0.3654	0.4569	0.389	0.3753	0.3741	0.3241	0.3407	0.369	0.3652
10	0.306	0.3989	0.4453	0.4616	0	0	0.3602	0.4377	0.4511	0.248	0.4008	0.4114	0.3992	0.4115	0.3892	0.3603	0.3934	0.3683
11+	0.4111	0.4331	0.4429	0.542	0	0	0.4947	0.5081	0.4562	0.4058	0	0.4045	0.4152	0.4157	0.3983	0.3849	0.4284	0.3823
	0.3329	0.2973	0.3308	0.2809	0.3032	0.2582	0.2895	0.3377	0.3342	0.2941	0.3306	0.3232	0.3127	0.3055	0.2467	0.2638	0.2911	0.2871

MOBILE GEAR - FALL SPAWNERS 4Tl
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4Tl

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	0	0	0	0	0	0	0	0	0.0753	0	0	0	0	0	0	0
2	0	0	0.0609	0.1154	0.096	0.1079	0.1109	0	0	0.1422	0.0959	0	0	0	0	0	0	0
3	0.1799	0.201	0.1916	0.1789	0.1709	0.1734	0.1621	0	0	0.2033	0.1651	0	0	0	0	0	0	0
4	0.2233	0.2473	0.1991	0.2256	0.212	0.2077	0.2115	0	0	0.2427	0.225	0	0	0	0	0	0	0
5	0.2593	0.2729	0.2698	0.2498	0.261	0.2343	0.2364	0	0	0.2683	0.2603	0	0	0	0	0	0	0
6	0.2854	0.2895	0.257	0.2863	0.2827	0.285	0.2593	0	0	0.289	0.305	0	0	0	0	0	0	0
7	0	0.3134	0.304	0.3408	0.3862	0.3185	0.3031	0	0	0.3148	0.3328	0	0	0	0	0	0	0
8	0.3419	0.3231	0.3366	0.2547	0.3559	0.3675	0.3313	0	0	0.3352	0.324	0	0	0	0	0	0	0
9	0	0.3352	0.3672	0.2603	0.3062	0.3648	0.3701	0	0	0.3435	0.38	0	0	0	0	0	0	0
10	0.3225	0.3195	0.4002	0.262	0.4239	0.2639	0.3278	0	0	0.4071	0.4042	0	0	0	0	0	0	0
11+	0.3981	0.3698	0.3915	0.2566	0.4461	0.4579	0.4236	0	0	0.4446	0.4108	0	0	0	0	0	0	0
	0.2361	0.3203	0.2518	0.2134	0.2019	0.2117	0.2366	0	0	0.3003	0	0	0	0	0	0	0	0

ALL GEARS - FALL SPAWNERS 4Tl
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4Tl

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0.096	0.1079	0.1109	0	0	0	0	0	0	0	0	0	0	0
3	0.1803	0.21	0.2068	0.2227	0.2179	0.1739	0.2312	0.2806	0.225	0.2478	0.2334	0.2257	0.1917	0.1864	0	0	0	0
4	0.2262	0.2555	0.2523	0.2502	0.2718	0.2149	0.2526	0.2743	0.2635	0.2327	0.2768	0.2589	0.238	0.2363	0.2178	0.2157	0.2084	0.2152
5	0.2672	0.2835	0.32	0.3132	0.3069	0.2511	0.2701	0.3068	0.296	0.2617	0.3047	0.2919	0.2877	0.2781	0.2494	0.2413	0.2443	0.244
6	0.2965	0.2904	0.3157	0.362	0.3702	0.2998	0.3189	0.3517	0.3313	0.3104	0.3566	0.3268	0.3252	0.3122	0	0.2602	0.2693	0.2659
7	0.2935	0.3179	0.3646	0.3966	0.4464	0.3523	0.3498	0.3699	0.3701	0.3337	0.392	0.3524	0.3425	0.354	0.2805	0.2657	0.3016	0.2854
8	0.3522	0.3341	0.386	0.4141	0.4464	0.3675	0.3928	0.3798	0.3903	0.3331	0.3957	0.3736	0.3685	0.3602	0.3398	0.3265	0.3345	0.2936
9	0.4221	0.3416	0.3998	0.4939	0	0.3648	0.4423	0.421	0.4031	0.3653	0.4569	0.389	0.3753	0.3741	0.3241	0.3407	0.369	0.3652
10	0.3191	0.324	0.4218	0.4599	0	0.2639	0.3582	0.4377	0.4511	0.248	0.4008	0.4114	0.3992	0.4115	0.3892	0.3603	0.3934	0.3683
11+	0.4096	0.3726	0.4429	0.542	0	0.4579	0.4947	0.5081	0.4562	0.4058	0	0.4045	0.4152	0.4157	0.3983	0.3849	0.4284	0.3823
	0.2589	0.3148	0.3028	0.2805	0.3023	0.2292	0.2856	0.3377	0.3342	0.2941	0.3306	0.3232	0.3127	0.3055	0.2467	0.2638	0.2911	0.287096

Table I. Catch-at-age for fall-spawning herring caught in NAFO unit areas 4Tf, 4Tg, 4Th, 4Tj and 4Tk, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fi

Tableau I. Prises selon l'âge pour les géniteurs d'automne capturés dans les sous-divisions de l'OPANO 4Tf, 4Tg, 4Th, 4Tj et 4Tk, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épulsés (stades

FIXED GEAR - FALL SPAWNERS 4Tf,g,h,j,k
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	904	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	82	8	38	6	0	0	0	0	253	0	0	0	0	0	0	0	0	0
3	3389	198	4534	595	352	394	399	572	976	1154	299	11	771	11	0	0	0	0
4	1500	4388	2296	6479	7256	7897	15893	4433	21298	12014	4291	1460	5824	5004	1297	115	1555	370
5	573	2211	2363	1732	3633	4705	5384	14452	5587	13864	16267	1654	5812	1690	7469	1904	307	7953
6	165	715	218	832	3068	2998	4253	5848	11335	6523	9609	7784	6681	1214	1106	3196	9730	1786
7	78	278	821	395	2120	904	2310	3075	2755	14777	4599	3495	31371	1202	596	835	13621	11141
8	118	279	136	267	744	1250	594	1398	1461	6693	6778	1609	8484	3932	1492	644	1772	10039
9	51	153	96	133	299	384	362	420	462	4061	3043	2391	3629	1233	3372	1570	2288	2531
10	0	48	151	72	89	57	112	415	120	1887	954	479	3816	769	1195	923	6009	2676
11+	3	49	14	13	9	86	20	36	163	1184	447	219	1743	1152	1362	1319	8144	8345
	5959	9231	10667	10524	17570	18675	29327	30649	44410	62157	46287	19102	68131	16208	17889	10506	43426	44840

MOBILE GEAR - FALL SPAWNERS 4Tf,g,h,j,k
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	1	140	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
2	1326	195	2342	75	0	3	0	0	23	0	52	0	0	0	0	6	0	0
3	15859	4032	36489	4337	0	81	1	0	114	6	36	0	0	0	0	8	0	391
4	4897	13005	14346	4281	0	114	1	0	83	10	40	0	0	0	162	62	804	55
5	936	10331	11347	598	0	50	6	0	11	16	37	0	0	0	133	346	308	256
6	287	6322	6590	104	0	25	0	0	5	50	44	0	0	0	146	84	873	121
7	383	1896	7340	304	0	4	0	0	1	46	119	0	0	0	99	110	1491	434
8	663	1478	5462	88	0	1	0	0	3	38	101	0	0	0	36	113	338	784
9	155	950	3184	257	0	1	0	0	1	13	56	0	0	0	39	115	154	0
10	197	340	1562	111	0	1	0	0	0	2	17	0	0	0	49	207	127	117
11+	1080	1501	896	62	0	0	0	0	0	0	32	0	0	0	16	474	334	66
	25783	40051	89698	10217	0	280	8	0	241	181	535	0	0	0	680	1525	4429	2224

ALL GEARS - FALL SPAWNERS 4Tf,g,h,j,k
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	905	140	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
2	1408	203	2380	81	0	3	0	0	276	0	52	0	0	0	0	6	0	0
3	19248	4230	41023	4932	352	475	400	572	1090	1160	335	11	771	11	0	8	0	391
4	6397	17393	16642	10760	7256	8011	15894	4433	21381	12024	4331	1460	5824	5004	1459	177	2359	425
5	1509	12542	13710	2330	3633	4755	5390	14452	5598	13880	16304	1654	5812	1690	7602	2250	615	8209
6	452	7037	6808	936	3068	3023	4253	5848	11340	6573	9653	7784	6681	1214	1252	3280	10603	1907
7	461	2174	8161	699	2120	908	2310	3075	2756	14823	4718	3495	31371	1202	695	945	15112	11575
8	781	1757	5598	355	744	1251	594	1398	1464	6731	6879	1609	8484	3932	1528	757	2110	10823
9	206	1103	3280	390	299	385	362	420	463	4074	3099	2391	3629	1233	3411	1685	2442	2531
10	197	388	1713	183	89	58	112	415	120	1889	971	479	3816	769	1244	1130	6136	2792
11+	1083	1550	910	75	9	86	20	36	163	1184	479	219	1743	1152	1378	1793	8478	8411
	31742	49282	100365	20741	17570	18955	29335	30649	44651	62338	46822	19102	68131	16207	18569	12031	47855	47064

Table J. Weights-at-age (kg) for fall-spawning herring caught in NAFO unit areas 4Tf, 4Tg, 4Th, 4Tj and 4Tk, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juven

Tableau J. Poids selon l'âge (kg) pour les géniteurs d'automne capturés dans les sous-divisions de l'OPANO 4Tf, 4Tg, 4Th, 4Tj et 4Tk, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (st

FIXED GEAR - FALL SPAWNERS 4Tf,g,h,j,k
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0231	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0.0787	0.1066	0.2115	0.0354	0	0	0	0	0.1793	0	0	0	0	0	0	0	0	0
3	0.1303	0.1828	0.2062	0.1951	0.2104	0	0.2273	0.2357	0.1786	0.2283	0.2342	0.2327	0.1929	0.1736	0	0	0	0
4	0.1773	0.2462	0.2498	0.2258	0.2619	0.1943	0.2431	0.2512	0.2405	0.2398	0.2673	0.2554	0.2433	0.2359	0.2197	0.2138	0.2106	0.2115
5	0.2139	0.282	0.298	0.3249	0.3	0.2514	0.2768	0.2822	0.2809	0.2726	0.2922	0.2784	0.2772	0.2623	0.2532	0.2322	0.2269	0.2256
6	0.2182	0.3239	0.3243	0.3834	0.3327	0.2829	0.3069	0.315	0.3133	0.3053	0.3219	0.319	0.3254	0.2982	0.2793	0.2507	0.2601	0.2515
7	0.2669	0.364	0.3397	0.3803	0.3696	0.3041	0.3374	0.3493	0.3499	0.3297	0.3533	0.3516	0.3474	0.3342	0.2888	0.2837	0.2852	0.2698
8	0.2765	0.4024	0.3385	0.4003	0.3645	0.3342	0.3992	0.3623	0.3596	0.351	0.3796	0.3778	0.3709	0.3556	0.3369	0.3182	0.3259	0.2948
9	0.3048	0.4285	0.3735	0.4429	0.3864	0.3564	0.4023	0.39	0.3854	0.3699	0.3982	0.3838	0.3963	0.376	0.3423	0.3511	0.3258	0.3212
10	0	0.4458	0.4316	0.467	0.3538	0.3946	0.3937	0.3813	0.3956	0.3703	0.4045	0.404	0.4084	0.3907	0.3651	0.357	0.36	0.3556
11+	0.4085	0.4568	0.3638	0.4346	0.4004	0.4098	0.4862	0.458	0.3605	0.4195	0.4509	0.4307	0.4299	0.4136	0.381	0.3897	0.3704	0.376
	0.1582	0.2509	0.2552	0.2676	0.3011	0.2384	0.2716	0.2965	0.2755	0.303	0.3254	0.333	0.3397	0.3102	0.2946	0.2955	0.3068	0.2941

MOBILE GEAR - FALL SPAWNERS 4Tf,g,h,j,k
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0692	0.0308	0	0	0	0	0	0	0	0.0753	0	0	0	0	0	0	0
2	0.0926	0.0331	0.1032	0.1144	0	0.1079	0	0	0.1136	0.1422	0.0959	0	0	0	0	0.066	0	0
3	0.1346	0.0727	0.1405	0.1789	0	0.1734	0.1313	0	0.1384	0.2033	0.1651	0	0	0	0	0.138	0	0.0715
4	0.1678	0.1495	0.1667	0.2255	0	0.2079	0.1665	0	0.1686	0.2427	0.225	0	0	0	0.1478	0.2053	0.1503	0.1134
5	0.2147	0.1823	0.2236	0.25	0	0.2345	0.1945	0	0.1925	0.2683	0.2603	0	0	0	0.208	0.2686	0.1656	0.1474
6	0.2279	0.1998	0.2357	0.2872	0	0.2854	0.2497	0	0.245	0.289	0.305	0	0	0	0.2722	0.2845	0.1902	0.199
7	0.2856	0.225	0.2634	0.341	0	0.3185	0.2805	0	0.2757	0.3148	0.3328	0	0	0	0.292	0.3343	0.2343	0.229
8	0.3142	0.2804	0.2502	0.2569	0	0.3675	0	0	0.2886	0.3352	0.324	0	0	0	0.3255	0.3747	0.222	0.23
9	0.2946	0.3294	0.2735	0.2607	0	0.3648	0.3964	0	0.2757	0.3435	0.38	0	0	0	0.3217	0.3922	0.2506	0
10	0.3146	0.3464	0.2832	0.262	0	0.2639	0	0	0	0.4071	0.4042	0	0	0	0.3024	0.4006	0.3347	0.3418
11+	0.3636	0.3813	0.3587	0.2626	0	0.4579	0	0	0	0.4446	0.4108	0	0	0	0.3816	0.4272	0.3274	0.3003
	0.1615	0.1806	0.1872	0.2122	0	0.2114	0.1831	0	0.1541	0.3032	0.2929	0	0	0	0.2433	0.3546	0.2151	0.1958

ALL GEARS - FALL SPAWNERS 4Tf,g,h,j,k
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0232	0.0308	0	0	0	0	0	0	0	0.0753	0	0	0	0	0	0	0
2	0.0918	0.036	0.1049	0.1085	0	0.1079	0	0	0.1738	0	0.0959	0	0	0	0	0.066	0	0
3	0.1338	0.0779	0.1478	0.1809	0.2104	0.0296	0.2271	0.2357	0.1744	0.2282	0.2268	0.2327	0.1929	0.1736	0	0.138	0	0.0715
4	0.17	0.1739	0.1782	0.2257	0.2619	0.1945	0.2431	0.2512	0.2402	0.2398	0.2669	0.2554	0.2433	0.2359	0.2117	0.2108	0.19	0.1988
5	0.2144	0.1999	0.2364	0.3057	0.3	0.2512	0.2767	0.2822	0.2807	0.2726	0.2921	0.2784	0.2772	0.2623	0.2524	0.2378	0.1962	0.2232
6	0.2244	0.2124	0.2385	0.3727	0.3327	0.2829	0.3069	0.315	0.3133	0.3052	0.3218	0.319	0.3254	0.2982	0.2785	0.2516	0.2543	0.2482
7	0.2824	0.2428	0.2711	0.3632	0.3696	0.3042	0.3374	0.3493	0.3499	0.3297	0.3528	0.3516	0.3474	0.3342	0.2893	0.2896	0.2802	0.2683
8	0.3085	0.2998	0.2523	0.3648	0.3645	0.3342	0.3992	0.3623	0.3595	0.3509	0.3788	0.3778	0.3709	0.3556	0.3366	0.3266	0.3093	0.2901
9	0.2971	0.3431	0.2764	0.3228	0.3864	0.3564	0.4023	0.39	0.3852	0.3698	0.3979	0.3838	0.3963	0.376	0.3421	0.3539	0.3211	0.3212
10	0.3146	0.3587	0.2963	0.3427	0.3538	0.3923	0.3937	0.3813	0.3956	0.3703	0.4045	0.404	0.4084	0.3907	0.3626	0.365	0.3595	0.355
11+	0.3637	0.3837	0.3588	0.2924	0.4004	0.4098	0.4862	0.458	0.3605	0.4195	0.4482	0.4307	0.4299	0.4136	0.381	0.3996	0.3687	0.3754
	0.1609	0.1938	0.1944	0.2403	0.3011	0.238	0.2716	0.2965	0.2749	0.303	0.325	0.333	0.3397	0.3102	0.2927	0.303	0.2982	0.2895

Table K. Catch-at-age for fall spawners caught by purse seines in 4Vn, 1978-1995. Spawning-group affinity for 1978-1991 assigned by gonad maturity for ripe, spawning and spent fish (stages 5, 6 and 7) and otolith characteristics for all remai

Tableau K. Prises selon l'âge pour les géniteurs d'automne capturés à l'aide de sennes coulissantes dans 4Vn, 1978-1995. De 1978 à 1991, la saison de frai est classée selon la maturité des gonades pour les poissons mûrs, en état de frai

FALL SPAWNERS 4Vn
GÉNITEURS D'AUTOMNE 4Vn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	0	0	0	0	0	0	5	20	12	0	0	0	0	0	0	0
2	42	5827	628	377	1888	1352	997	827	604	816	441	26	0	0	0	25	15	14
3	563	2622	2865	541	3147	4652	3551	1987	2533	1613	833	559	697	2105	20	159	280	137
4	1601	656	2602	6800	3103	3651	4271	3920	5162	4138	1103	1408	2264	5406	1096	456	1964	551
5	1092	167	888	693	1428	2114	2790	2982	2394	1413	3328	1130	1524	2547	3273	1814	722	4374
6	842	100	655	591	359	584	775	927	1375	735	2394	2443	413	750	1427	4357	2426	1266
7	628	324	663	0	158	218	377	590	1770	1040	575	460	2716	856	1474	1687	3193	3844
8	366	0	636	206	40	50	66	66	967	620	734	684	642	1266	990	1473	984	3294
9	449	0	905	236	47	83	58	130	245	165	346	429	857	1309	1379	1594	695	967
10	280	0	638	0	0	0	0	0	75	75	183	123	1686	539	983	1564	829	909
11+	156	0	493	0	57	38	19	48	7	22	79	292	3033	1699	4317	2587	1689	1732
	6019	9696	10973	9444	10227	12742	12904	11477	15137	10657	10028	7554	13833	16478	14959	15716	12798	17086

FALL SPAWNERS 4Vn
GÉNITEURS D'AUTOMNE 4Vn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	0	0	0	0	0	0	0.0378	0.0389	0.0349	0	0	0	0	0	0	0
2	0.1934	0.1067	0.1302	0.0803	0.1175	0.1409	0.1258	0.1144	0.0889	0.075	0.096	0.1197	0	0	0	0.028	0.0912	0.0854
3	0.1832	0.1755	0.1648	0.1901	0.1951	0.19	0.1992	0.2011	0.1481	0.1446	0.1589	0.1642	0.1726	0.1443	0.1322	0.118	0.1393	0.1275
4	0.2471	0.2262	0.2328	0.2089	0.236	0.2382	0.2405	0.2471	0.1838	0.1862	0.2085	0.2077	0.2025	0.1915	0.1796	0.1531	0.1608	0.1609
5	0.3042	0.2741	0.3035	0.2807	0.2571	0.2621	0.2655	0.2693	0.2202	0.2111	0.2395	0.2361	0.224	0.2229	0.2087	0.1783	0.18	0.1915
6	0.3323	0.2979	0.3374	0.3149	0.2943	0.2957	0.2934	0.2983	0.2535	0.2543	0.2605	0.2743	0.2646	0.2477	0.2381	0.2044	0.2121	0.2131
7	0.3562	0.3459	0.3655	0	0.325	0.3238	0.3194	0.3166	0.2601	0.2606	0.2943	0.2905	0.2924	0.2626	0.2468	0.227	0.2295	0.2201
8	0.3744	0	0.3917	0.4284	0.3612	0.3602	0.3543	0.3513	0.293	0.2968	0.319	0.3096	0.315	0.2972	0.2758	0.2455	0.2466	0.249
9	0.388	0	0.4	0.4137	0.3958	0.4046	0.3591	0.3794	0.3277	0.3301	0.3331	0.3406	0.336	0.3073	0.2856	0.2686	0.2822	0.2674
10	0.399	0	0.4136	0	0	0	0	0	0.3203	0.3179	0.3521	0.3371	0.3416	0.3206	0.2853	0.2827	0.2988	0.2898
11+	0.4294	0	0.4349	0	0.4205	0.4193	0.4078	0.4213	0.4458	0.3924	0.37	0.3477	0.3468	0.3544	0.3295	0.3105	0.324	0.3392
	0.3045	0.1462	0.2717	0.2245	0.2102	0.2204	0.2325	0.2459	0.2051	0.1964	0.2431	0.2593	0.285	0.2349	0.2644	0.2368	0.2319	0.2335

Table L. Catch-at-age for 4T herring spring spawners, including those caught by purse seines in 4Vn, 1978-1995. Numbers are in thousands of fish.

Tableau L. Prises selon l'âge pour les géniteurs de printemps dans 4T, y compris ceux capturés à la senne coulissante dans 4Vn, 1978-1995. En milliers de poissons.

FIXED GEAR - SPRING SPAWNERS 4TVn
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	425	0	14	10	0	0	0	0	0	59	0	0	0	53	0	0	0
2	14	198	169	394	162	248	84	330	10	271	501	0	104	65	619	6	0	0
3	5644	6922	10538	13093	23717	16174	4538	6009	3593	1684	4012	4093	2897	6293	2725	280	1817	331
4	25469	3140	6746	8353	4509	25937	13994	15844	18110	8051	8626	16434	14297	12101	30568	6477	5278	12469
5	1255	17307	2632	2688	1066	2097	8044	14353	12735	22119	11447	6223	10323	14809	11750	37705	26443	11120
6	1831	641	8501	1818	493	460	376	5198	11482	11213	15722	6114	3415	9180	7680	17143	47296	16846
7	1391	1242	1824	3363	323	102	58	1304	2932	8669	9255	7153	3074	3488	3497	6448	9030	24526
8	259	274	942	486	337	0	49	696	444	3676	7012	4491	4865	3201	1745	2676	4437	4948
9	447	136	851	454	123	0	4	61	32	516	1651	2635	2609	4764	1888	1954	1198	2003
10	1375	302	462	195	91	0	5	0	130	331	89	901	1000	2261	1888	1614	1225	1029
11+	1496	1454	699	961	571	0	0	1	205	162	530	283	265	1138	1738	2023	1599	2088
	39181	32041	33364	31819	31402	45018	27152	43796	49673	56692	58904	48327	42849	57299	64151	76326	98325	75482

MOBILE GEAR - SPRING SPAWNERS 4TVn
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	1479	12367	965	595	1525	302	522	826	167	73	2447	332	38	0	61	17	0	0
2	15379	14047	10852	4683	3790	4120	1850	1963	2362	409	4987	396	3463	1372	862	741	39	995
3	5909	16513	13124	3136	2821	5201	1989	2619	5218	1224	1515	1650	3521	4682	2742	597	3085	1235
4	16315	12113	12773	137	715	1519	1480	2090	5536	1966	1005	2100	2574	2481	4719	1968	2269	10147
5	2673	12527	5335	443	372	462	815	998	3132	4683	1362	856	2079	1378	2328	3520	5807	4633
6	4929	3627	6435	101	6	1	20	511	2634	3889	4768	2317	1165	771	1754	2620	8184	5268
7	5128	1772	3526	229	4	16	0	58	719	3148	2874	4075	715	674	374	1265	2015	7577
8	1303	1672	1783	389	19	36	15	0	495	1225	2411	1768	1925	1355	329	764	1886	1724
9	1328	411	1280	1	67	0	0	113	194	0	1617	1413	1034	336	453	1283	641	504
10	1107	145	295	252	1	0	0	0	0	0	0	428	425	364	342	1360	326	932
11+	5628	1450	340	3	8	0	0	145	45	37	570	23	176	344	250	1621	811	1237
	61178	76644	56708	9969	9328	11657	6691	9323	20502	16654	23556	15358	17115	13757	14214	15756	25063	34252

ALL GEARS - SPRING SPAWNERS 4TVn
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	1479	12792	965	609	1535	302	522	826	167	73	2506	332	38	0	114	17	0	0
2	15393	14245	11021	5077	3952	4368	1934	2293	2372	680	5488	396	3567	1437	1481	747	39	995
3	11553	23435	23662	16229	26538	21375	6527	8628	8811	2908	5527	5743	6418	10975	5467	877	4902	1566
4	41784	15253	19519	8490	5224	27456	15474	17934	23646	10017	9631	18534	16871	14582	35287	8445	7547	22616
5	3928	29834	7967	3131	1438	2559	8859	15351	15867	26802	12809	7079	12402	16187	14078	41225	32250	15753
6	6760	4268	14936	1919	499	461	396	5709	14116	15102	20490	8431	4580	9951	9434	19763	55480	22114
7	6519	3014	5350	3592	327	118	58	1362	3651	11817	12129	11228	3789	4162	3871	7713	11045	32102
8	1562	1946	2725	875	356	36	64	696	939	4901	9423	6259	6790	4556	2074	3440	6323	6672
9	1775	547	2131	455	190	0	4	174	226	516	3268	4048	3643	5100	2341	3237	1839	2507
10	2482	447	757	447	92	0	5	0	130	331	89	1329	1425	2625	2230	2974	1551	1960
11+	7124	2904	1039	964	579	0	0	146	250	199	1100	306	441	1482	1988	3644	2410	3325
	100359	108685	90072	41788	40730	56675	33843	53119	70175	73346	82460	63685	59964	71057	78365	92082	123386	109734

Table M. Weights-at-age (kg) for 4T herring spring spawners, including those caught by purse seines in 4Vn, 1978-1995.

Tableau M. Poids selon l'âge (kg) pour les géniteurs de printemps dans 4T, y compris ceux capturés à la senne coulissante dans 4Vn, 1978-1995.

FIXED GEAR - SPRING SPAWNERS 4TVn
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0195	0	0.1005	0.0366	0	0	0	0	0	0.0379	0	0	0	0.0501	0	0	0
2	0.1418	0.1608	0.1816	0.1397	0.1953	0.1721	0.0933	0.2132	0.1073	0.1513	0.0798	0	0.1495	0.1483	0.1111	0.124	0	0
3	0.1478	0.1698	0.1674	0.1834	0.1745	0.1554	0.1764	0.1836	0.1603	0.188	0.1605	0.1658	0.1599	0.1452	0.1421	0.1405	0.1494	0.1242
4	0.1888	0.2139	0.1861	0.2358	0.2105	0.2084	0.1957	0.2161	0.1959	0.1959	0.2031	0.2019	0.1957	0.1812	0.171	0.1667	0.1546	0.1597
5	0.2109	0.2291	0.2284	0.2848	0.264	0.2423	0.2137	0.2456	0.2419	0.2175	0.2402	0.2315	0.2242	0.2182	0.2002	0.1864	0.1773	0.183
6	0.2562	0.2441	0.2691	0.3269	0.3171	0.2675	0.2683	0.2789	0.2561	0.252	0.2662	0.2552	0.2584	0.2437	0.2309	0.2069	0.1985	0.2037
7	0.3221	0.3046	0.3067	0.3362	0.3717	0.3269	0.3029	0.3499	0.3194	0.2705	0.2875	0.2807	0.264	0.2576	0.2537	0.2395	0.2183	0.22
8	0.3076	0.3362	0.3319	0.3393	0.3794	0	0.3843	0.3705	0.3392	0.2781	0.3038	0.2939	0.2885	0.2855	0.2601	0.2505	0.2567	0.2397
9	0.3114	0.343	0.3678	0.3787	0.4026	0	0.4429	0.4001	0.3486	0.2959	0.3233	0.3124	0.306	0.2992	0.2886	0.2747	0.2942	0.2768
10	0.3308	0.3174	0.363	0.3986	0.406	0	0.3713	0	0.3159	0.2964	0.3754	0.3238	0.3072	0.3041	0.3015	0.2864	0.2944	0.2847
11+	0.3671	0.3529	0.3731	0.4082	0.446	0	0	0.4913	0.4181	0.3913	0.3367	0.2978	0.3306	0.3208	0.3198	0.2949	0.3212	0.319
	0.2054	0.2227	0.2264	0.2428	0.1957	0.1916	0.1991	0.2354	0.2289	0.2338	0.2531	0.2385	0.2306	0.2247	0.1999	0.2031	0.1983	0.2069

MOBILE GEAR - SPRING SPAWNERS 4TVn
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0.0787	0.0967	0.107	0.1057	0.0995	0.1183	0.0991	0.0886	0.065	0.0571	0.081	0.0882	0.0789	0	0.0511	0.0587	0	0.0000
2	0.1305	0.152	0.1532	0.1794	0.1607	0.1635	0.1678	0.1632	0.1293	0.1518	0.1132	0.1716	0.1724	0.1417	0.119	0.1157	0.1456	0.0889
3	0.1817	0.1483	0.1618	0.2233	0.2186	0.195	0.2183	0.2166	0.1678	0.1703	0.174	0.2131	0.199	0.1767	0.1471	0.137	0.1513	0.1310
4	0.2523	0.1774	0.2141	0.2389	0.2512	0.229	0.2369	0.2415	0.2365	0.2541	0.2367	0.2516	0.2437	0.1969	0.1995	0.1749	0.1776	0.1764
5	0.2556	0.2486	0.247	0.3678	0.2885	0.2933	0.2742	0.2971	0.2816	0.2972	0.3044	0.2626	0.2789	0.2335	0.2439	0.1893	0.1955	0.1976
6	0.2822	0.2513	0.2731	0.4102	0.3241	0.2731	0.3031	0.3112	0.307	0.3282	0.3226	0.3126	0.2988	0.2528	0.2729	0.2242	0.2218	0.2254
7	0.3026	0.282	0.2633	0.3286	0.3796	0.2455	0	0.2824	0.3241	0.3375	0.3588	0.341	0.3365	0.2889	0.2805	0.2628	0.264	0.2489
8	0.304	0.3122	0.2812	0.2846	0.3337	0.2375	0.3189	0	0.3003	0.3671	0.3889	0.3496	0.3214	0.2909	0.3068	0.3308	0.257	0.2701
9	0.3139	0.3525	0.3377	0.3839	0.3221	0	0	0.5884	0.291	0	0.4024	0.3671	0.3435	0.3392	0.3332	0.3655	0.2988	0.2928
10	0.3759	0.3115	0.382	0.3251	0.4328	0	0	0	0	0	0	0.3829	0.3927	0.3412	0.3412	0.3082	0.3274	0.3329
11+	0.3618	0.3917	0.3589	0.4081	0.4472	0	0	0.3466	0.3933	0.5328	0.4281	0.3838	0.3288	0.3509	0.3731	0.3254	0.333	0.3073
	0.2322	0.1792	0.208	0.2116	0.1822	0.1904	0.2064	0.2203	0.2267	0.2987	0.2581	0.3012	0.251	0.2162	0.2156	0.2391	0.2159	0.2141

ALL GEARS - SPRING SPAWNERS 4TVn
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0.0787	0.0941	0.107	0.1056	0.0991	0.1183	0.0991	0.0886	0.065	0.0571	0.08	0.0882	0.0789	0	0.0506	0.0587	0	0.0000
2	0.1305	0.1521	0.1537	0.1763	0.1621	0.164	0.1645	0.1704	0.1292	0.1516	0.1102	0.1716	0.1717	0.142	0.1157	0.1158	0.1456	0.0889
3	0.1651	0.1546	0.1643	0.1911	0.1792	0.165	0.1891	0.1936	0.1647	0.1805	0.1642	0.1794	0.1814	0.1586	0.1447	0.1381	0.1506	0.1296
4	0.2136	0.1849	0.2044	0.2359	0.216	0.2096	0.1997	0.219	0.2054	0.2073	0.2066	0.2075	0.2031	0.1839	0.1748	0.1686	0.1615	0.1672
5	0.2414	0.2373	0.2409	0.2966	0.2703	0.2515	0.2193	0.249	0.2497	0.2314	0.247	0.2353	0.2334	0.2195	0.2075	0.1866	0.1805	0.1873
6	0.2752	0.2502	0.2708	0.3313	0.3172	0.2675	0.2701	0.2818	0.2656	0.2716	0.2793	0.271	0.2687	0.2444	0.2387	0.2092	0.202	0.2089
7	0.3068	0.2913	0.2781	0.3357	0.3718	0.3159	0.3029	0.347	0.3203	0.2883	0.3044	0.3026	0.2777	0.2627	0.2563	0.2433	0.2267	0.2268
8	0.3046	0.3156	0.2987	0.315	0.377	0.2375	0.369	0.3705	0.3187	0.3003	0.3256	0.3096	0.2978	0.2871	0.2675	0.2684	0.2568	0.2476
9	0.3132	0.3501	0.3497	0.3787	0.3742	0	0.4429	0.5224	0.2992	0.2959	0.3624	0.3315	0.3167	0.3019	0.2972	0.3107	0.2958	0.2800
10	0.3509	0.3155	0.3704	0.3572	0.4063	0	0.3713	0	0.3159	0.2964	0.3754	0.3428	0.3327	0.3093	0.3076	0.2964	0.3013	0.3076
11+	0.3629	0.3723	0.3685	0.4082	0.446	0	0	0.3476	0.4136	0.4176	0.3841	0.3043	0.3299	0.3278	0.3265	0.3085	0.3252	0.3146
	0.2217	0.192	0.2148	0.2354	0.1926	0.1914	0.2006	0.2328	0.2282	0.2485	0.2546	0.2536	0.2364	0.2231	0.2027	0.2093	0.2019	0.2091

Table N. Catch-at-age for 4T herring spring spawners by gear type, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's

Tableau N. Prises selon l'âge pour les géniteurs de printemps dans 4T par type d'engin, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des o

FIXED GEAR - SPRING SPAWNERS 4T
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	425	0	14	10	0	0	0	0	0	59	0	0	0	53	0	0	0
2	14	198	169	394	162	248	84	330	10	271	501	0	104	65	619	6	0	0
3	5644	6922	10538	13093	23717	16174	4538	6009	3593	1684	4012	4093	2897	6293	2725	280	1817	331
4	25469	3140	6746	8353	4509	25937	13994	15844	18110	8051	8626	16434	14297	12101	30568	6477	5278	12469
5	1255	17307	2632	2688	1066	2097	8044	14353	12735	22119	11447	6223	10323	14809	11750	37705	26443	11120
6	1831	641	8501	1818	493	460	376	5198	11482	11213	15722	6114	3415	9180	7680	17143	47296	16846
7	1391	1242	1824	3363	323	102	58	1304	2932	8669	9255	7153	3074	3488	3497	6448	9030	24526
8	259	274	942	486	337	0	49	696	444	3676	7012	4491	4865	3201	1745	2676	4437	4948
9	447	136	851	454	123	0	4	61	32	516	1651	2635	2609	4764	1888	1954	1198	2003
10	1375	302	462	195	91	0	5	0	130	331	89	901	1000	2261	1888	1614	1225	1029
11+	1496	1454	699	961	571	0	0	1	205	162	530	283	265	1138	1738	2023	1599	2088
	39181	32041	33364	31819	31402	45018	27152	43796	49673	56692	58904	48327	42849	57299	64151	76326	98325	75482

MOBILE GEAR - SPRING SPAWNERS 4T
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	1421	6688	616	0	0	0	0	211	50	0	2447	332	30	0	61	1	0	0
2	14570	9040	8238	1854	716	737	91	1010	1433	183	4773	396	3245	1205	834	698	4	959
3	4931	16130	12223	1303	827	3640	287	1490	1154	397	1383	1545	2969	4574	2731	570	2611	1223
4	15957	12113	12630	137	48	993	844	1454	4070	1525	860	1920	1966	1491	4645	1917	2082	9858
5	2343	12527	5218	5	10	173	444	580	3132	4683	1235	757	1378	1089	2146	3344	5669	4529
6	4474	3329	6158	101	6	1	20	511	2369	3825	4768	2098	832	637	1181	2355	7976	5155
7	5128	1772	3528	229	4	16	0	58	719	3148	2815	4075	497	293	374	1115	1832	7435
8	1189	1672	1740	389	19	36	15	0	82	1158	2382	1659	1890	198	329	644	1833	1697
9	1314	411	1263	1	67	0	0	113	194	0	1617	1413	987	150	453	1283	558	500
10	1107	145	295	252	1	0	0	0	0	0	0	428	326	178	342	1360	326	924
11+	5596	1450	285	3	8	0	0	145	45	37	570	23	176	150	102	1621	811	1217
	58030	65277	52192	4274	1706	5596	1701	5572	13248	14956	22850	14646	14296	9965	13198	14908	23702	33497

ALL GEARS - SPRING SPAWNERS 4T
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	1421	7113	616	14	10	0	0	211	50	0	2506	332	30	0	114	1	0	0
2	14584	9238	8407	2248	878	985	175	1340	1443	454	5274	396	3349	1270	1453	704	4	1695
3	10575	23052	22761	14396	24544	19814	4825	7499	4747	2081	5395	5638	5866	10867	5456	850	4428	1445
4	41426	15253	19376	8490	4557	26930	14838	17298	22180	9576	9486	18354	16263	13592	35213	8394	7360	26478
5	3598	29834	7850	2693	1076	2270	8488	14933	15867	26802	12682	6980	11701	15898	13896	41049	32112	15847
6	6305	3970	14659	1919	499	461	396	5709	13851	15038	20490	8212	4247	9817	8861	19498	55272	22022
7	6519	3014	5350	3592	327	118	58	1362	3651	11817	12070	11228	3571	3781	3871	7563	10862	31250
8	1448	1946	2682	875	356	36	64	696	526	4834	9394	6150	6755	3399	2074	3320	6270	6533
9	1761	547	2114	455	190	0	4	174	226	516	3268	4048	3596	4914	2341	3237	1756	2549
10	2482	447	757	447	92	0	5	0	130	331	89	1329	1326	2439	2230	2974	1551	1843
11+	7092	2904	984	964	579	0	0	146	250	199	1100	306	441	1288	1840	3644	2410	3345
	97211	97318	85556	36093	33108	50614	28853	49368	62921	71648	81754	62973	57145	67265	77349	91234	122025	108979

Table O. Weights-at-age (kg) for 4T herring spring spawners by gear type, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by Mc

Tableau O. Poids selon l'âge (kg) pour les géniteurs de printemps dans 4T par type d'engin, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques d

FIXED GEAR - SPRING SPAWNERS 4T
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0195	0	0.1005	0.0366	0	0	0	0	0	0.0379	0	0	0	0.0501	0	0	0.0000
2	0.1418	0.1608	0.1816	0.1397	0.1953	0.1721	0.0933	0.2132	0.1073	0.1513	0.0798	0	0.1495	0.1483	0.1111	0.124	0	0.0000
3	0.1478	0.1698	0.1674	0.1834	0.1745	0.1554	0.1764	0.1836	0.1603	0.188	0.1605	0.1658	0.1599	0.1452	0.1421	0.1405	0.1494	0.1242
4	0.1888	0.2139	0.1861	0.2358	0.2105	0.2084	0.1957	0.2161	0.1959	0.1959	0.2031	0.2019	0.1957	0.1812	0.171	0.1667	0.1546	0.1597
5	0.2109	0.2291	0.2284	0.2848	0.264	0.2423	0.2137	0.2456	0.2419	0.2175	0.2402	0.2315	0.2242	0.2182	0.2002	0.1864	0.1773	0.1830
6	0.2562	0.2441	0.2691	0.3269	0.3171	0.2675	0.2683	0.2789	0.2561	0.252	0.2662	0.2552	0.2584	0.2437	0.2309	0.2069	0.1985	0.2037
7	0.3221	0.3046	0.3067	0.3362	0.3717	0.3269	0.3029	0.3499	0.3194	0.2705	0.2875	0.2807	0.264	0.2576	0.2537	0.2395	0.2183	0.2200
8	0.3076	0.3362	0.3319	0.3393	0.3794	0	0.3843	0.3705	0.3392	0.2781	0.3038	0.2939	0.2885	0.2855	0.2601	0.2505	0.2567	0.2397
9	0.3114	0.343	0.3678	0.3787	0.4026	0	0.4429	0.4001	0.3486	0.2959	0.3233	0.3124	0.306	0.2992	0.2886	0.2747	0.2942	0.2768
10	0.3308	0.3174	0.363	0.3986	0.406	0	0.3713	0	0.3159	0.2964	0.3754	0.3238	0.3072	0.3041	0.3015	0.2864	0.2944	0.2847
11+	0.3671	0.3529	0.3731	0.4082	0.446	0	0	0.4913	0.4181	0.3913	0.3387	0.2978	0.3306	0.3208	0.3198	0.2949	0.3212	0.3190
	0.2054	0.2227	0.2264	0.2428	0.1957	0.1916	0.1991	0.2354	0.2289	0.2338	0.2531	0.2385	0.2306	0.2247	0.1999	0.2031	0.1983	0.2069

MOBILE GEAR - SPRING SPAWNERS 4T
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0.079	0.0967	0.1054	0	0	0	0	0.0859	0.0866	0	0.081	0.0882	0.079	0	0.0511	0.0609	0	0.0000
2	0.1281	0.151	0.1525	0.1749	0.14	0.1432	0.1385	0.1583	0.1349	0.1893	0.1128	0.1716	0.1734	0.1483	0.1183	0.1167	0.0974	0.0882
3	0.1725	0.1475	0.1579	0.214	0.2127	0.1843	0.1872	0.2033	0.2102	0.1961	0.1733	0.2178	0.1957	0.1782	0.147	0.1358	0.1516	0.1310
4	0.2514	0.1774	0.2134	0.2389	0.2436	0.2159	0.2217	0.2319	0.2525	0.2733	0.2433	0.2586	0.2442	0.2076	0.1994	0.1737	0.1761	0.1764
5	0.2462	0.2486	0.2455	0.2698	0.2744	0.2812	0.2529	0.286	0.2816	0.2972	0.3109	0.2691	0.2791	0.2351	0.244	0.187	0.1957	0.1975
6	0.2733	0.2412	0.2681	0.4102	0.3241	0.2731	0.3031	0.3112	0.3159	0.3299	0.3226	0.3166	0.3063	0.2545	0.2627	0.2192	0.2218	0.2255
7	0.3026	0.282	0.2633	0.3286	0.3796	0.2455	0	0.2824	0.3241	0.3375	0.3603	0.341	0.3444	0.3196	0.2805	0.2583	0.2608	0.2491
8	0.2984	0.3122	0.2786	0.2846	0.3337	0.2375	0.3189	0	0.3392	0.3713	0.3889	0.3543	0.3222	0.3406	0.3068	0.3287	0.2571	0.2706
9	0.3121	0.3525	0.3357	0.3839	0.3221	0	0	0.5884	0.291	0	0.4024	0.3671	0.3427	0.3445	0.3332	0.3655	0.2993	0.2925
10	0.3759	0.3115	0.382	0.3251	0.4328	0	0	0	0	0	0	0.3829	0.4084	0.3477	0.3412	0.3082	0.3274	0.3331
11+	0.3614	0.3917	0.343	0.4081	0.4472	0	0	0.3466	0.3933	0.5328	0.4281	0.3838	0.3288	0.3797	0.3457	0.3254	0.333	0.3072
	0.2308	0.1875	0.2094	0.2218	0.1911	0.188	0.2214	0.229	0.2592	0.3139	0.2601	0.305	0.2501	0.206	0.21	0.238	0.2166	0.2144

ALL GEARS - SPRING SPAWNERS 4T
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0.079	0.0921	0.1054	0.1005	0.0366	0	0	0.0859	0.0866	0	0.08	0.0882	0.079	0	0.0506	0.0609	0	0.0000
2	0.1281	0.1512	0.1531	0.1687	0.1502	0.1505	0.1168	0.1718	0.1347	0.1666	0.1097	0.1716	0.1727	0.1483	0.1152	0.1168	0.0974	0.0882
3	0.1593	0.1542	0.1623	0.1862	0.1758	0.1607	0.177	0.1875	0.1724	0.1895	0.1638	0.18	0.178	0.1591	0.1446	0.1373	0.1507	0.1296
4	0.2129	0.1849	0.2039	0.2359	0.2108	0.2087	0.1972	0.2174	0.2063	0.2082	0.2067	0.2078	0.2016	0.1841	0.1747	0.1683	0.1607	0.1671
5	0.2339	0.2373	0.2398	0.2848	0.2641	0.2453	0.2158	0.2472	0.2497	0.2314	0.2471	0.2356	0.2307	0.2194	0.207	0.1864	0.1805	0.1872
6	0.2683	0.2417	0.2687	0.3313	0.3172	0.2675	0.2701	0.2818	0.2663	0.2718	0.2793	0.2709	0.2678	0.2444	0.2351	0.2084	0.2019	0.2088
7	0.3068	0.2913	0.2781	0.3357	0.3718	0.3159	0.3029	0.347	0.3203	0.2883	0.3045	0.3026	0.2752	0.2624	0.2563	0.2423	0.2255	0.2268
8	0.3	0.3156	0.2973	0.315	0.377	0.2375	0.369	0.3705	0.3392	0.3004	0.3254	0.3102	0.2979	0.2887	0.2675	0.2657	0.2568	0.2476
9	0.3119	0.3501	0.3486	0.3787	0.3742	0	0.4429	0.5224	0.2992	0.2959	0.3624	0.3315	0.3161	0.3006	0.2972	0.3107	0.2958	0.2799
10	0.3509	0.3155	0.3704	0.3572	0.4063	0	0.3713	0	0.3159	0.2964	0.3754	0.3428	0.3321	0.3073	0.3076	0.2964	0.3013	0.3076
11+	0.3626	0.3723	0.3644	0.4082	0.446	0	0	0.3476	0.4136	0.4176	0.3841	0.3043	0.3299	0.3277	0.3212	0.3085	0.3252	0.3146
	0.2206	0.1991	0.216	0.2403	0.1955	0.1912	0.2004	0.2347	0.2353	0.2505	0.2551	0.2539	0.2355	0.2219	0.2016	0.2088	0.2019	0.2092

Table P. Catch-at-age for spring-spawning herring caught in NAFO unit areas 4Tm, 4Tn, and 4To, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (sta

Tableau P. Prises selon l'âge pour les géniteurs de printemps capturés dans les sous-divisions de l'OPANO 4Tm, 4Tn et 4To, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7

FIXED GEAR - SPRING SPAWNERS 4Tm,n,o
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	10	99	91	132	6	3	6	10	118	17	0	97	65	0	6	0	0
3	1147	1297	3329	1594	3708	7724	832	2044	1088	1014	741	852	366	441	72	40	2	297
4	4839	509	589	920	2157	2824	1478	4244	5113	2983	3650	1866	1864	1545	2522	1028	29	492
5	171	3190	371	241	198	466	752	3949	5339	8047	6362	2551	1580	1337	3536	4737	169	385
6	15	119	3085	241	106	45	92	1748	3497	5428	9251	2437	1267	1284	1748	5501	2715	1930
7	29	132	357	1061	50	0	43	873	1805	5277	5892	3698	1278	960	1264	2364	2745	2089
8	10	24	70	82	92	0	36	510	267	2317	4834	2571	2090	815	876	1099	1168	914
9	0	0	120	50	19	0	2	0	2	364	1377	1671	1282	1392	1177	1021	634	664
10	293	35	0	23	28	0	0	0	61	122	38	825	443	920	1125	965	559	529
11+	35	55	0	16	16	0	0	0	182	104	521	265	169	550	1048	1310	904	821
	6539	5371	8020	4327	6506	11065	3238	13374	17364	25774	32683	16736	10434	9308	13368	18071	8926	8120

MOBILE GEAR - SPRING SPAWNERS 4Tm,n,o
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	6282	0	0	0	0	0	211	50	0	2419	332	30	0	61	1	0	0
2	2038	7253	0	25	713	28	86	1010	1430	182	4719	396	3245	1205	834	698	4	710
3	1579	1313	0	18	824	140	270	1490	1152	395	1367	1545	2969	4574	1092	453	1584	624
4	12071	419	0	2	48	37	796	1454	4062	1516	850	1920	1966	1491	3508	1601	1088	7607
5	1368	5489	0	0	10	7	418	580	3126	4656	1221	757	1378	1089	1375	1691	1101	4054
6	2608	1406	0	1	6	0	19	511	2364	3803	4714	2098	832	637	752	710	3242	4581
7	2300	1019	0	3	4	1	0	58	718	3129	2783	4075	497	293	157	493	662	6465
8	609	635	0	5	19	1	14	0	82	1151	2355	1659	1890	198	120	84	268	1223
9	593	130	0	0	67	0	0	113	194	0	1599	1413	987	150	301	35	191	123
10	893	67	0	3	1	0	0	0	0	0	0	428	326	178	323	634	90	440
11+	2369	432	0	0	8	0	0	145	45	37	564	23	176	150	94	410	174	759
	26428	24445	0	57	1700	214	1603	5572	13223	14869	22591	14648	14296	9965	8617	6810	8405	26586

ALL GEARS - SPRING SPAWNERS 4Tm,n,o
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	6282	0	8	0	0	0	211	50	0	2419	332	30	0	61	1	0	0
2	2038	7263	99	116	845	34	89	1016	1440	300	4736	396	3342	1270	834	704	4	710
3	2726	2610	3329	1612	4532	7864	1102	3534	2240	1409	2108	2397	3335	5015	1164	493	1586	921
4	16910	928	589	922	2205	2861	2274	5698	9175	4499	4500	3786	3830	3036	6030	2629	1117	8099
5	1539	8679	371	241	208	473	1170	4529	8465	12703	7583	3308	2958	2426	4911	6428	1270	4438
6	2623	1525	3085	242	112	45	111	2259	5861	9231	13965	4535	2099	1921	2500	6211	5957	6510
7	2329	1151	357	1064	54	1	43	931	2523	8406	8675	7773	1775	1253	1421	2857	3407	8554
8	619	659	70	87	111	1	50	510	349	3468	7189	4230	3980	1013	996	1183	1436	2137
9	593	130	120	50	86	0	2	113	196	364	2976	3084	2269	1542	1478	1056	825	787
10	1186	102	0	26	29	0	0	0	61	122	38	1253	769	1098	1448	1599	649	970
11+	2404	487	0	16	24	0	0	145	227	141	1085	288	345	700	1142	1720	1078	1580
	32967	29816	8020	4384	8206	11279	4841	18946	30587	40643	55274	31382	24732	19274	21985	24881	17329	34706

Table Q. Weights-at-age (kg) for spring-spawning herring caught in NAFO unit areas 4Tm, 4Tn, and 4To, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fi

Tableau Q. Poids selon l'âge (kg) pour les géniteurs de printemps capturés dans les sous-divisions de l'OPANO 4Tm, 4Tn et 4To, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6

FIXED GEAR - SPRING SPAWNERS 4Tm,n,o
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	0	0.144	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0.1758	0.179	0.1877	0.2089	0.1868	0.1554	0.1785	0.1073	0.2204	0.1576	0	0.1495	0.1483	0	0.124	0	0
3	0.1548	0.1742	0.1646	0.1989	0.1851	0.1381	0.2057	0.1971	0.2101	0.2064	0.1871	0.1901	0.1858	0.1716	0.1336	0.1706	0.1188	0.1236
4	0.1836	0.2172	0.2025	0.238	0.22	0.2015	0.2085	0.2585	0.2333	0.2128	0.2249	0.212	0.2167	0.1849	0.1835	0.1954	0.1585	0.1723
5	0.202	0.2344	0.2579	0.2733	0.2726	0.2735	0.2227	0.2972	0.2678	0.231	0.2553	0.241	0.2408	0.2192	0.2035	0.1917	0.1773	0.1872
6	0.3098	0.2214	0.2611	0.3107	0.2917	0.2166	0.3039	0.3303	0.2768	0.2679	0.2723	0.2626	0.2909	0.2383	0.2263	0.2173	0.2076	0.2172
7	0.3481	0.2993	0.3337	0.3288	0.3286	0	0.3021	0.3749	0.337	0.2781	0.2923	0.2844	0.2812	0.2599	0.2493	0.2409	0.2256	0.2161
8	0.2285	0.3459	0.2998	0.3262	0.3185	0	0.3857	0.3879	0.3451	0.2866	0.306	0.2982	0.3	0.2736	0.2731	0.2495	0.2751	0.2398
9	0	0	0.3665	0.3443	0.3447	0	0.4875	0	0.4518	0.2909	0.3232	0.3111	0.3181	0.2896	0.2878	0.2698	0.2954	0.2314
10	0.3441	0.3057	0	0.3751	0.3471	0	0.3733	0	0.3233	0.3195	0.4114	0.3222	0.3076	0.2976	0.304	0.281	0.295	0.2401
11+	0.3897	0.3382	0	0.4224	0.4051	0	0	0	0.4225	0.4192	0.3344	0.2928	0.3177	0.308	0.3254	0.2818	0.3156	0.2589
	0.1884	0.2215	0.2207	0.255	0.2062	0.1603	0.2171	0.2824	0.266	0.2523	0.2736	0.2685	0.2702	0.2459	0.2367	0.2253	0.2439	0.2188

MOBILE GEAR - SPRING SPAWNERS 4Tm,n,o
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.1005	0	0	0.0366	0	0	0.0859	0.0866	0	0.081	0.0882	0.079	0	0.0511	0.0609	0	0.0000
2	0.188	0.1727	0	0.1749	0.14	0.1432	0.1385	0.1583	0.1349	0.1893	0.1128	0.1716	0.1734	0.1483	0.1183	0.1167	0.0974	0.1014
3	0.208	0.2286	0	0.2143	0.2127	0.1843	0.1874	0.2033	0.2102	0.1961	0.1733	0.2178	0.1957	0.1782	0.1479	0.1454	0.1557	0.1399
4	0.2585	0.2627	0	0.2402	0.2436	0.2161	0.2218	0.2319	0.2525	0.2733	0.2433	0.2586	0.2442	0.2076	0.1988	0.1761	0.1872	0.1807
5	0.2453	0.293	0	0	0.2744	0.2819	0.2531	0.286	0.2816	0.2972	0.3109	0.2691	0.2791	0.2351	0.2399	0.1865	0.2079	0.2001
6	0.2707	0.2457	0	0.4132	0.3241	0	0.3031	0.3112	0.3159	0.3299	0.3226	0.3166	0.3063	0.2545	0.26	0.2195	0.2375	0.2249
7	0.3038	0.2805	0	0.3282	0.3796	0.2448	0	0.2824	0.3241	0.3375	0.3603	0.341	0.3444	0.3196	0.2913	0.2598	0.2623	0.2550
8	0.2898	0.2711	0	0.2844	0.3337	0.2375	0.3189	0	0.3392	0.3713	0.3889	0.3543	0.3222	0.3406	0.3219	0.3326	0.3012	0.2668
9	0.3129	0.3073	0	0	0.3221	0	0	0.5884	0.291	0	0.4024	0.3671	0.3427	0.3445	0.3427	0.3651	0.2806	0.3172
10	0.3918	0.3053	0	0.3249	0.4328	0	0	0	0	0	0	0.3829	0.4084	0.3477	0.3417	0.2807	0.3563	0.3570
11+	0.3603	0.4359	0	0	0.4472	0	0	0.3466	0.3933	0.5328	0.4281	0.3838	0.3288	0.3797	0.3413	0.3034	0.3277	0.3000
	0.2701	0.2027	0	0.2194	0.1911	0.1881	0.2215	0.229	0.2592	0.3139	0.2601	0.305	0.2501	0.206	0.2107	0.2014	0.2197	0.2172

ALL GEARS - SPRING SPAWNERS 4Tm,n,o
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.1005	0	0.144	0	0	0	0.0859	0.0866	0	0.081	0.0882	0.079	0	0.0511	0.0609	0	0.0000
2	0.188	0.1727	0.179	0.1849	0.1508	0.1509	0.1391	0.1584	0.1347	0.2015	0.113	0.1716	0.1727	0.1483	0.1183	0.1168	0.0974	0.1014
3	0.1856	0.2016	0.1646	0.1991	0.1901	0.1389	0.2012	0.1997	0.2102	0.2035	0.1782	0.208	0.1946	0.1776	0.147	0.1474	0.1557	0.1346
4	0.2371	0.2377	0.2025	0.238	0.2205	0.2017	0.2132	0.2517	0.2418	0.2332	0.2284	0.2356	0.2308	0.196	0.1924	0.1836	0.1865	0.1802
5	0.2405	0.2715	0.2579	0.2733	0.2727	0.2736	0.2336	0.2958	0.2729	0.2553	0.2643	0.2474	0.2586	0.2263	0.2137	0.1903	0.2038	0.1990
6	0.2709	0.2438	0.2611	0.3111	0.2934	0.2166	0.3038	0.326	0.2926	0.2934	0.2893	0.2876	0.297	0.2437	0.2364	0.2176	0.2239	0.2226
7	0.3044	0.2827	0.3337	0.3288	0.3324	0.2448	0.3021	0.3691	0.3333	0.3002	0.3141	0.3141	0.2989	0.2739	0.2539	0.2442	0.2327	0.2455
8	0.2888	0.2738	0.2998	0.3238	0.3211	0.2375	0.367	0.3879	0.3437	0.3147	0.3332	0.3202	0.3105	0.2867	0.279	0.2554	0.28	0.2553
9	0.3129	0.3073	0.3665	0.3443	0.3271	0	0.4875	0.5884	0.2926	0.2909	0.3658	0.3368	0.3288	0.2949	0.299	0.273	0.292	0.2448
10	0.38	0.3054	0	0.3693	0.3501	0	0	0	0.3233	0.3195	0.4114	0.3429	0.3503	0.3057	0.3124	0.2809	0.3035	0.2932
11+	0.3607	0.4249	0	0.4224	0.4191	0	0	0.3466	0.4167	0.449	0.3831	0.3001	0.3234	0.3234	0.3267	0.2869	0.3176	0.2786
	0.2539	0.2061	0.2207	0.2545	0.2031	0.1609	0.2186	0.2667	0.263	0.2749	0.2681	0.2855	0.2586	0.2253	0.2265	0.2188	0.2322	0.2176

Table R. Catch-at-age for spring-spawning herring caught in NAFO unit area 4TI, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) an

Tableau R. Prises selon l'âge pour les géniteurs de printemps capturés dans la sous-division de l'OPANO 4TI, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les c

FIXED GEAR - SPRING SPAWNERS 4TI
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4TI

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	319	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	144	0	247	0	211	0	129	0	0	14	0	7	0	0	0	0	0
3	4155	5409	6728	8441	15201	6228	2871	2766	2212	4	819	885	1241	2947	340	149	761	0
4	19229	2219	5318	4926	1369	16759	11055	7215	9234	1674	2544	3108	5313	7765	18270	2892	3005	5546
5	930	12615	1508	1150	169	1194	6616	6573	2804	11035	3490	1045	1979	7958	6104	19146	10110	4087
6	1333	367	3531	585	0	300	174	2514	3754	2764	5039	1188	931	3339	2687	6638	24567	7489
7	1139	608	762	1136	0	74	4	0	141	1340	2446	2092	698	1386	1318	1327	3316	15660
8	85	111	278	179	0	0	4	0	0	605	1335	542	1898	1740	472	675	1114	2066
9	360	0	90	96	0	0	0	0	0	62	88	210	372	2405	461	318	230	340
10	463	160	32	49	0	0	3	0	59	5	22	48	72	801	578	348	211	72
11+	753	254	23	231	0	0	0	0	0	0	3	2	23	205	228	272	240	216
	28447	22206	18270	17040	16739	24766	20727	19197	18204	17489	15800	9120	12534	28546	30458	31765	43554	35476

MOBILE GEAR - SPRING SPAWNERS 4TI
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4TI

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	180	87	165	4	3	691	5	0	0	0	0	0	0	0	0	0	0	0
3	1224	0	83	3	3	3411	15	0	0	0	0	0	0	0	0	0	0	0
4	1791	0	27	0	0	932	45	0	0	1	0	0	0	0	0	0	0	0
5	91	500	15	0	0	162	24	0	0	4	0	0	0	0	0	0	0	0
6	167	200	94	0	0	1	1	0	0	3	0	0	0	0	0	0	0	0
7	60	130	68	0	0	15	0	0	0	3	0	0	0	0	0	0	0	0
8	0	0	31	1	0	34	1	0	0	1	0	0	0	0	0	0	0	0
9	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11+	151	34	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3664	951	523	8	6	5246	91	0	0	12	0	0	0	0	0	0	0	0

ALL GEARS - SPRING SPAWNERS 4TI
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4TI

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	319	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	180	231	165	251	3	902	5	129	0	0	14	0	7	0	0	0	0	0
3	5379	5409	6811	8444	15204	9639	2886	2766	2212	4	819	885	1241	2947	340	149	761	0
4	21020	2219	5345	4926	1369	17691	11100	7215	9234	1675	2544	3108	5313	7765	18270	2892	3005	5546
5	1021	13115	1523	1150	169	1356	6640	6573	2804	11039	3490	1045	1979	7958	6104	19146	10110	4087
6	1500	567	3625	585	0	301	175	2514	3754	2767	5039	1188	931	3339	2687	6638	24567	7489
7	1199	738	830	1136	0	89	4	0	141	1343	2446	2092	698	1386	1318	1327	3316	15660
8	85	111	309	180	0	34	5	0	0	606	1335	542	1898	1740	472	675	1114	2066
9	360	0	107	96	0	0	0	0	0	62	88	210	372	2405	461	318	230	340
10	463	160	36	49	0	0	3	0	59	5	22	48	72	801	578	348	211	72
11+	904	288	27	231	0	0	0	0	0	0	3	2	23	205	228	272	240	216
	32111	23157	18793	17048	16745	30012	20818	19197	18204	17501	15800	9120	12534	28546	30458	31765	43554	35476

Table S. Weights-at-age (kg) for spring-spawning herring caught in NAFO unit area 4Tl, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 an

Tableau S. Poids selon l'âge (kg) pour les géniteurs de printemps capturés dans la sous-division de l'OPANO 4Tl, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon l

FIXED GEAR - SPRING SPAWNERS 4Tl
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4Tl

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0195	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0.1652	0	0.1253	0	0.1718	0	0.1506	0	0	0.1631	0	0.1499	0	0	0	0	0
3	0.1458	0.1694	0.1674	0.181	0.1677	0.1718	0.1691	0.1715	0.134	0.1322	0.1553	0.1493	0.1501	0.1431	0.1646	0.1309	0.1238	0
4	0.1894	0.215	0.1813	0.2378	0.1837	0.2092	0.1926	0.1912	0.1687	0.1828	0.1993	0.1913	0.1968	0.1805	0.1712	0.16	0.1576	0.1569
5	0.2077	0.2259	0.2138	0.2834	0.2105	0.2343	0.2118	0.2151	0.2156	0.209	0.2297	0.2136	0.2326	0.2189	0.1977	0.1869	0.1773	0.1733
6	0.2473	0.237	0.2669	0.308	0	0.2731	0.2676	0.2448	0.2319	0.2287	0.2597	0.237	0.2486	0.2417	0.2287	0.1986	0.1982	0.1953
7	0.3267	0.2993	0.2848	0.3265	0	0.3269	0.311	0	0.3021	0.2479	0.2786	0.2713	0.2755	0.241	0.2566	0.2407	0.2137	0.2164
8	0.3106	0.3459	0.3245	0.3066	0	0	0.3465	0	0	0.2532	0.2992	0.2951	0.2808	0.2904	0.2388	0.2486	0.258	0.2348
9	0.307	0	0.4681	0.3801	0	0	0	0	0	0.2702	0.2997	0.3075	0.3076	0.2976	0.2864	0.2749	0.2684	0.2652
10	0.3292	0.3057	0.3448	0.4113	0	0	0.3733	0	0.2897	0.326	0.3448	0.3373	0.3176	0.3014	0.2943	0.2907	0.2951	0.2933
11+	0.3738	0.3382	0.3996	0.4074	0	0	0	0	0	0	0.5046	0.3458	0.3288	0.3291	0.3011	0.3033	0.3069	0.2989
	0.2008	0.2123	0.2039	0.2238	0.1694	0.2018	0.1962	0.2033	0.1862	0.2143	0.2445	0.2237	0.223	0.2185	0.1913	0.1932	0.1934	0.1999

MOBILE GEAR - SPRING SPAWNERS 4Tl
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4Tl

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0	0.1054	0	0	0	0	0	0	0	0.081	0	0	0	0	0	0	0
2	0.1763	0.1763	0.1625	0.1749	0.14	0.1432	0.1385	0	0	0.1893	0.1128	0	0	0	0	0	0	0
3	0.1856	0	0.1914	0.2143	0.215	0.1843	0.187	0	0	0.1961	0.1733	0	0	0	0	0	0	0
4	0.2336	0	0.222	0.2402	0.2507	0.2159	0.221	0	0	0.2733	0.2433	0	0	0	0	0	0	0
5	0.2105	0.2963	0.2654	0	0	0.2812	0.2519	0	0	0.2972	0.3109	0	0	0	0	0	0	0
6	0.2781	0.2847	0.2667	0.4132	0	0.2731	0.3025	0	0	0.3299	0.3226	0	0	0	0	0	0	0
7	0.2921	0.3538	0.2555	0.3282	0	0.2455	0	0	0	0.3375	0.3603	0	0	0	0	0	0	0
8	0	0	0.2643	0.2844	0.317	0.2375	0.3189	0	0	0.3713	0.3889	0	0	0	0	0	0	0
9	0	0	0.3018	0	0.32	0	0	0	0	0	0.4024	0	0	0	0	0	0	0
10	0	0	0.3896	0.3249	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11+	0.4332	0.4129	0.3058	0	0	0	0	0	0	0.5328	0.4281	0	0	0	0	0	0	0
	0.2254	0.2949	0.2157	0.2034	0.1775	0.188	0.221	0	0	0.3196	0	0	0	0	0	0	0	0

ALL GEARS - SPRING SPAWNERS 4Tl
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4Tl

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0195	0.1054	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0.1763	0.1694	0.1625	0.1261	0.14	0.1499	0.1385	0.1506	0	0	0.1631	0	0.1499	0	0	0	0	0
3	0.1549	0.1694	0.1677	0.181	0.1677	0.1762	0.1692	0.1715	0.134	0.1322	0.1553	0.1493	0.1501	0.1431	0.1646	0.1309	0.1238	0
4	0.1932	0.215	0.1815	0.2378	0.1837	0.2096	0.1927	0.1912	0.1687	0.1829	0.1993	0.1913	0.1968	0.1805	0.1712	0.16	0.1576	0.1569
5	0.2079	0.2286	0.2143	0.2834	0.2105	0.2399	0.2119	0.2151	0.2156	0.209	0.2297	0.2136	0.2326	0.2189	0.1977	0.1869	0.1773	0.1733
6	0.2507	0.2538	0.2669	0.308	0	0.2731	0.2678	0.2448	0.2319	0.2288	0.2597	0.237	0.2486	0.2417	0.2287	0.1986	0.1982	0.1953
7	0.325	0.3089	0.2824	0.3265	0	0.3132	0.311	0	0.3021	0.2481	0.2786	0.2713	0.2755	0.241	0.2566	0.2407	0.2137	0.2164
8	0.3106	0.3459	0.3185	0.3065	0	0.2375	0.341	0	0	0.2534	0.2992	0.2951	0.2808	0.2904	0.2388	0.2486	0.258	0.2348
9	0.307	0	0.4417	0.3801	0	0	0	0	0	0.2702	0.2997	0.3075	0.3076	0.2976	0.2864	0.2749	0.2684	0.2652
10	0.3292	0.3057	0.3498	0.4113	0	0	0.3733	0	0.2897	0.326	0.3448	0.3373	0.3176	0.3014	0.2943	0.2907	0.2951	0.2933
11+	0.3837	0.347	0.3857	0.4074	0	0	0	0	0	0	0.5046	0.3458	0.3288	0.3291	0.3011	0.3033	0.3069	0.2989
	0.2036	0.2157	0.2042	0.2237	0.1694	0.1994	0.1963	0.2033	0.1862	0.2144	0.2445	0.2237	0.223	0.2185	0.1913	0.1932	0.1934	0.1999

Table T. Catch-at-age for spring-spawning herring caught in NAFO unit areas 4Tf, 4Tg, 4Th, 4Tj and 4Tk, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile

Tableau T. Prises selon l'âge pour les géniteurs de printemps capturés dans les sous-divisions de l'OPANO 4Tf, 4Tg, 4Th, 4Tj et 4Tk, 1978-1995. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (sta

FIXED GEAR - SPRING SPAWNERS 4Tf,g,h,j,k
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	481	0	5	10	0	0	0	0	0	59	0	0	0	0	0	0	0
2	14	1698	70	56	30	31	81	195	0	153	470	0	0	0	0	0	0	0
3	342	14821	481	3054	4808	2222	835	1198	293	665	2452	2356	1290	2905	1852	91	1054	34
4	1402	11692	840	2508	982	6354	1461	4384	3763	3394	2432	11460	7119	2792	9524	2557	2243	6431
5	154	6512	753	1298	698	437	677	3832	4592	3037	1594	2627	6764	5514	2078	13821	16165	6648
6	483	1717	1884	992	387	114	109	936	4231	3021	1433	2490	1217	4556	3246	5004	20015	7427
7	223	618	705	1167	273	28	12	431	985	2053	916	1364	1099	1142	915	2758	2969	6777
8	163	1034	594	225	245	0	9	186	177	754	843	1378	878	646	396	902	2155	1969
9	87	280	641	308	104	0	2	61	30	91	186	754	956	967	251	615	334	999
10	619	77	430	124	62	0	2	0	10	203	29	28	486	539	185	301	455	427
11+	708	982	675	714	554	0	0	1	22	58	6	16	73	383	463	441	455	1051
	4195	39912	7073	10451	8153	9186	3188	11224	14103	13429	10420	22473	19881	19445	18910	26490	45844	31887

MOBILE GEAR - SPRING SPAWNERS 4Tf,g,h,j,k
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	1421	406	601	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0
2	12352	1700	8073	1825	0	18	0	0	3	1	54	0	0	0	0	0	0	249
3	2128	14817	12140	1282	0	89	2	0	2	2	16	0	0	0	1639	117	1027	599
4	2095	11694	12603	135	0	24	3	0	8	8	10	0	0	0	1137	316	994	2251
5	884	6538	5203	5	0	4	2	0	6	23	14	0	0	0	771	1653	4568	475
6	1699	1723	6064	100	0	0	0	0	5	19	54	0	0	0	429	1645	4734	574
7	2768	623	3458	226	0	0	0	0	1	16	32	0	0	0	217	622	1170	970
8	580	1037	1709	383	0	1	0	0	0	6	27	0	0	0	209	560	1565	474
9	721	281	1246	1	0	0	0	0	0	0	18	0	0	0	152	1248	367	377
10	214	78	291	249	0	0	0	0	0	0	0	0	0	0	19	726	236	483
11+	3076	984	281	3	0	0	0	0	0	0	6	0	0	0	8	1211	637	459
	27938	39881	51669	4209	0	136	7	0	25	75	259	0	0	0	4581	8098	15298	6911

ALL GEARS - SPRING SPAWNERS 4Tf,g,h,j,k
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	1421	887	601	5	10	0	0	0	0	0	87	0	0	0	0	0	0	0
2	12366	3398	8143	1881	30	49	81	195	3	154	524	0	0	0	0	0	0	249
3	2470	29638	12621	4336	4808	2311	837	1198	295	667	2468	2356	1290	2905	3491	208	2081	632
4	3497	23386	13443	2643	982	6378	1464	4384	3771	3402	2442	11460	7119	2792	10661	2873	3237	8683
5	1038	13050	5956	1303	698	441	679	3832	4598	3060	1608	2627	6764	5514	2849	15474	20733	7123
6	2182	3440	7948	1092	387	114	109	936	4236	3040	1487	2490	1217	4556	3675	6649	24749	8002
7	2991	1241	4163	1393	273	28	12	431	986	2069	948	1364	1099	1142	1132	3380	4139	7747
8	743	2071	2303	608	245	1	9	186	177	760	870	1378	878	646	605	1462	3720	2443
9	808	561	1887	309	104	0	2	61	30	91	204	754	956	967	403	1863	701	1376
10	833	155	721	373	62	0	2	0	10	203	29	28	486	539	204	1027	691	910
11+	3784	1966	956	717	554	0	0	1	22	58	12	16	73	383	471	1652	1092	1510
	32133	79793	58742	14660	8153	9322	3195	11224	14128	13504	10679	22473	19882	19444	23491	34588	61143	38797

Table U. Weights-at-age (kg) for spring-spawning herring caught in NAFO unit areas 4Tf, 4Tg, 4Th, 4Tj and 4Tk, 1978-1995. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juv

Tableau U. Poids selon l'âge (kg) pour les géniteurs de printemps capturés dans les sous-divisions de l'OPANO 4Tf, 4Tg, 4Th, 4Tj et 4Tk, 1978-1995. La s saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisé

FIXED GEAR - SPRING SPAWNERS 4Tf,g,h,j,k
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0	0.0307	0	0.0297	0.0366	0	0	0	0	0	0.0379	0	.		0	0	.	0
2	0.1418	0.0568	0.1853	0.1247	0.1352	0.1716	0.091	0.2557	0	0.0981	0.0745	0	.		0	0	.	0
3	0.1497	0.1403	0.1865	0.1821	0	0.1699	0.1722	0.1888	0.1734	0.1603	0.1542	0.1632	0.1619	0.1433	0.141	0.1431	0.1679	0.1297
4	0.1989	0.1743	0.2055	0.2311	0.2272	0.2092	0.2059	0.2159	0.212	0.1875	0.1743	0.2031	0.1894	0.181	0.1679	0.1627	0.1504	0.1611
5	0.2403	0.2074	0.2431	0.2882	0.2744	0.231	0.2218	0.2447	0.2278	0.2129	0.2031	0.2295	0.2179	0.217	0.2026	0.1888	0.1772	0.1887
6	0.2788	0.2323	0.2864	0.3419	0.3241	0.2731	0.2392	0.2746	0.2604	0.2446	0.2499	0.2566	0.2321	0.2467	0.2353	0.2064	0.1975	0.2087
7	0.2949	0.2694	0.3167	0.3524	0.3796	0.3269	0.3032	0.2992	0.2895	0.2657	0.28	0.2851	0.2368	0.2757	0.2554	0.2378	0.2166	0.2294
8	0.3107	0.3375	0.3391	0.3702	0.4022	0	0.3936	0.3229	0.3302	0.2721	0.2991	0.2855	0.278	0.2873	0.2567	0.2533	0.2461	0.2447
9	0.3294	0.3735	0.3539	0.3839	0.4133	0	0.414	0.4001	0.3404	0.3333	0.3352	0.3168	0.2892	0.3168	0.2967	0.2828	0.3096	0.3109
10	0.3256	0.3168	0.3644	0.3978	0.4328	0	0.3668	0	0.422	0.2818	0.3522	0.3471	0.3054	0.3193	0.3085	0.2985	0.2933	0.3385
11+	0.3598	0.3714	0.3722	0.4081	0.4472	0	0	0.4913	0.383	0.3409	0.4621	0.3757	0.361	0.3348	0.3162	0.3288	0.3398	0.3701
	0.2634	0.1751	0.2909	0.2688	0.1305	0.2018	0.1998	0.2344	0.2384	0.2235	0.202	0.2221	0.2147	0.2237	0.1935	0.2025	0.1941	0.2117

MOBILE GEAR - SPRING SPAWNERS 4Tf,g,h,j,k
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0.079	0.0387	0.1054	0.0297	0	0	0	0	0.0866	0	0.081	0	0	0	0	0	0	0
2	0.1175	0.0572	0.1523	0.1749	0	0.1432	0.0905	0	0.1349	0.1893	0.1128	0	0	0	0	0	0	0.0504
3	0.1386	0.1403	0.1577	0.214	0	0.1843	0.1647	0	0.2102	0.1961	0.1733	0	0	0	0.1464	0.0987	0.1453	0.1218
4	0.2254	0.1743	0.2134	0.2389	0	0.2161	0.2034	0	0.2525	0.2733	0.2433	0	0	0	0.2011	0.1617	0.164	0.1619
5	0.2512	0.2077	0.2454	0.2698	0	0.2819	0.2197	0	0.2816	0.2972	0.3109	0	0	0	0.2513	0.1875	0.1927	0.1757
6	0.2768	0.2324	0.2681	0.4102	0	0	0.2283	0	0.3159	0.3299	0.3226	0	0	0	0.2673	0.219	0.2111	0.2306
7	0.3019	0.2695	0.2635	0.3286	0	0.2448	0.3058	0	0.3241	0.3375	0.3603	0	0	0	0.2727	0.2571	0.26	0.2095
8	0.3075	0.3373	0.2789	0.2846	0	0.2375	0.4161	0	0.3392	0.3713	0.3889	0	0	0	0.2981	0.3281	0.2495	0.2804
9	0.3114	0.3734	0.3362	0.3839	0	0	0.4036	0	0.291	0	0.4024	0	0	0	0.3143	0.3655	0.3091	0.2845
10	0.3098	0.3168	0.3819	0.3251	0	0	0.3668	0	0	0	0	0	0	0	0.3327	0.3322	0.3164	0.3113
11+	0.3587	0.3715	0.3435	0.4081	0	0	0	0	0.3933	0.5328	0.4281	0	0	0	0.3973	0.3329	0.3344	0.3191
	0.1944	0.1756	0.2093	0.2219	0	0.1877	0.197	0	0.2575	0.3133	0.2594	0	0	0	0.2086	0.2688	0.2149	0.2035

ALL GEARS - SPRING SPAWNERS 4Tf,g,h,j,k
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0.079	0.0344	0.1054	0.0297	0.0366	0	0	0	0	0	0.0518	0	0	0	0	0	0	0
2	0.1175	0.057	0.1526	0.1734	0.1352	0.1612	0.091	0.2557	0.1349	0.0987	0.0784	0	0	0	0	0	0	0.0504
3	0.1401	0.1403	0.1588	0.1915	0	0.1705	0.1722	0.1888	0.1736	0.1604	0.1543	0.1632	0.1619	0.1433	0.1435	0.1181	0.1567	0.1222
4	0.2148	0.1743	0.2129	0.2315	0.2272	0.2092	0.2059	0.2159	0.2121	0.1877	0.1746	0.2031	0.1894	0.181	0.1714	0.1626	0.1546	0.1613
5	0.2496	0.2076	0.2451	0.2881	0.2744	0.2315	0.2218	0.2447	0.2279	0.2135	0.204	0.2295	0.2179	0.217	0.2158	0.1887	0.1806	0.1878
6	0.2772	0.2324	0.2724	0.3482	0.3241	0.2731	0.2392	0.2746	0.2605	0.2451	0.2525	0.2566	0.2321	0.2467	0.239	0.2095	0.2001	0.2103
7	0.3014	0.2695	0.2725	0.3485	0.3796	0.3269	0.3032	0.2992	0.2895	0.2663	0.2827	0.2851	0.2368	0.2757	0.2587	0.2414	0.2289	0.2269
8	0.3082	0.3374	0.2944	0.3163	0.4022	0.2375	0.3936	0.3229	0.3302	0.2729	0.3019	0.2855	0.278	0.2873	0.271	0.282	0.2475	0.2516
9	0.3133	0.3734	0.3422	0.3839	0.4133	0	0.414	0.4001	0.3404	0.3333	0.3411	0.3168	0.2892	0.3168	0.3033	0.3382	0.3093	0.3037
10	0.3215	0.3168	0.3715	0.3493	0.4328	0	0.3668	0	0.422	0.2818	0.3522	0.3471	0.3054	0.3193	0.3108	0.3223	0.3012	0.3241
11+	0.3589	0.3715	0.3638	0.4081	0.4472	0	0	0.4913	0.383	0.3409	0.4451	0.3757	0.361	0.3348	0.3176	0.3318	0.3367	0.3546
	0.2034	0.1753	0.2191	0.2554	0.1305	0.2016	0.1998	0.2344	0.2385	0.224	0.2034	0.2221	0.2147	0.2237	0.1964	0.218	0.1993	0.2102

Table V. Weights-at-age (kg) for spring spawners caught by purse seines in 4Vn, 1978-1995. Spawning-group affinity for 1978-1991 assigned by gonad maturity for ripe, spawning and spent fish (stages 5, 6 and 7) and otolith characteristics for al

Tableau V. Poids selon l'âge (kg) pour les géniteurs de printemps capturés à l'aide de sennes coulissantes dans 4Vn, 1978-1995. De 1978 à 1991, la saison de frai est classée selon la maturité des gonades pour les poissons mûrs, en état de f

SPRING SPAWNERS 4Vn
GÉNITEURS DE PRINTEMPS 4Vn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	58	5679	349	595	1525	302	522	615	117	73	0	0	8	0	0	16	0	0
2	809	5007	2614	2829	3074	3383	1759	953	929	226	214	0	218	167	28	43	35	36
3	978	383	901	1833	1994	1561	1702	1129	4064	827	132	105	552	108	11	27	474	13
4	358	0	143	0	667	526	636	636	1466	441	145	180	608	990	74	51	187	289
5	330	0	117	438	362	289	371	418	0	0	127	99	701	289	182	176	138	104
6	455	298	277	0	0	0	0	0	265	64	0	219	333	134	573	265	208	113
7	0	0	0	0	0	0	0	0	0	0	59	0	218	381	0	150	183	141
8	114	0	43	0	0	0	0	0	413	67	29	109	35	1157	0	120	53	27
9	14	0	17	0	0	0	0	0	0	0	0	0	47	186	0	0	83	4
10	0	0	0	0	0	0	0	0	0	0	0	0	99	186	0	0	0	8
11+	32	0	55	0	0	0	0	0	0	0	0	0	0	194	148	0	0	20
	3148	11367	4516	5695	7622	6061	4990	3751	7254	1698	706	712	2821	3790	1016	848	1362	755

SPRING SPAWNERS 4Vn
GÉNITEURS DE PRINTEMPS 4Vn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0.0707	0.0966	0.1099	0.1057	0.0995	0.1183	0.0991	0.0895	0.0557	0.0571	0	0	0.0785	0	0	0.0586	0	0
2	0.1738	0.1538	0.1556	0.1823	0.1655	0.1679	0.1693	0.1684	0.1207	0.1214	0.123	0	0.1571	0.0941	0.1402	0.0991	0.1511	0.1079
3	0.2279	0.1809	0.2149	0.2299	0.2211	0.2198	0.2235	0.2342	0.1557	0.1579	0.1813	0.1447	0.217	0.1126	0.1785	0.1631	0.1494	0.1262
4	0.2903	0	0.2753	0	0.2517	0.2536	0.2571	0.2633	0.192	0.1878	0.1976	0.1772	0.2421	0.1807	0.2072	0.2216	0.1947	0.1774
5	0.3226	0	0.3141	0.3689	0.2889	0.3005	0.2996	0.3125	0	0	0.2415	0.2127	0.2785	0.2277	0.2433	0.2329	0.187	0.1994
6	0.3702	0.3639	0.3833	0	0	0	0	0	0.2279	0.2279	0	0.2744	0.2802	0.2448	0.2938	0.269	0.2203	0.2179
7	0	0	0	0	0	0	0	0	0	0	0.2872	0	0.3185	0.2653	0	0.2962	0.2959	0.2412
8	0.3627	0	0.3868	0	0	0	0	0	0.2926	0.2941	0.3899	0.2785	0.2791	0.2824	0	0.3421	0.2536	0.2394
9	0.4796	0	0.4831	0	0	0	0	0	0	0	0	0	0.3604	0.3349	0	0	0.2955	0.3214
10	0	0	0	0	0	0	0	0	0	0	0	0	0.3409	0.3349	0	0	0	0.3165
11+	0.433	0	0.4411	0	0	0	0	0	0	0	0	0	0	0.3287	0.3919	0	0	0.314
	0.2568	0.1316	0.1927	0.204	0.1802	0.1926	0.2013	0.2074	0.1674	0.1645	0.1952	0.2227	0.2555	0.243	0.2873	0.2579	0.203	0.2024