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2003 Evaluation of 4VWX Herring.

Évaluation des stocks de hareng dans 4VWX en 2003.

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Abstract

Fishery, sampling, acoustic survey and research survey results were compiled and used to evaluate the status of herring in the NAFO Division 4VWX area.

Landings from the SW Nova Scotia/Bay of Fundy spawning component amounted to 77,050t. Age composition of the catch contained a small fraction of fish older than the 1994 year-class (age 8). Recruiting herring from the 1998 and 2000 year-classes dominated the fishery in 2002.

Spawning stock biomass (SSB) in the SW Nova Scotia/Bay of Fundy spawning component was estimated from acoustic surveys of spawning grounds to be about 543,000t. For standard survey areas the SSB was 542,000t representing an increase over the past year. More spawning fish were documented on German Bank than in previous years. There was evidence of reappearance of spawning on the Seal Island grounds, but this area and Trinity Ledge remained well below historical levels.

The 2002 herring fishery on the Scotian Shelf banks landed 7,000t substantially less than in 2001. Catches were primarily in May and June in the vicinity of 'The Patch' as well as in the Western Hole/Roseway Bank areas. The July bottom trawl survey continued to indicate a general high abundance and widespread distribution of herring on the banks west of Sable Island, with the last 5 years the highest on record.

Changes to management and recent research efforts have improved the knowledge of the fishery in four of the coastal Nova Scotia spawning areas, but there remains the problem of a lack of biological and fishery information for much of this component. There is continued concern for the status of the Bras d'Or Lakes spawning herring.

Résumé

Nous avons compilé et utilisé les résultats de pêches, d'échantillonnages, de relevés acoustiques et de recherches pour évaluer l'état du stock de hareng dans les divisions 4VWX de l'OPANO.

Les débarquements de reproducteurs capturés dans le secteur sud-ouest de la Nouvelle-Écosse/baie de Fundy s'élevaient à 77 050 t. Les prises comprenaient une petite fraction de poissons plus vieux que la classe d'âge de 1994 (8 ans). Les harengs recrutés des classes d'âge de 1998 et de 2000 ont dominé la pêche en 2002.

D'après des relevés acoustiques réalisés sur les frayères, nous avons estimé la biomasse du stock reproducteur (BSR) du secteur sud-ouest de la Nouvelle-Écosse/baie de Fundy à environ 543 000 t. Dans les zones de relevés habituelles, la BSR était de 542 000 t, ce qui constitue une augmentation au cours de la dernière année. Nous avons observé un plus grand nombre de reproducteurs sur le banc German qu'au cours des dernières années. Nous avons également observé des signes que la reproduction aurait repris sur les frayères de l'île Seal, mais les niveaux actuels dans cette région et sur le récif de la Trinité demeurent bien en dessous des niveaux antérieurs.

La pêche du hareng 2002 sur les bancs de la plate-forme néo-écossaise a produit des débarquements de 7 000 t, ce qui est considérablement moins qu'en 2001. Les prises ont été faites surtout en mai et en juin près de la zone appelée « The Patch », de la fosse Western et du banc Roseway. Le relevé au chalut de fond de juillet a révélé une grande abondance et une vaste distribution du hareng sur les bancs situés à l'ouest de l'île de Sable. À cet égard, les cinq dernières années constituent des records.

Les modifications apportées à la gestion et les travaux de recherche récents ont permis d'améliorer nos connaissances de la pêche sur quatre frayères des côtes de la Nouvelle-Écosse, mais il manque toujours des données sur la biologie et la pêche pour la majeure partie de cette composante de reproducteurs. L'état du stock de reproducteurs du lac Bras d'Or continue de soulever des inquiétudes.

2002 Evaluation of 4VWX Herring

1) Objectives and Management

The 1999-2002 Scotia-Fundy Herring Integrated Fisheries Management Plan set out principles, conditions, and management measures for the 4VWX herring fisheries. The main principle stated in the plan was "*the conservation of the herring resource and the preservation of all of its spawning components*" (DFO 1999).

The following conservation objectives developed in 1997 (Sinclair 1997) appeared in the plan:

1) To maintain the reproductive capacity of herring in each management unit through:
- persistence of all spawning components in the management unit;
- maintenance of biomass of each spawning component above a minimum threshold;
- maintenance of a broad age composition for each spawning component; and
- maintenance of a long spawning period for each spawning component.

2) To prevent growth overfishing:
- continue to strive for fishing mortality below $F_{0.1}$

3) To maintain ecosystem integrity/ecological relationships ("ecosystem balance").

Since 1997 there has been a set of biological indicators used in decision making as follows (DFO 1997):

Biological considerations for 4WX herring fishery in-season decision making:

OBSERVATIONS	POSITIVE	NEGATIVE
Spawning time	normal	Late or early
Spawning location	Traditional areas	Not as expected
Spawning relative amount	More than in previous years	Less
Size, age composition	Broad age span with younger recruiting year classes as well	Narrow age span; missing year classes
Distribution of fish	Presence in expected areas	Missing in expected areas
Relative fish abundance	Lots of fish and good catch rates and trip success	Few fish; lack of sets; low catch rates
Fish behavior	As expected, related to fishing success and previous experience	Fish acting abnormally
Physiology / Condition	Usual feeding and fat content at appropriate times	Abnormal conditions of feed and fat for time and place
Environmental factors	Water temp, salinity, plankton abundance	Differences from previous years?

These biological indicators have been considered as evidence for performance against objectives, and it is assumed that they relate to the overall conservation objectives (Sinclair 1997) as follows:

Biological indicators as they apply to conservation objectives from Sinclair (1997).

Observation	Conservation Objective
Spawning time	1
Spawning location	1
Relative amount	1
Size and age composition	1,2
Distribution	2,3
Relative abundance	2
Behavior	2
Physiology / Condition	1,2,3
Environmental factors	3

These observations were considered and applied to the 2002 fishery as part of the overall evaluation.

An “in-season” management process, first implemented in the southwest Nova Scotia fishery during 1995, continued to be used widely within the 4VWX management area (DFO 1997, Stephenson et al 1996,1999a). The approach encouraged surveying using the commercial fleet under scientific direction prior to fishing (“survey, assess, then fish” protocol). This was to ensure that effort was distributed appropriately among various components of the stock (particularly among spawning components) according to the relative size and current state of each component. The use of this approach in recent years has improved data collection and enabled modifications to management decisions to be made with the involvement of participants and on the basis of up-to-date information.

For the purposes of evaluation and management, the 4VWX herring stock complex is divided into four components (Fig. 1):

1. SW Nova Scotia/Bay of Fundy spawning component
2. Offshore Scotian Shelf Banks spawning component
3. Coastal (South Shore, Eastern Shore and Cape Breton) spawning component
4. SW New Brunswick migrant juveniles.

The Georges Bank spawning component (Fig. 1) is not included in this evaluation except to document Canadian herring landings from that area (Table 1). This fishery is included in the Gulf of Maine stock complex and has been recently evaluated separately (DFO 2003).

Collaborative research efforts with the fishing industry have been reduced compared with recent years (Paul 1998, 1999). The Pelagics Research Council that had assisted with industry collaborations was dissolved in March 2001. Since then a major portion of the herring industry (including the purse seine sector and

major processors) formed the Herring Science Council (HSC), and some members of the fixed gear sector began forming a separate Joint Project Agreement with DFO to undertake collaborative scientific projects. The herring industry has continued to provide biological sampling and samples while the purse seine and gillnet sectors undertook key acoustic surveys.

Under the auspices of the HSC a dedicated field biologist was hired and initiatives such as tagging, summary of fleet activities (Appendix A), and analysis of acoustic records from fishing trips resumed in 2002.

In recent years, negative and mixed signals have prompted caution in establishment of the TAC and in the management of the fishery. Effort has been made to compile relevant information from areas that have received less research effort and are less well documented, particularly the coastal Nova Scotia (Clark et al 1999) and Scotian Shelf (Harris and Stephenson 1999) spawning components.

2) SW NOVA SCOTIA/BAY OF FUNDY SPAWNING COMPONENT

2.1 The Fishery

Herring fishing locations, NAFO unit areas used for catch and sample aggregation and fishing areas defined by groupings of 10 mile squares (i.e. 10 minute squares of latitude and longitude) are shown in Figures 2 to 5.

The 2002 TAC for this component was 80,000t, a slight increase of 2,000t from the previous year (Table 2, Figure 6). Eighty percent of the catch limit was initially allocated to the mobile gear sector and 20% to the fixed gear sector, as has been done historically. Some transfer of uncaught fixed gear quota to the mobile fleet occurred late in the season, which then allowed most of the TAC to be caught.

Total landings from this component for the quota year 2002-2003 (77,054t) were similar to landings of the past 4 years (Table 2). Landings by the purse seine sector (75,518t) were approximately 9,500t higher than in 2001. Landings by both gillnet (393t) and the Nova Scotia weirs (1,143t) were substantially lower than in 2001.

The temporal and spatial distribution of the purse seine fishery was generally as expected compared to the average of the last decade (Table 3-4). The largest purse seine fisheries occurred on the German Bank and Scots Bay spawning grounds, and on summer feeding fish off Long Island, N. S. and around Grand Manan (Figure 7). Catches were up on Gannet/Dry Ledge, Grand Manan and Lurcher Shoals compared to recent years. There was a 50% decrease in catch on the Long Island shore area which is attributed to market conditions and better fishing in the Grand Manan area.

During the 1970's and 1980's, a large fishery took place on over-wintering aggregations in Chedabucto Bay. In 2002, however, there was no fishing effort in this area as vessels that traditionally fished here were successfully fishing elsewhere. There was a small fishery of 370t on over-wintering herring in January 2002 off Halifax Harbour (Chebucto Head). This took place after surveying and tagging of this group which had an estimated biomass of 20,300t and mean length of 24.9cm (Melvin et al 2002).

A small gillnet fishery that took place in the traditional areas (in June on the Spectacle Buoy area and in Sept. on Trinity Ledge) landed only 393t (Table 1-2, Figure 8). There have been lower landings in the gillnet sector in recent years because of reduced effort due to lack of market and price. The reduction in effort has also been attributed to the continued success of the lucrative lobster fishery for which most gill-netters are license holders.

Catches in the Nova Scotia weirs of 1,143t were lower than in 2001 but not as poor as in 2000, which had a historic low of 702t (Table 2, Figure 9). The decrease was attributed to problems in availability of fish to this fixed stationary gear. The seasonal timing of landing by month were later than usual with peak catches in August rather than the normal of May or June seen historically (Table 5, Figure 10-12). Catches in recent years for the Nova Scotia weirs have been highly variable and not as consistent in their amount or timing as in the previous decade.

2.2 Resource Status

Acoustic Surveys

Acoustic surveys were undertaken on the major spawning areas and in some of the major fishing areas. Sonar and sounders of the purse seine and gillnet fleets were used to document the number, location and approximate size of herring schools. Data were collected during "structured surveys" (Melvin and Power 1999) and opportunistically from many fishing trips (Melvin et al 2003). Biomass estimates were made using a standard length to target strength relationship and is the method used in recent assessments (Melvin et al 2002).

In 1997 and 1998 acoustic surveys were ad hoc and followed no formal survey design. Since 1999 surveys on the main spawning components have followed a standardized survey design within predefined areas. Acoustic surveys in Scots Bay and on German Bank have occurred at regular intervals and provided good coverage of the spawning area. Consequently, the biomass estimates since 1999 likely reflect trends in abundance.

In spite of attempts to implement rigorous and consistent surveys, there have been changes that have reduced comparability. In 2001 there were six structured surveys of German Bank. In 2002 there were only two structured surveys on German Bank, and the later part of the season was documented only from ad hoc

fishing excursions. In addition, the poor survey coverage and frequency on Trinity Ledge may mean that the reduced SSB for this area reflects only survey effort and not the trend in abundance.

Acoustic surveys in 2002 documented 542,220t of spawning stock biomass (Table 6) in the standard areas. This represents a significant increase over the previous year and it allayed much of the concern over the large decline in SSB for German Bank that was observed in 2001 (Melvin et al 2003).

While there have been differences in the frequency of survey coverage in past years, some standard pre-defined areas have been surveyed consistently and well for the past three years. More spawning fish were documented on German Bank than in the previous years despite a reduced survey effort. There was evidence of reappearance of spawning on the Seal Island grounds, but this area and Trinity Ledge remained well below historical levels.

Spawning ground turnover rates

The current acoustic survey method on spawning grounds is dependent on periodic turnover of spawning fish on the grounds. Acoustic surveys are required to be separated by at least 10 to 14 days to allow for turnover and to prevent double counting (Power et al 2002). This aspect of the assessment method was the subject of investigation in 2001 and of intensive sampling for maturity stage in the 2002 fishing season. The results are summarized by Melvin et al. (2003) and were used to assist in the evaluation of turnover timing and the inclusion or exclusion of specific acoustic surveys.

Exploitation Rates on Spawning Grounds

An important utility of the acoustic surveys is the ability to estimate partial exploitation rates for spatially and temporally different spawning groups. If a large part of the total catch is taken from spawning groups that are surveyed then the partial exploitation rates will reflect almost all of the total exploitation. This is useful information for assessing the impact of fishing on individual spawning units as well as for the overall stock component (Table 7).

For this analysis only the three major spawning components Scots Bay, German Bank, Trinity Ledge which have received consistent survey effort were included (Table 7a-7b). Since there are questions about comparability between years only data since 1997 are shown. Catches throughout the year from the spawning grounds were assumed to be site specific, while catches from all other areas were considered non-spawning and were allocated based on the relative spawning ground SSB amounts. In addition the SSB for Seal Island and Spectacle Buoy were allocated to the German Bank spawning area (Table 7b). Logbook catches were also adjusted proportionally to the overall 4WX stock catch (Table 7c).

The exploitation rates were calculated for both the logbook catches (Table 7d) and the overall adjusted catch (Table 7e) as:

Exp =(Catch on spawning ground + (Catch non-spawning areas * SSB_a / Overall SSB)) / SSB_a

where SSB_a is the observed SSB for that spawning ground area.

Calculation of exploitation rates by component showed that the larger grounds (German Bank and Scots Bay) have a low overall exploitation of 0.07 to 0.21. Trinity Ledge had higher levels (0.08 to 0.50) but this may be problem of both catch allocation and inconsistent survey effort over the period. The overall exploitation rate for the 4WX stock ranged between 0.10 and 0.18, which is below target of F0.1 = 0.24.

Fleet Activity

A summary of daily fishery information compiled by the Herring Science Council and DFO (Appendix A) showed the presence of substantial amounts of herring in some areas other than spawning grounds. Herring were abundant on summer feeding areas off southwest Nova Scotia and Grand Manan.

Tagging

From 1998 to 2002, the Pelagics Research Council/Herring Science Council, in partnership with Fisheries and Oceans, Canada, conducted a number of tagging trips on herring spawning grounds and on the major Nova Scotia over-wintering grounds. Although this project has concluded, tags continue to be returned and the information on the overall returns has been summarized (Waters et al 2001, Mouland et al 2003).

Sampling and Catch at Age

Comprehensive biological sampling continued with substantial involvement of the fishing industry. A total of 1,621 samples comprising 176,000 fish were measured for length while 7,648 fish were sampled for age. The distribution of samples by gear and month is presented in Table 8-10. The sources of samples are shown in Table 11 with the bulk of samples coming from the processing industry, as has been the case since 1996. Additional samples were collected by: DFO personnel, observers deployed on purse seine vessels and from DFO research surveys. Sampling from the commercial fishery was well matched to the spatial and temporal distribution of the fishery. Additional sampling from research vessel surveys during the spring and summer resulted in widespread geographic coverage as in the past (Figure 13).

Consistent with previous assessments, the catch at age was constructed using the MFD ‘Catch at Age’ application (version 8.03) which is a Marine Fish Division windows based program for computing catch at age statistics as part of the stock

assessment process. Data files used by 'Catch at Age' were created with the 'CATCHFRM' application that was used to select fish sample data from the Pelagic Samples Database. These data included a 2% adjustment for the shrinkage due to freezing on the length measurements for frozen samples (Hunt et al 1986). The length-weight relationships, which are also required as input to the 'Catch at Age' application, were calculated using an Oracle SQL*Plus script. The catch at age statistics were then calculated from length frequency and age-length key samples. The data were grouped or combined and then age-length keys were applied to length frequencies to produce catch at age statistics by NAFO unit area, gear-type and month.

Age Composition of the Catch

Under $F_{0.1}$ fishing and constant average recruitment, the age composition of the population would be expected to be similar to that shown in Figure 14. There is peak abundance at age 4, substantial fish surviving older than age 6 and a buildup of fish at ages 11+. This expected or ideal age structure has been used in recent assessments for comparison of the actual catch at age which has been characterized by a predominance of younger ages 2-3 and few fish older than six years old (Stephenson et al 1999b, 2001; Power et al 2002).

The 1998 year-class (at age 4) again dominated the stock catch at age by weight with about 40% of the weight of herring landed, while the 2000 year-class (at age 2) dominated by number in the catch (Table 12, Figure 15). The recruiting 1998 year-class was taken throughout the season and dominated most gear types, areas and months except for gillnet where the mesh size used avoids their capture (Table 13, Figure 16). The 2000 year-class was seen mostly in May-June and Oct-Nov in the Grand Manan banks, and south of German Bank near Browns Bank (Table 14, Figure 17-18).

The dominance of the 1998 year-class (age 4) throughout the fishery in 2002 confirmed that it is a strong year-class. These fish were taken throughout the fishing season and were dominant in landings from all gear types. The precise strength of the recruiting 2000 year-class (age 2) is not known but there are indications that it may be strong. In contrast, as has been noted in previous assessments, there are very few fish older than age 7 in the catch. The rapid decline in the abundance of a year-class implies high total mortality.

The historical series of catch at age was extended with the current fishing year and is shown as total number caught as well as percent by age (Table 15-16). The series shows very few fish older than age 7 in recent years and has been dominated by ages 2 and 4 since 1998 (Figure 19). The series is primarily made up of fish younger than age 6 but older ages were a feature when strong year-classes (i.e. 1976 and 1983) were progressing through the fishery (Figure 20).

The proportion of age 4+, 5+ and 7+ were determined from the catch at age based on total numbers to determine trends in the older fraction of the catch (Figure 21). Age 7+ has shown a declining trend since about 1990 corresponding to the demise of the 1983 year-class, which was the last very strong year-class in this component. Age 5+ is more variable but has also exhibited a declining trend in recent years. Age 4+ has declined since 1996 but has rebounded for the current year with recruitment of the strong 1998 year-class.

The average weights at age showed little change for all ages (Table 17 and Fig. 22-23) were within the range of data observed historically (Power and Iles 2001).

2.3 Sources of Uncertainty

The evaluation of stock status in this area relies in large part on the spawning stock biomass estimates derived from industry acoustic surveys. There is considerable variability around acoustic estimates (standard errors are in the range of 15-45%) although studies of individual weir catches indicate that acoustic biomass estimates are within 15% of the amount of fish harvested. Uncertainty may also arise from assumptions concerning the residence time of herring on spawning grounds, target strength estimates and the coverage of surveys in relation to the extent of spawning.

A summary of attributes used previously as biological indicators in this fishery (DFO 1997) indicate both positive and negative signs (Table 18). While there was good abundance of spawners in some areas, other areas were below historic levels. In addition, while there was a continued strong 1998 year-class the apparent targeting of age 1 and 2 year olds may be of concern if they are not strong recruiting year-classes. Other indicators of spawning timing, fish distribution, relative abundance, physiology and behaviour appeared normal.

2.4 Ecosystem Considerations

Herring is prominent in the diet of many fish, birds and marine mammals, and should be managed with these interactions in mind. At present, use of a natural mortality rate of 0.2 and maintenance of SSB at moderate to high levels are assumed to account for these interactions.

Recent management initiatives to protect spawning components are intended to maintain the spatial and temporal diversity of herring spawning.

2.5 Outlook

Recent assessments of the SWNS/BOF spawning component suggested that fishing mortality should remain below F0.1 (about 20% exploitation rate), for a number of years in order to rebuild spawning stock biomass in all spawning areas and to expand the age composition so as to meet the explicit biological objectives of management (Sinclair 1997).

In 2000 there appeared to have been deterioration in stock status (DFO 2001). It was noted that there was little, if any, evidence of rebuilding of this population in the recent past when catches were between 77,000t and 85,000t. It was suggested that catches for 2001 be reduced to below that of the previous three years and the catch limit was reduced.

In 2001, with a reduced catch limit, there were some positive developments including the reappearance of spawning on Seal Island and signs of a strong 1998 year-class. There remained some negative biological signs, including an apparent decrease in the SSB on German Bank, an absence of older fish in the entire population, and the SSB on the Trinity Ledge and Seal Island spawning areas at less than historical levels. This evaluation stated: “Improved prognosis for this stock requires an increase in total SSB from standard areas, adequate performance of all major spawning grounds and expanded age composition” (DFO 2002).

In current year (the 2002 fishing season) there were several positive developments. Acoustic surveys of German Bank documented approximately 400,000t, an amount much greater than last year and more consistent with expectations from previous observations. Spawning was observed and documented for a second consecutive year on the Seal Island grounds. The 1998 year-class was confirmed to be strong, and there were signs that the 2000 year-class may also be strong.

Despite these positive developments, some of the conservation objectives specified for this fishery are not being fully met. While there is evidence of good recruitment, the population contains fewer older fish than would be expected of an ideal age distribution. The rapid decline in year-classes (failure to reach older ages) is a sign of continued high total mortality. In addition there is limited spawning on the Trinity Ledge and Seal Island areas and the SSB on both of these spawning grounds is well below historical levels.

There has been substantial progress against objectives in 2002 with an overall increase in SSB, including an increase of SSB on German Bank and maintenance of SSB on Scots Bay spawning grounds. The strong 1998 year-class is expected to improve age composition in the future. This recent good recruitment is expected to result in continued positive development of SSB, age composition and re-occupation of spawning grounds if catches remain at levels of recent years. Increased catch levels may still result in improvement of SSB but at a lower rate; however, a large increase in catches could compromise improvement.

2.6 Management Considerations

The in-season management approach, which spreads the effort in the fishery spatially and temporally among spawning components, is seen as beneficial in

achieving the conservation objectives. The “survey, assess, then fish” protocol is effective in spreading the catch appropriately among spawning components in proportion to their relative size and is considered an important safeguard.

Acoustic surveys have become critical to stock status evaluation (Melvin et al 2003). Surveys conducted in 2002 conformed to the proposed survey design. It is important that there be continued attention to coverage and survey design, in order to assure year-to-year consistency in these surveys in all spawning areas.

3) OFFSHORE SCOTIAN SHELF BANKS SPAWNING COMPONENT

3.1 The Fishery

A foreign fishery during the period 1963 -1973 is estimated to have removed as much as 60,000t per year from the offshore Scotian Shelf banks (Stephenson et al 1987). Few herring were caught after the extension of jurisdiction in 1977 until 1996, when a fishery was initiated by the 4WX purse seine fleet and 11,700t was taken (Table 1,2).

Since 1996 a fishery has taken place on feeding aggregations on the offshore banks primarily in May and June with catches ranging from 2,000 to 20,000t (Table 2, Figure 24). The variability in catch levels was often due to problems of fish being too deep, weather and market conditions rather than in the abundance of herring in these areas.

The 2002 fishery on Scotian Shelf Banks was smaller than in 2001, with landings of 7,000t, about 5,000t less than in 2001. Fishing took place primarily in May and June, in the vicinity of The Patch as well as in the Western Hole/Roseway Bank areas (Figure 25).

In 2002, herring continued to be caught as by-catch in the domestic bottom trawl fishery on the Scotian Shelf edge and slope, but the amount was less than 80t (Figure 26). There was no midwater trawl activity on the offshore Scotian Shelf banks in 2002.

Age composition of the catch in the previous year was dominated by age 2 by number of fish and ages 5 and 6 by weight (Figure 27). Similarly, the 2002 fishery was dominated by the 2000 year-class (age 2) in number and the 1996 and 1997 year-classes (ages 6 and 5 respectively) in weight (Table 19, Figure 28). The large numbers of 2-year-olds in the catch was attributed to landings for bait in the Western Hole area. The Halifax purse seine catches in January 2002 were dominated by 4 year olds, representing the 1998 year-class (Table 19).

3.2 Research and Industry Surveys

Industry Surveys

Fleet activity and catch was reduced during the fishery in May and June on the Scotian Shelf. There were also few occasions of fish documented using acoustic recorders. No structured mapping or acoustic surveys took place and no analysis of the fishing night acoustic data was warranted (Melvin et al 2003).

July Bottom Trawl Survey

The summer bottom trawl survey showed few herring on the Scotian Shelf during the 1970's, increasing amounts during the 1980's and a relatively widespread distribution in recent years (Harris and Stephenson 1999, Power et al 2002, Stephenson et al 2001). Offshore herring catches during the 2002 July bottom trawl survey (Hunt 2002 MS) were the second highest in the 33-year time series with an average of 163 fish per standard tow for strata 55 through 78 (Table 20, Figure 29). While the 2000-2002 catches of herring in the survey were lower than the peak in 1999, survey results of the past five years have been among the highest on record. For the past 20 years the same methods and vessel have been used by this survey (i.e. Western IIa ground trawl by the Alfred Needler).

Trends are similar for the combined strata from each of the areas 4W and 4X (Table 20, Figure 30). The strata areas used for selection of trawling stations in this ground-trawl survey series are shown in Figure 31. Herring were again widely distributed on banks west of Sable Island (Figure 32-33) and were comparable to average catches from the last ten years (Figure 34). The survey data for areas 4WX combined were also analysed by age to produce stratified mean numbers per tow over the series (Table 21, Figure 35). There was a lack of consistency with the large year-classes observed in the fishery and a lack of tracking of these year-classes from year to year and so this analysis was not pursued any further.

Fall Herring Survey

The 2002 fall herring survey with the Alfred Needler extended from Oct. 22 to Nov. 2, 2002 and covered a large area including several offshore banks and inshore areas near Halifax and Port Mouton (Power 2002 MS). Very few fish were documented except in the area off Port Mouton and on "The Patch".

No large aggregations of herring were observed during the survey. Herring were not widespread but were caught in boxes 1, 7, 9, 10 and 11 (Figure 36). The largest aggregation of herring, resulting in a catch of 222 kg was made on 'The Patch' in box 11. The size frequency of the herring for the survey ranged from 17 to 34cm with smaller fish caught in box 1 and 9 and larger fish in box 7, 10 and 11. A summary of the length composition of herring catches from the larger sets (n >= 10) and for the overall survey is shown in Figure 37.

3.3 Outlook and Management Considerations

The summer bottom trawl research survey demonstrates that there is a considerable abundance of herring spread widely over the offshore banks of the Scotian Shelf. Information from previous assessments indicates the presence of at least some autumn spawning on Western Bank in recent years. There is very little new information to add and no reason to change the previous outlook:

- Recorded landings in the foreign fisheries of 13,000t to 60,000t between 1969 and 1973 did not appear to be sustainable.

- The initial catch allocation for 2003 should not exceed the 12,000t reference value used in the recent fishing plans.

There continues to be insufficient documentation of stock size, distribution and spawning behavior for this component. Industry, DFO Science and Management are encouraged to continue to work together to improve the biological basis for management. There continues to be the need for industry surveys to estimate abundance.

4) COASTAL (SOUTH SHORE, EASTERN SHORE AND CAPE BRETON) NOVA SCOTIA SPAWNING COMPONENT

4.1 The Fishery and Resource Status

There have been increases in the number of active herring gillnet licenses in recent years. This was the seventh year for a fishery on spawning fish east of Halifax and the sixth year of gillnet roe fisheries off Little Hope and Glace Bay. Total recorded landings of 10,375t in the three major gillnet fisheries along the coast of Nova Scotia were much higher than in previous years (Table 22). Survey biomass estimates in two of the four areas were the highest observed to date (Table 23) (Melvin et al 2003). The Bras d'Or herring fishery remained closed for the third consecutive year.

<u>East of Halifax (4W Eastern Shore)</u>

The herring roe fishery in September and October landed 3,334t. Sampling was limited to two samples and indicated that the catch was composed mainly of the 1995 and 1996 year-class (ages 6-7) (Table 24, Figure 38-40). Acoustic surveys undertaken by the Eastern Shore Fishermen's Protective Association in October 2002 resulted in an SSB of 41,450t, the highest for the area to date (Melvin et al 2003).

Little Hope

The fishery occurred in the Port Mouton/Little Hope area in September and October. A total of 3,982t of herring were landed, up from 2,904t in the previous year. Sampling of the catch indicated a size range of 26 to 34 cm with 97% of the fish ripe and running (Figure 41,42). The catch was composed primarily of the 1995-1997 year-classes (ages 5-7) (Table 24, Figure 43).

An acoustic estimate of 56,000t SSB is the highest for this area to date. The estimate was made from an automated acoustic recorder used during the fishery and over four survey nights.

Glace Bay

The fishery off Glace Bay, Cape Breton took place in September and October. Landings increased to 3,058t from 1,204t the previous year. Samples from the fishery indicated large fish from 26 to 37cm with a modal length near 33cm (Figure 44). Ninety nine percent of the fish collected for detailed samples were ripe and running (Figure 45). Fish aged 7-8 (1994-1995 year-class) dominated the catch (Table 24, Figure 46).

In the July groundfish survey, stratum 42 (Figure 31) covers the area of 4Vn that includes the fall roe fishery off Glace Bay. In 2001, survey catches by number and weight from this stratum were the highest in the past twelve years (Table 25). In 2002, however, overall catches of herring in this stratum were reduced dramatically. There is a great deal of annual variability in the numbers and weights of herring caught by this survey and it may not be representative of herring abundance.

Data from on the herring fishery distribution and abundance was limited and difficult to obtain. A single mapping survey on Oct. 10, late in the fall fishery, documented only about 7,700t of spawning fish off Glace Bay (Melvin et al 2003).

Bras d'Or Lakes

The fishery was closed in 2002, however there was limited sampling undertaken by the Eskasoni Fish and Wildlife Commission in April and May. Twelve samples taken for length, sex, maturity and age (Table 24, Figures 47-49). There were no acoustic surveys conducted in the Bras d'Or Lakes to document the abundance of spawning herring in 2002.

4VWX Misc. Gear Catches

Catches by trap from the Sydney Bight area in May and June amounted to 133t and was made up of mostly 4 and 5 year old fish (Table 26). In addition there were 76t of miscellaneous trap and gillnet catches in areas 4W and 4X, which were

primarily for bait and took place outside the spawning period. The age composition of these catches was determined from a general age composition based on the overall fishery (Table 26).

4.2 Outlook and Management Considerations

In coastal Nova Scotia, there is no overall quota, and apart from the areas mentioned above, the size and historical performance of many small spawning groups are poorly documented. In addition to traditional fisheries for bait and personal use, there are directed roe fisheries on the spawning grounds which have developed over the past seven years.

As the inshore roe fisheries from East of Halifax, Little Hope and Glace Bay have developed, participants have contributed to sampling and surveying and have attempted to follow the 'survey, assess, fish' protocol. Survey and sample effort in these areas has mostly improved over previous years and should be continued.

Management approaches and recent research efforts have improved knowledge in these three locations, but there has been no increase in knowledge of adjacent areas. The lack of knowledge on the specifics of stock structure and lack of documentation of the historical fishery, coupled with limited survey information preclude evaluation of current fishing mortality for much of this component. Individual spawning groups within this component are considered vulnerable to fishing because of their relatively small size and proximity to shore. As in the past several years, it is recommended that no coastal spawning area should experience a large effort increase until significantly more information is available on the state of that spawning group. There should be no new fisheries developed when there is uncertainty regarding stock composition and degree of mixing.

Since 1997 the status of herring in the Bras d'Or Lakes has been cause for concern. Spawning is still absent from some traditional areas and the observed biomass of spring spawners is very low. It is therefore appropriate to reiterate that from a biological perspective, no fishing should take place on this spawning component.

The "survey, assess, then fish (<10%)" protocol is considered useful for spawning components that are considered to be healthy and of sufficient size, but is not practical for all coastal spawning groups.

5) SW NEW BRUNSWICK MIGRANT JUVENILES

The southwest New Brunswick weir and shutoff fishery have relied, for over a century, on the aggregation of large numbers of juvenile herring (ages 1-3) near shore at the mouth of the Bay of Fundy (Figure 9-12). These have traditionally been considered to be a mixture of juveniles, dominated by fish originating from

NAFO Subarea 5 spawning components, and have therefore been excluded from the 4WX quota. Mature herring (ages 4+) taken in this fishery are considered to be of 4WX origin.

The number and distribution of active weirs have decreased over the past decade, due in part to the conversion of weir sites to aquaculture, as well as the reduction in landings over the past decade in the Passamaquoddy Bay area (Table 27). The 2002 catch of 11,800t for N.B. weir and shutoffs was the lowest since 1984 (Table 2, Figure 50) and there is concern for this component. Industry observations indicate an abundance of herring in the vicinity of the weirs but this did not result in increased catches.

Landings by month had a peak in August (Table 5) and their relative amount was reduced from recent years. The seasonal timing was late with very little catch until July and catches dropping off after August, similar to previous years.

The 2002 catch was dominated by the 2000 year-class (age 2), which made up almost 70% of the catch by number and over 60% of the catch by weight. The 1998 year-class at age 4 was also prominent making up over 16% of the catch by weight (Table 28, Figure 51).

The recent US management plan (NEFSC 1998) assumes that all of the juvenile herring from this fishery originate from the US “coastal complex” (5Y + 5Z) which is reported to be at record high levels of abundance.

In 2002 the Fundy Weir Fishermen Association, Inc., in partnership with the New Brunswick Department of Agriculture, Fisheries and Aquaculture, the Grand Manan Fishermen’s Association, Connors Brothers Ltd. and Fisheries and Oceans, Canada, initiated a tagging program, to be conducted over a three year period. The purpose of this project is to investigate the seasonal movements and migration of herring in the Bay of Fundy with the long-term goal of providing information on stock structure. The results to date are summarized by Mouland et al. (2003).

6) 5Z Georges Bank

The activities of a single midwater trawler on the Canadian portion of Georges Bank (area 5Z) have also been summarized (Table 1). It was reported that abundance and availability of herring were good on the bank especially later in the season. There were a total of 1,605t landed from May to Oct. with most of the landings in August (Figure 52). These catches were dominated by the 1998 year-class at age 4 in numbers by weight (Table 29).

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Table 1. 4VWX herring fishery landings (t) by month, gear sector and management unit for 2002 (calendar year).

			Month											
	Area	**Gear**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
Coastal Nova Scotia	4Vn	Trap					46	87							133
		Bras d'Or Gillnet		1		2	8	1	0						12
(South Shore,		Glace Bay Gillnet									924	2,134			3,059
Eastern Shore,	4W	Eastern Shore Gillnet								5	1,354	1,916	65		3,339
Cape Breton)	4X	Little Hope Gillnet								9	2,396	1,587			3,993
		Trap						3	5		34				42
Coastal Nova Scotia Total				1		2	54	91	5	14	4,708	5,637	65		10,577
Offshore S.S.	4WX	Offshore P. Seine				849	789	5,324							6,962
		Midwater Trawl													-
		Bottom Trawl	4	2	4	1	4	9	12	1	6	11	20	2	77
Offshore S.S. Total			4	2	4	850	793	5,333	12	1	6	11	20	2	7,039
S.W. Nova Scotia	4W	Fall/Winter P. Seine													-
	4X	Fall/Winter P. Seine	1,256									3,637	2,536	18	7,447
		Halifax P. Seine	367												367
		Summer P. Seine				180	4,002	1,414	16,162	17,416	14,161	8,099			61,434
		Gillnet "Stock"					0	115	22		256				393
		N.S. Weirs					23	95	240	558	228				1,143
	5Y	Summer P. Seine					46	1,384	5,440	80	148	1,362			8,460
		Fall/Winter P. Seine											60	111	171
S.W. Nova Scotia Total			1,623			180	4,070	3,008	21,863	18,054	14,793	13,098	2,596	129	79,414
Migrant Juveniles	4X	N.B. Weirs					84	20	1,099	6,446	2,878	1,260	20		11,807
		N.B. Shutoff									42	18	7		67
Migrant Juveniles Total							84	20	1,099	6,446	2,920	1,278			11,874
Georges Bank	5ZE	5Z Purse Seine													-
		Midwater Trawl							157	197	884	367			1,605
Georges Bank Total									157	197	884	367			1,605

Total	110,509

Table 2. Historic series of nominal and adjusted annual landings (t) by major gear components and seasons of the 4WX herring fishery, 1963-2002 (the 1963-73 Offshore Scotian Shelf landings are from Stephenson et al. (1987)).

Year^	4W Winter Purse Seine	4Xs Fall&Winter Purse Seine	4Xqr Summer Purse Seine	4X Summer Gillnet	4Xr Summer Weir	4WX Stock Nominal Landings	4WX Stock Adjusted Landings*	4WX Stock TAC	Non-Stock 4Xs Weir and Shutoff	Offshore Scotian Shelf Banks	Total 4WX Adjusted Landings
1963		6,871	15,093	2,955	5,345	30,264	30,264		29,366	3,000	62,630
1964		15991	24,894	4,053	12,458	57,396	57,396		29,432	2,000	88,828
1965		15,755	54,527	4,091	12,021	86,394	86,394		33,346	6,000	125,740
1966		25,645	112,457	4,413	7,711	150,226	150,226		35,805	2,000	188,031
1967		20,888	117,382	5,398	12,475	156,143	156,741		30,032	1,000	187,773
1968		42,223	133,267	5,884	12,571	193,945	196,362		33,145	18,000	247,507
1969	25,112	13,202	84,525	3,474	10,744	137,057	150,462		26,539	121,000	298,001
1970	27,107	14,749	74,849	5,019	11,706	133,430	190,382		15,840	87,000	293,222
1971	52,535	4,868	35,071	4,607	8,081	105,162	129,101		12,660	28,000	169,761
1972	25,656	32,174	61,158	3,789	6,766	129,543	153,449		32,699	21,000	207,148
1973	8,348	27,322	36,618	5,205	12,492	89,985	122,687		19,935	14,000	156,622
1974	27,044	10,563	76,859	4,285	6,436	125,187	149,670		20,602		170,272
1975	27,030	1,152	79,605	4,995	7,404	120,186	143,897		30,819		174,716
1976	37,196	746	58,395	8,322	5,959	110,618	115,178		29,206		144,384
1977	23,251	1,236	68,538	18,523	5,213	116,761	117,171	109,000	23,487		140,658
1978	17,274	6,519	57,973	6,059	8,057	95,882	114,000	110,000	38,842		152,842
1979	14,073	3,839	25,265	4,363	9,307	56,847	77,500	99,000	37,828		115,328
1980	8,958	1,443	44,986	19,804	2,383	77,574	107,000	65,000	13,525		120,525
1981	18,588	1,368	53,799	11,985	1,966	87,706	137,000	100,000	19,080		156,080
1982	12,275	103	64,344	6,799	1,212	84,733	105,800	80,200	25,963		131,763
1983	8,226	2,157	63,379	8,762	918	83,442	117,400	82,000	11,383		128,783
1984	6,336	5,683	58,354	4,490	2,684	77,547	135,900	80,000	8,698		144,598
1985	8,751	5,419	87,167	5,584	4,062	110,983	165,000	125,000	27,863		192,863
1986	8,414	3,365	56,139	3,533	1,958	73,409	100,000	97,600	27,883		127,883
1987	8,780	5,139	77,706	2,289	6,786	100,700	147,100	126,500	27,320		174,420
1988	8,503	7,876	98,371	695	7,518	124,653	199,600	151,200	33,421		233,021
1989	6,169	5,896	68,089	95	3,308	83,557	97,500	151,200	44,112		141,612
1990	8,316	10,705	77,945	243	4,049	102,627	172,900	151,200	38,778		211,678
1991	17,878	2,024	73,619	538	1,498	97,010	130,800	151,200	24,576		155,376
1992	14,310	1,298	80,807	395	2,227	100,227	136,000	125,000	31,967		167,967
1993	10,731	2,376	81,478	556	2,662	98,464	105,089	151,200	31,573		136,662
1994	9,872	3,174	64,509	339	2,045	80,099	80,099	151,200	22,241		102,340
1995	3,191	7,235	48,481	302	3,049	62,499	62,499	80,000	18,248		80,747
1996	2,049	3,305	42,708	6,340	3,476	58,068	58,068	57,000	15,913	11,745	85,726
1997	1,759	2,926	40,357	6,816	4,019	56,117	56,117	57,000	20,552	20,261	96,930
1998	1,405	1,494	67,433	2,231	4,464	77,027	77,027	90,000	20,091	5,591	102,709
1999	1,235	4,764	64,432	1,660	5,461	77,552	77,552	105,000	18,644	12,646	108,842
2000	1,012	4,738	78,010	823	701	85,284	85,284	100,000	16,829	2,182	104,295
2001	0	4,001	62,004	1,857	3,708	71,570	71,570	78,000	20,209	12,503	104,282
2002	367	5,257	69,894	393	1,143	77,054	77,054	80,000	11,874	7,039	95,967
2003		6,362				6,362	6,362	TBA			6,362

^Annual landings by purse seiners are defined for the period from October 15 of the preceding year to October 14 of the current year.

*Adjusted totals includes misreporting adjustments for 1978-84 (Mace 1985) and for 1985-93 (Stephenson 1993, Stephenson et al 1994)

All landings by other gear types are for the calendar year.

Table 3. Summary of herring purse seine catches (t) from 1984 to 2002 by year and fishing grounds.

	Year																			
Ground	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Avg 1990-2001
Browns Bank			732						86		1,903	1,554	40	14	3,139	1,326	686	420		1,019
Chedabucto Bay	490	4,216	7,498	6,374	7,523	8,325	12,470	12,596	3,084	1,378	1,407	2,049	1,759		1,583	1,151	10			3,749
Gannet,Dry Ledge		5,675	2,187	1,474	14,901	2,010	4,213	6,294	18,527	2,935	2,588	2,693	1,963	4,590	4,156	10,215	12,155	3,596	9,047	6,160
German Bank		15,522	13,346	16,547	18,392	8,087	11,744	23,193	3,235	4,045	9,662	19,549	15,898	13,576	20,556	24,660	25,747	24,143	22,355	16,334
Grand Manan	372	4,989	5,823	4,298	4,440	4,300	5,442	4,225	2,722	783	6,846	5,297	6,005	5,312	15,983	7,855	18,442	10,591	17,753	7,459
Long Island		974	3,365	7,499	10,722	21,719	18,484	9,470	3,213	2,814	7,666	7,906	4,385	3,557	12,360	18,180	10,942	12,862	6,642	9,320
Lurcher		476	132		2,928	18	65	151	2,141	1,560	530	382	243	599	57	81	1,083	383	7,683	606
N.B. Coastal	384	188	621	960	1,031	3,033	2,347	488	992	598	99	1,502	271	1,176	782	2,029	361	1,250	3,113	991
Pollock Point																		1,689		1,689
S.W. Grounds		558	1,108	184	181	276	56	521	225	2,961	3,444	6,205	3,035	797	1,239	4,111	2,153	115	791	2,072
Scots Bay			36	3,822	4,145	6,583	9,003	7,982	7,987	5,258	10,840	980	8,984	4,894	8,210	1,789	10,926	10,785	8,202	7,303
Seal Island		13,818	8,894	11,560	19,019	23,420	25,344	12,740	10,455	3,874	2,820	465	1,567	492	617	567	267	101	238	4,942
Trinity		35,860	13,505	18,744	18,539	266	1,113	3,259	4,612	1,348	2,366	370	3,448	5,308	2,825	1,220	254	63	1,609	2,182
Yankee Bank					194	250	3,647	817	119	10	175	323	9	4	159	82	133	8	78	457
Unknown	45	184	500	200			200	579	494	140		73			62	84	27			207
4WX Stock Total	1,291	82,458	57,745	71,661	102,015	78,287	94,127	82,314	57,888	27,703	50,345	49,348	47,606	40,319	71,727	73,350	83,186	66,005	77,511	61,993

Misc Nonstock Areas	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Avg 1990-2001
Georges Bank							91	64			266		2,491	79			265			542
Liverpool								13		4,067	4,177									2,752
Shelburne				59				64		526	161		56					233		173
Halifax										652	1,945		585	455			1,002	472	367	852
Offshore Banks													11,800	18,770	4,284	8,669	1,645	3,901	5,078	8,178
Western Hole			41	154				213	3,451	2,255	1,495	108	127	691	1,012	1,057	47	7,555	1,884	1,637
Sydney Bight		3,511	4,250	1,751	2,100	1,330	3,591	3,606		396		3,951	4,267		52					2,644
Misc Nonstock Total		3,511	4,291	1,964	2,100	1,330	3,682	3,959	3,451	7,896	8,044	4,059	19,325	19,995	5,348	9,726	2,958	12,161	7,329	8,384

Overall Total	1,291	85,968	62,036	73,625	104,116	79,617	97,809	86,273	61,339	35,598	58,389	53,407	66,931	60,314	77,075	83,076	86,144	78,166	84,840	70,377

Table 4. Summary of the percentage of herring purse seine catches from 1984 to 2002 by year and fishing grounds.

Ground	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Avg 1990-2001
Browns Bank			1%						0%		3%	3%	0%	0%	4%	2%	1%	1%		1%
Chedabucto Bay	38%	5%	12%	9%	7%	10%	13%	15%	5%	4%	2%	4%	3%		2%	1%	0%			4%
Gannet,Dry Ledge		7%	4%	2%	14%	3%	4%	7%	30%	8%	4%	5%	3%	8%	5%	12%	14%	5%	11%	9%
German Bank		18%	22%	22%	18%	10%	12%	27%	5%	11%	17%	37%	24%	23%	27%	30%	30%	31%	26%	23%
Grand Manan	29%	6%	9%	6%	4%	5%	6%	5%	4%	2%	12%	10%	9%	9%	21%	9%	21%	14%	21%	10%
Long Island		1%	5%	10%	10%	27%	19%	11%	5%	8%	13%	15%	7%	6%	16%	22%	13%	16%	8%	13%
Lurcher		1%	0%		3%	0%	0%	0%	3%	4%	1%	1%	0%	1%	0%	0%	1%	0%	9%	1%
N.B. Coastal	30%	0%	1%	1%	1%	4%	2%	1%	2%	2%	0%	3%	0%	2%	1%	2%	0%	2%	4%	1%
Pollock Point																		2%		0%
S.W. Grounds		1%	2%	0%	0%	0%	0%	1%	0%	8%	6%	12%	5%	1%	2%	5%	2%	0%	1%	3%
Scots Bay			0%	5%	4%	8%	9%	9%	13%	15%	19%	2%	13%	8%	11%	2%	13%	14%	10%	11%
Seal Island		16%	14%	16%	18%	29%	26%	15%	17%	11%	5%	1%	2%	1%	1%	1%	0%	0%	0%	7%
Trinity		42%	22%	25%	18%	0%	1%	4%	8%	4%	4%	1%	5%	9%	4%	1%	0%	0%	2%	3%
Yankee Bank					0%	0%	4%	1%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	1%
Unknown	4%	0%	1%	0%			0%	1%	1%	0%		0%			0%	0%	0%			0%
Total	100%	96%	93%	97%	98%	98%	96%	95%	94%	78%	86%	92%	71%	67%	93%	88%	97%	84%	91%	87%

Misc Nonstock Areas	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Avg 1990-2001
Georges Bank							0%	0%			0%		4%	0%			0%			0%
Liverpool								0%		11%	7%									2%
Shelburne				0%				0%		1%	0%		0%					0%		0%
Halifax										2%	3%		1%	1%			1%	1%	0%	1%
Offshore Banks													18%	31%	6%	10%	2%	5%	6%	6%
Western Hole			0%	0%				0%	6%	6%	3%	0%	0%	1%	1%	1%	0%	10%	2%	2%
Sydney Bight		4%	7%	2%	2%	2%	4%	4%		1%		7%	6%		0%					2%
Misc Nonstock Total		4%	7%	3%	2%	2%	4%	5%	6%	22%	14%	8%	29%	33%	7%	12%	3%	16%	9%	13%

Table 5. Monthly weir landings (t) for New Brunswick and Nova Scotia; 1978 to 2002.

		MONTH												
PROVINCE	YEAR	1	2	3	4	5	6	7	8	9	10	11	12	Year Total
N.B.	1978	3				512	802	5,499	10,275	10,877	4,972	528	132	33,599
	1979	535	96			25	1,120	7,321	9,846	4,939	5,985	2,638	74	32,579
	1980					36	119	1,755	5,572	2,352	1,016	216		11,066
	1981					70	199	4,431	3,911	2,044	2,435	1,686	192	14,968
	1982		17			132	30	2,871	7,311	7,681	3,204	849	87	22,181
	1983					65	29	299	2,474	5,382	3,945	375		12,568
	1984					6	3	230	2,344	2,581	3,045	145		8,353
	1985					22	89	4,217	8,450	6,910	4,814	2,078	138	26,718
	1986	43				17		2,480	10,114	5,997	6,233	2,564	67	27,516
	1987	39	21	6	12	10	168	2,575	10,893	6,711	5,362	703	122	26,621
	1988		12	1	90	657	287	5,993	11,975	8,375	8,457	2,343	43	38,235
	1989		24		95	37	385	8,315	15,093	10,156	7,258	2,158		43,520
	1990					93	20	4,915	14,664	12,207	7,741	168		39,808
	1991					57	180	4,649	10,319	6,392	2,028	93		23,717
	1992				15	50	774	5,477	10,989	9,597	4,395	684		31,981
	1993					14	168	5,561	14,085	8,614	2,406	470	10	31,328
	1994				18		55	4,529	10,592	3,805	1,589	30		20,618
	1995					15	244	4,517	8,590	3,956	896	10		18,228
	1996					19	676	4,819	7,767	1,917	518	65		15,781
	1997				8	153	1,017	6,506	7,396	5,316				20,396
	1998					560	713	3,832	8,295	5,604	525			19,529
	1999					690	805	5,155	9,895	2,469	48			19,063
	2000					10	7	2,105	7,533	4,940	1,713	69		16,376
	2001					35	478	3,931	8,627	5,514	1,479			20,064
	2002					84	20	1,099	6,446	2,878	1,260	20		11,807
NB Total		619	169	7	238	3,370	8,387	103,082	223,455	147,213	81,323	17,892	866	586,620
N.S.	1978				1	490	3,704	2,990	239	46	111	198	79	7,858
	1979					811	3,458	1,418	420	39	136	57		6,339
	1980					69	647	1,271	395					2,383
	1981					50	437	983	276	37		41		1,824
	1982					16	267	468	195	172	12			1,130
	1983				2	286	141	188	208	53		18		896
	1984					113	1,032	736	602	220				2,702
	1985					378	1,799	1,378	489			11		4,055
	1986					385	403	71	704	390	5			1,957
	1987					1,503	2,526	1,215	1,166	367				6,776
	1988					1,217	2,976	1,696	1,204	386				7,480
	1989					340	1,018	870	843	226				3,296
	1990					208	973	1,482	879	538	52			4,132
	1991				3	23	149	719	342	262				1,498
	1992					35	659	405	754	371				2,224
	1993					226	908	608	867	53				2,662
	1994					111	736	499	519	180				2,045
	1995					236	1,255	1,059	470	29				3,049
	1996					430	1,267	1,232	358	188				3,476
	1997					70	1,874	1,739	271	65				4,019
	1998					1,304	1,677	390	359	317				4,048
	1999					1,958	1,513	547	488	31				4,537
	2000						16	151	326	191				683
	2001					105	1,439	1,565	391	207				3,708
	2002					23	95	240	558	228				1,143
NS Total					7	10,386	30,968	23,920	13,324	4,596	315	326	79	83,921
Overall Total		619	169	7	245	13,756	39,355	127,002	236,779	151,809	81,638	18,218	945	670,541

Table 6. Summary of the minimum observed spawning stock biomass for each of the surveyed spawning grounds in the Bay of Fundy/SW Nova component of the 4WX stock complex (Melvin et al 2003).

Location/Year	1997	1998	1999	2000	2001	2002
Scots Bay	160,100	72,500	41,000	106,300	163,900	141,000
Trinity Ledge	23,000	6,800	3,900	600	14,800	8,100
German Bank	370,400	440,700	460,800	356,400	190,500	393,100
Spectacle B						
- Spring	15,000	1,300	0	0	1,100	0
- Fall					87,500	
Sub-Total	568,500	521,300	505,700	463,300	457,800	542,200
Seal Island					3,300	1,200
Browns					45,800	
Total					506,900	543,400

Table 7. Partial exploitation rates (%) by major spawning grounds and for the overall Bay of Fundy/SW Nova component of the 4WX stock complex with a) acoustic survey SSB (data for Seal Island and Spectacle Buoy included as German Bank) b) logbook catch by spawning component c) logbook catch adjustments to 4WX stock catch d) exploitation rates using unadjusted logbook catch e) exploitation rates using adjusted catch.

A) Acoustic Survey SSB (t)	1997	1998	1999	2000	2001	2002
Scots Bay	160,168	72,473	40,972	106,316	163,900	141,000
Trinity	23,000	6,762	3,885	621	14,800	8,100
German Bank	385,400	442,033	460,823	356,372	282,400	394,357
Total SSB	568,568	521,268	505,680	463,309	461,100	543,457

B) Logbook Catch (t)	1997	1998	1999	2000	2001	2002
Scots Bay	4,894	8,210	1,789	10,926	10,739	8,202
Trinity	5,308	2,825	1,220	103	113	1,609
German Bank	13,576	20,556	24,660	25,631	24,139	22,355
Total SSB	23,778	31,591	27,668	36,660	34,991	32,166

C) Overall Catch (t)	1997	1998	1999	2000	2001	2002
Logbook: non-spawning areas	16,541	40,136	45,682	46,526	31,014	45,345
Logbook: spawning areas	23,778	31,591	27,668	36,660	34,991	32,166
Total Logbook	40,319	71,727	73,350	83,186	66,005	77,511
Adjusted: non-spawning areas	23,022	43,102	48,299	47,700	33,629	45,078
Adjusted: spawning areas	33,095	33,925	29,253	37,584	37,941	31,976
4WX Stock Catch Total	56,117	77,027	77,552	85,284	71,570	77,054

D) Exploitation (logbook catches)	1997	1998	1999	2000	2001	2002
Scots Bay	0.06	0.19	0.13	0.20	0.13	0.14
Trinity	0.26	0.49	0.40	0.27	0.07	0.28
German Bank	0.06	0.12	0.14	0.17	0.15	0.14
Overall Exploitation (logbook)	0.07	0.15	0.15	0.18	0.16	0.14

E) Exploitation (adjusted catch)	1997	1998	1999	2000	2001	2002
Scots Bay	0.07	0.20	0.14	0.21	0.14	0.14
Trinity	0.27	0.50	0.41	0.27	0.08	0.28
German Bank	0.08	0.13	0.15	0.17	0.16	0.14
Overall 4WX Stock Exploitation	0.10	0.15	0.15	0.18	0.16	0.14

Table 8. Summary of biological samples by gear-type and month as taken during the 2002 4VWX herring fisheries. NO_LF is the number of length frequency samples collected, NO_MEAS is the number of length frequency fish measured and Aged is the number of detail fish with age determined.

		Month												
Gearname	Data	1	2	3	4	5	6	7	8	9	10	11	12	Grand Total
4W Purse Seine	Sum of NO_LF	2					67							69
	Sum of NO_MEAS	229					7952							8181
	Sum of Aged	28					89							117
Gillnet	Sum of NO_LF		2		12					13	5			32
	Sum of NO_MEAS		83		2291					838	115			3327
	Sum of Aged		45		598					260	118			1021
N.B. Purse Seine	Sum of NO_LF	45	1				9	5	11	19	71	18		179
	Sum of NO_MEAS	4716	106				1052	490	1261	2035	8332	2004		19996
	Sum of Aged	202	0				43	21	0	75	232	56		629
N.B. Weirs	Sum of NO_LF					2	2	66	191	125	35			421
	Sum of NO_MEAS					239	257	6743	20649	14068	4475			46431
	Sum of Aged					38	23	159	222	265	289			996
N.S. Purse Seine	Sum of NO_LF	4			4	44	22	145	189	113	28	3		552
	Sum of NO_MEAS	922			588	6333	2647	19599	25358	14497	3812	118		73874
	Sum of Aged	162			12	198	100	261	1059	417	33	35		2277
N.S. Weirs	Sum of NO_LF						1	8	4	1				14
	Sum of NO_MEAS						130	864	451	100				1545
	Sum of Aged						0	78	30	0				108
Resrch. Otter Trawl	Sum of NO_LF	1	22	36			6	96			3	3		167
	Sum of NO_MEAS										142	252		394
	Sum of Aged	24	177	438			56	1079			47	82		1903
4Vn Trap	Sum of NO_LF					1	1							2
	Sum of NO_MEAS					230	233							463
	Sum of Aged					55	42							97
5Y CAN P.Seine	Sum of NO_LF						26	76		1	2		1	106
	Sum of NO_MEAS						3096	8964			206		134	12400
	Sum of Aged						43	209		23	0		0	275
5Y USA P.Seine/MWT	Sum of NO_LF	2	11				1	10				9		33
	Sum of NO_MEAS	236	1417					1147				921		3721
	Sum of Aged	36	56				33	0				12		137
5Z USA P.Seine/MWT	Sum of NO_LF	15	16										1	32
	Sum of NO_MEAS	1752	1872										100	3724
	Sum of Aged	34	30										0	64
5Z CAN MW Trawl	Sum of NO_LF							6	3	4	1			14
	Sum of NO_MEAS							1198	617	619	154			2588
	Sum of Aged							24	0	0	0			24
Total Sum of NO_LF		69	52	36	16	47	135	412	398	276	145	33	2	1621
Total Sum of NO_MEAS		7855	3478		2879	6802	15367	39005	48336	32157	17236	3295	234	176644
Total Sum of Aged		486	308	438	610	291	429	1831	1311	1040	719	185	0	7648

Table 9. Summary of number of age determinations by gear-type and month as taken in the 2002 4VWX herring fisheries.

Sum of Aged	Month												
Gearname	1	2	3	4	5	6	7	8	9	10	11	12	Grand Total
4W Purse Seine	28					89							117
Gillnet		45		598					260	118			1021
N.B. Purse Seine	202	0				43	21	0	75	232	56		629
N.B. Weirs					38	23	159	222	265	289			996
N.S. Purse Seine	162			12	198	100	261	1059	417	33	35		2277
N.S. Weirs						0	78	30	0				108
Resrch. Otter Trawl	24	177	438			56	1079			47	82		1903
4Vn Trap					55	42							97
5Y CAN P.Seine						43	209		23	0		0	275
5Y USA P.Seine/MWT	36	56				33	0				12		137
5Z USA P.Seine/MWT	34	30										0	64
5Z CAN MW Trawl							24	0	0	0			24
Grand Total	486	308	438	610	291	429	1831	1311	1040	719	185	0	7648

Table 10. Summary of samples collected for length by gear-type and month as taken in the 2002 4VWX herring fisheries.

Sum of NO_LF (# samples)	Month												
Gearname	1	2	3	4	5	6	7	8	9	10	11	12	Grand Total
4W Purse Seine	2					67							69
Gillnet		2		12					13	5			32
N.B. Purse Seine	45	1				9	5	11	19	71	18		179
N.B. Weirs					2	2	66	191	125	35			421
N.S. Purse Seine	4			4	44	22	145	189	113	28	3		552
N.S. Weirs						1	8	4	1				14
Resrch. Otter Trawl	1	22	36			6	96			3	3		167
4Vn Trap					1	1							2
5Y CAN P.Seine						26	76		1	2		1	106
5Y USA P.Seine/MWT	2	11				1	10				9		33
5Z USA P.Seine/MWT	15	16										1	32
5Z CAN MW Trawl							6	3	4	1			14
Grand Total	69	52	36	16	47	135	412	398	276	145	33	2	1621

Table 11. Number of herring samples collected by DFO personnel from commercial fisheries (Commercial), by members of the fishing industry (Industry), observer program (Observer), independent observers on foreign vessels (OSS) and DFO research surveys (Research).

	Sample Source					
Year	**Commercial**	**Industry**	**Observer**	**OSS**	**Research**	**Total**
1990	422			185		607
1991	448			167	1	616
1992	330			205	1	536
1993	183			421		604
1994	223			228	14	465
1995	138			244	108	490
1996	127	868	49		69	1,113
1997	78	1,443			114	1,635
1998	225	1,376			98	1,699
1999	49	1,388	89		198	1,724
2000	34	1,387	108		177	1,706
2001	47	1,455	96		190	1,788
2002	17	1,339	84		181	1,621
Average	**179**	**1,322**	**85**	**242**	**105**	**1,123**

Table 12. Herring catch at age for the 2002 purse seine, weir and gillnet fisheries conducted on the southwest Nova Scotia spawning component (4WX stock).

SW Nova Scotia Stock
Catch at age (numbers and weight)

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	15,500	303,723	98,597	210,620	75,258	27,973	12,846	1,577	70	23	3	746,188	
% numbers	2%	41%	13%	28%	10%	4%	2%	0%	0%	0%	0%	100%	
Catch wt. (t)	280	13,626	10,408	31,215	13,944	6,190	3,270	449	23	9	1	79,416	
% catch wt.	0%	17%	13%	39%	18%	8%	4%	1%	0%	0%	0%	100%	
Avg. len (cm)	13.5	18.7	24.4	27.0	28.8	30.4	31.6	32.7	34.5	35.6	37.5	23.4	Avg. Len
Avg. wt. (g)	18.1	44.9	105.6	148.2	185.3	221.3	254.5	284.6	333.7	398.2	415.0	106.4	Avg. wt

Catch Numbers (000's)	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total
4X Winter Purse Seine	0	40,936	4,099	907	3	6	0	0	0	0	0	45,950
4X Halifax Seine	0	119	1,475	1,773	134	21	61	11	0	0	0	3,594
4X Summer Purse Seine	7,235	195,102	81,214	193,504	72,306	26,839	12,012	1,345	58	21	3	589,639
4X Fall Purse Seine	8,265	62,702	10,849	10,416	1,480	280	69	7	0	0	0	94,067
4X N.S. Weir	0	4,863	959	3,851	975	354	195	22	0	0	0	11,219
4X Gillnet	0	0	3	169	360	472	508	193	12	2	0	1,718
Total Numbers by Age	15,500	303,723	98,597	210,620	75,258	27,973	12,846	1,577	70	23	3	746,188

Percent Numbers	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total
4X Winter Purse Seine	0%	89%	9%	2%	0%	0%	0%	0%	0%	0%	0%	100%
4X Halifax Seine	0%	3%	41%	49%	4%	1%	2%	0%	0%	0%	0%	100%
4X Summer Purse Seine	1%	33%	14%	33%	12%	5%	2%	0%	0%	0%	0%	100%
4X Fall Purse Seine	9%	67%	12%	11%	2%	0%	0%	0%	0%	0%	0%	100%
4X N.S. Weir	0%	43%	9%	34%	9%	3%	2%	0%	0%	0%	0%	100%
4X Gillnet	0%	0%	0%	10%	21%	27%	30%	11%	1%	0%	0%	100%
Percent Numbers by Age	2%	41%	13%	28%	10%	4%	2%	0%	0%	0%	0%	100%

Catch Weight (t)	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total
4X Winter Purse Seine	0	906	261	88	1	1	0	0	0	0	0	1,256
4X Halifax Seine	0	8	126	192	21	4	14	3	0	0	0	367
4X Summer Purse Seine	104	9,127	8,839	28,968	13,436	5,944	3,062	385	20	8	1	69,894
4X Fall Purse Seine	176	3,431	1,071	1,370	242	55	15	2	0	0	0	6,362
4X N.S. Weir	0	155	111	570	175	78	49	6	0	0	0	1,144
4X Gillnet	0	0	0	28	70	107	130	53	4	1	0	393
Total Weight (t) by Age	280	13,626	10,408	31,215	13,944	6,190	3,270	449	23	9	1	79,416

Percent Weight	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total
4X Winter Purse Seine	0%	72%	21%	7%	0%	0%	0%	0%	0%	0%	0%	100%
4X Halifax Seine	0%	2%	34%	52%	6%	1%	4%	1%	0%	0%	0%	100%
4X Summer Purse Seine	0%	13%	13%	41%	19%	9%	4%	1%	0%	0%	0%	100%
4X Fall Purse Seine	3%	54%	17%	22%	4%	1%	0%	0%	0%	0%	0%	100%
4X N.S. Weir	0%	14%	10%	50%	15%	7%	4%	1%	0%	0%	0%	100%
4X Gillnet	0%	0%	0%	7%	18%	27%	33%	14%	1%	0%	0%	100%
Percent Weight by Age	0%	17%	13%	39%	18%	8%	4%	1%	0%	0%	0%	100%

Table 13. Herring catch at age by NAFO unit area for the 2002 summer purse seine fishery conducted on the southwest Nova Scotia spawning component (4WX stock).

Summer Purse - overall

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	7,235	195,102	81,214	193,504	72,306	26,839	12,012	1,345	58	21	3	589,639	
% numbers	1%	33%	14%	33%	12%	5%	2%	0%	0%	0%	0%	100%	
Catch wt. (t)	104	9,127	8,839	28,968	13,436	5,944	3,062	385	20	8	1	69,894	
% catch wt.	0%	13%	13%	41%	19%	9%	4%	1%	0%	0%	0%	100%	
Avg. len (cm)	12.0	19.0	24.6	27.1	28.9	30.4	31.6	32.7	34.5	35.6	37.5	24.4	Avg. Len
Avg. wt. (g)	14.4	46.8	108.8	149.7	185.8	221.5	254.9	286.2	337.6	402.6	415.0	118.5	Avg. wt

5Yb Purse	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	66	27,985	11,673	22,926	7,537	2,454	782	44	-	-	-	73,465	
% numbers	0%	38%	16%	31%	10%	3%	1%	0%	0%	0%	0%	100%	
Catch wt. (t)	2	1,524	1,395	3,420	1,393	525	189	12	-	-	-	8,460	
% catch wt.	0%	18%	16%	40%	16%	6%	2%	0%	0%	0%	0%	100%	
Avg. len (cm)	16.5	20.1	25.1	26.9	28.8	30.2	31.3	32.5	-	-		24.4	Avg. Len
Avg. wt. (g)	28.7	54.5	119.5	149.2	184.8	214.1	241.9	273.7	-	-		115.2	Avg. wt

4Xs Purse	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	1,997	58,891	7,725	7,732	2,124	478	89	6	-	-	-	79,042	
% numbers	3%	75%	10%	10%	3%	1%	0%	0%	0%	0%	0%	100%	
Catch wt. (t)	41	3,163	764	1,100	376	100	20	2	-	-	-	5,565	
% catch wt.	1%	57%	14%	20%	7%	2%	0%	0%	0%	0%	0%	100%	
Avg. len (cm)	14.7	20.0	24.0	26.9	28.7	30.2	31.2	33.4	-	-		21.2	Avg. Len
Avg. wt. (g)	20.6	53.7	98.9	142.2	176.9	208.8	228.0	271.5	-	-		70.4	Avg. wt

4Xr Purse	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	1,000	19,344	15,587	48,982	14,716	5,742	2,907	365	22	-	3	108,668	
% numbers	1%	18%	14%	45%	14%	5%	3%	0%	0%	0%	0%	100%	
Catch wt. (t)	23	901	1,774	7,339	2,726	1,286	745	105	7	-	1	14,906	
% catch wt.	0%	6%	12%	49%	18%	9%	5%	1%	0%	0%	0%	100%	
Avg. len (cm)	15.3	19.1	24.9	27.0	28.8	30.4	31.7	32.8	34.3	-	37.5	25.8	Avg. Len
Avg. wt. (g)	22.7	46.6	113.8	149.8	185.2	224.0	256.4	286.6	320.6	-	415.0	137.2	Avg. wt

4Xq Purse	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	4,172	70,924	44,855	113,304	47,490	18,014	8,224	931	36	21	-	307,970	
% numbers	1%	23%	15%	37%	15%	6%	3%	0%	0%	0%	0%	100%	
Catch wt. (t)	39	3,031	4,822	17,025	8,861	4,002	2,105	267	13	8	-	40,172	
% catch wt.	0%	8%	12%	42%	22%	10%	5%	1%	0%	0%	0%	100%	
Avg. len (cm)	9.9	18.5	24.5	27.1	28.9	30.4	31.6	32.7	34.6	35.6		25.1	Avg. Len
Avg. wt. (g)	9.2	42.7	107.5	150.3	186.6	222.2	255.9	286.7	348.1	402.6		130.4	Avg. wt

4Xpo Purse	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	-	17,958	1,373	560	440	151	11	0	-	-	-	20,494	
% numbers	0%	88%	7%	3%	2%	1%	0%	0%	0%	0%	0%	100%	
Catch wt. (t)	-	508	86	84	81	31	3	0	-	-	-	791	
% catch wt.	0%	64%	11%	11%	10%	4%	0%	0%	0%	0%	0%	100%	
Avg. len (cm)	-	16.3	20.7	27.2	29.0	29.9	31.0	32.7	-	-		17.3	Avg. Len
Avg. wt. (g)	-	28.3	62.3	149.8	183.4	202.9	226.5	274.3	-	-		38.6	Avg. wt

Table 14. Herring catch at age by month for the 2002 summer purse seine fishery conducted on the southwest Nova Scotia spawning component (4WX stock).

May Purse	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	2,853	55,525	14,002	4,761	1,797	866	331	47	15	-	-	80,196	
% numbers	4%	69%	17%	6%	2%	1%	0%	0%	0%	0%	0%	100%	
Catch wt. (t)	5	1,782	1,170	605	325	184	81	13	5	-	-	4,169	
% catch wt.	0%	43%	28%	15%	8%	4%	2%	0%	0%	0%	0%	100%	
Avg. len (cm)	7.1	17.0	22.7	25.9	28.8	30.2	31.5	33.1	34.4	-		18.7	Avg. Len
Avg. wt. (g)	1.7	32.1	83.6	127.1	180.7	212.1	243.3	286.4	326.7	-		52.0	Avg. wt

June Purse	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	-	1,965	2,306	6,195	4,735	2,250	924	112	7	-	3	18,495	
% numbers	0%	11%	12%	33%	26%	12%	5%	1%	0%	0%	0%	100%	
Catch wt. (t)	-	80	267	929	854	471	221	31	2	-	1	2,857	
% catch wt.	0%	3%	9%	33%	30%	16%	8%	1%	0%	0%	0%	100%	
Avg. len (cm)	-	18.0	25.0	27.2	28.9	30.3	31.5	33.0	34.2	-	37.5	27.0	Avg. Len
Avg. wt. (g)	-	40.8	115.7	150.0	180.4	209.5	239.2	277.1	309.3	-	415.0	154.5	Avg. wt

July Purse	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	-	5,021	18,947	63,663	30,555	10,647	3,738	240	2	-	-	132,814	
% numbers	0%	4%	14%	48%	23%	8%	3%	0%	0%	0%	0%	100%	
Catch wt. (t)	-	246	2,410	9,853	5,839	2,347	920	66	1	-	-	21,682	
% catch wt.	0%	1%	11%	45%	27%	11%	4%	0%	0%	0%	0%	100%	
Avg. len (cm)	-	19.1	25.5	27.2	29.0	30.3	31.3	32.4	33.5	-		27.4	Avg. Len
Avg. wt. (g)	-	49.0	127.2	154.8	191.1	220.4	246.1	277.0	307.5	-		163.3	Avg. wt

Aug Purse	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	183	11,793	14,902	54,827	18,435	7,885	4,898	609	18	21	-	113,570	
% numbers	0%	10%	13%	48%	16%	7%	4%	1%	0%	0%	0%	100%	
Catch wt. (t)	1	477	1,669	8,404	3,498	1,836	1,331	183	7	8	-	17,416	
% catch wt.	0%	3%	10%	48%	20%	11%	8%	1%	0%	0%	0%	100%	
Avg. len (cm)	11.5	18.6	24.8	27.1	28.8	30.5	31.9	32.8	35.0	35.6		26.7	Avg. Len
Avg. wt. (g)	7.2	40.4	112.0	153.3	189.8	232.9	271.8	301.2	379.8	402.6		153.3	Avg. wt

Sept Purse	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	295	36,354	18,035	47,457	11,263	3,725	1,542	318	16	-	-	119,006	
% numbers	0%	31%	15%	40%	9%	3%	1%	0%	0%	0%	0%	100%	
Catch wt. (t)	7	2,024	1,956	6,894	2,002	809	378	85	5	-	-	14,161	
% catch wt.	0%	14%	14%	49%	14%	6%	3%	1%	0%	0%	0%	100%	
Avg. len (cm)	15.7	20.0	24.6	27.0	28.7	30.5	31.7	32.6	34.3	-		24.8	Avg. Len
Avg. wt. (g)	24.7	55.7	108.4	145.3	177.8	217.1	245.0	268.4	316.0	-		119.0	Avg. wt

Oct Purse	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	3,904	84,445	13,022	16,601	5,522	1,465	579	20	-	-	-	125,558	
% numbers	3%	67%	10%	13%	4%	1%	0%	0%	0%	0%	0%	100%	
Catch wt. (t)	91	4,518	1,366	2,283	918	297	131	5	-	-	-	9,609	
% catch wt.	1%	47%	14%	24%	10%	3%	1%	0%	0%	0%	0%	100%	
Avg. len (cm)	15.4	20.0	24.8	27.0	28.7	30.5	31.6	33.5	-	-		21.8	Avg. Len
Avg. wt. (g)	23.2	53.5	104.9	137.5	166.2	202.7	226.3	272.6	-	-		76.5	Avg. wt

Table 15. Catch at age (thousands) for the Southwest Nova Scotia / Bay of Fundy herring spawning component, 1965-2002.

	Year											
Year	1	2	3	4	5	6	7	8	9	10	11+	Total
1965	270,378	1,084,719	34,835	234,383	49,925	10,592	1,693	561	54	37	1	1,687,178
1966	154,323	914,093	448,940	73,382	321,857	45,916	13,970	7,722	1,690	215	1	1,982,109
1967	722,208	613,970	153,626	266,454	110,051	159,203	57,948	4,497	409	296	148	2,088,810
1968	164,703	2,389,061	224,956	83,109	290,285	73,087	90,617	31,977	15,441	5,668	1,175	3,370,079
1969	108,875	290,329	531,812	132,319	162,439	112,631	62,506	22,595	6,345	2,693	722	1,433,266
1970	699,720	576,896	76,532	286,278	201,215	120,280	111,937	41,257	21,271	7,039	2,674	2,145,099
1971	87,570	404,224	183,896	106,630	113,566	75,593	93,620	50,022	36,618	7,536	5,695	1,164,970
1972		649,254	71,984	148,516	77,207	75,384	49,065	48,700	26,055	13,792	11,679	1,171,636
1973	1,018	167,454	781,061	130,851	40,128	30,334	22,046	20,249	23,871	11,630	13,386	1,242,028
1974	18,411	766,064	93,606	803,651	68,276	19,093	10,232	6,565	12,786	7,102	9,031	1,814,817
1975	3,199	317,641	239,827	124,599	514,605	66,302	12,298	4,409	4,778	3,847	6,225	1,297,730
1976	240	55,596	206,535	153,782	68,804	268,839	21,460	5,571	3,951	2,059	3,446	790,283
1977	1,170	153,921	31,572	218,478	119,234	51,173	177,247	13,977	3,170	1,415	3,894	775,251
1978	35,381	383,611	40,887	12,906	122,108	68,410	31,088	108,975	11,082	2,425	1,676	818,549
1979	342	183,982	250,393	54,620	5,430	23,142	18,255	11,836	41,389	4,527	2,411	596,327
1980	2,339	12,503	80,518	474,091	27,930	4,373	4,692	6,560	2,985	10,641	2,739	629,371
1981		103,051	50,883	102,743	451,482	32,978	2,418	2,767	1,917	538	2,149	750,926
1982	3,589	102,133	150,764	22,640	98,206	211,043	14,627	2,080	1,354	1,250	1,014	608,700
1983	5,488	191,682	150,328	244,007	24,483	60,678	89,982	10,352	1,728	642	1,324	780,694
1984		88,433	243,542	224,354	146,096	22,716	21,654	28,299	9,515	2,183	9,000	795,792
1985	9,022	216,740	337,591	302,782	147,670	42,404	14,075	18,178	7,997	1,201	470	1,098,130
1986	63	125,300	275,903	292,792	56,937	31,599	10,770	4,320	2,942	1,356	349	802,331
1987	2,300	82,940	126,436	527,443	242,597	45,933	19,481	7,292	3,361	3,120	650	1,061,553
1988	151	148,399	113,208	195,096	434,192	236,089	42,533	21,208	4,186	3,797	2,845	1,201,704
1989	8	101,788	114,095	61,842	79,451	169,023	76,684	18,303	8,270	3,814	3,057	636,335
1990		178,532	130,176	171,560	89,922	101,066	201,901	116,788	31,466	10,572	6,848	1,038,831
1991		96,960	179,463	183,647	88,431	41,352	50,380	80,732	45,516	18,291	13,524	798,296
1992	9	168,561	132,642	286,923	126,510	75,473	34,458	35,369	59,136	34,558	20,653	974,292
1993	166	76,405	43,766	194,198	130,713	67,708	33,820	21,481	21,893	20,684	11,175	622,009
1994	151	103,885	142,260	53,700	118,015	72,512	36,059	14,889	8,706	10,447	15,533	576,157
1995	1,831	113,457	219,777	112,245	36,784	36,402	22,127	6,474	4,217	2,957	3,566	559,837
1996		37,496	37,715	256,063	54,534	16,862	9,151	3,300	1,782	1,310	1,605	419,818
1997	356	56,561	87,395	78,098	131,062	18,917	5,131	3,636	894	620	874	383,544
1998	137	264,901	62,322	138,751	97,065	97,464	20,679	3,856	1,730	1,288	398	688,591
1999	2,694	112,893	223,283	147,840	131,463	57,291	10,044	613	212	70	13	686,415
2000	841	364,078	75,330	108,560	124,083	60,754	25,829	4,454	251	33	23	764,236
2001	51	73,368	325,273	57,175	60,409	31,891	15,509	2,203	304	8	4	566,193
2002	15,500	303,723	98,597	210,620	75,258	27,973	12,846	1,577	70	23	3	746,188

Table 16. Catch at age (%) for the Southwest Nova Scotia / Bay of Fundy herring spawning component, 1965-2002.

	Year											
Year	1	2	3	4	5	6	7	8	9	10	11+	Total
1965	16	64	2	14	3	1	0	0	0	0	0	100
1966	8	46	23	4	16	2	1	0	0	0	0	100
1967	35	29	7	13	5	8	3	0	0	0	0	100
1968	5	71	7	2	9	2	3	1	0	0	0	100
1969	8	20	37	9	11	8	4	2	0	0	0	100
1970	33	27	4	13	9	6	5	2	1	0	0	100
1971	8	35	16	9	10	6	8	4	3	1	0	100
1972	-	55	6	13	7	6	4	4	2	1	1	100
1973	0	13	63	11	3	2	2	2	2	1	1	100
1974	1	42	5	44	4	1	1	0	1	0	0	100
1975	0	24	18	10	40	5	1	0	0	0	0	100
1976	0	7	26	19	9	34	3	1	0	0	0	100
1977	0	20	4	28	15	7	23	2	0	0	1	100
1978	4	47	5	2	15	8	4	13	1	0	0	100
1979	0	31	42	9	1	4	3	2	7	1	0	100
1980	0	2	13	75	4	1	1	1	0	2	0	100
1981	-	14	7	14	60	4	0	0	0	0	0	100
1982	1	17	25	4	16	35	2	0	0	0	0	100
1983	1	25	19	31	3	8	12	1	0	0	0	100
1984	-	11	31	28	18	3	3	4	1	0	1	100
1985	1	20	31	28	13	4	1	2	1	0	0	100
1986	0	16	34	36	7	4	1	1	0	0	0	100
1987	0	8	12	50	23	4	2	1	0	0	0	100
1988	0	12	9	16	36	20	4	2	0	0	0	100
1989	0	16	18	10	12	27	12	3	1	1	0	100
1990	-	17	13	17	9	10	19	11	3	1	1	100
1991	-	12	22	23	11	5	6	10	6	2	2	100
1992	0	17	14	29	13	8	4	4	6	4	2	100
1993	0	12	7	31	21	11	5	3	4	3	2	100
1994	0	18	25	9	20	13	6	3	2	2	3	100
1995	0	20	39	20	7	7	4	1	1	1	1	100
1996	-	9	9	61	13	4	2	1	0	0	0	100
1997	0	15	23	20	34	5	1	1	0	0	0	100
1998	0	38	9	20	14	14	3	1	0	0	0	100
1999	0	16	33	22	19	8	1	0	0	0	0	100
2000	0	48	10	14	16	8	3	1	0	0	0	100
2001	0	13	57	10	11	6	3	0	0	0	0	100
2002	2	41	13	28	10	4	2	0	0	0	0	100

Table 17. Average weights at age (g) for the SW Nova Scotia component of the 4WX herring fishery (weighted by fishery) for 1965-2002 (values for 1979-83 are averages for the period 1968-78 as in Iles et al. 1984).

	Year									
Year	1	2	3	4	5	6	7	8	9	10
1965	10	41	112	172	218	254	286	323	354	389
1966	10	41	112	172	218	254	286	323	354	389
1967	10	41	112	172	218	254	286	323	354	389
1968	10	33	112	148	185	244	276	399	338	410
1969	10	37	105	162	207	242	282	306	334	390
1970	10	32	119	169	211	257	292	332	369	389
1971	10	66	143	199	230	254	293	329	362	388
1972	10	44	138	192	223	262	292	322	345	380
1973	10	29	106	143	225	252	279	331	360	389
1974	10	48	110	175	206	240	277	322	342	352
1975	10	21	94	179	216	240	268	333	358	379
1976	10	33	114	159	233	249	277	317	382	404
1977	10	65	113	174	214	274	293	325	328	416
1978	10	28	112	181	229	259	302	330	351	397
1979	10	41	112	172	218	254	286	323	354	389
1980	10	41	112	172	218	254	286	323	354	389
1981	10	41	112	172	218	254	286	323	354	389
1982	10	41	112	172	218	254	286	323	354	389
1983	10	41	112	172	218	254	286	323	354	389
1984	10	38	132	191	229	259	280	296	309	364
1985	10	53	118	204	249	278	315	334	344	440
1986	10	55	124	182	239	271	306	329	360	400
1987	12	50	98	153	199	245	274	290	318	350
1988	13	21	88	154	196	242	281	304	327	341
1989	7	33	79	162	207	238	274	303	324	353
1990	10	31	92	161	200	234	255	287	319	336
1991	10	48	100	147	186	217	251	270	303	322
1992	9	25	100	148	181	216	252	275	295	313
1993	18	29	108	153	188	215	251	279	302	324
1994	12	37	79	131	175	203	223	253	289	304
1995	15	42	76	136	187	223	247	293	300	326
1996	10	33	98	137	168	228	266	308	332	355
1997	19	34	80	161	190	238	284	314	358	376
1998	10	38	76	131	177	210	251	296	308	337
1999	20	42	75	120	172	220	263	304	344	378
2000	26	61	95	138	171	206	235	269	316	360
2001	22	58	108	150	190	227	268	293	327	370
2002	18	45	106	148	185	221	255	285	334	398

Table 18. 2002 fishery observations for the SW Nova Scotia spawning component based on a summary of attributes used previously as biological indicators (DFO 1997).

Biological Attribute	**Positive**	**Negative**
Spawning time	Normal in most areas	
Spawning location	Spawning seen for second year on Seal Island after several years of absence	
Spawning: relative amount	Documented SSB highest in recent years with comparable surveys. More SSB observed on German Bank than in previous year	SSB well below historical levels on Trinity and Seal Island
Size/Age composition	Strong recruiting 1998 year-class; indications that 2000 year-class may be strong	Few fish older than age 7; 1999 year-class appears weak
Distribution	As expected in most key over-wintering, summer feeding and spawning areas	
Relative fish abundance	Lots of fish, good catch rate and trip success	
Physiology, condition and behaviour	Nothing unusual noted; fat content as expected	

Table 19. 2002 4WX offshore herring purse seine and Halifax fisheries catch at age.

4WX Offshore Purse
Catch at age (number and weight)

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	-	26,202	3,467	5,638	7,926	7,260	6,756	1,172	212	9	3	58,645	
% numbers	0%	45%	6%	10%	14%	12%	12%	2%	0%	0%	0%	100%	
Catch wt. (t)	-	679	315	846	1,472	1,588	1,668	325	65	3	1	6,962	
% catch wt.	0%	10%	5%	12%	21%	23%	24%	5%	1%	0%	0%	100%	
Avg. len (cm)	-	16.0	23.2	27.2	29.1	30.7	31.9	33.0	34.1	35.5	36.0	23.3	Avg. Len
Avg. wt. (g)	-	25.9	90.8	150.1	185.7	218.8	246.9	277.1	307.6	348.3	364.2	118.7	Avg. wt

Halifax P.Seine
Catch at age (numbers and weight)

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	-	119	1,475	1,773	134	21	61	11	-	-	-	3,594	
% numbers	0%	3%	41%	49%	4%	1%	2%	0%	0%	0%	0%	100%	
Catch wt. (t)	-	8	126	192	21	4	14	3	-	-	-	367	
% catch wt.	0%	2%	34%	52%	6%	1%	4%	1%	0%	0%	0%	100%	
Avg. len (cm)	-	21.7	23.2	25.2	28.2	29.8	31.8	32.7	-	-		24.5	Avg. Len
Avg. wt. (g)	-	67.6	85.1	108.3	155.1	184.6	228.5	248.7	-	-		102.1	Avg. wt

Table 20. Herring abundance indices: larval abundance index (average number of larvae per m² from 79 index stations) and herring by-catch (stratified numbers per tow) from the July groundfish survey.

Larval Herring Bongo Survey No.per m2 to bottom					Summer groundfish by-catch (mean nos per tow for herring)									
					4WX area combined strata 453/495				4W Only strata 453/466		4X Only strata 470/495		Offshore Banks strata 455/478	
Year	Cruise	Mean	SE	N	Cruise	Mean#	SE	N	Mean#	SE	Mean#	SE	Mean#	SE
1970					A175/176	4.1	1.5	95	4.9	2.4	1.6	0.6		
1971					A188/189	4.0	1.9	86	2.6	1.2	3.6	2.6		
1972	P109	9.4	1.8	79	A200/201	1.4	0.6	105	1.7	1.0	0.5	0.1		
1973	P127	6.6	1.3	79	A212/213	0.9	0.3	96	0.4	0.3	1.0	0.4		
1974	P147	49.5	10.9	79	A225/226	0.7	0.3	102	0.2	0.0	1.0	0.4		
1975	P160	11.7	1.5	58	A236/237	0.9	0.4	104	0.8	0.4	0.7	0.4		
1976	P175	13.5	2.9	79	A250/251	0.4	0.2	103	0.1	0.1	0.5	0.3		
1977	P190	6.3	1.0	79	A265/266	0.5	0.3	106	0.0	0.0	0.8	0.5		
1978	P207	4.5	0.5	77	A279/280	0.3	0.3	103	0.5	0.5	0.1	0.0		
1979	P232	7.1	2.1	79	A292/293	0.6	0.5	106	0.0	0.0	1.0	0.7		
1980	P246	26.2	6.7	79	A306/307	0.5	0.5	105	0.0	0.0	0.8	0.8		
1981	P263	2.7	0.3	78	A321/322	1.5	1.4	104	0.0	0.0	2.3	2.1		
1982	P280	10.6	1.2	77	H080/081	1.5	0.9	108	0.5	0.3	1.9	1.4		
1983	P298	13.9	1.6	74	N012/013	2.4	0.8	106	2.6	1.2	2.2	1.0	2.1	1.0
1984	P315	12.7	1.4	78	N031/032	7.0	3.5	102	3.3	1.2	10.5	6.8	8.5	5.4
1985	P329	40.8	4.6	79	N048/049	3.4	1.8	111	6.6	3.8	0.3	0.1	5.0	2.9
1986	P344	18.9	2.1	78	N065/066	23.2	14.9	118	30.8	26.7	16.0	14.3	23.4	20.3
1987	P361	27.9	3.2	78	N85/86/87	10.4	5.6	135	17.0	11.3	4.0	1.8	12.9	8.6
1988	P377	100.7	11.5	76	N105/106	2.1	0.6	127	2.7	1.2	1.5	0.5	2.0	0.9
1989	P391	54.5	6.1	79	N123/124	8.4	1.8	124	11.8	3.4	4.5	1.2	9.8	2.7
1990	P408	27.2	3.1	79	N139/140	5.6	1.9	156	7.4	3.6	3.4	1.0	6.5	2.9
1991	P422	48.2	5.5	78	N154/H231	10.6	5.8	137	13.0	8.8	5.0	1.8	14.3	9.0
1992	P437	57.0	6.4	79	N173/174	16.5	4.9	136	16.2	6.6	40.8	15.7	23.6	7.4
1993	P451	55.0	6.2	78	N189/190	18.7	4.5	137	6.3	2.5	30.4	8.5	15.0	4.7
1994	N211	5.4	0.7	77	N221/222	76.4	30.2	140	108.4	58.9	45.9	18.4	91.1	45.1
1995	N232	20.3	4.6	78	N226/227	63.5	24.2	140	100.5	47.9	28.4	12.8	92.7	37.6
1996	N252	9.5	1.6	77	N246/247	40.2	14.2	135	53.2	24.5	27.1	14.1	46.5	19.5
1997	N765	23.3	2.7	77	N726/734	31.8	15.3	137	34.6	10.1	51.3	39.3	29.3	7.7
1998	N865	33.6	3.8	77	N827/832	99.52	20.65	131	147.6	39.92	54.76	14.5	130.3	30.3
1999	no survey				N925/929	229.8	83.8	133	264.2	101.0	199.4	130.2	226.2	74.4
2000	no survey				N426/431	90.6	20.0	146	146.3	40.6	38.7	7.4	124.7	30.5
2001	no survey				N2001-032/037	145.9	47.7	139	152.7	81.3	139.5	52.5	132.4	60.9
2002	no survey				N2002-037/040	161.9	48.6	147	172.7	81.3	151.9	55.6	162.6	61.1

Table 21. Stratified numbers per tow by age of herring for unit area 4WX from DFO July research survey.

Year	1	2	3	4	5	6	7	8	9	10	11+	Unkown	TOTAL
1970			0.1	1.6	1.2	0.8	0.2	0.1	0.0				4.0
1971			0.4	0.8	1.3	0.7	0.5	0.0	0.0	0.0	0.0	0.1	3.9
1972		0.1	0.0	0.2	0.3	0.4	0.2	0.1	0.0	0.0	0.0	0.1	1.4
1973			0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.1	0.9
1974		0.0	0.1	0.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.8
1975		0.0	0.1	0.2	0.3	0.1	0.0	0.0	0.0	0.0	0.1		0.9
1976		0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0		0.4
1977		0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0			0.3	0.5
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0		0.4
1979		0.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.6
1980	0.0	0.0	0.0	0.0	0.0	0.0						0.5	0.5
1981	0.1	0.1	0.4	0.7	0.2	0.0	0.0	0.0	0.0	0.0		0.0	1.5
1982		0.1	0.3	0.3	0.7	0.4	0.0	0.0	0.0	0.0	0.0	0.0	1.9
1983	0.0	0.6	0.2	0.6	0.1	0.3	0.3	0.1	0.0	0.0	0.0	0.0	2.4
1984	0.0	0.1	0.4	0.8	1.2	0.3	0.3	0.3	0.0	0.1	3.5	0.0	7.0
1985		0.1	0.2	1.1	1.0	0.6	0.2	0.2	0.1	0.0	0.0	0.0	3.4
1986		0.2	7.2	7.2	4.7	2.4	1.1	0.2	0.1	0.1	0.1	0.0	23.4
1987	0.0	1.0	3.7	2.7	1.1	0.8	0.4	0.3	0.2	0.1	0.1		10.4
1988		0.3	0.1	0.4	0.7	0.4	0.1	0.0	0.0	0.0	0.0	0.0	2.1
1989	0.2	0.2	0.4	0.8	1.0	2.9	1.7	0.3	0.1	0.1	0.1	0.1	8.0
1990	0.1	0.2	0.6	0.8	0.7	0.7	1.3	0.7	0.1	0.0	0.1	0.0	5.3
1991		0.1	0.5	1.6	1.9	1.1	1.6	2.7	0.9	0.2	0.1	0.0	10.9
1992		11.6	1.3	1.8	2.8	4.1	2.1	1.9	2.6	0.6	0.3	0.1	29.1
1993		0.1	0.8	3.1	4.2	4.1	3.1	1.3	0.9	0.8	0.4		18.8
1994		0.1	5.1	9.5	23.2	18.4	7.0	0.5	1.4	3.4	1.2	6.1	75.9
1995	0.0	0.5	10.7	13.1	9.4	13.8	9.2	3.3	1.6	1.0	1.3	0.1	63.9
1996	0.0	0.3	1.8	19.1	7.9	5.3	3.2	1.1	0.3	0.2	0.2	0.0	39.4
1997	1.2	20.0	1.8	5.7	9.1	2.0	1.2	0.6	0.2	0.1	0.3	0.9	43.2
1998	0.1	1.5	2.4	22.0	37.8	28.4	5.2	1.4	0.4	0.2	0.2	0.0	99.5
1999	0.2	7.3	59.5	32.6	92.9	29.8	2.3	0.1	0.0	0.0		0.1	224.7
2000	0.1	1.2	9.1	31.7	30.8	13.2	4.0	0.4	0.0	0.0		0.0	90.6
2001		5.3	95.0	14.1	22.7	7.2	1.3	0.1	0.0			0.0	145.8
2002	1.8	34.9	41.8	56.9	18.4	5.1	2.4	0.4	0.0	0.0		0.2	161.9

Table 22. Recorded landings (t) of herring from major gillnet fisheries on the Coastal Nova Scotia Spawning component.

Landings (t)

	1996	1997	1998	1999	2000	2001	2002
East of Halifax	1,280	1,520	1,100	1,628	1,350	1,898	3,334
Little Hope		490	1,170	2,919	2,043	2,904	3,982
Glace Bay		170	1,730	1,040	834	1,204	3,058
Bras d'Or Lakes	170	160	120	31	56	0	1
Total	1,450	2,340	4,120	5,618	4,283	6,006	10,375

Table 23. Summary of the estimated biomass for locations outside the Bay of Fundy/Southwest Nova Scotia quota area. All areas except the Scotian Shelf are for individual spawning grounds and are estimates of SSB (Melvin et al 2003).

Area	1999	2000	2001	2002
Little Hope	14,600	5,200	21,300	56,015
Eastern Passage	9,500	10,870	16,700	41,455
Bras d'Or Lakes	-	70	-	-
Glace Bay	-	-	21,200	7,700
Scotian Shelf	22,300	85,600	145,000	-

Table 24. Catch at age for herring from Coastal Nova Scotia fisheries in 2002.

4X Port Mouton/Little Hope Gillnet
Catch at age (number and weight)

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	-	-	62	2,079	4,869	5,479	4,732	1,321	72	13	-	18,625	
% numbers	0%	0%	0%	11%	26%	29%	25%	7%	0%	0%	0%	100%	
Catch wt. (t)	-	-	8	331	900	1,190	1,170	365	23	4	-	3,992	
% catch wt.	0%	0%	0%	8%	23%	30%	29%	9%	1%	0%	0%	100%	
Avg. len (cm)	-	-	26.7	28.0	29.4	30.8	32.0	33.0	34.3	35.5		30.6	Avg. Len
Avg. wt. (g)	-	-	134.5	159.0	185.0	217.3	247.3	276.2	315.1	353.5		214.3	Avg. wt

4W Eastern Shore herring gillnet (needs to be updated with revised samples)
Catch at age (number and weight)

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	-	-	66	1,888	4,574	4,865	3,782	843	40	7	-	16,065	
% numbers	0%	0%	0%	12%	28%	30%	24%	5%	0%	0%	0%	100%	
Catch wt. (t)	-	-	9	295	832	1,038	919	232	13	3	-	3,340	
% catch wt.	0%	0%	0%	9%	25%	31%	28%	7%	0%	0%	0%	100%	
Avg. len (cm)	-	-	26.8	27.9	29.3	30.8	32.0	33.0	34.3	35.5		30.4	Avg. Len
Avg. wt. (g)	-	-	135.2	156.3	181.9	213.3	242.9	275.8	315.1	353.5		207.9	Avg. wt

Glace Bay herring gillnet
Catch at age (numbers and weight)

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	-	-	-	318	959	1,764	3,761	3,539	534	92	30	10,996	
% numbers	0%	0%	0%	3%	9%	16%	34%	32%	5%	1%	0%	100%	
Catch wt. (t)	-	-	-	60	203	420	1,036	1,115	178	34	12	3,058	
% catch wt.	0%	0%	0%	2%	7%	14%	34%	36%	6%	1%	0%	100%	
Avg. len (cm)	-	-	-	28.0	29.3	30.6	32.4	34.1	34.9	36.4	37.5	32.4	Avg. Len
Avg. wt. (g)	-	-	-	187.7	211.6	238.0	275.3	315.1	334.2	374.8	405.2	278.1	Avg. wt

Bras d'Or Lakes herring gillnet
Catch at age (number and weight)

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	-	-	-	0	1	2	8	18	11	2	1	41	
% numbers	0%	0%	0%	0%	1%	5%	19%	42%	25%	6%	1%	99%	
Catch wt. (t)	-	-	-	0	0	0	2	5	3	1	0	12	
% catch wt.	0%	0%	0%	0%	1%	4%	17%	42%	27%	6%	2%	98%	
Avg. len (cm)	-	-	-	28.8	29.5	30.8	32.6	34.0	35.1	36.2	38.2	34.0	Avg. Len
Avg. wt. (g)	-	-	-	193.1	204.3	227.8	260.6	289.5	312.9	337.1	382.9	289.7	Avg. wt

Table 25. Summary of herring catches for the 4Vn inshore area (stratum 42) during the July groundfish survey;1990 to 2002 in numbers and weight (kg).

Year	Total Number	Average No. Per Set	Total Weight	Average Wt. Per Set
1990	1	0	0	0
1991	11	2	4	1
1992	0	0	0	0
1993	13	3	4	1
1994	1,301	217	432	72
1995	359	60	80	13
1996	0	0	0	0
1997	2	0	1	0
1998	37	7	6	1
1999	1,605	229	431	62
2000	42	7	11	2
2001	2,938	490	944	157
2002	91	18	26	5

Table 26. 2002 4Vn trap, 4W trap and 4VWX miscellaneous fisheries catch at age.

4Vn Trap
Catch at age (numbers and weight)

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	-	1	50	182	138	95	103	55	14	4	1	643	
% numbers	0%	0%	8%	28%	21%	15%	16%	8%	2%	1%	0%	100%	
Catch wt. (t)	-	0	7	30	27	21	26	15	4	1	0	133	
% catch wt.	0%	0%	5%	23%	20%	16%	19%	12%	3%	1%	0%	100%	
Avg. len (cm)	-	22.0	25.0	27.2	28.9	30.7	32.0	33.6	35.1	35.6	38.5	29.5	Avg. Len
Avg. wt. (g)	-	99.6	137.3	167.6	194.9	224.6	249.9	281.5	311.3	324.2	391.1	207.0	Avg. wt

4VWX Misc
Catch at age (numbers and weight)

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	22	341	112	153	60	27	14	4	4	7	5	749	
% numbers	3%	45%	15%	20%	8%	4%	2%	0%	0%	1%	1%	99%	
Catch wt. (t)	0	16	11	22	11	6	4	1	1	2	2	76	
% catch wt.	1%	21%	14%	28%	14%	7%	5%	1%	2%	3%	2%	98%	
Avg. len (cm)	13.8	18.8	23.9	26.8	28.8	30.4	31.7	33.3	34.3	35.5	37.0	22.9	Avg. Len
Avg. wt. (g)	18.0	46.9	100.1	143.1	178.5	213.3	243.9	284.2	312.8	348.3	397.5	101.5	Avg. wt

Table 27. Weir catches (t), number of active weirs and the catch per weir, 1978 to 2002.

	Catch t			No. Active Weirs			Catch per weir		
Year	NB	NS	Total Catch	NB	NS	Total No.	NB	NS	Average
1978	33,599	7,858	41,458	208	31	239	162	253	173
1979	32,579	6,339	38,918	210	27	237	155	235	164
1980	11,066	2,383	13,449	120	29	149	92	82	90
1981	14,968	1,824	16,793	147	28	175	102	65	96
1982	22,181	1,130	23,311	159	19	178	140	59	131
1983	12,568	896	13,464	143	23	166	88	39	81
1984	8,353	2,702	11,056	116	13	129	72	208	86
1985	26,718	4,055	30,774	156	14	170	171	290	181
1986	27,516	1,957	29,473	105	18	123	262	109	240
1987	26,621	6,776	33,397	123	21	144	216	323	232
1988	38,235	7,480	45,715	191	21	212	200	356	216
1989	43,520	3,296	46,817	171	20	191	255	165	245
1990	39,808	4,132	43,940	154	22	176	258	188	250
1991	23,717	1,498	25,216	143	20	163	166	75	155
1992	31,981	2,224	34,206	151	12	163	212	185	210
1993	31,328	2,662	33,990	145	10	155	216	266	219
1994	20,618	2,045	22,662	129	11	140	160	186	162
1995	18,228	3,049	21,277	106	10	116	172	305	183
1996	15,781	3,476	19,257	101	12	113	156	290	170
1997	20,396	4,019	24,415	102	15	117	200	268	209
1998	19,529	4,048	23,577	108	15	123	181	270	192
1999	19,063	4,537	23,600	100	14	114	191	324	207
2000	16,376	683	17,058	77	3	80	213	228	213
2001	20,064	3,708	23,772	101	14	115	199	265	207
2002	11,807	1,143	12,950	83	9	92	142	127	141
Totals	586,620	83,921	670,541	3349	431	3780	175	195	177

Table 28. New Brunswick weir and shut-off catch at age for herring in 2002.

NB Weir and Shutoff combined
Catch at age (numbers and weight)

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	33,184	178,663	15,588	13,167	2,303	346	95	6	-	-	-	243,352	
% numbers	14%	73%	6%	5%	1%	0%	0%	0%	0%	0%	0%	100%	
Catch wt. (t)	632	7,338	1,465	1,918	417	78	25	2	-	-	-	11,874	
% catch wt.	5%	62%	12%	16%	4%	1%	0%	0%	0%	0%	0%	100%	
Avg. len (cm)	14.4	18.4	23.5	26.8	28.5	30.3	31.5	31.9	-	-		18.7	Avg. Len
Avg. wt. (g)	19.0	41.1	94.0	145.7	181.1	225.3	258.3	270.0	-	-		48.8	Avg. wt

NB Weirs (only)
Catch at age (numbers and weight)

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	32,841	177,567	15,534	13,128	2,297	345	95	6	-	-	-	241,813	
% numbers	14%	73%	6%	5%	1%	0%	0%	0%	0%	0%	0%	100%	
Catch wt. (t)	625	7,289	1,460	1,913	416	78	24	2	-	-	-	11,807	
% catch wt.	5%	62%	12%	16%	4%	1%	0%	0%	0%	0%	0%	100%	
Avg. len (cm)	14.4	18.4	23.5	26.8	28.5	30.3	31.5	31.9	-	-		18.7	Avg. Len
Avg. wt. (g)	19.0	41.0	94.0	145.7	181.1	225.3	258.3	270.0	-	-		48.8	Avg. wt

NB Shutoff (only)
Catch at age (numbers and weight)

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	343	1,096	54	39	6	1	0	0	-	-	-	1,538	
% numbers	22%	71%	3%	3%	0%	0%	0%	0%	0%	0%	0%	100%	
Catch wt. (t)	7	49	5	5	1	0	0	0	-	-	-	67	
% catch wt.	10%	73%	8%	8%	2%	0%	0%	0%	0%	0%	0%	100%	
Avg. len (cm)	14.4	18.6	23.6	26.6	28.4	30.0	31.7	32.0	-	-		18.1	Avg. Len
Avg. wt. (g)	19.2	44.5	94.8	139.2	172.2	205.6	244.9	252.2	-	-		43.6	Avg. wt

Table 29. 5Z Georges Bank (Canadian portion) midwater trawl fishery catch at age for 2002.

5Ze Can. Midwater Trawl
Catch at age (numbers and weight)

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total	
Numbers (x1,000)	-	-	764	4,747	2,696	1,465	766	90	-	-	-	10,528	
% numbers			7%	45%	26%	14%	7%	1%				100%	
Catch wt. (t)	-	-	90	613	439	277	165	21	-	-	-	1,605	
% catch wt.			6%	38%	27%	17%	10%	1%				100%	
Avg. len (cm)	-	-	26.2	26.9	29.0	30.5	31.8	32.5	-	-		28.3	Avg. Len
Avg. wt. (g)	-	-	117.8	129.1	162.7	189.4	215.7	229.6	-	-		152.5	Avg. wt

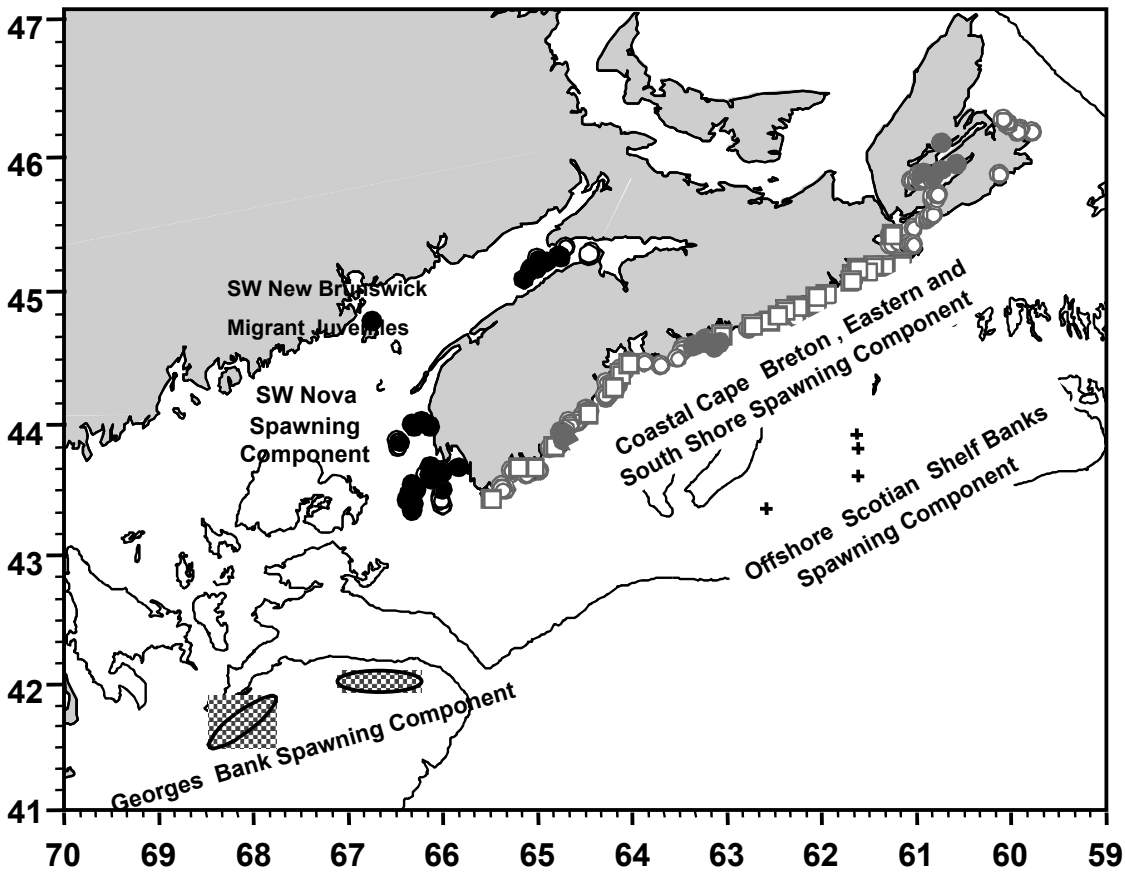

Figure 1. Management units for herring in areas 4VWX and 5 showing locations of known current (solid) and historical (open) spawning locations.

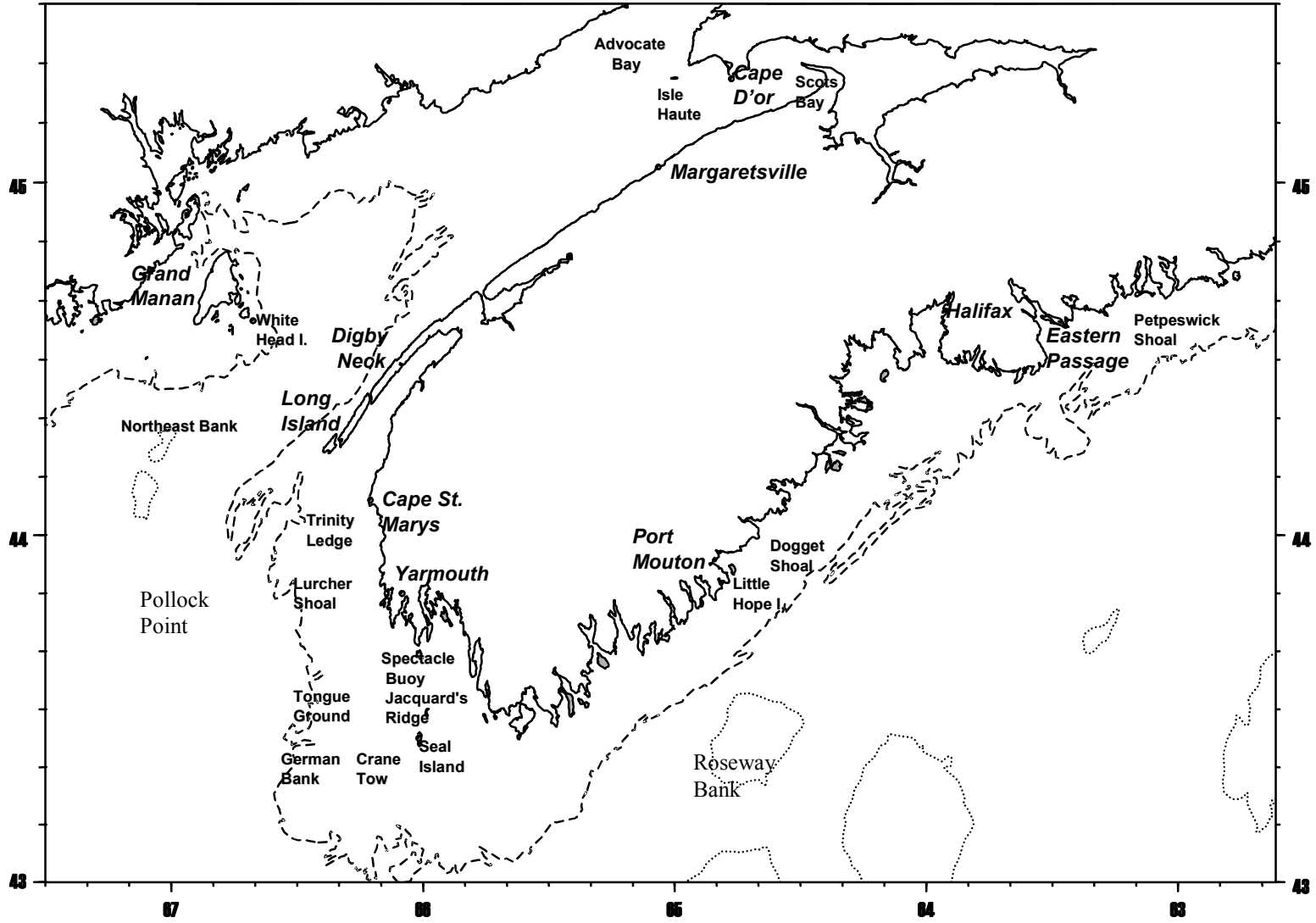

Figure 2. Fishing locations for herring in southwest and coastal Nova Scotia.

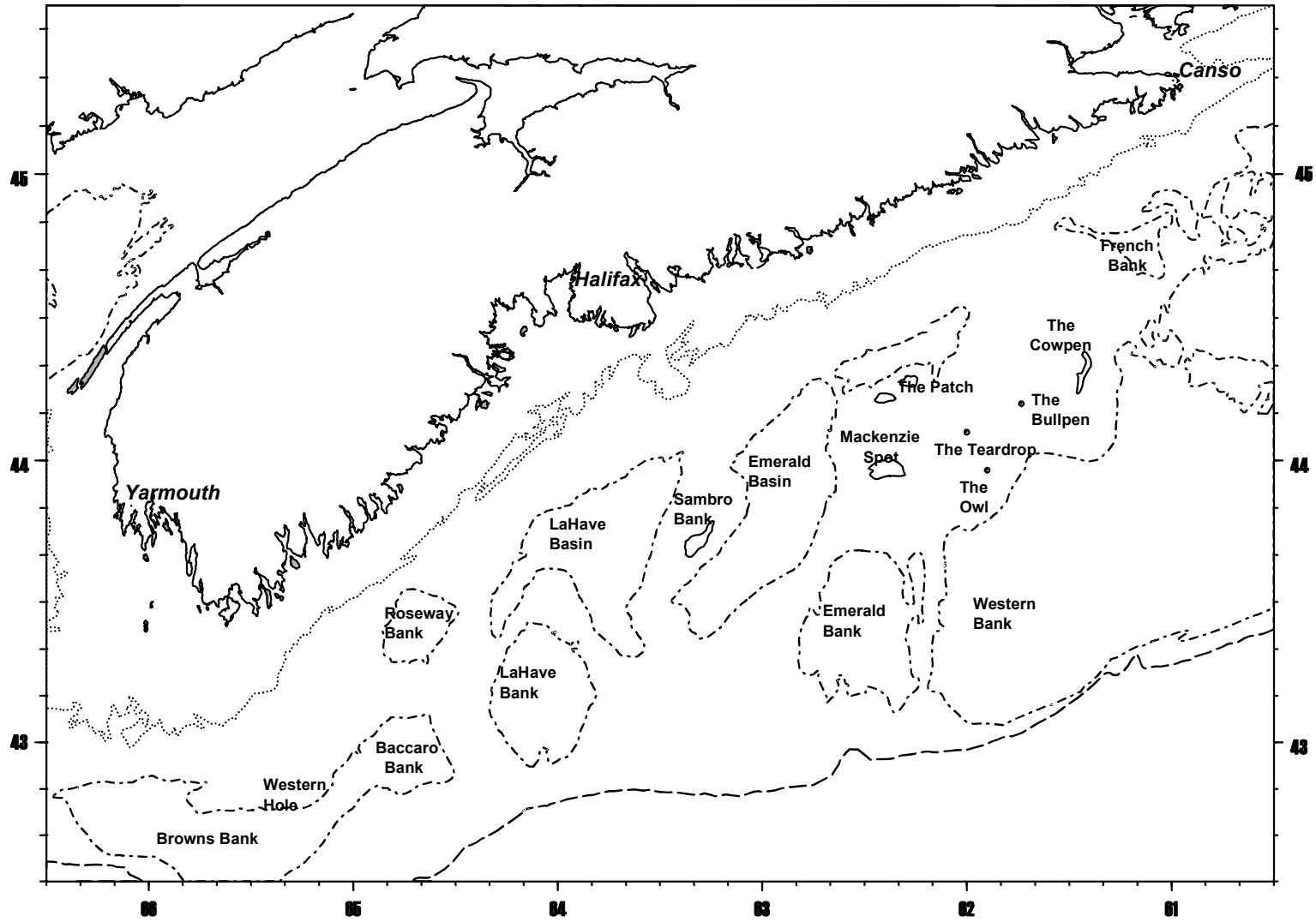

Figure 3. Fishing locations for herring on the offshore Scotian Shelf banks.

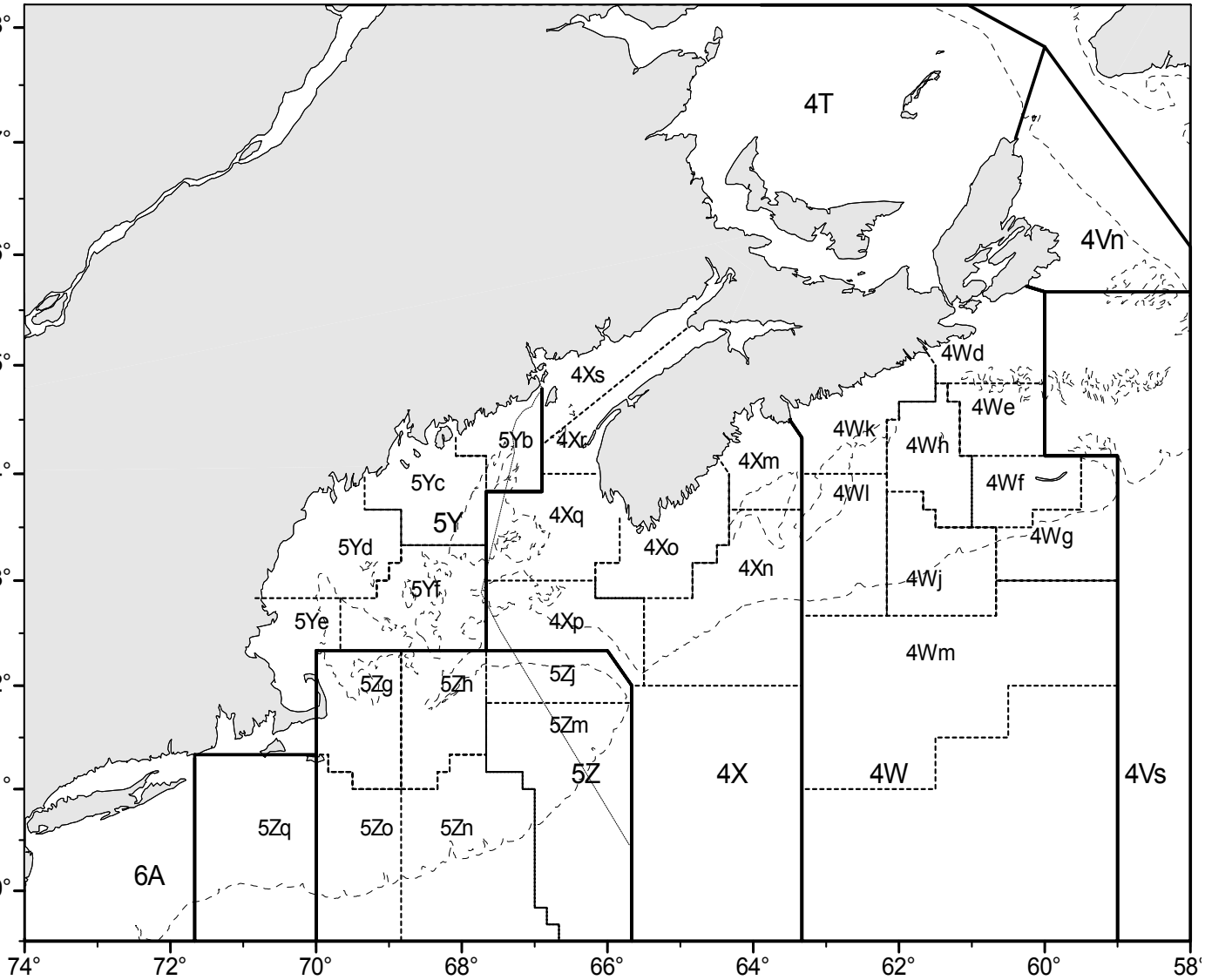

Figure 4. Major and minor NAFO unit areas as used for sample and catch data aggregation.

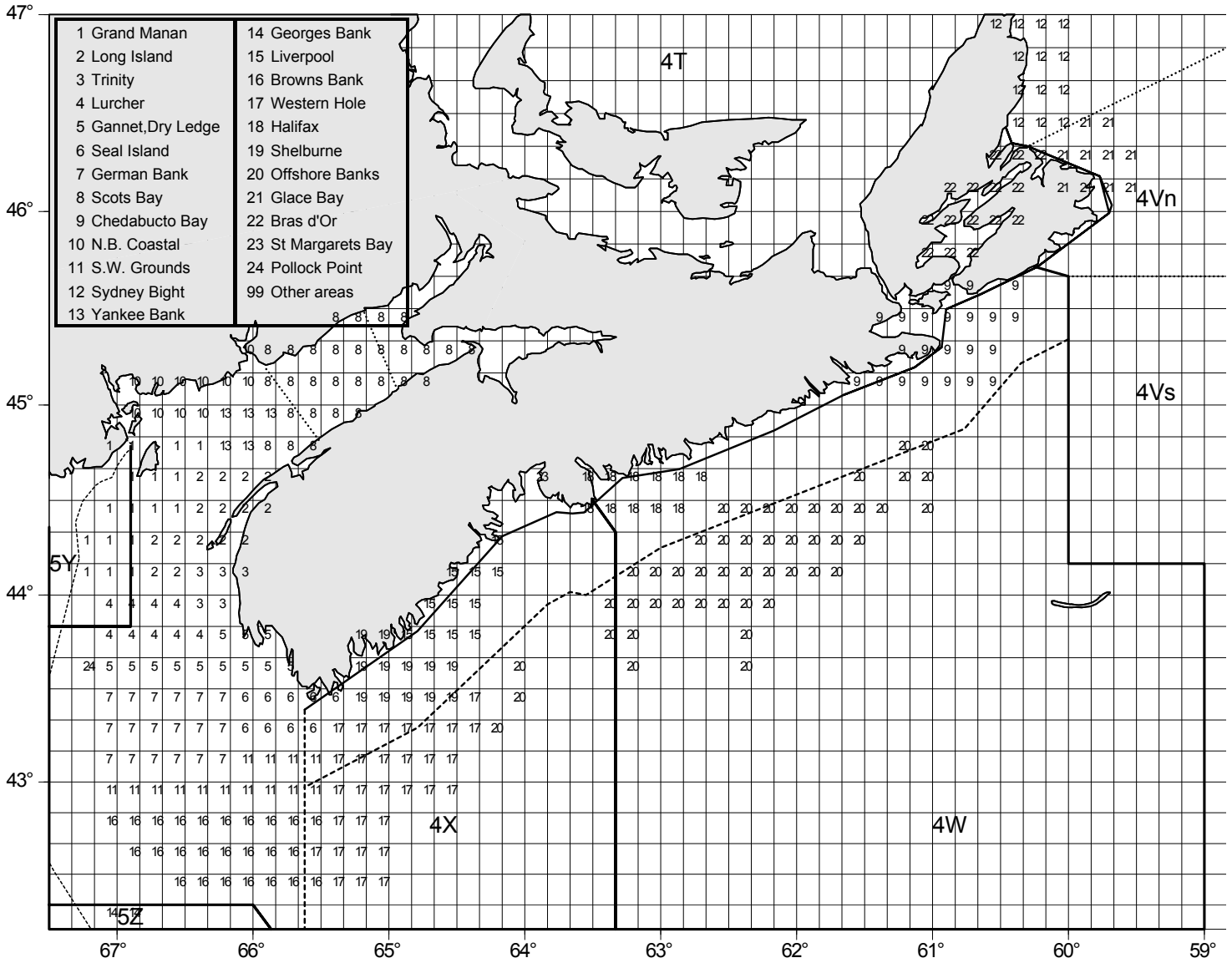

Figure 5. Herring fishing ground areas and management lines.

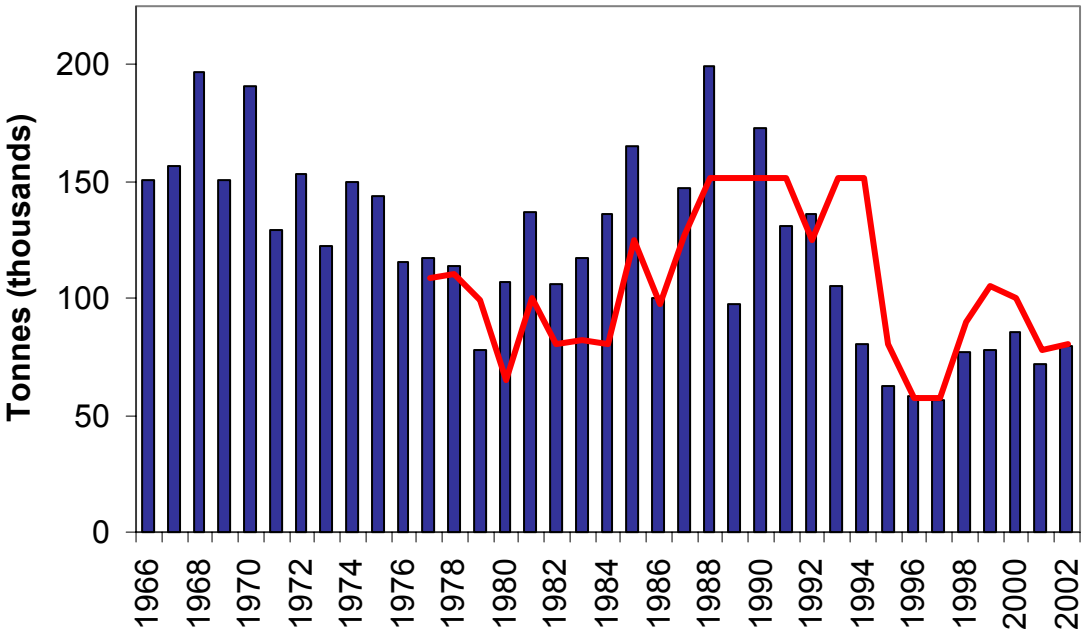

Figure 6. Annual herring landings and TAC (quota) for the southwest Nova Scotia spawning component (4WX stock).

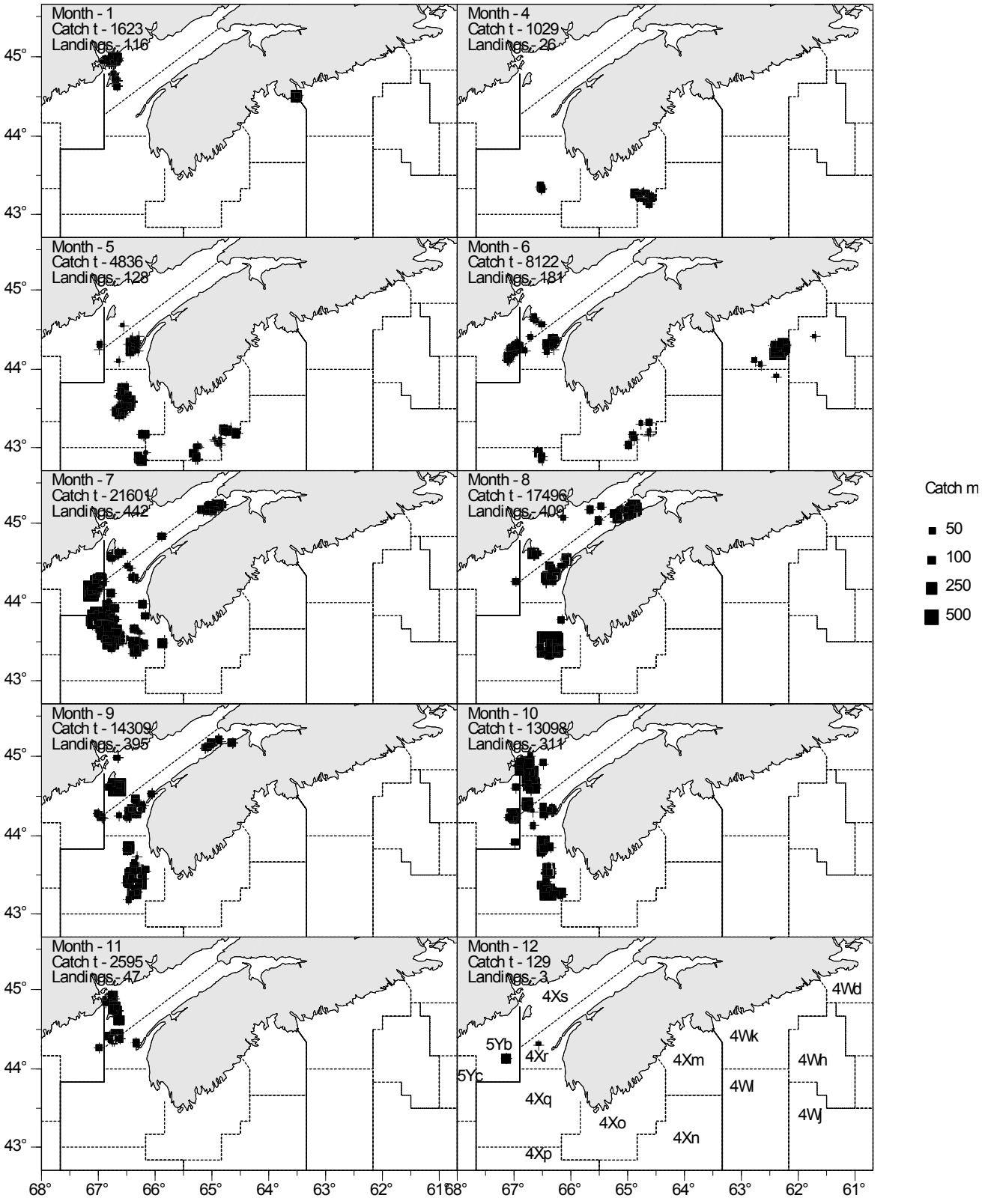

Figure 7. 2002 herring purse seine catches (t) for NAFO areas 4VWX by month (data from Statistics Division ZIF database).

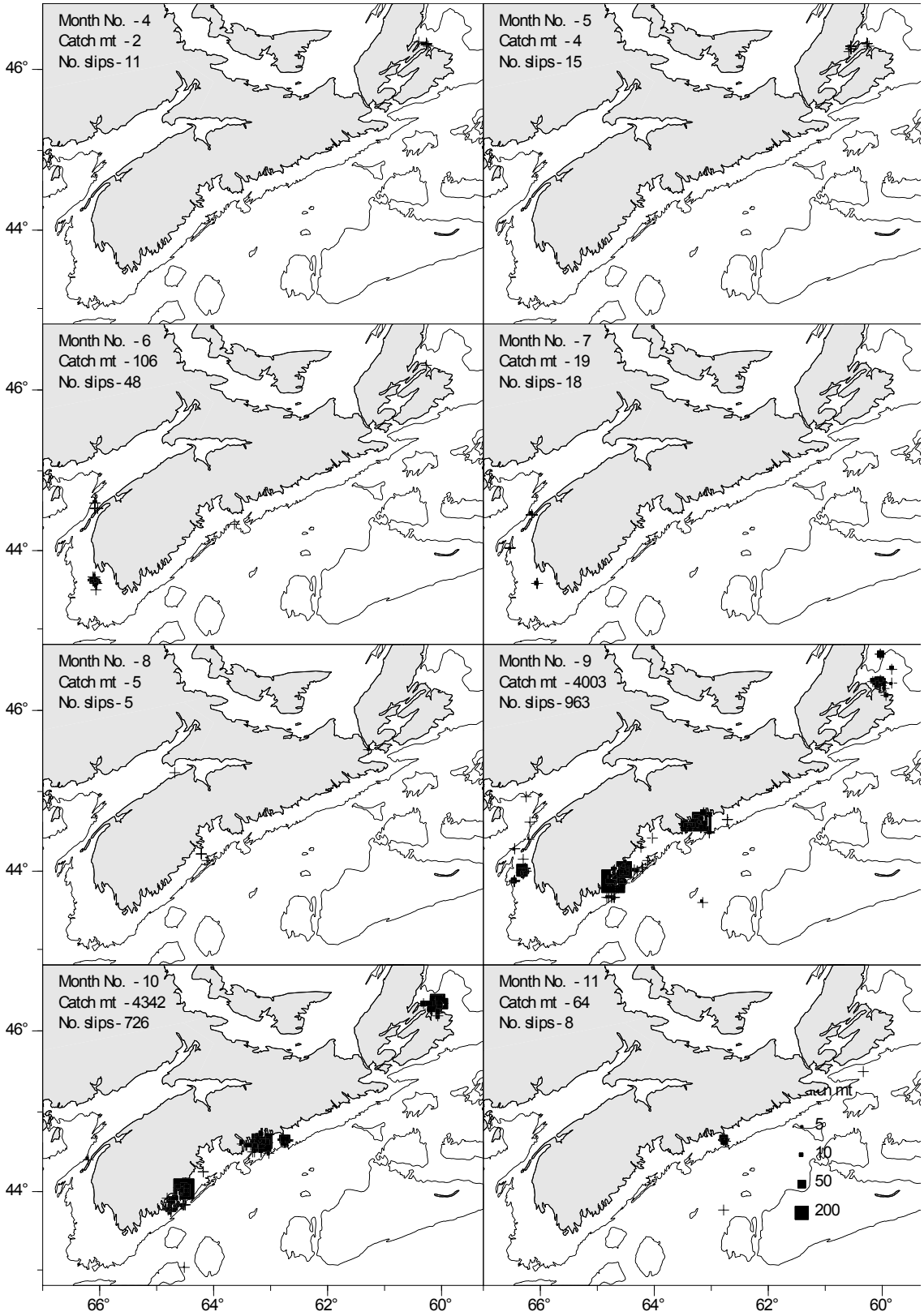

Figure 8. 2002 herring gillnet catches (t) for NAFO areas 4VWX by month (data from Statistics Division ZIF database).

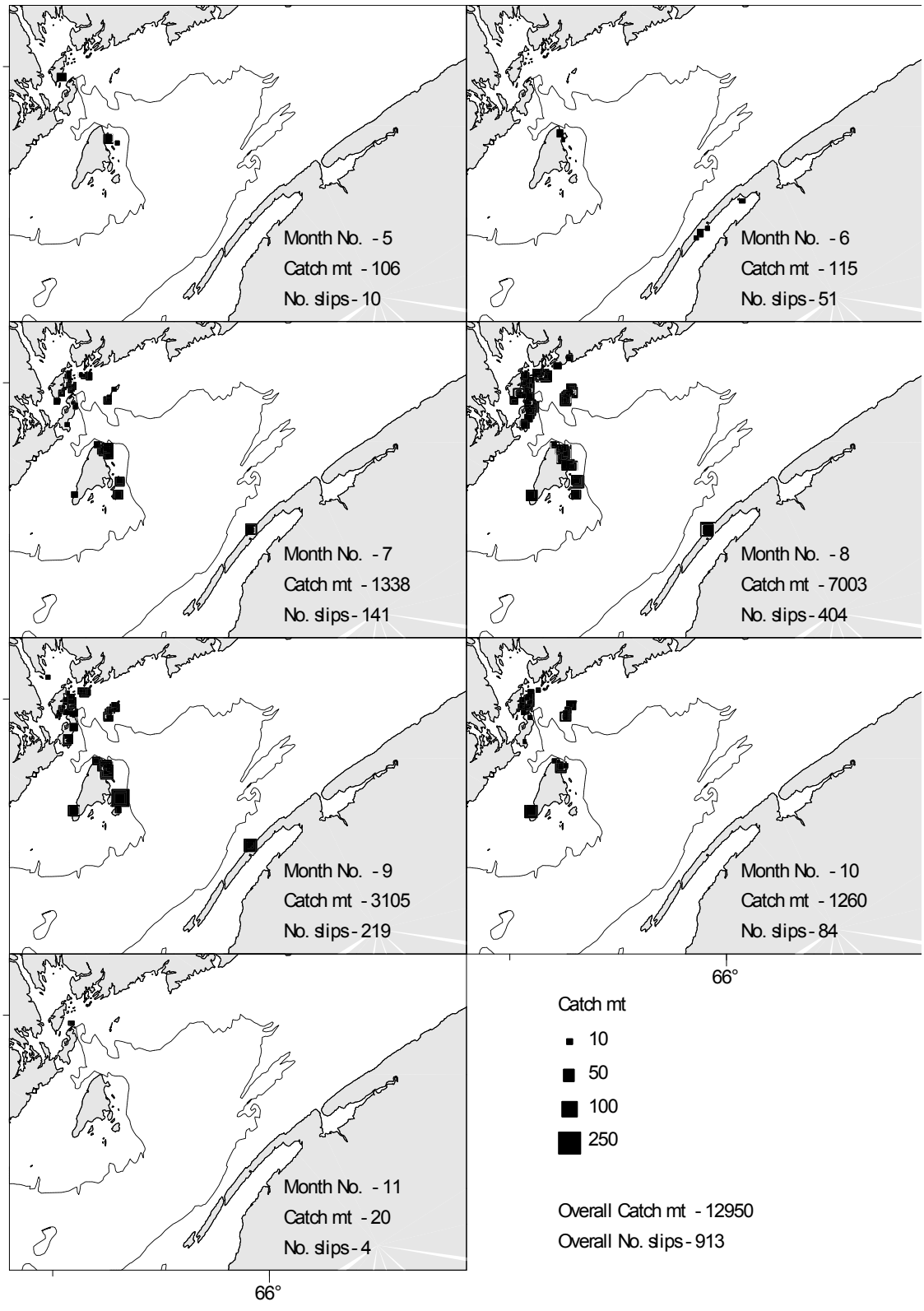

Figure 9. 2002 New Brunswick and Nova Scotia herring weir catches by month.

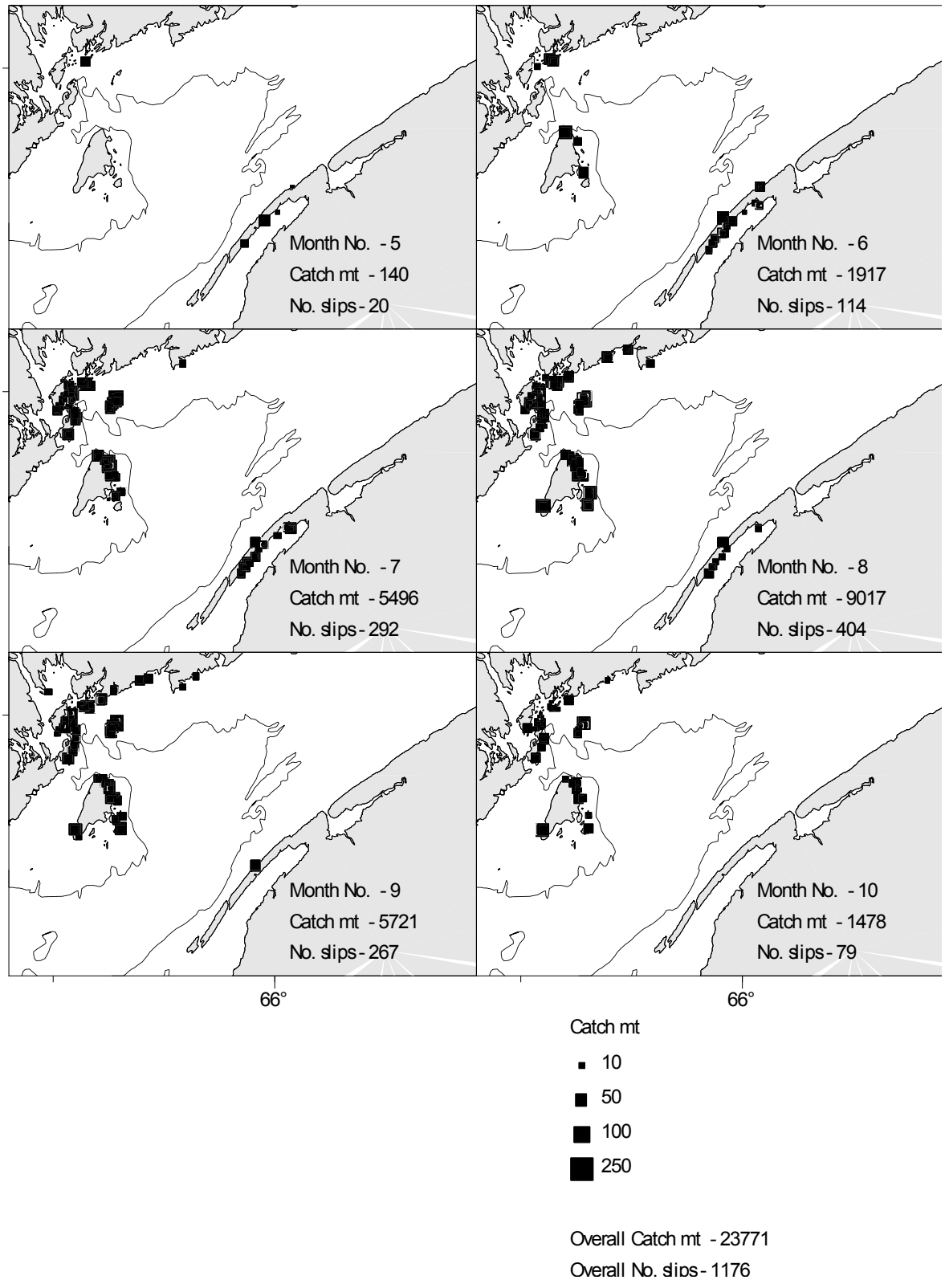

Figure 10. 2001 New Brunswick and Nova Scotia herring weir catches by month.

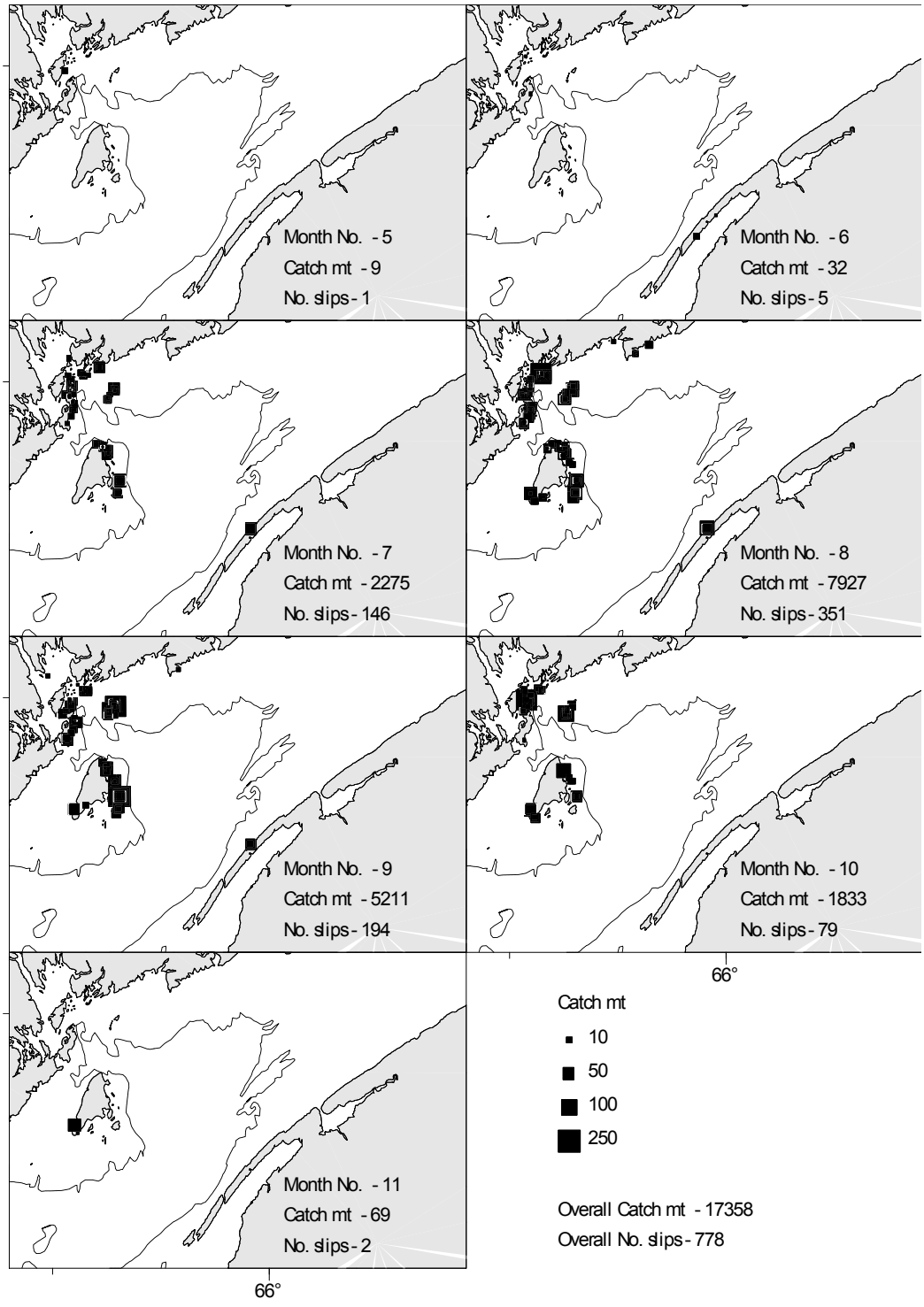

Figure 11. 2000 New Brunswick and Nova Scotia herring weir catches by month.

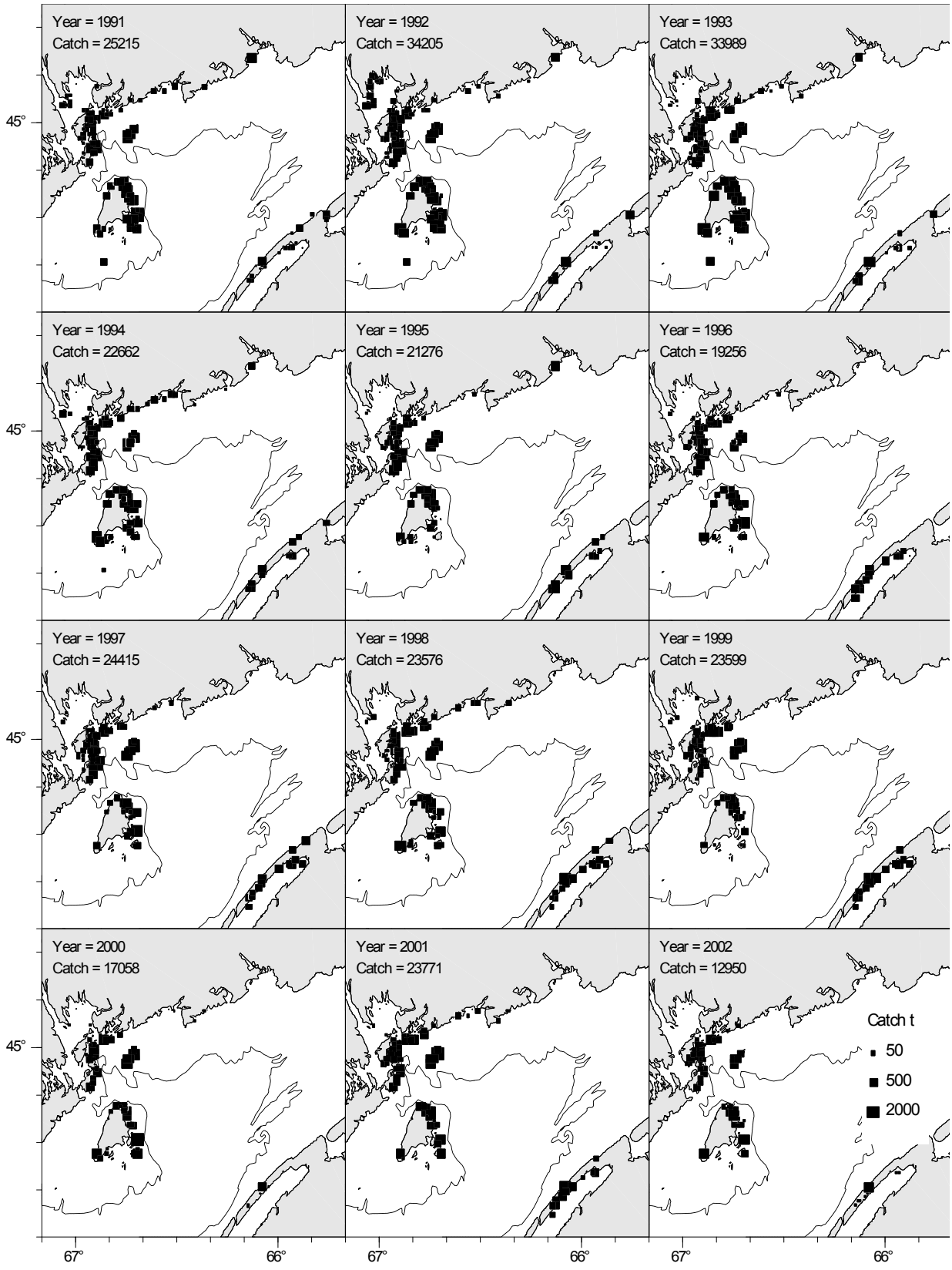

Figure 12. 1991-2002 New Brunswick and Nova Scotia herring weir catches.

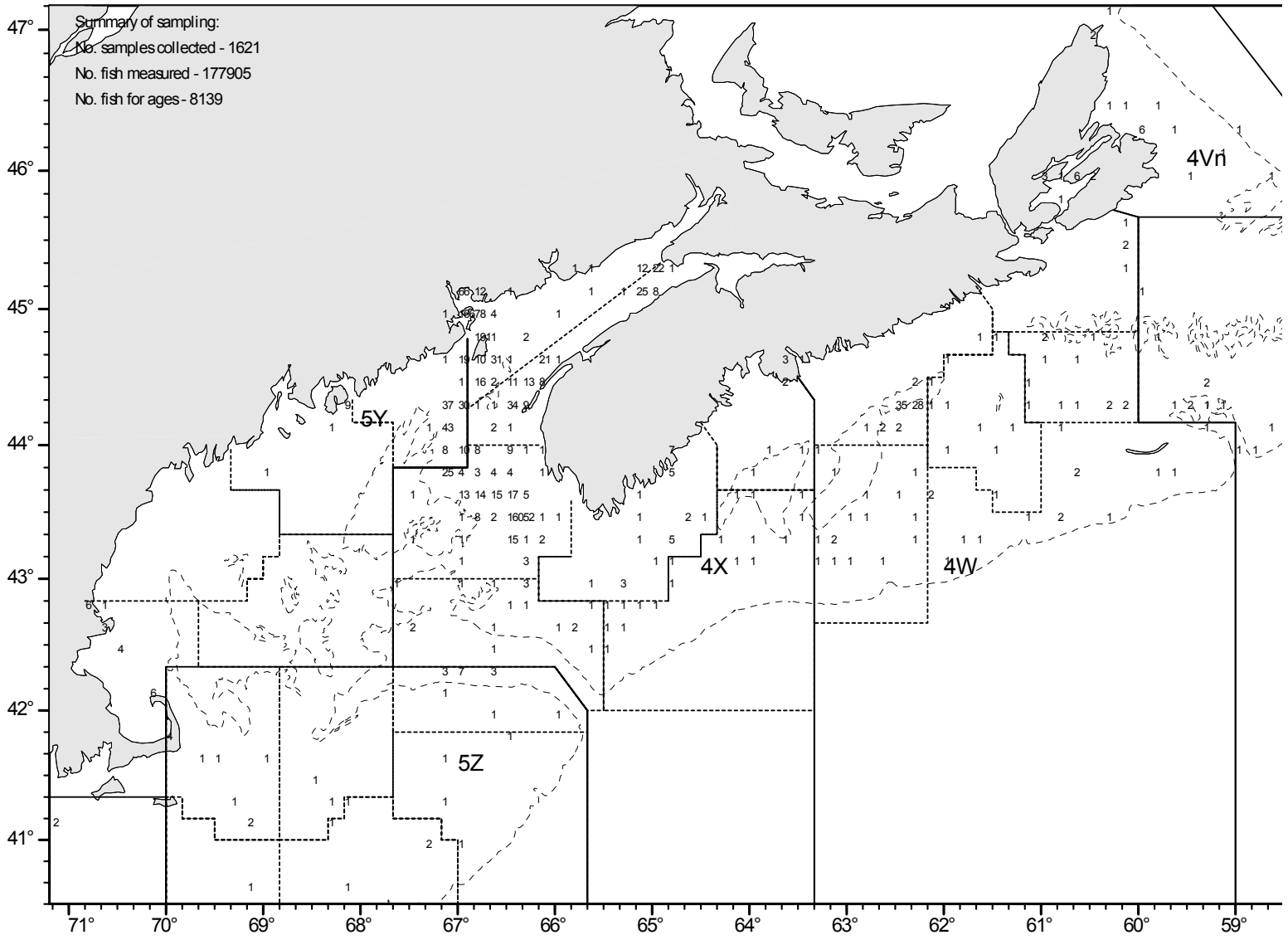

Figure 13. 2002 herring sampling coverage from all sources (number of length frequency samples by 10 mile square).

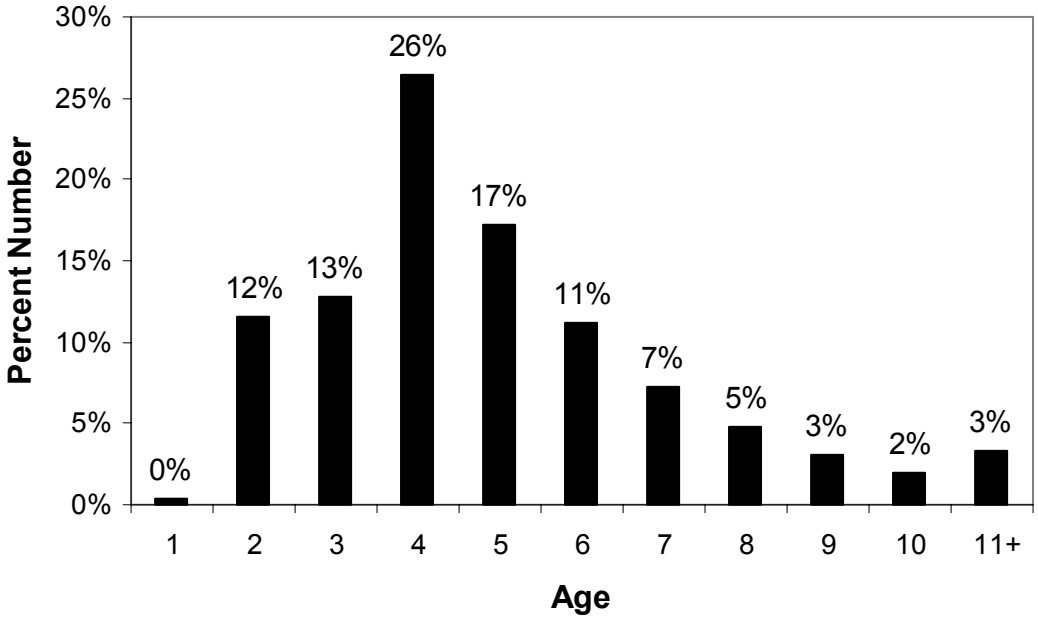

Figure 14. Expected age structure of SW Nova Scotia herring with fishing at $F_{0.1}$ and constant average recruitment. Parameters: long-term F=0.23, annual recruitment=1.8 billion, natural mortality=0.2, partial recruitment vector=0.006, 0.235, 0.339 and 1.

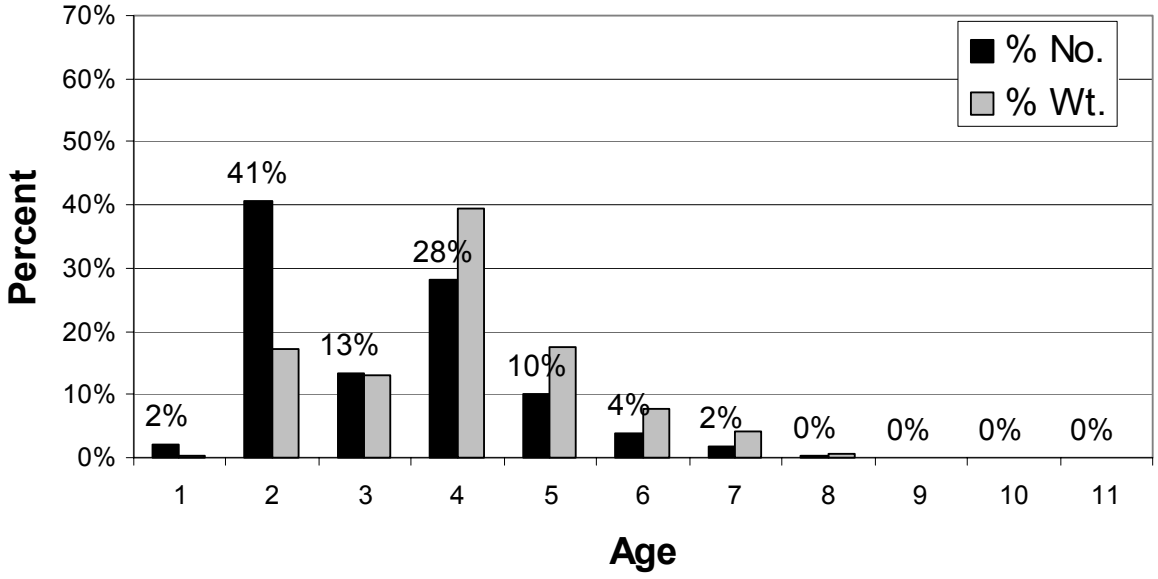

Figure 15. Catch at age for 2002 for the overall southwest Nova Scotia spawning component (% numbers and % weight).

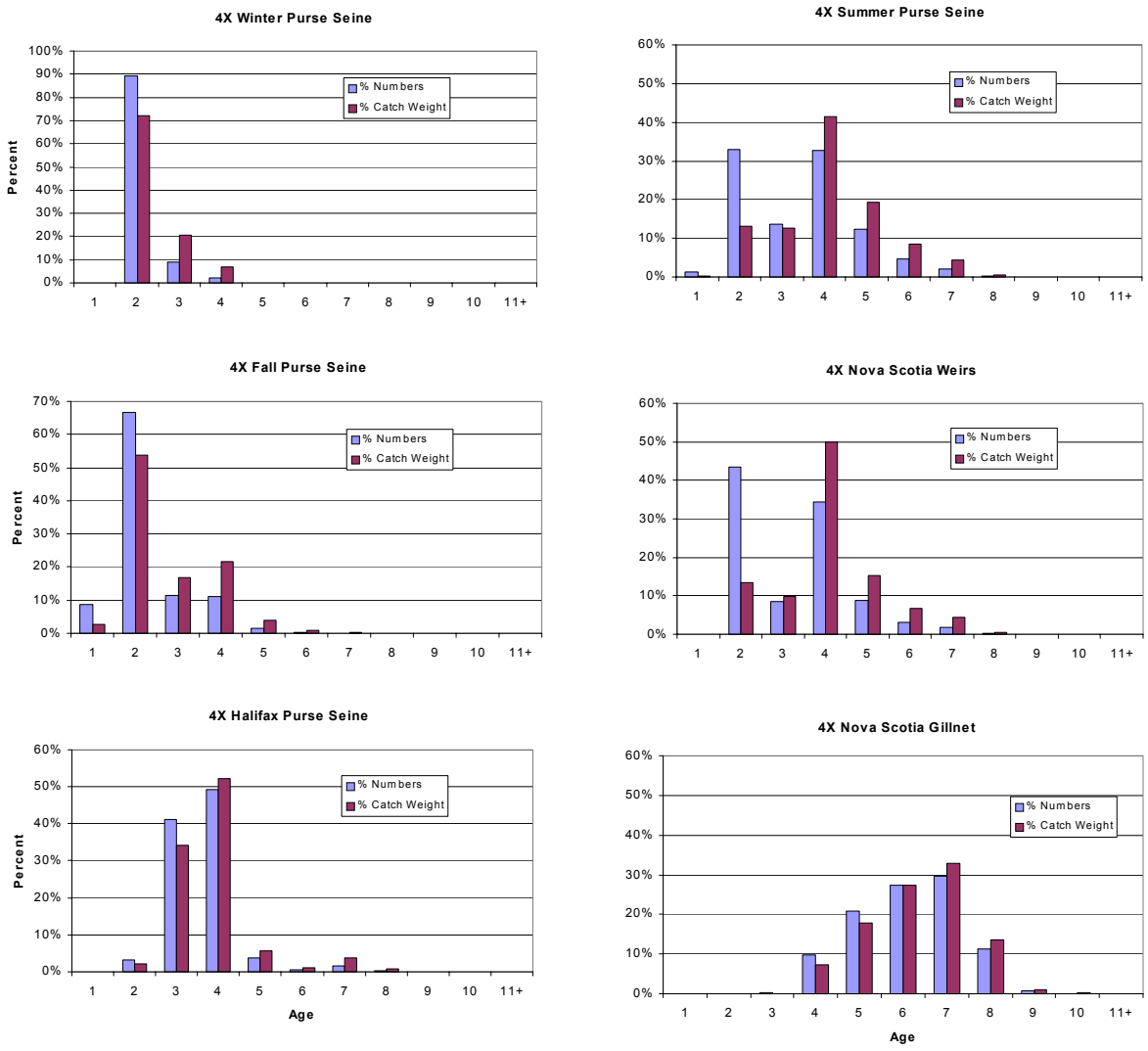

Figure 16. Catch at age for the 2002 southwest Nova Scotia spawning component (% numbers and % weight) by gear type.

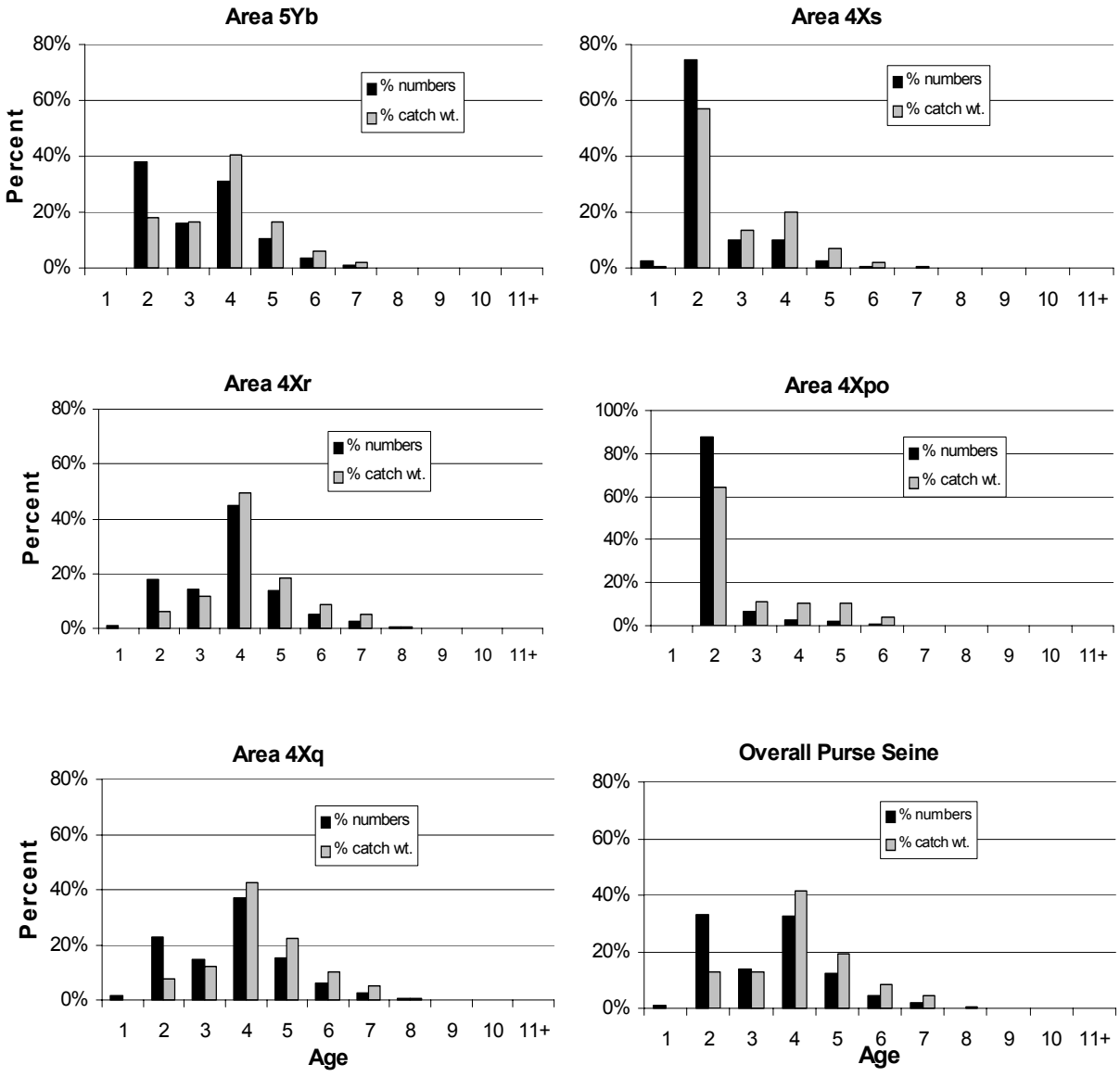

Figure 17. Herring catch at age by NAFO unit area for the 2002 summer purse seine fishery conducted on the southwest Nova Scotia spawning component (4WX stock).

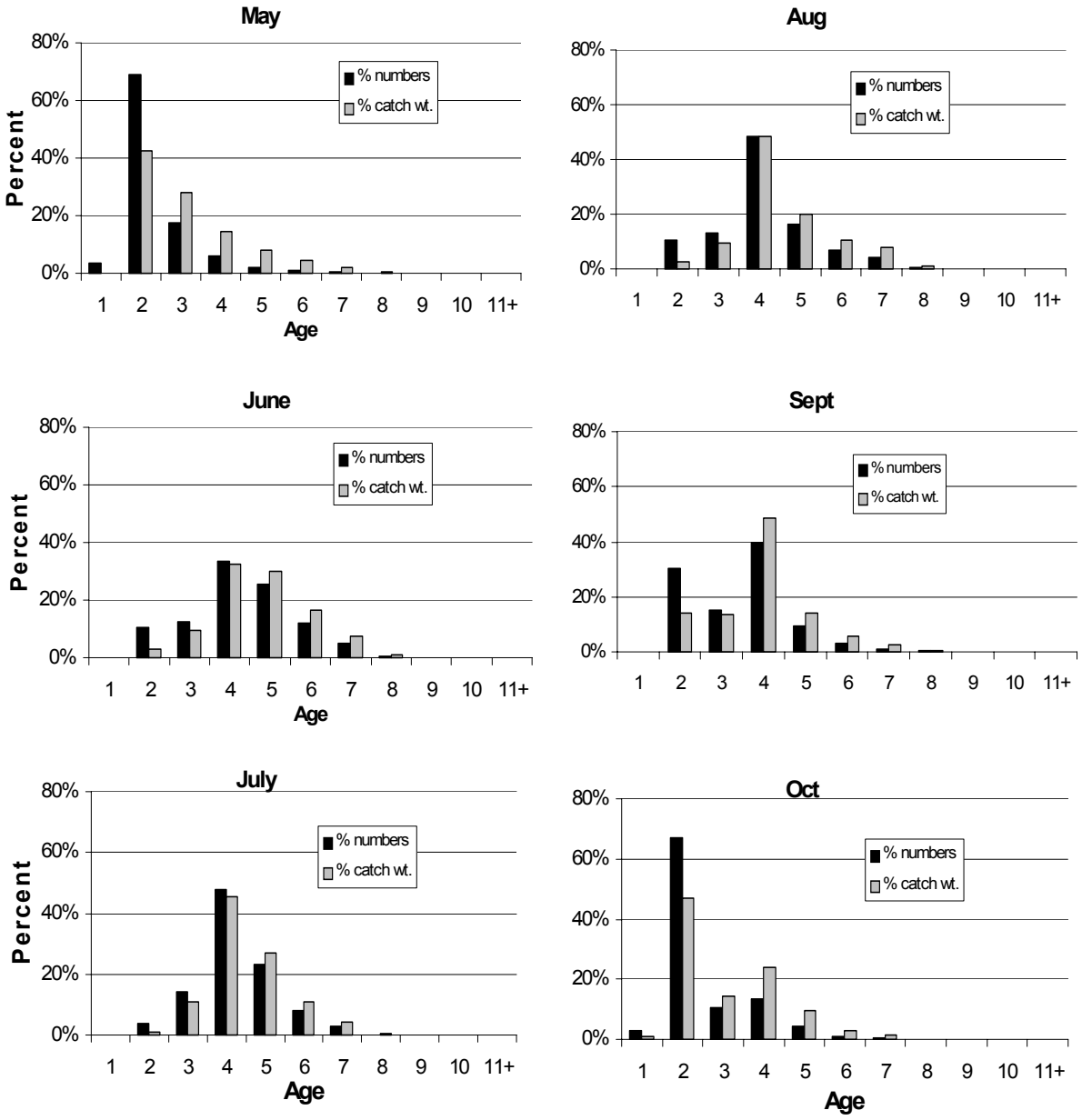

Figure 18. Herring catchat age by month for the 2002 summer purse seine fishery conducted on the southwest Nova Scotia spawning component (4WX stock).

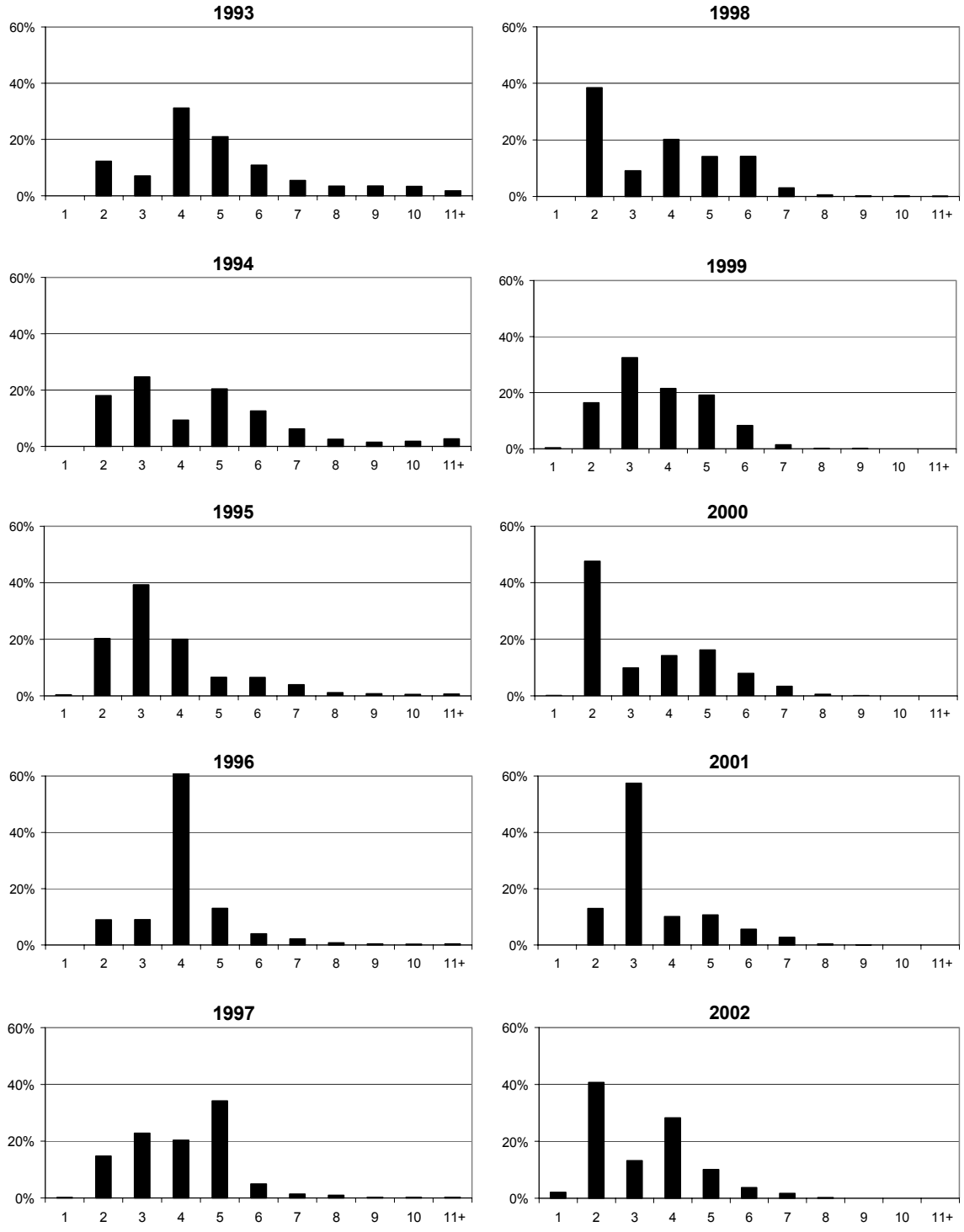

Figure 19. Catch at age (% numbers) for the southwest Nova Scotia spawning component (4WX stock) from 1993 to 2002.

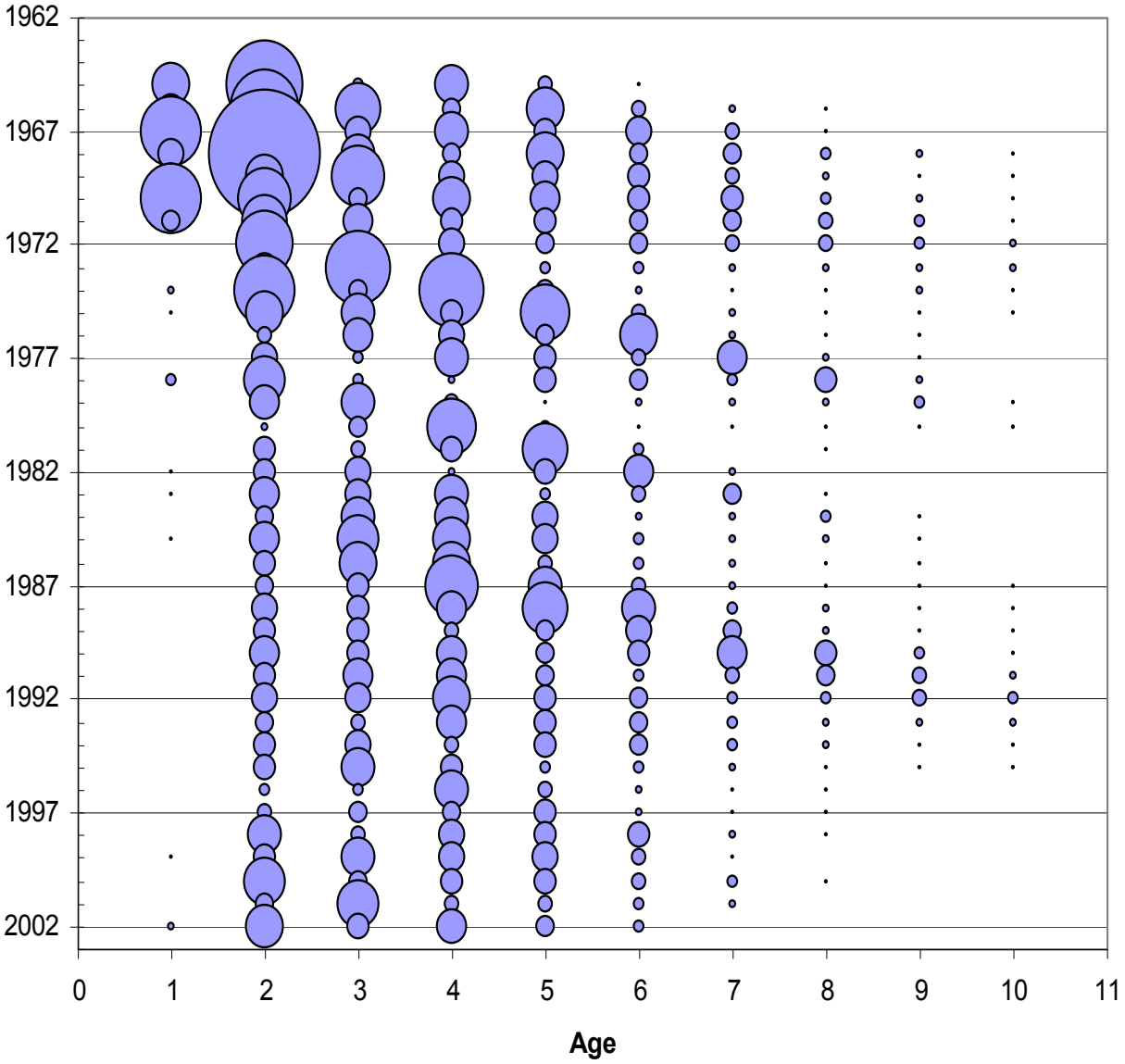

Figure 20. Historic catch at age (numbers in millions) for the SW Nova Scotia spawning component. Refer to Table 14 for actual numbers represented by symbol size. The value for 1968 at age 2 represents the maximum in the series of 2,389 million.

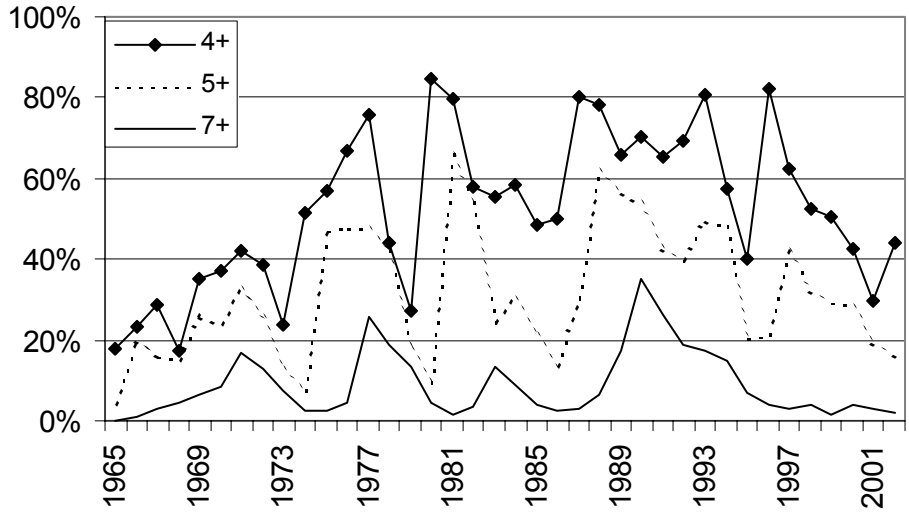

Figure 21. Overall proportions (percent numbers) of ages 4+, 5+ and 7+ in the catch at age for the SW Nova Scotia spawning component for the period 1965 to 2002.

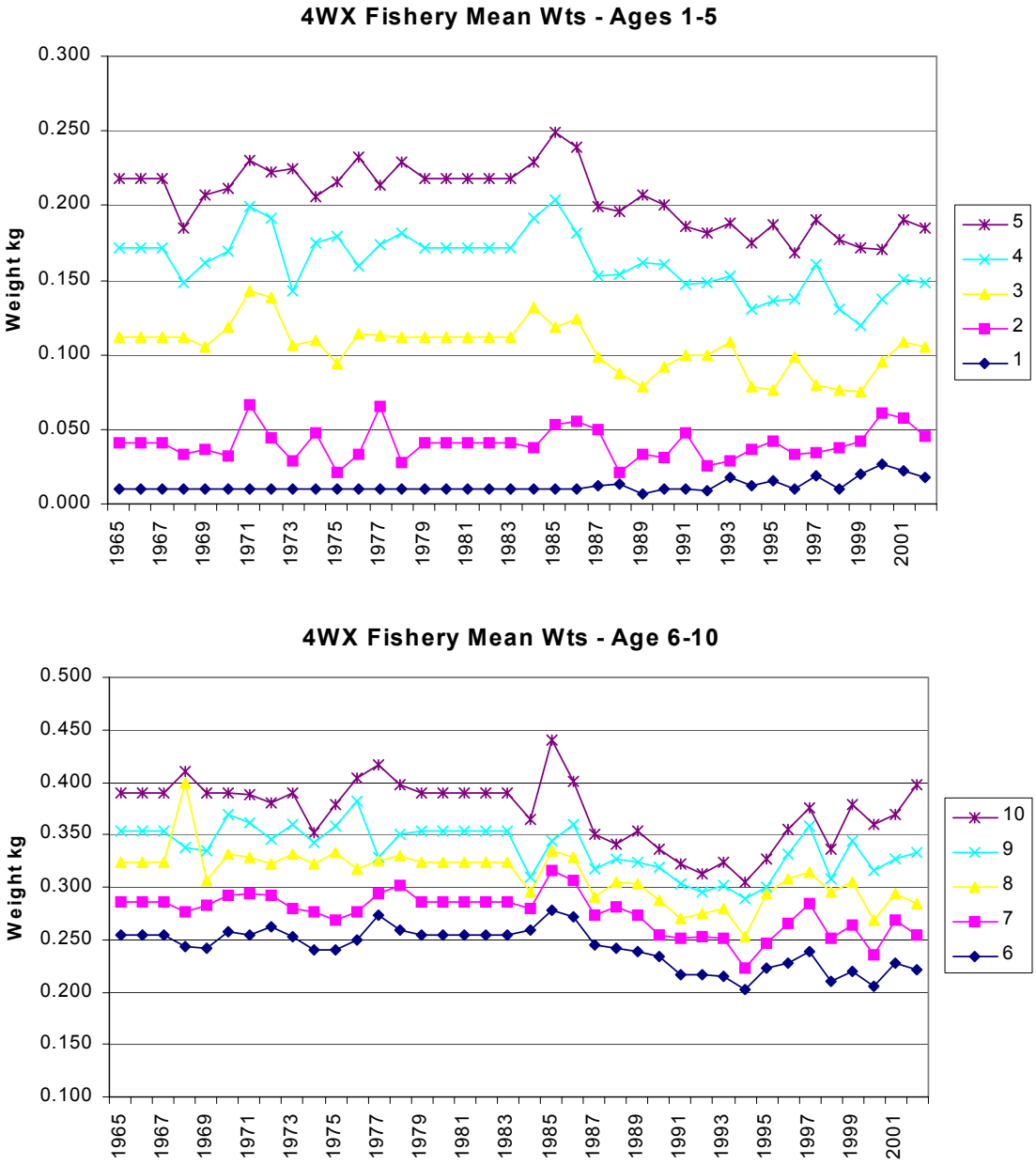

Figure 22. Average weights at age (g) for the SW Nova Scotia component of the 4WX herring fishery (weighted by fishery) for 1965-2002.

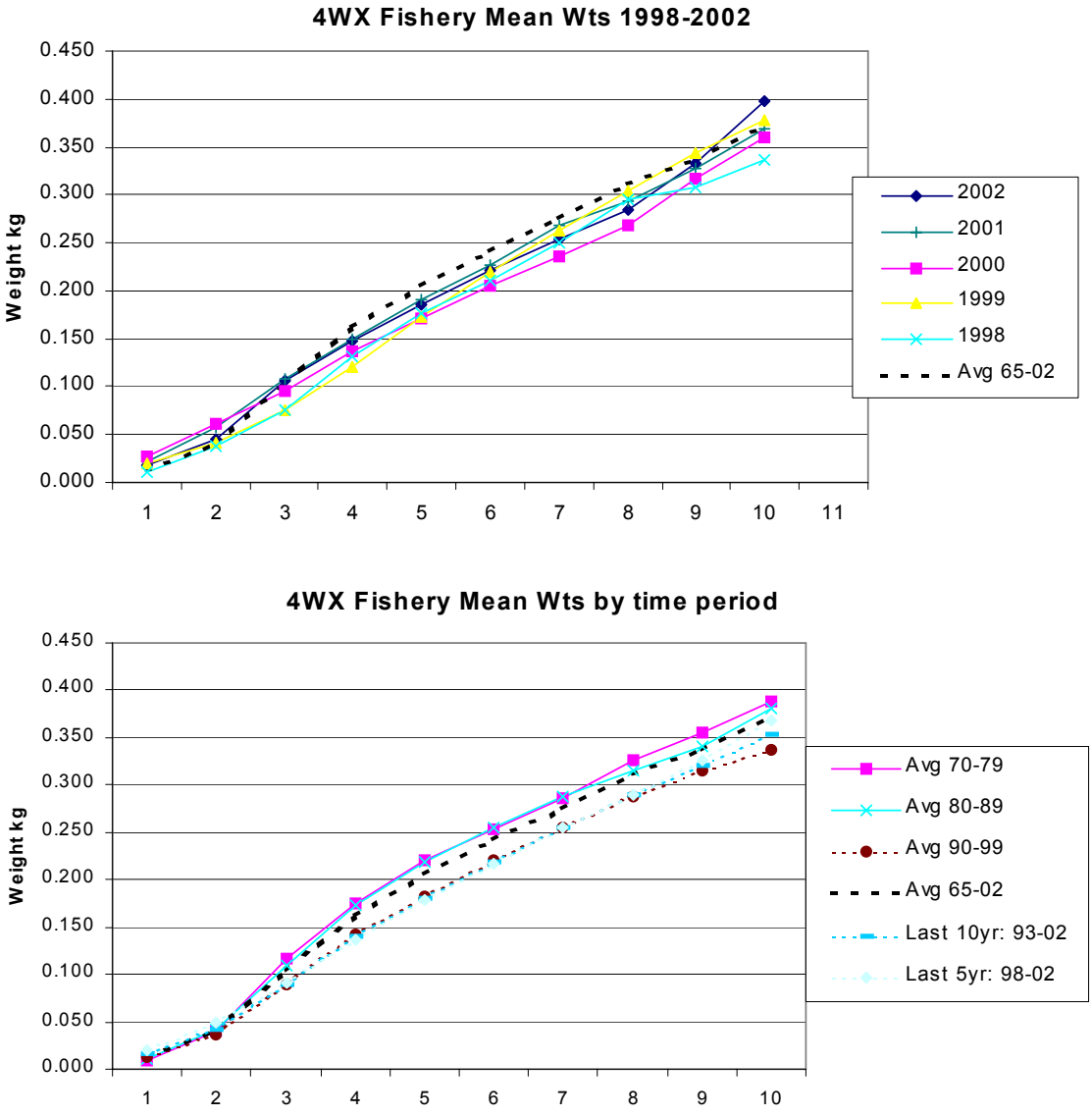

Figure 23. Average weights at age (g) for the SW Nova Scotia component of the 4WX herring fishery (weighted by fishery) for a) most recent 5 years individually (top panel) and b) for 10 year time periods since 1970 as well as the most recent 5 and 10 year periods combined.

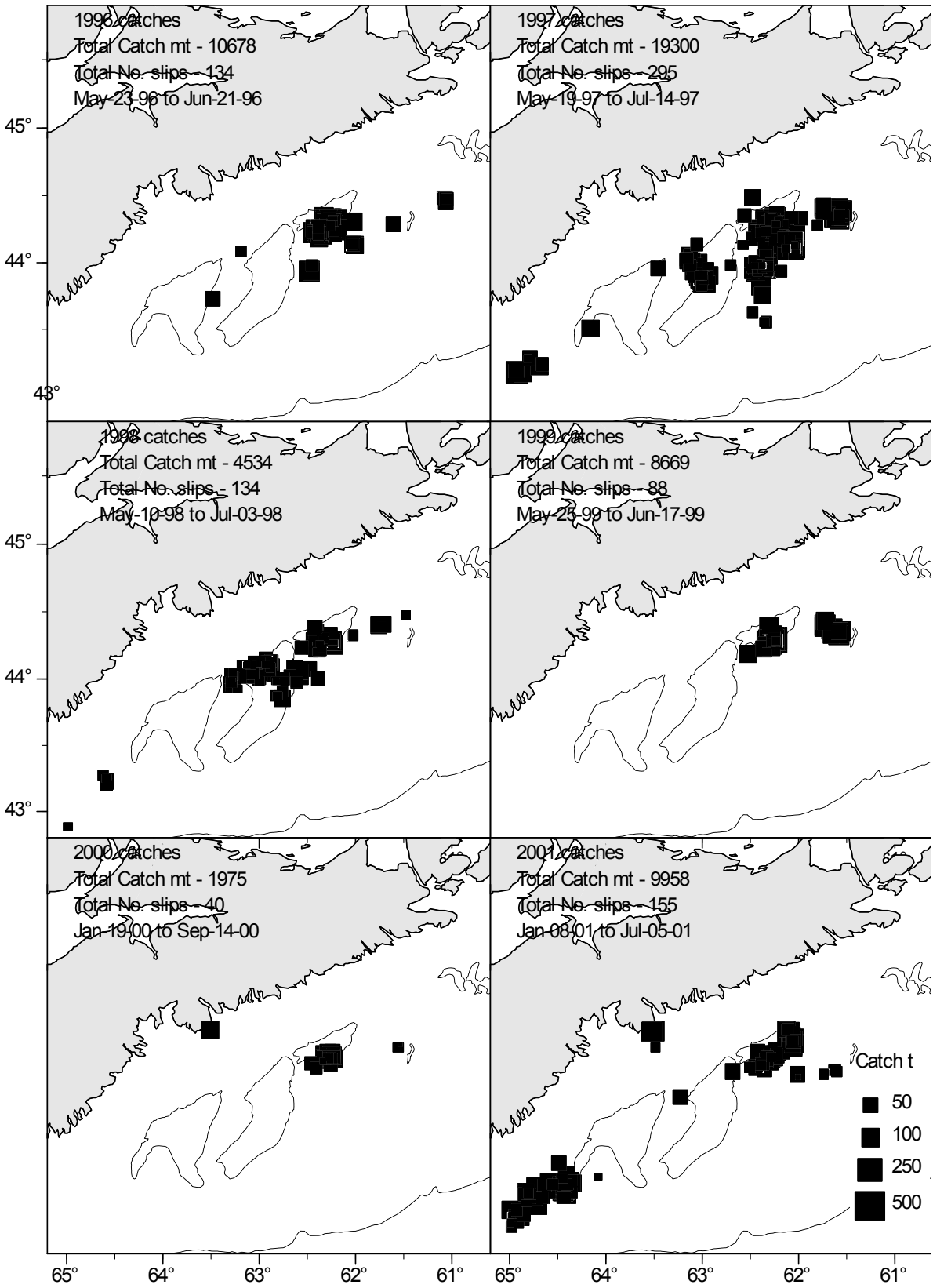

Figure 24. Herring purse seine catches (t) on offshore Scotian Shelf banks, 1996 to 2001.

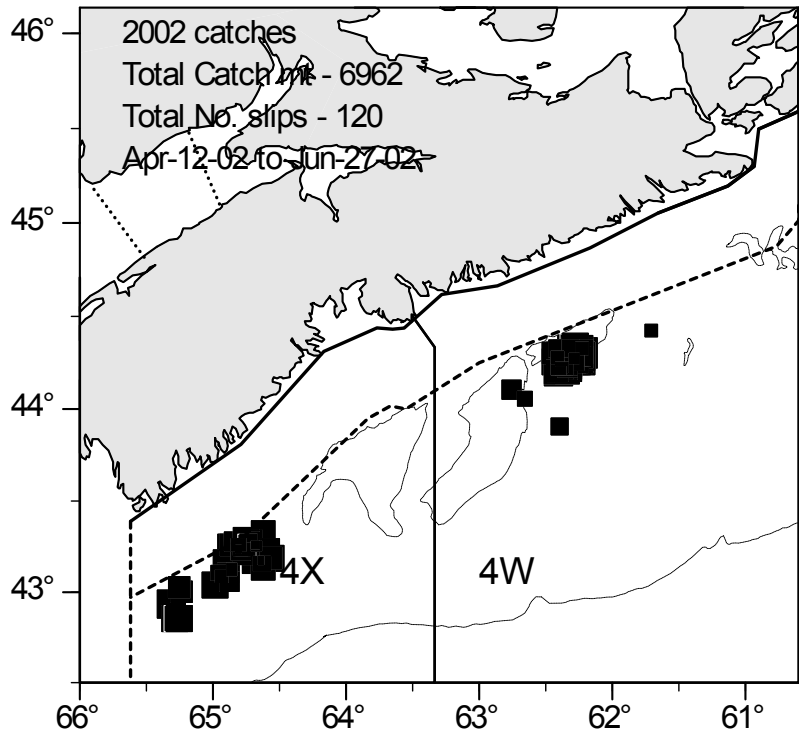

Figure 25. Herring purse seine catches (t) on the offshore Scotian Shelf banks for 2002 with embayment and 25 mile offshore lines shown.

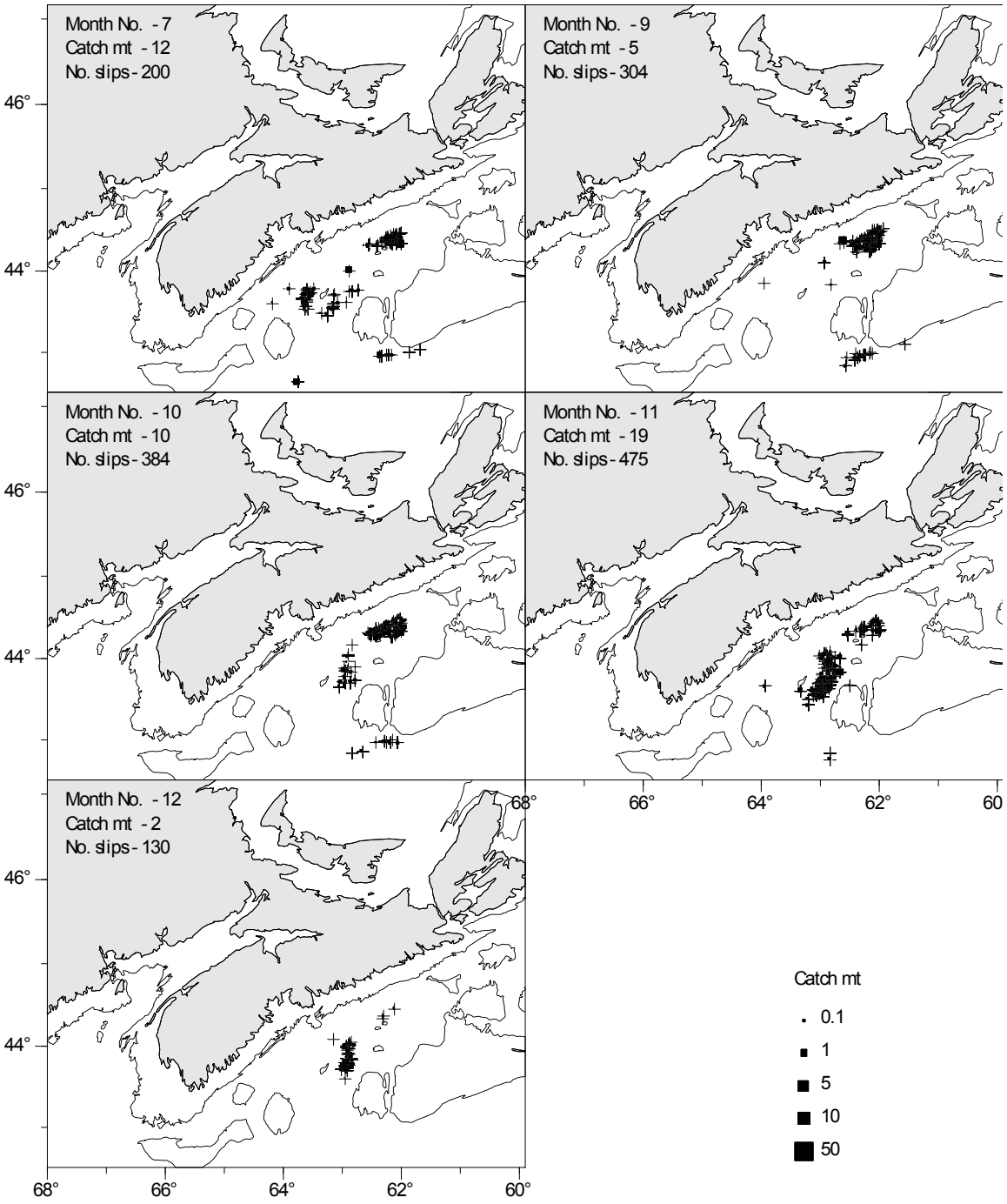

Figure 26. 2002 herring trawl by-catches (t) for NAFO areas 4VWX by month (data from Statistics Division ZIF database).

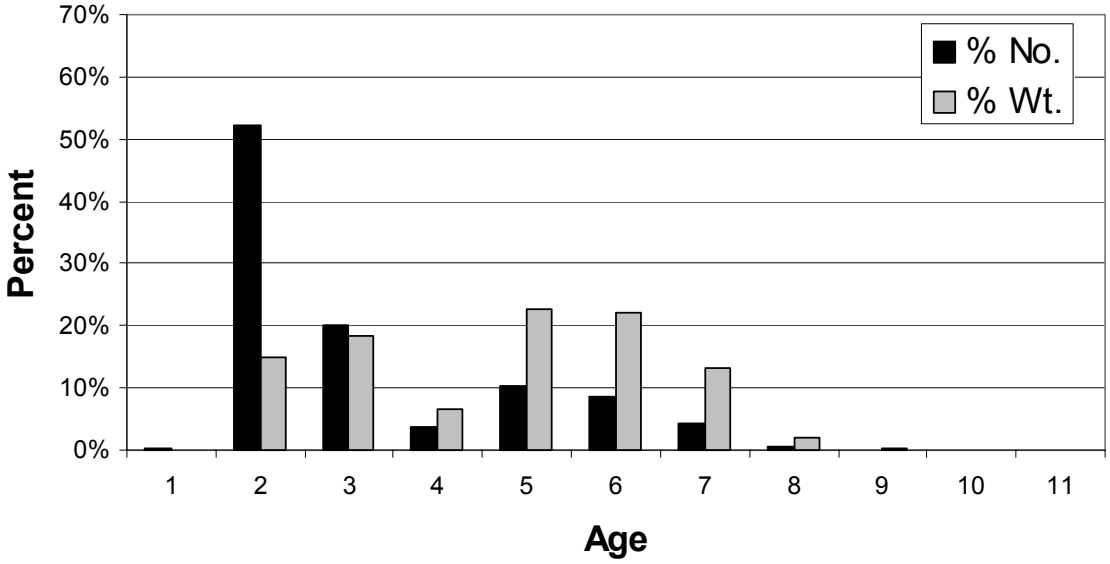

Figure 27. Catch at age for herring for the offshore Scotian Shelf Banks spawning component from the 2001 purse seine fishery.

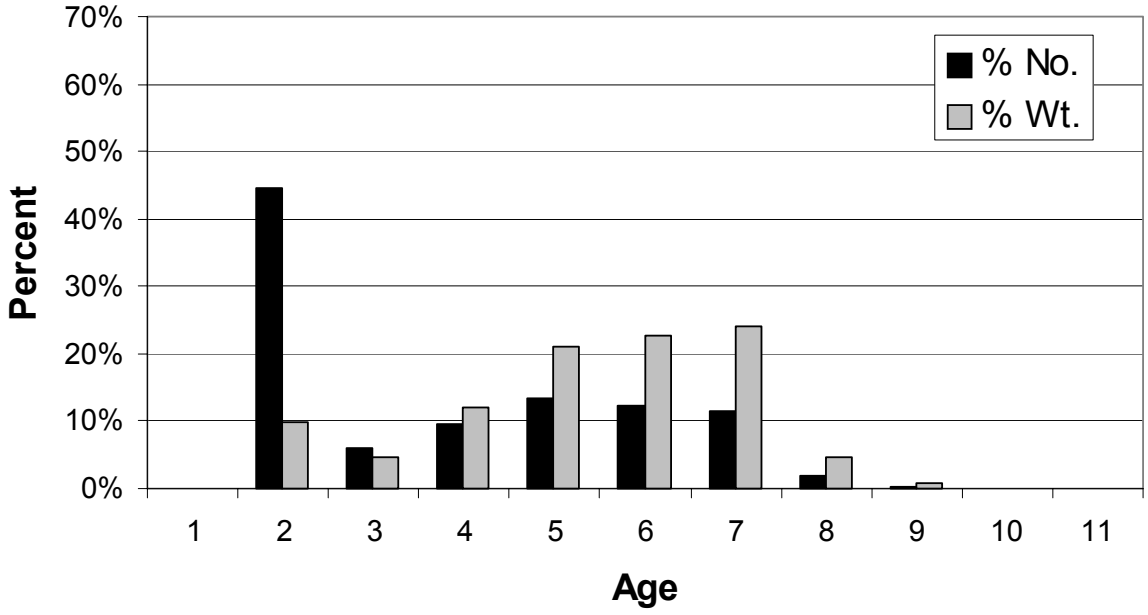

Figure 28. Catch at age for herring for the offshore Scotian Shelf Banks spawning component from the 2002 purse seine fishery.

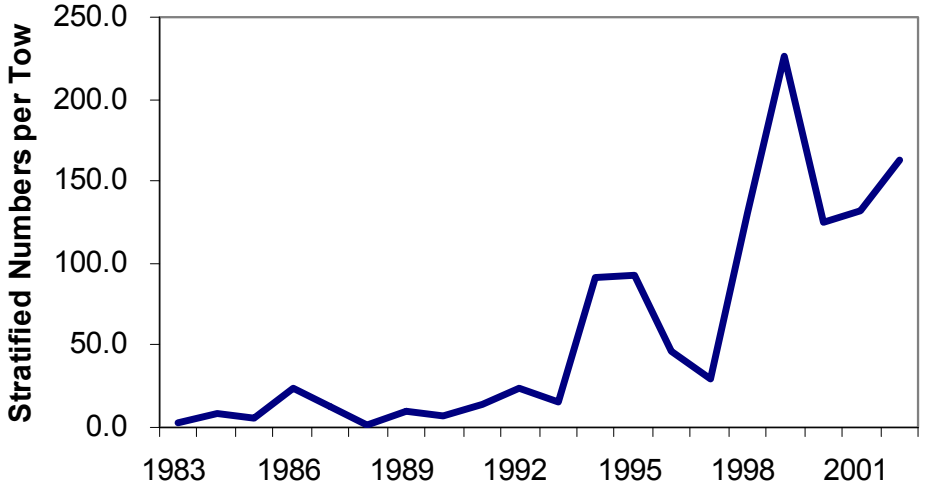

Figure 29. Number of herring caught per standard tow in the July bottom trawl survey of the offshore Scotian Shelf Banks, 1983 to 2002 (strata 55-78).

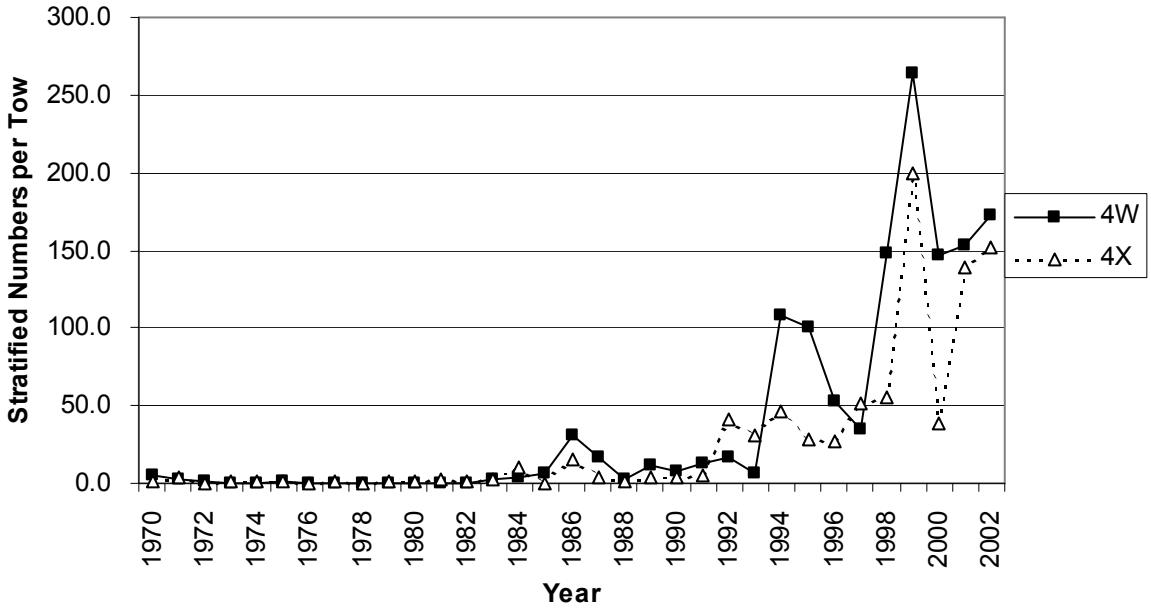

Figure 30. Number of herring caught per standard tow in the July bottom trawl survey of the offshore Scotian Shelf Banks, 1970 to 2002 for area 4W (strata 53-66) and area 4X (strata 70-95).

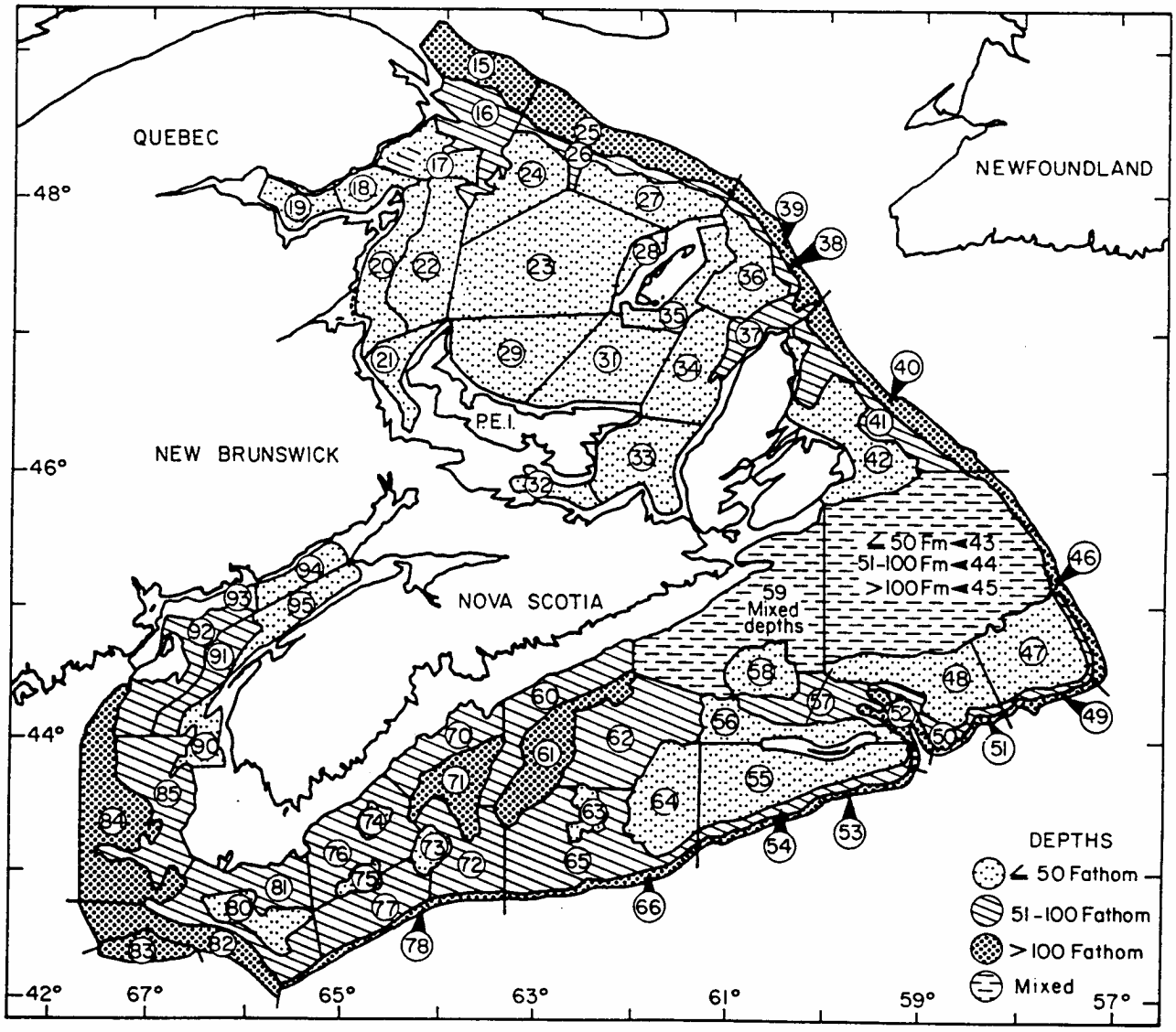

Figure 31. Groundfish survey strata in NAFO Divisions 4T, 4V, 4W and 4X (from Doubleday, 1981).

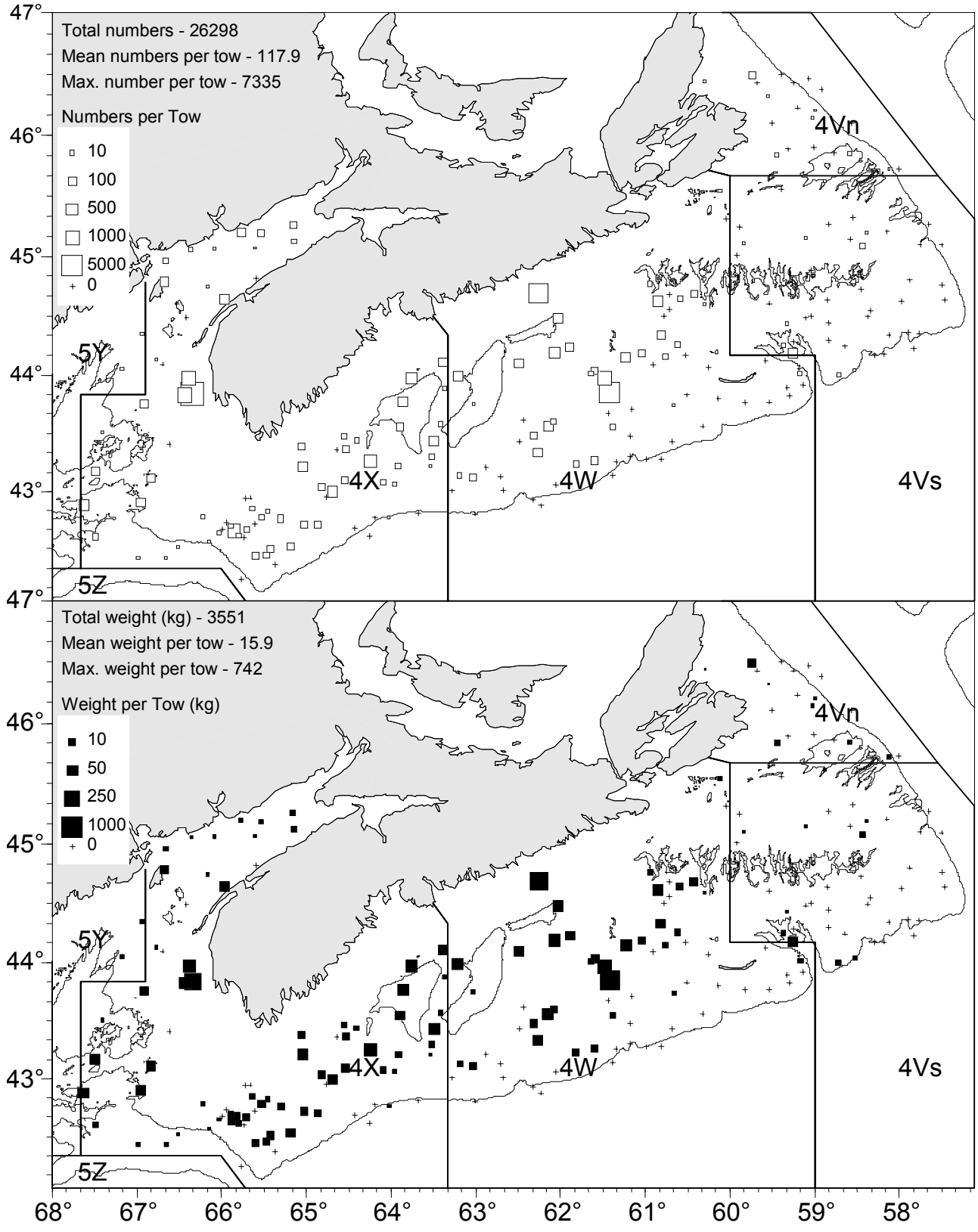

Figure 32. Herring catches in numbers and weight per tow from 4VWX summer ground trawl survey by the Alfred Needler (NED2002-037/040: July 3-30, 2002).

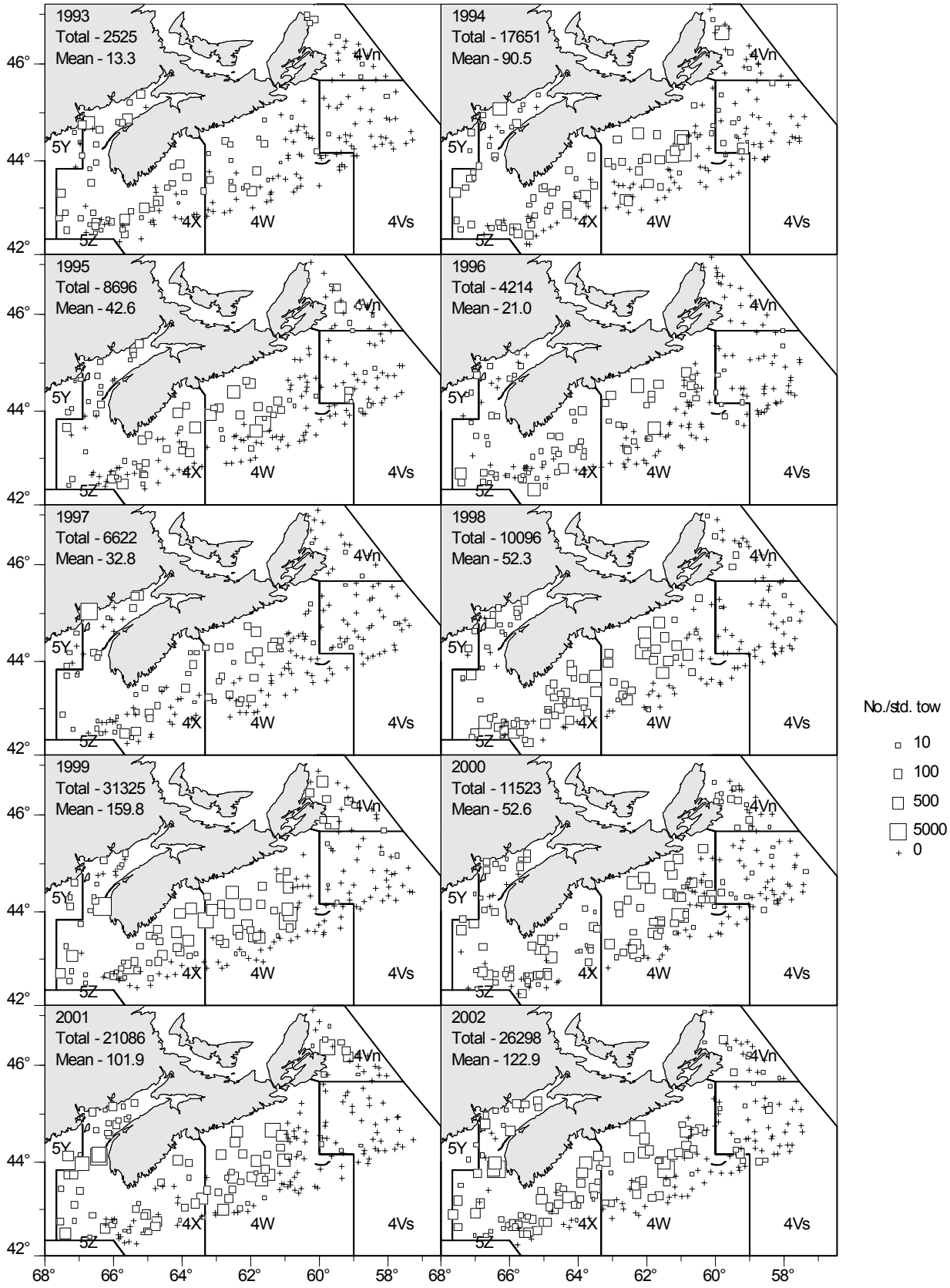

Figure 33. Herring catches (numbers per standard tow) from the July bottom trawl survey for 1991-2002.

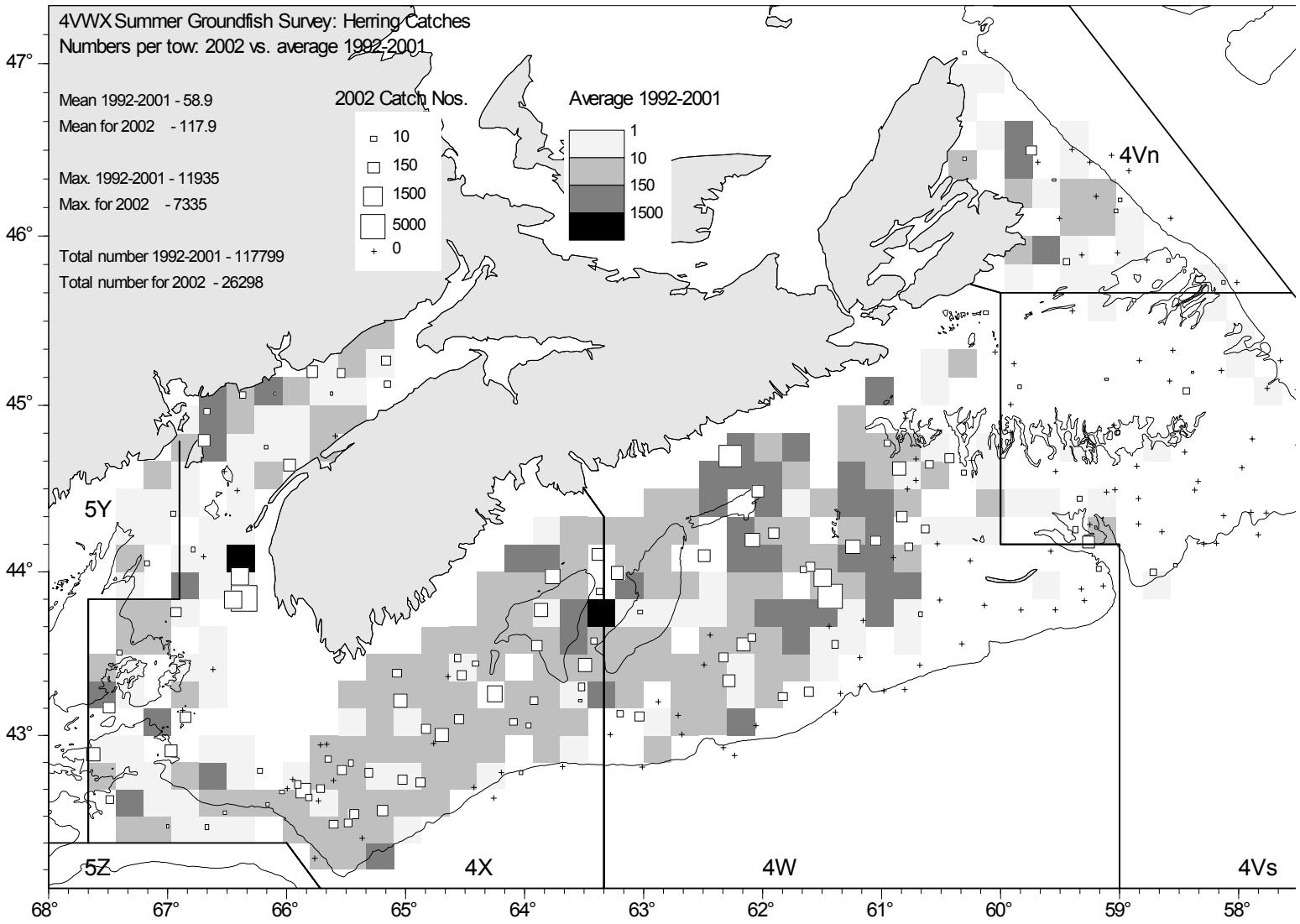

Figure 34. Herring catches (numbers per standard tow) from the 2002 July bottom trawl survey compared to the average catches from the last 10 years for this survey.

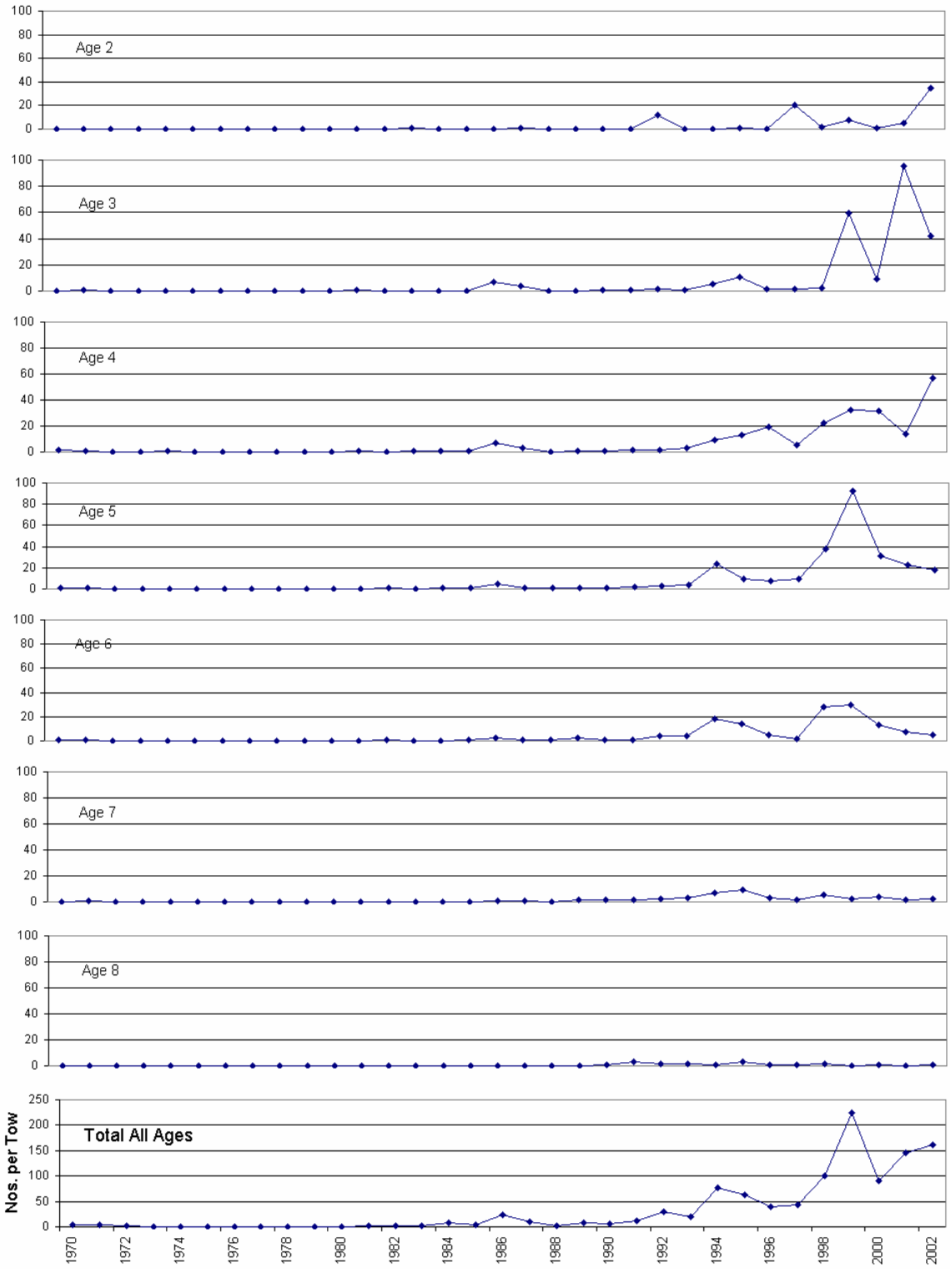

Figure 35. Stratified herring abundance by age and overall for all ages combined (numbers per tow) from the July ground trawl survey for area 4WX (strata 53 to 95).

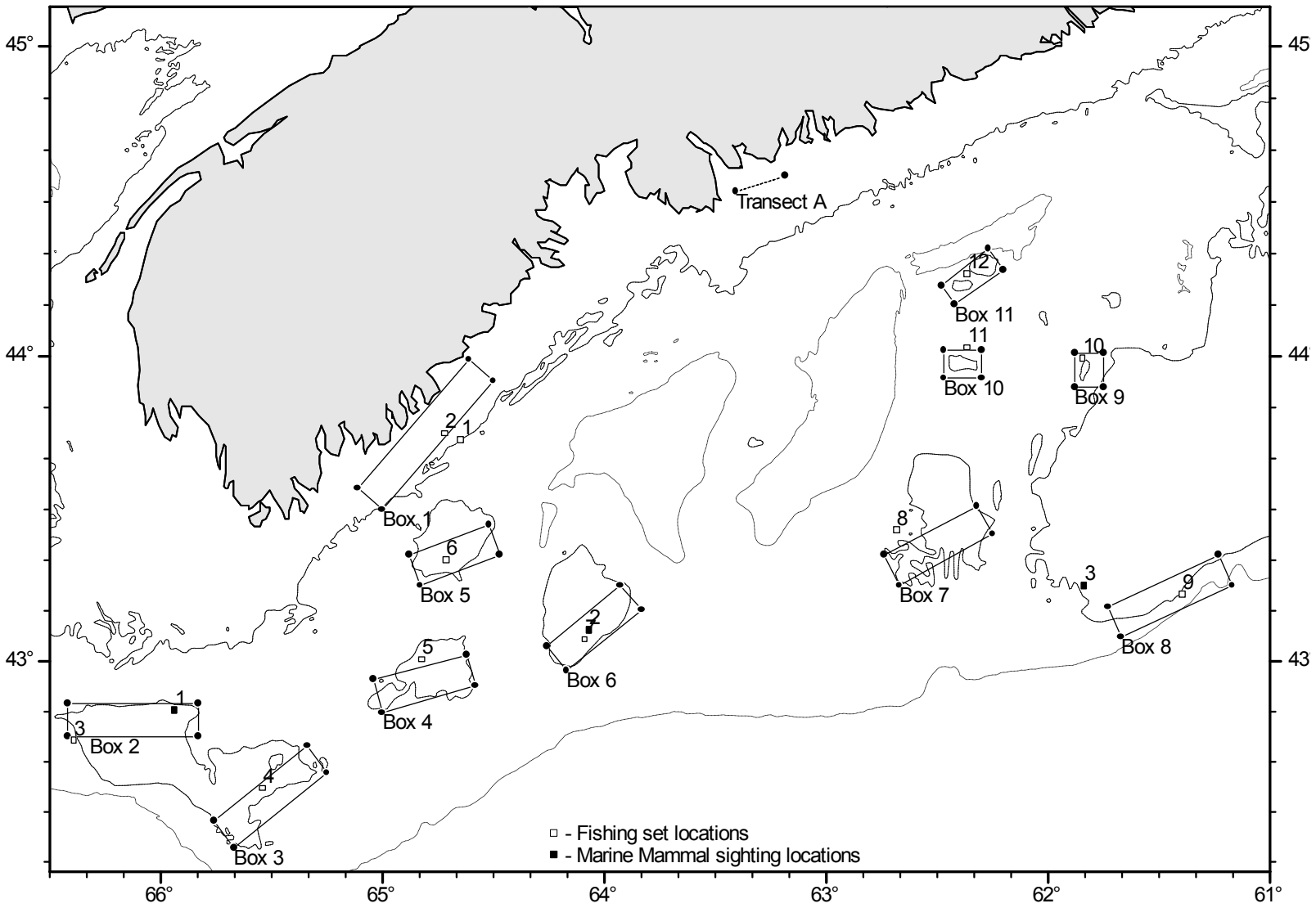

Figure 36. Survey boxes, fishing set locations for the Alfred Needler herring acoustic survey (NED200067) from Oct. 22 to Nov. 2, 2002.

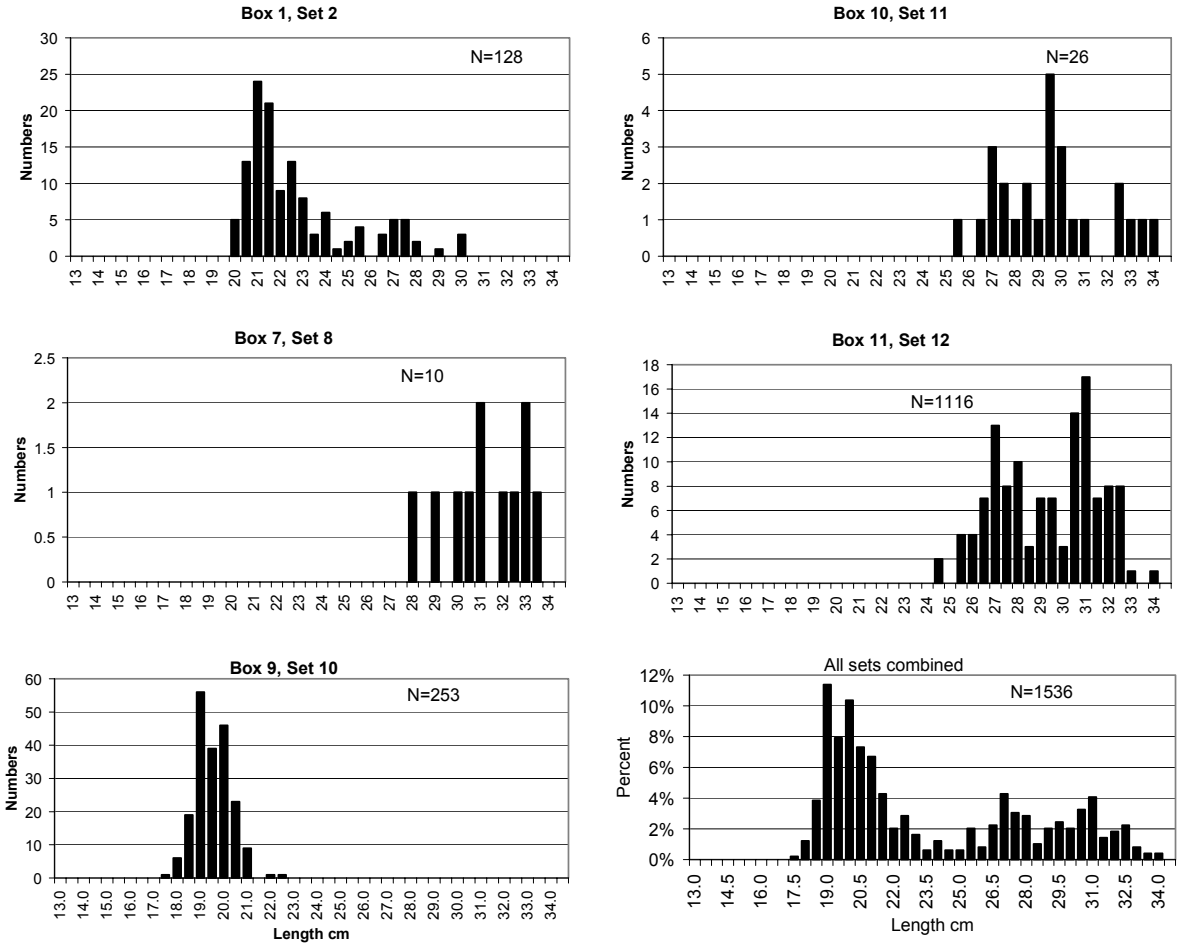

Figure 37. Herring length frequencies by set (numbers caught) and overall for all sets combined (percent numbers) for the Alfred Needler herring acoustic survey (NED2002-067).

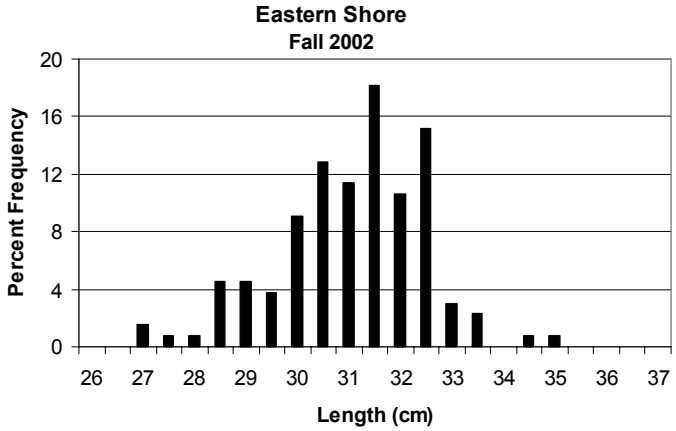

Figure 38. Length frequency of herring sampled from the 2002 Eastern Shore (east of Halifax) fall gillnet roe fishery.

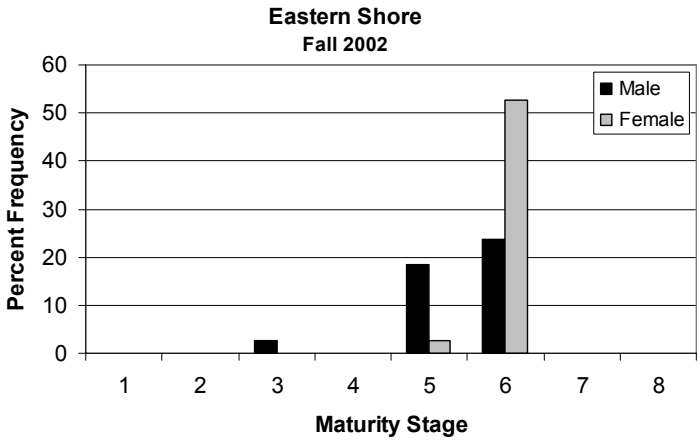

Figure 39. Maturity stages of herring sampled from the 2002 fall gillnet roe fishery east of Halifax.

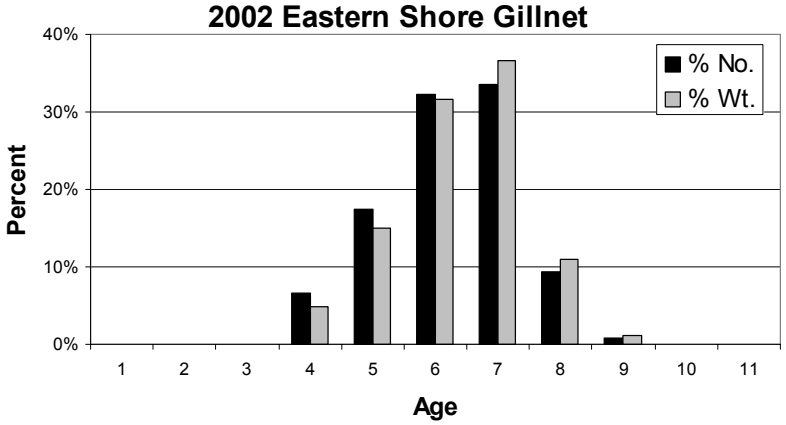

Figure 40. Herring catch at age (% numbers and % weight) for the fall 2002 gillnet roe fishery east of Halifax.

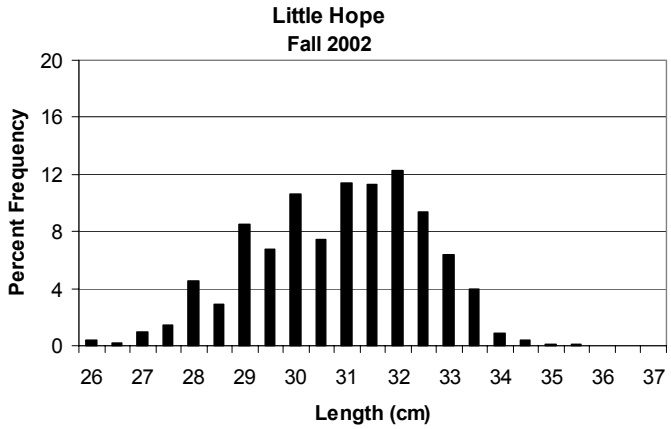

Figure 41. Length frequency of herring sampled from the Little Hope 2002 fall gillnet roe fishery.

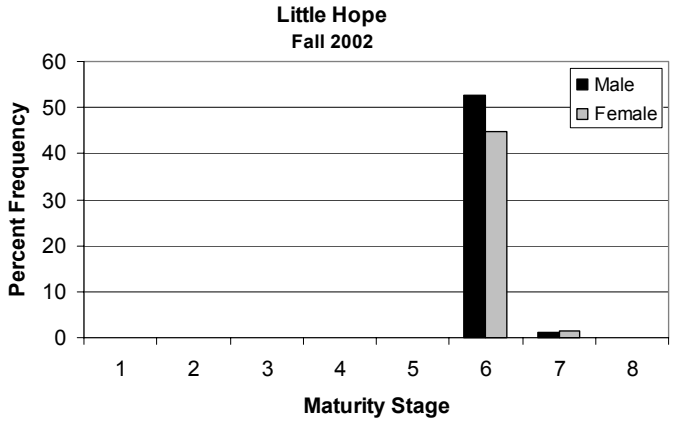

Figure 42. Maturity stages of herring sampled from the Little Hope 2002 fall gillnet roe fishery.

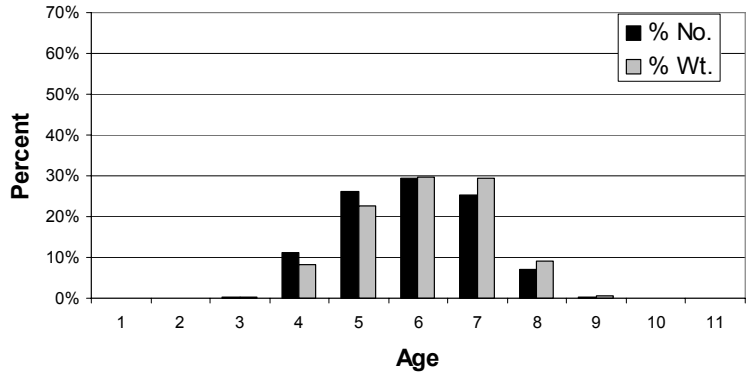

Figure 43. Catch at age (% numbers and % weight) of herring from the fall 2002 Port Mouton/Little Hope gillnet fishery.

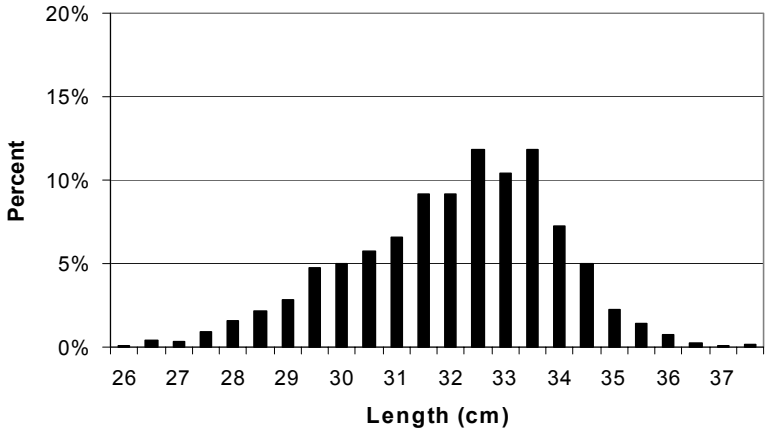

Figure 44. Length frequency of herring sampled from the Glace Bay 2002 fall gillnet roe fishery.

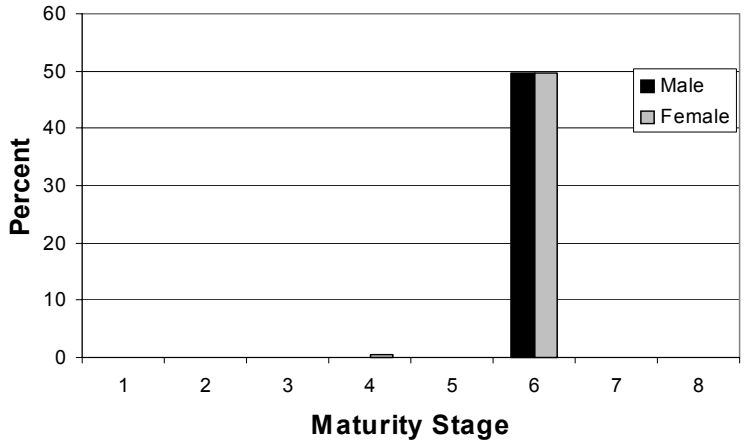

Figure 45. Maturity stages of herring sampled from the Glace Bay 2002 fall gillnet roe fishery.

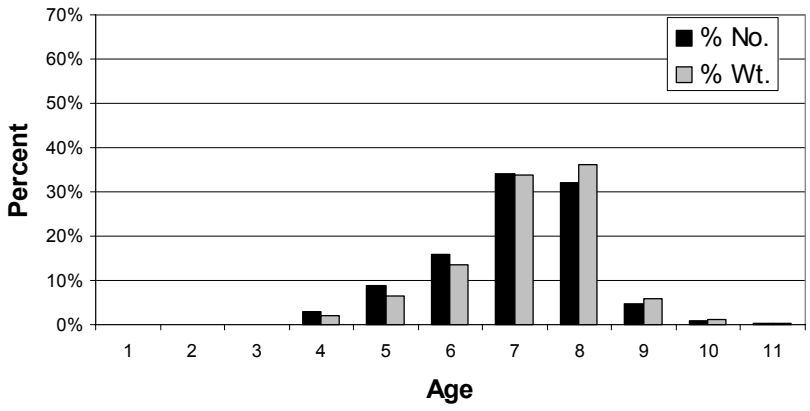

Figure 46. Catch at age (% numbers and % weight) of herring from the fall 2002 Glace Bay gillnet fishery.

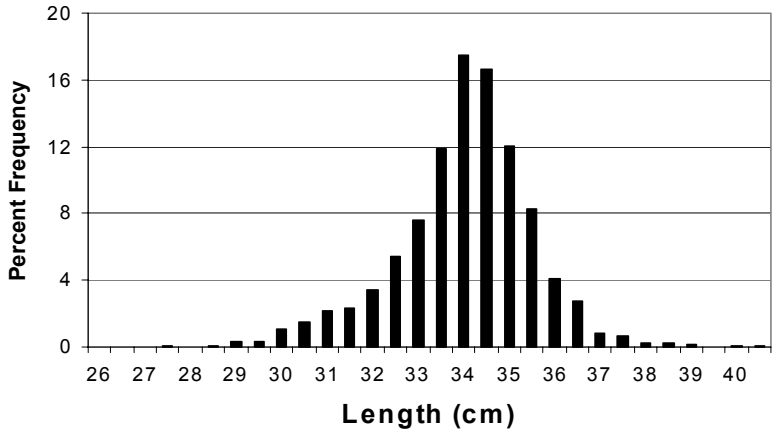

Figure 47. Length frequency of herring sampled from the spring 2002 Bras d'Or Lakes experimental gillnets.

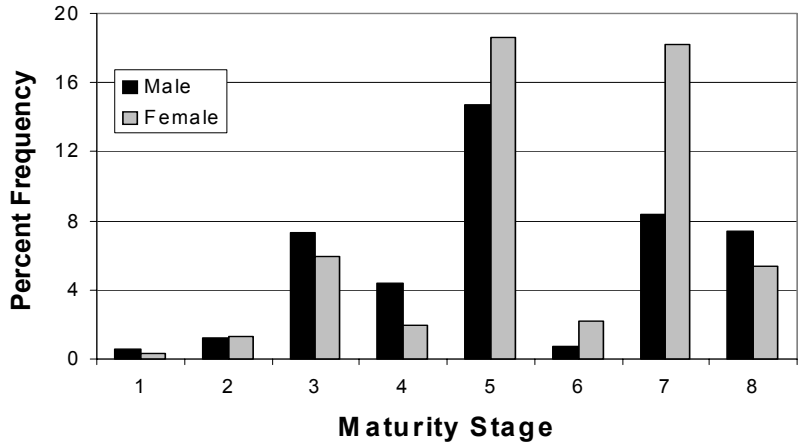

Figure 48. Maturity stages of herring sampled from the spring 2002 Bras d'Or Lakes experimental gillnets.

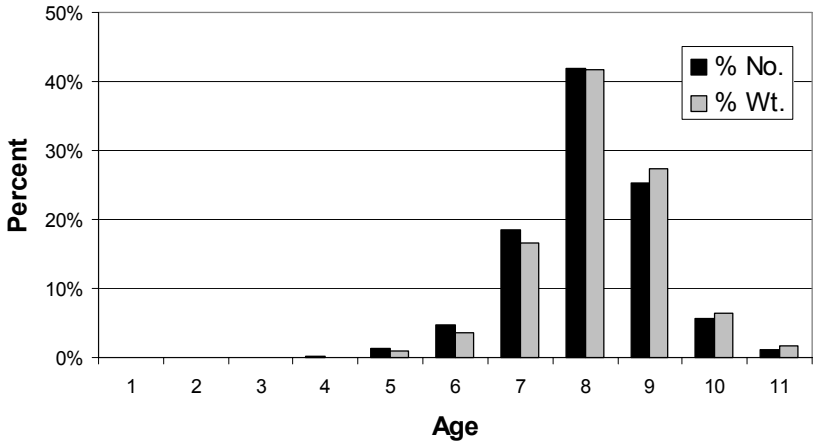

Figure 49. Catch at age (% catch numbers) of herring from the 2002 Bras D'Or Lakes spring gillnet fishery.

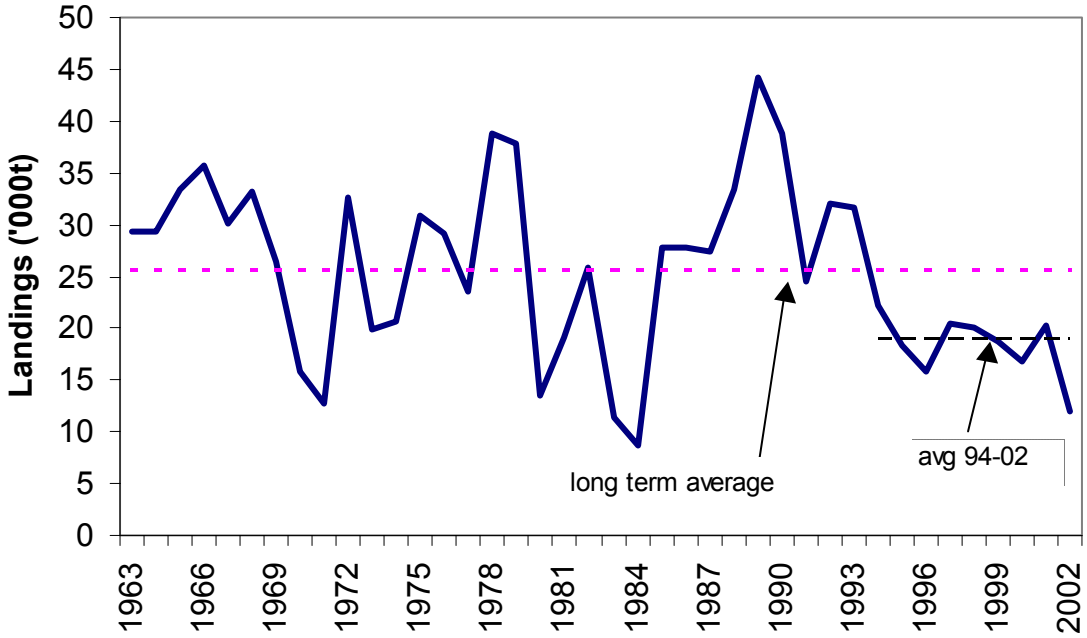

Figure 50. Herring landings from the southwest New Brunswick weir and shutoff fishery, 1963-2002.

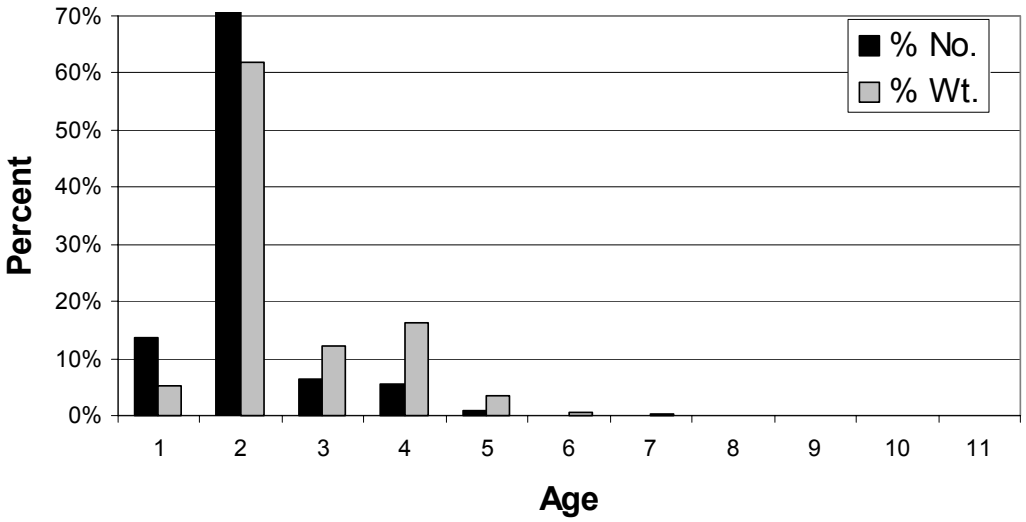

Figure 51. Catch at age (% numbers and % weight) of herring from the 2002 southwest New Brunswick weir and shutoff fisheries.

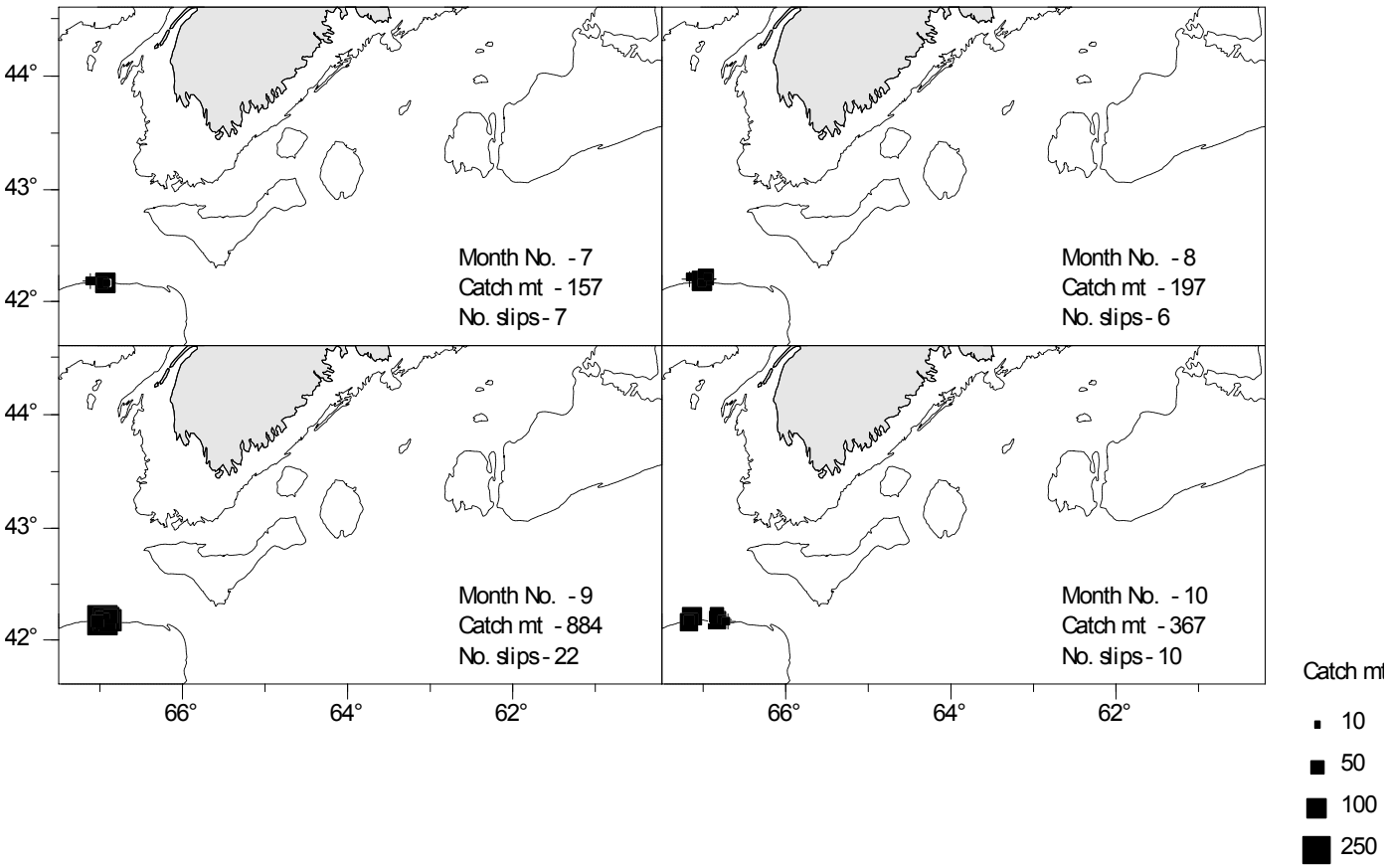

Figure 52. Herring midwater trawler (Morning Star) catches by month from Georges Bank for 2002.

2002 4WX Herring Fishery: Report of Fleet Seiner Activity

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The herring industry, in association with the Herring Science Council, provides an annual summary of seiner fleet activity throughout the fishing season. This gives a general overview of the activities of the purse seine fleet and highlights important anecdotal information that may otherwise be lost. Information was gathered through association records, captains' reports and comments, through HSC and DFO staff, and through DFO landings and samples databases. The overall landings by fishing area, month and week are summarized in Table A1-1 to A1-3 and Figure A1-1 to A1-5. Sampling by NAFO unit area week is shown in Table A1-4. The following is a summary of the activities for the 2001-2002 quota year purse seine fishery and for the 2003 Chebucto Head fishery.

Offshore/Scotian Shelf Banks

Summary

- Reactivated fishing area since 1996
- The 2002 Offshore/Scotian Shelf purse seine fishery took place between week 16, April 14-20 and week 26, June 24-30, 2002.
- Approximately 66% of landings in the month of April and 13% of landings in the month of May came from Western Hole. About 58% of landings in June came from the Offshore Banks, with 3% coming from Western Hole.
- 6,962t were landed in this area, less than in 2001 (11,689t) and 1999 (9726t) but more than in 2000 (1,692t).
- Weather was described as poor for the majority of the 2002 Offshore/Scotian Shelf fishery.
- Fish were staying deep in the water and were not aggregating well during most evenings.

Week 16: April 14 to 20
Five fishing vessels were active. Fishing took place on the Outer Banks (Roseway). The weather was poor for fishing. Landings were very low and fish were staying too deep to catch. Fish size ranged from 5.5" to 7". Until now, large amounts of fish had not been sighted. Five landings were made from Western Hole, and three from the Outer Banks. Landings totalled 242t, and the average fish length was 15.9 cm.

Week 17: April 21 to 27
Six seiners fished Roseway Bank this week. The boats concentrated on the southwest corner of Roseway Bank. The weather was bad for most of the week. Lots of feed was seen in the water column. Herring were staying deep in the water and only moving

upward after dark. The water temperature was between 1 and 2^0C. At the same time in 2001, the water was warmer (approximately 4^0C). Fish size was small, with lengths between 5.5 and 8 inches. It was reported that there were signs of more fish moving into the bank. Fish seemed to be disbursed across the ocean bottom both day and night. The main market for herring this week was bait, with small amounts going to other markets (e.g.: mink food). Twelve landings were made from Western Hole, and two from the Outer Banks. Landings totalled 453t, and the average fish length was 16.8 cm.

Week 18: April 28 – May 4
Three landings were made from Western Hole, and one from the Outer Banks. A total of 235t of herring was landed over the week, with an average length of 16.7 cm.

Week 19: May 5- May 10
Two landings were made from both Western Hole and the Outer Banks. Landings totalled 115t.

Week 20: May 12- May 18
Two landings totalling 32t were made from Western Hole this week.

Week 22: May 26 to June 1
The fishery on the Patch was active this week, with twelve seiners fishing. Herring showed up well in the daytime, and lay on bottom all night. There were very low landings by half of the fleet this week. The weather was bad, although markets for the fish were good and there were no sightings reported of non-market fish. Four landings were made from Western Hole and six from the Outer Banks this week. Total herring landings amounted to 407t. The fish samples showed an average length of 27.5 cm.

Week 23: June 2- June 8
Landings from the Outer Banks this week totalled 27t. A total of 2,548 t were landed this week from the Offshore Banks. The average length of herring was 30 cm.

Week 24: June 9- June 14
Sixteen landings were made from the Outer Banks this week. A total of 78t was landed. Fish size averaged 30.3 cm.

Week 25: June 16- June 21
Landings from the Outer Bank area totalled 31t. Overall 2,445t were landed this week, with an average size of 30.7 cm.

Week 26: June 24- June 30
Ten herring seiners fished the Patch this week. The weather was very bad with a lot of wind. The fleet was able to fish for only two nights. The herring stayed deep in the water, at bottom. Fish showed on sounders as a light skim on the bottom, and they would not bunch up in the evenings. Fish length averaged between 12 and 13 inches, and fish were described as being in food market type condition. Two landings were made from Western Hole, and five landings were made from the Outer Banks. A total of 183t was landed.

South West Nova Scotia Component

The quota year for South West Nova is from October 15 to the following October 14, and so catches from October 15 to December 31, 2001 are included in the quota total. The 2001-year fishing weeks are summarized separately below.

Summary

- The purse seine fleet concentrated their efforts on pre-spawning aggregations mainly on the Long Island Shore, the Grand Manan Banks, Trinity Ledge, and Gannett Dry Ledge.
- Spawning aggregations were targeted on German Bank and Scots Bay.
- Total landings (75,440t) were higher than in 2001 (66,005t) and 1999 (73.350t), but lower than in 2000 (83,186t).
- An increase in fishing activity in the fall was noted in weeks 42-45, 2001. Similarly, Weeks 2-5 showed activity in the New Brunswick Coastal area and on the Grand Manan Banks. This was different from 2001.
- Fishing started earlier in the spring at week 16: April 14-20, compared to 2001 when the fishery started at week 20: May 6-12.
- The weather was poor until the end of June, and then was described as good for the remainder of the fishery.
- In May about 30% of landings came from Gannett Dry Ledge. In June the majority were from the Long Island Shore (22%) and in July most of the landings (30%) were from Lurcher. In both August and September the majority of landings were from German Bank (55%). The month of October had 40% of landings coming from the Grand Manan Banks.

<u>2001 Fishing Weeks</u>

Week 42: October 15- October 19
Ten landings were from the Long Island Shore, three from the coastal New Brunswick area, and sixteen from Grand Manan.

Week 43: October 22- October 26
There were 20 landings from Grand Manan Banks, 11 landings from coastal New Brunswick, four landings from the Long Island Shore, and four landings from Gannett Dry Ledge.

Week 44: October 28- November 3
Eight landings were made from Grand Manan, fifteen from coastal New Brunswick, and two from the Long Island Shore area this week.

Week 45: November 5- November 9
There were three landings from the Long Island Shore and two landings from Grand Manan this week.

Appendix A. 2002 4WX Herring Fishery: Report of Seiner Fleet Activity

2002 Fishing Weeks

Week 2: January 6- January 12
Nine landings were made from coastal New Brunswick (88t) and seven landings were made from Grand Manan (109t) this week. The average fish size was 18.1 cm.

Week 3: January 13- January 19
Thirteen landings were made from coastal New Brunswick (393t) this week. Eight landings were made from Grand Manan (28t). The average fish size was 15.5 cm.

Week 4: January 20- January 26
A total of 19 landings were made from coastal New Brunswick (227t), and five landings were made from Grand Manan (28t). The average fish size was 15.7 cm.

Week 5: January 27- February 2
Twenty-one landings were made from coastal New Brunswick (94t) this week. The average fish size was 15.2 cm.

Week 16: April 14 to 20
Two nights of fishing took place west of German Bank this week. Fish size ranged from 6 to 7 inches. It was noted that herring were "coming up good after dark", and that there was lots of feed in the water. However, the quantity of fish in this area was low as well. All fish caught went for the bait market. Three landings were made from German Bank (180t) this week. Fish were 15.9 cm on average.

Week 17: April 21 to April 27
Approximately 6 vessels fished Roseway Bank this week. The weather was bad for most of the week. The fish stayed deep, only coming to the surface after dark. Herring were dispersed across the bottom both day and night. Fish were found in different areas from previous weeks, mostly on the Southwest corner of Roseway Bank. A good amount of feed was showing in the water. The water temperature was between 1 and 2^{o}C, warmer than the previous year when the temperature was about 4^{o}C. The fish were small this week, 5.5 to 7 inches. The market preferred bait, with some going for mink food. There were signs of herring moving into the area. A total of 453t were landed this week with an average length of 16.7 cm.

Week 18: April 28 to May 4
This week six vessels fished Lurcher. The weather was poor for most of the week. Fish were staying deep in the water column. The fish were notably lean, ranging in size from 5 to 7 inches. There was a still lot of feed in the water. Due to the bad weather, searching for fish in other places was not possible. Plenty of fish were spotted on the Long Island Shore, but there was too much (lobster) gear there to set. Lots of fish were identified moving from outside German Bank, north along the 50 fathom edge to the west of Yarmouth. Herring seemed to be moving towards St. Mary's Bay or Brier Island. Three landings were made from Lurcher (310t) where the average fish size was 16.7cm. One landing was made from Gannett Dry Ledge (59t), and one from the Southwest Grounds (18t) with an average fish size of 28.8 cm.

Week 19: May 5- May 11
Three landings were made from Gannett Dry Ledge (313t), six landings were made from Lurcher (55t), three from the Long Island Shore (137t), and six from German Bank (298t). Average herring lengths for 4Xq and 4Xr were 14.1 and 16.6 cm respectively.

Week 20: May 12- May 18
Four landings were made from Gannett Dry Ledge (358t), three from the Long Island Shore, one from Grand Manan (42t), and one from German Bank (145t).

Week 21: May 19 to May 24
Six herring seiners fished the Long Island Shore this week. The weather was fair to poor with windy conditions. Fish tended to be at the surface. They were between five and seven inches in length and were described as lean. Large amounts of fish were described as moving north. Plenty of fish were spotted on the Prong (5 to 6 inches in length) and on the Long Island shore (6-7 inches in length). The boats fishing in this area were able to find marketable fish each night. Small fish were observed in many different areas this week. Sixteen landings were made from the Long Island Shore (616t), twenty from Gannett Dry Ledge (386t), two from Lurcher, eight from German Bank (372t), and two from Grand Manan (13t).

Week 22: May 25- May 31
Six seiners fished the Northwest Ledge this week. A nice aggregation of fish was located, with fish averaging 12 inches in length. The fish were staying deep and hard on the bottom. The weather over the week was poor. Feed was plentiful in the area. Non-market fish showed up many times from the Long Island Shore, Prong, and Northeast and Southwest Banks. Also reports were made of larger fish moving up the shore from south of Yarmouth and Lurcher. Eleven landings were made from the Long Island Shore (133t with an average length of 27.3 cm), seven from the Southwest Grounds (306t with an average length of 27.8 cm), and four from the Gannett Dry Ledge (119t with an average length of 18.0 cm).

Week 23: June 2- June 8
Eleven landings were made from Grand Manan (355t), one from the Long Island Shore (60t), and two landings from the Southwest Grounds (206t with an average length of 27.9 cm). Average lengths of herring from 4Xs and 5Yb were 19.2 and 27.7 cm respectively.

Week 24: June 9 to June 15
Six seiners fished the Northeast and Southwest Banks. Fish stayed deep in a thin layer on the bottom. Plenty of non-market fish were spotted averaging about 6.5 inches in length. The herring that were landed averaged between 10 and 12 inches in length and were full of feed. The markets called for more fish than were landed. The weather was generally bad so the fish did not settle down. Nine landings were made from Grand Manan (511t), and ten landings were made from the Long Island Shore (214t, average length 27.8 cm) this week. Average lengths of herring from 4Xs and 5Yb were 25.7 and 26.6 cm respectively.

Week 25: June 16 to June 21
Five seiners fished Northeast and Southwest Bank this week. More fish were entering and exiting the banks than in previous weeks. Fish were still small this week, but enough large fish were found. The majority of fishing activity was on the Southwest Bank where there was a better chance of catching larger fish. It was noted that there was plenty of feed on the banks. Fishermen were saying that they are seeing more feed on the surface than ever before. A total of twenty-four landings were made from the Grand Manan Banks (906t) this week. Average lengths of herring from 4Xs and 5Yb were 27.6 and 27.0 cm respectively.

Week 26: June 23 to 28
Six seiners fished the Long Island Shore this week. The weather was described as fair to poor. Fish tended to remain deep in the water, and were about 10 to11 inches in length, in food condition. Plenty of small non-market fish could be seen around the Shore, Northeast Bank, and the Prong. A good showing of large herring was spotted on the Northwest Ledge, but they did not come up off bottom. The market was caught only two nights this week. Eight landings were made from Grand Manan (906t) and nine landings were made from the Long Island Shore (398t, average length 27.9 cm).

Week 27: June 30 to July 5
Between six and fourteen vessels fished the Northeast bank, Lurcher, and the Southwest Bank. The weather was fair to unsettled this week, and quite foggy. Large amounts of small fish were still on the fishing grounds at around the 50-fathom edge. Fish were sighted from the back of German bank to Lurcher. Herring stayed at the water surface and were about 10 to 11 inches and 12 to13 inches in size, and in food condition. The herring were deep in the daytime and then skimmed out after dark. Fish had hard roe. Feed was plentiful at the water surface and the fish had lots of feed in them. There were fifteen landings from Grand Manan (865t), forty-four from Gannett Dry Ledge (2888t), eight landings from Lurcher (1378t), one landing from Seal Island (109t), and two landings from Trinity Ledge (72t). The average herring lengths from 4Xq, 4Xs, and 5Yb were 28.3, 28.0, and 27.6 cm respectively.

Week 28: July 7 to July 12
Six seiners fished the Southwest and Northeast Banks during the week. Ten boats fished the Teardrop and Pollock Humps. The weather was better this week; it was described as fair to good. There were lots of large fish and plenty of feed in the water this week. Fish stayed deep but came up to the surface and bunched up well at dark. Fish were 10 to 11 inches in length, and were in food condition. All vessels were able to land the required market each night. Thirty-four landings were made from Grand Manan (1,743t, average length 28.3 cm), nine landings from German Bank (706t, average length 28.5 cm), and thirty landings from Lurcher Shoal (2,204t).

Week 29:July 14- July 20
Thirty one landings were made from Grand Manan (1,460t) this week, with six vessels fishing in that area. Sixty landings were made from Lurcher Shoal (3,347t, average length 28.2 cm). Four landings were made from Gannett Dry Ledge (325t). A total of 178t was landed from Scots Bay. The average lengths of herring from 4Xs and 5Yb were 26.4 and 25.8 cm respectively.

Week 30: July 21-26
Fourteen vessels fished off Yarmouth, heading for areas like the Pollock Shoals. The weather conditions were good for fishing. The fish were in market condition and everyone seemed to be getting the fish that they wanted. All in all it was a good week for landings. Most vessels landed their fish in Yarmouth. The plan was to stick around until the fish moved, and then head for Scot's Bay to scout out the herring there. Six vessels fished on the Northeast Bank, where there was a good showing of fish. All vessels were catching the market they desired each night. The weather conditions were fair to good. Herring stayed at the water surface, and were 7 to 9 inches in length. The fish were described as "feedy". Small non-market fish showed on the Prong and Northwest Ledge in good quantities. Twenty five landings were made from Grand Manan (851t, average length 26.6 cm), one from Yankee Bank (78t, average length 22.6 cm), six from Scots Bay (1,551 t, average length 27.6 cm), one from the Long Island Shore (36t), three from Gannett Dry Ledge (113t), and five from German Bank (741t, average length 26.9 cm).

Week 31: July 28- August 2
Six seiners fished German Bank this week. The weather conditions were good. The herring stayed deep and those that were caught were about 10 to11 inches in length. Markets were for food fish and some roe. On Sunday, July 28, it was reported that the fish stayed deep all night, covering 3/4 of a fathom on bottom for about 4 miles with various densities (light to heavy). Water temperatures were about 55^{o}F. On Thursday night the fish that were caught had hard roe (ready to spawn in two weeks). Successful fishing sets were made this week, bringing in good quantities of fish. Six to nine seiners started fishing on the Northeast Bank this week. The fish were bigger than last week (9 to 11 inches). On Sunday, July 28, 10 boats made a survey of Scots Bay. By mid-week, six vessels moved into the area and fished for two nights. The fish were 9 to 11 inches in length and were mostly hard roe fish. There was not a big concentration of fish at that time. Towards the end of the week, six vessels moved to the Northwest Ledge. The fish were plentiful in various sizes. Thirty-four landings were reported from German Bank (1,775t, average length 26.7 cm), fifteen from the Long Island Shore (629t), twenty-eight from Scots Bay (1,154t, average length 26.2 cm from 4Xr), eight from Grand Manan (250t), and three from Gannett Dry Ledge (93t).

Week 32: August 4- August 10
Six seiners fished on German Bank this week. Good weather was prevalent, and the fish stayed deep in the water column. Fishermen reported that the fish were between 10 and 11 inches in length and they were going for the food market. A skim of fish was noted deep in the water, about 4 to 5 miles long and from the bottom to about 5 fathoms off bottom. Six boats fished the Long Island Shore and Northwest Ledge this week, where fish were showing up in good amounts. Fish ranged in size from 9 to 12 inches, and seemed to stay at the water surface. The herring observed were described as "feedy" in the beginning of the evening, but clean by daylight. Weather conditions were good, and fish were going for the food market. In this area good amounts of small non-market fish were showing up. Twenty two landings were made from the Long Island Shore (694t), nine from German Bank (301t, average length 27.5 cm), one from coastal New Brunswick (43t), one from Grand Manan (30t, average length 18.8 cm), and thirty from Scots Bay (2,666t, average length 27.3 cm).

Week 33: August 11- August 16
The week started out with a survey by 14 seiners of Scots Bay on the night of Sunday, August 11 (4 acoustic recording vessels and 10 non-recording). Approximately 400 km^2 were covered. Fish were in roe condition, with a few mixed slinks. The night of August 12 showed a good amount of fish in Scots Bay, but the fish were found to be hard or spent. Fish were 9 to 12 inches in length. The herring caught were 50% in roe condition later in the week. Although there were lots of herring in Scots Bay, dogfish were a problem for the seiners. Twenty-seven landings were made from Scots Bay (853t).

In the latter part of the week, fish stayed deep on German Bank. South of the spawn tow, a large amount of fish (3-4 miles) bearing hard roe was encountered. The herring were 10 to 12 inches in length. These fish were a week from spawning. Fish were in food condition. Southwest winds prevailed at speeds of 15-20 knots. Thirty-two landings were made from German Bank (1,693t, average length 28.2 cm) this week.

Six vessels fished the Long Island Shore. The weather was good. Fish were up at the surface and ranged from 9 to 12 inches in length. The tides were off later in the week, so the boats moved on to Scots Bay. Thirteen landings were made from the Long Island Shore (263t) area, and two landings were made from Grand Manan (32t, average length 20.2 cm).

Week 34: August 18 to August 23
Nine vessels fished German Bank this week. The weather on the Bank was good, with fish staying deep, at 10-11 inches in length. The fish caught were in roe condition. The evening of August 29 showed a water temperature of 59^oF. Forty-six landings were made from German Bank (3,526t, average length 28.5 cm.

Six vessels fished in Scots Bay this week. Weather conditions were good. The fish seemed to stay at the water surface, had a length of 9 to 12 inches, and were mostly hard roe. Fishing mainly took place off Margaretsville. Seiners were able to catch their required market each night. On the night of August 21, a structured survey was conducted in Scots Bay. Two vessels with recording systems on board, and five vessels recording results on paper, participated in the survey. An area of about 110 km^2 was covered. A large grouping of non-market fish were noted off Saint John while travelling back and forth to Black's Harbour. Twenty-four landings were made from Scots Bay (905t) this week. There were 11 landings from the Long Island Shore, and 3 from Grand Manan (64t).

Week 35: August 25 to August 30
Six seiners fished Scots Bay this week. The fishing occurred off Margaretsville. The fishing was described as "good". Weather was suitable for fishing, with fish staying at the surface, and having lengths of 10 to11 inches. All boats were able to get the market they desired each night. Fish were in various stages, with some spent, hard, and soft. There was a good showing of fish. Eight landings were made from Scots Bay (370t) this week.

Eleven seiners fished on German Bank this week. The weather was described as good, with a bit of Northeast winds at 15 nautical miles per hour. Fish were once again staying deep in the water column. Fish caught ranged in size from 10 to 11 inches, and were in roe condition. Most of the herring were found on the location known as the Spawn Tow. Three to four miles of fish were observed in this area, showing medium to high densities. The night of Monday, August 26, a non-fishing night survey of German Bank and Seal Island was conducted. Seven seiners (4 recording vessels) surveyed German Bank, while three seiners (1 recording vessel) surveyed the Seal Island area. A good amount of fish was documented on German Bank, with some areas of very high density recorded. Throughout the week, the boats were able to get the herring that they needed for their market. Forty-six landings were made from German Bank (2,498 average length 28.1 cm) this week. Twenty landings were made from the Long Island Shore (371t) this week, and four were made from Grand Manan (64t).

Week 36: September 1 to September 7
Weather conditions were good for fishing this week. Fish were staying at the surface, had lengths of 10 to 11 inches, and were in three conditions (roe, slinks, and food).

Six seiners fished Scots Bay at the beginning of the week. Fishing took place off of Margaretsville. On the night of September 2, a structured survey was undertaken in Scots Bay. Six seiners participated in the survey. Fishing took place after the survey ended, however all boats were not able to make successful sets. Dogfish were a major problem that night, with large amounts noted. The amount of herring in the Bay decreased steadily this week. Fish in the Bay were in roe condition. Nine landings were made from Scots Bay (555t) this week.

Six to eight boats fished on the Northwest Ledge in the latter part of the week. Plenty of small fish were seen at 5 to 6 inches in length. Eleven landings were made from the Long Island Shore (373t), and three from Grand Manan (195t).

Twelve seiners fished in the German Bank area this week. Fish stayed deep, were 10 to11 inches in length, and were in roe condition. Fishing was carried out once again on the Spawn Tow. Fish were so deep, that on one night it was reported that successful fishing sets could not be made by some. Thirty-two landings were made from German Bank (2,091t) this week.

Week 37: September 8 to September 13
Between six and eight seiners fished on the Northwest Ledge during the week. The weather and the fishing were good. Fish stayed up at the water surface, had lengths of 10 to 11 inches, and were either slinks or in food condition. There were many small fish as well. Seventeen landings were made from the Long Island Shore (434t), six landings from Grand Manan (265t), and three from Gannett Dry Ledge (125t). Two landings were noted from Scot's Bay.

September 10 was the second structured survey of German Bank and Seal Island. This was once again a non-fishing survey night. Approximately 550 km^2 was covered. A total of 300 km^2 was covered on German Bank alone, with four recording systems and two boats recording a paper survey. Two vessels conducted a paper survey of Seal

Island. The mean length of fish was found to be 27.2 cm. Eighteen landings were made from German Bank (1,199t) this week.

Week 38: September 15 to September 20
Six seiners fished around White Head, Grand Manan at the beginning of the week. Weather conditions were good, fish (10 to 11 inches in length) were staying at the surface and were in food condition. There was a lot of fish around. Seventeen landings were made from Grand Manan (625t, average length 22.6 cm). Ten landings came from the Long Island Shore (591t, average length 24.6 cm), one from coastal New Brunswick (45t), and one from the Gannett Dry Ledge (384t).

Nine to fourteen seiners fished on German Bank this week. Two to three miles of fish, showing heavy and red on the sounders, and from bottom up 15 fathoms, were observed on the Spawn Tow. The fish were 10 to 11 inches in length and in spawning condition. The wind was a factor in the beginning of the week, and again at the end. When boats were able to fish, they were able to get the fish they needed for market. The night of September 17, a member of the DFO Science team went out on one of the seiners. Very dense fish aggregations were observed on German Bank. On the night of September 19 a large amount of fish was also observed on German Bank and two seiners with recording systems on board ran lines over the fish. This acoustic data was analyzed and a biomass estimate derived. This became the third German Bank Survey. Thirty-seven landings were made from German Bank this week (3,460t).

Week 39: September 22 to September 27
Between six and eight seiners fished between Grand Manan and the Long Island Shore this week. The weather was fine during the week. Fish were up at surface, 10 to 11 inches in length, and were in food market condition. Everyone was able to get their market each night this week. The fish were noted as having plenty of feed in them. Small non-market fish were spotted on the Northeast Bank and on the Prong. Thirteen landings were made from the Long Island Shore (707t), twenty from Grand Manan (938t), thirty from Gannett Dry Ledge (737t), one from Lurcher (104t), four from Trinity (477t), and fifteen from German Bank (1,004t).

Week 40: September 29 to October 5
Between six and twelve seiners fished Grand Manan and the Northeast Bank this week. Weather was fair. Fish were at the surface and had lengths of 8 to 9 inches. The fish were caught for bait. The fish were less "feedy" than in previous weeks. Thirty-eight landings came from Grand Manan (1,909t), six from the Long Island Shore (360t), two from Lurcher (235t), one from Gannett Dry Ledge (550t), and three from Trinity (724t).

Approximately ten vessels fished on German Bank this week. The weather varied from fair to bad on the Bank throughout the week. Both bait and roe fish showed up on German Bank this week. There were no roe fish showing on the Spawn Tow this week, and a good amount of bait fish was located 5 to 6 miles north of the Spawn Tow. Twenty-one landings were made from German Bank (640t) this week. A total of 119t was landed from coastal New Brunswick.

Week 41: October 6 to October 12
Six seiners fished on the Prong and White Head this week, where there was a good showing of fish. The weather was good for fishing. Herring stayed at surface, was 8 to 9 inches in length, and was destined for the food market. As in previous weeks, there were many sightings of non-market, smaller fish and a little bit of feed. All boats were able to get their market. One vessel looked twice, without success, for roe fish on the Spawn Tow. Thirty-nine landings were from Grand Manan (1,572t) this week. Twenty-nine landings were made from German Bank (1,703t), eighteen from Gannett Dry Ledge (877t), four from Lurcher (155t), eight from Trinity Ledge (272t), nine from coastal New Brunswick (281t), and two from Seal Island (64t).

Week 42: October 13-October 14
Five landings were made from Grand Manan to finish off the 2002 4WX herring fishery.

Overwintering Areas

Chebucto Head

Week 3: January 16-22, 2003
One seiner equipped with a sounder and sonar recorder and one other vessel travelled to Chebucto Head to carry out surveying and tagging on the over-wintering stock. The weather was very poor. On January 20 they observed a small bunch of fish. A survey-tagging event was scheduled for the following day but the next day there were no signs of fish in the area. The boats left for home in days following. No tagging or surveying was carried out.

Acknowledgements

An expression of sincere thanks to Joy Fry of the Atlantic Herring Co-op and to Donna Larkin of South West Seiners Co. Ltd., who provided seiner location and catch information integral to this report. Many thanks is extended to Captain Delma Doucette, Captain Glen d'Eon, and Captain Carmen d'Eon whose contribution of weekly fishing activity reports and expert opinion added tremendously to the body of this report and to the understanding of the past fishing season.

Appendix A. 2002 4WX Herring Fishery: Report of Seiner Fleet Activity

Table A-1. 2002 and 2003 (to date) herring purse seine catches (t) for quota years by fishing ground and month using data from weekly Commercial Data Division updates.

2002 quota year catches

Sum of CATCH_MT		MONTH								
YEAR	Fishing Grounds	1	4	5	6	7	8	9	10	Grand Total
2002	Gannet,Dry Ledge			1235		4914	71	1246	1427	8893
	German Bank		180	815		1961	9279	7754	2343	22332
	Grand Manan	211		55	1908	5002	387	2023.1	3481	13067.1
	Halifax	367								367
	Long Island			886	684	342	2159	2105	360	6536
	Lurcher			471		6929		104	390	7894
	N.B. Coastal	1045					43	45	400	1533
	Offshore Banks				5078					5078
	S.W. Grounds			585	206					791
	Scots Bay					2120	5557	555		8232
	Seal Island					109			64	173
	Trinity					147		477	996	1620
	Western Hole		849	789	246					1884
	Yankee Bank					78				78
2002 Total		1623	1029	4836	8122	21602	17496	14309.1	9461	78478.1
Grand Total		1623	1029	4836	8122	21602	17496	14309.1	9461	78478.1

2003 quota year catches

Sum of CATCH_MT		MONTH					
YEAR	Fishing Grounds	1	2	10	11	12	Grand Total
2002	Grand Manan			2123	2207	111	4441
	Long Island			110	78	18	206
	N.B. Coastal			1519	311		1830
2002 Total				3752	2596	129	6477
2003	Grand Manan	314	306				620
	N.B. Coastal	1550	187				1737
	Yankee Bank	26					26
2003 Total		1890	493				2383
Grand Total		1890	493	3752	2596	129	8860

Appendix A. 2002 4WX Herring Fishery: Report of Seiner Fleet Activity

Table A-2. 2002 herring purse seine catches (t) for quota year ending Oct. 14, 2002 by fishing ground and week using data from weekly Commercial Data Division updates.

	WEEK															
Fishing Grounds	1	2	3	4	5	15	16	17	18	19	20	21	22	23	24	25
Gannet,Dry Ledge									59	313	358	386	119			
German Bank							180			298	145	372				
Grand Manan	46	109	28	28							42	13		355	511	906
Halifax		367														
Long Island										137		616	133	60	214	12
Lurcher									310	55	106					
N.B. Coastal	243	88	393	227	94											
Offshore Banks														2548	78	2445
S.W. Grounds									18			261	306	206		
Scots Bay																
Seal Island																
Trinity																
Western Hole						154	242	453	235	115	32		407	70		
Yankee Bank																
Grand Total	289	564	421	255	94	154	422	453	622	918	683	1648	965	3239	803	3363

	WEEK															
Fishing Grounds	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Gannet,Dry Ledge	618	2888	948	325	113	93						125	384	737	550	877
German Bank			706		741	1775	301	1693	3526	2498	2091	1199	3460	1004	640	1703
Grand Manan	136	865	1743	1460	851	250	30	32	94	64	195	265	625	938	1909	1572
Halifax																
Long Island	398		116		36	629	694	263	392	371	373	434	591	707	360	
Lurcher		1378	2204	3347										104	235	155
N.B. Coastal							43						45		119	281
Offshore Banks	7															
S.W. Grounds																
Scots Bay				178	1551	1154	2666	853	905	370	555					
Seal Island		109														64
Trinity	75	72												477	724	272
Western Hole	176															
Yankee Bank					78											
Weekly Total	1410	5312	5717	5310	3370	3901	3734	2841	4917	3303	3214	2023	5105	3967	4537	4924

Appendix A. 2002 4WX Herring Fishery: Report of Seiner Fleet Activity

Table A-3. 2002 -2003 (to date) herring purse seine catches (t) for quota years by fishing ground and week using data from weekly Commercial Data Division updates.

2003 quota year catches

Sum of CATCH_MT		WEEK																
YEAR	Fishing Grounds	1	2	3	4	5	6	7	8	42	43	44	45	46	47	48	49	Grand Total
2002	Grand Manan									1448	634	445	382	533	482	406	111	4441
	Long Island										110			78			18	206
	N.B. Coastal									317	881	559	73					1830
2002 Total										1765	1625	1004	455	611	482	406	129	6477
2003	Grand Manan		256		39	99	214		12									620
	N.B. Coastal	655	254	293	270	78	32	130	25									1737
	Yankee Bank		26															26
2003 Total		655	536	293	309	177	246	130	37									2383
Grand Total		655	536	293	309	177	246	130	37	1765	1625	1004	455	611	482	406	129	8860

Table A-4. Purse seine herring mean size (mm) from length frequency sampling by NAFO unit area and week for the 2002 fishery.

	AREA									
	4Wk	4Xm	4Xo	4Xp	4Xq	4Xr	4Xs	5Yb	5Yd	Overall
WEEK	457	461	463	464	465	466	467	511	512	Mean
1							159			159
2	250	242					181			224
17			168							168
18			167	288	167					207
19					141	166				153
20					194					194
21					224	202				213
22			275	278	180	273		212		244
23	300			279		232	192	277		256
24	303					278	257	266		276
25	307					290	276	270		286
26			299		282	279	268			282
27					283		280	276		280
28					285		280	267	272	276
29					282		264	258	271	269
30					269	276	266	226		259
31					267	262				264
32					275	273	188			245
33					282	262	202			249
34					285	268	190			248
35					281	265				273
36					274	268				271
37					274	260	206			247
38					259	246	226			244
39					232	189	202			208
40					212	196	206	207		205
41					259		202			231
42							197			197
43							223			223
44							226			226
16			159							159
47						256	232			244
3							155			155
4							157			157
5							152			152
8							145			145
45							178			178
46							207			207
48							190			190
49								165		165
Overall	290	242	214	282	248	250	211	242	272	238

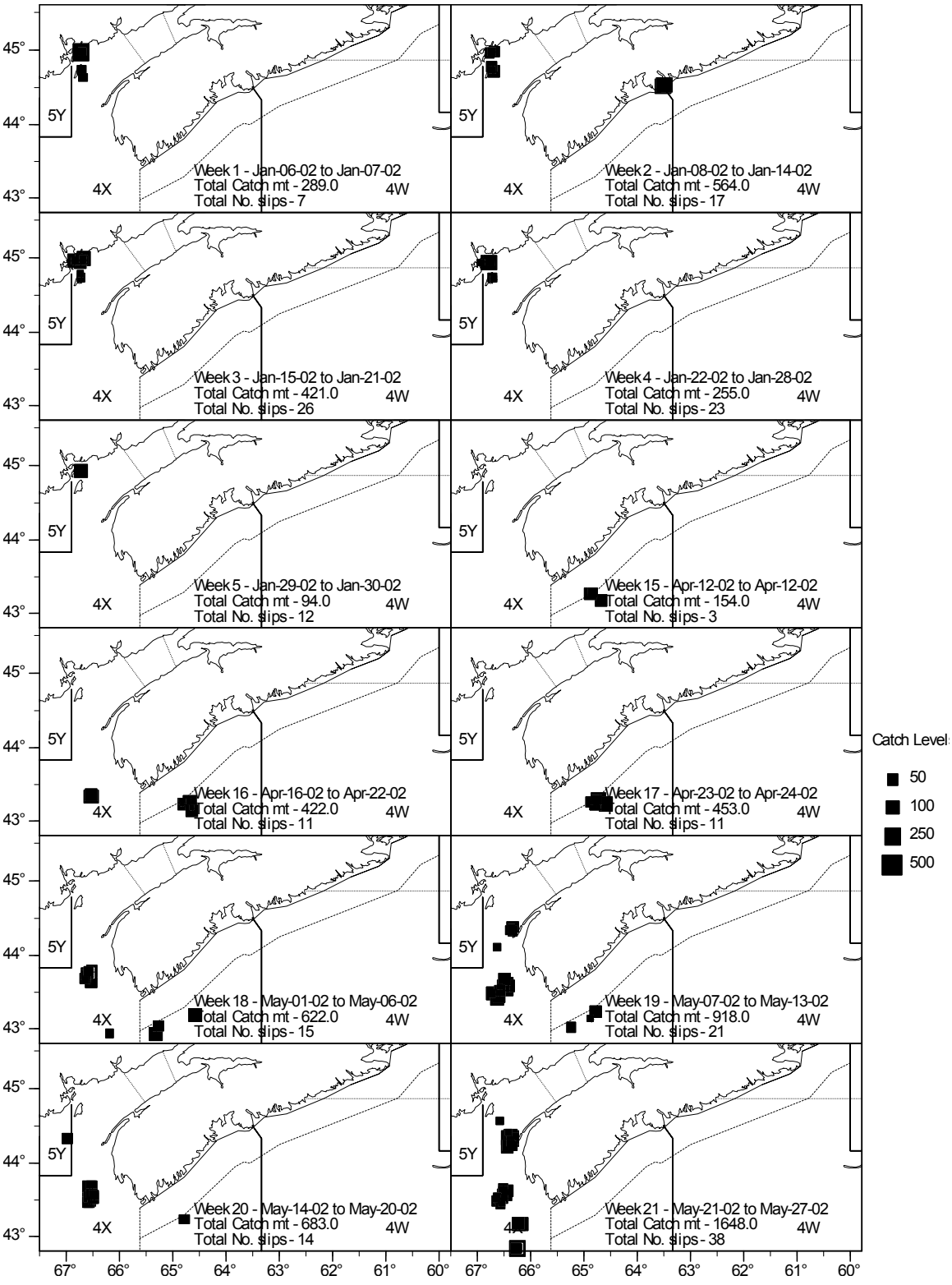

Figure A1-1. Herring purse seine catches (t) for weeks 1-21 for the 2002 fishery (data from Commercial Data Division weekly updates).

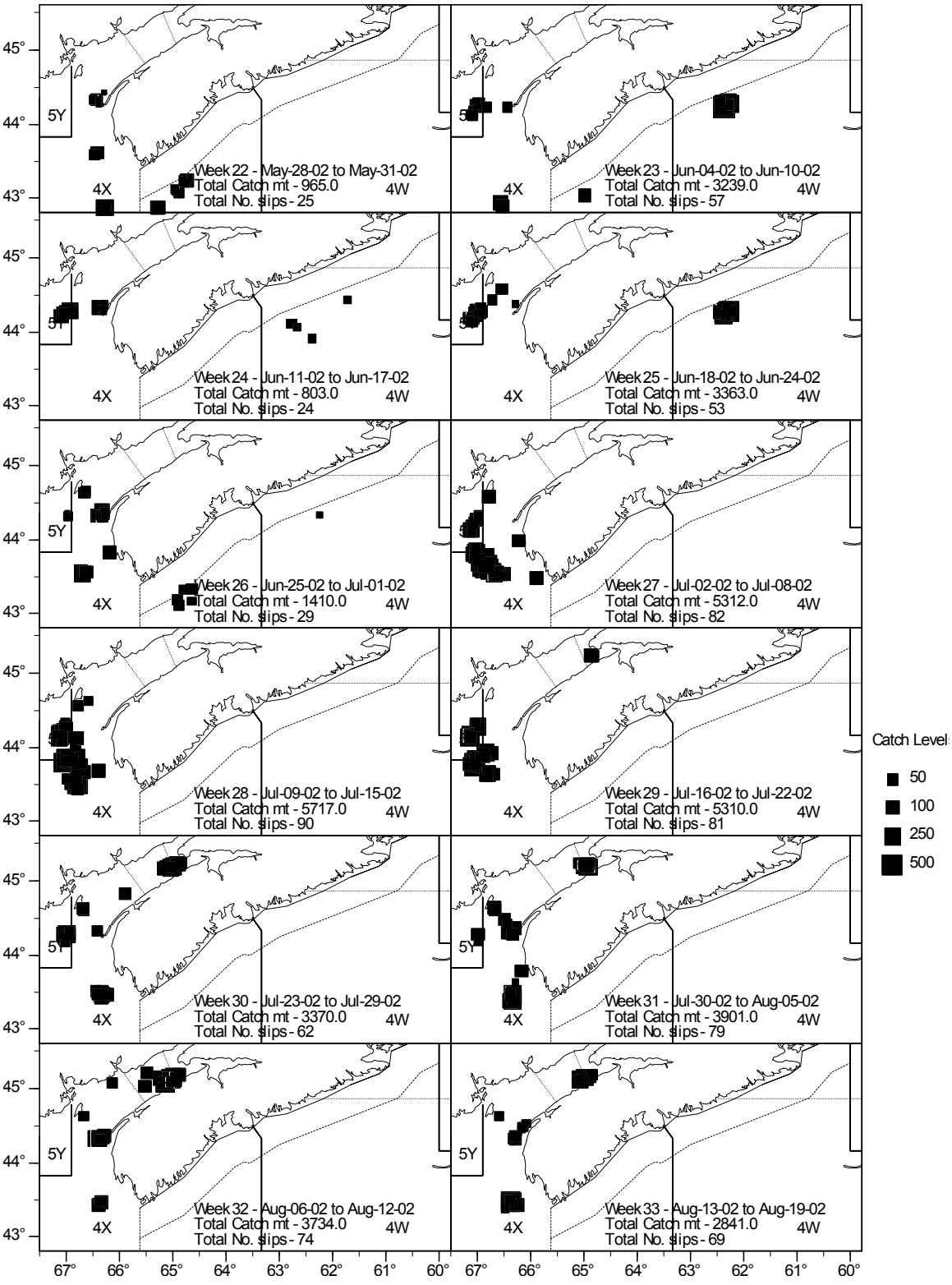

Figure A1-2. Herring purse seine catches (t) for weeks 22-33 for the 2002 fishery (data from Commercial Data Division weekly updates).

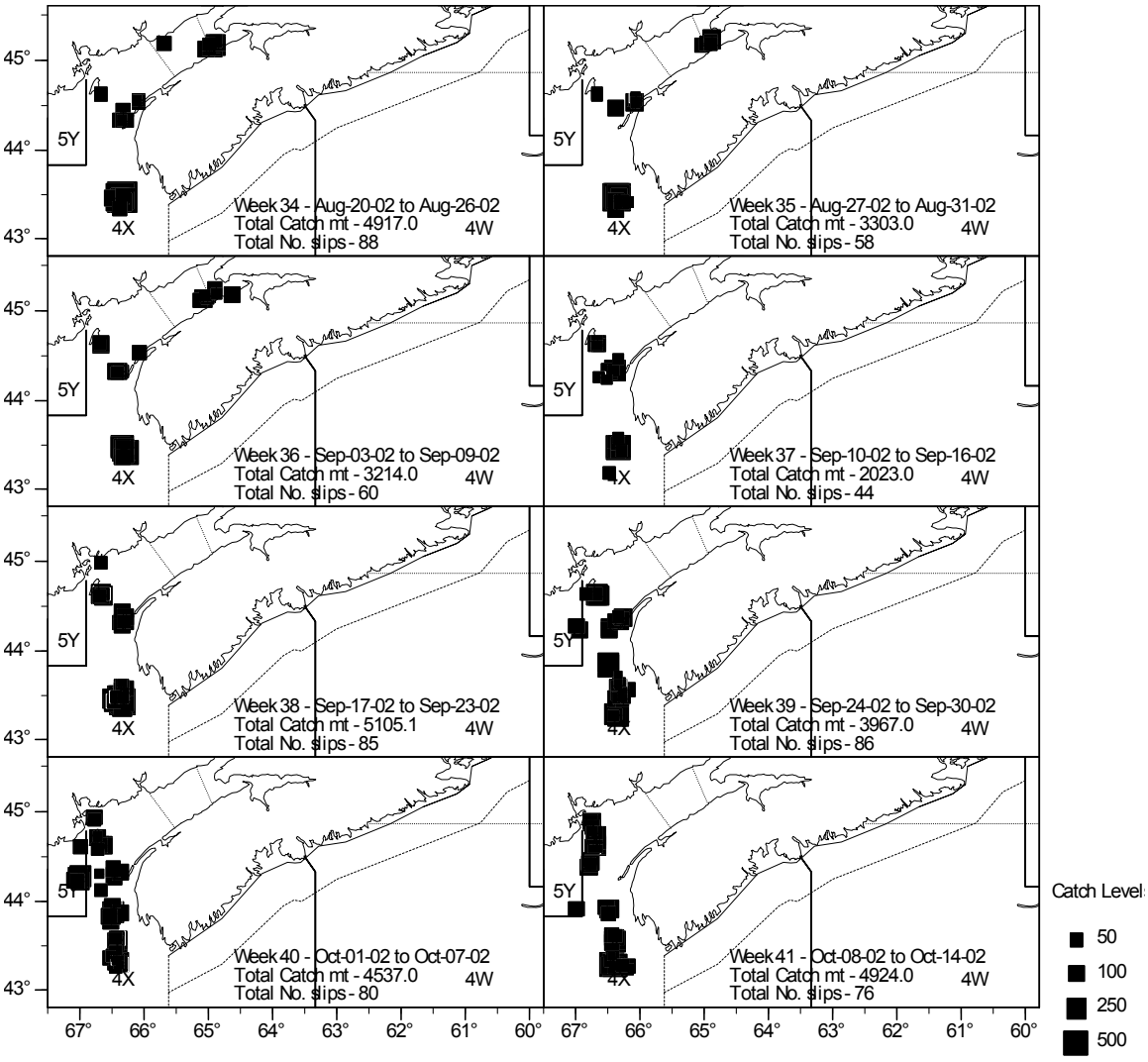

Figure A1-3. Herring purse seine catches (t) for weeks 34-41 for the 2002 quota year fishery (data from Commercial Data Division weekly updates).

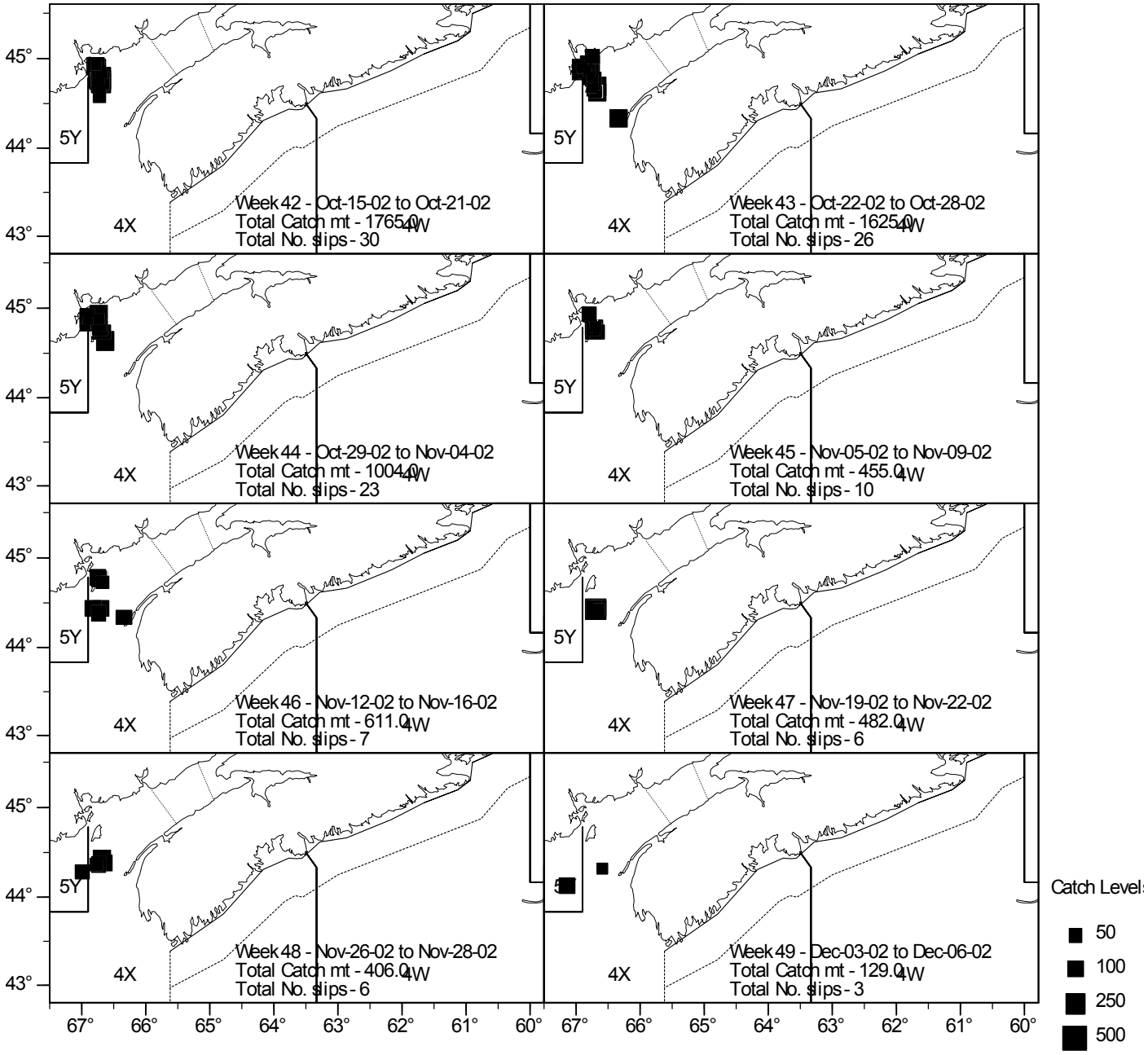

Figure A1-4. Herring purse seine catches (t) for weeks 42-49 (Oct/Dec 2002) for the 2002-2003 quota year fishery (data from Commercial Data Division weekly updates).

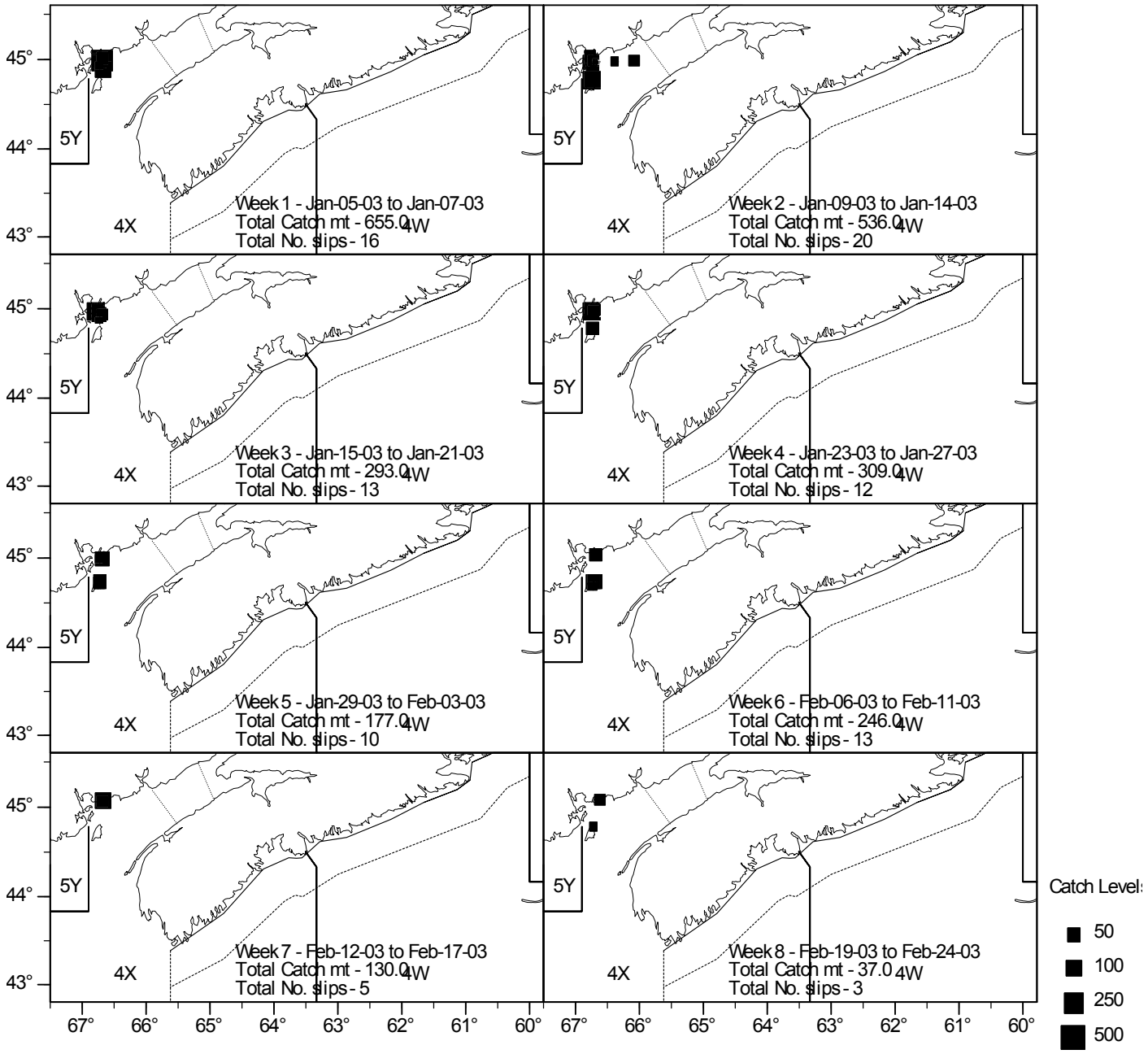

Figure A1-5. Herring purse seine catches (t) for weeks 1-8 (Jan/Feb 2003) for the 2002-2003 quota year fishery (data from Commercial Data Division weekly updates).