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Newfoundland East and Southeast Coast Herring - An Assessment of Stocks in 1992 and 1993

by

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Abstract

Results of the analysis of data from 1992 and part of 1993 are presented for the five herring stock complexes assessed within the Newfoundland region. Commercial landings decreased from 19100 t in 1991 to 11300 t in 1992 due primarily to a reduction in fishing effort. The 1987 year-class of spring spawners continued as the dominant year-class in the commercial fishery. Biomass estimates were available for two of the stock areas from acoustic surveys conducted in 1992 and 1993. A target strength - fish length relationship was calculated from experiments conducted in 1993. Acoustic survey estimates from 1988 to 1993 were recalculated using this relationship. Trends in abundance were also examined from research gillnet catch rates. It was concluded that although east and southeast Newfoundland herring stocks rebuilt through the 1980's with the recruitment of a moderately sized 1982 year-class and have been maintained by the smaller 1987 year-class, stock sizes did not increase to levels observed during the 1970's. There are good indications of 1991 and 1992 yeaar-classes in most areas, the sizes of which cannot yet be quantified. As recruitment of year-classes between 1987 and 1991 is poor, the 1987 year-class will have to sustain commercial fisheries until at least 1996.

Résumé

On présente ici les résultats de l'analyse des données de 1992 et d'une partie de 1993 concernant les stocks de hareng des cinq secteurs évalués dans la région de Terre-Neuve. Les débarquements commerciaux ont diminué, passant de 19 100 t en 1991 à 11 300 t en 1992, en raison principalement d'une réduction de l'effort de pêche. Les reproducteurs de printemps de la classe d'âge de 1987 ont continué de former la majeure partie des prises commerciales. Des estimations de biomasse ont été établies à partir de relevés acoustiques effectués en 1992 et en 1993 pour deux des zones de stocks considérées. En se fondant sur des expériences réalisées en 1993, on a établi une relation entre l'abondance cible et la longueur des poissons, dont on s'est ensuite servi pour corriger les relevés acoustiques effectués de 1988 à 1993. Par ailleurs, on a examiné les tendances de l'abondance par rapport aux taux de prises au filet maillant des navires de recherche. Il en ressort que les stocks n'ont pas retrouvé leurs niveaux d'abondance des années 1970, bien que ceux de l'est et du sud-est de Terre-Neuve se soient relevés dans les années 1980 grâce au recrutement de la classe d'âge de 1982, qui était modérément importante, et se soient maintenus par l'apport d'une classe plus petite, celle de 1987. Les classes d'âge de 1991 et de 1992 paraissent bonnes dans la plupart des zones, mais on ne peut encore en quantifier l'effectif. Comme le recrutement des classes d'âge de 1987 à 1991 est médiocre, c'est la classe d'âge de 1987 qui devra alimenter la pêche commerciale jusqu'en 1996 au moins.

Introduction

There are five herring stock complexes within the Newfoundland region which are assessed by Science Branch of the Department of Fisheries and Oceans. These are: White Bay - Notre Dame Bay (WB-NDB), Bonavista Bay - Trinity Bay (BB-TB), Conception Bay - Southern Shore (CB-SS), St. Mary's Bay - Placentia Bay (SMB-PB), and Fortune Bay (FB) (Fig.1).

Historically, assessments of these stocks have been reviewed annually at the May meeting of the Pelagic Committee, formally a subcommittee of CAFSAC. In recent years, biomass estimates from acoustic surveys have formed the basis of the assessments for these stocks (Wheeler et al. 1991, 1992).

Biomass estimates from the 1988, 1990, and 1992 acoustic surveys were derived using a target strength - fish length relationship calculated from experiments conducted in Newfoundland coastal waters (Wheeler 1991). This relationship was substantially different from that of Foote (1987), which was recommended for use by CAFSAC (O'Boyle and Atkinson 1989).

In 1992, a standard target technique was developed (G. Rose, pers. comm.) to calibrate the dual beam processor presently used for cod and herring acoustic research in the Newfoundland region. This technique, which allows the user to calibrate the acoustic system in situ, replaced the previously used hydrophone calibration method.

In preparing for the May 1993 assessment of Newfoundland herring stocks, a detailed reanalysis of all target strength experiments was conducted applying this standard target calibration technique. The results of this analysis indicated that there were changes in some calibration parameters based upon the new calibration technique which, in turn, resulted in changes to calculated herring target strengths. Herring target strengths from the experiments were still larger than those of Foote (1987) but the difference was not as great as in the original analysis. Rather than try to quantify these differences, it was decided to conduct a further series of target strength experiments during the spring of 1993 using the standard target procedure to calibrate the acoustic system. As the results of these experiments would be critical to the calculation of biomass estimates from the acoustic surveys, the assessment of Newfoundland herring stocks was deferred at the May 1993 Pelagic Committee meeting.

This Research Document includes information and analyses which were presented and reviewed at the February 1994 Pelagic Committee meeting. Resource status and future prospects were determined from the following data sources: information from the 1992 and 1993 commercial fisheries, 1992 commercial catch at age data, age distributions and catch rates at age from the 1992 research gillnet program, results from the 1993 target strength experiments, results from the 1992 and 1993 acoustic surveys, and the recalculation of acoustic biomass estimates from 1988 to 1993 using the 1993 target strength - fish length relationship. A complete analysis of data from 1993 was not possible as all commercial and research biological samples were not yet processed and consequently 1993 commercial catch at age and research gillnet catch rate at age data were not available for inclusion in this report.

Description of the 1992 and 1993 Commercial Fisheries and Management Plans

Herring landings from east and southeast Newfoundland herring stocks peaked at 31000 t in 1979. The increased landings through the late 1970's coincided both with the recruitment of the very strong 1968 year-class and with increased markets due to the collapse of the North Sea herring stocks. Commercial fisheries were closed, or reduced to bait fisheries only, during the early 1980's due to a decline in abundance caused by poor recruitment subsequent to the 1968 year-class. Stock sizes increased through the 1980's with the recruitment of the moderately sized 1982 year-class and the somewhat smaller 1987 year-class. Landings over the last five years have been controlled by markets; TAC's have not been a limiting factor.

Total landings in 1992 (Table 1, Fig. 2) were approximately 11300 t, a decrease of 7800 t from 1991. There were a number of factors which accounted for this decrease. There was a reduction in effort during the fall purse seine fishery in the two northern stock areas where 85% of the catch is taken. The fishery during the fall of 1991 was subsidized by a joint federal - provincial program. This subsidy was not paid in 1992. The combination of no subsidy, the low price for herring (3.5 to 5.0 cents per pound) and the northern cod compensation program, kept many fishermen from fishing during the fall of 1992. Those fishermen that did fish for pelagics targeted their effort towards localized concentrations of mackerel which were worth 2.5 times that of herring.

Landings in 1993 (Table 1, Fig. 2), as derived from provisional purchase slip data, were approximately 5400 t. This estimate will likely increase when all purchase slip data are tabulated. Similar to recent years, most fish were landed in White Bay - Notre Dame Bay and Bonavista Bay - Trinity Bay during the fall purse seine fishery (Tables 2 and 3). There was also a limited winter purse seine fishery in St. Mary's Bay - Placentia Bay (Table 5). The fisheries in the remaining two areas, Conception Bay - Southern Shore and Fortune Bay were negligible (<300 t) and were spring gillnet fisheries for bait only (Tables 4 and 6). There was little effort exerted in the fall purse seine fishery in the two northern areas due to the low price of herring. In White Bay - Notre Dame Bay, the purse seine fleet directed their efforts towards mackerel because of its higher value. Herring were taken when fish of the required market size were encountered. This was confounded by the presence of numerous concentrations of small fish, primarily 1991 year-class. Similarly, in Bonavista Bay - Trinity Bay, there were continuous comments by fishermen during the fall fishery of concentrations of small herring. The market requirements in both areas were for large herring, greater than 300 g (age 9+); the combination of the presence of small fish and low prices reduced the fishing effort in Bonavista Bay - Trinity Bay.

The herring management plan within the Newfoundland Region has remained essentially unchanged for the past several years. The 1992 and 1993 plans, with an allowance (t) to fixed gear (gillnets and traps), and allocations (t) to bar seines and purse seines within each stock area were as follows:

Stock Area	Fixed Gear	Bar Seine	Purse Seine	Reserve	TAC
White Bay Notre Dame Bay	2000	500 500	4000 4000	2500	13500
Bonavista Bay Trinity Bay	2000	1000 1000	2000 2000	2000	10000
Conception Bay Southern Shore	200	100	600 100	500	1500
St. Mary's Bay Placentia Bay	200	100	500 500	200	1500
Fortune Bay	500	500	0	500	1500
Labrador Coast	500	200	0	0	700
South Coast Nfld.	500	100	0	0	600

The only changes from the 1991 plan were increases to the purse seine allocations in Conception Bay - Southern Shore and St. Mary's Bay - Placentia Bay, with concurrent decreases to the fixed gear allowances in these areas. TAC's were not changed in any area.

Assessment Data Sources

Biological Sampling

There were 13,136 herring sampled in 1992 (Table 7) a decrease of 17% from 1991. This decrease was due to the reduction of the research gillnet program in 1992 to the spring season only. When apportioned by stock area, month, and gear type (Table 8), samples were available for 91% of the commercial catch. Samples were collected randomly; all fish sampled were measured and aged. The processing of biological samples from 1993 was not completed in time for inclusion in this report.

Mean weights at age for 1992 (Table 9) were derived from commercial and research samples of spring spawning herring collected from January to June. Mean weights at age have declined in most areas within the past three years.

1992 Commercial Fishery Catch at Age

As in 1991, the 1987 year-class continued to dominate (>40%) the fishery (by number) in the two northern areas, White Bay - Notre Dame Bay and Bonavista Bay - Trinity Bay, where 85% of the total catch was taken (Tables 10 and 11, Fig. 3). There was no evidence of recruitment of subsequent year-classes to the fishery in either of these two areas. The 1990 year-class, which accounted for approximately 10% of the catch in White Bay - Notre Dame Bay in 1991, accounted for less than 2% of the catch in 1992. Older fish, aged 10+, continued to account for a substantial part (~40%) of the catch in White Bay - Notre Dame Bay. These fish were not as evident (<15%) in the catch in Bonavista Bay - Trinity Bay.

In St. Mary's Bay - Placentia Bay (Table 13, Fig. 4), the only other area with a fishery of any consequence (900 t), fish aged 11+ accounted for 49% of the catch (by number). The 1982, 1986, and 1987 year-classes each accounted for 10-15% of the catch. A similar age distribution was observed in the 1991 fishery.

Research Gillnet Program

Program Description

The research gillnet program was initiated in the Newfoundland Region in the early 1980's to derive an abundance index for herring independent of the commercial fishery. Commercial fishermen in each of the five stock areas are provided with a fleet of five standardized gillnets, mesh sizes 2"-3". They are contracted to fish these nets for a period of one month each year, to maintain an accurate daily record of their catches, and to collect samples of their catch at specified intervals. In some areas, research gillnet data are also available from the 1970's when nets were set by research technicians from Science Branch.

In 1992 and 1993, the program was restricted to the spring season only. A fall program, conducted annually in the three northern stock areas from 1980 to 1991, was eliminated due to a reduction in operating budget. The spring program has been conducted annually in the two southern areas since 1982 and in the three northern areas since 1985. In 1992 and 1993, 25 fishermen participated in the spring program. There were no changes to the database from the most recent assessment (Wheeler et al. 1992).

Age distributions (Figs. 5 and 6) and catch rates at age (Tables 15-19) were available from all stock areas for 1992. In addition, 1993 data were available from Bonavista Bay - Trinity Bay ; biological samples from other areas were not processed in time for inclusion in this report.

Research Gillnet Catch at Age

Age distributions, by number, from 1992 (and 1993 in Bonavista Bay - Trinity Bay) showed the continued dominance of the 1987 year-class in the two northern stock areas (Fig. 5). There was a greater percentage of older fish in the three southern areas (Fig. 6) where fish aged 11+ represented >25% of the catch, perhaps indicating a lower level of exploitation of

these stocks. There was no evidence of the 1988 or 1989 year-classes in the catch in any of the areas. More recent year-classes would not be recruited to the research gillnets as herring are first recruited to these nets at age 3.

Research Gillnet Catch Rates at Age

Catch rates decreased from 1991 to 1992 in four of the five stock areas (Tables 15-19). Similarly, there has been a declining trend in catch rates in most areas since the late 1980's. However, catch rates in White Bay - Notre Dame Bay (Table 15) and Fortune Bay (Table 19) are still much larger relative to other areas. There is evidence in all areas from catch rates at ages 4 and 5, that the 1987 year-class is much smaller (10% - 50%) than the 1982 year-class. For two areas from which there are research gillnet catch rates from the early 1970's (Tables 16 and 18), there is some evidence that the 1982 year-class is also much smaller than the very large 1968 year-class.

Target Strength Experiments

Purpose of Experiments

The target strength, or echo intensity, of individual fish must be known to quantify the results of acoustic biomass estimation surveys. Although it is best to quantify acoustic survey estimates with in situ target strength measurements ie. measurements from fish in their natural environment during the survey , this is very difficult with herring due to their dense schooling behavior.

From 1988 to 1992, the results of east and southeast Newfoundland herring acoustic surveys were quantified using a target strength - fish length relationship calculated from experiments conducted in coastal Newfoundland waters (Wheeler 1991). A detailed reanalysis of these experimental data during the winter of 1993 indicated that there had been errors in the hydroacoustic system calibration. As it was impossible to quantify these errors, it was decided to conduct a detailed series of experiments in 1993 to measure the target strengths of a broad length range of live herring and to derive a target strength - fish length relationship to quantify the results of all east and southeast Newfoundland herring acoustic surveys.

Experimental Method

The experiments were conducted over a six week period in May, June and September within a net enclosure in Holyrood, Conception Bay (Fig. 1). The net enclosure, measuring 6 m by 6 m by 11 m deep (mesh size 19 mm), was deployed from a floating platform moored in 14 m of water. Live herring were obtained from a trap and gillnets set adjacent to the experimental site. Only herring in good condition, based upon visual examination, were used in the experiments.

For each experiment, herring within a specific length range were released into the net

enclosure. An acclimation period of 20 to 24 hours was given prior to measuring fish target strengths. All target strength measurements were made during daylight hours (1030 h - 1200 h). The dual beam processor was calibrated using a standard sphere immediately prior to and after each experiment. The criteria for selection of single fish targets (Table 20) were the same for all groups of fish measured. These criteria were chosen to be as restrictive as possible to eliminate multiple targets from the analysis.

Results of Experiments

The mean target strengths of ten different groups of herring were measured (Table 21). Each group consisted of from 3 to 100 fish. The range of fish lengths within each of these groups was minimized (2 - 4 cm) although there was some overlap between groups (Fig. 7). The length range of herring acoustically measured (15 - 38 cm) included fish of ages 2 to 11+.

The resulting target strength - fish length relationship from the series of experiments (Fig. 8) was: $TS = 20 \log L - 65.5$ ($r^2=0.76$).

There are concerns regarding the applicability of an experimentally derived target strength - fish length relationship to survey results; however, it was decided that, to date, this relationship, derived from the 1993 Holyrood experiments, was the best available to apply to all east and southeast Newfoundland herring acoustic surveys until such time that in situ measurements can be used.

Acoustic Surveys

Survey Design

Results were available from 1992 acoustic surveys of White Bay - Notre Dame Bay and Bonavista Bay - Trinity Bay and 1993 surveys of Conception Bay - Southern Shore and Bonavista Bay - Trinity Bay.

Survey design was unchanged from previous surveys (Wheeler 1990, 1991, 1992). The 1992 surveys and 1993 survey of Conception Bay - Southern Shore were conducted from the *R.V. Shamook*, equipped with an Engells 400 midwater trawl for biological sampling. As there were problems sampling herring with this gear during these surveys, the 1993 survey of Bonavista Bay - Trinity Bay was conducted from the *R.V. Marinus*, equipped with a capelin purse seine (100 fathoms by 15 fathoms) for biological sampling. The capelin seine was used rather than a larger mesh herring seine to avoid meshing small herring (1991 and 1992 year-classes) during the survey.

Biological Sampling

Biological sampling was adequate in the 1992 survey of White Bay - Notre Dame Bay (Table 22) to calculate a biomass estimate. Herring were caught in three midwater trawl sets

and were also available from six commercial purse seine sets taken from the area at the time of the survey. Samples were obtained from six of eleven strata where herring were detected and which accounted for 92% of the biomass estimate.

During the 1992 Bonavista Bay - Trinity Bay acoustic survey, herring concentrations were detected acoustically throughout the area. However, no biological samples were obtained as herring schools were small in size and fast-moving and were able to avoid capture by the midwater trawl. There was also no commercial fishery in the area at the time of the survey from which to obtain samples. Consequently, there was no biomass estimate calculated from this survey.

No herring were detected during the 1993 acoustic survey of Conception Bay - Southern Shore. This survey was conducted in January to measure overwintering herring concentrations. It is possible that there were either no overwintering fish or, due to the small population size, that they were not detected by the acoustic system.

For the 1993 survey of Bonavista Bay - Trinity Bay, a combination of research samples (caught by purse seine during the survey) and samples from the commercial purse seine fishery at the time of the survey were available. These samples were obtained from five of the eleven strata where herring were detected and accounted for 57% of the biomass estimate (Table 22).

Hydroacoustic System Calibration

The echo integrator and transducers used during the 1992 and 1993 acoustic surveys were calibrated by BioSonics Inc. in March, 1992 (Table 23). In addition, the dual beam processor, used to calculate in situ target strengths, was calibrated with a standard sphere on several occasions during each survey. To avoid any potential problems caused by differences in water and air temperatures, the transducer was left in the water throughout the entire survey, except during vessel berthing operations.

Acoustic Survey Results

Integrated density estimates were calculated for the 443 transects surveyed throughout White Bay - Notre Dame Bay in 1992 (Table 24) and for the 189 transects surveyed in Bonavista Bay - Trinity Bay in 1993 (Table 25). Formulas used to calculate mean densities, variances, and biomass estimates remain unchanged from previous surveys and are given in Wheeler (1991).

In White Bay - Notre Dame Bay, by number (Fig. 9a), the 1992 year-class was dominant, occurring along twelve transects on the eastern side of White Bay (stratum 5) and accounting for 87% of the population estimate. However, 79% of the biomass was detected in Hamilton Sound (stratum 24) where a mixture of but primarily 1987 year-class (Fig. 9b), were found along a single transect. Herring aged 6+ accounted for 33% of the biomass estimate.

In Bonavista Bay - Trinity Bay, population numbers at age (Fig. 10a) and biomass at age

(Fig. 10b) showed similar trends with the 1991 year-class accounting for 80% of population numbers and 61% of population weight. Detected biomass was spread between two areas in Bonavista Bay (strata 27 and 29) and two areas in Trinity Bay (strata 40 and 41). Herring aged 6+ accounted for only 22% of the biomass estimate.

Mean biomass (t), population numbers ($x10^6$), and acoustic backscatter (m^2/s.r.) by stock area from the 1988, 1990, 1992 and 1993 acoustic surveys are summarized in the following text table. The target strength - fish length relationship from the 1993 Holyrood experiments was used to calculate biomass estimates for each of these surveys:

Stock Area	Year	Biomass (t)	Population Nos. ($x10^6$)	Acoustic Backscatter
WB-NDB	1988	22700	98	21100
	1990	-	-	15400
	1992	113500	3,668	151100
BB-TB	1988	30800	117	32600
	1990	54000	258	62000
	1992	-	-	40800
	1993	24400	246	37500
CB-SS	1988	1400	7	1700
	1993	0	0	0
SMB-PB	1990	39800	134	40200
	1992	12000	56	12800
FB	1990	15200	59	16400
	1992	18600	58	19000

Status of Stocks

East and southeast Newfoundland herring stocks rebuilt through the 1980's with the recruitment of the moderately sized 1982 year-class and have been maintained by the recruitment of the smaller 1987 year-class. However, comparison of research gillnet catch rates at age from the early 1970's and mid 1980's suggest that stocks did not increase to the

levels observed during the 1970's. There are good indications of small herring (1991 and 1992 year-classes) in most areas, but sizes of these year-classes cannot yet be quantified.

The most recent acoustic biomass estimate of the White Bay - Notre Dame Bay stock in 1992 indicated a mature biomass (ages 5+) of approximately 100000 t. Research gillnet catch rates increased consistently from 1988 to 1991 and remained at a high level in 1992. In recent years, the fall purse seine fishery in the area has been targeting mackerel rather than herring. In the short-term, catches in the order of recently recommended catch levels are not expected to exert excessive exploitation rates on the stock.

The mature biomass estimate for Bonavista Bay - Trinity Bay from the two most recent acoustic surveys was low, approximately 13000 t from the 1990 acoustic survey and approximately 6500 t from the 1993 survey. Research gillnet catch rates have fluctuated through the late 1980's, increasing with recruitment of the 1982 and 1987 year-classes but declining each of the past two years. The fall purse seine fleet in 1993 had difficulty targeting larger herring (>300 g) and were hampered by the presence of small herring (1991 year-class). Recent exploitation rates of mature herring may have been high and therefore caution should be exercised in setting catch levels for this stock.

There is limited information available for Conception Bay - Southern Shore. No herring were detected during the most recent acoustic survey. The only other acoustic estimate, from 1988, was 1400 t. Research gillnet catch rates have fluctuated in recent years but decreased by a factor of three between 1991 and 1992. Stock affinity is also not clear, especially during the fall when herring from adjacent stock areas frequent the area. Historically, this stock complex has been small. Caution should also be exercised in setting catch levels for this area.

The 1992 acoustic biomass estimate for St. Mary's Bay - Placentia Bay was 12000 t, 72% of which was mature fish. Research gillnet catch rates have declined since the late 1980's but remained stable between 1991 and 1992. This stock may be in gradual decline but catches in the order of recently recommended catch levels are not expected to exert excessive exploitation rates.

The 1992 acoustic biomass estimate for Fortune Bay was 18600 t, 96% of which was mature fish. Although research gillnet catch rates have declined in recent years, they continue to remain at relatively high levels, compared to other stock areas. Catch levels from this stock over the past decade indicate that it is the least exploited of the Newfoundland stocks. Increasing exploitation to recently recommended catch levels is not expected to exert excessive exploitation rates on this stock.

Outlook for the Future and Management Implications

The outlook for the future will depend upon the recruitment of the 1991 and 1992 year-classes. The importance of the 1982 year-class has declined as it has passed through the population in most areas. The 1987 year-class, estimated to be much smaller than the 1982 year-class, will have to sustain the fisheries until at least 1996 or 1997 when the 1991 and 1992 year-classes are recruited.

Market requirements must also be considered in the outlook for the future. In recent years, the fall purse seine fishery in the two northern areas has been targeting larger fish (>300 g). Most of the mature fish in these areas are now of the 1987 year-class. In 1994, these fish will range from 275 - 300 g and may or may not meet market requirements. Based upon acoustic survey estimates, herring greater than 300 g (ages 9+) will account for approximately 30% of the biomass in White Bay - Notre Dame Bay and less than 5% in Bonavista Bay - Trinity Bay. Targeting older fish will be further confounded by the presence of the 1991 and 1992 yearclasses. Unless market requirements change, this problem will continue for the foreseeable future in the northern areas. In the two southern areas, St. Mary's Bay - Placentia Bay and Fortune Bay, this problem should not be as acute as research gillnet and acoustic survey data indicate a greater proportion of older herring in these stocks.

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Table 1. Landings and TAC's ('000 t) of east and southeast Newfoundland herring, by stock area.

	WB-NDB		BB-TB		CB-SS		SMB-PB		FB	
Year	Catch	TAC	Catch	TAC	Catch	TAC	Catch	TAC	Catch	TAC
1974	4.0	-	2.3	-	2.7	-	6.5	-	2.3	-
1975	5.6	-	5.9	-	3.5	-	6.7	-	0.9	-
1976	12.5	-	9.9	-	2.5	-	4.1	-	0.5	-
1977	11.6	10.0	12.0	9.5	2.2	2.1	3.3	3.3	0.6	3.4
1978	13.4	7.9	8.0	7.8	1.9	1.8	3.5	4.0	1.0	1.0
1979	15.7	11.5	9.8	8.4	0.9	0.9	3.6	3.4	1.2	1.0
1980	6.5	5.3	5.4	4.4	0.5	0.4	2.5	2.5	0.5	1.0
1981	4.7	5.3	4.0	4.8	0.2	0.5	0.6	1.2	0.1	0.2
1982	2.0	1.2	0.5	0.7	0.1	0.2	0.1	0.0	0.1	0.0
1983	0.4	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0
1984	1.5	1.5	0.2	0.4	0.1	0.1	0.1	0.0	0.1	0.0
1985	1.8	2.0	0.6	0.8	0.1	0.2	0.1	0.6	0.1	0.3
1986	2.8	5.5	1.8	3.8	0.2	0.6	0.1	2.1	0.1	0.7
1987	13.5	32.5	6.1	13.7	1.0	3.5	0.3	2.5	0.1	2.4
1988	7.4	34.7	11.7	16.2	0.3	0.6	1.1	8.9	0.1	4.7
1989	6.4	14.0	4.9	6.9	1.2	1.5	0.4	1.5	0.1	1.5
1990	5.1	16.5	3.7	23.4	0.3	1.5	0.5	1.5	0.1	1.5
1991	8.5	13.5	9.1	10.0	0.4	1.5	1.0	1.5	0.1	1.5
1992	5.6	13.5	4.6	10.0	0.1	1.5	0.9	1.5	0.1	1.5
1993	1.7	13.5	2.3	10.0	0.1	1.5	1.1	1.5	0.2	1.5

Table 2. White Bay (WB) - Notre Dame Bay (NDB) herring landings and TAC's (t), by gear, 1977-93.

		Gear							
Year	Area	Purse Seine	Ringnet	Midwater Trawl	Bar Seine	Gillnet	Trap	Total	TAC
1977	WB	-	1228	-	39	268	240	1775	
	NDB	-	4961	-	2096	2438	355	9850	
	Combined	-	6189	-	2135	2706	595	11625	10000
1978	WB	-	1254	-	240	1133	331	2958	
	NDB	-	3980	-	306	5859	311	10456	
	Combined	-	5234	-	546	6992	642	13414	7900
1979	WB	-	832	-	9	978	64	1883	
	NDB	-	1968	-	2274	8971	598	13811	
	Combined	-	2800	-	2283	9949	662	15694	11500
1980	WB	-	747	-	-	1269	83	2099	
	NDB	-	913	-	727	2778	13	4431	
	Combined	-	1660	-	727	4047	96	6530	5300
1981	WB	-	220	-	14	646	23	903	
	NDB	-	1065	-	400	2209	107	3781	
	Combined	-	1285	-	414	2855	130	4684	5300
1982	WB	-	-	-	7	402	52	461	
	NDB	-	-	-	136	1425	1	1562	
	Combined	-	-	-	143	1827	53	2023	1200
1983	WB	-	15	-	-	76	7	98	
	NDB	-	-	-	-	329	-	329	
	Combined	-	15	-	-	406	7	427	0
1984	WB	-	-	-	4	342	4	350	
	NDB	-	-	-	3	1115	-	1118	
	Combined	-	-	-	7	1457	4	1468	1500
1985	WB	-	-	-	2	564	-	566	
	NDB	1	-	-	9	1248	-	1258	
	Combined	1	-	-	11	1812	-	1824	2000
1986	WB	112	-	-	1	196	7	316	
	NDB	1152	-	-	86	1119	83	2440	
	Combined	1264	-	-	87	1315	90	2756	5500
1987	WB	4283	-	-	37	396	-	4716	
	NDB	6570	-	-	530	1030	650	8780	
	Combined	10853	-	-	567	1426	650	13496	32500
1988	WB	1822	-	-	20	65	-	1907	
	NDB	4410	-	-	284	704	113	5511	
	Combined	6232	-	-	304	769	113	7418	34700
1989	WB	672	-	-	-	113	10	795	
	NDB	4372	-	-	45	976	206	5599	
	Combined	5044	-	-	45	1089	216	6394	14000
1990	WB	108	-	-	1	90	21	220	
	NDB	3398	-	-	30	1289	151	4868	
	Combined	3506	-	-	31	1379	172	5088	16500
1991*	WB	1318	-	-	2	311	23	1654	
	NDB	5805	-	-	80	946	41	6872	
	Combined	7123	-	-	82	1257	64	8526	13500
1992*	WB	1252	-	-	-	252	4	1508	
	NDB	2964	-	-	6	1102	48	4120	
	Combined	4216	-	-	6	1354	52	5628	13500
1993*	WB	121	-	-	-	34	-	155	
	NDB	686	-	-	104	739	2	1531	
	Combined	807	-	-	104	773	-	1686	13500

* provisional

Table 3. Bonavista Bay (BB) - Trinity Bay (TB) herring landings and TAC's (t), by gear, 1977-93.

		Gear							
Year	Area	Purse Seine	Ringnet	Midwater Trawl	Bar Seine	Gillnet	Trap	Total	TAC
1977	BB	-	6223	236	2495	309	-	9263	
	TB	-	1548	-	927	174	45	2694	
	Combined	-	7771	236	3422	483	45	11957	9500
1978	BB	-	4239	-	150	1320	3	5712	
	TB	-	1055	-	966	308	8	2337	
	Combined	-	5294	-	1116	1628	11	8049	7800
1979	BB	-	3490	-	377	2374	4	6245	
	TB	-	1181	-	1615	680	55	3531	
	Combined	-	4671	-	1992	3054	59	9776	8400
1980	BB	-	1714	-	652	1321	-	3687	
	TB	-	964	-	405	336	13	1718	
	Combined	-	2678	-	1057	1657	13	5405	4400
1981	BB	-	1100	-	713	1399	7	3219	
	TB	-	78	-	361	367	19	825	
	Combined	-	1178	-	1074	1766	26	4044	4800
1982	BB	-	-	-	-	386	4	390	
	TB	-	-	-	25	76	6	107	
	Combined	-	-	-	25	462	10	497	700
1983	BB	-	-	-	-	52	-	52	
	TB	-	-	-	27	17	-	44	
	Combined	-	-	-	27	69	-	96	0
1984	BB	-	-	-	-	135	-	135	
	TB	-	-	-	-	41	-	41	
	Combined	-	-	-	-	176	-	176	400
1985	BB	-	-	-	4	290	2	296	
	TB	-	-	-	2	312	6	320	
	Combined	-	-	-	6	602	8	616	800
1986	BB	767	-	-	7	362	5	1141	
	TB	356	-	-	30	233	5	624	
	Combined	1123	-	-	37	595	10	1765	3800
1987	BB	4762	-	-	72	218	-	5052	
	TB	838	-	-	15	175	1	1029	
	Combined	5600	-	-	87	393	1	6081	13700
1988	BB	7550	-	-	151	144	-	7845	
	TB	3410	-	-	317	93	82	3902	
	Combined	10960	-	-	468	237	82	11747	16200
1989	BB	1459	-	-	13	92	-	1564	
	TB	3149	-	-	141	65	6	3361	
	Combined	4608	-	-	154	139	6	4925	6900
1990	BB	904	-	-	2	126	7	1039	
	TB	1819	-	-	721	84	24	2648	
	Combined	2723	-	-	723	210	31	3687	23400
1991*	BB	4458	-	-	7	147	43	4655	
	TB	3760	-	-	567	85	-	4412	
	Combined	8218	-	-	574	232	43	9067	10000
1992*	BB	4209	-	-	3	197	2	4411	
	TB	51	-	-	63	44	-	158	
	Combined	4260	-	-	66	241	2	4569	10000
1993*	BB	2001	-	-	4	234	-	2239	
	TB	31	-	-	2	72	1	106	
	Combined	2032	-	-	6	306	1	2345	10000

* provisional

Table 4. Conception Bay (CB) - Southern Shore (SS) herring landings and TAC's (t), by gear, 1977-93.

		Gear							
Year	Area	Purse Seine	Ringnet	Midwater Trawl	Bar Seine	Gillnet	Trap	Total	TAC
1977	CB	-	1248	-	58	174	12	1492	
	SS	-	442	-	-	18	200	660	
	Combined	-	1690	-	58	192	212	2152	2100
1978	CB	-	1098	-	11	415	3	1527	
	SS	-	133	-	14	78	193	418	
	Combined	-	1231	-	25	493	196	1945	1800
1979	CB	-	432	-	-	210	63	705	
	SS	-	10	-	18	49	111	188	
	Combined	-	442	-	18	259	174	893	900
1980	CB	-	319	-	16	107	1	443	
	SS	-	-	-	-	2	32	34	
	Combined	-	319	-	16	109	33	477	400
1981	CB	-	-	-	-	160	2	162	
	SS	-	-	-	-	53	8	61	
	Combined	-	-	-	-	213	10	223	500
1982	CB	-	-	-	-	84	1	85	
	SS	-	-	-	-	7	5	12	
	Combined	-	-	-	-	91	6	97	200
1983	CB	-	-	-	-	17	-	17	
	SS	-	-	-	-	-	-	-	
	Combined	-	-	-	-	17	-	17	0
1984	CB	-	-	-	-	49	-	49	
	SS	-	-	-	-	-	-	-	
	Combined	-	-	-	-	49	-	49	100
1985	CB	-	-	-	-	81	-	81	
	SS	-	-	-	-	16	-	16	
	Combined	-	-	-	-	97	-	97	200
1986	CB	76	-	-	-	102	1	179	
	SS	-	-	-	1	23	1	25	
	Combined	76	-	-	1	125	2	204	600
1987	CB	580	-	-	187	185	10	962	
	SS	-	-	-	-	15	3	18	
	Combined	580	-	-	187	200	13	980	3500
1988	CB	197	-	-	1	36	1	235	
	SS	1	-	-	-	7	73	81	
	Combined	198	-	-	1	43	74	316	600
1989	CB	1167	-	-	-	69	-	1236	
	SS	-	-	-	-	9	1	10	
	Combined	1167	-	-	-	78	1	1246	1500
1990	CB	261	-	-	-	53	-	314	
	SS	-	-	-	-	12	-	12	
	Combined	261	-	-	-	65	-	326	1500
1991*	CB	382	-	-	-	18	-	400	
	SS	8	-	-	-	7	1	16	
	Combined	390	-	-	-	25	1	416	1500
1992*	CB	16	-	-	-	33	-	49	
	SS	-	-	-	-	4	-	4	
	Combined	16	-	-	-	37	-	53	1500
1993*	CB	10	-	-	-	23	-	33	
	SS	-	-	-	1	10	-	11	
	Combined	10	-	-	1	33	-	44	1500

* provisional

Table 5. St. Mary's Bay (SMB) - Placentia Bay (PB) herring landings and TAC's (t), by gear, 1977-93.

		Gear							
Year	Area	Purse Seine	Ringnet	Midwater Trawl	Bar Seine	Gillnet	Trap	Total	TAC
1977	SMB	-	1131	-	221	531	29	1912	
	PB	740	524	-	14	78	-	1356	
	Combined	740	1655	-	235	609	29	3268	3300
1978	SMB	-	1523	-	66	490	3	2082	
	PB	557	612	-	29	214	33	1445	
	Combined	557	2135	-	95	704	36	3527	4000
1979	SMB	-	1570	-	131	332	9	2042	
	PB	359	891	-	17	307	1	1575	
	Combined	359	2461	-	148	639	10	3617	3400
1980	SMB	-	645	-	16	352	12	1025	
	PB	182	892	-	9	339	30	1452	
	Combined	182	1537	-	25	691	42	2477	2500
1981	SMB	-	44	-	8	122	-	174	
	PB	-	311	-	-	149	1	461	
	Combined	-	355	-	8	271	1	635	1200
1982	SMB	-	-	-	-	10	-	10	
	PB	-	-	-	4	31	-	35	
	Combined	-	-	-	4	41	-	45	0
1983	SMB	-	-	-	-	13	-	13	
	PB	-	-	-	-	27	-	27	
	Combined	-	-	-	-	40	-	40	0
1984	SMB	-	-	-	-	11	-	11	
	PB	-	-	-	1	95	-	96	
	Combined	-	-	-	1	106	-	107	0
1985	SMB	-	-	-	1	31	-	32	
	PB	3	-	-	-	113	-	116	
	Combined	3	-	-	1	144	-	148	600
1986	SMB	4	-	-	-	17	-	21	
	PB	-	-	-	2	107	-	109	
	Combined	4	-	-	2	124	-	130	2100
1987	SMB	33	-	-	5	47	5	90	
	PB	-	-	-	1	161	-	162	
	Combined	33	-	-	6	208	5	252	2500
1988	SMB	-	-	-	-	25	-	25	
	PB	887	-	-	12	176	-	1075	
	Combined	887	-	-	12	201	-	1100	8900
1989	SMB	-	-	-	-	8	-	8	
	PB	263	-	-	1	131	2	397	
	Combined	263	-	-	1	139	2	405	1500
1990	SMB	-	-	-	-	18	-	18	
	PB	379	-	-	-	144	-	523	
	Combined	379	-	-	-	162	-	541	1500
1991*	SMB	-	-	-	-	16	-	16	
	PB	742	-	-	110	104	34	990	
	Combined	742	-	-	110	120	34	1006	1500
1992*	SMB	-	-	-	-	2	-	2	
	PB	781	-	-	2	125	-	908	
	Combined	781	-	-	2	127	-	910	1500
1993*	SMB	262	-	-	-	3	-	265	
	PB	667	-	-	84	119	-	870	
	Combined	929	-	-	84	122	-	1135	1500

* provisional

Table 6. Fortune Bay (FB) herring landings and TAC's (t), by gear, 1977-93.

Year	Gear						Total	TAC
	Purse Seine	Ringnet	Midwater Trawl	Bar Seine	Gillnet	Trap		
1977	188	-	-	364	22	5	579	3400
1978	104	-	-	854	41	-	999	1000
1979	285	-		-829	81	-	1195	1000
1980	97	-	-	265	89	-	451	1000
1981	-	-	-	30	37	-	67	200
1982	-	-	-	-	20	2	22	0
1983	-	-	-	-	15	-	15	0
1984	-	-	-	-	21	-	21	0
1985	-	-	-	-	52	-	52	300
1986	1	-	-	1	92	-	94	700
1987	-	-	-	2	144	-	146	2400
1988	-	-	-	-	89	-	89	4700
1989	-	-	-	3	104	2	109	1500
1990	-	-	-	-	92	-	92	1500
1991*	-	-	-	-	123	-	123	1500
1992*	-	-	-	-	130	-	130	1500
1993*	-	-	-	-	175	-	175	1500

* provisional

Table 7. Number of fish sampled from the Newfoundland herring fishery, by area and gear, 1988-92 (research samples in parenthesis).

Year	Area	Gear Type: Trap		Bar Seine		Gillnet	Purse Seine		Midw. Trawl		Total Sampled	Comm. Catch (t)
1988	WB	-	-	-	-	50 (1229)	200	-	-	-	250 (1229)	1907
	NDB	46	-	-	-	349 (1817)	300	(600)	-	-	695 (2417)	5511
	BB	-	-	-	-	297 (2320)	400	-	-	-	697 (2320)	7845
	TB	100	-	100	-	200 (1100)	300	-	-	-	700 (1100)	3902
	CB	50	-	-	-	178 (1213)	141	-	-	-	369 (1213)	235
	SS	94	-	-	-	- (377)	-	-	-	-	94 (377)	81
	SMB	-	-	-	-	98 (731)	48	-	-	-	146 (731)	25
	PB	-	-	-	-	134 (846)	136	-	-	-	270 (846)	1075
	FB	-	-	-	-	194 (1246)	-	-	-	-	194 (1246)	89
	Total	290	-	100	-	1500(10879)	1525	(600)	-	-	3415(11479)	20670
1989	WB	-	-	-	-	133 (1742)	100	-	-	-	233 (1742)	795
	NDB	50	-	-	-	196 (2562)	300	-	-	-	546 (2562)	5599
	BB	-	-	-	-	148 (1995)	150	-	-	-	298 (1995)	1564
	TB	100	(100)	50	-	200 (1817)	200	(100)	-	-	550 (2017)	3361
	CB	-	-	-	-	204 (1044)	150	-	-	-	354 (1044)	1236
	SS	-	-	-	-	99 (342)	-	-	-	-	99 (342)	10
	SMB	-	-	-	-	100 (687)	-	-	-	-	100 (687)	8
	PB	-	-	-	-	100 (794)	200	-	-	-	300 (794)	397
	FB	-	-	-	-	237 (1226)	-	-	-	-	237 (1226)	109
	Total	150	(100)	50	-	1417(12209)	1100	(100)	-	-	2717(12409)	13079
1990	WB	-	-	-	-	127 (1355)	50	(200)	-	(79)	177 (1634)	220
	NDB	-	-	50	-	250 (1889)	350	(200)	-	(224)	659 (2313)	4868
	BB	-	-	-	-	100 (1277)	400	(100)	-	(50)	500 (1427)	1039
	TB	-	-	100	(568)	150 (1610)	200	(36)	-	(6)	450 (2220)	2648
	CB	-	-	-	-	44 (1223)	99	-	-	-	143 (1223)	314
	SS	-	-	-	-	37 (192)	-	-	-	-	37 (192)	12
	SMB	-	-	-	-	50 (747)	-	-	-	-	50 (747)	18
	PB	-	-	-	-	87 (698)	171	(71)	200	-	258 (969)	523
	FB	-	-	-	-	90 (1283)	-	(200)	149	-	90 (1632)	92
	Total	-	-	150	(568)	935(10274)	1270	(807)	349	(359)	2364(12357)	9734
1991[a]	WB	-	(50)	-	-	100 (1853)	150	-	-	-	250 (1903)	1654
	NDB	-	-	-	-	200 (2084)	350	-	-	-	550 (2084)	6872
	BB	100	-	-	-	100 (2264)	400	-	-	(10)[b]	600 (2274)	4655
	TB	-	-	150	-	150 (2533)	417	-	-	-	717 (2533)	4412
	CB	-	(50)	-	-	98 (1454)	100	-	-	-	198 (1504)	400
	SS	48	-	-	-	- (190)	-	-	-	-	48 (190)	16
	SMB	-	-	-	-	50 (724)	-	-	-	-	50 (724)	16
	PB	-	-	-	-	139 (448)	191	-	-	-	330 (448)	990
	FB	-	-	-	-	162 (1233)	-	-	-	-	162 (1233)	123
	Total	148	(100)	150	-	999(12783)	1608	-	-	(10)	2905(12893)	19138
1992[a]	WB	-	(412)	-	-	94 (697)	250	(50)	-	(200)	344 (1359)	1508
	NDB	-	(551)	-	-	150 (1597)	600	-	-	(34)[c]	750 (2182)	4120
	BB	-	-	-	-	50 (1147)	288	(100)	-	(30)[d]	288 (1277)	4411
	TB	-	(368)	100	-	86 (1427)	-	-	-	(150)[e]	186 (1945)	158
	CB	-	(516)	-	-	150 (750)	72	(100)	-	-	222 (1366)	49
	SS	-	-	-	-	- (107)	-	-	-	-	- (107)	4
	SMB	-	-	-	-	50 (515)	-	-	-	(2)[f]	50 (517)	2
	PB	-	-	50	-	45 (727)	192	(100)	-	-	287 (827)	908
	FB	-	-	-	-	135 (1244)	-	-	-	-	135 (1244)	130
	Total	-	(1847)	150	-	760 (8211)	1402	(350)	-	(416)	2312(10824)	11290

a 1991-92 catches are provisional
b handline
c includes 30 hooked lines
d includes 2 hooked lines
e includes 150 dipnet
f otter trawl

Table 8. Commercial catch (t) and sampling (number of fish) for 1992, by stock area, month, and gear type.

		WB-NDB		BB-TB		CB-SS		SMB-PB		FB	
Month	Gear	Catch	Number Sampled	Catch	Number Sampled	Catch	Number Sampled	Catch	Number Sampled	Catch	Number Sampled
Jan.	Gillnet	-	-	-	-	-	-	1	-	2	50
	Purse Seine	-	-	-	-	-	-	31	-	-	-
Feb.	Gillnet	-	-	-	-	-	-	-	-	1	-
	Purse Seine	-	-	-	-	-	-	288	146	-	-
March	Gillnet	2	-	-	-	-	-	2	-	2	-
Apr.	Gillnet	7	-	31	-	7	50	40	45	21	-
	Purse Seine	-	-	784	50	-	-	456	46	-	-
	Bar Seine	-	-	44	50	-	-	-	-	-	-
May	Gillnet	496	50	138	100	8	50	52	50	70	20
	Purse Seine	-	-	595	40	16	29	6	-	-	-
	Bar Seine	-	-	10	50	-	-	-	50	-	-
June	Gillnet	616	94	41	-	9	-	20	-	29	20
	Purse Seine	-	-	47	-	-	-	1	-	-	-
	Bar Seine	6	-	11	-	-	-	2	-	-	-
July	Gillnet	74	-	8	-	2	-	1	-	1	-
	Purse Seine	8	-	-	-	-	-	-	-	-	-
	Trap	4	-	-	-	-	-	-	-	-	-
	Bar Seine	-	-	2	-	-	-	-	-	-	-
Aug.	Gillnet	-	-	-	-	-	-	1	-	1	45
Sept.	Gillnet	14	-	3	-	1	50	-	-	1	-
	Purse Seine	790	50	11	43	-	-	-	-	-	-
Oct.	Gillnet	72	50	7	36	-	-	3	-	-	-
	Purse Seine	2621	200	345	48	40	-	-	-	-	-
Nov.	Gillnet	67	50	10	-	8	-	6	-	2	-
	Purse Seine	797	550	2478	100	-	-	-	-	-	-
	Trap	36	-	2	-	-	-	-	-	-	-
Dec.	Gillnet	5	-	4	-	1	-	1	-	2	-
	Purse Seine	-	50	-	-	-	-	-	-	-	-
	Trap	12	-	-	-	-	-	-	-	-	-
Comb.	Gillnet	1353	244	242	136	36	150	128	95	132	135
	Purse Seine	4216	850	4260	281	56	29	782	192	-	-
	Bar Seine	6	-	67	100	-	-	-	50	-	-
	Trap	52	-	2	-	-	-	2	-	-	-
Total		5627	1094	4571	517	92	179	912	337	132	135

Table 9. Mean weights at age (g) of spring-spawning herring, by stock area, from samples collected January to June, 1987 - 1992. Sample sizes in parenthesis.

Stock Area	Age	1987		1988		1989		1990		1991		1992	
WB-NDB	0	-	-	-	-	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	81	(5)	-	-	-	-	-	-	-	-
	3	-	-	148	(40)	124	(65)	122	(293)	122	(16)	122	(1)
	4	207	(24)	214	(22)	195	(198)	179	(152)	172	(665)	164	(52)
	5	233	(236)	235	(207)	227	(54)	234	(158)	212	(77)	199	(1108)
	6	269	(31)	256	(207)	249	(579)	259	(72)	247	(44)	229	(81)
	7	293	(15)	295	(42)	273	(915)	279	(475)	278	(29)	261	(45)
	8	318	(32)	316	(57)	296	(52)	296	(696)	287	(214)	277	(40)
	9	349	(4)	323	(102)	311	(71)	329	(43)	312	(405)	296	(142)
	10	330	(2)	333	(12)	332	(121)	336	(126)	331	(37)	322	(405)
	11+	399	(69)	414	(217)	412	(364)	418	(333)	393	(236)	373	(375)
BB-TB	0	-	-	-	-	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-	-	-	-	-
	2	69	(53)	83	(5)	82	(17)	70	(8)	-	-	-	-
	3	136	(10)	129	(207)	147	(94)	144	(227)	132	(15)	133	(16)
	4	205	(28)	196	(17)	212	(429)	219	(138)	202	(670)	174	(20)
	5	222	(655)	233	(91)	248	(27)	262	(376)	257	(188)	216	(707)
	6	268	(17)	255	(1049)	265	(172)	272	(51)	287	(484)	256	(166)
	7	299	(11)	285	(20)	280	(1423)	285	(204)	286	(54)	287	(345)
	8	318	(8)	318	(24)	293	(22)	314	(962)	289	(287)	287	(46)
	9	396	(3)	358	(19)	323	(26)	353	(19)	322	(1053)	282	(192)
	10	326	(4)	-	-	347	(27)	362	(37)	339	(65)	307	(638)
	11+	397	(99)	421	(281)	411	(240)	421	(178)	387	(140)	340	(305)
CB-SS	0	-	-	-	-	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	69	(6)	125	(24)	-	-	54	(1)	-	-
	3	168	(18)	149	(34)	188	(61)	173	(161)	137	(2)	129	(12)
	4	188	(3)	232	(19)	220	(176)	250	(127)	235	(133)	-	-
	5	246	(702)	248	(37)	274	(25)	271	(117)	269	(48)	241	(161)
	6	271	(23)	269	(665)	282	(48)	282	(12)	286	(91)	276	(96)
	7	297	(43)	284	(25)	293	(517)	303	(62)	311	(12)	293	(133)
	8	318	(11)	313	(41)	294	(14)	329	(474)	296	(46)	298	(11)
	9	322	(5)	346	(7)	342	(31)	349	(15)	321	(289)	300	(46)
	10	328	(4)	346	(2)	375	(10)	359	(27)	345	(18)	318	(239)
	11+	422	(114)	425	(87)	416	(98)	426	(56)	388	(65)	348	(134)
SMB-PB	0	-	-	-	-	-	-	-	-	-	-	-	-
	1	-	-	14	(1)	30	(1)	30	(3)	-	-	22	(35)
	2	80	(91)	120	(4)	97	(14)	87	(8)	77	(4)	59	(16)
	3	183	(77)	164	(29)	163	(222)	162	(148)	140	(22)	137	(36)
	4	222	(8)	232	(33)	221	(70)	242	(186)	212	(271)	191	(12)
	5	264	(1114)	261	(32)	266	(17)	273	(63)	258	(103)	242	(340)
	6	294	(83)	285	(1111)	271	(57)	291	(16)	278	(45)	276	(101)
	7	310	(113)	305	(58)	309	(908)	311	(44)	298	(13)	292	(58)
	8	340	(24)	320	(188)	328	(37)	343	(667)	302	(30)	299	(17)
	9	370	(8)	330	(28)	343	(126)	362	(43)	331	(233)	315	(32)
	10	378	(1)	350	(6)	347	(32)	367	(184)	346	(26)	331	(194)
	11+	447	(53)	419	(92)	430	(41)	406	(122)	362	(189)	362	(349)
FB	0	-	-	-	-	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-	-	-	15	(80)
	2	-	-	-	-	112	(1)	102	(1)	-	-	61	(170)
	3	-	-	-	-	144	(42)	145	(393)	134	(2)	138	(5)
	4	-	-	-	-	180	(6)	215	(16)	186	(143)	170	(22)
	5	247	(873)	236	(5)	209	(2)	252	(3)	233	(53)	209	(313)
	6	293	(24)	275	(932)	252	(29)	268	(1)	244	(7)	254	(36)
	7	323	(140)	295	(26)	296	(1028)	292	(52)	276	(5)	288	(7)
	8	352	(41)	331	(130)	329	(18)	322	(716)	289	(54)	295	(11)
	9	375	(14)	353	(38)	348	(64)	339	(47)	319	(672)	309	(41)
	10	424	(4)	390	(6)	378	(46)	356	(162)	338	(63)	329	(305)
	11+	460	(139)	462	(58)	463	(58)	421	(148)	372	(284)	367	(685)

Table 10. Commercial catch at age of spring and autumn spawning herring for White Bay - Notre Dame Bay, 1970-1992.

Spring Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987 b	1988 c	1989	1990	1991 a	1992 a
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	195	26	3113	1	1	2273	1
2	10	1	5	1	1	2	56	50	1	1	115	445	76	1	6	3	29	1105	407	23	1	29	940
3	1	129	290	727	4	128	24	1671	55	60	46	152	371	38	12	187	975	324	1044	128	1936	386	207
4	12	88	2396	1411	123	215	506	107	2034	50	1240	41	332	46	124	350	2945	7201	291	613	285	16183	942
5	24	161	353	2825	3142	453	237	468	317	2928	92	1231	59	23	1218	240	308	25843	2984	124	637	1542	8940
6	24	64	69	761	5446	5438	868	184	1034	323	1080	63	268	14	73	1486	667	1651	11819	3106	240	553	483
7	972	425	122	719	1193	7069	10893	793	517	1410	17	805	34	93	114	108	1258	1067	1036	10566	2451	103	371
8	11	10184	403	654	697	1123	17145	7363	2509	767	496	64	258	1	157	275	198	2088	1137	370	7360	2145	211
9	83	233	1363	416	1506	838	1328	12675	10807	2222	179	344	19	26	37	94	162	399	1454	1081	532	4432	722
10	159	254	205	1685	858	810	3364	1055	11756	14413	1450	194	192	4	122	81	179	442	315	844	1132	537	2796
11+	275	3105	808	794	2378	3999	8535	15707	14379	27508	14653	10908	4059	805	1938	2110	1973	4566	2943	2178	1148	2201	3509
Total	1572	14645	6015	9994	15349	20076	42957	40074	43410	49683	19369	14248	5669	1052	3802	4935	8889	44712	26543	19034	15723	30384	19122

Autumn Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991 a	1992 a
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	1	1	53	1	1	6	1	1	1	1	71	1	72	1	1	1	10	2	1	1	1	1	1
4	1	1	17	7	11	64	31	45	6	1	13	13	26	74	60	29	67	297	92	65	130	188	109
5	26	6	74	22	124	3	35	35	24	10	13	86	62	25	409	94	69	469	115	12	65	450	187
6	10	14	79	25	10	25	51	85	155	267	23	11	16	23	66	333	79	156	45	5	52	98	172
7	39	11	67	60	48	16	20	54	171	172	272	1	12	1	30	137	373	112	20	574	84	36	48
8	60	26	1	25	2	21	40	1	24	160	4	100	9	1	8	32	68	630	7	70	37	128	46
9	20	17	164	13	46	3	46	94	2	133	19	1	42	6	7	23	6	152	560	1	1	249	80
10	11	19	81	97	7	2	4	1	130	1	1	4	1	1	3	10	1	10	6	533	4	120	19
11+	172	291	562	298	346	302	329	182	238	298	450	65	23		24	74	42	108	306	29	577	2733	613
Total	342	388	1100	550	597	444	559	500	753	1045	868	284	265	134	610	735	717	1938	1154	1292	953	4005	1277

Spring and Autumn Spawners

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987 b	1988 c	1989	1990	1991 a	1992 a
Total	1914	15033	7115	10544	15946	20520	43516	40574	44163	50728	20237	14532	5934	1186	4412	5670	9606	46650	27697	20326	16676	34389	20399
% SS	82.1	97.4	84.5	94.8	96.3	97.8	98.7	98.8	98.3	97.9	95.7	98.0	95.5	88.7	86.2	87.0	92.5	95.8	95.8	93.6	94.3	88.4	93.7
% AS	17.9	2.6	15.5	5.2	3.7	2.2	1.3	1.2	1.7	2.1	4.3	2.0	4.5	11.3	13.8	13.0	7.5	4.2	4.2	6.4	5.7	11.6	6.3

a - preliminary
b - also 4475 age 0 SS
c - also 10 age 0 SS

Table 11. Commercial catch at age of spring and autumn spawning herring for Bonavista Bay - Trinity Bay , 1970-1992.

Spring Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985 b	1986	1987 c	1988	1989	1990	1991 a	1992 a
1	1	1	1	1	1	1	5	10	1	1	1	1	1	1	1	1	151	296	717	1	1	115	1
2	1	1	1	1	1	1	14	16	22	6	15	136	1	1	4	13	207	1352	6612	563	58	689	499
3	1	690	10	1	1	392	77	248	26	286	13	246	8	4	22	175	443	413	9910	1043	3094	210	1056
4	1	311	1347	60	2	134	493	135	357	167	195	53	11	34	35	70	4445	2845	267	3323	422	13551	271
5	9	102	389	4887	235	163	123	759	122	765	43	256	2	7	210	87	261	16208	3674	264	2350	2586	12612
6	55	64	91	126	4795	2564	166	227	251	19	293	26	30	2	9	351	161	334	21739	1428	94	3859	2422
7	808	361	75	96	424	14330	4897	50	112	436	52	288	5	15	5	37	262	359	782	8639	629	347	579
8	35	1373	88	1	151	455	20697	6209	598	101	264	23	35	1	12	27	38	126	713	13	4439	1550	194
9	126	151	480	48	294	995	909	23206	4412	530	75	321	5	8	2	13	10	33	8	216	235	7505	1394
10	69	126	14	271	69	727	854	774	13394	5575	967	88	65	2	2	22	31	6	55	100	325	447	2054
11+	212	522	213	1	1849	1679	4306	5890	5956	19994	12259	11762	1186	159	154	797	657	956	1247	508	466	891	653
Total	1318	3702	2709	5493	7822	21441	32541	37524	25251	27880	14177	13200	1349	234	456	1593	6668	22928	45724	16098	12113	31750	21735

Autumn Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991 a	1992 a
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	253	1	1	1	1
3	1	1	1	1	1	1	10	1	1	1	14	6	3	1	1	1	1	1	54	1	5	6	1
4	9	1	1	1	1	26	22	55	16	1	11	115	1	10	3	5	51	2	22	55	139	140	10
5	1	10	1	1	1	30	77	16	14	27	17	106	8	2	84	18	80	391	88	76	55	837	219
6	1	1	1	1	1	1	23	176	61	114	83	33	10	5	14	203	59	237	357	136	9	152	205
7	4	4	2	1	16	22	66	86	58	30	188	83	3	2	17	96	292	87	216	237	61	17	118
8	17	23	2	48	2	41	34	112	28	175	45	283	8	1	3	54	149	360	202	18	50	99	1
9	18	3	5	1	1	6	62	30	23	13	112	36	25	1	5	22	24	138	818	83	58	104	5
10	17	21	1	1	1	19	8	73	82	16	3	4	1	1	1	10	1	2	2	697	19	125	1
11+	738	406	33	1	1216	259	1069	1069	417	800	463	230	37	3	9	29	30	156	237	193	89	481	167
Total	808	472	49	58	1242	407	1373	1620	702	1179	938	898	98	28	139	440	689	1394	2250	1498	487	1963	729

Spring and Autumn Spawners

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985 b	1986	1987 c	1988	1989	1990	1991 a	1992 a
Total	2126	4174	2758	5551	9064	21848	33914	39144	25953	29059	15115	14098	1447	262	595	2033	7355	24322	47974	17596	12600	33713	22464
% SS	62.0	88.7	98.2	99.0	86.3	98.1	96.0	95.9	97.3	95.9	93.8	93.6	93.2	89.3	76.6	78.4	90.6	94.3	95.3	91.5	96.1	94.2	96.8
% AS	38.0	11.3	1.8	1.0	13.7	1.9	4.0	4.1	2.7	4.1	6.2	6.4	6.8	10.7	23.4	21.6	9.4	5.7	4.7	8.5	3.9	5.8	3.2

a - preliminary
b - also 10 age 0 SS
c - also 3124 age 0 SS

Table 12. Commercial catch at age of spring and autumn spawning herring for Conception Bay - Southern Shore , 1970-1992.

Spring Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991 a	1992 a
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	714	22	1	1	1	1
2	1	1	1	67	4	9	1177	7	1	1	1	1	1	1	1	1	6	1	2	718	1	1	1
3	1	36	7	2	1	418	28	127	1	4	1	25	2	1	3	58	1	36	87	833	87	1	1
4	15	31	1625	34	5	30	97	5	99	9	3	4	5	1	27	11	389	73	25	1319	36	304	1
5	17	19	134	4521	122	16	23	101	32	34	1	26	1	1	47	11	7	3486	252	15	49	70	12
6	21	11	55	242	9655	2057	31	45	65	7	19	9	2	1	5	17	13	17	502	123	1	214	17
7	255	43	29	329	153	8592	2330	13	14	38	1	28	1	1	1	2	16	26	33	1696	57	23	27
8	12	272	79	142	83	120	4771	950	3	4	12	3	5	1	2	2	3	10	5	10	434	4	2
9	13	26	361	44	39	517	89	4241	734	31	1	14	1	1	1	1	1	2	1	37	18	356	3
10	11	11	67	175	13	238	252	49	3080	270	49	13	1	1	1	1	3	1	1	2	24	47	33
11+	46	65	122	28	658	891	714	959	1358	1640	1101	504	176	13	7	97	81	65	45	138	82	57	26
Total	393	516	2481	5585	10734	12889	9513	6498	5388	2039	1190	628	196	23	96	202	521	4431	975	4892	790	1078	124

Autumn Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991 a	1992 a
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	1	1	1	1	2	7	1	1	1	1	1	1	9	1	1	1	23	1	1	365	1	1	1
4	1	1	1	2	3	162	1	7	4	2	1	14	5	1	4	3	7	7	1	1	3	70	7
5	1	1	1	2	8	40	49	29	50	17	1	8	14	2	60	6	18	37	49	1	10	25	23
6	8	1	1	1	6	81	27	150	30	80	1	3	1	3	6	52	21	27	96	3	4	24	9
7	20	1	1	38	17	18	23	87	69	15	32	7	1	1	6	24	94	32	90	67	2	3	1
8	36	6	1	35	1	49	23	72	9	57	3	14	2	2	3	13	29	32	39	13	2	1	1
9	5	34	1	1	6	11	31	13	10	17	6	2	2	5	1	3	10	21	42	5	15	4	1
10	6	11	1	1	1	14	12	7	34	6	1	1	1	1	1	1	3	13	1	31	18	6	1
11+	114	89	1	94	45	318	193	373	282	245	32	9	5	12	1	15	10	8	1	15	89	14	15
Total	194	147	11	177	91	702	362	741	491	442	80	61	42	30	85	120	217	180	322	503	146	150	61

Spring and Autumn Spawners

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991 a	1992 a
Total	587	663	2492	5762	10825	13591	9875	7239	5879	2481	1270	689	238	53	181	322	738	4611	1297	5395	936	1228	185
% SS	67.0	77.8	99.6	96.9	99.2	94.8	96.3	89.8	91.6	82.2	93.7	91.1	82.4	43.4	53.0	62.7	70.6	96.1	75.2	90.7	84.4	87.8	67.0
% AS	33.0	22.2	0.4	3.1	0.8	5.2	3.7	10.2	8.4	17.8	6.3	8.9	17.6	56.6	47.0	37.3	29.4	3.9	24.8	9.3	15.6	12.2	33.0

a - preliminary

Table 13. Commercial catch at age of spring and autumn spawning herring for St. Mary's Bay - Placentia Bay , 1970-1994.

Spring Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991 a	1992 a
1	3	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	476	1	1	76	995	74	365	52	30	87	133	1	1	1	8	1	1	34	1	22	1	37	68
3	109	557	207	326	280	2234	391	1423	175	663	332	193	1	5	9	7	1	19	1	48	115	1	47
4	4434	116	20375	77	234	471	1906	140	1817	279	133	42	2	2	24	18	143	2	22	9	189	222	7
5	59	2111	725	15470	126	147	208	736	123	2263	153	111	3	3	36	27	19	502	163	1	64	160	363
6	76	80	5154	566	14328	1591	267	87	596	96	1270	51	8	2	6	21	28	29	2457	24	15	170	231
7	645	251	365	6757	436	13858	862	50	64	614	57	338	3	4	3	15	9	47	119	463	30	12	55
8	66	45	650	93	6049	146	5622	1039	106	85	470	28	14	1	24	3	4	9	213	34	494	110	53
9	72	13	352	224	138	3391	201	3830	512	66	38	80	4	9	1	25	1	3	16	100	45	493	74
10	37	22	73	193	238	350	2256	134	3827	501	237	6	4	1	10	5	5	1	36	5	172	88	383
11+	107	96	403	315	624	1323	1361	2448	2185	4785	2971	466	69	39	44	125	30	11	147	34	128	948	965
Total	6084	3293	28306	24098	23451	23586	13440	9940	9436	9440	5795	1317	110	68	166	248	242	658	3176	741	1254	2242	2247

Autumn Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991 a	1992 a
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1
3	1	1	24	5	2	1	11	1	1	1	1	1	1	1	1	1	1	4	1	5	7	1	1
4	1	9	61	150	2	7	4	47	23	11	96	139	1	18	17	9	16	12	20	5	37	14	7
5	2	2	175	52	96	68	214	52	435	143	35	116	7	6	101	20	24	32	30	18	61	87	8
6	1	53	15	71	146	182	67	209	92	598	52	10	1	12	32	86	15	80	239	8	54	40	50
7	71	31	61	10	80	89	32	81	244	73	419	11	1	4	21	46	97	30	90	56	24	23	33
8	112	43	37	54	95	206	17	69	122	216	79	50	1	1	5	36	28	82	35	43	47	65	27
9	19	84	101	17	93	6	94	26	38	21	126	7	1	1	3	10	16	24	270	67	58	98	64
10	28	35	71	68	51	37	11	22	52	2	25	1	1	1	1	3	4	3	5	178	17	40	1
11+	202	314	539	737	970	677	329	526	561	348	492	29	2	4	8	24	15	12	53	164	173	495	479
Total	439	574	1086	1166	1537	1275	781	1035	1570	1415	1327	366	18	50	191	237	218	282	745	546	480	865	672

Spring and Autumn Spawners

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991 a	1992 a
Total	6523	3867	29392	25264	24988	24861	14221	10975	11006	10855	7122	1683	128	118	357	485	460	940	3921	1287	1734	3107	2919
% SS	93.3	85.2	96.3	95.4	93.8	94.9	94.5	90.6	85.7	87.0	81.4	78.3	85.9	57.6	46.5	51.1	52.6	70.0	81.0	57.6	72.3	72.2	77.0
% AS	6.7	14.8	3.7	4.6	6.2	5.1	5.5	9.4	14.3	13.0	18.6	21.7	14.1	42.4	53.5	48.9	47.4	30.0	19.0	42.4	27.7	27.8	23.0

a - preliminary

Table 14. Commercial catch at age of spring and autumn spawning herring for Fortune Bay , 1970-1992.

Spring Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991 a	1992 a
1	1	1	617	23	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	29475	167	1515	2210	389	2	82	27	1	1	25	1	1	1	2	1	1	1	1	1	1	1	1
3	5988	23223	256	925	1314	277	15	2103	42	1	16	144	1	2	1	54	1	1	1	1	1	1	1
4	11953	6086	19690	67	552	581	318	25	2677	183	3	16	3	2	4	3	145	1	1	1	1	23	1
5	133	23525	2896	5694	130	112	228	327	62	3833	69	4	3	1	3	39	4	304	1	1	2	8	3
6	281	1165	10767	475	4435	87	129	166	237	15	1122	3	1	1	2	12	69	11	219	18	2	1	1
7	7894	5747	351	1712	250	1490	11	26	43	165	7	21	2	1	1	2	20	49	7	274	12	1	1
8	233	3514	4432	73	1094	16	338	43	139	5	183	2	36	1	2	1	6	18	26	1	155	6	1
9	16	132	991	282	36	142	36	188	52	24	1	23	1	10	1	1	1	4	6	17	17	274	2
10	225	148	34	558	117	22	188	4	326	1	11	1	5	1	2	1	2	1	1	11	20	1	75
11+	257	537	366	173	255	201	140	244	302	167	50	12	5	18	23	15	14	38	10	24	1	72	266
Total	56456	64245	41915	12192	8573	2931	1486	3154	3882	4396	1488	228	59	39	42	130	264	429	274	350	213	389	353

Autumn Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991 a	1992 a
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	1	1	1	1	7	1	7	1	1	1	1	5	1	1	1	1	1	1	1	1	1	1	1
4	1	598	1	48	9	22	9	23	1	7	4	64	1	1	1	17	3	1	2	3	10	1	1
5	334	1	84	50	87	12	38	19	36	5	3	16	7	1	9	4	8	4	1	6	5	1	4
6	1	136	25	79	65	39	26	19	6	50	3	1	2	2	4	26	16	7	5	1	12	8	5
7	443	175	185	8	12	19	13	1	25	1	3	1	1	1	6	12	38	11	5	6	17	1	3
8	816	769	44	32	27	20	1	1	12	17	1	1	1	1	1	7	12	25	1	31	7	3	1
9	412	626	310	15	5	11	27	1	6	12	1	1	1	1	1	4	5	10	13	3	54	1	1
10	1	470	125	27	1	7	1	1	1	1	1	1	1	1	1	1	1	5	1	17	1	3	1
11+	2201	1956	793	97	85	45	9	2	18	12	1	1	1	1	1	2	5	14	10	5	5	1	5
Total	4212	4734	1570	359	300	178	133	70	108	108	20	93	18	12	27	76	91	80	41	75	114	22	24

Spring and Autumn Spawners

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991 a	1992 a
Total	60668	68979	43485	12551	8873	3109	1619	3224	3990	4504	1508	321	77	51	69	206	355	509	315	425	327	411	377
% SS	93.1	93.1	96.4	97.1	96.6	94.3	91.8	97.8	97.3	97.6	98.7	71.0	76.6	76.5	60.9	63.1	74.4	84.3	87.0	82.4	65.1	94.6	93.6
% AS	6.9	6.9	3.6	2.9	3.4	5.7	8.2	2.2	2.7	2.4	1.3	29.0	23.4	23.5	39.1	36.9	25.6	15.7	13.0	17.6	34.9	5.4	6.4

a - preliminary

Table 15. Unstandardized research gillnet catch rates at age (numbers per days fished) by spawning type, for White Bay - Notre Dame Bay, spring program.

Stock: WBNDB Season: SPRING

AUTUMN SPAWNERS

Age	1971	1988	1989	1990	1991	1992
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.1	0.0	0.0	0.0
4	0.0	0.0	0.0	2.5	2.7	0.0
5	0.0	0.8	7.4	2.7	4.4	1.7
6	2.2	1.4	2.0	2.5	2.3	14.2
7	0.0	0.8	4.8	0.9	2.7	2.2
8	3.9	0.7	4.8	1.5	1.7	0.2
9	1.9	4.8	6.9	2.1	4.8	1.2
10	0.0	0.1	21.7	0.2	0.0	0.3
11	41.8	1.5	18.6	17.5	22.6	8.6
Total	49.8	10.1	66.4	29.2	41.2	28.4

SPRING SPAWNERS

Age	1971	1988	1989	1990	1991	1992
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	5.0	17.5	91.0	18.2	0.0
4	24.9	2.0	47.1	56.2	410.0	21.5
5	3.9	23.9	12.2	57.7	47.7	493.7
6	22.3	63.9	138.3	17.8	22.7	33.5
7	27.5	6.0	199.2	157.6	12.5	13.7
8	1010.9	5.0	10.6	213.1	139.7	10.3
9	14.4	12.9	17.5	12.6	272.5	47.2
10	28.8	1.9	26.5	28.9	36.3	127.9
11	176.8	36.6	61.4	105.8	176.0	110.8
Total	1309.5	157.0	529.7	740.1	1135.6	858.6

SPRING AND AUTUMN SPAWNERS COMBINED

Age	1971	1988	1989	1990	1991	1992
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	5.0	17.5	91.0	18.2	0.0
4	24.9	2.0	47.1	58.8	412.6	21.5
5	3.9	24.7	19.6	60.4	52.1	495.4
6	24.5	65.3	140.2	20.3	25.0	47.6
7	27.5	6.8	203.9	158.6	15.2	15.9
8	1014.8	5.7	15.4	214.6	141.4	10.5
9	16.3	17.7	24.4	14.7	277.4	48.5
10	28.8	2.0	48.2	29.0	36.3	128.2
11	218.6	38.1	80.0	123.3	198.6	119.4
Total	1359.3	167.1	596.1	769.3	1176.8	887.0

Table 16. Unstandardized research gillnet catch rates at age (numbers per days fished), by spawning type, Bonavista Bay - Trinity Bay, sp

Stock: BBTB Season: SPRING

AUTUMN SPAWNERS

Age	1971	1972	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	2.1	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	10.2	13.0	0.0	6.6	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.1	0.0	0.1
5	0.2	0.0	0.0	4.8	0.7	0.6	39.0	0.5	0.0	0.0	0.3	0.3	0.4	5.8	0.5	1.7
6	0.0	0.0	10.2	2.1	3.1	0.6	6.3	10.9	0.6	0.3	0.2	0.3	0.2	3.2	2.5	5.0
7	0.0	0.0	29.4	2.4	0.0	0.0	0.0	1.9	0.8	0.4	0.2	1.9	0.9	1.7	1.0	3.9
8	0.0	0.0	4.7	2.1	0.0	0.6	0.0	1.3	0.2	1.3	0.0	1.3	1.2	1.1	0.5	0.8
9	0.0	0.0	35.8	0.7	0.7	0.0	0.4	0.0	0.0	0.7	0.5	0.5	1.2	3.4	0.7	0.4
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	3.3	0.1	1.0	0.4	0.1
11	0.6	10.2	71.5	1.7	1.4	2.8	2.1	0.7	0.0	0.0	0.3	2.4	7.3	15.0	9.5	4.6
Total	0.8	10.2	161.4	28.8	5.9	12.1	47.8	15.5	1.6	3.1	1.5	10.1	11.3	31.2	15.1	16.7

SPRING SPAWNERS

Age	1971	1972	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.1	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.6	0.3	0.1	0.1	0.0	0.0	0.0	0.0
3	1.6	2.6	0.0	19.9	3.1	4.4	20.2	18.3	0.9	1.2	5.8	2.3	8.8	1.4	0.3	2.6
4	15.5	483.5	17.3	4.6	1.4	35.8	8.2	7.6	151.6	1.2	0.3	21.8	8.2	76.3	1.2	1.7
5	2.5	220.8	0.0	1.7	0.3	1.2	37.7	4.3	2.4	104.5	2.3	0.9	27.7	18.4	46.2	8.2
6	2.6	14.4	53.1	1.5	1.0	0.0	3.5	11.2	2.6	1.5	30.0	5.5	4.5	42.5	8.1	50.6
7	13.9	44.4	0.0	5.2	0.0	0.7	0.7	1.0	3.1	0.0	0.5	57.7	12.2	4.9	10.3	6.4
8	80.2	56.2	3.5	0.0	0.7	0.0	2.2	1.0	0.9	0.0	0.4	0.9	60.8	30.1	2.3	7.0
9	4.1	331.9	0.0	4.2	0.3	9.8	0.0	1.0	0.3	0.3	0.6	0.6	0.8	94.9	17.6	3.7
10	10.6	5.2	41.4	5.9	0.3	1.6	2.2	1.1	0.2	0.7	0.0	0.7	3.2	5.7	34.8	13.1
11	13.9	147.7	575.0	166.7	56.3	181.0	146.4	39.3	10.8	6.4	12.5	5.5	8.9	12.6	16.8	20.2
Total	145.1	1306.8	690.2	209.4	63.5	233.8	221.8	84.8	174.2	116.0	52.6	96.0	135.1	286.8	137.6	113.5

SPRING AND AUTUMN SPAWNERS COMBINED

Age	1971	1972	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.1	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.6	0.3	0.1	0.1	0.0	0.0	0.0	0.0
3	1.6	2.6	0.0	22.0	3.1	5.5	20.2	18.3	0.9	1.2	5.8	2.3	8.8	1.4	0.3	2.7
4	15.5	483.5	27.4	17.6	1.4	42.4	8.2	7.6	151.6	1.5	0.3	21.9	8.3	76.4	1.2	1.9
5	2.7	220.8	0.0	6.5	1.0	1.8	76.7	4.8	2.4	104.5	2.6	1.2	28.1	24.1	46.7	9.8
6	2.6	14.4	63.3	3.5	4.1	0.6	9.9	22.1	3.2	1.8	30.2	5.8	4.7	45.7	10.7	55.6
7	13.9	44.4	29.4	7.6	0.0	0.7	0.7	2.9	4.0	0.4	0.7	59.6	13.0	6.5	11.3	10.3
8	80.2	56.2	8.1	2.1	0.7	0.6	2.2	2.3	1.1	1.3	0.4	2.2	62.0	31.2	2.8	7.9
9	4.1	331.9	35.8	4.9	1.0	9.8	0.4	1.0	0.3	1.1	1.1	1.1	2.1	98.4	18.3	4.1
10	10.6	5.2	41.4	5.9	0.3	1.6	2.2	1.2	0.2	0.7	0.0	4.0	3.3	6.7	35.3	13.2
11	14.5	157.9	646.5	168.4	57.7	183.8	148.5	40.0	10.8	6.4	12.8	7.9	16.2	27.6	26.3	24.8
Total	145.9	1317	851.6	238.2	69.4	245.9	269.6	100.3	175.8	119.1	54.1	106.1	146.4	318.0	152.8	130.2

Table 17. Unstandardized research gillnet catch rates at age (numbers per days fished) by spawning type, Conception Bay - Southern Shore, spring program.

Stock: CBSS Season: SPRING

AUTUMN SPAWNERS

Age	1980	1985	1986	1987	1988	1989	1990	1991	1992
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	1.2	0.0	0.0	0.5	0.0	0.0
4	0.0	0.9	0.3	1.2	0.0	0.1	2.5	0.6	0.2
5	0.0	1.3	4.7	1.4	6.5	0.4	1.7	8.5	0.3
6	0.0	26.6	10.3	3.9	12.1	1.5	0.8	1.4	3.9
7	0.0	20.8	66.9	6.8	20.3	3.2	0.1	2.7	1.7
8	0.0	16.7	20.2	9.3	9.9	5.2	1.6	4.1	0.6
9	0.0	3.4	12.5	1.3	20.1	0.6	1.2	5.7	0.6
10	0.0	1.9	0.7	2.4	0.1	4.8	0.0	11.4	0.5
11	0.0	27.1	29.8	4.3	3.7	1.9	3.8	52.1	7.6
Total	0.0	98.9	145.5	31.5	72.7	17.8	12.3	86.2	15.3

SPRING SPAWNERS

Age	1980	1985	1986	1987	1988	1989	1990	1991	1992
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0
3	0.0	8.4	0.0	19.1	5.9	16.2	19.2	0.0	0.6
4	0.0	1.5	121.9	2.5	26.4	25.3	11.7	25.5	0.0
5	0.0	6.5	3.3	180.2	22.5	13.9	9.0	8.7	17.9
6	0.0	18.6	22.8	8.3	725.2	20.4	1.2	24.7	7.3
7	0.9	2.6	5.6	13.7	32.3	110.0	5.6	2.7	8.5
8	0.0	2.2	4.3	4.5	69.5	7.4	49.8	9.7	1.6
9	0.0	0.5	1.3	3.2	9.8	6.5	1.7	70.3	1.9
10	0.9	0.0	1.3	1.3	2.0	1.4	2.4	6.0	19.4
11	42.2	130.6	57.6	85.5	84.2	31.1	5.5	14.1	7.3
Total	44.0	171.0	217.3	317.9	978.7	232.0	106.3	161.6	64.8

SPRING AND AUTUMN SPAWNERS COMBINED

Age	1980	1985	1986	1987	1988	1989	1990	1991	1992
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0
3	0.0	8.4	0.0	20.2	5.9	16.2	19.7	0.0	0.6
4	0.0	2.4	122.2	3.7	26.4	25.4	14.2	26.1	0.2
5	0.0	7.8	7.9	181.6	29.0	14.3	10.7	17.2	18.3
6	0.0	45.2	33.1	12.1	737.3	21.9	2.0	26.1	11.2
7	0.9	23.3	72.6	20.4	52.6	113.2	5.8	5.4	10.2
8	0.0	18.9	24.6	13.7	79.4	12.7	51.4	13.7	2.2
9	0.0	3.9	13.8	4.4	29.9	7.1	2.9	76.0	2.6
10	0.9	1.9	2.0	3.7	2.0	6.2	2.5	17.4	19.9
11	42.2	157.7	87.4	89.8	87.9	33.0	9.3	66.1	14.9
Total	44.0	269.9	362.8	349.4	1051.4	249.8	118.6	247.8	80.1

Table 18. Unstandardized research gillnet catch rates at age (numbers per days fished), by spawning type, St. Mary's Bay - Placentia Bay, spring program.

Stock: SMBPB Season: SPRING

AUTUMN SPAWNERS

Age	1970	1971	1973	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.6	0.5	6.2	0.9	0.7	2.0	0.0	0.1	0.1	0.4	0.0
4	0.9	8.4	0.2	0.6	10.3	10.8	36.8	8.0	4.6	1.1	1.8	1.0	3.0	1.1
5	23.0	0.6	0.0	2.0	1.9	53.2	14.2	16.6	8.2	1.2	3.8	4.5	10.5	3.7
6	1.3	28.3	1.2	0.2	5.3	15.9	39.0	10.2	14.9	2.9	1.5	2.8	3.0	5.4
7	29.4	10.9	1.4	0.0	1.0	22.8	14.4	42.2	8.5	5.2	3.8	2.9	1.2	1.6
8	58.7	9.5	4.8	0.2	0.5	1.5	12.2	10.4	20.6	5.0	2.8	3.3	3.0	0.8
9	20.3	17.4	0.0	0.1	0.8	4.1	1.5	3.6	7.5	8.3	2.0	6.7	1.9	1.9
10	9.1	6.9	0.3	0.0	0.4	0.8	2.5	1.5	0.7	1.2	5.0	2.0	1.2	1.0
11	40.0	43.2	21.9	0.5	2.6	13.5	10.9	4.5	4.6	4.4	4.3	29.7	7.8	16.4
Total	182.7	125.2	29.9	4.1	23.2	128.6	132.5	97.8	71.5	29.2	24.9	52.9	32.1	31.9

SPRING SPAWNERS

Age	1970	1971	1973	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.2	1.8	0.7	0.0	0.0	0.0	0.4	0.2	0.1	0.1	0.0
3	6.7	230.3	0.6	0.2	11.3	18.5	59.2	0.3	13.7	2.3	23.5	11.2	1.2	2.7
4	627.5	35.0	0.0	0.6	2.0	21.7	5.9	125.6	1.7	4.2	6.0	19.5	21.5	0.7
5	71.5	420.5	243.1	0.4	1.0	6.9	9.9	8.5	151.9	2.7	1.8	5.7	9.3	21.8
6	56.7	37.0	4.8	1.4	1.1	2.7	6.9	17.4	11.6	100.3	3.5	2.4	2.5	3.8
7	278.0	178.9	39.9	0.2	3.5	0.9	2.4	3.5	17.7	6.2	64.3	5.0	0.7	2.4
8	87.7	33.9	0.3	1.7	0.4	7.3	2.1	2.6	4.0	14.4	3.3	69.9	1.4	1.0
9	18.9	13.4	1.2	0.4	5.2	0.2	8.6	0.1	2.1	3.0	12.6	2.4	10.8	1.6
10	62.1	15.4	8.2	0.4	0.6	10.1	2.7	2.4	0.6	0.1	3.1	16.7	1.4	7.5
11	139.0	64.8	4.8	6.5	21.5	46.7	45.4	12.1	7.4	7.2	4.9	6.8	6.3	13.1
Total	1349.4	1028.1	302.4	11.9	48.4	115.6	143.1	172.5	210.4	140.9	123.3	139.5	55.1	54.8

SPRING AND AUTUMN SPAWNERS COMBINED

Age	1970	1971	1973	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.2	1.8	0.7	0.0	0.0	0.0	0.4	0.2	0.1	0.1	0.0
3	6.7	230.3	0.6	0.8	11.8	24.7	60.2	1.0	15.7	2.3	23.6	11.3	1.5	2.8
4	628.4	43.3	0.2	1.2	12.3	32.5	42.7	133.6	6.3	5.3	7.8	20.5	24.5	1.8
5	94.5	421.1	243.1	2.3	2.9	60.2	24.1	25.1	160.1	3.9	5.6	10.2	19.8	25.5
6	58.0	65.3	6.1	1.6	6.4	18.6	45.8	27.6	26.4	103.2	4.9	5.1	5.6	9.1
7	307.4	189.8	41.4	0.2	4.5	23.7	16.9	45.7	26.2	11.4	68.1	7.9	1.8	4.0
8	146.4	43.4	5.1	1.9	0.9	8.8	14.3	13.0	24.6	19.4	6.1	73.2	4.5	1.8
9	39.2	30.8	1.2	0.5	6.0	4.3	10.0	3.7	9.6	11.2	14.6	9.0	12.7	3.6
10	71.2	22.3	8.5	0.4	1.0	10.8	5.2	3.9	1.3	1.3	8.0	18.7	2.6	8.5
11	179.0	108.0	26.8	7.0	24.1	60.2	56.2	16.6	11.9	11.6	9.2	36.5	14.1	29.5
Total	1532.1	1153.3	332.3	16.0	71.6	244.2	275.6	270.3	281.9	170.1	148.2	192.4	87.2	86.7

Table 19. Unstandardized research gillnet catch rates at age (numbers per days fished), by spawning type, Fortune Bay, spring program.

Stock: FB Season: SPRING

AUTUMN SPAWNERS

Age	1970	1971	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	7.5	2.2	0.0	0.0
4	0.0	0.0	0.3	18.0	0.0	13.9	8.5	0.1	0.2	0.2	6.6	2.5	1.1
5	0.0	0.0	1.4	6.0	27.5	7.9	5.0	3.3	0.1	3.7	1.0	5.8	6.3
6	0.0	2.1	0.2	20.6	10.5	74.2	9.3	4.0	3.0	1.4	2.0	2.2	9.2
7	0.0	4.2	0.0	2.0	17.3	38.7	28.3	4.5	3.8	11.2	1.4	1.6	5.2
8	8.2	1.4	0.0	1.1	3.6	17.5	9.0	25.6	3.0	8.9	4.7	1.8	3.7
9	2.8	14.1	0.0	0.5	0.9	13.9	2.0	10.0	12.1	3.1	9.4	2.1	5.8
10	0.0	2.1	0.0	0.0	0.2	3.3	1.0	5.2	1.1	20.8	0.5	7.2	2.1
11	6.8	12.7	0.1	0.7	3.1	6.0	1.7	17.3	13.8	24.8	19.6	24.2	17.9
Total	17.8	36.7	2.0	48.9	63.0	175.3	64.9	69.9	37.2	81.4	47.4	47.7	51.3

SPRING SPAWNERS

Age	1970	1971	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
3	0.0	10.4	0.6	8.4	0.0	14.4	0.0	0.0	0.0	12.2	98.8	0.7	0.3
4	122.4	13.8	0.8	6.0	19.6	2.8	224.5	0.0	0.0	0.9	1.4	71.2	3.6
5	5.6	168.3	0.6	3.9	13.2	205.4	8.8	532.1	3.1	0.9	0.0	22.0	61.3
6	16.7	15.2	0.1	3.1	5.4	69.5	70.0	11.7	419.7	15.9	0.0	2.9	11.6
7	236.5	31.5	0.2	2.4	1.2	15.8	48.4	48.3	9.8	664.7	6.2	2.2	1.3
8	2.8	86.4	6.0	2.7	3.6	4.6	10.0	20.7	50.5	15.0	236.8	28.6	1.7
9	5.6	0.0	0.3	44.0	0.3	8.8	0.8	4.8	11.3	65.4	19.7	371.2	6.3
10	0.0	6.2	0.8	4.6	3.9	6.5	2.0	1.4	2.1	33.7	59.0	49.9	70.3
11	8.3	13.8	0.8	53.7	90.6	135.8	36.0	71.8	19.6	125.3	56.1	184.9	175.0
Total	397.5	345.6	10.3	128.7	137.9	463.6	400.1	690.2	515.6	934.9	479.4	733.5	331.4

SPRING AND AUTUMN SPAWNERS COMBINED

Age	1970	1971	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
3	0.0	10.4	0.6	8.4	0.0	14.5	0.0	0.0	0.0	19.6	101.0	0.7	0.3
4	122.4	13.8	1.1	24.0	19.6	16.6	233.0	0.1	0.2	1.1	8.1	73.7	4.8
5	5.6	168.3	2.0	9.9	40.7	213.2	13.8	535.4	3.2	4.6	1.0	27.8	67.6
6	16.7	17.3	0.3	23.7	15.8	143.7	79.3	15.7	422.7	17.3	2.0	5.2	20.8
7	236.5	35.6	0.2	4.5	18.5	54.5	76.7	52.8	13.6	675.9	7.6	3.8	6.6
8	11.0	87.8	6.0	3.8	7.2	22.2	19.0	46.3	53.5	23.8	241.5	30.4	5.3
9	8.3	14.1	0.3	44.5	1.2	22.7	2.8	14.8	23.5	68.5	29.0	373.3	12.1
10	0.0	8.3	0.8	4.6	4.1	9.8	3.0	6.6	3.2	54.4	59.4	57.1	72.4
11	15.2	26.5	0.9	54.4	93.7	141.8	37.7	89.1	33.4	150.1	75.7	209.0	192.9
Total	415.3	382.3	12.3	177.6	200.9	638.9	465.0	760.1	552.8	1016.3	526.8	781.2	382.7

Table 20. Criteria used for the selection of single targets in 1993 Holyrood herring target strength experiments.

	Min.	Max.
1/2 PW	0.28 ms	0.52 ms
1/4 PW	0.28 ms	0.60 ms
1/8 PW	0.56 ms	-

TS = 10 x LOG (BXS)

-3 < OFFAXIS < 0

where:

1/2 PW = 1/2 peak pulse width amplitude (ms)

1/4 PW = 1/4 peak pulse width amplitude (ms)

1/8 PW = 1/8 peak pulse width amplitude (ms)

TS = average target strength (dB)

BXS = backscattering cross section (m^2)

OFFAXIS = location of target in relation to acoustic axis (dB)

Table 21. Results of 1993 Holyrood herring target strength experiments.

Mean Fish Lgt. (cm)	Fish Lgt. Range (cm)	No. of Fish in Enclosure	No. of Targets Measured	Average T.S. (dB)	Standard Error
16.62	15.3 - 18.0	100	280	-42.38	0.364
17.29	16.4 - 18.2	50	352	-40.13	0.233
22.76	20.4 - 25.9	48	186	-37.00	0.425
24.79	24.1 - 26.5	19	552	-37.98	0.295
30.07	29.3 - 31.1	3	977	-36.42	0.250
31.08	30.2 - 32.0	5	904	-38.59	0.220
31.26	28.9 - 32.1	24	130	-35.98	0.659
34.58	33.2 - 36.5	19	482	-34.08	0.288
34.86	33.3 - 36.8	5	829	-32.57	0.240
35.93	34.7 - 37.8	26	124	-35.24	0.821

Table 22. Biological samples used to calculate mean lengths (cm), mean weights (gm) and population numbers at age from the 1992 herring acoustic survey of White Bay - Notre Dame Bay and the 1993 herring acoustic survey of Bonavista Bay - Trinity Bay.

Stock Area	Survey Strata	Survey Dates	Sampling Location	Sample Strata	Sample Dates	Sampling Gear	# Fish Sampled	Mean Lgt.	Mean Wgt.
WB-NDB	5	Nov. 9-10	Chouse Bk.	5	Nov. 10	Res. MWT	100	5.6	1.0
			Pumbly Cove	5	Nov. 10	Res. MWT	100	5.3	0.6
			Western Arm	5	Nov. 10	Comm. PS	100	32.6	293.5
	6	Nov. 11	Chouse Bk.	5	Nov. 10	Res. MWT	100	5.6	1.0
			Pumbly Cove	5	Nov. 10	Res. MWT	100	5.3	0.6
	9	Nov. 12-13	Kings Pt.	9	Nov. 12	Comm. PS	100	30.8	247.0
	10	Nov. 13-15	Chouse Bk.	5	Nov. 10	Res. MWT	100	5.6	1.0
			Pumbly Cove	5	Nov. 10	Res. MWT	100	5.3	0.6
			Southern Arm	10	Nov. 13	Comm. PS	150	29.4	232.2
	12	Nov. 15-17	Triton	13	Dec. 5	Comm. PS	50	34.7	334.9
	13	Nov. 17-18	Triton	13	Dec. 5	Comm. PS	50	34.7	334.9
	14	Nov. 18	Triton	13	Dec. 5	Comm. PS	50	34.7	334.9
	16	Nov. 19-20	Loon Bay	20	Nov. 25	Comm. PS	100	32.1	275.3
	18	Nov. 23-26	Loon Bay	20	Nov. 25	Comm. PS	100	32.1	275.3
	21	Nov. 27	Loon Bay	20	Nov. 25	Comm. PS	100	32.1	275.3
	24	Nov. 29	Change Is.	24	Nov. 29	Jigger	26	25.3	120.3
			Fogo Is.	24	Nov. 15	Comm. PS	100	32.3	266.2
BB-TB	27	Nov. 17-19	Lockers Bay	27	Nov. 15	Comm. PS	100	32.7	277.4
	29	Nov. 20-22	Bessy Is.	29	Nov. 13	Comm. PS	50	24.1	104.1
	30	Nov. 22	Richards Is.	30	Nov. 22	Res. PS	100	21.8	74.5
	31	Nov. 23	Richards Is.	30	Nov. 22	Res. PS	100	21.8	74.5
	32	Nov. 24	Clode Sound	33	Dec. 2	Comm. PS	100	33.1	279.7
	33	Nov. 24-25	Clode Sound	33	Dec. 2	Comm. PS	100	33.1	279.7
	34	Nov. 25-27	Clode Sound	33	Dec. 2	Comm. PS	100	33.1	279.7
	38	Dec. 1-3	Deep Bight	40	Dec. 4	Res. PS	100	21.2	71.1
	40	Dec. 3-5	Deep Bight	40	Dec. 4	Res. PS	100	21.2	71.1
	41	Dec. 5-6	Deep Bight	40	Dec. 4	Res. PS	100	21.2	71.1
	45	Dec.6	Deep Bight	40	Dec. 4	Res. PS	100	21.2	71.1

Table 23. Hydroacoustic system calibration parameters used during 1992 White Bay -Notre Dame Bay and 1993 Bonavista Bay - Trinity Bay herring acoustic surveys.

Parameter		White Bay Notre Dame Bay	Bonavista Bay	Trinity Bay
Source Level (dB/uPa)		216.18	215.75	214.69
Receive Sens. (dBv/UPa)		-155.33	-155.33	-156.11
Fixed Receiver Gain (dB)		-6	-6	-6
TVG Gain		20logR	20logR	20logR
Pulse Length (msec)		0.4	0.4	0.4
Beam Pattern Factor		0.00092	0.00092	0.00111
Sampling Thres. (v)	@ 3-120 m	0.05	0.05	0.05
	@ 120-150 m	0.10	0.10	0.10

Table 24. Biomass and backscatter estimates, for White Bay - Notre Dame Bay, from the 1992 acoustic survey.

STOCK AREA	STRATUM	STRATUM AREA (m2)	TARGET STRENGTH (dB/kg)	TRANSECT NUMBER	TRANSECT LENGTH (n.mi.)	TRANSECT AREA (m2)	TRANSECT BIOMASS (t)	WEIGHTED DENSITY (kg/m2)	STRATUM BIOMASS (t)	ABSOLUTE STRATUM VARIANCE	TRANSECT TOTAL SCATTER (m2/sr)	WEIGHTED SCATT. COEFF. (/sr)	STRATUM TOTAL SCATTER (m2/sr)	RELATIVE STRATUM VARIANCE
WB-NDB	5	1.190E+08	-19.85	22	1.04	1.784E+06	26	0.01439			271	1.489E-04		
				23	0.83	1.431E+06	0	0.00000			0	0.000E+00		
				24	2.16	3.697E+06	0	0.00014			3	1.422E-06		
				25	2.17	3.716E+06	142	0.07801			1469	8.076E-04		
				26	3.57	6.131E+06	34	0.01865			351	1.931E-04		
				27	0.60	1.022E+06	1	0.00075			14	7.794E-06		
				28	0.80	1.375E+06	3	0.00160			30	1.656E-05		
				29	0.32	5.574E+05	1	0.00065			12	6.713E-06		
				30	0.50	8.546E+05	2	0.00096			18	9.899E-06		
				31	0.68	1.170E+06	0	0.00011			2	1.138E-06		
				32	0.97	1.672E+06	1	0.00067			13	6.884E-06		
				33	0.43	7.431E+05	0	0.00000			0	0.000E+00		
				34	0.34	5.759E+05	0	0.00000			0	0.000E+00		
				35	0.87	1.486E+06	0	0.00000			0	0.000E+00		
				36	0.40	6.874E+05	2	0.00088			17	9.159E-06		
				37	1.29	2.211E+06	417	0.22914			4316	2.372E-03		
				16		1.820E+06		0.02162	2573	2.89166E+12		2.238E-04	26634	3.098E+08
						2.911E+07								
	6	8.500E+07	-19.85	38	0.45	7.803E+05	1	0.00066			8	6.839E-06		
				39	1.17	2.006E+06	0	0.00000			0	0.000E+00		
				40	0.71	1.226E+06	0	0.00000			0	0.000E+00		
				41	0.54	9.289E+05	0	0.00000			0	0.000E+00		
				42	0.67	1.152E+06	0	0.00000			0	0.000E+00		
				43	0.47	7.989E+05	0	0.00000			0	0.000E+00		
				44	0.55	9.475E+05	0	0.00000			0	0.000E+00		
				7		1.120E+06		0.00009	8	72195823.13		9.770E-07	83	7.736E+03
						7.840E+06								
	9	4.900E+07	-29.66	62	1.32	2.267E+06	0	0.00000			0	0.000E+00		
				63	0.90	1.542E+06	0	0.00000			0	0.000E+00		
				64	1.44	2.471E+06	3	0.00197			3	2.133E-06		
				65	0.82	1.412E+06	0	0.00000			0	0.000E+00		
				66	1.47	2.527E+06	1039	0.73222			1124	7.918E-04		
				67	0.23	3.902E+05	0	0.00000			0	0.000E+00		
				68	0.22	3.716E+05	0	0.00000			0	0.000E+00		
				69	0.38	6.503E+05	0	0.00000			0	0.000E+00		
				70	0.42	7.246E+05	0	0.00000			0	0.000E+00		
				71	0.68	1.170E+06	10	0.00678			10	7.336E-06		
				72	1.03	1.765E+06	0	0.00000			0	0.000E+00		
				73	1.93	3.307E+06	242	0.17023			261	1.841E-04		
				74	0.84	1.449E+06	0	0.00000			0	0.000E+00		
				75	0.67	1.152E+06	0	0.00000			0	0.000E+00		
				76	0.69	1.189E+06	0	0.00000			0	0.000E+00		
				77	0.61	1.040E+06	0	0.00000			0	0.000E+00		
				78	0.41	7.060E+05	0	0.00000			0	0.000E+00		
				17		1.420E+06		0.05360	2626	3.83913E+12		5.796E-05	2840	4.607E+06
						2.413E+07								
	10	8.800E+07	-29.79	79	1.15	1.969E+06	0	0.00000			0	0.000E+00		
				80	2.70	4.626E+06	0	0.00007			0	7.354E-08		
				81	1.39	2.378E+06	0	0.00000			0	0.000E+00		
				82	3.35	5.741E+06	0	0.00000			0	0.000E+00		
				83	2.63	4.515E+06	0	0.00000			0	0.000E+00		
				84	3.01	5.165E+06	0	0.00000			0	0.000E+00		
				85	3.51	6.019E+06	724	0.23062			760	2.420E-04		
				86	1.74	2.991E+06	0	0.00000			0	0.000E+00		
				87	2.76	4.738E+06	0	0.00000			0	0.000E+00		
				88	2.43	4.162E+06	731	0.23289			767	2.444E-04		
				89	2.31	3.957E+06	0	0.00000			0	0.000E+00		
				90	1.71	2.935E+06	445	0.14160			467	1.486E-04		
				91	0.80	1.375E+06	297	0.09455			312	9.924E-05		
				92	2.51	4.310E+06	1606	0.51137			1685	5.367E-04		
				93	0.22	3.716E+05	58	0.01852			61	1.943E-05		
				94	0.31	5.388E+05	0	0.00000			0	0.000E+00		
				95	0.17	2.973E+05	0	0.00000			0	0.000E+00		
				96	0.25	4.273E+05	0	0.00000			0	0.000E+00		
				18		3.140E+06		0.06831	6011	7.33769E+12		7.170E-05	6309	8.083E+06
						5.652E+07								
	12	7.200E+07	-29.94	97	1.36	2.341E+06	0	0.00000			0	0.000E+00		
				98	1.30	2.229E+06	0	0.00000			0	0.000E+00		
				99	0.43	7.431E+05	0	0.00000			0	0.000E+00		
				100	0.68	1.170E+06	0	0.00000			0	0.000E+00		
				116	2.58	4.422E+06	0	0.00000			0	0.000E+00		
				117	0.79	1.356E+06	0	0.00000			0	0.000E+00		
				118	0.77	1.319E+06	0	0.00000			0	0.000E+00		
				119	0.48	8.175E+05	0	0.00000			0	0.000E+00		
				120	0.62	1.059E+06	0	0.00000			0	0.000E+00		
				121	0.89	1.523E+06	0	0.00000			0	0.000E+00		
				122	1.80	3.084E+06	652	0.29797			661	3.021E-04		
				123	2.97	5.091E+06	78	0.03550			79	3.600E-05		
				124	2.25	3.864E+06	0	0.00000			0	0.000E+00		
				125	0.93	1.598E+06	0	0.00000			0	0.000E+00		
				14		2.187E+06		0.02382	1715	2.1951E+12		2.415E-05	1739	2.257E+06
						3.062E+07								

Table 24 cont'. Biomass and backscatter estimates, for White Bay - Notre Dame Bay, from the 1992 acoustic survey.

STOCK AREA	STRATUM	STRATUM AREA (m2)	TARGET STRENGTH (dB/kg)	TRANSECT NUMBER	TRANSECT LENGTH (n.mi.)	TRANSECT AREA (m2)	TRANSECT BIOMASS (t)	WEIGHTED DENSITY (kg/m2)	STRATUM BIOMASS (t)	ABSOLUTE STRATUM VARIANCE	TRANSECT TOTAL SCATTER (m2/sr)	WEIGHTED SCATT. COEFF. (/sr)	STRATUM TOTAL SCATTER (m2/sr)	RELATIVE STRATUM VARIANCE
	13	8.400E+07	-29.94	126	0.47	7.989E+05	26	0.01238			26	1.256E-05		
				127	0.37	6.317E+05	0	0.00000			0	0.000E+00		
				128	0.47	7.989E+05	0	0.00000			0	0.000E+00		
				129	0.54	9.289E+05	0	0.00000			0	0.000E+00		
				130	1.55	2.657E+06	0	0.00000			0	0.000E+00		
				131	1.18	2.025E+06	0	0.00000			0	0.000E+00		
				132	1.93	3.307E+06	0	0.00000			0	0.000E+00		
				133	2.09	3.586E+06	0	0.00000			0	0.000E+00		
				134	1.16	1.988E+06	0	0.00000			0	0.000E+00		
				135	2.14	3.679E+06	13	0.00602			13	6.099E-06		
				136	1.99	3.418E+06	132	0.06292			133	6.380E-05		
				137	1.07	1.839E+06	0	0.00000			0	0.000E+00		
				138	0.83	1.431E+06	0	0.00000			0	0.000E+00		
				139	1.28	2.192E+06	0	0.00000			0	0.000E+00		
				14		2.091E+06		0.00581	488	1.30629E+11		5.890E-06	495	1.343E+05
						2.928E+07								
	14	5.500E+07	-29.94	140	0.29	5.016E+05	0	0.00000			0	0.000E+00		
				141	0.38	6.503E+05	0	0.00000			0	0.000E+00		
				142	0.17	2.973E+05	0	0.00000			0	0.000E+00		
				143	0.49	8.360E+05	0	0.00000			0	0.000E+00		
				144	0.23	3.902E+05	0	0.00000			0	0.000E+00		
				145	0.25	4.273E+05	0	0.00000			0	0.000E+00		
				146	0.81	1.393E+06	0	0.00000			0	0.000E+00		
				147	0.75	1.282E+06	0	0.00000			0	0.000E+00		
				148	0.86	1.468E+06	0	0.00000			0	0.000E+00		
				149	1.04	1.784E+06	0	0.00000			0	0.000E+00		
				150	1.70	2.917E+06	0	0.00000			0	0.000E+00		
				151	2.21	3.790E+06	0	0.00000			0	0.000E+00		
				152	1.12	1.914E+06	1238	0.91182			1255	9.245E-04		
				13		1.358E+06		0.07014	3858	1.4554E+13		7.112E-05	3911	1.496E+07
						1.765E+07								
	16	1.530E+08	-29.77	162	1.80	3.084E+06	0	0.00000			0	0.000E+00		
				163	2.19	3.753E+06	0	0.00000			0	0.000E+00		
				164	1.68	2.880E+06	163	0.07156			172	7.545E-05		
				165	1.92	3.288E+06	0	0.00000			0	0.000E+00		
				166	2.34	4.013E+06	0	0.00000			0	0.000E+00		
				167	2.03	3.474E+06	0	0.00000			0	0.000E+00		
				168	1.39	2.378E+06	0	0.00000			0	0.000E+00		
				169	0.90	1.542E+06	0	0.00000			0	0.000E+00		
				170	0.57	9.847E+05	0	0.00000			0	0.000E+00		
				171	0.25	4.273E+05	0	0.00000			0	0.000E+00		
				172	1.03	1.765E+06	0	0.00000			0	0.000E+00		
				173	0.68	1.170E+06	0	0.00000			0	0.000E+00		
				174	0.64	1.096E+06	0	0.00000			0	0.000E+00		
				175	1.15	1.969E+06	0	0.00000			0	0.000E+00		
				14		2.273E+06		0.00511	782	5.97721E+11		5.389E-06	825	6.645E+05
						3.183E+07								
	18	2.430E+08	-29.77	183	1.91	3.270E+06	0	0.00000			0	0.000E+00		
				184	1.92	3.288E+06	0	0.00000			0	0.000E+00		
				187	3.00	5.146E+06	0	0.00000			0	0.000E+00		
				188	3.09	5.295E+06	0	0.00000			0	0.000E+00		
				194	1.52	2.601E+06	0	0.00000			0	0.000E+00		
				200	2.73	4.682E+06	0	0.00000			0	0.000E+00		
				201	2.50	4.292E+06	870	0.16158			918	1.704E-04		
				207	4.38	7.506E+06	0	0.00000			0	0.000E+00		
				210	4.91	8.416E+06	0	0.00000			0	0.000E+00		
				211	2.09	3.586E+06	0	0.00000			0	0.000E+00		
				218	4.84	8.305E+06	0	0.00000			0	0.000E+00		
				219	4.81	8.249E+06	0	0.00000			0	0.000E+00		
				12		5.386E+06		0.01346	3272	1.12465E+13		1.420E-05	3450	1.250E+07
						6.463E+07								
	21	1.640E+08	-29.77	231	1.06	1.821E+06	0	0.00000			0	0.000E+00		
				232	0.22	3.716E+05	0	0.00000			0	0.000E+00		
				233	1.90	3.251E+06	0	0.00000			0	0.000E+00		
				234	0.66	1.133E+06	0	0.00000			0	0.000E+00		
				235	0.22	3.716E+05	0	0.00000			0	0.000E+00		
				236	2.61	4.477E+06	0	0.00000			0	0.000E+00		
				237	1.41	2.415E+06	0	0.00000			0	0.000E+00		
				238	4.25	7.283E+06	421	0.13276			444	1.400E-04		
				239	4.31	7.394E+06	0	0.00000			0	0.000E+00		
				9		3.169E+06		0.01475	2419	4.42771E+12		1.555E-05	2551	4.922E+06
						2.852E+07								
	24	8.670E+08	-29.43	253	3.83	6.577E+06	0	0.00000			0	0.000E+00		
				254	2.55	4.366E+06	2594	0.62095			2958	7.080E-04		
				255	1.00	1.709E+06	0	0.00000			0	0.000E+00		
				256	0.71	1.226E+06	0	0.00000			0	0.000E+00		
				257	3.35	5.741E+06	0	0.00000			0	0.000E+00		
				258	3.17	5.444E+06	0	0.00000			0	0.000E+00		
				5		4.177E+06		0.10349	89727	1.24264E+16		1.180E-04	102311	1.616E+10
						2.506E+07								
										1.24738E+16				1.6514E+10
				Total Transect Length =	198.11			Total Stock Biomass =	113479			Total Stock Scatter =	151148	128509
														0.850
									S.E. =	111686			S.E. =	128509
									C.V. =	0.98			C.V. =	0.85

Table 25. Biomass and backscatter estimate for Bonavista Bay - Trinity Bay, from the 1993 acoustic survey.

STOCK AREA	STRATUM	STRATUM AREA (m2)	TARGET STRENGTH (dB/kg)	TRANSECT NUMBER	TRANSECT LENGTH (n.mi.)	TRANSECT AREA (m2)	TRANSECT BIOMASS (t)	WEIGHTED DENSITY (kg/m2)	STRATUM BIOMASS (t)	ABSOLUTE STRATUM VARIANCE	TRANSECT TOTAL SCATTER (m2/sr)	WEIGHTED SCATT. COEFF. (/sr)	STRATUM TOTAL SCATTER (m2/sr)	RELATIVE STRATUM VARIANCE
BB-TB	27	2.770E+08	-29.63	5	0.21	1.801E+05	0	0.00000			0	0.000E+00		
				6	5.80	4.973E+06	0	0.00000			0	0.000E+00		
				7	5.21	4.467E+06	0	0.00000			0	0.000E+00		
				8	4.29	3.679E+06	0	0.00000			0	0.000E+00		
				9	5.90	5.059E+06	0	0.00000			0	0.000E+00		
				10	4.52	3.876E+06	0	0.00000			0	0.000E+00		
				11	5.32	4.562E+06	0	0.00000			0	0.000E+00		
				12	5.30	4.545E+06	4	0.00134			5	1.462E-06		
				13	2.78	2.384E+06	0	0.00000			0	0.000E+00		
				14	3.43	2.941E+06	663	0.21010			722	2.288E-04		
				15	0.84	7.203E+05	13	0.00417			14	4.538E-06		
				16	0.59	5.059E+05	1	0.00016			1	1.759E-07		
				12		3.158E+06		0.01798	4981	2.44489E+13		1.958E-05	5424	2.899E+07
						3.789E+07								
	29	2.080E+08	-28.03	22	1.39	1.192E+06	0	0.00000			0	0.000E+00		
				23	4.93	4.227E+06	131	0.08363			206	1.316E-04		
				24	1.15	9.861E+05	0	0.00000			0	0.000E+00		
				25	0.42	3.601E+05	0	0.00000			0	0.000E+00		
				26	1.25	1.072E+06	23	0.01455			36	2.289E-05		
				5		1.567E+06		0.01964	4084	2.89467E+12		3.091E-05	6428	7.171E+06
						7.837E+06								
	30	2.800E+08	-27.45	27	5.58	4.785E+06	0	0.00000			0	0.000E+00		
				28	2.21	1.895E+06	36	0.01070			64	1.924E-05		
				2		3.340E+06		0.00535	1497	4.60123E+12		9.619E-06	2693	1.489E+07
						6.680E+06								
	31	1.200E+08	-27.45	29	1.30	1.115E+06	34	0.02617			62	4.708E-05		
				30	1.18	1.012E+06	0	0.00000			0	0.000E+00		
				31	0.95	8.146E+05	0	0.00000			0	0.000E+00		
				32	1.26	1.080E+06	0	0.00000			0	0.000E+00		
				33	2.19	1.878E+06	0	0.00000			0	0.000E+00		
				34	4.89	4.193E+06	0	0.00000			0	0.000E+00		
				35	0.13	1.115E+05	27	0.02031			48	3.653E-05		
				36	0.33	2.830E+05	0	0.00000			0	0.000E+00		
				8		1.311E+06		0.00581	697	3.38325E+11		1.045E-05	1254	1.095E+06
						1.049E+07								
	32	7.200E+07	-29.58	37	1.76	1.509E+06	14	0.01883			16	2.074E-05		
				38	0.55	4.716E+05	0	0.00000			0	0.000E+00		
				39	1.34	1.149E+06	0	0.00000			0	0.000E+00		
				40	0.16	1.372E+05	0	0.00000			0	0.000E+00		
				51	0.63	5.402E+05	0	0.00000			0	0.000E+00		
				52	0.80	6.860E+05	0	0.00000			0	0.000E+00		
				6		7.489E+05		0.00314	226	34070840446		3.457E-06	249	4.134E+04
						4.493E+06								
	33	6.600E+07	-29.58	41	0.89	7.632E+05	0	0.00000			0	0.000E+00		
				42	0.88	7.546E+05	0	0.00000			0	0.000E+00		
				43	1.47	1.260E+06	0	0.00000			0	0.000E+00		
				44	1.21	1.038E+06	0	0.00000			0	0.000E+00		
				45	1.08	9.261E+05	19	0.01968			21	2.168E-05		
				46	0.80	6.860E+05	0	0.00000			0	0.000E+00		
				47	1.49	1.278E+06	1	0.00150			2	1.656E-06		
				7		9.579E+05		0.00303	200	34210122735		3.333E-06	220	4.151E+04
						6.705E+06								
	34	1.340E+08	-29.58	48	2.77	2.375E+06	0	0.00030			0	3.327E-07		
				49	1.23	1.055E+06	0	0.00000			0	0.000E+00		
				50	1.34	1.149E+06	127	0.10113			140	1.114E-04		
				53	0.78	6.688E+05	0	0.00000			0	0.000E+00		
				54	0.50	4.287E+05	0	0.00000			0	0.000E+00		
				55	1.77	1.518E+06	0	0.00000			0	0.000E+00		
				56	1.88	1.612E+06	0	0.00000			0	0.000E+00		
				7		1.258E+06		0.01449	1942	3.99306E+12		1.596E-05	2139	4.845E+06
						8.806E+06								

Table 25 cont'. Biomass and backscatter estimate for Bonavista Bay - Trinity Bay, from the 1993 acoustic survey.

STOCK AREA	STRATUM	STRATUM AREA (m2)	TARGET STRENGTH (dB/kg)	TRANSECT NUMBER	TRANSECT LENGTH (n.mi.)	TRANSECT AREA (m2)	TRANSECT BIOMASS (t)	WEIGHTED DENSITY (kg/m2)	STRATUM BIOMASS (t)	ABSOLUTE STRATUM VARIANCE	TRANSECT TOTAL SCATTER (m2/sr)	WEIGHTED SCATT. COEFF. (/sr)	STRATUM TOTAL SCATTER (m2/sr)	RELATIVE STRATUM VARIANCE
	38	9.200E+07	-27.49	85	0.38	3.087E+05	0	0.00000			0	0.000E+00		
				86	0.23	1.972E+05	0	0.00000			0	0.000E+00		
				87	1.33	1.140E+06	0	0.00000			0	0.000E+00		
				88	1.05	9.003E+05	0	0.00000			0	0.000E+00		
				89	0.58	4.973E+05	0	0.00000			0	0.000E+00		
				90	0.57	4.888E+05	0	0.00000			0	0.000E+00		
				91	0.51	4.373E+05	0	0.00000			0	0.000E+00		
				92	0.52	4.459E+05	0	0.00000			0	0.000E+00		
				93	0.23	1.972E+05	0	0.00000			0	0.000E+00		
				94	0.16	1.372E+05	0	0.00000			0	0.000E+00		
				95	0.25	2.144E+05	0	0.00000			0	0.000E+00		
				96	0.26	2.229E+05	0	0.00000			0	0.000E+00		
				97	0.34	2.915E+05	0	0.00000			0	0.000E+00		
				98	0.49	4.202E+05	0	0.00000			0	0.000E+00		
				99	0.87	7.460E+05	10	0.02067			18	3.685E-05		
				100	0.68	5.831E+05	0	0.00000			0	0.000E+00		
				101	0.26	2.229E+05	0	0.00000			0	0.000E+00		
				102	1.91	1.638E+06	42	0.08837			76	1.575E-04		
				103	0.46	3.944E+05	13	0.02704			23	4.819E-05		
				104	0.27	2.315E+05	0	0.00000			0	0.000E+00		
				105	0.41	3.516E+05	0	0.00000			0	0.000E+00		
				21		4.794E+05		0.00648	596	1.15253E+11		1.155E-05	1063	3.647E+05
						1.007E+07								
	40	7.700E+07	-27.49	114	0.13	1.115E+05	0	0.00000			0	0.000E+00		
				115	0.13	1.115E+05	0	0.00000			0	0.000E+00		
				116	0.12	1.029E+05	0	0.00000			0	0.000E+00		
				117	0.30	2.572E+05	0	0.00000			0	0.000E+00		
				118	0.10	8.575E+04	0	0.00000			0	0.000E+00		
				119	0.11	9.432E+04	0	0.00000			0	0.000E+00		
				120	0.17	1.458E+05	0	0.00000			0	0.000E+00		
				121	0.17	1.458E+05	0	0.00000			0	0.000E+00		
				122	0.87	7.460E+05	3	0.00641			6	1.142E-05		
				123	1.06	9.089E+05	0	0.00000			0	0.000E+00		
				124	0.99	8.489E+05	41	0.08004			73	1.427E-04		
				125	1.99	1.706E+06	85	0.16566			151	2.953E-04		
				126	1.15	9.861E+05	0	0.00000			0	0.000E+00		
				127	0.99	8.489E+05	0	0.00000			0	0.000E+00		
				128	0.84	7.203E+05	0	0.00023			0	4.178E-07		
				129	0.62	5.316E+05	42	0.08122			74	1.448E-04		
				130	0.41	3.516E+05	190	0.37118			339	6.616E-04		
				17		5.120E+05		0.04146	3192	3.13126E+12		7.389E-05	5689	9.948E+06
						8.703E+06								
	41	5.400E+07	-27.49	131	0.40	3.430E+05	0	0.00000			0	0.000E+00		
				132	0.43	3.687E+05	137	0.40904			245	7.291E-04		
				133	0.25	2.144E+05	0	0.00000			0	0.000E+00		
				134	0.37	3.173E+05	0	0.00000			0	0.000E+00		
				135	0.36	3.087E+05	149	0.44230			265	7.883E-04		
				136	0.31	2.658E+05	10	0.02916			17	5.197E-05		
				137	0.22	1.886E+05	0	0.00000			0	0.000E+00		
				138	1.00	8.575E+05	0	0.00000			0	0.000E+00		
				139	0.28	2.401E+05	130	0.38717			232	6.901E-04		
				140	0.30	2.572E+05	0	0.00000			0	0.000E+00		
				10		3.361E+05		0.12677	6845	1.38919E+13		2.259E-04	12201	4.413E+07
						3.361E+06								
	45	9.500E+07	-27.49	147	0.92	7.889E+05	0	0.00000			0	0.000E+00		
				148	1.08	9.261E+05	16	0.01170			28	2.085E-05		
				149	2.31	1.981E+06	0	0.00000			0	0.000E+00		
				150	1.84	1.578E+06	0	0.00000			0	0.000E+00		
				151	0.79	6.774E+05	0	0.00000			0	0.000E+00		
				152	1.70	1.458E+06	0	0.00000			0	0.000E+00		
				153	2.00	1.715E+06	0	0.00000			0	0.000E+00		
				154	1.41	1.209E+06	0	0.00000			0	0.000E+00		
				155	1.47	1.260E+06	0	0.00000			0	0.000E+00		
				186	2.36	2.024E+06	0	0.00000			0	0.000E+00		
				187	1.40	1.200E+06	0	0.00000			0	0.000E+00		
				11		1.347E+06		0.00106	101	10952820908		1.896E-06	180	3.480E+04
						1.482E+07								
										5.34938E+13				1.116E+08
				Total Transect Length =	139.56			Total Stock Biomass =	24362			Total Stock Scatter =	37541	
									S.E.=	7314			S.E.=	10562
									C.V.=	0.300			C.V.=	0.281

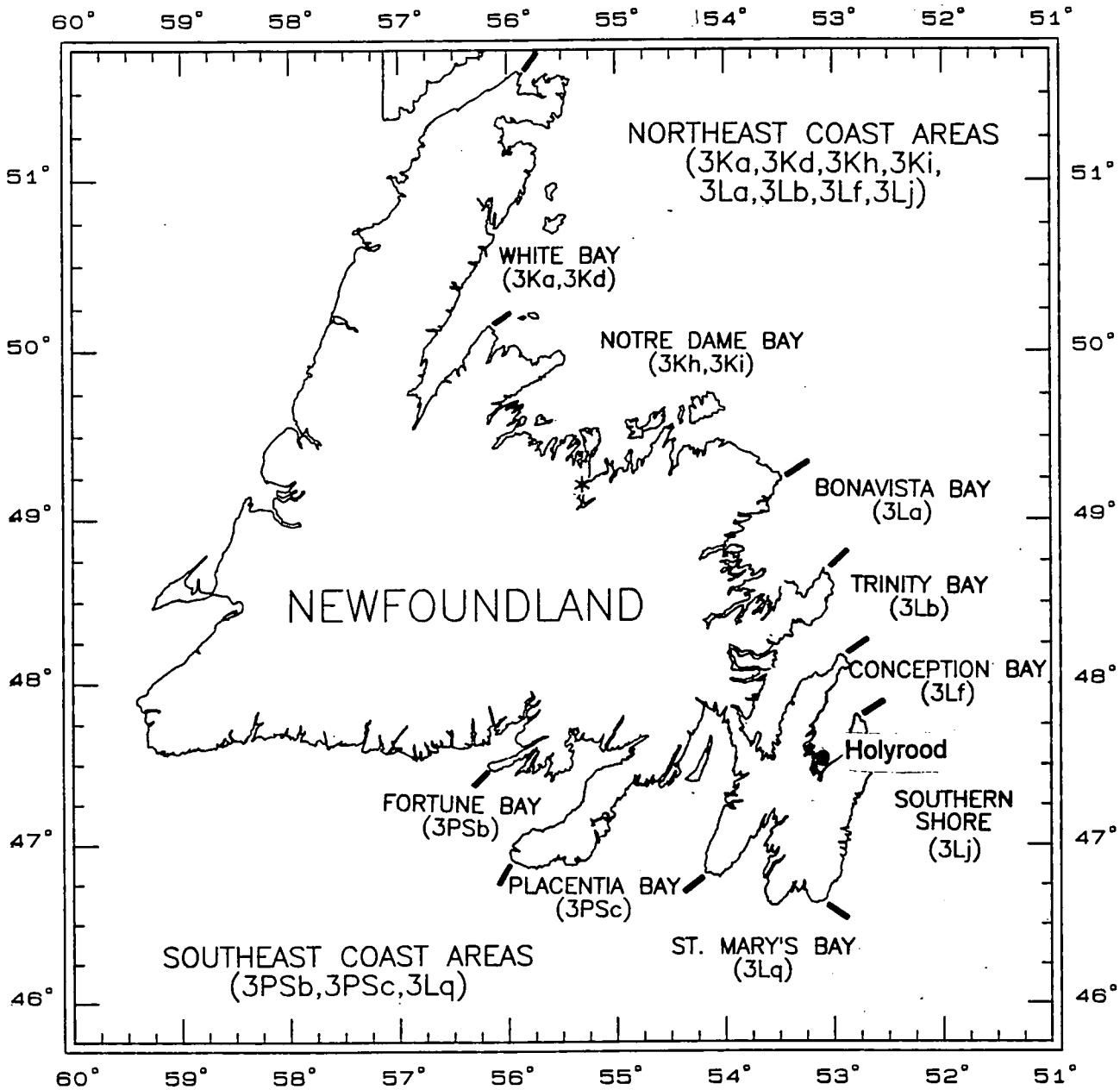


Fig. 1. Area map indicating herring stock complexes within the Newfoundland region and the location of the 1993 herring target strength experiments in Holyrood, Conception Bay.

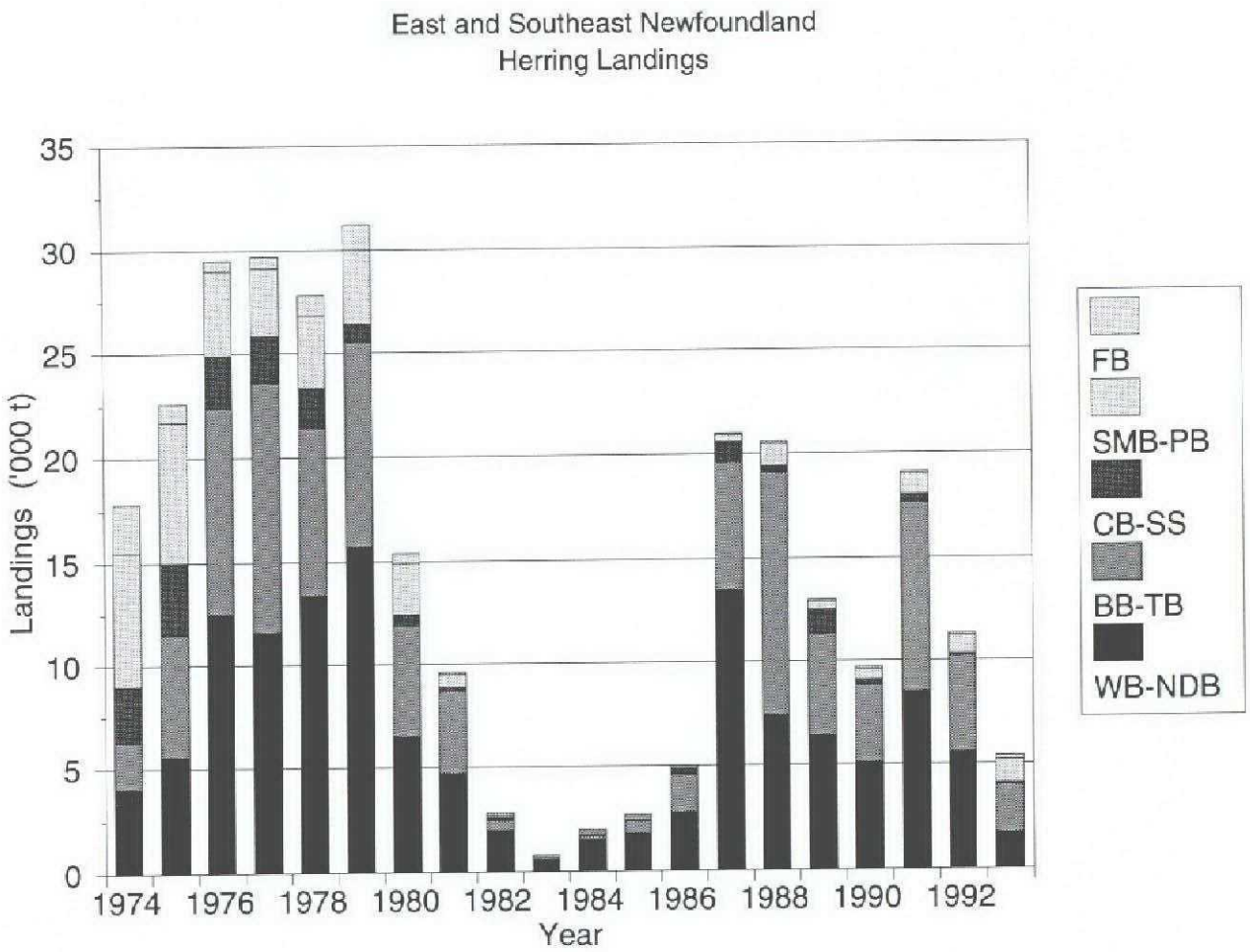


Fig. 2. East and southeast Newfoundland herring landings, 1974 - 1993.

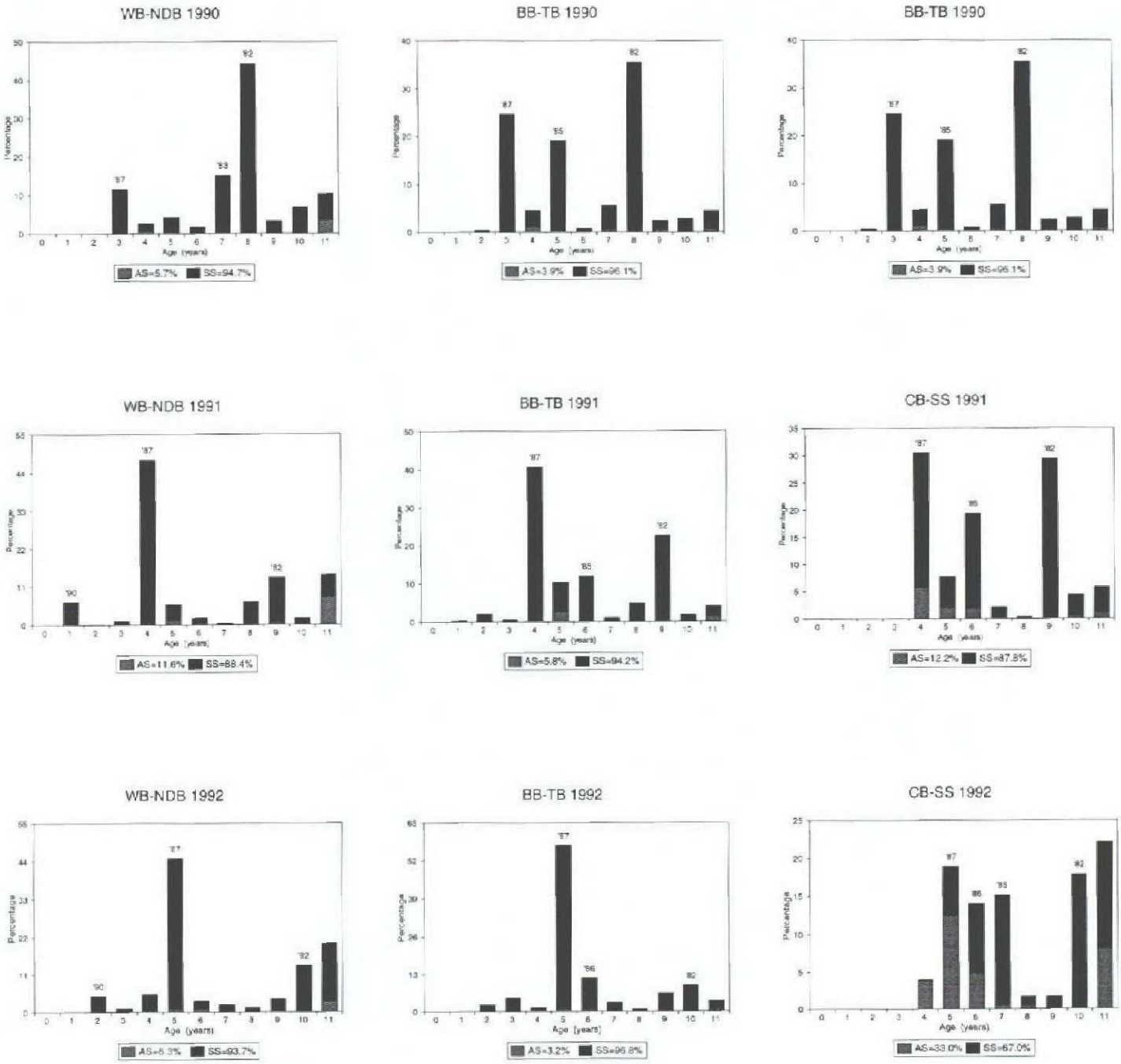


Fig. 3. Age distribution of herring from the commercial fishery, White Bay - Notre Dame Bay, Bonavista Bay - Trinity Bay, and Conception Bay - Southern Shore, 1990 - 1992.

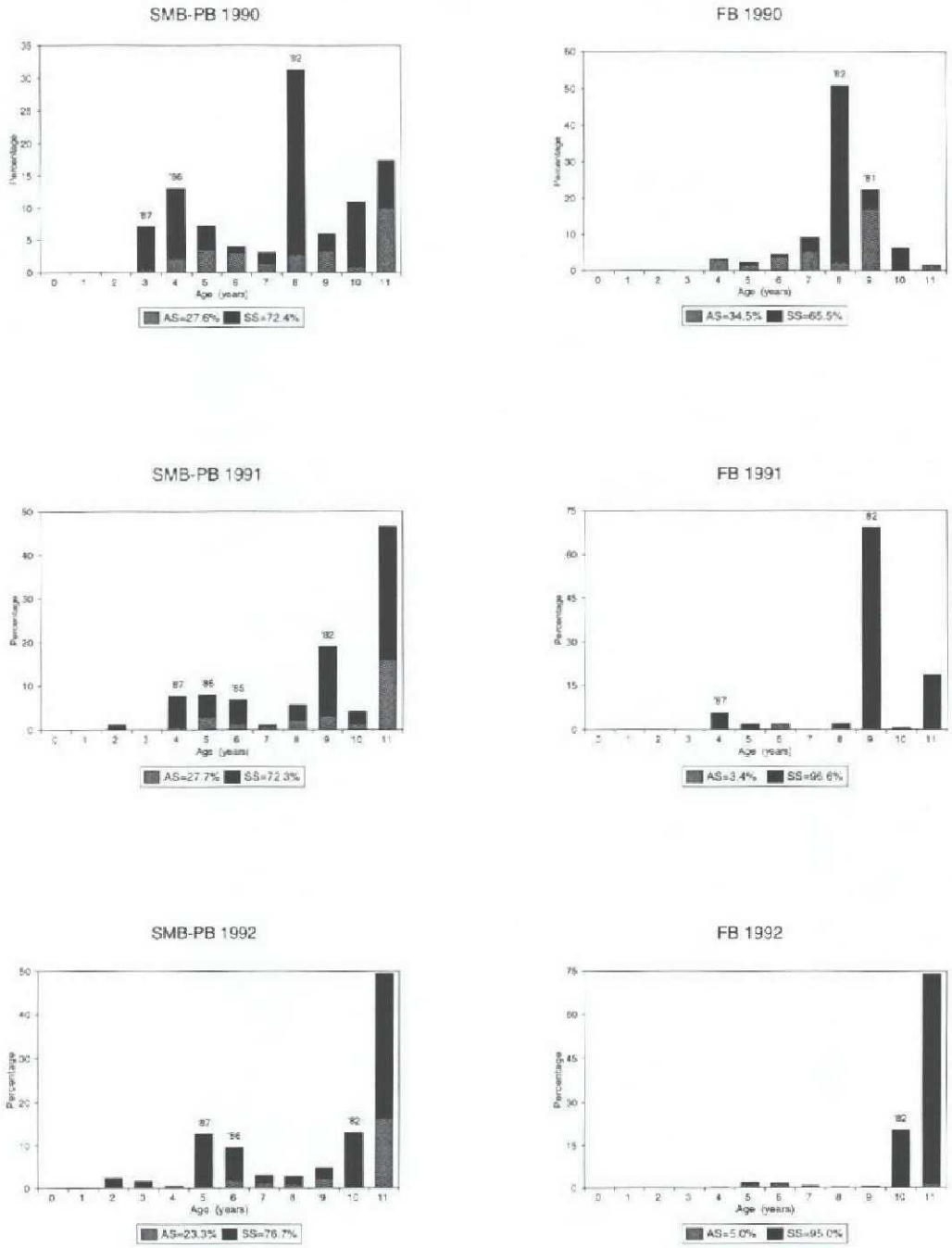


Fig. 4. Age distribution of herring from the commercial fishery, St. Mary's Bay - Placentia Bay and Fortune Bay, 1990 -1992.

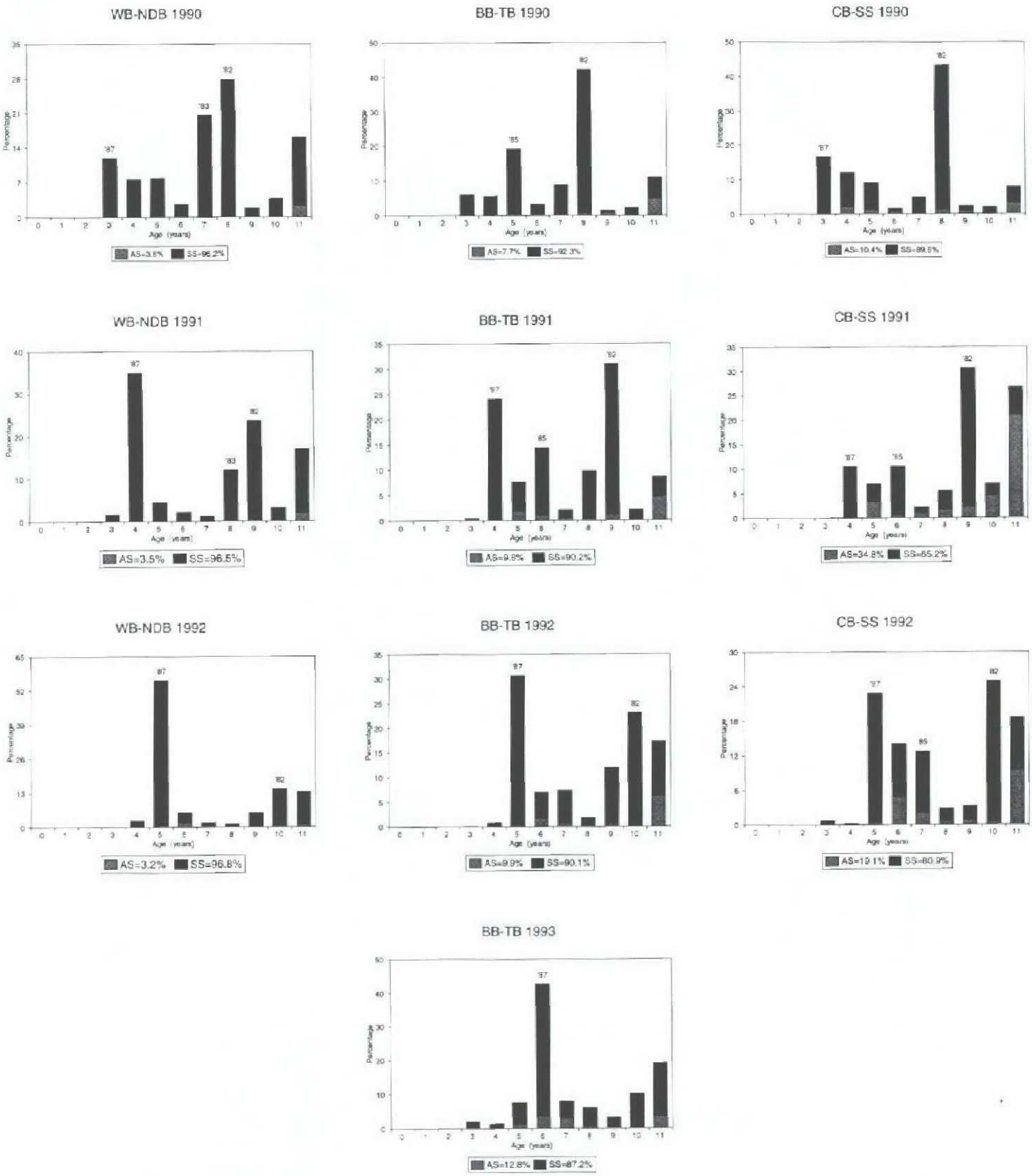


Fig. 5. Age distribution (by number) of herring from the spring reseach gillnet program, White Bay - Notre Dame Bay, Bonavista Bay - Trinity Bay, and Conception Bay - Southern Shore, 1990 - 1993.

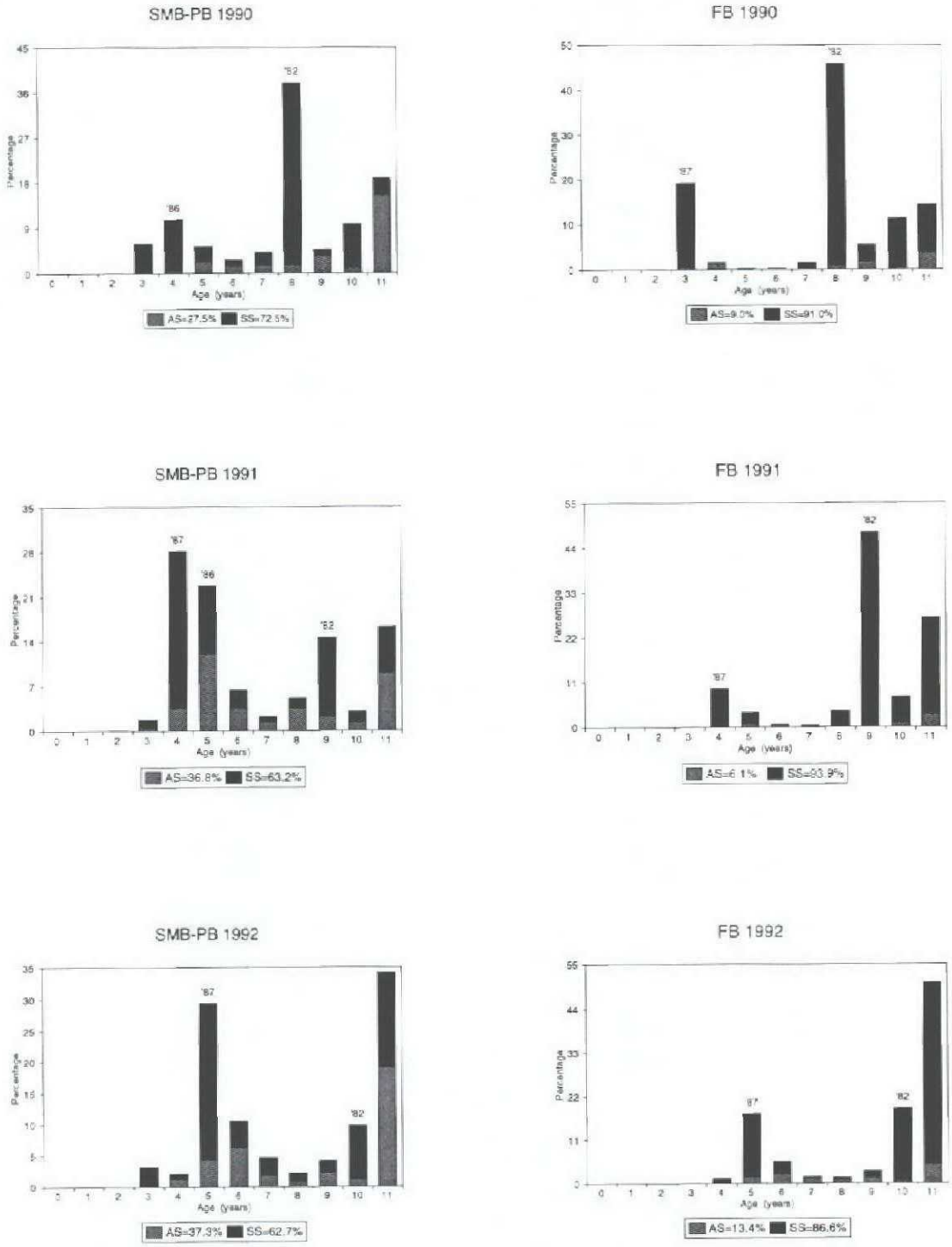


Fig. 6. Age distribution (by number) of herring from the spring research gillnet program, St. Mary's Bay - Placentia Bay, and Fortune Bay, 1990 - 1992.

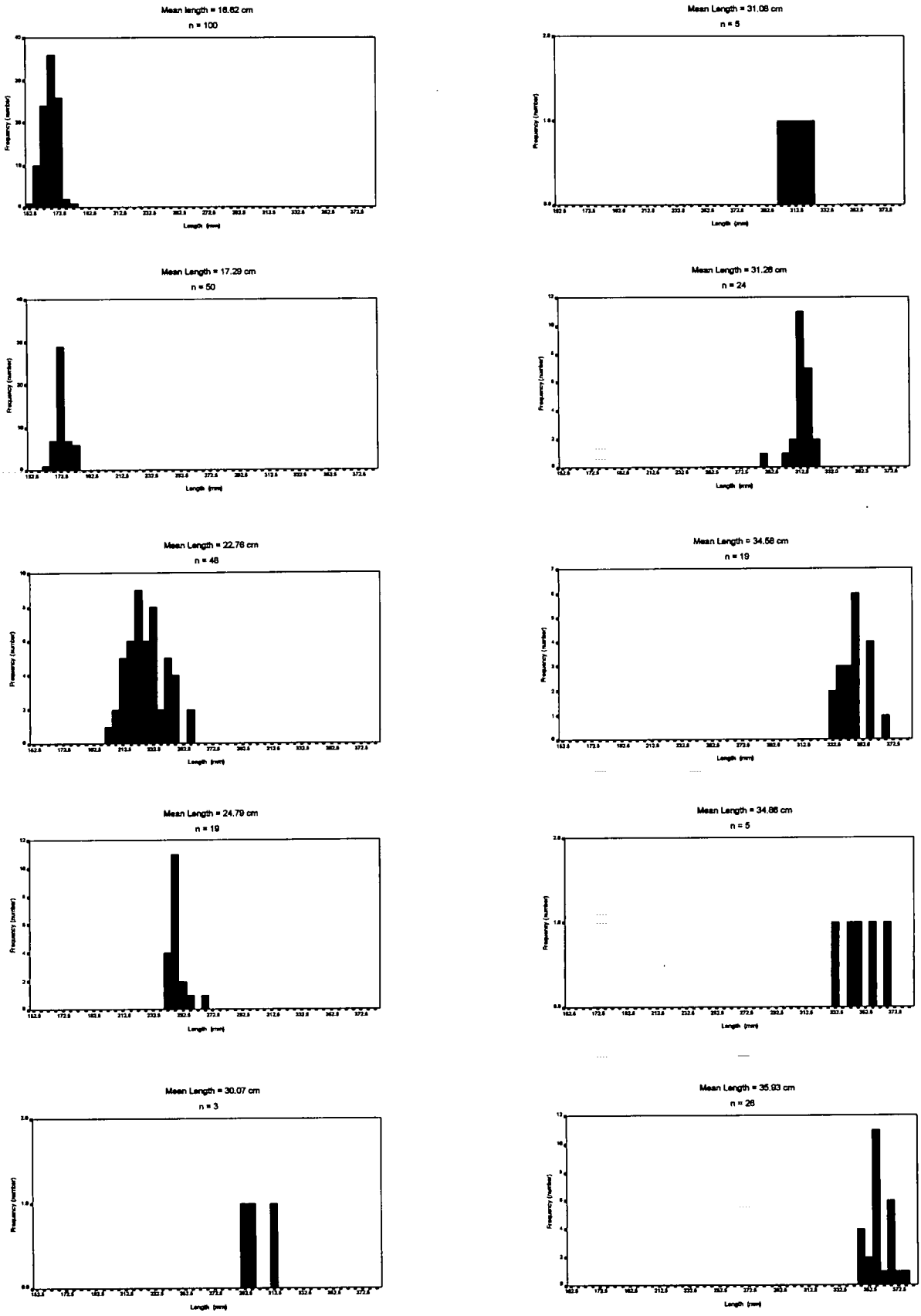


Fig. 7. Length distributions and sample sizes of herring used for 1993 Holyrood herring target strength experiments.

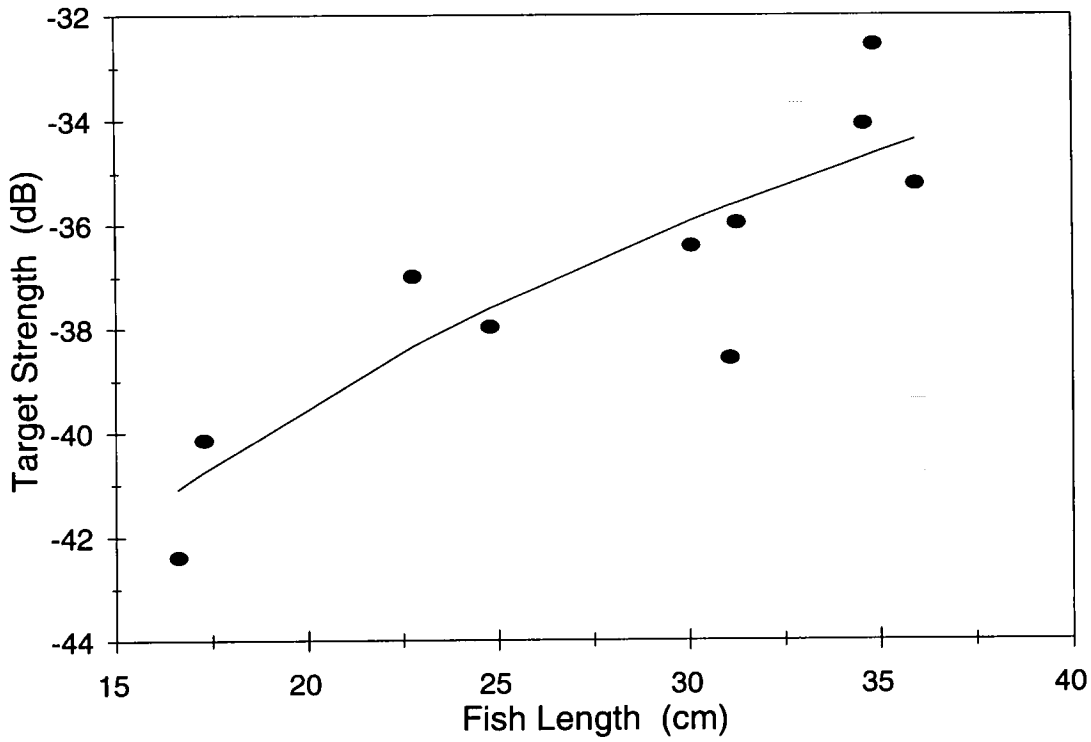
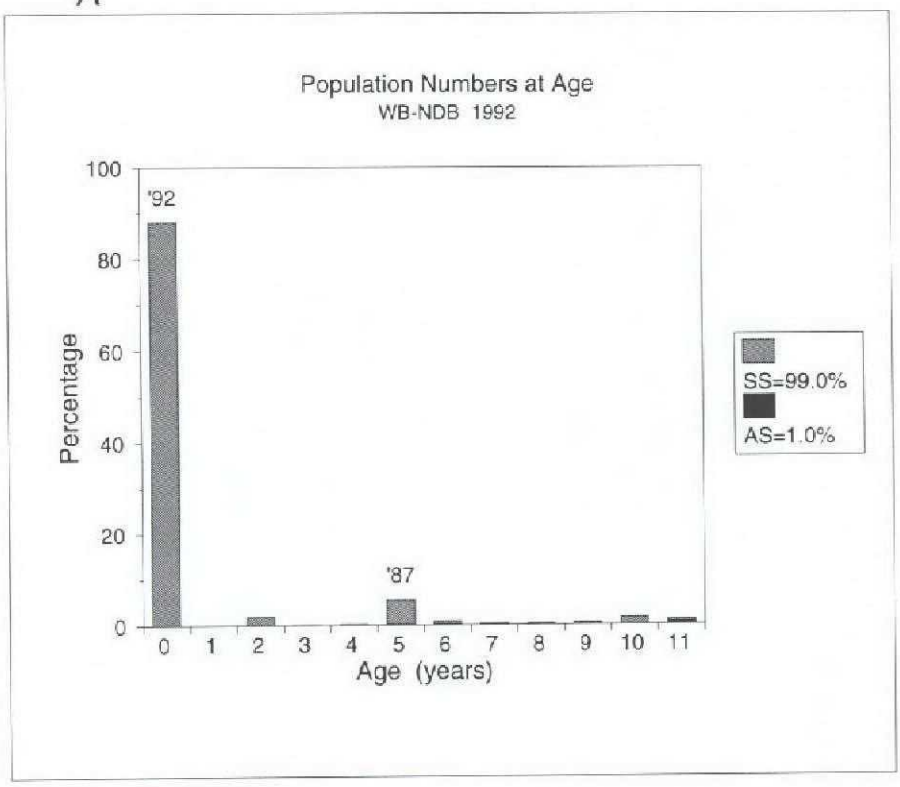


Fig. 8. Herring target strength - fish length relationship derived from 1993 experiments conducted in Holyrood, Conception Bay.

A



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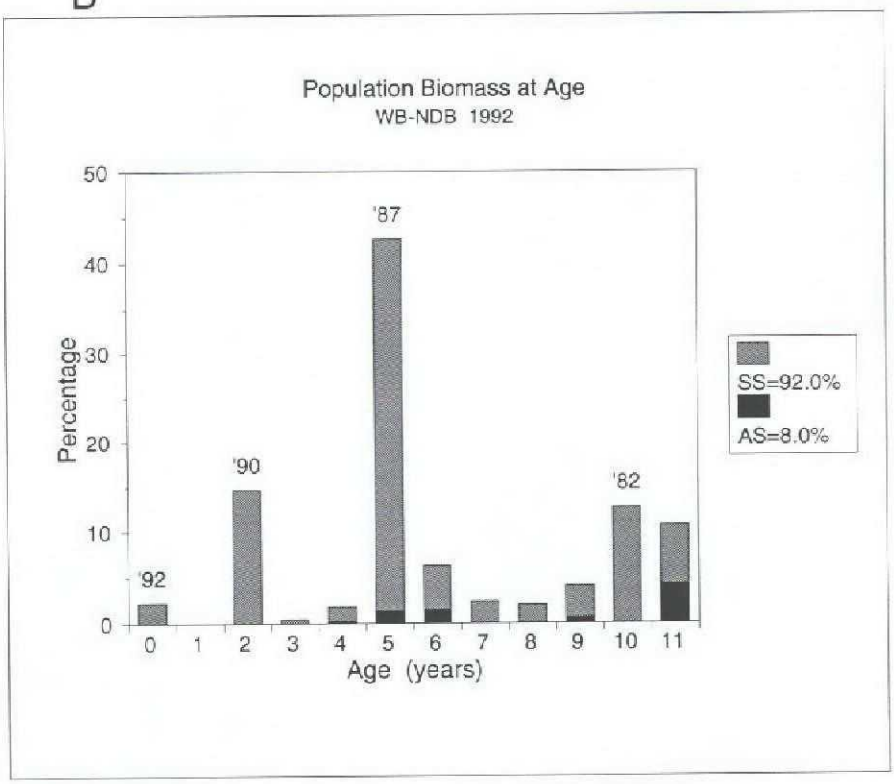
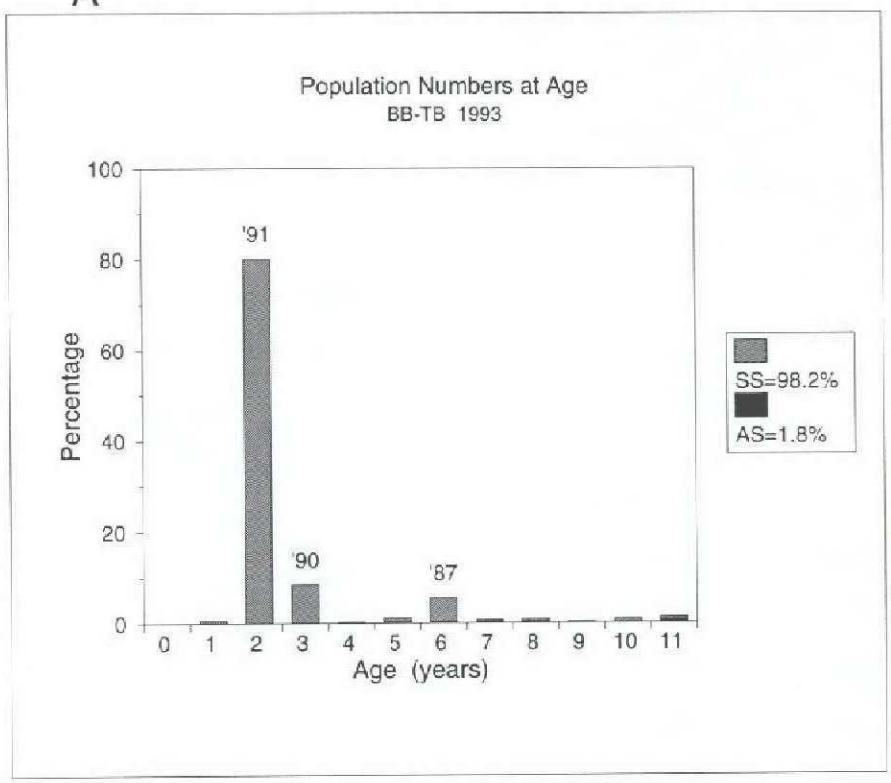


Fig. 9. Population numbers at age and biomass at age from the 1992 White Bay - Notre Dame Bay herring acoustic survey.

A



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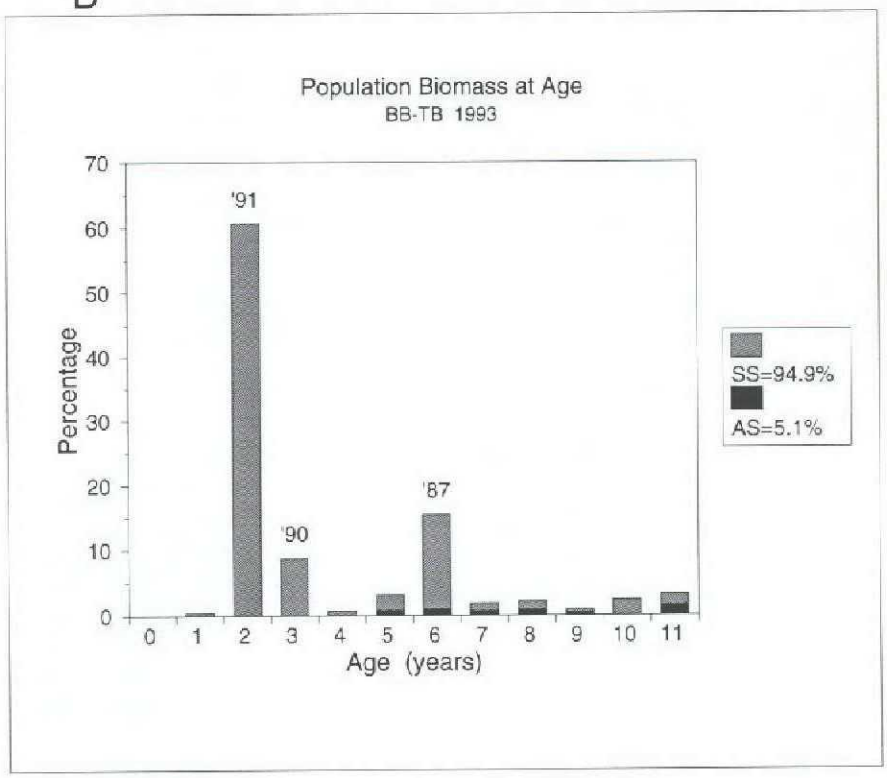

Fig. 10. Population numbers at age and biomass at age from the 1993 Bonavista Bay - Trinity Bay herring acoustic survey.