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Newfoundland East and Southeast Coast Herring - 1987 Assessment

by

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ABSTRACT

Data analyses are presented from 1987 for the five herring stock complexes within the Newfoundland Region: a) White Bay-Notre Dame Bay, 2) Bonavista Bay-Trinity Bay, 3) Conception Bay-Southern Shore, 4) St. Mary's Bay-Placentia Bay, and 5) Fortune Bay. Commercial landings increased from 4800 t in 1986 to 22600 t in 1987. The 1982 year-class continued to dominate both in the commercial fishery and in the research gillnet program. Biomass estimates were calculated from an acoustic survey using a dual beam hydroacoustic system rather than the sonar-sounder technique of previous years. Advice is provided based upon the acoustic survey, research gillnet catch rates, the dominance off a single year-class and historical fishing patterns.

RESUME

On présente des analyse des données de 1987 sur les cinq zones de stocks de hareng de la région de Terre-Neuve : 1) baie White-baie Norte Dame, 2) baie de Bonavista-baie de Trinité, 3) baie de Conception-côte sud, 4) baie St. Mary's-baie de Placentia et 5) baie de Fortune. Les débarquements commerciaux sont passées de 4 800 t en 1986 à 22 600 t en 1987. La classe d'âge de 1982 est restée prédominante tant dans la pêche commerciale que dans le programme de recherche au filet maillant. Les estimations de biomasse ont été établies à partir d'une étude acoustique réalisée au moyen d'un système hydro-acoustique à double faisceau plutôt qu'à l'aide de sonars et d'échosondeurs comme cela s'était fait précédemment. Les avis formulés sont fondés sur l'étude acoustique, sur les taux de prises obtenus dans le cadre du programme de recherche au filet maillant, sur la prédominance d'une classe d'âge et sur les caractéristiques historiques de la pêche.

INTRODUCTION

DESCRIPTION OF THE FISHERY

As in 1986, the 1987 herring management plan provided an allowance for fixed gear (gillnets and traps) within each stock area (Fig. 1) with allocations to bar seines and purse seines based on TAC residuals and/or market expectations. There was also a limited fixed gear allowance and bar seine allocation along the Labrador coast and south coast (Pass Island to Cinq Cerf Bay) of Newfoundland. The spring fishery opened April 6 in all areas and closed June 7 in St. Mary's Bay-Placentia Bay, and Fortune Bay but was extended to June 21 in the three northern areas. The fall fishery opened August 15 and closed December 31 for all areas.

The management plan provided allowances and allocations for the spring fishery. For the two southeast coast stock areas, the entire TAC was allocated to the spring fishery; however, for the three northern areas, a portion of the TAC was held in reserve. The fall fishery allocations included uncaught portions of the spring fishery allocations plus a portion of the reserves, where necessary. Advised catch levels and allocations by fleet sector and stock area were as follows:

Stock Area	TAC (t)	Fixed gear allowance (t)	Allocation (t)		Reserve (t)
			Bar seine	Purse seine	
White Bay-Notre Dame Bay (WB-NDB)	31500	6000	1000 1900	6000 9700	6900
Bonavista Bay-Trinity Bay (BB-TB)	13700	2500	150 1150	6000 1650	2250
Conception Bay-Southern Shore (CB-SS)	3500	1000	150 100	1000 300	950
St. Mary's Bay-Placentia Bay (SMB-PB)	2550	950	300 300	500 500	0
Fortune Bay (FB)	2400	500	1500	400	0
Labrador Coast	-	500	200	-	-
South coast Newfoundland	-	100	100	-	-

NOMINAL CATCHES

TACs and landings (x 10^3 t) by stock area are listed below for 1980 to 1987.

		1980	1981	1982	1984	1984	1985	1986	1987
WB-NDB	TAC	5.3	5.3	1.2	0.0	1.5	2.0	5.5	32.5
	Catch	6.5	4.7	2.0	0.4	1.5	1.8	2.7*	14.0*
BB-TB	TAC	4.4	4.8	0.7	0.0	0.4	0.8	3.8	13.7
	Catch	5.4	4.0	0.5	0.1	0.2	0.6	1.7*	6.9*
CB-SS	TAC	0.4	0.5	0.2	0.0	0.1	0.2	0.6	3.5
	Catch	0.5	0.2	0.1	≤0.1	≤0.1	0.1	0.2*	1.3*
SMB-PB	TAC	2.5	1.2	0.0	0.0	0.0	0.6	2.1	2.5
	Catch	2.5	0.6	≤0.1	≤0.1	0.1	0.1	0.1*	0.3*
FB	TAC	1.0	0.2	0.0	0.0	0.0	0.3	0.7	2.4
	Catch	0.5	0.1	≤0.1	≤0.1	≤0.1	0.1	0.1*	0.1*

* preliminary

ANECDOTAL INFORMATION

The historical development of the Newfoundland herring fishery has been reviewed in previous documents (Wheeler and Chaulk 1987, Wheeler et al. 1986). The fishery reopened in 1986 after several years of closure due to low stock abundance. Quotas were not taken in either 1986 or 1987 due to poor market conditions. However, even given the poor market conditions, 1987 landings from the northern stock areas (Tables 1-3) were in excess of 20,500 t, comparable with the peak years of 1976-79. In these areas, the 1987 fishery was concentrated in the fall when plants could obtain the high fat content product required by the limited market. The fishery in the two southeast coast stock areas, traditionally a winter and spring fishery, did not develop in 1987 (Tables 4 and 5) as markets were poor and plants were preparing for the more lucrative capelin fishery. There were attempts during the spring to supply herring for the roe market; however, the protracted spawning period made it difficult to obtain sufficient roe at the required stage of maturity.

INPUT DATA

BIOLOGICAL SAMPLING

The number of herring sampled in the Newfoundland region in 1987, from the commercial fishery and research programs, was 13,462 (Table 6). This represented a decrease of 15% from 1986, due mainly to a decrease in the number of research samples collected. When apportioned by stock area, month, and gear type (Table 7), samples were available for 89% of the commercial catch; up from 79% in 1986. Samples were collected randomly; all fish sampled were measured and aged.

Mean weights at age for 1987 (Table 8) were derived from commercial and research samples of spring spawning herring collected from January to June.

COMMERCIAL FISHERY DATA

Commercial catch-at-age data (Tables 9-13 and Figs. 2-3) were calculated for spring and autumn spawners for each stock area by applying age compositions and mean fish weights from the appropriate commercial samples to the landings. As in the past, catch-at-age data were generated using research samples collected from commercial mesh size gillnets for those areas where no commercial samples were available. Both 1986 and 1987 catch data are preliminary as final catch statistics are not yet available. Data for autumn spawners, 1970-87, have been included in this assessment as in the three southern areas, autumn spawners have, at times, accounted for greater than 25% of the catch.

As in 1986, the 1982 year-class of spring spawners dominated the fishery (by number) in all areas, accounting for 53% to 80% of the catch. The relative importance of the 1979 year-class declined from previous years especially in the northern areas where the 1983 year-class was the second most abundant. The 1986 year-class represented approximately 10% of the catch in Conception Bay-Southern Shore. This may be anomalous, i.e. a function of the samples chosen to calculate catch at age. Further evidence in 1988 will be required before suggesting the strength of this year-class. The 1985 year-class represented between 2% to 5% of the commercial catch in three of the five stock areas. This is consistent with reports during the fishery of small fish being available in most areas.

The percentage of spring spawners in the catch increased in all areas consistent with the recruitment of the 1982 year-class. As in previous years, the percentage of autumn spawners generally increased from north to south.

Except for Bonavista Bay-Trinity Bay, the percent age composition of the 1987 commercial catch (Fig. 4) is very comparable to that projected from last year's assessment. As was discussed last year, sampling during the 1986 acoustic survey in Bonavista Bay-Trinity Bay from which projections were made, may have been biased toward the 1985 year-class accounting for differences in that area between the projected and observed catch at age (Wheeler and Chaulk 1987).

No commercial catch-rate data were collected in 1987. As gillnet landings represented less than 15% of the total catch, it was decided not to use data from this source to calculate catch rates. Purse seines accounted for 82% of the landings. However, purse seine catch rates have not been used recently as an index of abundance for any Atlantic Canada herring stock and for the North Sea herring it has been determined that commercial catch rates may not be a useful indicator of abundance (Anon. 1988). Therefore, it was decided not to collect such information in the Newfoundland region, but to concentrate research efforts on abundance indices independent of the commercial fishery.

RESEARCH SURVEY DATA

A. Acoustic Survey

Subsequent to CAFSAC deliberations last year, it was decided to conduct a survey in the fall of 1987 along the northeast coast utilizing a dual-beam hydroacoustic system.

The objectives of the survey were as follows:

1) To derive unscaled density estimates through echo integration along predetermined coastline transects in each of the stock areas.

2) To determine in situ mean backscattering cross-section estimates from as many herring schools as possible in order to scale the integration outputs.

3) To derive population numbers and biomass estimates by areal expansion of the density estimates from the coastline transects.

4) To compare density estimates between coastline (along shore) transects and zigzag (inshore-offshore) transects in a subsample of randomly selected areas to determine if herring densities were greater nearshore (0-50 m) or offshore (50-90 m) within the stock boundaries.

5) To determine herring distribution patterns within the stock areas to aid in future survey design.

Prior to the survey, each of the two northern stock areas, White Bay-Notre Dame Bay and Bonavista Bay-Trinity Bay was divided into grids or strata of approximately 100 km^2 surface area (Appendices 1-4). As in previous surveys, the outer stock boundary was determined by the 90 m contour. However, in areas with extensive offshore shoal water, the outer boundary was determined as the point four nautical miles from shore. Grids with equal surface area were chosen to allow intra-stock density differences to be accounted for in stock biomass estimation. A coastline transect (i.e. parallel to shore) through each grid was chosen. As these transects were not chosen randomly within grids, results based upon areal expansions, may be biased. However, the objective was to make the transects and survey design comparable with previous years. Survey coverage was included in each grid throughout the entire stock area to avoid the problem of extrapolation from surveyed to non-surveyed areas experienced in previous surveys. A more detailed zigzag transect, from shore to the outer stock boundary, was included in addition to the coastline transect in seven randomly selected grids. The purpose was to provide replicate coverage and to compare herring density estimates nearshore and offshore within the stock area. It was impossible due to time constraints to include replicate transects in all grids.

The survey commenced October 11, 1987, off Cape Bauld at the northern extreme of White Bay and proceeded southward, terminating December 10, 1987, off Grates Point at the southern extreme of Trinity Bay. Approximately 2900 km of transect were surveyed in 63 of the 82 predetermined grids. The remaining 19 grids were not surveyed due to inclement weather conditions and insufficient survey time. Most of the non-surveyed grids (70%) were in eastern Notre Dame Bay. Biomass estimates calculated for adjacent grids were small (<20 t) suggesting that exclusion of these non-surveyed grids would not affect overall results. A BIOSONICS dual beam hydroacoustic system was deployed from the R. V. MARINUS during the entire survey. A commercial purse seine vessel was chartered from October 11 to November 20 to collect biological samples. No vessel was available from November 21 to December 10. During this time, samples were obtained from commercial vessels fishing in the survey area.

The age structure and spawning affinity of herring was derived from samples taken from 19 locations in 13 grids (Table 14). Sampling was adequate in Notre Dame Bay, Bonavista Bay, and Trinity Bay where samples were obtained from grids which accounted for at least 29% of the total fish numbers. However, in White Bay, samples were obtained from one grid only which accounted for 1.5% of the total estimated numbers. As in the commercial fishery, age distributions from the acoustic survey samples, weighted to account for density differences between grids (Fig. 5) showed the dominance of the 1982 year-class in both stock areas. In White Bay-Notre Dame Bay, the 1982 year-class represented 52% of the population (by number), in Bonavista Bay-Trinity Bay 66%. The 1983 year-class was second most dominant, and represented 19% and 17% of the population in each area. The 1985 year-class accounted for approximately 4% of the population in both areas and the 1987 year-class 11% in White Bay-Notre Dame Bay. As in the past, spring spawners dominated, representing in excess of 90% of the population in both areas.

B. Research Gillnet Program

The research gillnet program was continued for the eighth consecutive year during the spring and fall along the northeast coast and for the sixth year during the spring along the southeast coast. In 1987, 22 fishermen were each contracted to fish a fleet of five gillnets, mesh sizes 2", 2 1/4", 2 1/2", 2 3/4", and 3" for one month, to maintain an accurate daily log record of catches and to collect and freeze samples of their catch. Catch at age (Tables 15-21) and age distributions (Figs. 6 and 7) were calculated by applying age distributions of samples taken during the month, normally at four-day intervals, to catches during that interval and then combining these interval age distributions to obtain one for the entire month. The 1982 year-class dominated in all areas, representing 50-70% of the catch, by number. No other year-class, except for fish ages 11+ in White Bay-Notre Dame Bay, accounted for more than 10% of the catch. The 1985 year-class represented 5% of the catch in Bonavista Bay-Trinity Bay. In comparison, in 1984, the 1982 year-class represented 10% of the catch in the same area. The percentage of spring-spawners has remained consistent from last year in the two northern stock areas but has continued to increase in the southern areas. Catch rates (Tables 22-27 and Fig. 8) have increased from 1986 to 1987 for three of the four stock areas for which there are data available. For Notre Dame Bay, catch rates are the second highest on record. For St. Mary's Bay-Placentia Bay and Fortune Bay, catch rates are the highest on record. However, for Bonavista Bay-Trinity Bay, they are the lowest yet recorded. Logbooks for all fishermen from 1980-87 were reviewed to determine if catch rate fluctuations could be better explained. For White Bay-Notre Dame Bay, catch rates have increased from 1986 to 1987 due to substantial increases in catches for two of the five fishermen. However, catch rates for two of the fishermen declined substantially from 1986 to 1987. One fisherman suggested it was due to prevailing offshore winds in 1987. Examination of his logbook showed little difference in wind direction and speed between 1986 and 1987. Catch rates for all fishermen in Bonavista Bay-Trinity Bay declined from 1986 to 1987. This is impossible to explain given the recruitment of the 1982 year-class to the stock. One fisherman in Bonavista Bay suggested that conditions were good for herring in the fall of 1987; however, the fish remained too deep for the nets. This was also apparent during the acoustic survey as purse seine sampling was more difficult due to the depth distribution of the fish. Another fisherman in Trinity Bay noted that there were no herring netted anywhere in Trinity Bay during the fall of 1987. He had kept nets in the water until December with no success. However, fishermen in the same area are presently (April 1988) experiencing very large catch rates. There were no data collected

from Conception Bay-Southern Shore in the fall of 1987 due to a misunderstanding with the fishermen involved. However, catch rates of two new fishermen during the spring were consistent with results from 1986. Catch rates of the five fishermen in St. Mary's Bay-Placentia Bay have remained very consistent over the last three years. In 1987, the catch rate of the 2" nets decreased; whereas, the catch rates of the 2 1/4" and 2 1/2" nets increased (Fig. 7) consistent with the recruitment of a single (1982) year-class. In Fortune Bay, catch rates have increased steadily from 1982 with the exception of 1986. Similar to St. Mary's Bay-Placentia Bay, the catch rates were higher in the larger mesh sized nets in 1987. Catch rates for the two southeast coast stock areas appear to better reflect stock conditions than do those of the three northern areas. This may be a function of both migratory patterns and possibly market conditions. The research gillnet program is conducted during the fall for the three northern areas at a time when herring are migrating back into the bays to overwinter. Catch rates are therefore dependent both upon the temporal and spatial patterns of migration. Along the southeast coast, the program is conducted during the spring on overwintering fish which are preparing to spawn. Market conditions for herring have been poor and variable during the 1980s. The degree to which a fisherman maintains his nets along the northeast coast during the fall may depend upon the availability of markets for the fish. This is less of a problem along the southeast coast during the spring as most fishermen consistently either use or sell their herring for lobster bait. Research gillnet data from 1980-87 will be reviewed in detail prior to the next assessment to determine if data should be collected during the fall when fish are still migrating or only in the spring on overwintering concentrations.

ASSESSMENT RESULTS

BIOMASS CALCULATION FROM THE ACOUSTIC SURVEY

During the acoustic survey, integration was conducted in real time along the transects and dual beam data, necessary to calculate target strengths, were collected and stored for later analysis by back-tracking over previously integrated fish concentrations.

The water column was divided into ten meter depth strata for integration. Mean squared voltages per depth strata were output every five minutes along the transect. These were then averaged along the entire transect within a grid to provide an unscaled density estimate for that grid.

For the 28 schools from which dual beam data were collected, 1255 single targets were distinguished with a mean backscattering cross section of 0.0003642 m^2/fish. This single value was used in the scaling factor to convert mean squared voltages to fish densities for all areas surveyed. However, a subsequent and more detailed examination of the frequency distribution of mean backscattering cross sections (Table 28) by bay indicated a broad range of values. These were converted to target strengths and fish lengths according to the following equations given by Foote (1987)

$$T.S.=10 \log \sigma b.s./4\pi$$
$$T.S.=20 \log L-71.9$$

where $\sigma b.s.$=mean backscattering cross section (M^2)

L=fish length (cm)

Of the 1255 targets, 610 were from a single school in White Bay. These were eliminated from further analysis as notes in the acoustic log suggested that, based upon voltage amplitudes (1.0-1.5 mv), this school may have been mackerel. A mean back scattering cross section was then calculated for only those targets within the length range for herring (5.6 cm < L < 44.2 cm). This eliminated those observations at each end of the frequency distribution which represented either noise or multiple targets. The value, 0.0003217 M^2/fish, provided population estimates 12% larger than the original in situ estimate which included all 1255 targets. However, when this was weighted to account for abundance differences between bays, the revised value, 0.0003718 M^2/fish, provided population estimates within 2% of the original.

Fish density per depth stratum was multiplied by the acoustically sampled water volume per depth stratum to determine fish numbers per depth stratum Population numbers within the grid were determined by areal extrapolation from the estimate of fish numbers along the transect within the grid. Population estimates were compared for those grids which included both coastline and zigzag transects (Table 29). For five of the seven grids, population estimates derived from the zigzag transect were larger than those derived from the coastline transect. In examining the reason for this, it was determined that fish densities were randomly distributed by depth (Fig. 9). Therefore, population estimates derived from the zigzag transects should be larger as the zigzag transects included deeper water and hence a greater ensonified volume. Fish densities were then extrapolated by grid volume rather than surface area to account for this distribution pattern. Population estimates derived from zigzag transects were greater for three of the seven grids when volumetric extrapolation was used. For three, the shoreline transects gave greater estimates and for one there was very little difference. However, extrapolation by volume also assumes a linear relationship between fish biomass and water depth. Data from the seven zigzag transects were re-analyzed to calculate fish numbers (which are proportional to biomass) by water depth (10 meter intervals) adjusted for searching time (Fig. 10). Although the relationship is dome-shaped and not linear, the assumption of linearity is not severely violated over most of the depth range surveyed, as fish numbers by depth increase in near linear fashion from 0 to 65 M. Any positive bias introduced by assuming a linear relationship would be more than countered by the exclusion of fish outside the 90 m contour. The relationship suggests that the outer stock boundary should be approximately 120 M and that population estimates are biased downward by surveying to 90 M only.

The mean fish weights from samples collected during the survey (Table 14) were applied to the volumetrically derived estimates of population numbers (Tables 30 and 31) to obtain biomass estimates. Population numbers were apportioned by spawning type based upon percentages of spring and autumn spawners in samples collected during the survey (Table 32). Population numbers at age (Tables 33 and 34) were then calculated from age composition of the samples.

Biomass estimates for White Bay-Notre Dame Bay and Bonavista Bay-Trinity Bay from the 1987 and previous surveys are presented in Table 35. Last year, only those surveyed or core grids in Notre Dame Bay were considered. However, upon the recommendation of CAFSAC, a proration factor of 1.66 was used to estimate total biomass for White Bay-Notre Dame Bay. For both stock areas, biomass estimates peaked in 1985 and have subsequently declined.

Population numbers at age projected to January 1988 have similarly been compared (Table 36) from the 1987 survey, the 1986 survey and from an average of the 1983-86 surveys as used last year for projections. For White Bay-Notre Dame Bay, year-classes exhibit similar trends between the surveys. The differences for Bonavista Bay-Trinity Bay may be highly dependent on sampling. As stated last year (Wheeler and Chaulk 1987), sampling during the 1986 survey may have been biased toward the 1985 year-class in Bonavista Bay-Trinity Bay. In both areas, the relative size of the 1983 year-class compared to the 1982 year-class is smaller in the most recent survey. The combined population estimate for the two stock areas (525.9×10^{-6}) is much more comparable to that from the 1986 survey (519.7×10^{6}) than to the average estimate from the 1983-86 surveys (996.7×10^{6}) used last year for projections.

PROGNOSIS

Catch Projections

Projections were run for White Bay-Notre Dame Bay and Bonavista Bay-Trinity Bay based upon the population numbers at age from the 1987 survey. These vectors were projected to January 1988 accounting for the commercial catch subsequent to the 1987 survey and assuming a natural mortality rate of 0.20.

As in previous years, the following partial recruitment pattern, based upon a historical combined purse seine and gillnet fishery (Winters and Moores 1977) was used for both stock areas:

Age	2	3	4	5	6	7	8	9	10	11+
P.R.	0.10	0.35	0.60	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Mean weights at age were those derived from samples collected during January-June 1987 (Table 9). Natural mortality was assumed to be 0.20. Recruitment at age 2 in 1989 was assumed to be zero. $F_{0.1}$ was assumed to be 0.30.

Three options were used in projections: a) assuming the recommended catches in 1988 and F = 0.30 in 1989, 2) assuming F = 0.30 in 1988 and 1989, and 3) assuming 1987 catch levels in 1988 and F = 0.30 in 1989. The projected biomass and catch levels ($\times 10^3$ t) are summarized in the following text table:

		WB-NDB		BB-TB	
		1988	1989	1988	1989
Option 1	2+ Biomass	94.2	54.3	30.9	12.4
	Catch	34.7	11.9	16.2	2.9
Option 2	2+ Biomass	94.2	67.0	30.9	21.3
	Catch	21.8	14.9	7.2	5.0
Option 3	2+ Biomass	94.2	74.6	30.9	21.6
	Catch	14.0	16.7	6.9	5.0

$F_{0.1}$ projections based upon the 1987 survey (Option 2) suggest that projections made last year, based upon an average population vector from the 1983-86 surveys (Option 1), were overly optimistic. In retrospect, it may have been better last year to project from the 1986 survey estimates rather than from average population estimates of the 1983-86 surveys.

Given problems with the acoustic survey design and certain data treatments, CAFSAC felt that advice could not be provided based upon the survey alone. Advice was therefore provided based upon the acoustic survey, research gillnet catch rates, the dominance of a single year-class and historical fishing patterns. All five of the stocks are dominated by a single large year-class, comparable to the situation during the 1970's. Catch levels, in particular in the north, approximated maximum levels during the 1970's. There is no evidence of strong recruitment since 1983 and insufficient information available to estimate the strength of the 1985 year-class. Therefore, until more information becomes available next year, it is advised that 1988 and 1989 catches for all stock areas be maintained at 1987 levels. However for St. Mary's Bay-Placentia Bay and Fortune Bay, where 1987 catch levels were very low, precautionary TAC's of 1500 t are advised to allow for monitoring of the stocks.

Management Implications

Advised catch levels both for the current year and 1989 are much lower than those advised last year as population estimates from the 1987 acoustic survey are lower than the average estimates from the 1983-86 surveys used for projections last year. However, populations estimates from the 1986 and 1987 surveys are very comparable. Also, for White Bay-Notre Dame Bay and Bonavista Bay-Trinity Bay, the only stock areas surveyed in 1987, population trends have been similar over the past five years, peaking in 1985 and declining since then. This is consistent with advice provided last year which suggested that yields from these stocks will decrease unless there is adequate recruitment of younger year-classes. Recruitment appears to be generally weak since the 1982 and 1983 year-classes. However, there is limited evidence from both the research gillnet catches and the commercial fishery that the 1985 year-class may be of moderate strength. Until further evidence of the strength of this year-class becomes available within the next year, it is not possible to predict the long-term (3 to 5 year) potential of these stocks.

There are divergent views concerning the ability to calculate absolute population estimates from acoustic surveys. The major concern is in the determination of target strength. ICES scientists in their most recent assessment of the North Sea herring stocks acknowledged that the question of precision, mostly around target strength, remains unchanged. However, they point out that acoustic surveys are proving very valuable as they have the advantage of providing estimates of absolute abundance and age composition, are efficient in terms of data acquisition per unit survey time and are useful for several species simultaneously. Major changes will be made prior to the next acoustic survey, primarily in survey design. However, until a superior methodology is developed, acoustic surveys will continue to be employed to assess herring stocks within the Newfoundland Region.

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Table 1. White Bay (W.B.)- Notre Dame Bay (N.D.B.) herring landings (t), by gear, 1974-87.

		Gear						
Year	Area	Purse seine	Ringnet	Midwater trawl	Bar seine	Gillnet	Trap	Total
1974	W.B.	-	8	11	53	738	632	1442
	N.D.B.	-	6	-	85	2191	312	2594
	Combined	-	14	11	138	2929	944	4036
1975	W.B.	828	-	-	46	1209	329	2412
	N.D.B.	1183	108	-	12	1631	209	3143
	Combined	2011	108	-	58	2840	538	5555
1976	W.B.	1724	487	-	18	509	246	2984
	N.D.B.	2908	3412	-	589	2242	353	9504
	Combined	4632	3899	-	607	2751	599	12488
1977	W.B.	-	1228	-	39	268	240	1775
	N.D.B.	-	4961	-	2096	2438	355	9850
	Combined	-	6189	-	2135	2706	595	11625
1978	W.B.	-	1254	-	240	1133	331	2958
	N.D.B.	-	3980	-	306	5859	311	10456
	Combined	-	5234	-	546	6992	642	13414
1979	W.B.	-	832	-	9	978	64	1883
	N.D.B.	-	1968	-	2274	8971	598	13811
	Combined	-	2800	-	2283	9949	662	15694
1980	W.B.	-	747	-	-	1269	83	2099
	N.D.B.	-	913	-	727	2778	13	4431
	Combined	-	1660	-	727	4047	96	6530
1981	W.B.	-	220	-	14	646	23	903
	N.D.B.	-	1065	-	400	2209	107	3781
	Combined	-	1285	-	414	2855	130	4684
1982	W.B.	-	-	-	7	402	52	461
	N.D.B.	-	-	-	136	1425	1	1562
	Combined	-	-	-	143	1827	53	2023
1983	W.B.	-	15	-	-	76	7	98
	N.D.B.	-	-	-	-	329	-	329
	Combined	-	15	-	-	406	7	427
1984	W.B.	-	-	-	4	342	4	350
	N.D.B.	-	-	-	3	1115	-	1118
	Combined	-	-	-	7	1457	4	1468
1985	W.B.	-	-	-	2	564	-	566
	N.D.B.	1	-	-	9	1248	-	1258
	Combined	1	-	-	11	1812	-	1824
1986*	W.B.	112	-	-	1	196	7	316
	N.D.B.	1124	-	-	71	1108	81	2384
	Combined	1236	-	-	72	1304	88	2700
1987*	W.B.	4090	-	-	60	387	4	4541
	N.D.B.	7205	-	-	551	1031	645	9432
	Combined	11,295	-	-	611	1418	649	13,973

* provisional

Table 2. Bonavista Bay (B.B.) - Trinity Bay (T.B.) herring landings (t), by gear, 1974-87.

		Gear						
Year	Area	Purse seine	Ringnet	Midwater trawl	Bar seine	Gillnet	Trap	Total
1974	B.B.	-	-	-	21	611	10	642
	T.B.	-	428	-	154	976	93	1651
	Combined	-	428	-	175	1587	103	2293
1975	B.B.	1559	-	-	34	414	2	2009
	T.B.	1370	1790	-	242	411	90	3903
	Combined	2929	1790	-	276	825	92	5912
1976	B.B.	2812	3052	-	24	328	139	6355
	T.B.	1614	1054	-	465	419	30	3582
	Combined	4426	4106	-	489	747	169	9937
1977	B.B.	-	6223	236	2495	309	-	9263
	T.B.	-	1548	-	927	174	45	2694
	Combined	-	7771	236	3422	483	45	11,957
1978	B.B.	-	4239	-	150	1320	3	5712
	T.B.	-	1055	-	966	308	8	2337
	Combined	-	5294	-	1116	1628	11	8049
1979	B.B.	-	3490	-	377	2374	4	6245
	T.B.	-	1181	-	1615	680	55	3531
	Combined	-	4671	-	1992	3054	59	9776
1980	B.B.	-	1714	-	652	1321	-	3687
	T.B.	-	964	-	405	336	13	1718
	Combined	-	2678	-	1057	1657	13	5405
1981	B.B.	-	1100	-	713	1399	7	3219
	T.B.	-	78	-	361	367	19	825
	Combined	-	1178	-	1074	1766	26	4044
1982	B.B.	-	-	-	-	386	4	390
	T.B.	-	-	-	25	76	6	107
	Combined	-	-	-	25	462	10	497
1983	B.B.	-	-	-	-	52	-	52
	T.B.	-	-	-	27	17	-	44
	Combined	-	-	-	27	69	-	96
1984	B.B.	-	-	-	-	135	-	135
	T.B.	-	-	-	-	41	-	41
	Combined	-	-	-	-	176	-	176
1985	B.B.	-	-	-	4	290	2	296
	T.B.	-	-	-	2	312	6	320
	Combined	-	-	-	6	602	8	616
1986*	B.B	706	-	-	7	402	5	1120
	T.B.	347	-	-	35	215	5	602
	Combined	1053	-	-	42	617	10	1722
1987*	B.B	5404	-	-	72	226	-	5702
	T.B.	1006	-	-	14	186	1	1207
	Combined	6410	-	-	86	412	1	6909

* provisional

Table 3. Conception Bay (C.B.)- Southern Shore (S.S.) herring landings (t), by gear, 1974-87.

		Gear						
Year	Area	Purse seine	Ringnet	Midwater trawl	Bar seine	Gillnet	Trap	Total
1974	C.B.	48	2107	-	67	131	134	2487
	S.S.	-	32	-	14	72	86	204
	Combined	48	2139	-	81	203	220	2691
1975	C.B.	13	2281	-	388	166	24	2872
	S.S.	315	-	-	23	160	169	667
	Combined	328	2281	-	411	326	193	3539
1976	C.B.	-	1704	258	76	153	92	2283
	S.S.	-	44	-	-	8	149	201
	Combined	-	1748	258	76	161	241	2484
1977	C.B.	-	1248	-	58	174	12	1492
	S.S.	-	442	-	-	18	200	660
	Combined	-	1690	-	58	192	212	2152
1978	C.B.	-	1098	-	11	415	3	1527
	S.S.	-	133	-	14	78	193	418
	Combined	-	1231	-	25	493	196	1945
1979	C.B.	-	432	-	-	210	63	705
	S.S.	-	10	-	18	49	111	188
	Combined	-	442	-	18	259	174	893
1980	C.B.	-	319	-	16	107	1	443
	S.S.	-	-	-	-	2	32	34
	Combined	-	319	-	16	109	33	477
1981	C.B.	-	-	-	-	160	2	162
	S.S.	-	-	-	-	53	8	61
	Combined	-	-	-	-	213	10	223
1982	C.B.	-	-	-	-	84	1	85
	S.S.	-	-	-	-	7	5	12
	Combined	-	-	-	-	91	6	97
1983	C.B.	-	-	-	-	17	-	17
	S.S.	-	-	-	-	-	-	-
	Combined	-	-	-	-	17	-	17
1984	C.B.	-	-	-	-	49	-	49
	S.S.	-	-	-	-	-	-	-
	Combined	-	-	-	-	49	-	49
1985	C.B.	-	-	-	-	81	-	81
	S.S.	-	-	-	-	16	-	16
	Combined	-	-	-	-	97	-	97
1986*	C.B.	62	-	-	-	102	1	165
	S.S.	-	-	-	1	23	1	25
	Combined	62	-	-	1	125	2	190
1987*	C.B.	727	-	15	324	239	10	1315
	S.S.	-	-	-	-	15	3	18
	Combined	727	-	15	324	254	13	1333

* provisional

Table 4. St. Mary's Bay (SMB)-Placentia Bay (PB) herring landings (t), by gear, 1974-87.

		Gear					
Year	Area	Purse seine	Ringnet	Bar seine	Gillnet	Trap	Total
1974	S.M.B.	1710	51	271	470	37	2539
	P.B.	3200	-	212	510	11	3933
	Combined	4910	51	483	980	48	6472
1975	S.M.B.	1032	711	554	674	243	3214
	P.B.	2638	-	225	450	188	3501
	Combined	3670	711	779	1124	431	6715
1976	S.M.B.	-	920	158	352	25	1455
	P.B.	2056	172	242	177	-	2647
	Combined	2056	1092	400	529	25	4102
1977	S.M.B.	-	1131	221	531	29	1912
	P.B.	740	524	14	78	-	1356
	Combined	740	1655	235	609	29	3268
1978	S.M.B.	-	1523	66	490	3	2082
	P.B.	557	612	29	214	33	1445
	Combined	557	2135	95	704	36	3527
1979	S.M.B.	-	1570	131	332	9	2042
	P.B.	359	891	17	307	1	1575
	Combined	359	2461	148	639	10	3617
1980	S.M.B.	-	645	16	352	12	1025
	P.B.	182	892	9	339	30	1452
	Combined	182	1537	25	691	42	2477
1981	S.M.B.	-	44	8	122	-	174
	P.B.	-	311	-	149	1	461
	Combined	-	355	8	271	1	635
1982	S.M.B.	-	-	-	10	-	10
	P.B.	-	-	4	31	-	35
	Combined	-	-	4	41	-	45
1983	S.M.B.	-	-	-	13	-	13
	P.B.	-	-	-	27	-	27
	Combined	-	-	-	40	-	40
1984	S.M.B.	-	-	-	11	-	11
	P.B.	-	-	1	95	-	96
	Combined	-	-	1	106	-	107
1985	S.M.B.	-	-	1	31	-	32
	P.B.	3	-	-	113	-	116
	Combined	3	-	1	144	-	148
1986*	S.M.B.	1	-	-	17	-	18
	P.B.	-	-	2	107	-	109
	Combined	1	-	2	124	-	127
1987*	S.M.B.	43	-	5	47	5	100
	P.B.	-	-	1	160	-	161
	Combined	43	-	6	207	5	261

* provisional

Table 5. Fortune Bay herring landings (t), by gear, 1974-87.

Year	Gear				Total
	Purse seine	Bar seine	Gillnet	Trap	
1974	1928	268	72	-	2268
1975	809	81	19	-	909
1976	109	310	43	-	462
1977	188	364	22	5	579
1978	104	854	41	-	999
1979	285	829	81	-	1195
1980	97	265	89	-	451
1981	-	30	37	-	67
1982	-	-	20	2	22
1983	-	-	15	-	15
1984	-	-	21	-	21
1985	-	-	52	-	52
1986*	1	1	91	-	93
1987*	-	2	144	-	146

* provisional

Table 6. Number of fish sampled from the Newfoundland herring fishery, by area and gear, 1983-87 (research samples in parenthesis).

Year	Area	Gear type: Trap	Bar seine	Gillnet	Ringnet	Total sampled	Comm. catch (t)
1983	WB	-	63	376 (799)	22	461 (799)	98
	NDB	-	-	(1230)	200 (2927)	200 (4157)	329
	BB	700	-	645 (1210)	(2056)	1345 (3275)	52
	TB	527	-	548 (678)	(700)	1075 (1378)	44
	CB	326	-	50 (145)	(450)	376 (595)	17
	SS	150	-	-	-	150	-
	SMB	-	-	(659)	798	798 (659)	13
	PB	100	-	(605)	-	100 (605)	27
	FB	-	-	(1017)	-	(1017)	15
	Total	1803	63	1619 (6343)	1020 (6142)	4505 (12485)	595
1984	WB	121	-	825 (1207)	-	946 (1207)	350
	NDB	-	50	2116 (1150)	(664)	2166 (1814)	1118
	BB	-	-	550 (1860)	(844)	550 (2704)	135
	TB	150	(100)	200 (800)	(700)	350 (1600)	41
	CB	(100)	-	50 (400)	(464)	50 (964)	49
	SS	-	-	-	-	-	-
	SMB	-	-	(1110)	223	223 (1110)	11
	PB	98	-	488 (653)	(136)	586 (789)	96
	FB	-	-	4666 (612)	(182)	466 (794)	21
	Total	369 (100)	50 (100)	4695 (7792)	223 (2990)	5337 (10982)	1821
1985	WB	175	-	580 (1047)	-	755 (1047)	566
	NDB	-	100	994 (1200)	(237)	1094 (1437)	1258
	BB	-	-	1048 (2036)	(350)	1048 (2386)	296
	TB	-	-	536 (1000)	(317)	536 (1317)	320
	CB	26	-	450 (800)	(150)	476 (950)	81
	SS	-	-	100 (500)	-	100 (500)	16
	SMB	-	-	50 (598)	50	100 (598)	32
	PB	-	-	92 (697)	50	142 (697)	116
	FB	-	-	500 (900)	(250)	500 (1150)	52
	Total	201	100	4350 (8778)	100 (1304)	4751 (10082)	2737
1986	WB	-	-	(1150)	100	100 (1150)	316
	NDB	77	50	600 (1222)	50 (400)	777 (1622)	2384
	BB	150	-	400 (1949)	389 (150)	939 (2099)	1120
	TB	150	100	400 (800)	150 (700)	800 (1500)	602
	CB	150 (236)	-	344 (1010)	(100)	494 (1346)	165
	SS	-	-	(579)	-	(579)	25
	SMB	50	-	100 (850)	150	300 (850)	18
	PB	50	-	582 (558)	(350)	632 (908)	109
	FB	-	-	286 (1338)	(100)	286 (1438)	93
	Total	627 (236)	150	2712 (9456)	839 (1800)	4328 (11492)	4832
1987	WB	-	-	350 (850)	246	596 (850)	4541
	NDB	250	-	300 (1174)	583 (313)	1133 (1487)	9432
	BB	50	-	265 (1592)	546 (169)	861 (1761)	5703
	TB	-	100	196 (1100)	386 (50)	682 (1150)	1208
	CB	50 (200)	-	150 (500)	200	400 (700)	1314
	SS	50	-	95 (250)	-	145 (250)	18
	SMB	-	50 (200)	50 (800)	50	150 (1000)	99
	PB	-	-	200 (786)	-	200 (786)	161
	FB	-	-	191 (1300)	-	191 (1300)	145
	Total	400 (200)	150 (200)	1797 (8352)	2011 (532)	4358 (9284)	22621

Table 7. Commercial catch (t) and sampling (number of fish) for 1987, by stock area, month, and gear type.

		WB-NDB		BB-TB		CB-SS		SMB-PB		FB	
Month	Gear	Catch	# Sampled	Catch	# Sampled	Catch	# Sampled	Catch	# Sampled	Catch	# Sampled
January	Gillnet	-	-	-	-	-	-	-	-	1	-
February	Gillnet	-	-	-	-	-	-	-	-	1	-
March	Gillnet	-	-	-	-	-	-	1	64	10	50
April	Gillnet	132	100	50	96	18	168	90	357	69	455
	Bar seine	-	-	2	-	-	-	1	-	-	-
	Purse seine	-	-	88	50	-	-	23	50	-	-
May	Gillnet	505	100	198	246	162	435	69	542	43	321
	Trap	237	50	-	-	11	-	5	-	-	-
	Bar seine	230	-	29	50	1	-	5	150	-	-
	Purse seine	362	100	703	100	22	50	20	-	-	-
June	Gillnet	261	100	15	46	39	139	17	50	5	-
	Trap	345	-	-	50	1	100	-	-	-	-
	Bar seine	145	-	54	50	-	-	-	100	-	-
	Purse seine	350	-	150	50	108	50	-	-	-	-
July	Gillnet	49	54	5	-	5	-	-	-	3	-
	Trap	-	50	-	-	-	50	-	-	-	-
	Bar seine	1	-	-	-	-	-	-	-	-	-
	Purse seine	-	-	1	-	-	-	-	-	-	-
August	Gillnet	75	299	24	247	5	-	1	-	3	-
	Trap	23	50	-	-	1	100	-	-	-	-
	Bar seine	1	-	-	-	-	-	-	-	-	-
	Purse seine	589	49	8	50	49	-	-	-	-	-
September	Gillnet	76	215	36	79	5	50	24	-	3	50
	Trap	21	50	1	-	-	50	-	-	-	-
	Bar seine	30	-	1	-	59	-	-	-	-	-
	Purse seine	1967	147	73	147	43	50	-	-	-	-
October	Gillnet	224	645	25	798	14	-	-	-	-	-
	Trap	23	50	-	-	-	-	-	-	-	-
	Bar seine	92	-	-	-	8	-	-	-	-	-
	Purse seine	4626	463	1151	92	198	50	-	-	-	-
	Otter trawl	-	-	-	-	15	-	-	-	-	-
November	Gillnet	95	-	57	426	3	-	2	-	3	-
	Bar seine	91	-	1	-	67	-	-	-	-	-
	Purse seine	1765	293	1177	513	18	-	-	-	-	-
December	Gillnet	-	-	2	50	2	-	2	-	2	-
	Bar seine	22	-	-	-	188	-	-	-	-	-
	Purse seine	1636	40	3058	149	291	-	-	-	-	-
Combined	Gillnet	1417	1513	412	1988	253	792	206	1013	143	876
	Trap	649	250	1	50	13	300	5	-	-	-
	Bar seine	612	-	87	100	323	-	6	250	-	-
	Purse seine	11295	1092	6408	1151	729	200	43	50	-	-
	Otter Trawl	-	-	-		15	-	-	-	-	-

Table 8. Mean weight at age (g) of Newfoundland spring spawning herring from samples collected January-June, 1987. Sample sizes in parenthesis.

	Stock area				
Age	WB-NDB	BB-TB	CB-SS	SMB-PB	FB
2	-	69 (53)	-	80 (91)	-
3	-	136 (10)	168 (18)	183 (77)	-
4	207 (24)	205 (28)	188 (3)	222 (8)	-
5	233 (236)	222 (655)	246 (702)	264 (1114)	247 (873)
6	269 (31)	268 (17)	271 (23)	294 (83)	293 (24)
7	293 (15)	299 (11)	297 (43)	310 (113)	323 (140)
8	318 (32)	318 (8)	318 (11)	340 (24)	352 (41)
9	349 (4)	396 (3)	322 (5)	370 (8)	375 (14)
10	330 (2)	326 (4)	328 (4)	378 (1)	424 (4)
11+	399 (69)	397 (99)	422 (114)	447 (53)	460 (139)

Table 9. Commercial catch at age of spring and autumn spawning herring for White Bay-Notre Dame Bay, 1970-87 (* preliminary).

	Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Spring spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	10	1	5	1	1	2	56	50	1	1	115
	3	1	129	290	727	4	128	24	1671	55	60	46
	4	12	88	2396	1411	123	215	506	107	2034	50	1240
	5	24	161	353	2825	3142	453	237	468	317	2928	92
	6	24	64	69	761	5446	5438	868	184	1034	323	1080
	7	972	425	122	719	1193	7069	10893	793	517	1410	17
	8	11	10184	403	654	697	1123	17145	7363	2509	767	496
	9	83	233	1363	416	1506	838	1328	12675	10807	2222	179
	10	159	254	205	1685	858	810	3364	1055	11756	14413	1450
	11+	275	3105	808	794	2378	3999	8535	15707	14379	27508	14653
Total SS		1572	14645	6015	9995	15349	20076	42957	40074	43410	49683	19369
Autumn spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	1	1
	3	1	1	53	1	1	6	1	1	1	1	71
	4	1	1	17	7	11	64	31	45	6	1	13
	5	26	6	74	22	124	3	35	35	24	10	13
	6	10	14	79	25	10	25	51	85	155	267	23
	7	39	11	67	60	48	16	20	54	171	172	272
	8	60	26	1	25	2	21	40	1	24	160	4
	9	20	17	164	13	46	3	46	94	2	133	19
	10	11	19	81	97	7	2	4	1	130	1	1
	11+	172	291	562	298	346	302	329	182	238	298	450
Total AS		342	388	1100	550	597	444	559	500	753	1045	868
Total AS & SS		1914	15033	7115	10545	15946	20520	43516	40572	44163	50728	20237
% SS		82.1	97.4	84.5	94.8	96.3	97.8	98.7	98.8	98.3	97.9	95.7
% AS		17.9	2.6	15.5	5.2	3.7	2.2	1.3	1.2	1.7	2.1	4.3

	Age	1981	1982	1983	1984	1985	1986*	1987*
Spring spawners	1	1	1	1	1	1	1	23
	2	445	76	1	6	3	26	999
	3	152	371	38	12	187	947	412
	4	41	332	46	124	350	2843	7709
	5	1231	59	23	1218	240	302	27152
	6	63	268	14	73	1486	661	1600
	7	805	34	93	114	108	1236	1028
	8	64	258	1	157	275	198	2024
	9	344	19	26	37	94	161	380
	10	194	192	4	122	81	177	517
	11+	10908	4059	805	1938	2110	1951	4692
Total SS		14248	5669	1052	3802	4935	8503	46536**
Autumn spawners	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1
	3	1	72	1	1	1	10	2
	4	13	26	74	60	29	66	290
	5	86	62	25	409	94	68	552
	6	11	16	23	66	333	76	156
	7	1	12	1	30	137	372	205
	8	100	9	1	8	32	68	628
	9	1	42	6	7	23	6	148
	10	4	1	1	3	10	1	10
	11+	65	23	1	24	74	39	104
Total AS		284	265	135	610	735	708	2097
Total AS & SS		14532	5934	1187	4412	5670	9211	48633
% SS		98.0	95.5	88.6	86.2	87.0	92.3	95.7
% AS		2.0	4.5	11.4	13.8	13.0	7.7	4.3

** 4242 age 0's in 1987 SS not included

Table 10. Commercial catch at age of spring and autumn spawning herring for Bonavista Bay-Trinity Bay, 1970-87 (* preliminary).

	Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Spring spawners	1	1	1	1	1	1	1	5	10	1	1	1
	2	1	1	1	1	1	1	14	16	22	6	15
	3	1	690	10	1	1	392	77	248	26	286	13
	4	1	311	1347	60	2	134	493	135	357	167	195
	5	9	102	389	4887	235	163	123	759	122	765	43
	6	55	64	91	126	4795	2564	166	227	251	19	293
	7	808	361	75	96	424	14330	4897	50	112	436	52
	8	35	1373	88	1	151	455	20697	6209	598	101	264
	9	126	151	480	48	294	995	909	23206	4412	530	75
	10	69	126	14	271	69	727	854	774	13394	5575	967
	11+	212	522	213	1	1849	1679	4306	5890	5956	19994	12259
Total SS		1318	3702	2709	5488	7822	21441	32539	37524	25251	27880	14177
Autumn spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	1	1
	3	1	1	1	1	1	1	10	1	1	1	14
	4	9	1	1	1	1	26	22	55	16	1	11
	5	1	10	1	1	1	30	77	16	14	27	17
	6	1	1	1	1	1	1	23	176	61	114	83
	7	4	4	2	1	16	22	66	86	58	30	188
	8	17	23	2	48	2	41	34	112	28	175	45
	9	18	3	5	1	1	6	62	30	23	13	112
	10	17	21	1	1	1	19	8	73	82	16	3
	11+	738	406	33	1	1216	259	1069	1069	417	800	463
Total AS		808	472	49	58	1242	407	1373	1620	702	1179	938
Total AS & SS		2126	4174	2758	5546	9064	21848	33912	39114	25953	29059	15115
% SS		62.0	88.7	98.2	99.0	86.3	98.1	96.0	95.9	97.3	95.9	93.8
% AS		38.0	11.3	1.8	1.0	13.7	1.9	4.0	4.1	2.7	4.1	6.2

	Age	1981	1982	1983	1984	1985	1986*	1987*
Spring spawners	1	1	1	1	1	1	141	394
	2	136	1	1	4	13	190	1424
	3	246	8	4	22	175	397	576
	4	53	11	34	35	70	4163	3084
	5	256	2	7	210	87	253	18732
	6	26	30	2	9	351	162	397
	7	288	5	15	5	37	262	441
	8	23	35	1	12	27	39	89
	9	321	5	8	2	13	10	43
	10	88	65	2	2	22	31	6
	11+	11762	1186	159	154	797	635	919
Total SS		13200	1349	234	456	1593**	6283	26105**
Autumn spawners	1	1	1	1	1	1	1	15
	2	1	1	1	1	1	1	1
	3	6	3	1	1	1	1	1
	4	115	1	10	3	5	50	2
	5	106	8	2	84	18	81	508
	6	33	10	5	14	203	58	268
	7	83	3	2	17	96	277	78
	8	283	8	1	3	54	150	439
	9	36	25	1	5	22	25	124
	10	4	1	1	1	10	1	3
	11+	230	37	3	9	29	30	201
Total AS		898	98	28	139	440	675	1640
Total AS & SS		14098	1447	262	595	2033	6958	27745
% SS		93.6	93.2	89.3	76.6	78.4	90.3	94.1
% AS		6.4	6.8	10.7	23.4	21.6	9.7	5.9

** 10 age 0's in 1985 SS not included
** 2396 age 0's in 1987 SS not included

Table 11. Commercial catch at age of spring and autumn spawning herring for Conception Bay-Southern Shore, 1970-87 (* preliminary).

	Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Spring spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	67	4	9	1177	7	1	1	1
	3	1	36	7	2	1	418	28	127	1	4	1
	4	15	31	1625	34	5	30	97	5	99	9	3
	5	17	19	134	4521	122	16	23	101	32	34	1
	6	21	11	55	242	9655	2057	31	45	65	7	19
	7	255	43	29	329	153	8592	2330	13	14	38	1
	8	12	272	79	142	83	120	4771	950	3	4	12
	9	13	26	361	44	39	517	89	4241	734	31	1
	10	11	11	67	175	13	238	252	49	3080	270	49
	11+	46	65	122	28	658	891	714	959	1358	1640	1101
Total SS		393	516	2481	5585	10734	12889	9513	6498	5388	2039	1190
Autumn spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	1	1
	3	1	1	1	1	2	7	1	1	1	1	1
	4	1	1	1	2	3	162	1	7	4	2	1
	5	1	1	1	2	8	40	49	29	50	17	1
	6	8	1	1	1	6	81	27	150	30	80	1
	7	20	1	1	38	17	18	23	87	69	15	32
	8	36	6	1	35	1	49	23	72	9	57	3
	9	5	34	1	1	6	11	31	13	10	17	6
	10	6	11	1	1	1	14	12	7	34	6	1
	11+	114	89	1	94	45	318	193	373	282	245	32
Total AS		194	147	11	177	91	702	362	741	491	442	80
Total AS & SS		587	663	2492	5762	10825	13591	9875	7239	5879	2481	1270
% SS		67.0	77.8	99.6	96.9	99.2	94.8	93.6	89.8	91.6	82.2	93.7
% AS		33.0	22.2	0.4	3.1	0.8	5.2	3.7	10.2	8.4	17.8	6.3

	Age	1981	1982	1983	1984	1985	1986*	1987*
Spring spawners	1	1	1	1	1	1	1	714
	2	1	1	1	1	1	5	1
	3	25	2	1	3	58	1	66
	4	4	5	1	27	11	346	135
	5	26	1	1	47	11	7	4914
	6	9	2	1	5	17	12	19
	7	28	1	1	1	2	16	28
	8	3	5	1	2	2	3	14
	9	14	1	1	1	1	1	3
	10	13	1	1	1	1	3	1
	11+	504	176	13	7	97	80	61
Total SS		628	196	23	96	202	475	5956
Autumn spawners	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1
	3	1	9	1	1	1	19	1
	4	14	5	1	4	3	6	5
	5	8	14	2	60	6	18	29
	6	3	1	3	6	52	21	27
	7	7	1	1	6	24	93	27
	8	14	2	2	3	13	29	30
	9	2	2	5	1	3	10	22
	10	1	1	1	1	1	3	9
	11+	9	5	12	1	15	10	6
Total AS		61	42	30	85	120	211	158
Total AS & SS		689	238	53	181	322	686	6114
% SS		91.1	82.4	43.4	53.0	62.7	69.2	97.4
% AS		8.9	17.6	56.6	47.0	37.3	30.8	2.6

Table 12. Commercial catch at age of spring and autumn spawning herring for St. Mary's Bay-Placentia Bay, 1970-87 (* preliminary).

	Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Spring spawners	1	3	1	1	1	3	1	1	1	1	1	1
	2	476	1	1	76	995	74	365	52	30	87	133
	3	109	557	207	326	280	2234	391	1423	175	663	332
	4	4434	116	20375	77	234	471	1906	140	1817	279	133
	5	59	2111	725	15470	126	147	208	736	123	2263	153
	6	76	80	5154	566	14328	1591	267	87	596	96	1270
	7	645	251	365	6757	436	13858	862	50	64	614	57
	8	66	45	650	93	6049	146	5622	1039	106	85	470
	9	72	13	352	224	138	3391	201	3830	512	66	38
	10	37	22	73	193	238	350	2256	134	3827	501	237
	11+	107	96	403	315	624	1323	1361	2448	2185	4785	2971
Total SS		6084	3293	28306	24098	23451	23586	13440	9940	9436	9440	5795
Autumn spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	1	1
	3	1	1	24	5	2	1	11	1	1	1	1
	4	1	9	61	150	2	7	4	47	23	11	96
	5	2	2	175	52	96	68	214	52	435	143	35
	6	1	53	15	71	146	182	67	209	92	598	52
	7	71	31	61	10	80	89	32	81	244	73	419
	8	112	43	37	54	95	206	17	69	122	216	79
	9	19	84	101	17	93	6	94	26	38	21	126
	10	28	35	71	68	51	37	11	22	52	2	25
	11+	202	314	539	737	970	677	329	526	561	348	492
Total AS		439	574	1086	1166	1537	1275	781	1035	1570	1415	1327
Total AS & SS		6523	3867	29392	25264	24988	24861	14221	10975	11006	10855	7122
% SS		93.3	85.2	96.3	95.4	93.8	94.9	94.5	90.6	85.7	87.0	81.4
% AS		6.7	14.8	3.7	4.6	6.2	5.1	5.5	9.4	14.3	13.0	18.6

	Age	1981	1982	1983	1984	1985	1986*	1987*
Spring spawners	1	1	1	1	1	1	1	1
	2	1	1	1	8	1	1	35
	3	193	1	5	9	7	1	23
	4	42	2	2	24	18	132	2
	5	111	3	3	36	27	19	524
	6	51	8	2	6	21	27	29
	7	338	3	4	3	15	9	48
	8	28	14	1	24	3	4	9
	9	80	4	9	1	25	1	3
	10	6	4	1	10	5	5	1
	11+	466	69	39	44	125	30	11
Total SS		1317	110	68	166	248	230	686
Autumn spawners	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	2
	3	1	1	1	1	1	1	4
	4	139	1	18	17	9	16	12
	5	116	7	6	101	20	24	33
	6	10	1	12	32	86	15	86
	7	11	1	4	21	46	96	31
	8	50	1	1	5	36	28	85
	9	7	1	1	3	10	16	24
	10	1	1	1	1	3	4	3
	11+	29	2	4	8	24	15	12
Total AS		366	18	50	191	237	217	293
Total AS & SS		1683	128	118	357	485	447	979
% SS		78.3	85.9	57.6	46.5	51.1	51.5	70.1
% AS		21.7	14.1	42.4	53.5	48.9	48.5	29.9

Table 13. Commercial catch at age of spring and autumn spawning herring for Fortune Bay, 1970-87 (* preliminary).

	Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Spring spawners	1	1	1	617	23	1	1	1	1	1	1	1
	2	29475	167	1515	2210	389	2	82	27	1	1	25
	3	5988	23223	256	925	1314	277	15	2103	42	1	16
	4	11953	6086	19690	67	552	581	318	25	2677	183	3
	5	133	23525	2896	5694	130	112	228	327	62	3833	69
	6	281	1165	10767	475	4435	87	129	166	237	15	1122
	7	7894	5747	351	1712	250	1490	11	26	43	165	7
	8	233	3514	4432	73	1094	16	338	43	139	5	183
	9	16	132	991	282	36	142	36	188	52	24	1
	10	225	148	34	558	117	22	188	4	326	1	11
	11+	257	537	366	173	255	201	140	244	302	167	50
Total SS		56456	64245	41915	12192	8573	2931	1486	3154	3882	4396	1488
Autumn spawners	1	1	1	1	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	1	1
	3	1	1	1	1	7	1	7	1	1	1	1
	4	1	598	1	48	9	22	9	23	1	7	4
	5	334	1	84	50	87	12	38	19	36	5	3
	6	1	136	25	79	65	39	26	19	6	50	3
	7	443	175	185	8	12	19	13	1	25	1	3
	8	816	769	44	32	27	20	1	1	12	17	1
	9	412	626	310	15	5	11	27	1	6	12	1
	10	1	470	125	27	1	7	1	1	1	1	1
	11+	2201	1956	793	97	85	45	9	2	18	12	1
Total AS		4212	4734	1570	359	300	178	133	70	108	108	20
Total AS & SS		60668	68979	43485	12551	8873	3109	1619	3224	3990	4504	1508
% SS		93.1	93.1	96.4	97.1	96.6	94.3	91.8	97.8	97.3	97.6	98.7
% AS		6.9	6.9	3.6	2.9	3.4	5.7	8.2	2.2	2.7	2.4	1.3

	Age	1981	1982	1983	1984	1985	1986*	1987*
Spring spawners	1	1	1	1	1	1	1	1
	2	1	1	1	2	1	1	1
	3	144	1	2	1	54	1	1
	4	16	3	2	4	3	137	1
	5	4	3	1	3	39	4	304
	6	3	1	1	2	12	68	11
	7	21	2	1	1	2	19	49
	8	2	36	1	2	1	5	18
	9	23	1	10	1	1	1	4
	10	1	5	1	2	1	2	1
	11+	12	5	18	23	15	13	38
Total SS		228	59	39	42	130	252	429
Autumn spawners	1	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1
	3	5	1	1	1	1	1	1
	4	64	1	1	1	17	3	1
	5	16	7	1	9	4	8	4
	6	1	2	2	4	26	16	7
	7	1	1	1	6	12	38	11
	8	1	1	1	1	7	12	25
	9	1	1	1	1	4	5	10
	10	1	1	1	1	1	1	5
	11+	1	1	1	1	2	5	14
Total AS		93	18	12	27	76	91	80
Total AS & SS		321	77	51	69	206	343	509
% SS		71.0	76.6	76.5	60.9	63.1	73.5	84.3
% AS		29.0	23.4	23.5	39.1	36.9	26.5	15.7

Table 14. Location and number of herring sampled from the 1987 acoustic survey.

Grid No.	Location	No. Sampled	Mean Lgt. (cm)	Mean Wgt. (g)	Grids to which samples are applied
16	Western Arm, White Bay	100	31.9	271.6	1-19
21	Middle Arm, Green Bay	50	33.0	321.5	20 + 21
21	Kings Point, Green Bay	50	33.7	337.7	20 + 21
21	Green Bay Island, Green Bay	50	33.9	341.6	20 + 21
22	Southern Arm, Green Bay	100	31.6	272.9	22 + 23
22	Saltwater Pond, Halls Bay	113	9.1	5.2	22 + 23
25	Osmonton Arm, New Bay	100	31.8	278.9	24 + 25
26	Strong Is. Tickle, New Bay	50	30.6	250.3	26
28	Upper Black Is., Bay of Exploits	50	31.9	281.4	27 +28
30	Sugarloaf Is., Bay of Exploits	50	31.6	270.7	29-51
30	Samson Is., Bay of Exploits	43	31.9	280.7	29-51
55	Lockers Bay, Bonavista Bay	50	32.1	266.7	52-59
56	Lakeman Is., Bonavista Bay	169	11.9	13.0	52-59
61	Bloody Bay, Bonavista Bay	50	31.9	268.9	61
62	Tumbler Is., Bonavista Bay	50	32.1	265.2	60, 62 + 63
65	Clode Sounde, Bonavista Bay	50	31.9	267.5	64-69
65	Chandlers Reach, Bonavista Bay	50	31.2	251.5	64-69
76	Hickman's Hr., Trinity Bay	94	33.1	285.7	70-82
76	Little Heart's Ease, Trinity Bay	50	31.9	255.2	70-82

Table 15. Catch at age (numbers of herring) calculated from catch/effort data and biological samples for the research gillnet program, by area and season (* adjusted to account for shallow nets).

Area	Season	Age	1980*	1981*	1982*	1983	1984	1985	1986	1987
			Autumn spawners							
WB-NDB	Fall	1	-	-	-	-	-	-	-	-
		2	-	-	-	-	-	-	-	-
		3	465	36	633	11	2513	10	1	1
		4	63	130	312	2047	370	290	517	2346
		5	206	6	351	238	7364	286	692	3023
		6	253	51	305	613	1841	2657	589	2252
		7	259	5	8	197	227	1432	1831	415
		8	14	27	6	27	190	13	472	1262
		9	22	-	139	44	57	10	64	437
		10	-	-	-	124	44	5	10	319
		11+	600	28	33	274	598	441	233	165
		Total	1881	284	1786	3576	13204	5145	4409	10220
			Spring spawners							
			1980*	1981*	1982*	1983	1984	1985	1986	1987
		1	3	-	-	-	-	-	-	-
		2	1383	705	779	53	4194	518	32	214
		3	1172	817	2688	7224	1146	25839	1608	60
		4	28735	179	515	11780	3431	3626	19228	5785
		5	974	3950	315	1068	15124	2226	2249	52421
		6	12983	160	178	2058	778	11544	1604	5232
		7	360	833	72	2896	1522	1317	6864	2357
		8	4109	74	844	347	2544	1297	665	8509
		9	619	314	-	3247	180	1430	444	1265
		10	4760	126	1432	761	1516	1003	532	789
		11+	71096	13087	17733	46209	45887	22918	8991	15211
		Total	126189	20244	24554	75642	76322	71718	42218	91843
			Autumn and spring spawners combined							
			1980*	1981*	1982*	1983	1984	1985	1986	1987
		1	3	-	-	-	-	-	-	-
		2	1383	705	779	53	4194	518	32	214
		3	1636	853	3321	7234	3659	25849	1609	61
		4	28798	309	825	13827	3801	3916	19745	8131
		5	1180	3955	666	1306	22487	2512	2941	55444
		6	13236	211	483	2671	2619	14201	2193	7484
		7	619	838	79	3093	1749	2749	8695	2772
		8	4122	102	852	374	2734	1311	1137	9771
		9	641	314	139	3291	238	1440	508	1702
		10	4760	126	1432	885	1560	1008	542	1108
		11+	71695	13117	17766	46483	46485	23360	9224	15376
		Total	128070	20528	26340	79218	89526	76863	46626	102063

Table 16. Catch at age (numbers of herring) calculated from catch/effort data and biological samples for the research gillnet program, by area and season (* adjusted to account for shallow nets).

Area	Season	Age	1980*	1981*	1982*	1983	1984	1985	1986	1987
			Autumn spawners							
BB-TB	Fall	1	–	–	–	–	–	–	–	–
		2	–	–	–	–	–	–	–	–
		3	99	1	3071	36	74	61	24	–
		4	160	170	481	5279	203	156	94	54
		5	66	30	1598	1327	3907	131	336	140
		6	154	22	53	1559	847	1467	383	138
		7	336	19	269	364	826	638	1070	104
		8	80	302	17	231	77	135	275	516
		9	33	3	777	98	315	45	174	138
		10	–	–	–	687	–	8	19	27
		11+	267	155	826	704	736	195	138	122
		Total	1119	699	7090	10285	6986	2837	2512	1239
			Spring spawners							
			1980*	1981*	1982*	1983	1984	1985	1986	1987
		1	–	–	–	–	–	–	–	2
		2	2714	166	761	138	3046	356	340	713
		3	168	235	10889	1290	1285	8405	807	55
		4	1694	31	2918	16008	1239	668	15251	847
		5	110	97	735	1709	9579	302	287	8421
		6	564	25	2140	655	469	1342	307	373
		7	36	196	9	1801	217	84	628	317
		8	99	–	429	24	344	23	89	310
		9	28	155	–	715	–	93	14	94
		10	242	6	95	135	304	–	110	30
		11+	13354	7783	9550	15076	7476	2934	1444	1208
		Total	19005	8695	27523	37551	23959	14206	19277	12370
			Autumn and spring spawners combined							
			1980*	1981*	1982*	1983	1984	1985	1986	1987
		1	–	–	–	–	–	–	–	2
		2	2714	166	761	138	3046	356	340	713
		3	267	236	13960	1325	1359	8466	831	55
		4	1854	201	3396	21287	1442	824	15345	901
		5	176	127	2328	3036	13486	433	623	8561
		6	718	47	2196	2215	1316	2809	690	511
		7	374	214	278	2165	1043	722	1698	421
		8	179	302	445	254	421	158	364	826
		9	61	158	777	813	315	138	188	232
		10	242	6	95	822	304	8	129	57
		11+	13621	7935	10376	15780	8212	3129	1582	1330
		Total	20204	9393	34613	47836	30945	17043	21789	13609

Table 17. Catch at age (numbers of herring) calculated from catch/effort data and biological samples for the research gillnet program, by area and season (* adjusted to account for shallow nets).

Autumn spawners

Area	Season	Age	1980	1981	1982	1983*	1984	1985	1986	1987
BB-TB	Spring	1	-	-	-	-	-	-	-	-
		2	-	-	-	-	-	-	-	-
		3	-	-	-	6	-	-	-	-
		4	-	-	-	33	-	2	-	11
		5	-	-	-	3	311	19	-	-
		6	-	-	-	3	50	409	23	10
		7	-	-	-	-	-	72	33	12
		8	-	-	-	3	-	49	9	41
		9	-	-	-	-	3	-	-	23
		10	-	-	-	-	-	5	-	-
		11+	-	-	-	14	17	28	-	-
		Total	-	-	-	61	382	585	65	97

Spring spawners

	1980	1981	1982	1983*	1984	1985	1986	1987
1	-	-	-	-	-	-	-	-
2	-	-	-	-	8	-	60	10
3	-	-	-	22	161	697	30	36
4	-	-	-	179	65	289	5606	35
5	-	-	-	6	301	165	87	3345
6	-	-	-	-	29	426	97	49
7	-	-	-	3	5	39	113	-
8	-	-	-	-	18	37	32	3
9	-	-	-	50	-	38	10	13
10	-	-	-	8	17	40	9	21
11+	-	-	-	905	1171	1495	400	204
Total	-	-	-	1169	1775	3226	6444	3716

Autumn and spring spawners combined

	1980	1981	1982	1983*	1984	1985	1986	1987
1	-	-	-	-	-	-	-	-
2	-	-	-	-	8	-	60	10
3	-	-	-	28	161	697	30	36
4	-	-	-	212	65	291	5606	46
5	-	-	-	8	612	184	87	3345
6	-	-	-	3	79	835	120	59
7	-	-	-	3	5	110	146	12
8	-	-	-	3	18	86	41	44
9	-	-	-	50	3	38	10	36
10	-	-	-	8	17	45	9	21
11+	-	-	-	919	1189	1523	400	204
Total	-	-	-	1229	2157	3811	6509	3813

Table 18. Catch at age (numbers of herring) calculated from catch/effort data and biological samples for the research gillnet program, by area and season.

Area	Season	Age	1980	1981	1982	1983	1984	1985	1986	1987
			Autumn spawners							
CB-SS	Fall	1	-	-	-	-	-	-	-	-
		2	-	-	-	58	-	-	-	-
		3	-	-	-	7	229	280	6	-
		4	-	-	-	137	201	804	220	-
		5	-	-	-	24	6837	472	375	-
		6	-	-	-	38	1260	3376	240	-
		7	-	-	-	3	332	1046	856	-
		8	-	-	-	2	36	691	382	-
		9	-	-	-	32	57	3	193	-
		10	-	-	-	-	33	5	100	-
		11+	-	-	-	22	41	402	51	-
		Total	-	-	-	323	9026	7079	2423	-
			Spring spawners							
			1980	1981	1982	1983	1984	1985	1986	1987
		1	-	-	-	-	-	-	137	-
		2	-	-	-	70	2565	75	86	-
		3	-	-	-	37	597	29034	36	-
		4	-	-	-	62	2174	1623	3239	-
		5	-	-	-	6	4162	930	214	-
		6	-	-	-	8	275	1139	220	-
		7	-	-	-	9	224	4	153	-
		8	-	-	-	-	426	66	19	-
		9	-	-	-	10	-	79	46	-
		10	-	-	-	8	-	-	59	-
		11+	-	-	-	218	2841	2644	282	-
		Total	-	-	-	428	13263	35594	4492	-
			Autumn and spring spawners combined							
			1980	1981	1982	1983	1984	1985	1986	1987
		1	-	-	-	-	-	-	137	-
		2	-	-	-	128	2565	75	86	-
		3	-	-	-	44	826	29314	42	-
		4	-	-	-	199	2374	2427	3459	-
		5	-	-	-	30	10999	1402	589	-
		6	-	-	-	46	1535	4516	460	-
		7	-	-	-	12	556	1049	1009	-
		8	-	-	-	2	461	757	401	-
		9	-	-	-	42	57	82	239	-
		10	-	-	-	8	33	5	159	-
		11+	-	-	-	239	2883	3046	333	-
		Total	-	-	-	751	22289	42673	6915	-

Table 19. Catch at age (numbers of herring) calculated from catch/effort data and biological samples for the research gillnet program, by area and season.

Area	Season	Age	1980	1981	1982	1983	1984	1985	1986	1987
			Autumn spawners							
CB-SS	Spring	1	–	–	–	–	–	–	–	–
		2	–	–	–	–	–	–	–	–
		3	–	–	–	–	–	–	–	64
		4	–	–	–	–	–	54	21	64
		5	–	–	–	–	–	81	285	21
		6	–	–	–	–	–	1624	626	211
		7	–	–	–	–	–	1266	4089	372
		8	–	–	–	–	–	1017	1234	507
		9	–	–	–	–	–	219	771	68
		10	–	–	–	–	–	118	48	130
		11+	–	–	–	–	–	1655	1823	231
		Total	–	–	–	–	–	6033	8898	1668
			Spring spawners							
			1980	1981	1982	1983	1984	1985	1986	1987
		1	–	–	–	–	–	–	–	–
		2	–	–	–	–	–	–	–	–
		3	–	–	–	–	–	506	–	1020
		4	–	–	–	–	–	101	7444	128
		5	–	–	–	–	–	397	202	9544
		6	–	–	–	–	–	1141	1388	451
		7	–	–	–	–	–	152	341	722
		8	–	–	–	–	–	133	268	233
		9	–	–	–	–	–	28	–	162
		10	–	–	–	–	–	–	81	64
		11+	–	–	–	–	–	7973	3511	4524
		Total	–	–	–	–	–	10431	13234	16848
			Autumn and spring spawners combined							
			1980	1981	1982	1983	1984	1985	1986	1987
		1	–	–	–	–	–	–	–	–
		2	–	–	–	–	–	–	–	–
		3	–	–	–	–	–	506	–	1084
		4	–	–	–	–	–	155	7465	192
		5	–	–	–	–	–	477	487	9565
		6	–	–	–	–	–	2765	2014	662
		7	–	–	–	–	–	1418	4430	1094
		8	–	–	–	–	–	1150	1502	740
		9	–	–	–	–	–	247	771	230
		10	–	–	–	–	–	118	129	194
		11+	–	–	–	–	–	9628	5334	4755
		Total	–	–	–	–	–	16464	22132	18516

Table 20. Catch at age (numbers of herring) calculated from catch/effort data and biological samples for the research gillnet program, by area and season.

Area	Season	Age	1982	1983	1984	1985	1986	1987
			Autumn spawners					
SMB-PB	Spring	1	-	-	-	-	-	-
		2	-	-	-	-	-	-
		3	67	67	863	126	104	312
		4	68	1370	1508	4778	1122	706
		5	234	250	7454	1854	2327	1270
		6	22	699	2232	5073	1426	2306
		7	4	132	3178	1886	5913	1311
		8	18	61	206	1585	1458	3200
		9	8	97	567	194	508	1164
		10	5	45	112	320	205	104
		11+	58	349	1891	1413	623	716
		Total	484	2970	18010	17228	13685	11089
			Spring spawners					
			1982	1983	1984	1985	1986	1987
		1	-	-	-	-	-	-
		2	18	227	101	-	1	-
		3	23	1444	2589	7692	55	2127
		4	66	256	3038	750	17580	242
		5	49	126	962	1293	1188	23547
		6	162	147	372	903	2452	1805
		7	18	452	132	310	483	2724
		8	200	50	1022	279	366	604
		9	46	669	34	1123	7	339
		10	48	82	1393	354	340	90
		11+	790	2747	6540	5902	1682	1127
		Total	1421	6200	16182	18607	24155	32605
			Combined					
			1982	1983	1984	1985	1986	1987
		1	-	-	-	-	-	-
		2	18	227	101	-	1	-
		3	90	1511	3452	7818	159	2439
		4	134	1626	4546	5527	18702	948
		5	282	276	8416	3148	3515	24817
		6	184	846	2604	5976	3879	4111
		7	21	584	3309	2196	6396	4035
		8	218	111	1228	1864	1824	3804
		9	54	766	601	1317	515	1503
		10	54	127	1505	674	545	194
		11+	849	3096	8430	7315	2305	1843
		Total	1905	9170	34192	35835	37841	43694

Table 21. Catch at age (numbers of herring) calculated from catch/effort data and biological samples for the research gillnet program, by area and season.

Area	Season	Age	1982	1983	1984	1985	1986	1987
			Autumn spawners					
FB	Spring	1	–	–	–	–	–	–
		2	–	–	–	–	–	–
		3	2	–	–	8	–	–
		4	18	1082	–	833	808	5
		5	86	361	1595	476	479	275
		6	13	1236	608	4442	887	340
		7	2	122	1006	2324	2687	375
		8	–	63	207	1051	855	2150
		9	–	30	51	827	192	837
		10	–	–	12	197	95	437
		11+	4	39	177	351	166	1456
		Total	126	2933	3658	10508	6169	5875
			Spring spawners					
			1982	1983	1984	1985	1986	1987
		1	–	–	–	–	–	–
		2	4	–	–	–	–	–
		3	38	495	–	870	–	–
		4	51	361	1130	153	21317	–
		5	40	234	765	12321	824	44671
		6	5	183	316	4179	6662	988
		7	15	152	78	950	4589	4048
		8	392	159	208	274	938	1723
		9	19	2642	19	522	92	399
		10	53	275	229	385	171	98
		11+	55	3219	5250	8139	3414	6049
		Total	672	7720	7996	27793	38006	57976
			Combined					
			1982	1983	1984	1985	1986	1987
		1	–	–	–	–	–	–
		2	4	–	–	–	–	–
		3	40	495	–	878	–	–
		4	70	1443	1130	986	22125	5
		5	127	596	2360	12797	1303	44946
		6	17	1419	925	8621	7549	1328
		7	17	274	1084	3274	7276	4423
		8	392	222	415	1324	1793	3873
		9	19	2672	71	1349	284	1236
		10	53	275	241	582	266	535
		11+	59	3257	5428	8490	3580	7505
		Total	798	10653	11654	38301	44175	63851

Table 22. Total catch (number of fish), number of days fished, and catch rates for the research gillnet program, White Bay-Notre Dame Bay (* catch rates adjusted to account for shallow nets).

Area	Community	Year	Total catch	Days fished	Catch/ days fished
WB	Croque	1984	1486	25	60
		1985	1151	29	40
		1986	3139	29	108
		1987	2657	33	81
	Westport	1980	5962*	56	103*
		1981	2835*	37	77*
		1982	6474*	30	216*
		1983	6991	31	226
		1984	11112	31	358
		1985	28211	31	910
		1986	5859	31	189
		1987	65332	27	2420
	Brents Cove	1982	19866	30	662
		1983	27270	19	1420
		1984	53915	30	1785
		1985	9066	33	275
		1986	5987	26	230
	La Scie	1980	17256*	26	664*
		1981	4262	25	173
NDB	Harry's Harbour	1981	2395	29	81
		1983	34027	33	1031
		1984	4881	33	148
		1985	7334	35	210
		1986	15051	31	486
		1987	28316	31	913
	Leading Tickles	1981	3528	33	107
		1983	10637	30	355
		1984	10642	30	355
		1985	25729	31	841
		1986	3555	32	111
		1987	2235	30	75
	Hillgrade	1980	104852*	59	1777*
		1981	7788*	32	243*
		1982	0*	32	0*
		1983	293	32	9
	Herring Neck	1984	7890	31	255
		1985	5373	33	163
		1986	13036	30	435
		1987	3522	28	126
WB-NDB	Combined	1980	128070*	141	908*
		1981	20808*	156	136*
		1982	26340*	92	286*
		1983	79218	145	546
		1984	89926	180	500
		1985	76864	192	401
		1986	46627	179	260
		1987	102062	149	685

Table 23. Total catch (number of fish), number of days fished, number of days hauled, and catch rates for the research gillnet program, Bonavista Bay-Trinity Bay (* catch rates adjusted to account for shallow nets).

Area	Community	Year	Total catch	Days fished	Catch/ days fished
BB	Centreville	1980	2720*	53	51*
		1981	2280*	31	74*
		1982	1404	27	52
		1983	1430	31	46
		1984	1754	31	57
		1985	3459	32	108
		1986	5514	34	162
		1987	3507	30	117
	Salvage	1980	11594*	33	351*
		1981	633*	36	18*
		1982	27944*	31	901*
		1983	19639	28	701
		1984	11656	31	376
		1985	1819	30	61
		1986	3354	32	105
		1987	1144	29	39
	Portland	1981	6734	28	237
		1982	3059	30	102
	Charlottetown	1983	12660	37	339
		1984	5888	30	198
		1985	6666	32	208
		1986	1874	33	57
		1987	375	32	12
	Newman Sound (S)	1983	1229*	5	246
		1984	2157	8	270
		1985	1728	6	288
		1986	817	6	136
	Newman Sound (F)	1984	199	11	18
		1985	440	8	55
		1986	569	8	71
		1987	728	8	91
	Kings Cove	1987	3692	33	111
TB	Port Rexton	1982	1698	31	55
		1983	13435	32	420
		1984	6244	32	195
		1985	3233	32	101
		1986	10478	32	327
		1987	2283	31	74
	Hickmans Harbour	1980	5891*	46	128*
		1981	242*	31	8*
		1982	424*	31	14*
	Long Beach	1983	721	29	25
		1984	5205	33	158
		1985	1436	33	44
		1987	1880	29	65
	Chance Cove (S)	1985	2083	32	65
		1986	5692	31	184
		1987	3812	32	119
BB-TB	Combined (S)	1983	1229*	5	246*
		1984	2157	8	270
		1985	3811	38	100
		1986	6509	37	176
		1987	3812	32	119
	Combined (F)	1980	20204*	132	153*
		1981	9888*	126	78*
		1982	34412*	150	229*
		1983	47885	157	304
		1984	30946	168	184
		1985	17043	167	102
		1986	21789	139	157
		1987	13609	192	71

Table 24. Total catch (number of fish), number of days fished, number of days hauled, and catch rates for the research gillnet program, Conception Bay-Southern Shore.

Area	Community	Year	Total catch	Days fished	Catch/ days fished
CB	Foxtrap (S)	1985	10515	33	319
		1986	19695	31	635
	Holyrood (S)	1987	2184	42	52
	Bay Roberts (F)	1983	2442	30	81
		1984	22289	32	697
		1985	42453	31	1369
		1986	5245	29	181
	Holyrood (F)	1986	1030	32	32
SS	Burnt Cove (S)	1985	5949	28	216
		1986	2437	30	81
	Renews (S)	1987	16330	11	1512
	Burnt Cove (F)	1985	220	32	7
		1986	640	32	20
CB-SS	Combined (S)	1985	16464	61	272
		1986	22132	61	363
		1987	18514	53	351
	Combined (F)	1983	2442	30	81
		1984	22289	32	697
		1985	42673	63	677
		1986	6915	93	74

Table 25. Total catch (number of fish), number of days fished, number of days hauled, and catch rates for the research gillnet program, St. Mary's Bay–Placentia Bay.

Area	Community	Year	Total catch	Days fished	Catch/ days fished
SMB	Riverhead	1982	680	25	27
		1983	962	31	31
		1984	2960	46	64
		1985	6108	32	191
		1986	16386	22	732
		1987	16028	31	517
	Colinet	1982	71	31	2
		1983	3193	37	86
		1984	3270	31	105
		1985	637	34	19
		1986	4040	30	135
		1987	12855	31	415
PB	Long Harbour	1982	663	32	21
		1983	3142	29	108
		1984	27357	32	855
		1985	20823	32	651
		1986	12720	31	410
		1987	12932	32	404
	Swift Current	1982	491	31	16
		1983	1873	31	60
		1984	818	31	26
		1985	8267	32	258
		1986	1351	30	45
		1987	1532	33	47
	Red Harbour	1986	3343	27	126
		1987	346	28	12
SMB–PB	Combined	1982	1905	119	16
		1983	9174	142	65
		1984	34405	140	246
		1985	35835	130	276
		1986	37840	140	270
		1987	43693	155	282

Table 26. Total catch (number of fish), number of days fished, number of days hauled, and catch rates for the research gillnet program, Fortune Bay.

Area	Community	Year	Total catch	Days fished	Catch/ days fished
FB	Long Harbour	1982	53	33	2
		1983	9711	29	335
		1984	5806	32	181
		1985	9016	34	265
		1986	14214	33	431
		1987	20479	29	706
	Belle Bay	1982	746	32	23
		1983	942	31	30
		1984	5908	26	227
		1985	29285	26	1118
		1986	21560	37	580
		1987	36998	25	1480
	Connaigre Bay	1986	8401	25	336
		1987	6373	30	212
FB	Combined	1982	799	65	12
		1983	10653	60	178
		1984	11714	58	202
		1985	38301	60	636
		1986	44175	95	464
		1987	63850	84	760

Table 27. Catch per days fished, by stock area, year, and mesh size, from the research gillnet program.

Stock area	Year	Mesh size 2"	2 1/4"	2 1/2"	2 3/4"	3"	Combined
WB-NDB	1980	69	218	262	206	133	908
	1981	16	23	41	33	18	133
	1982	13	30	97	17	57	286
	1983	46	63	195	163	75	546
	1984	42	85	164	150	72	499
	1985	76	81	134	66	45	401
	1986	40	36	82	62	41	260
	1987	104	148	218	121	92	685
BB-TB	1980	15	32	51	39	16	153
	1981	4	8	30	21	15	78
	1982	8	75	82	34	28	227
	1983	24	46	91	81	60	304
	1984	29	28	53	43	30	184
	1985	21	25	25	17	14	102
	1986	23	33	58	28	15	157
	1987	8	15	21	18	9	71
CB-SS	1983	5	4	6	1	9	81
	1984	88	123	262	138	84	697
	1985	172	182	192	81	48	677
	1986	3	16	25	18	12	74
SMB-PB	1982	2	2	5	4	3	16
	1983	15	13	15	15	14	72
	1984	38	56	61	49	41	246
	1985	77	73	51	47	29	276
	1986	73	77	70	32	17	270
	1987	46	87	75	53	22	282
FB	1982	1	3	4	2	2	12
	1983	31	26	41	49	30	176
	1984	9	48	29	49	65	201
	1985	37	164	153	154	130	636
	1986	76	87	99	139	62	464
	1987	65	102	152	273	168	760

Table 28. Frequency distribution of back scattering cross sections, by bay, calculated in situ during the 1987 acoustic survey.

Back scattering cross section (m^2/fish)	Target strength (dB)	Fish length (cm)	Number of targets					
			WB	WB*	NDB	BB	TB	All Areas*
.00001585	-59	4.4	44	8	2	0	0	10
.00002512	-57	5.6	182	39	4	1	3	47
.00003981	-55	7.0	235	41	17	2	6	66
.00006310	-53	8.8	168	36	20	0	3	59
.00010000	-51	11.1	125	51	13	0	6	70
.00015850	-49	14.0	56	43	23	2	2	70
.00025120	-47	17.6	52	35	23	0	10	68
.00039810	-45	22.2	33	23	23	0	3	49
.00063100	-43	27.9	36	27	22	1	8	58
.00100000	-41	35.1	32	15	12	1	7	35
.00158500	-39	44.2	20	10	4	2	11	27
.00251200	-37	55.7	8	9	2	1	7	16
.00398100	-35	70.0	6	6	0	3	2	9
.00631000	-33	88.2	3	3	2	1	0	6
.01000000	-31	111.0	3	1	0	1	0	2
.01585000	-29	139.8	1	1	0	0	0	1
.02512000	-27	176.0	0	0	0	1	0	1

* excludes targets from school off Hampden, W.B.

Table 29. Comparison of population estimates (x 10^3) derived from coastline and zigzag transects, 1987 acoustic survey.

Grid	Population Numbers (x 10^3)		
	Coastline	Zigzag	Ratio
6	296.2	26.0	11.4: 1
15	3465.8	4746.4	1 : 1.4
21	623.8	6050.5	1 : 9.7
26	6957.4	27836.0	1 : 4.0
28	2802.2	3879.2	1 : 1.4
61	1671.1	428.4	3.9 : 1
65	25832.0	55881.0	1 : 2.2

Table 30. Mean fish density, population numbers and biomass by grid, for White Bay-Notre Dame Bay from the 1987 acoustic survey.

Stock Area	Grid #	Transect Lgt (km)	Mean Density (fish/m³)	Grid Volume (x 10^9 m³)	Fish Numbers (x 10^3)	Mean Fish Wgt (kg)	Biomass (t)
WB	1	49.3	.1164E-01	6.64	77290	.2716	20992
	2	39.1	.1069E-02	5.29	5655	.2716	1536
	3	12.2	.5667E-03	5.75	3259	.2716	885
	4	20.7	.1562E-04	3.98	62	.2716	17
	5	34.6	.3811E-03	1.86	709	.2716	193
	6C	37.0	.1417E-03	2.39	339	.2716	92
	6Z	34.6	.1054E-04	2.39	25	.2716	7
	7	15.4	.1796E-04	4.99	90	.2716	24
	8	49.3	.5416E-02	6.40	34662	.2716	9414
	9	20.4	.1818E-03	3.25	591	.2716	160
	10	38.2	.1519E-03	6.49	986	.2716	268
	11	-	-	4.17	-	-	-
	12	38.2	.1260E-02	6.30	7938	.2716	2156
	13	101.9	.4517E-02	8.36	37762	.2716	10256
	14	58.5	.2041E-02	3.99	8144	.2716	2212
	15C	95.0	.7987E-03	3.63	2899	.2716	787
	15Z	115.2	.6978E-03	3.63	2533	.2716	688
	16	68.7	.6218E-03	4.10	2549	.2716	692
	17	10.2	-	4.14	-	-	-
	18	47.6	.6231E-03	3.53	2200	.2716	597
	19	-	-	3.16	-	-	-
		754.1			184455		50097
NDB	20	17.8	.5291E-03	6.50	3439	.3336	1147
	21C	119.8	.1270E-03	6.02	765	.3336	255
	21Z	110.0	.1033E-02	6.02	6219	.3336	2075
	22	180.0	.1847E-01	4.84	89395	.1392	12444
	23	30.6	.5375E-02	3.43	18436	.1392	2566
	24	103.7	.2937E-02	3.62	10632	.2789	2965
	25	86.7	.1057E-02	3.10	3277	.2789	914
	26C	70.4	.1590E-02	3.10	4929	.2503	1234
	26Z	68.3	.2859E-02	3.10	8863	.2503	2218
	27	42.4	.6184E-02	2.78	17192	.2814	4837
	28C	87.4	.9198E-03	5.42	4985	.2814	1403
	28Z	115.2	.6769E-03	5.42	3669	.2814	1032
	29	50.9	.2669E-02	5.54	14786	.2753	4071
	30	59.4	.4272E-03	5.79	2473	.2753	681
	31	58.5	.5585E-02	3.60	20106	.2753	5535
	32	9.3	.8768E-04	3.73	327	.2753	90
	33	32.2	.1844E-01	4.70	86668	.2753	23860
	34	5.2	.7425E-05	4.26	32	.2753	9
	35	-	-	2.54	-	-	-
	36	-	-	3.98	-	-	-
	37	13.5	.2730E-04	2.40	66	.2753	18
	38	-	-	1.66	-	-	-
	39	5.9	.1419E-04	1.39	20	.2753	5
	40	2.5	.4773E-05	1.91	9	.2753	3
	41	-	-	3.66	-	-	-
	42	-	-	2.84	-	-	-
	43	-	-	3.82	-	-	-
	44	-	-	2.65	-	-	-
	45	-	-	3.76	-	-	-
	46	-	-	4.79	-	-	-
	47	-	-	2.23	-	-	-
	48	-	-	3.04	-	-	-
	49	-	-	1.76	-	-	-
	50	-	-	2.90	-	-	-
	51	-	-	3.30	-	-	-
		992.1			285609		64470
WB-NDB		1746.2			470064		114567

Table 31. Mean fish density, population numbers and biomass by grid, for Bonavista Bay-Trinity Bay from the 1987 acoustic survey.

Stock Area	Grid #	Transect Lgt (km)	Mean Density (fish/m³)	Grid Volume (x 10^9 m³)	Fish Numbers (x 10³)	Mean Fish Wgt (kg)	Biomass (t)
BB	52	-	-	0.87	-	-	-
	53	17.8	.2277E-04	2.53	58	.1398	8
	54	66.3	.5423E-03	3.78	2050	.1389	287
	55	48.3	.4906E-04	3.77	185	.1398	26
	56	22.0	.1214E-03	4.06	493	.1398	69
	57	26.3	.8121E-05	3.85	31	.1398	4
	58	-	-	4.20	-	-	-
	59	17.8	.3377E-04	5.09	172	.1398	24
	60	11.1	.8901E-03	4.22	3756	.2652	996
	61C	43.3	.3481E-03	3.96	1378	.2689	371
	61Z	55.4	.1250E-03	3.96	495	.2689	133
	62	21.3	.8266E-05	3.80	31	.2652	8
	63	68.0	.4293E-03	4.29	1843	.2652	488
	64	53.3	.3102E-02	5.26	16317	.2595	4234
	65C	110.4	.5876E-02	5.74	33728	.2595	8752
	65Z	101.3	.8112E-02	5.74	46563	.2595	12083
	66	98.5	.8356E-02	4.58	38270	.2595	9931
	67	13.5	.1653E-03	3.63	600	.2595	156
	68	28.9	.7187E-04	4.12	296	.2595	77
	69	9.3	.1261E-03	5.19	654	.2595	170
		659.1			111814		28694
TB	70	9.3	.2710E-03	5.37	1455	.2751	400
	71	-	-	4.61	-	-	-
	72	-	-	3.91	-	-	-
	73	34.1	.2652E-04	4.78	127	.2751	35
	74	119.5	.1695E-02	5.26	8916	.2751	2453
	75	10.2	.4525E-03	5.00	2263	.2751	622
	76	97.6	.2913E-02	3.66	10662	.2751	2933
	77	45.2	.2290E-02	4.29	9824	.2751	2703
	78	53.9	.9472E-04	4.51	427	.2751	118
	79	34.8	.4548E-03	4.03	1873	.2751	515
	80	41.7	.6680E-04	4.01	268	.2751	74
	81	41.7	.5307E-04	4.02	213	.2751	59
	82	5.2	.4500E-04	4.23	190	.2751	52
		493.2			36218		9964
BB-TB		1152.3			148032		38658

Table 32. Population numbers, by spawning type, grid and stock area from the 1987 acoustic survey.

Stock Area	Grid No.	Total Numbers (x 10^6)	% from samples AS	% from samples SS	Total numbers (x 106) AS	Total numbers (x 106) SS
WB-NDB	1-19	184.5	4.0	96.0	7.4	177.1
	20-21	9.7	4.0	96.0	0.4	9.3
	22-23	107.8	0.5	99.5	0.5	107.3
	24-25	13.9	2.0	98.0	0.3	13.6
	26	8.9	0.0	100.0	0.0	8.9
	27-28	20.9	0.0	100.0	0.0	20.9
	29-40	124.5	0.0	100.0	0.0	124.5
		470.1			8.6	461.5
BB-TB	53-59	3.0	8.0	92.0	0.2	2.8
	60-63	5.6	6.0	94.0	0.3	5.3
	61	0.5	10.0	90.0	0.1	0.4
	64-69	102.7	4.0	96.0	4.1	98.6
	70-82	36.2	13.9	86.1	5.0	31.2
		148.0			9.8	138.3

Table 33. Population numbers at age for White Bay-Notre Dame Bay, by spawning type and grid, from the 1987 acoustic survey.

Age	Grids # 1-19				Grids 20-21				Grids 22-23			
	% from samples		Nos. at age (x 106)		% from samples		Nos. at age (x 106)		% from samples		Nos. at age (x 106)	
	AS	SS	AS	SS	AS	SS	AS	SS	AS	SS	AS	SS
0	-	-	-	-		-	- -	-	-	50.3		
54.0												
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	1.0	-	1.8	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	0.5	-	0.5
4	50.0	20.8	3.7	36.8	-	14.6	-	1.4	100.0	14.1	0.5	15.1
5	50.0	72.0	3.7	127.5	33.3	46.5	0.1	4.3	-	34.2	-	36.7
6	-	2.1	-	3.7	-	4.9	-	0.5	-	1.0	-	1.1
7	-	2.1	-	3.7	-	4.2	-	0.4	-	-	-	-
8	-	1.0	-	1.8	-	4.2	-	0.4	-	-	-	-
9	-	-	-	-	33.3	1.4	0.1	0.1	-	-	-	-
10	-	-	-	-	-	2.1	-	0.2	-	-	-	-
11+	-	1.0	-	1.8	33.3	22.1	0.1	2.0	-	-	-	-
			7.4	177.1			0.3	9.3			0.5	107.4

Age	Grids # 24-25				Grid 26				Grids 27-28			
	% from samples		Nos. at age (x 106)		% from samples		Nos. at age (x 106)		% from samples		Nos. at age (x 106)	
	AS	SS	AS	SS	AS	SS	AS	SS	AS	SS	AS	SS
0	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	3.1	-	0.4	-	40.0	-	3.5	-	18.0	-	3.8
3	-	-	-	-	-	-	-	-	-	-	-	-
4	50.0	39.8	0.1	5.5	-	8.0	-	0.7	-	8.0	-	1.7
5	-	50.0	-	6.8	-	32.0	-	2.8	-	52.0	-	10.8
6	50.0	6.1	0.1	0.8	-	4.0	-	0.4	-	4.0	-	0.8
7	-	-	-	-	-	2.0	-	0.2	-	4.0	-	0.8
8	-	1.0	-	0.1	-	4.0	-	0.4	-	2.0	-	0.4
9	-	-	-	-	-	2.0	-	0.2	-	2.0	-	0.4
10	-	-	-	-	-	-	-	-	-	-	-	-
11+	-	-	-	-	-	8.0	-	0.7	-	10.0	-	2.1
			0.2	13.6			-	8.9			-	20.8

Age	Grids # 29-40				ALL GRIDS	
	% from samples		Nos. at age (x 106)		Nos. at age (x 106)	
	AS	SS	AS	SS	AS	SS
0	-	-	-			54.0
1	-	1.1	-	1.4		1.4
2	-	7.5	-	9.3		18.8
3	-	4.3	-	5.4		5.9
4	-	23.7	-	29.5	4.3	90.7
5	-	43.0	-	53.5	3.8	242.4
6	-	-	-	-		7.3
7	-	1.1	-	1.4		6.5
8	-	10.7	-	13.3		16.4
9	-	3.2	-	4.0		4.7
10	-	2.2	-	2.7		2.9
11+	-	3.2	-	4.0		10.6
			-	124.5	8.1	461.6

Table 34. Population numbers at age for Bonavista Bay-Trinity Bay, by spawning type and grid, from the 1987 acoustic survey.

Age	Grids # 53-59				Grids 60, 62, 63				Grid 61			
	% from samples		Nos. at age (x 106)		% from samples		Nos. at age (x 106)		% from samples		Nos. at age (x 106)	
	AS	SS	AS	SS	AS	SS	AS	SS	AS	SS	AS	SS
0	-	53.3	-	1.5	-	-	-	-	-	-	-	-
1	-	1.1	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	-	4.3	-	0.1	-	4.3	-	0.2	-	20.0	-	0.1
5	25.0	38.0	0.1	1.0	33.3	89.3	0.1	4.7	-	73.4	0	0.3
6	12.5	2.2	-	0.1	-	-	-	-	40.0	2.2	-	-
7	12.5	1.1	-	-	-	-	-	-	40.0	-	-	-
8	12.5	-	-	-	66.7	-	0.2	-	20.0	2.2	-	-
9	12.5	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11+	25.0	-	0.1	-	-	6.4	-	0.3	-	2.2	-	-
			0.2	2.7			0.3	5.2			-	0.4

Age	Grids # 64-69				Grids 70-82				ALL GRIDS	
	% from samples		Nos. at age (x 106)		% from samples		Nos. at age (x 106)		Nos. at age (x 106)	
	AS	SS	AS	SS	AS	SS	AS	SS	AS	SS
0	-	-	-	-	-	-	-	-	-	1.5
1	-	-	-	-	-	-	-	-	-	-
2	-	6.3	-	6.2	-	1.6	-	0.5	-	6.7
3	-	1.0	-	1.0	-	-	-	-	-	1.0
4	-	21.9	-	21.6	-	2.4	-	0.7	-	25.1
5	50.0	66.7	2.1	65.7	15.0	87.9	0.8	27.4	3.1	99.1
6	-	-	-	-	5.0	1.6	0.3	0.5	0.3	0.6
7	-	-	-	-	-	0.8	-	0.3	-	0.3
8	-	1.0	-	1.0	50.0	0.8	2.5	0.2	2.7	1.2
9	50.0	-	2.0	-	15.0	0.8	0.8	0.3	2.8	0.3
10	-	-	-	-	-	-	-	-	-	-
11+	-	3.1	-	3.1	15.0	4.1	0.8	1.3	0.9	4.8
			4.1	98.6			5.2	31.2	9.8	140.6

Table 35. Biomass (t) estimates from the acoustic surveys, 1983-87, for White Bay-Notre Dame Bay and Bonavista Bay-Trinity Bay.

Survey year	WB-NDB		BB-TB
	Core grids	Prorated	
1983	81,900	136,000	12,000
1984	47,400	78,700	59,800
1985	119,500	198,400	99,900
1986	76,000	126,200	25,700
1987		114,600	38,700

Table 36. Comparison of population numbers at age ($x10^6$) from 1987 and previous surveys for White Bay-Notre Dame Bay and Bonavista Bay-Trinity Bay.

		WB-NDB			BB-TB		
Age	Year-class	1987 survey	1986 survey	1983-86 surveys	1987 survey	1986 survey	1983-86 surveys
1	1987	47.2	-	-	0.0	-	-
2	1986	1.3	0.0	0.0	0.0	50.6	50.7
3	1985	16.9	9.2	4.1	5.6	134.9	97.0
4	1984	5.3	3.1	0.7	0.5	2.6	31.0
5	1983	80.2	14.8	162.5	22.8	2.2	63.3
6	1982	214.2	144.7	335.7	84.2	21.0	149.9
7	1981	6.2	12.8	7.8	0.3	0.7	1.7
8	1980	5.7	24.8	6.3	0.0	0.2	0.9
9	1979	15.0	30.9	23.0	1.1	1.5	5.2
10	1978	4.3	0.9	1.4	0.3	0.0	0.0
11+	≤1977	10.3	59.7	50.4	4.5	5.1	5.1
Total		406.6	300.9	591.9	119.3	218.8	404.8

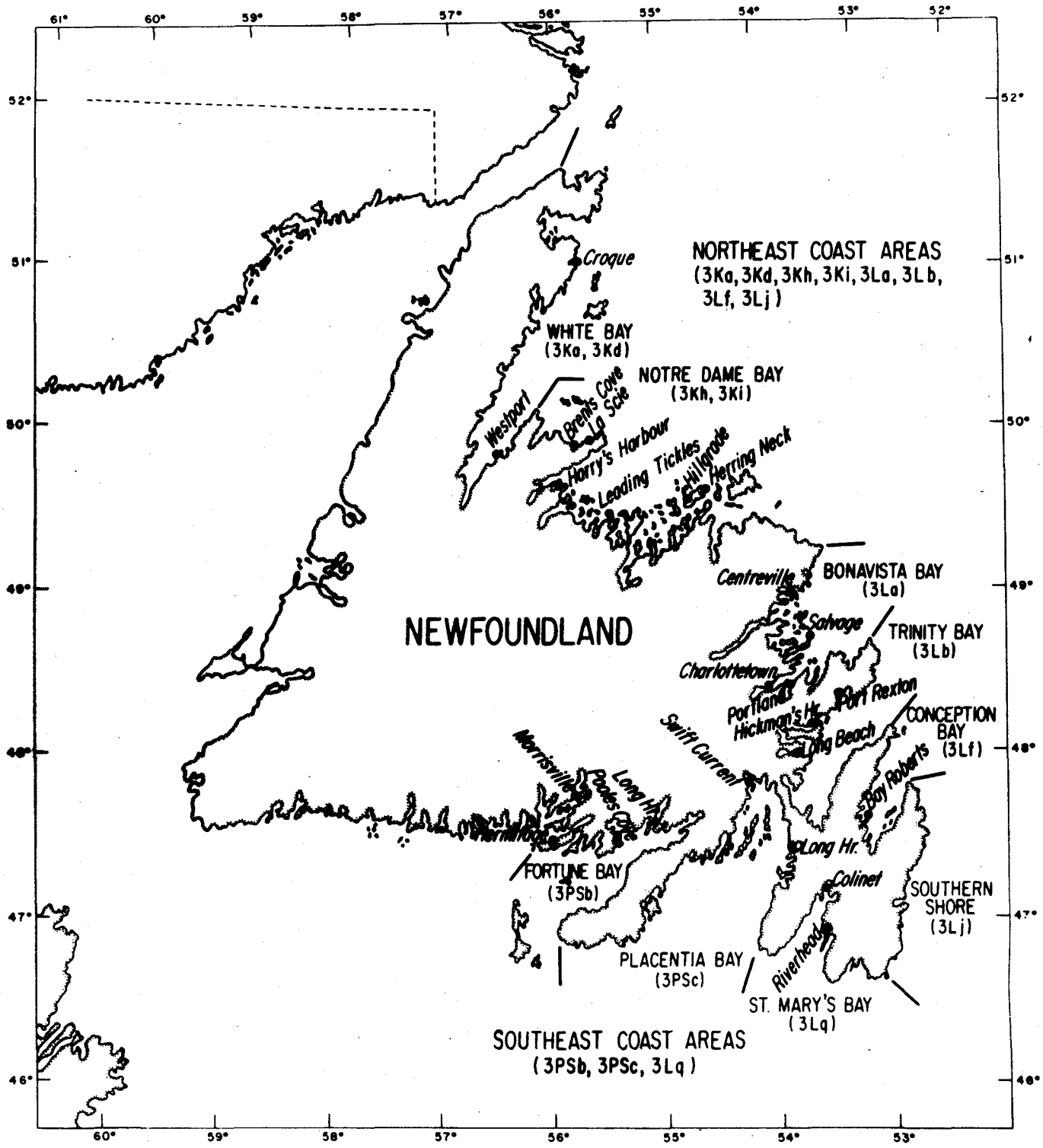


Fig. 1. Area map showing Newfoundland herring stock complexes.

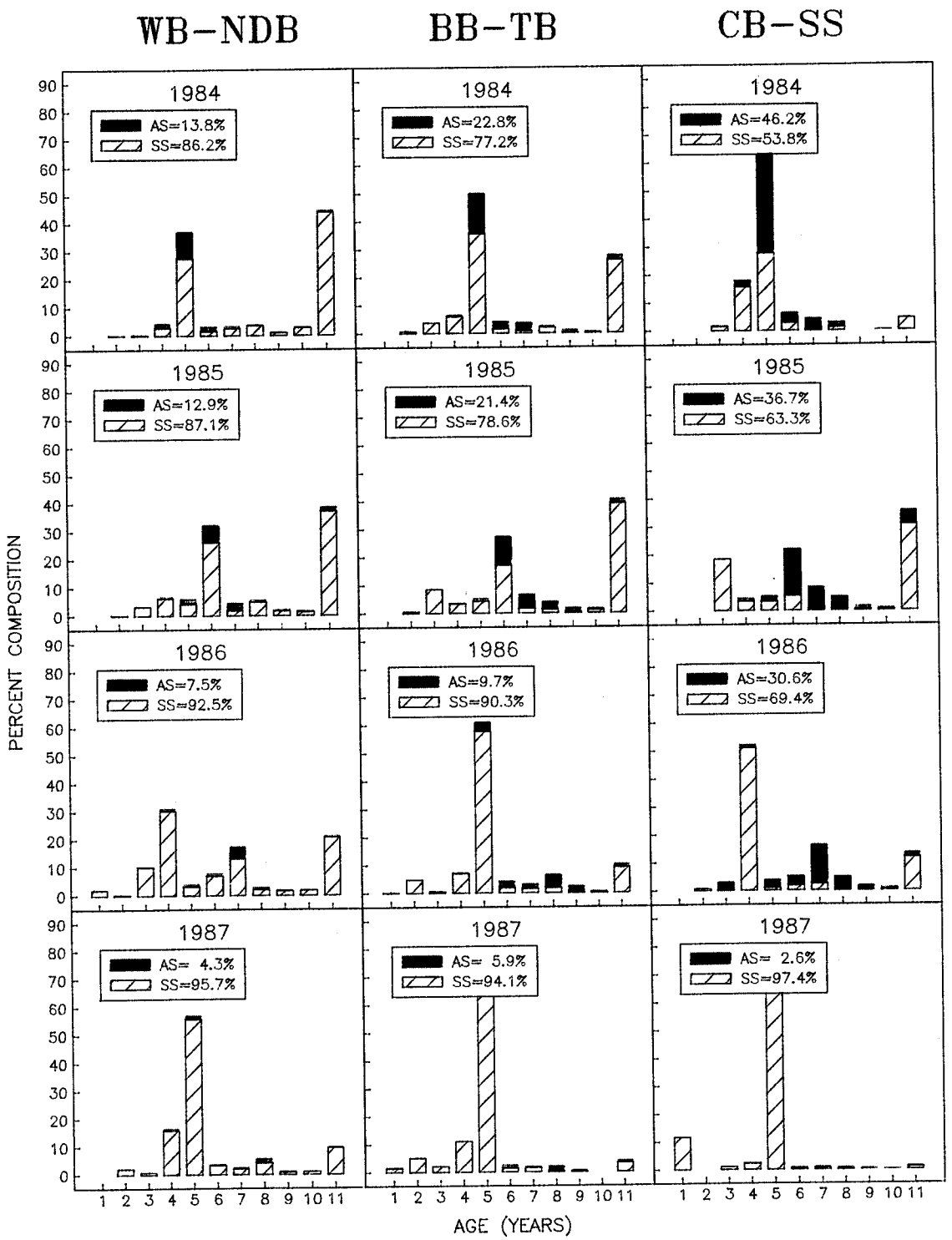


Fig.2. Age composition of herring from the commercial fishery, White Bay – Notre Dame Bay (WB–NDB), Bonavista Bay – Trinity Bay (BB–TB), and Conception Bay – Southern Shore (CB–SS), 1984–87.

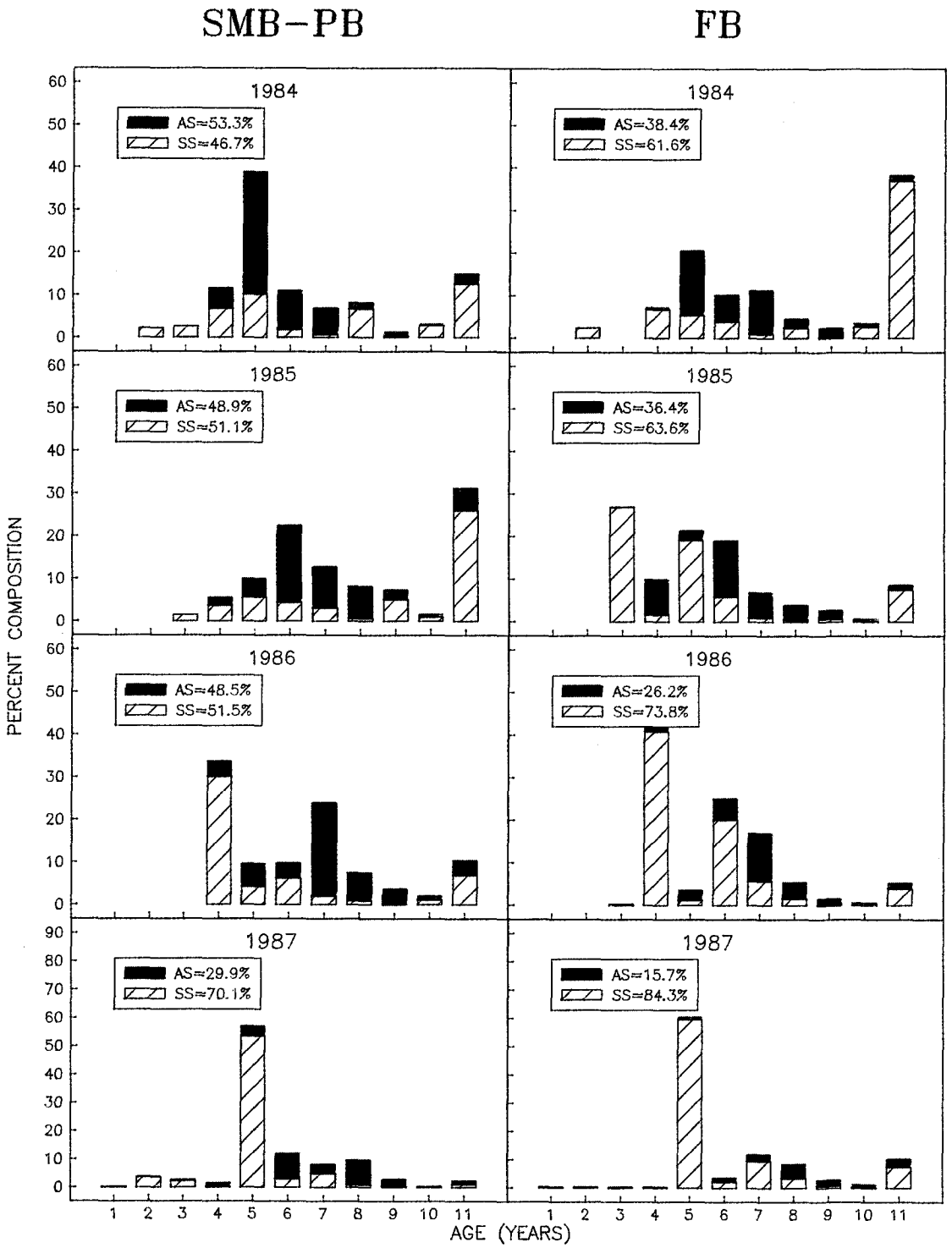


Fig.3. Age composition of herring from commercial fishery, St. Mary's Bay – Placentia Bay (SMB–PB), and Fortune Bay (FB), 1984–87.

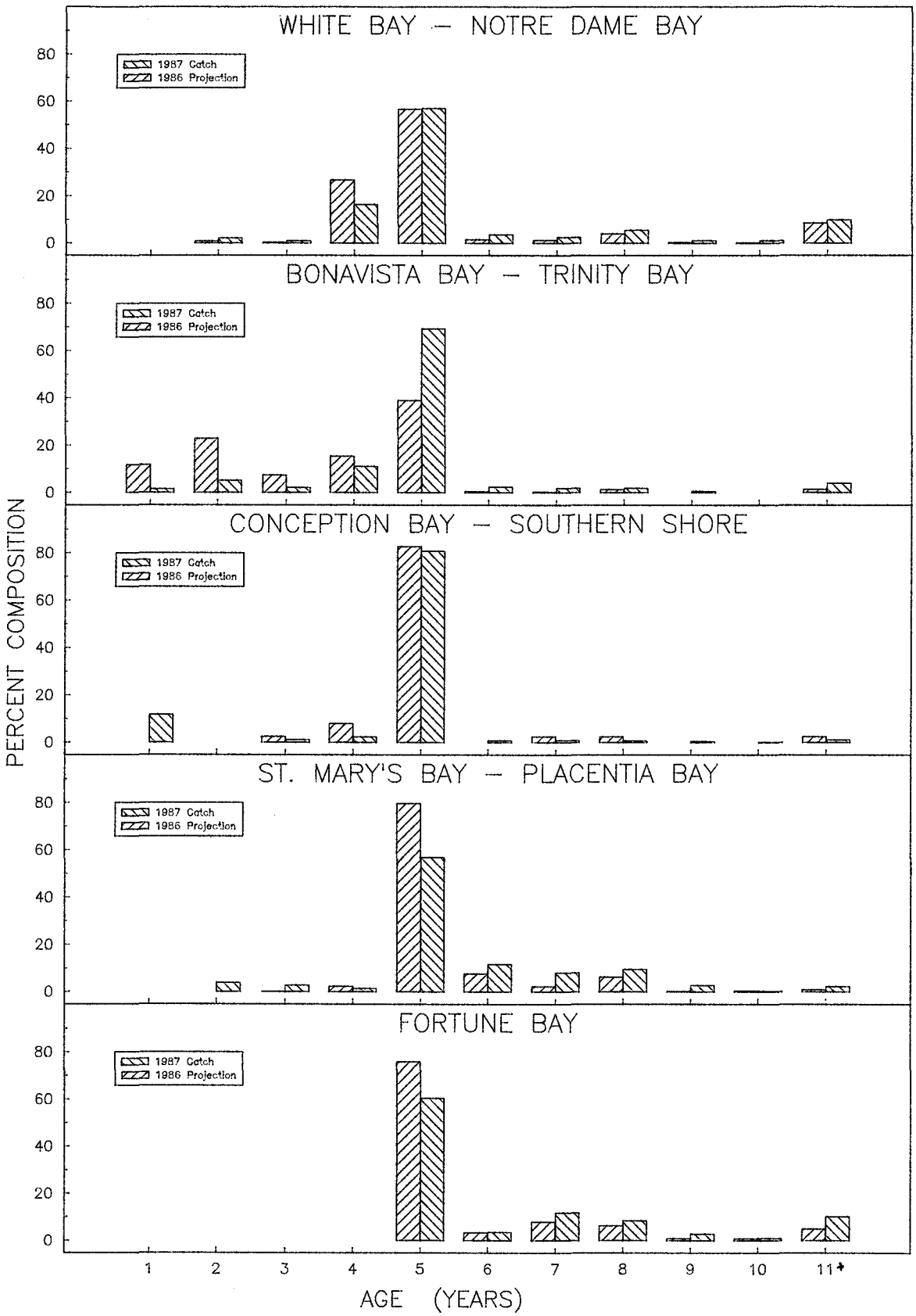


Fig. 4. Comparision between the projected commercial catch at age from the 1986 assessment and the actual 1987 catch at age.

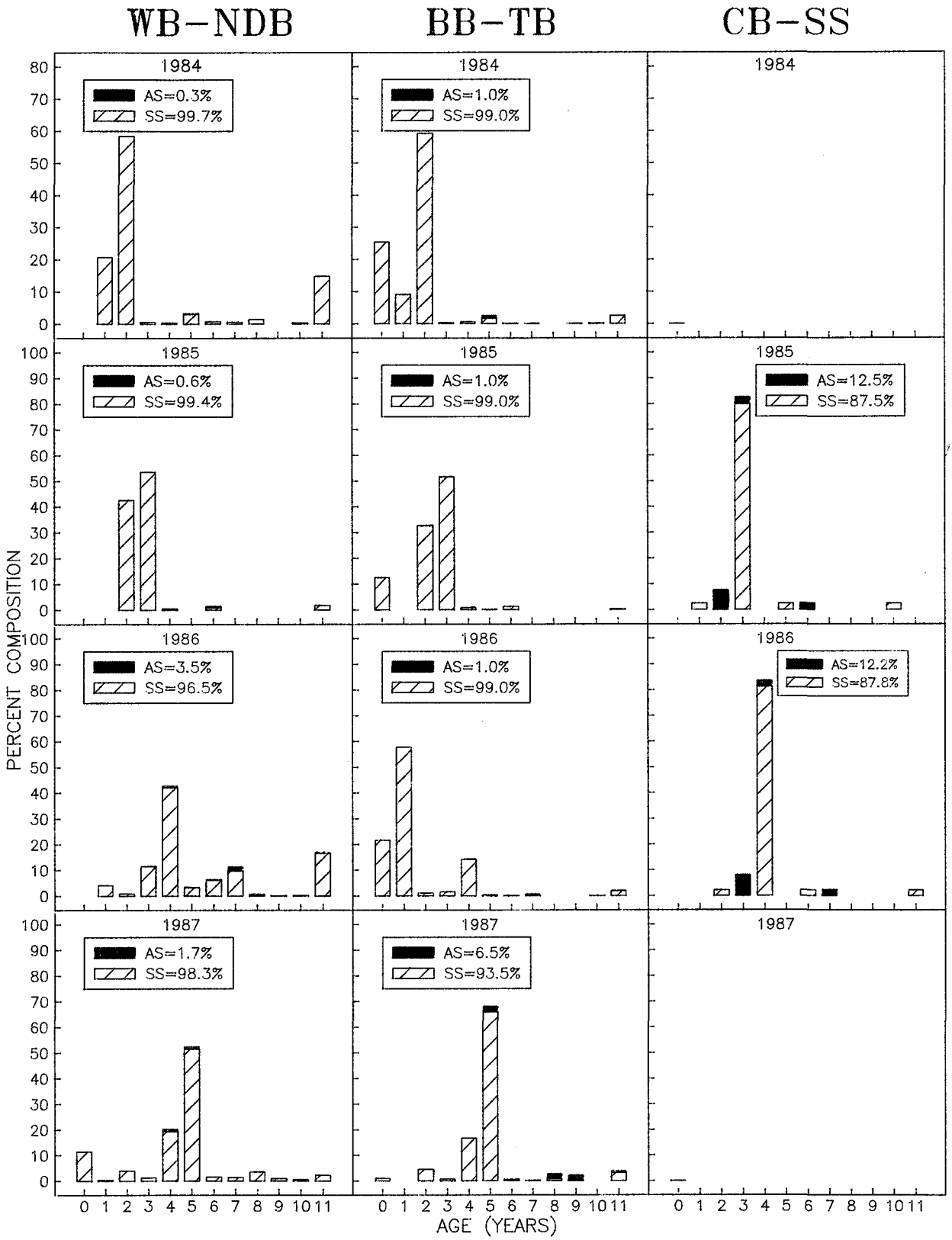


Fig.5. Stock age composition of herring from acoustic purse seine surveys, 1984–87, for White Bay–Notre Dame Bay (WB–NDB), Bonavista Bay–Trinity Bay (BB–TB), and Conception Bay–Southern Shore (CB–SS).

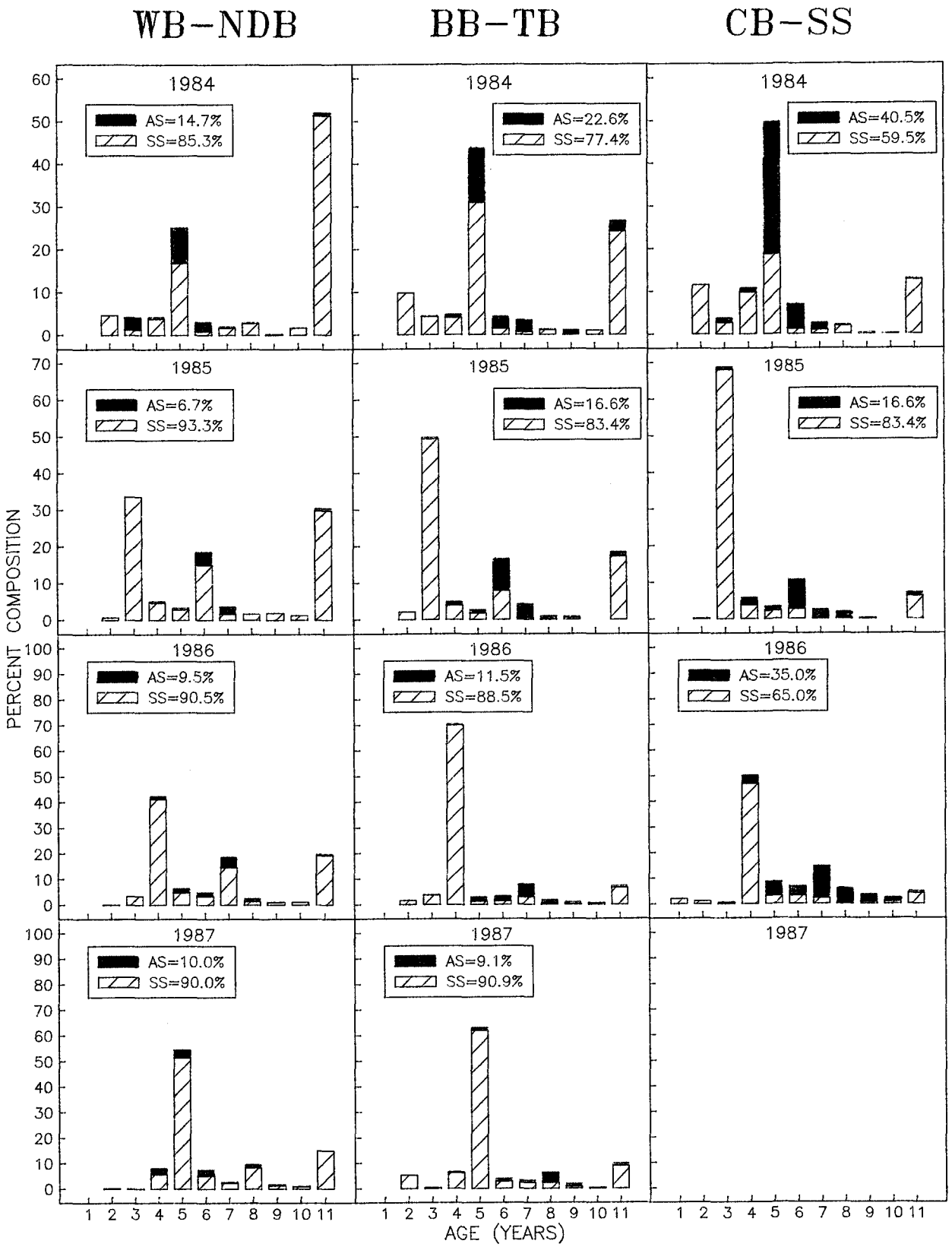


Fig.6. Age composition of herring from research gillnets, White Bay – Notre Dame Bay, Bonavista Bay – Trinity Bay, and Conception Bay – Southern Shore, 1984–87.

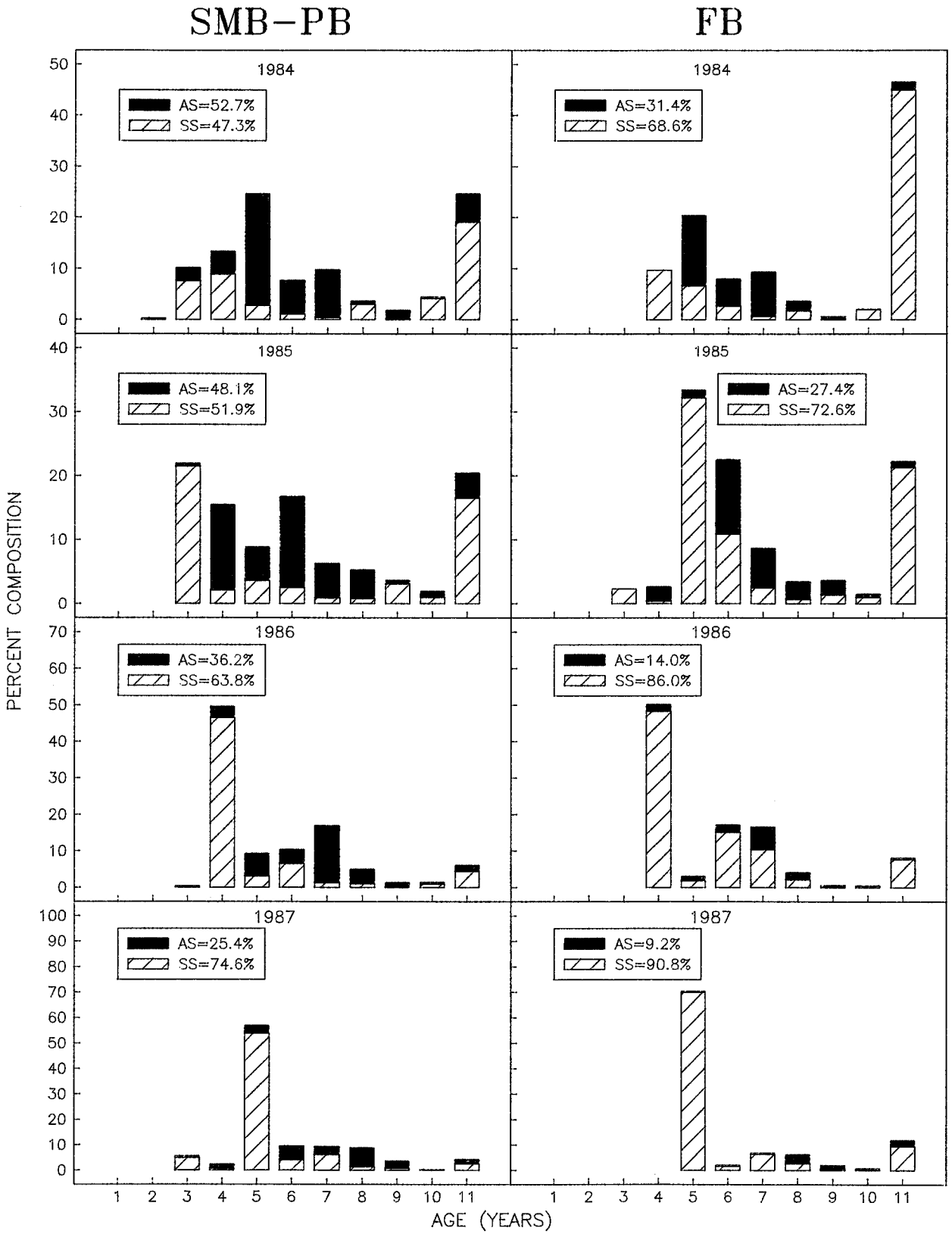


Fig.7. Age composition of herring from research gillnets, St. Mary's – Placentia Bays and Fortune Bay, 1984–87.

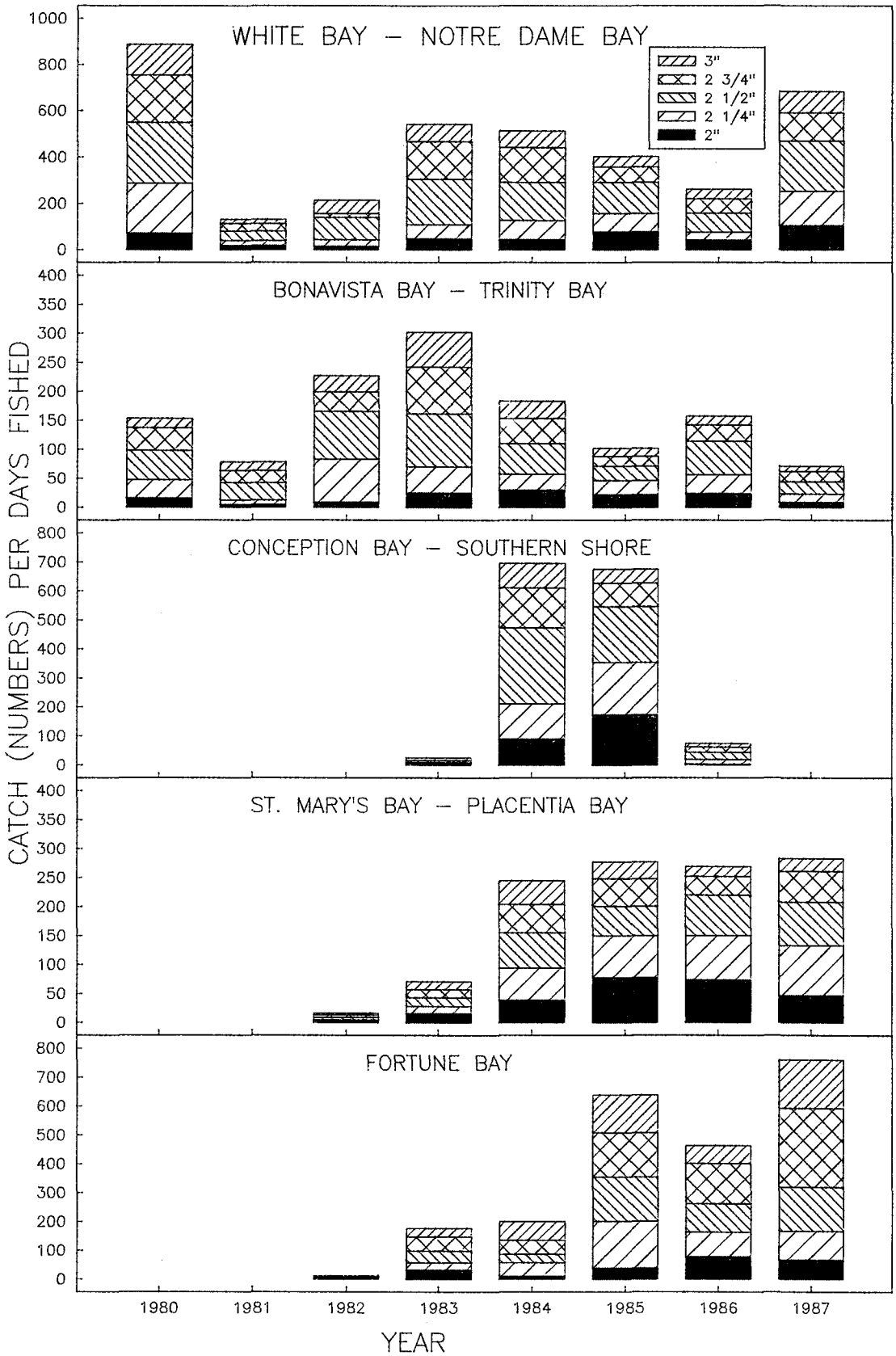


Fig.8. Catch rate (number of fish caught per days fished) by mesh size from the research gillnet program, 1980–87.

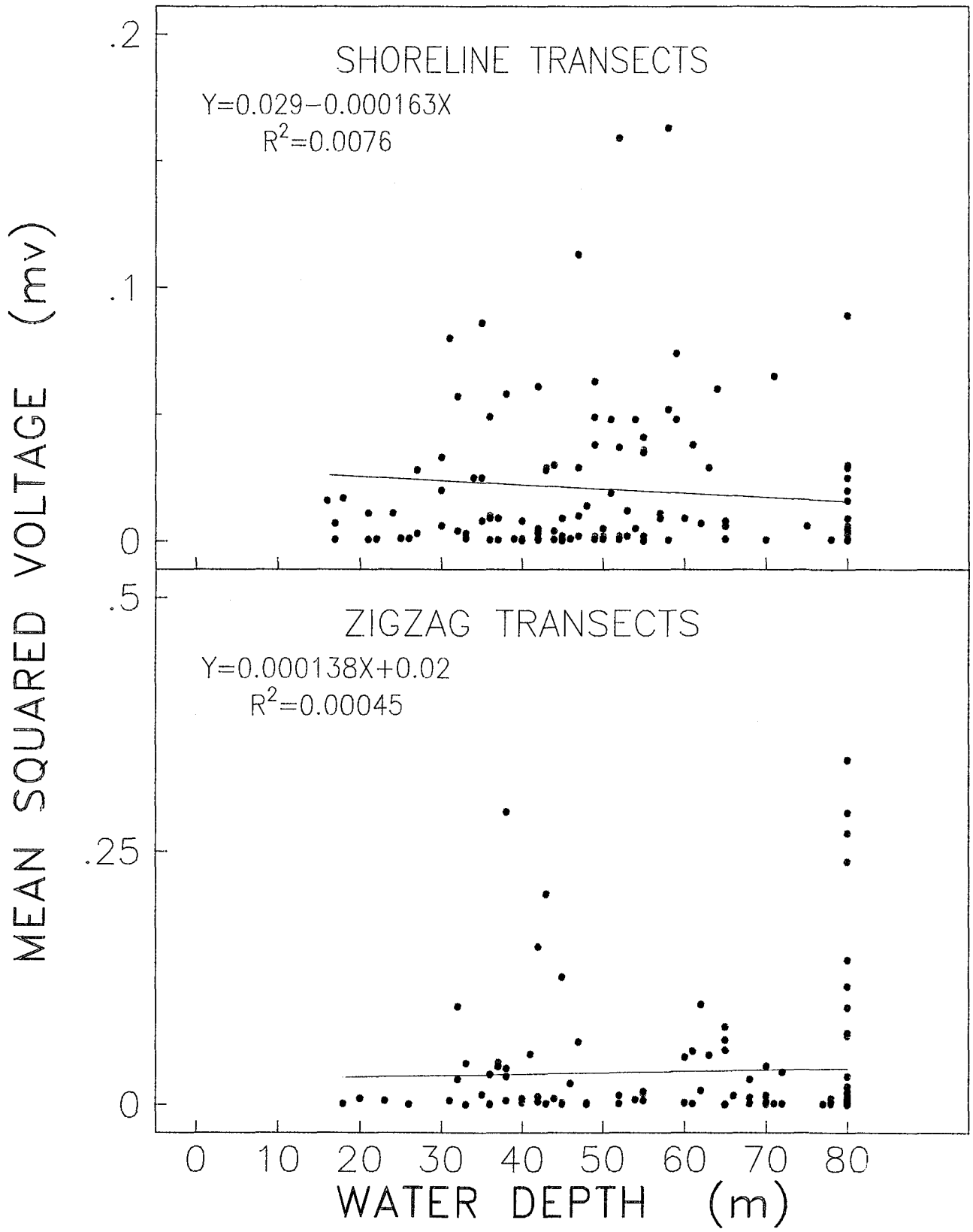


Fig.9. Fish density (expressed as mean squared voltages) vs. water depth from the 1987 acoustic survey.

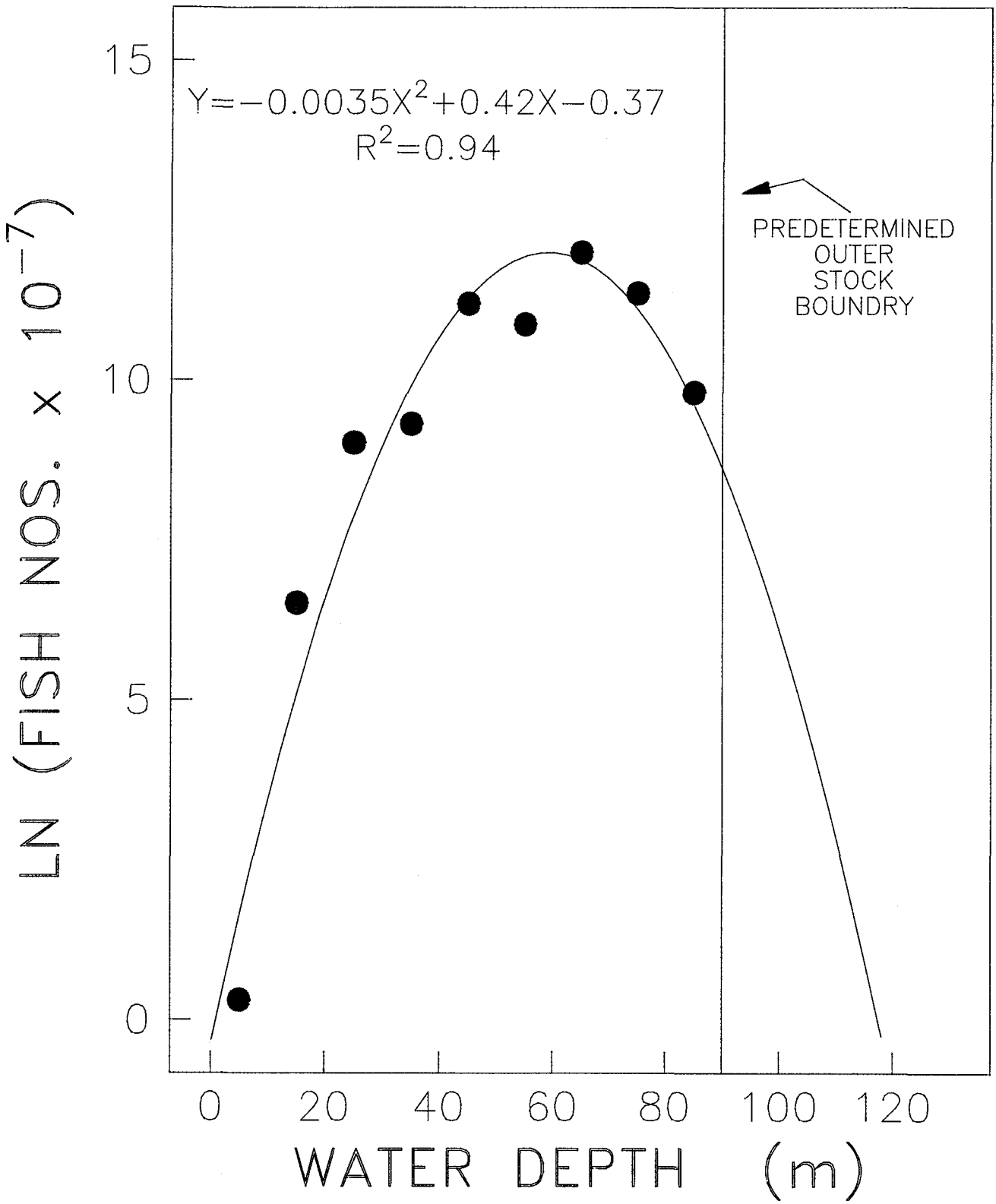
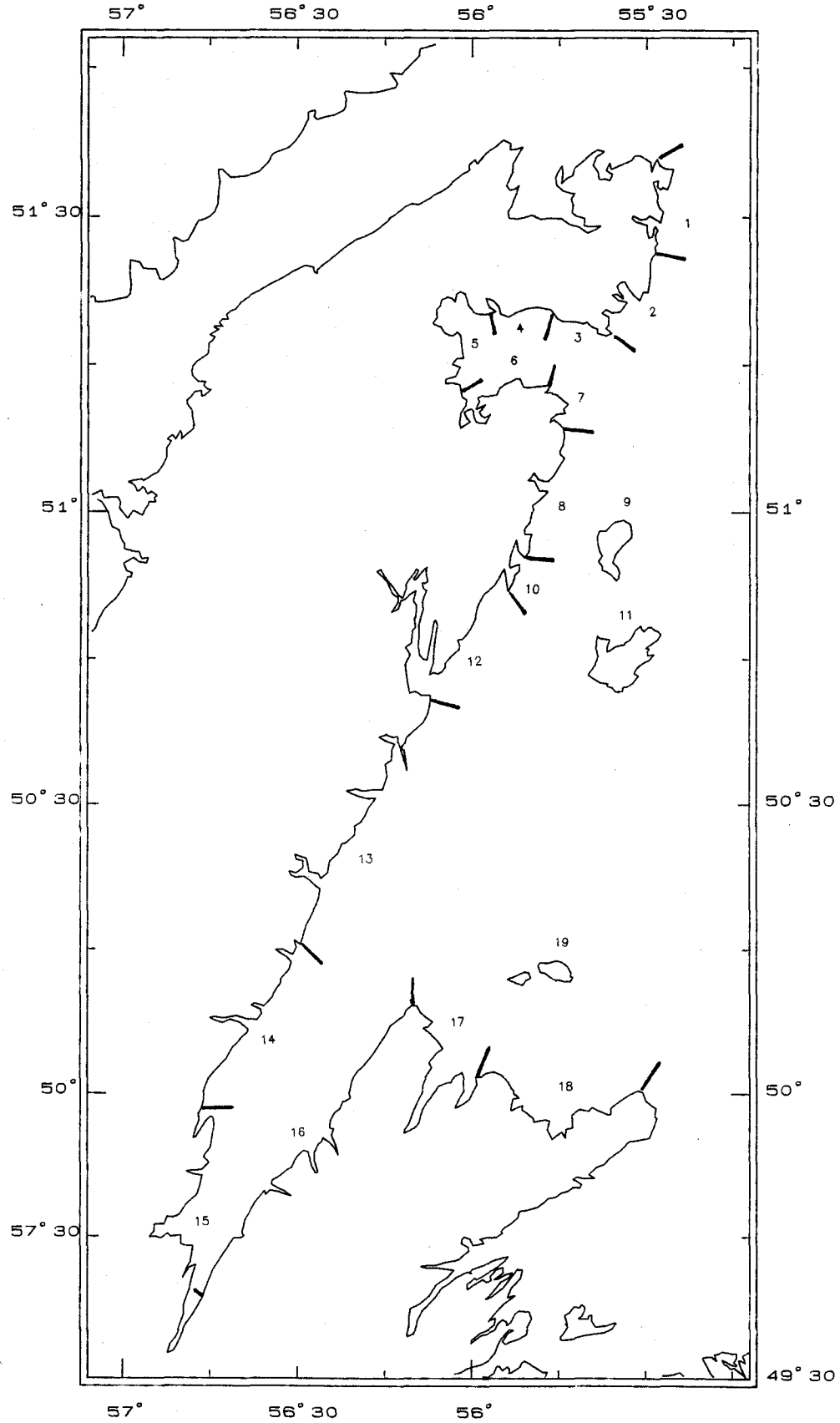
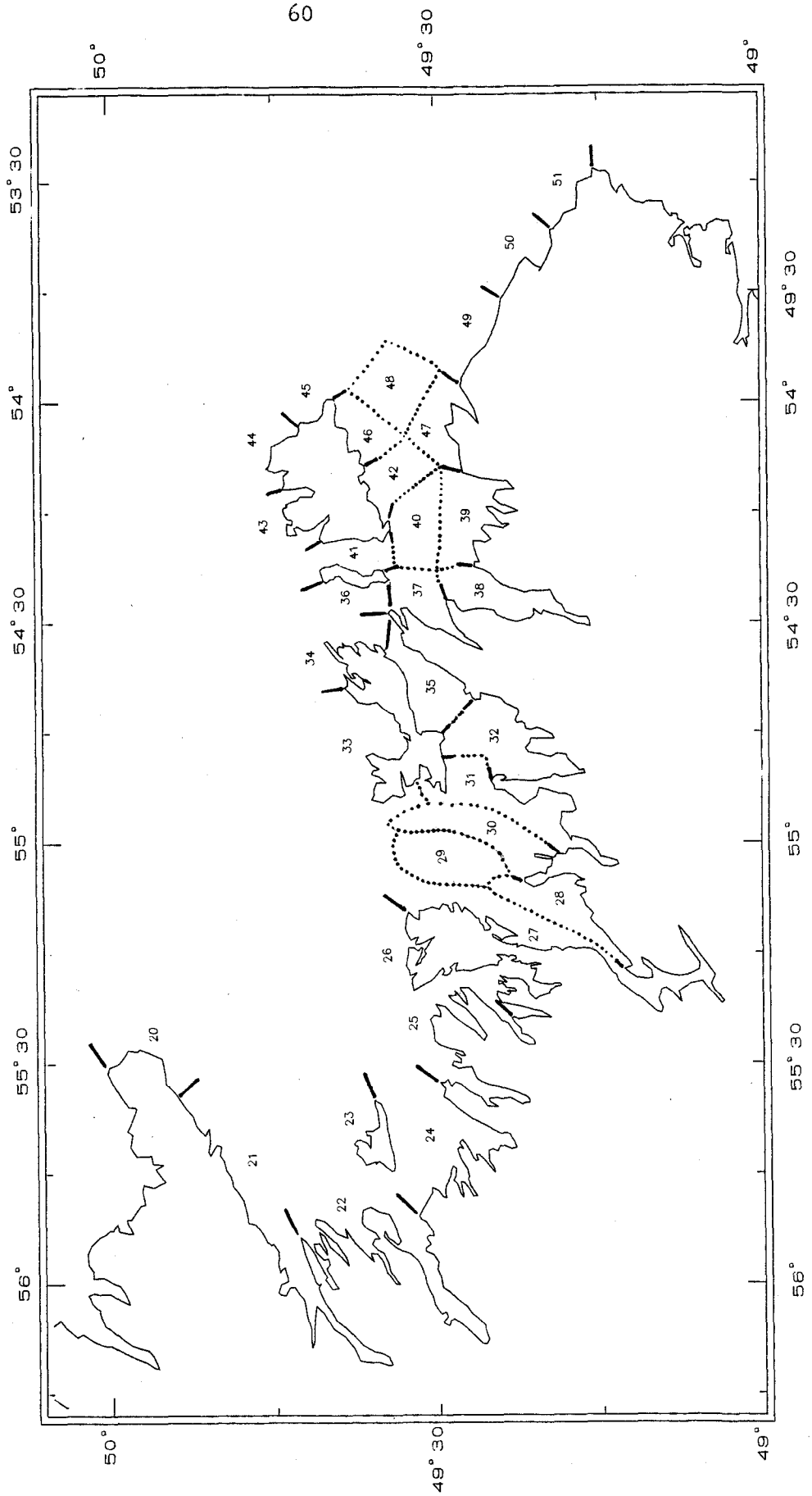


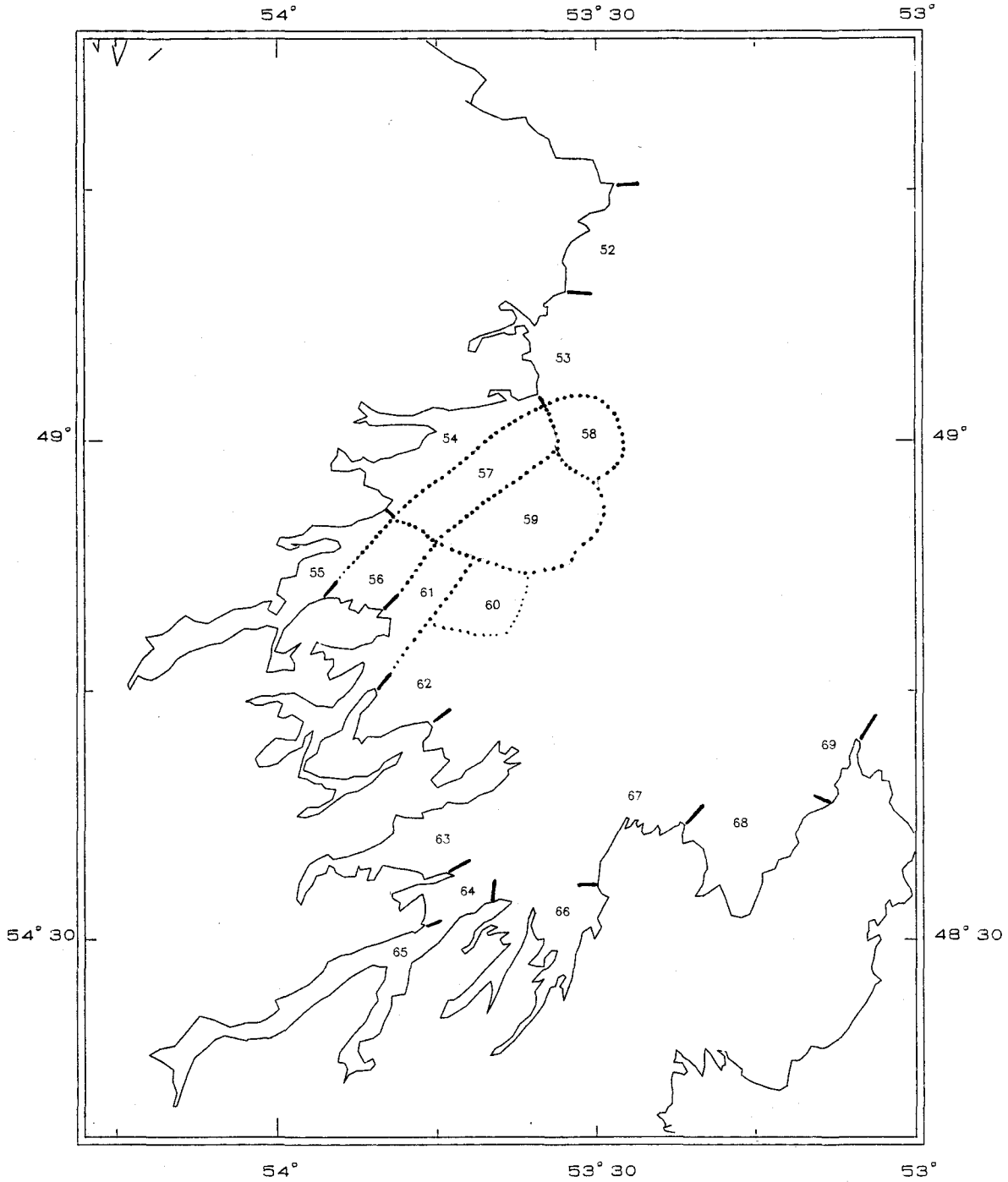
Fig. 10. Estimate of fish numbers by water depth, adjusted to account for seaching time, along all zigzag transects during the 1987 acoustic survey.



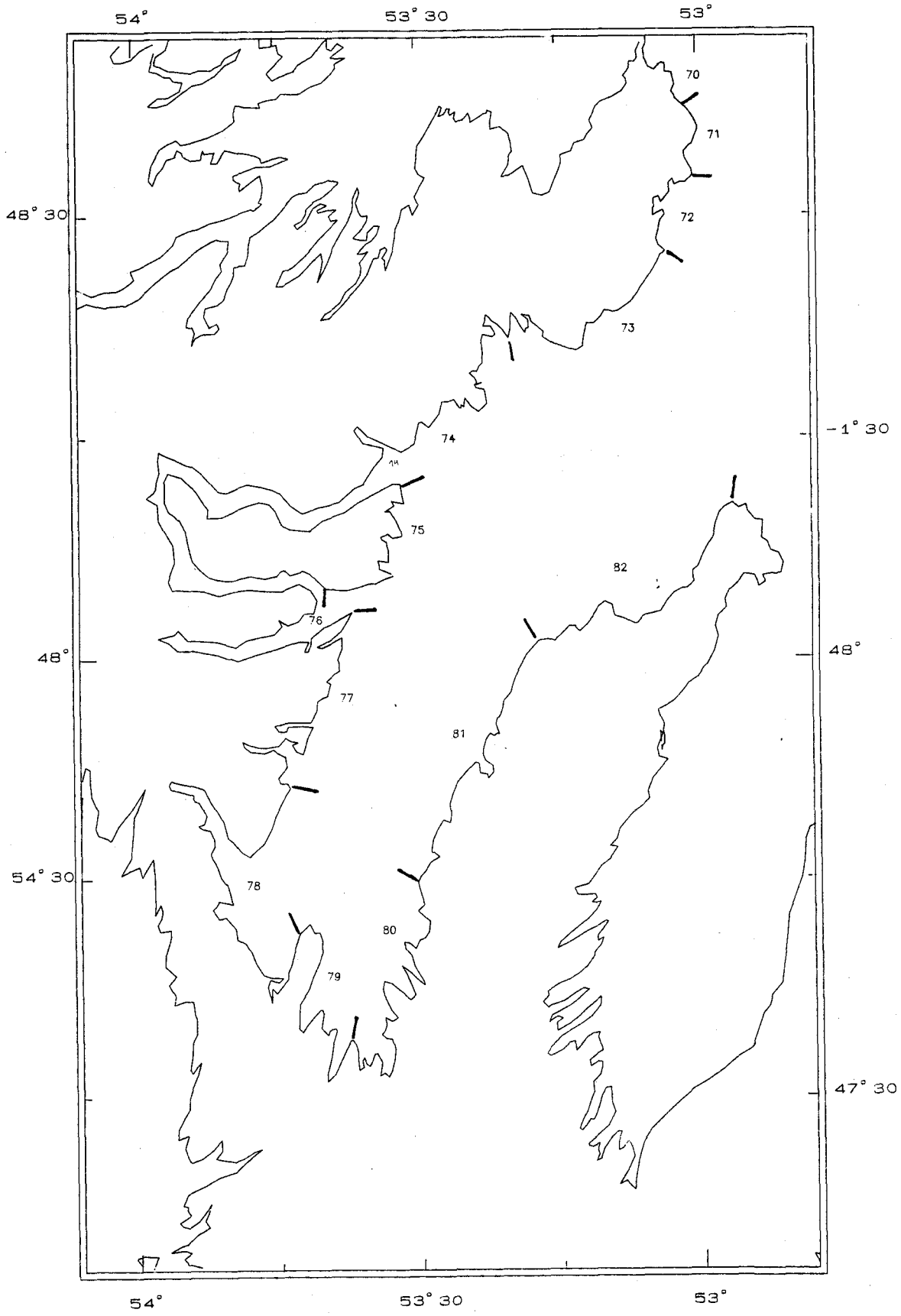
App. 1. 1987 acoustic survey grids in White Bay.



App. 2. 1987 acoustic survey grids in Notre Dame Bay.



App. 3. 1987 acoustic survey grids in Bonavista Bay.



App. 4. 1987 acoustic survey grids in Trinity Bay.