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Newfoundland East and Southeast Coast Herring - An Assessment of Stocks to the Spring of 2000

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Abstract

Results of analysis of data from 1998 to the spring of 2000 are presented for four herring stocks along the east and southeast coasts of Newfoundland. Commercial landings in 1998 (4200 t) were lower than in 1997 (7500 t) due primarily to poor market conditions and to reduced quotas. Landings in 1999 decreased further to 3400 t. Spring spawners of the 1991 and 1992 year classes dominated the 1998 and 1999 catches in most areas. Three series of abundance indices were available for each of the stock areas including research gill net catch rates and acoustic survey biomass estimates extending back to the early 1980's, and commercial gill net catch rates commencing in 1996. Gill net and purse seine fisher observations were also available since 1996. Stock abundances were estimated from integrated catch at age analysis for three of four stock areas and from a research gill net catchability analysis for the remaining area. The status of each stock was defined by a stock status classification system based upon environmentally dependent stock-recruit relationships. The status of the White Bay - Notre Dame Bay stock was classified as very poor. The Bonavista Bay - Trinity Bay stock was classified as good to very good, and the St. Mary's Bay -Placentia Bay and Fortune Bay stocks were classified as moderate to good.

Résumé

Les résultats de l'analyse des données obtenues de 1998 au printemps 2000 sont présentés pour quatre stocks de hareng des côtes est et sud-est de Terre-Neuve. Les débarquements commerciaux de 1998 (4200 t) ont été inférieurs à ceux de 1997 (7500 t), surtout en raison de la baisse des marchés et de la réduction des quotas. Les débarquements de 1999 ont chuté davantage pour s'établir à 3400 t. Les géniteurs de printemps des classes d'âge de 1991 et 1992 ont dominé les prises de 1998 et 1999 dans la plupart des zones. Trois séries d'indices d'abondance ont été obtenues pour chacune des zones de stock et comprenaient des taux de capture de la pêche de recherche au filet maillant, des estimations de biomasse par relevés acoustiques remontant au début des années 1980, ainsi que des taux de capture de la pêche commerciale au filet maillant débutant en 1996. Des observations de pêcheurs au filet maillant et à la senne coulissante ont aussi été obtenues depuis 1996. L'abondance des stocks a été estimée à partir de l'analyse des captures intégrées selon l'âge, pour trois des quatre zones de stock, et à partir d'une analyse de la vulnérabilité au filet maillant de la pêche de recherche, pour l'autre zone. L'état de chaque stock a été défini à l'aide d'un système de classement fondé sur des relations stock-recrutement en fonction des conditions environnementales. L'état du stock des baies White et Notre Dame a été qualifié de très faible. Celui du stock des baies Bonavista-Trinity a été de bon à très bon et celui des stocks des baies St. Mary's-Placentia et Fortune, de moyen à bon.

Introduction

There are five herring stocks distributed along the east and southeast coasts of Newfoundland (Figure 1): 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). This document provides an assessment of four of these stocks to the spring of 2000; CB-SS was excluded from the analysis due to the limited commercial fishery and lack of scientific data.

In recent years, east and southeast Newfoundland herring stocks have been assessed bi-annually, most recently in the fall of 1998 (Wheeler et al. 1999). The current assessment follows closely with the methodology used in 1998.

This document is divided into several sections, outlining the steps taken to assess these herring stocks in 2000. The first section examines the commercial fishery data and the associated biological sampling used to calculate the 1998 and 1999 commercial catches at age. The next section examines the abundance indices for each of the stocks. This section is sub-divided as three series of abundance indices were available, research gill net catch rates and acoustic survey biomass estimates extending back to the early 1980's, and commercial gill net catch rates commencing in 1996. Gill net fisher observations and purse seine fisher observations were also available since 1996. The third section describes the estimation of stock sizes using integrated catch at age analysis (ICA) for three of the four stock areas, and using a research gill net catchability analysis for the fourth (FB). Risk analysis methodology is also included in this section. The document concludes with information on the current status of each stock and the associated risk analysis. Assessment proceedings and management deliberations are provided in an Appendix.

Section 1.0 - Description of the 1998 and 1999 Commercial Fisheries and Catches at Age

1.1 Biological Sampling

Biological samples are collected each year from the east and southeast Newfoundland commercial herring fisheries. As well as providing information on the age distribution of commercial landings, commercial catch at age data are used in sequential population models (eg: ICA) to estimate stock sizes.

Commercial catch data (t), by bay, month and gear type, are provided by the Policy and Economics Branch. Catch data for recent years are considered preliminary as the Policy and Economics Branch has not finalized catch statistics for these years.

1.2 The 1998 Fishery

Fisheries Management Branch formulated a two year (1997 and 1998) management plan for east and southeast Newfoundland herring based upon the 1996 Draft SSR released by Science Branch after the 1996 herring stock assessment meetings (Wheeler et al. 1997). As defined by the stock status classification system, the plan allowed for a restricted fishery in WB-NDB and BB-TB and a commercial

fishery in SMB-PB and FB. Restricted fisheries were established for the two northern areas as the status of these stocks was considered *poor to moderate* and fishing mortalities of 5% to 10% were recommended. The status of the two southern stocks was considered to be *good to very good* with recommended fishing mortalities of 20%.

The TAC's for the 1998 fisheries, based upon the two year management plan, were generally lower than those in 1997 (Table 1). Quotas were taken in one stock area only

(SMB-PB) and 1998 landings (4200 t) were lower than in 1997 (7500 t) (Tables 2 - 5 and Figure 2).

The level of biological sampling was more than adequate as 1200 herring were sampled from the 1998 fisheries (Table 6).

As in 1997 (Wheeler et al. 1999), spring spawners of the 1991 year class dominated in the commercial catches in BB-TB, and SMB-PB (Tables 8 - 11 and Figure 3). However, in WB-NDB the 1994 and 1995 year classes of spring spawners dominated, a shift from 1997 when the 1990 and 1991 year classes were dominant. In FB, spring spawners of the 1992 year class dominated, unlike in 1997 when fish age 11+ were dominant. Spring spawners accounted for greater than 75% of the catch in all areas except SMB-PB where autumn spawners accounted for 36% of the catch.

Mean weights at age (Table 12 and Figure 4) were similar from 1997 to 1998 for older ages. However, there was some evidence of increased growth for the younger ages.

1.3 The 1999 Fishery

Prior to the 1999 fishery, Fisheries Management Branch formulated a new two year (1999 and 2000) integrated management plan for east and southeast Newfoundland herring. This was based upon the 1998 SSR released by Science Branch after the 1998 herring stock assessment meetings (Wheeler et al. 1999). As defined by the stock status classification system, the plan allowed for a restricted fishery in WB-NDB and commercial fisheries in BB-TB, SMB-PB and FB. A restricted fishery was established for the northern area as the status of this stock was considered *poor to moderate* and fishing mortalities of 5% to 10% were recommended. The status of the remaining stocks was considered to be *moderate to good* with recommended fishing mortalities of approximately 20%.

TAC's for each of the stock areas were the same in 1999 as in 1998 (Table 1). Quotas were not taken in any of the stock areas and 1999 landings (3400 t) were again lower than in 1998 (4200 t) (Tables 2 - 5 and Figure 2).

The level of biological sampling was again more than adequate in 1999 as 884 herring were sampled from the fisheries (Table 7).

The distribution of year classes in the 1999 fisheries was similar to that in 1998 (Tables 8 - 11 and Figure 3). The 1991 year class of spring spawners dominated in BB-TB and SMB-PB, the 1994 and 1995 year classes of spring spawners dominated in

WB-NDB, and the 1992 spring spawning year class again dominated in FB. Spring spawners accounted for greater than 85% of the catch in all areas except SMB-PB where the percentage of autumn spawners increased to 48% of the catch. Mean weights at age, on average, were similar to 1998 (Table 12 and Figure 4).

Section 2.0 - Abundance Indices

2.1 Research Gill Net Program

The research gill net program was initiated in 1982 to derive abundance indices independent of the commercial fishery. Each year, commercial fishers are contracted to provide catch rate data and biological samples of their catch. In 2000, twenty-two fishers participated in the program (Figure 5), six in WB-NDB, eight in BB-TB, five in SMB-PB and three in FB.

Age distributions of herring (by number) from the research gill net program were available up to and including 1999; biological samples from the 2000 program have not yet been processed. In 1999, there was a broad range of spring spawning year classes which dominated the catches (Figure 6). In WB-NDB, the 1994 year class was dominant followed by the 1995 year class. In BB-TB, the 1991 year class was dominant, also followed by the 1995 year class. In SMB-PB, the 1996 year class was dominant and in FB, the 1992 year class dominated.

Spring spawning herring continued to dominate the catches in all areas (Figure 6) and represented greater than 74% of the catch in WB-NDB, BB-TB, and FB. In SMB-PB, the percentage of autumn spawners represented 33% of the catch in both 1998 and 1999.

Year classes are normally recruited to the research gill nets by age three or four years (Wheeler et al. 1997). There was substantial recruitment of the 1996 year class as 3 year olds in 1999 in SMB-PB and FB, where it accounted for 30% and 8% of the catch respectively. Similarly, there was substantial recruitment of the 1995 year class as 4 year olds in 1999 in WB-NDB and BB-TB where it accounted for approximately 30% of the catch in each area and in SMB-PB where it accounted for approximately 15% of the catch.

Catch rates at age for spring spawning herring only from the research gill net program are presented by stock area in Table 13 and Figure 7. Catch rates only are available for 2000 as these biological samples have not yet been processed. Catch rates and age distributions by bay are presented in Figures 8 - 10.

Catch rates for WB-NDB have continued to decline since last examined in 1998 (Figure 7). This decline has been continuous since 1992; catch rates in 2000 were 6% of the peak catch rates in 1992 and were the lowest in the time series. When examined by bay (Figure 8), catch rates have declined in both WB and NDB.

Catch rates for BB-TB have declined continuously since last examined and in 2000 were also the lowest in the time series (Figure 7). The decline from 1997 to 2000

occurred in both bays (Figure 9) but was more pronounced in BB where 2000 catch rates were the lowest during the time series; in TB, 2000 catch rates increased marginally from 1999.

Catch rates for SMB-PB increased from 1998 to 1999 and remained stable in 2000 (Figure 7). However, most of the increase occurred in the SMB portion of the stock area only (Figure 10).

After increasing consistently from 1992 to 1998, catch rates in FB declined both in 1999 and 2000 (Figure 7). However, catch rates are still five times higher than in any other area and are supported by a broad range of ages including substantial numbers of fish age 11+ years.

2.2 Acoustic Survey Biomass Estimates

Acoustic surveys have been conducted on an annual basis since the early 1980's as part of the research program to assess Atlantic herring stocks within the Newfoundland Region. Acoustic biomass estimates, and distributional and behavioral information are available from four surveys since the last assessment, one conducted in WB-NDB in the fall of 1998, one conducted in FB during the winter of 1999, one conducted in BB-TB in the fall of 1999, and one conducted in SMB-PB in late winter 2000. Distributional information only is available from an acoustic survey of the northeast coast of Newfoundland conducted in January 2000.

In all surveys (except the 2000 northeast coast survey), the survey area was defined as the area from the coastline to the 120 m depth contour. The survey areas were divided into strata based upon geographical features and herring distribution patterns, 22 strata in WB-NDB (Figures 13 and 14), 14 strata in FB (Figure 20), 21 strata in BB-TB (Figure 25), and 26 strata in SMB-PB (Figure 28).

The design of the acoustic surveys remained unchanged from recent surveys (Wheeler et al. 1999) and followed that described by Anderson et al. (1998).

The 1998 fall WB-NDB survey was conducted from the *Andrew and Nicholas*, a 16.8 m chartered commercial purse seining vessel. The survey commenced in Carmanville, Notre Dame Bay on November 9, 1998 and terminated in Fleur de Lys, White Bay on December 9, 1998. The total length of transects surveyed was 645 n.mi. The survey averaged 21.9 n.mi. of transects per twelve hour day and all strata were surveyed. During the survey, there was 17% downtime, one lay day, one day repairing damage to the seine, and two days due to storms.

The 1999 winter FB survey was conducted from the *Sea Gem*, a 19.8 m chartered commercial purse seining vessel. The survey commenced at Fortune on March 9, 1999 and terminated at Pass Island on March 30, 1999. The total length of transects surveyed was 288 n.mi. The survey averaged 18.5 n.mi. of transects per twelve hour day and all strata were surveyed. During the survey, there was 24% downtime, including two days due to storms.

The 1999 fall BB-TB survey was conducted from the *Three T's 1*, a 16.2 m chartered commercial purse seining vessel. The survey commenced at Grates Point, Trinity Bay on November 8, 1999 and terminated at Shoe Cove Point, Bonavista Bay on December 8, 1999. The total length of transects surveyed was 489 n.mi. The survey averaged 17.3 n.mi. of transects per twelve hour day and all strata were surveyed. During the survey, there was 15% downtime, including one lay day.

The 2000 winter SMB-PB survey was conducted from the *Valerie Amanda 2*, an 18.3 m chartered commercial purse seining vessel. The survey commenced at St. Lawrence, Placentia Bay on March 6, 2000 and terminated at St. Joseph's, St. Mary's Bay on April 5, 2000. The total length of transects surveyed was 614 n.mi. The survey averaged 19.8 n.mi. of transects per twelve hour day and all strata were surveyed. During the survey, there was 22% downtime, including one lay day and several partial days due to storms.

The January 2000 survey along the northeast coast was conducted from the *CGV Teleost*, a Departmental research trawler. The survey was designed to search for aggregations of cod in deep water inlets in Notre Dame Bay, Bonavista Bay, and Trinity Bay. It also provided distributional information on herring in the areas searched.

A *Femto* Model 9001 acoustic data acquisition system was used in all of the dedicated herring surveys in conjunction with a *BioSonics* Model 105 echo sounder and 120 kHz transducer (operating in single beam mode). The transducer, mounted in a v-fin, was deployed at a depth of approximately 3 m astern and abeam of the vessel.

The acoustic system was calibrated in September 1998, in September 1999, and again in April 2000. The calibration parameters were as follows:

Parameters	Sept. 1998	Sept. 1999	Apr. 2000
Source Level / Receive Sensitivity:	42.37 dB	42.25 dB	42.23 dB
Fixed Receiver Gain:	11.265 dB	11.308 dB	9.928 dB
TVG Gain:	20 log R	20 log R	20 log R
Attenuation Coefficient:	0.0347 dB/m	0.0347 dB/m	0.0347 dB/m
Pulse Length:	0.4 ms	0.4 ms	0.4 ms
Average Beam Factor:	-29.4 dB	-29.4 dB	-29.4 dB

The September 1998 calibration parameters were used for the WB-NDB and FB surveys, the September 1999 parameters were used for the BB-TB survey, and the April 2000 parameters were used for the SMB-PB survey.

During the surveys, a detailed log record was maintained for each transect and also while steaming between transects. Observations were recorded of all fish concentrations (pelagic and groundfish) detected on both the echogram and oscilloscope.

The acoustic data, as recorded in the detailed log, were edited, subsequent to the surveys, using a *Femto* acoustic data editing system. All bottom signals were removed

and only those fish concentrations considered to be herring (from visual inspection of oscilloscope and echogram images) were included in the analyses.

Where concentrations warranted, and depth and weather conditions permitted, biological samples of herring were collected during the surveys using a purse seine.

Acoustic back-scatter was converted to herring density using the following target strength - fish length relationship calculated for herring by Wheeler et al. (1994):

$$T.S. = 20 \log L - 65.5$$

Mean fish lengths were derived from biological samples collected during the survey. Target strength per fish was converted to target strength per unit fish weight using mean fish weights from the biological samples. Age distributions were also calculated from the samples.

Formulas used to calculate mean densities, variances, and biomass estimates remained unchanged from previous surveys and are described in Wheeler (1991).

For the purpose of plotting herring distributions, mean densities (g/m²) were calculated per 10 sec. (~30 m) intervals along each transect for the surveys.

2.2.1 White Bay - Notre Dame Bay

During this survey, 440 transects were surveyed (Figures 15 and 16). Herring were acoustically detected in 10 of the 23 strata surveyed. Concentrations of herring were detected and integrated in Shoal Bay and near Island Harbour, Fogo Island, in Twillingate Harbour, near Hornet Island and Thwart Island and in Botwood Run in the Bay of Exploits, in Cottrell's Cove, Besom Cove, Mill Cove and near Point Learnington in New Bay, near Robert's Arm, in Southern Arm, and near King's Point in Green Bay.

Herring were sampled by purse seine in eleven locations during the survey; in addition, a purse seine sample from the commercial fishery was available from one other location (Table 14). Mean lengths and weights were calculated for combined samples on a stratum by stratum basis (Table 15 and Figure 11) and were available for eight of the ten strata in which herring were acoustically detected. Length distributions of the combined samples by stratum are also presented in Figure 12. The mean lengths and weights were used to calculate target strengths (Table 15). Target strengths from adjacent strata were used for those strata in which herring were acoustically detected but for which no biological samples were obtained.

A biomass estimate of 19529 t was derived from the survey area (Table 16), 100% of which was in Notre Dame Bay. Approximately 27% of the estimated biomass was detected in one stratum, in the Botwood Run area (Figure 15).

Spring spawners accounted for 98.7% of the population numbers (Figure 17). The estimate of spring spawners (19200 t) represented a substantial increase from the last acoustic survey of the area in 1994 (Table 17) but was lower than estimates through the 1980's. The 1995 year class accounted for 35% of the population estimate; there was

also evidence of recruitment of the 1997 and 1998 year classes which each accounted for approximately 18% of the population estimate (Figure 17).

2.2.2 Fortune Bay

During this survey, 322 transects were surveyed (Figure 21). Herring were acoustically detected in 5 of the 10 strata surveyed. Concentrations of herring were detected and integrated near Bay L'Argent, Little Bay, in Long Harbour, near Belleoram, in Bay de L'eau, and near Harbour Breton.

Herring were sampled by purse seine in four locations during the survey (Table 18). Mean lengths and weights were calculated for combined samples on a stratum by stratum basis (Table 19 and Figure 18) and were available for four of the five strata in which herring

were acoustically detected. Length distributions of the combined samples by stratum are also presented in Figure 19. The mean lengths and weights were used to calculate target strengths (Table 19). Target strength from the adjacent stratum was used for the stratum in which herring were acoustically detected but for which no biological samples were obtained.

A biomass estimate of 30408 t was derived from the survey area (Table 20). Approximately 91% of the estimated biomass was detected in two strata, 52% in the Bay L'Argent area and 39% in Long Harbour (Figure 21).

Spring spawners accounted for 98% of the population numbers (Figure 22). The estimate of spring spawners (30000 t) represented a substantial increase from the last acoustic survey of the area (Table 21) and was the highest in the time series. The 1992 year class dominated, accounting for 75% of the population estimate (Figure 22).

2.2.3 Bonavista Bay - Trinity Bay

During this survey, 292 transects were surveyed (Figure 26). Herring were acoustically detected in 10 of the 20 strata surveyed. Concentrations of herring were detected and integrated in Trinity Bay near Hopeall, Dildo, Norman's Cove, Tickle Harbour Point, Clarenville, and Catalina, and in Bonavista Bay near Summerville, Princeton, Matthew Cove, Kate Harbour, Woody Island, Great Chance Harbour, Milners Cove, Buckley Point, Ratchet Cove, Glovertown, Culls Harbour, Long Island Reach, Chalky Cove, Dover, Cat Bay, Lewis Island, Indian Island, and Black Duck Cove.

Herring were sampled by purse seine in ten locations during the survey and by jiggers in one location (Table 22). A purse seine sample from the commercial fishery was also available from one other location. Mean lengths and weights were calculated for combined samples on a stratum by stratum basis (Table 22 and Figure 23) and were available for eight of the ten strata in which herring were acoustically detected. Length distributions of the combined samples by stratum are also presented in Figure 24. The mean lengths and weights were used to calculate target strengths (Table 23). Target strengths from adjacent strata were used for the strata in which herring were acoustically detected).

A biomass estimate of 22674 t was derived from the survey area (Table 24), 91% of which was in Bonavista Bay. Approximately 70% of the estimated biomass was detected in one stratum, in northern Bonavista Bay (Figure 26).

Spring spawners accounted for only 43% of the population numbers (Figure 27). The estimate of spring spawners (15200 t) represented a substantial decrease from the last acoustic survey of the area (Table 25). The 1997 and 1998 year classes of autumn spawners dominated, accounting for 51% of the population estimate (Figure 27).

2.2.4 St. Mary's Bay - Placentia Bay

During this survey, 356 transects were surveyed. Herring were acoustically detected in 3 of the 21 strata surveyed (Figure 29). Concentrations of herring were few and were located only near Arnold's Cove and Argentia in Placentia Bay and near Mall Bay in St. Mary's Bay.

No herring were sampled by purse seine during the survey; however, samples from the commercial fishery were available from one location near Argentia. The mean length (319 mm) and weight (247 g) from these were used to calculate a target strength which was applied to the three strata in which herring were detected.

A biomass estimate of 3810 t was derived from the survey area, 86% of which was detected in Placentia Bay (Table 26). Approximately 62% of the biomass estimate was detected one stratum, in the Arnold's Cove area (Figure 29).

Spring spawners accounted for 52% of the population numbers (Figure 30). The estimate of spring spawners (2000 t) represented a substantial decrease from the last survey of the area and was the lowest in the time series (Table 27). The 1995 year class of spring and autumn spawners dominated, accounting for 25% of the population estimate (Figure 30).

2.2.5 Northeast Newfoundland Coast

The January 2000 acoustic survey along the northeast coast included transects through the major deep water inlets in each of the bays. Herring were detected and integrated in the Halls Bay and Roberts Arm areas in Green Bay, in Bloody Reach and offshore in Bonavista Bay, and in Smith Sound in Trinity Bay (Figure 32). Herring were sampled in each of these locations using a Campelan bottom trawl (Table 28). Although none of the herring samples were aged, length distributions (Figure 31) indicated that most of the sampled herring were 1997 and 1998 year classes.

Biomass estimates were not calculated from this survey. However, the acoustic data indicate that herring were aggregated in deep water (>120 m) in all areas and deeper than the outer survey boundary in BB-TB less than two months after the completion of the 1999 fall survey.

2.3 Commercial Gill Net Logbook Program

In 1996, an initiative was undertaken by Science Branch within the Newfoundland region to increase the scientific information derived from the fixed gear herring fishery and to allow for the quantitative input of commercial fishers in the assessment process.

The long-term goal of this program is to develop a time series of catch per unit effort (CPUE) data from the commercial fixed gear fishery. These data will complement information derived from the research gill net program which has been used to track herring year class abundance since the early 1980's.

From 1996 to 1999, logbooks, prepared by Science Branch, were distributed by Fisheries Management Branch to greater than 2000 fishers along the east and southeast coasts of Newfoundland as part of the fisher's fixed gear herring licence package. In 2000, logbooks were mailed directly to approximately 2800 fishers in an effort to ensure that all fixed gear and bait fishers received a logbook.

The logbook, the format of which has been described in Wheeler et al. (1999), was designed to be completed by gill net fishers involved in the spring commercial (food fish) fishery, spring bait (lobster) fishery, and/or fall commercial fishery. Subsequent to the 1998 fishery, the logbook was revised (Appendix 1) to allow fishers to indicate the number of nights that each net was fished each time that it was hauled.

Prior to this assessment, a standardized panel area was calculated for each mesh size net by calculating the mean net panel area by mesh size for data collected from all areas between 1996 and 1999. Catch rates for the entire time series were then standardized to allow for comparisons between areas and years.

All logbooks received to September 8, 2000 have been included in this analysis.

2.3.1 White Bay - Notre Dame Bay

The number of logbook returns decreased from 13 in 1998 to 5 in 1999 and then to 4 in 2000 (Table 29 and Figure 33). The age range of fishers remained relatively stable over the same time period. The total number of nets fished decreased substantially from 49 in 1998 to 11 in 2000. The number of nights fished also decreased substantially from 486 in 1998 to 142 in 2000. The mean mesh size of nets fished fluctuated over the time period but decreased by 2% from 1999 to 2000. Mean panel area increased over the three year period and was 41% larger in 2000 than in 1998. The spatial distribution of fishing effort represented by the logbooks was similar in all years and was restricted primarily to the eastern portion of Notre Dame Bay (Figure 34). The temporal distribution of fishing effort was also similar over the time period (Figure 33). Catch rates increased slightly from 1998 to 1999 but then decreased from 1999 to 2000 and have shown a declining trend from 1996 to 2000 (Figure 35). The decline in catch rates was somewhat consistent with the observations of fishers who indicated a slight decline in abundance from average in 1998 to below average each year since 1998 (Figure 35).

2.3.2 Bonavista Bay - Trinity Bay (BB-TB)

The number of logbook returns has been stable from 1998 to 2000, ranging from 5 to 7 per year (Table 29 and Figure 36). The age range of fishers increased slightly over the same time period. The total number of nets fished decreased from 1998 to 1999 but increased from 1999 to 2000. The number of nights fished exhibited similar trends. The mean mesh size of nets fished decreased marginally from 1998 to 2000 (<1%) whereas

mean panel area increased substantially (42%) over the same time period. The spatial distribution of fishing effort represented by the logbooks has been widespread and similar in most years except for 1998 when it was restricted to Trinity Bay only (Figure 37). The temporal distribution of fishing effort has also been comparable over the time series (Figure 36). Catch rates increased from 1998 to 1999 and again from 1999 to 2000. After declining from 1996 to 1998, catch rates in 2000 were comparable with peak values in 1996 (Figure 38). The increase from 1998 to 2000 was not comparable with the observations of fishers who indicated that abundance was stable and slightly above average over this time period. They also indicated that spawning intensity had decreased from above average in 1998 to well below average in 2000 (Figure 38).

2.3.3 St. Mary's Bay - Placentia Bay (SMB-PB)

The number of logbook returns decreased from 8 in 1998 to 6 in 1999 and to only 1 in 2000 (Table 29 and Figure 39). Consequently, any conclusions regarding 2000 are limited. The age range of fishers was similar from 1998 to 1999 but increased from 1999 to 2000. The total number of nets fished and nights fished decreased substantially over the time period. The mean mesh size of nets fished decreased substantially from 1998 to 1999 but increased marginally from 1999 to 2000; the mean mesh size in 2000 was 2% smaller than in 1998. The mean panel area of nets increased from 1998 to 1999 and again from 1999 to 2000; the mean panel area in 2000 was 30% larger than in 1998. The spatial distribution of fishing represented by the logbooks was restricted to one location in Placentia Bay in 2000 (Figure 40). In previous years, logbooks were returned primarily from Placentia Bay but were more broadly distributed. The temporal distribution of fishing effort in 2000 was also reduced as a consequence of being from a single logbook (Figure 39). Catch rates decreased from 1998 to 1999 and again from 1999 to 2000, continuing the trend from 1996 (Figure 41). Catch rates in 2000 were the lowest in the time series. This was comparable with the observations of fishers who indicated that abundance was stable but at a very low level (Figure 41). They also indicated that spawning intensity decreased from 1998 to 2000 and was currently well below average (Figure 41).

2.3.4 Fortune Bay (FB)

The number of logbook returns decreased from 11 in 1998 to 8 in 1999 and to 4 in 2000 (Table 29 and Figure 42). The mean age of fishers remained stable from 1998 to 2000. The total number of nets fished and nights fished decreased over the time period. The mean mesh size of nets increased from 1998 to 1999 and again from 1999 to 2000; the mean mesh size in 2000 was 5% larger than in 1998. The mean panel area of nets increased from 1998 to 2000; in 2000, the mean panel area of nets increased from 1998 to 2000; in 2000, the mean panel area was 11% larger than in 1998. Although the number of logbooks in 2000 was reduced, the spatial distribution of returns was broad and similar to previous years (Figure 40). Similarly, the temporal distribution of fishing effort was similar across the time series (Figure 42). Catch rates decreased from 1998 to 1999 but increased to a peak in 2000 (Figure 43). This was comparable with the observations of fishers who indicated that abundance had increased slightly and was well above average (Figure 43). Similarly, they also indicated that spawning intensity was stable and well above average (Figure 43).

2.4 Commercial Purse Seine Questionnaire

In 1996, a questionnaire was designed to quantitatively evaluate biological and fishery related information obtained from east and southeast Newfoundland herring purse seine fishers.

Each year, a list of names and telephone numbers has been provided by Fisheries Management Branch, DFO, of all east and southeast Newfoundland herring purse seine fishers who participated in the fishery. As the number of fishers was relatively small (Table 30), it was decided to contact all fishers rather than sub-sample the population. To minimize time and costs, the surveys were conducted by telephone.

For the three northern areas, the purse seine fishery occurred in the fall only and survey results were available to 1999. For St. Mary's Bay - Placentia Bay, there was a late winter / early spring fishery and a fall fishery. Survey results are available to 2000 for the winter / spring fishery and to 1999 only for the fall fishery.

For 1998, 30 of 34 fishers (88%) who participated in the fishery (all areas) were contacted. For 1999, 23 of 24 fishers (96%) were contacted, and to date in 2000, the only fisher who participated in the spring purse seine fishery in St. Mary's Bay - Placentia Bay was contacted. In all years, a minimum of three attempts were made to contact the remaining fishers.

The number of fishers participating in the purse seine fishery and consequently in the telephone survey remained constant from 1998 to 1999 in WB-NDB and BB-TB but decreased in SMB-PB. Overall, the numbers of fishers participating in the purse seine fishery decreased by 31% from 1998 to 1999 (Table 30).

2.4.1 Questions Regarding Herring Abundance

Three questions were asked to compare herring abundance in one's home bay in current and previous years (Figure 44). Fishers in WB-NDB and BB-TB indicated that herring abundance continued to be above average in 1998 and 1999. In SMB-PB, fishers indicated that herring abundance was well below average in 1998 and average in 1999 and 2000. Fishers were also asked to retrospectively estimate abundance in their home bay in the previous year. For all stock areas, the retrospective abundance estimates for 1997 from the 1998 survey and for 1998 from the 1999 survey were variable. In general, estimates for 1997 were closer to the current year estimate than were estimates for 1998. When asked to compare abundance in the current year to when they started fishing herring by purse seine (Figure 45), the majority of fishers in all stock areas indicated that current abundance was lower than when they first started fishing. This is a reversal of trends from the last assessment (Wheeler et al. 1999) when most fishers indicated that current abundance was greater than when they first started fishing.

2.4.2 Fleet Characteristics

All respondents were asked a series of questions to characterize the demographics of the population of purse seine fishers; these were designed to monitor changes in fishing experience and fleet capacity.

Responses indicated that the mean age of fishers remained stable over the entire time period in all areas, with most in the age 40 - 50 range (Figure 45). There was a slight increase in mean age in some areas. Responses also indicated that participants in the 1999 fishery had the same or slightly less experience, on average, than those in previous years.

The average fishing vessel length and capacity decreased over the time series in all areas except BB-TB (Table 31).

2.4.3 Questions on the Fishery

Fishers were asked questions regarding the bays and the months in which they fished (Figure 46). In WB-NDB, fishers predominantly fished in NDB; the fishery occurred from October to December and was later in 1999 than in 1998. The number of fishers in WB-NDB remained stable from 1998 to 1999. In BB-TB, there was an equal distribution of fishers between bays; the fishery also occurred from October to December and similarly was later in 1999 than in 1998. The number of fishers in BB-TB increased from 1998 to 1999. In SMB-PB, the proportion of fishers in PB increased from 1988 to 2000; there was a spring fishery which ranged from January to May and in 1998, there was also a fall fishery. The total numbers of fishers in SMB-PB decreased from 1998 to 2000.

Three questions were asked regarding abundance of herring during the current fishery compared to previous years (Figure 47). When asked to compare the number and size of herring schools detected in the current year fishery with the previous year, respondents indicated a decrease in 1999 compared to 1998 in all areas except WB-NDB. When asked to compare abundance of herring detected in the fishery compared to when they first started fishing herring, respondents indicated a decrease in 1999 in all areas.

A series of questions were asked to determine the distribution of fishing effort. To facilitate analysis, each stock area was divided into geographical sub-areas or strata (Figure 48). In all areas and years, successful sets were restricted to a few strata within each stock area; successful fishing sets were not widely distributed throughout the stock areas. The percentage of successful sets increased from 1998 to 1999 in BB-TB and SMB-PB but decreased in WB-NDB. In all areas and years, the majority of successful sets occurred during daylight hours.

The total landings of the purse seine fleet (Table 32) increased in WB-NDB and BB-TB from 1998 to 1999 but decreased in SMB-PB. The ratio of removals to landings remained stable in all areas. The principal reason for discarding in 1998 and 1999 in most areas was the size of fish (Figure 49). There were mixed responses regarding the amount of herring discarded in the current fishery compared with the previous year (Figure 50).

2.4.4 Biological Events

A question was asked to quantify observations regarding the seasonal timing of herring migration in the current year compared to the previous year (Figure 50). With the exception of BB-TB (where it was later), the seasonal timing of herring migration was perceived to be the same in 1999 as in 1998.

Section 3.0 - Estimation of Stock Sizes

3.1 Integrated Catch at Age Analysis

As in the last assessment of these stocks (Wheeler et al. 1999), integrated catch at age analysis (ICA) was used to estimate population sizes for three of the four stock areas. The ICA model could not be fitted for the FB stock as catches and fishing mortalities were very low through much of the time series. Therefore, as in 1998, a research gill net catchability analysis was used to estimate the population size for FB.

For the ICA analysis, the following input data and parameters were used:

Input Data

- Catch numbers and weights at ages 2 to 11+ from 1970 (or 1971) to 1999 (dependent upon stock area) (Tables 33 35)
- Age-disaggregated research gill net catch rates (Tables 36 38)
 - WB-NDB: spring (1988-99) and fall (1981-91)
 - BB-TB: spring (1988-99) and fall (1980-91)
 - SMB-PB: spring (1982-99)
 - FB: spring (1982-99)
- Age-aggregated acoustic biomass estimates (Tables 36 38)
 - WB-NDB: 1983-98
 - BB-TB: 1984-99
 - SMB-PB: 1986-2000
 - FB: 1986-99
- Natural mortality = 0.20 for all ages and years
- Maturity ogive (Wheeler et al. 1989)
 - Age 2 = 0.01
 - Age 3 = 0.35
 - Age 4 = 0.60
 - Age 5+ = 1.00
- Proportion of fishing mortality (F) and natural mortality (M) before spawning = 0.00

Input Parameters

- Number of years for separable constraint = 7 for WB-NDB, and 10 for BB-TB and SMB-PB
- Reference age for separable constraint = 5
- Constant selection pattern assumed
- Selection on last age = 1.00
- First age for calculation of reference F = 5
- Last age for calculation of reference F = 9
- All ages in catches at age weighted equally
- Acoustic biomass estimates treated as estimates of absolute stock size
- Research gill net catch rates treated as proportionate indices of abundance
- Range of feasible fishing mortalities = 0.02 to 3.00

- Equal weights assigned to the abundance indices relative to the catch at age
- Estimate of the extent to which errors in each age of the age structured indices are correlated = 1.00

All input parameters were the same as in the 1998 assessment (Wheeler et al. 1999) with two exceptions. In 1998, the number of years of separable constraint for all areas was 10. Also, in 1998, the estimate of the extent to which errors in each age of the age structured indices are correlated was set to 0.50 for WB-NDB.

ICA population numbers at age, by year and by stock area are given in Tables 39 - 41. Biomass estimates, by year and stock area, are given in Figure 51; results from the last assessment (Wheeler et al. 1999) are provided for comparison.

3.2 Research Gill Net Catchability Analysis

As in the last assessment, the current stock size for the FB stock was estimated using a research gill net catchability analysis. The catchability coefficient (Table 42) was applied to current research gill net catch rates to estimate age 5+ population numbers. Population numbers were converted to biomass using mean weights from the research gill net data.

Population estimates derived from the catchability coefficient were compared to acoustic biomass estimates (Table 42); the most recent estimates for 1999 were within 25% of each other.

3.3 Stock-recruit Relationships and Stock Status Classification System

As in recent assessments of these stocks (Wheeler et al. 1997, 1999), stock status is described in relation to a stock status classification system. This system links exploitation rates to recruitment estimates at given spawning stock levels based upon stock specific environmentally dependent stock-recruit relationships. Stock status zones are then defined along these stock-recruit curves with appropriate exploitation levels (Figure 52). The environmentally dependent stock-recruit relationships for WB-NDB, BB-TB, and SMB-PB were unchanged from the 1998 assessment (Wheeler et al. 1999).

3.4 Projections and Risk Analysis

For the three stocks assessed by ICA (WB-NDB, BB-TB, and SMB-PB), two year projections (2001 and 2002) were run using the integrated catch projection (ICP) software of Patterson (1998).

For these projections, catches in 2000 were assumed to approximate 1999 catches; ie. WB-NDB = 1000 t, BB-TB = 1500 t, and SMB-PB = 500 t. For WB-NDB, projections were run at fishing mortalities of F = 0.00 and F = 0.05, the lower and upper recommended fishing mortalities for zone 1 of the stock status classification system (Figure 52). For BB-TB, projections were run at fishing mortalities of F = 0.10 and F = 0.20, the lower and upper recommended mortalities for zone 3, and for SMB-PB, projections were run at fishing mortalities of F = 0.05 and F = 0.10, the lower and upper mortalities of F = 0.05 and F = 0.10, the lower and upper mortalities for zone 2.

The following parameters were used in the projections:

Projection Parameters

- Random number seed = 120
- Lag in years between spawning and recruitment at age = 2
- Single fleet per stock area with 100% retention at all ages
- Mean weights at age in the catch and discards equal to 1999 weights at age
- Mean natural mortality from 1994 to 1999 = 0.20
- Mean maturity ogive from 1994 to 1999
- Mean weights at age from 1994 to 1999
- Geometric mean recruitment
- Range of years for estimating recruitment = 1970 (or 1971) to 1999
- Stock-recruit residuals assumed to be auto-correlated
- Recruitment estimates for the last year of the catch at age data and for the subsequent year were taken from the ICA model fit
- 5%, 25%, 50%, 75% and 95% percentile points were used to calculate the distribution of fishing mortality, yield, stock size, and recruitment
- 200 simulations were run for making estimates of uncertainty, using random draws of population parameters as estimated from the ICA maximum likelihood fit

Results of the projections are provided in Table 43. A risk analysis of the probability that spawning stock biomass would be less than the reference biomass levels of the stock status classification system was also calculated. For WB-NDB, the risk was calculated that spawning biomass would be less than the reference level for zone 1. For BB-TB, the risk was calculated that spawning biomass would be less than the reference level for zone 1. For BB-TB, the risk was calculated that spawning biomass would be less than the reference level for zone 4, and for SMB-PB, the risk was calculated that spawning biomass would be less than the reference level for zone 2.

Section 4 - Stock Status

4.1 White Bay - Notre Dame Bay

4.1.1 The Fishery

Landings in 1999 were 1050 t, 97% of which were taken by purse seines during the fall (Table 2), and mostly from the eastern portion of the stock area (Figure 48).

The commercial fishery was dominated by age 4 and 5 herring (1995 and 1994 year classes) which accounted for 85% (numbers) of the landings (Figure 3).

4.1.2 Resource Status

Research gill net catch rates have decreased continuously since 1992; catch rates in 2000 were the lowest in the 13 year time series and were 94% lower than the peak in 1992 (Figure 7). Similar to the commercial fishery, the 1994 and 1995 year classes dominated in the research gill nets, accounting for 75% of the catch in 1999 (Figure 6).

The age 5+ biomass estimated from the most recent acoustic survey in the fall of 1998 was 1600 t (Figure 53). The previous acoustic estimate in 1994 was 1100 t.

However, the 1995 year class (at age 3) dominated in the 1998 survey and the total biomass from the survey was 19500 t.

Commercial gill net catch rates have decreased continuously from 1996 to 2000 (Table 29) and are currently 94% lower than in 1996. These same gill net fishers indicated that herring abundance was well below average in 2000 (Figure 35).

Purse seine fishers indicated that herring abundance was well above average in 1999 (Figure 44) but much lower than when they first started fishing herring.

The 2000 mature biomass estimate from the integrated catch at age analysis was 22700 t (Figure 53), a slight increase from 1998.

Recruitment continued to be poor. The dominant 1994 year class was estimated from the ICA to be 70% of the strength of the moderately strong 1982 year class (Figure 57). The 1995 year class was only 35% of the strength of the 1982 year class.

4.1.3 Summary

With the exception of one indicator (purse seine fisher observations), all indices show that this stock continues to be low in abundance. Based upon the stock status classification system, the current analysis indicates that the stock should be classified in zone 1, *very poor* (Figure 53).

The stock continues to be at a low level relative to peak levels in the mid 1970's due to poor recruitment through the 1980's and 1990's. Although the 1994 and 1995 year classes are currently dominant, they are not large year classes. Pre-recruit estimates of the 1997 and 1998 year classes indicate that they are not large.

Risk analysis indicates that with 2001 and 2002 catches in the order of 1300 t and 1180 t respectively, there is greater than 50% probability that the mature stock biomass will remain in zone 1 of the stock status classification system (Table 43). This probability decreases by approximately 7% if catches are less than 100 t.

4.2 Bonavista Bay - Trinity Bay

4.2.1 The Fishery

Landings in 1999 were 143 t (Table 3), approximately 56% of which were taken by purse seines in a fall fishery in both bays (Figure 48). A spring bar seine fishery in both bays accounted for 30% of the landings.

The commercial fishery was dominated by age 8 herring (1991 year class) which accounted for 45% of the landings (Figure 3). This year class has dominated in the fishery since 1995.

4.2.1 Resource Status

Research gill net catch rates have decreased continuously since 1997; catch rates in 2000 were the lowest in the 13 year time series and were 85% lower than the peak in 1997 (Figure 7). Similar to the commercial fishery, the 1991 year class dominated in the

research gill nets, accounting for 55% of the catch in 1999 (Figure 6). The 1994 and 1995 year classes accounted for 20% and 30% of the catch respectively.

The age 5+ biomass estimated from an acoustic survey in the fall of 1999 was 10400 t (Figure 54). This was a decrease from the previous acoustic estimate (31200 t) in 1996. However, the 1997 year class (at age 2) dominated in the 1999 survey and the total biomass from the survey was 22700 t. There was also evidence of recruitment of the 1998 and 1999 year classes in the survey.

Commercial gill net catch rates decreased from 1996 to 1998 and increased from 1998 to 2000 and are currently similar to the peak in 1996 (Table 29). These same gill net fishers indicated that herring abundance was average in 2000 (Figure 38).

Purse seine fishers indicated that herring abundance was above average in 1999 (Figure 44) but somewhat lower than when they first started fishing herring.

The 2000 mature biomass estimate from the sequential population model was 30900 t (Figure 54), an increase since 1998.

The 1991 year class, estimated to be approximately 60% of the strength of the 1982 year class (Figure 57), continued to dominate. The 1995 year class was estimated to be 39% the strength of the 1982 year class.

4.2.3 Summary

Abundance indices for this stock provide mixed signals. Research gill net catch rates and acoustic biomass estimates indicate that the stock is declining in abundance. Commercial gill net catch rates and observations of fishers are more positive. Based upon the stock status classification system, the current analysis indicates that this stock should be classified in zone 4, *good to very good* (Figure 54).

However, the stock is still at a low level relative to peak levels in the mid 1970's. Although the 1991 and 1995 year classes have dominated in the 1990's, they are not strong year classes. Pre-recruit estimates of the 1998 and 1999 year classes also indicate that they are not large.

Risk analysis indicates that with 2001 and 2002 catches of 4650 t and 3580 t respectively, there is a 32% - 40% probability that the mature biomass will decrease to zone 3 within the stock status classification system (Table 43). By reducing catches to approximately 2000 t, this probability would be reduced by 8%.

4.3 St. Mary's Bay - Placentia Bay

4.3.1 The Fishery

Landings in 1999 were 330 t (Table 4), 99% of which were taken by purse seines during the late winter and spring in Placentia (Figure 48).

The commercial fishery was dominated by the 1991 year class, which accounted for 40% of the landings (Figure 3). This year class has dominated the commercial fishery since 1995.

4.3.2 Resource Status

Research gill net catch rates decreased from 1996 to 1998 and increased from 1998 to 2000 (Figure 7). Unlike the commercial fishery, the 1996 year class dominated in the research gill nets, accounting for approximately 30% of the catch in 1999 (Figure 6). The 1991 and 1995 year classes each accounted for approximately 15% of the catch.

The age 5+ biomass estimated from an acoustic survey in the early spring of 2000 was 1900 t (Figure 55). This was a decrease from the previous acoustic estimate (10700 t) in 1998. The 1995 year class (at age 5) dominated in the 2000 acoustic survey. There was limited evidence of the 1996 year class in the survey.

Commercial gill net catch rates have decreased continuously from 1996 to 2000 and are currently 68% lower than in 1996 (Table 29). The lone gill net fisher who returned a logbook in 2000 indicated that herring abundance was well below average (Figure 41). He also indicated that herring abundance was average (Figure 44) but much lower than when he first started fishing herring.

The mature biomass estimate for 2000 from the sequential population model was 14500 t (Figure 55), similar to the mature biomass from the 1998 assessment (14800 t) of the stock.

The 1991 year class, dominant in the commercial fishery, was estimated to be of similar strength to the 1982 year class (Figure 57). The 1995 and 1996 year classes, dominant in the acoustic survey and research gill net catches respectively, were each estimated to be approximately 60% the strength of the 1982 year class.

4.3.3 Summary

With the exception of research gill net catch rates in St. Mary's Bay, all indices show that this stock is at a similar or lower level than in 1998. Based upon the stock status classification system, the current analysis indicates that the stock should be classified in zone 3, *moderate to good* (Figure 55).

The stock is at a moderate level relative to peak levels in the early 1970's. However, there is no evidence of strong recruitment of recent year classes.

Risk analysis indicates that with 2001 and 2002 catches in the order of 1380 t and 1300 t, there is a 29% to 34% probability that the mature stock biomass would decrease to zone 2 within the stock status classification system (Table 43). This increases by 8% - 12% with catches of 2620 t and 2200 t. With any of the above catch levels, there is greater than 80% probability that the mature stock biomass would not increase to zone 4.

4.4 Fortune Bay

4.4.1 The Fishery

Landings in 1999 were 455 t, 74% of which were taken by bar seine during the spring, primarily in Long Harbour (Table 5).

The commercial fishery was dominated by age 7 herring (1992 year class), which accounted for 50% of the landings (Figure 3). Fish aged 11+, which had been dominant until 1997, still accounted for 30% of the landings.

4.4.2 Resource Status

Research gill net catch rates peaked in 1998 and decreased in 1999 and 2000 (Figure 7); catch rates in 2000 were 42% lower than in 1998 but were still high relative to other stock areas. Similar to the commercial fishery, the 1992 year class dominated in the research gill nets, accounting for 29% of the catch in1999 (Figure 6). Fish aged 11+ and the 1991 year class accounted fo 27% and 19% of the catch respectively. There was also evidence of the recruitment of the 1996 year class.

The age 5+ biomass, estimated from an acoustic survey in the early spring of 1999, was 12400 t (Table 42), a decrease from the previous acoustic estimate (15700 t) in 1997. However, the 1996 year class (at age 3) dominated in the 1999 acoustic survey; the total biomass estimate for the survey was 30400 t. There was no evidence of recruitment of more recent year classes in the survey.

Commercial gill net catch rates have fluctuated at high levels from 1996 to 2000 (Table 29) and are currently at the highest level in the five year time series. These same gill net fishers indicated that herring abundance was well above average in 2000 (Figure 43).

The age 5+ biomass from the research gill net catchability analysis was 15000 t (Table 42), a decrease since the 1998 assessment (27300 t) of the stock. This decrease is consistent with the decrease in research gill net catch rates, because it is calculated directly from research gill net catch rates.

4.4.3 Summary

Abundance indices for this stock provide mixed signals. Research gill net catch rates and the acoustic biomass estimate indicate that the mature biomass has declined in abundance since the last assessment. Commercial gill net catch rates and observations of fishers are more positive. Based upon the stock status classification system, the current analysis indicates that the stock should be classified in zone 3, *moderate to good* (Figure 56).

Fish aged 11+ continue to contribute significantly to the spawning biomass and there has been very limited fishing mortality.

Risk analysis indicates that with 2001 and 2002 catches in the order of 1000 - 2000 t, there is a 32% to 43% probability that the mature biomass would decrease to zone 2 within the stock status classification system (Table 43). With either of the above

catch levels, there is greater than 60% probability that the mature biomass would not increase to zone 4.

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	WB-N	1DB	BB-	ТВ	SMB-	PB	FB	
Year	Catch	TAC	Catch	TAC	Catch	TAC	Catch	TAC
1977	11.6	10.0	12.0	9.5	3.3	3.3	0.6	3.4
1978	13.4	7.9	8.0	7.8	3.5	4.0	1.0	1.0
1979	15.7	11.5	9.8	8.4	3.6	3.4	1.2	1.0
1980	6.5	5.3	5.4	4.4	2.5	2.5	0.5	1.0
1981	4.7	5.3	4.0	4.8	0.6	1.2	0.1	0.2
1982	2.0	1.2	0.5	0.7	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
1984	1.5	1.5	0.2	0.4	0.1	0.0	0.1	0.0
1985	1.8	2.0	0.6	0.8	0.1	0.6	0.1	0.3
1986	2.8	5.5	1.8	3.8	0.1	2.1	0.1	0.7
1987	13.5	32.5	6.1	13.7	0.3	2.5	0.1	2.4
1988	7.4	34.7	11.7	16.2	1.1	8.9	0.1	4.7
1989	6.4	14.0	4.9	6.9	0.4	1.5	0.1	1.5
1990	5.1	16.5	3.7	23.4	0.5	1.5	0.1	1.5
1991	8.7	13.5	9.1	10.0	1.0	1.5	0.1	1.5
1992	5.7	13.5	4.7	10.0	0.9	1.5	0.1	1.5
1993	1.7	13.5	2.9	10.0	1.2	1.5	0.2	1.5
1994	1.4	13.5	2.7	10.0	1.0	1.5	0.3	1.5
*1995	1.6	1.2	1.4	1.0	0.8	1.1	0.5	1.5
*1996	0.6	1.6	1.1	1.4	0.5	0.7	0.1	0.5
*1997	2.2	4.9	1.1	1.6	3.9	6.6	0.1	5.4
*1998	0.7	2.5	1.0	2.5	2.3	2.0	0.1	5.4
*1999	1.1	2.5	1.4	2.5	0.3	2.0	0.5	5.4

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

										_
				Gea	ar					
	A	Purse	D: /	Midwater	Bar	0.11				
rear	Area	Seine	Ringnet	Irawi	Seine	Gillnet	Irap	lotal	TAC	
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	6026	-	-	80	946	41	6872		
	Combined	7344	-	-	82	1257	64	8526	13500	
1992	WB	1292	-	-	-	252	4	1548		
	NDB	2983	-	-	6	1101	48	4138		
	Combined	4275	-	-	6	1353	52	5686	13500	
1993	WB	121	-	-	-	34	-	155		
	NDB	685	-	-	104	739	7	1535	40500	
	Combined	806	-	-	104	113	1	1690	13500	
1994	WB	144	-	-	5	20	62	231		
	NDB	226	-	-	84	833	8	1151	12500	
	Complined	370	-	-	89	803	70	1382	13500	
1995*	WB	200	-	-	-	15	9	224		
	NDB	454	-	-	25	894	-	1373	1000	
	Combined	654	-	-	25	909	9	1597	1200	
1996*	WB	153	-	-	-	-	-	153		
	NDB	252	-	-	-	229	-	481	1000	
	Combined	405	-	-	-	229	-	634	1600	
1997*	WB	12	-	-	-	9	-	21		
	NDB	2141	-	-	-	11	/ 7	2159	4000	
	Complined	2153	-	-	-	20	/	2100	4900	
1998*	WB	106	-	-	-	1	7	114		
	NDB	500	-	-	/ 7	30	2	539	2500	
	Combined	606	-	-	1	31	9	000	2500	
1999*	WB	-	-	-	-	-	-	1045		
	NDB	1011	-	-	-	34	-	1045	2500	
	Complned	1011	-	-	-	04	-	1040	2000	

Table 2. White Bay (WB) - Notre Dame Bay (NDB) herring landings and TAC's (t), by gear, 1988-99.

		Durac		Gea	ar Bor				
Year	Area	Seine	Ringnet	Trawl	Seine	Gillnet	Trap	Total	TAC
1988	BB TB Combined	7550 3410 10960	-	- -	151 317 468	144 93 237	82 82	7845 3902 11747	16200
1989	BB TB Combined	1459 3149 4608	-		13 141 154	92 65 139	6	1564 3361 4925	6900
1990	BB TB Combined	904 1819 2723	- -	-	2 721 723	126 84 210	7 24 31	1039 2648 3687	23400
1991	BB TB Combined	4458 3760 8218	-	-	7 567 574	147 85 232	43 - 43	4655 4412 9067	10000
1992	BB TB Combined	4372 52 4424	- -	-	3 63 66	197 48 245	2 - 2	4574 163 4737	10000
1993	BB TB Combined	2487 31 2517	-	-	3 16 19	237 79 316	- 1 1	2727 127 2854	10000
1994	BB TB Combined	1984 39 2023	- -	-	1 235 236	356 70 426	- -	2341 344 2685	10000
1995*	BB TB Combined	338 278 616	- -	-	7 117 124	522 93 615	- 2 2	867 490 1357	1000
1996*	BB TB Combined	344 318 662	- -	-	- 13 13	300 78 378	- -	644 409 1053	1400
1997*	BB TB Combined	321 329 650	- -	-	210 210	72 129 201	41 41	393 709 1102	1600
1998*	BB TB Combined	331 333 661	- -	- -	96 8 104	148 22 170	- 22 22	575 385 960	2500
1999*	BB TB Combined	564 245 809	-	- -	222 208 430	95 100 195	-	881 553 1434	2500

Table 3. Bonavista Bay (BB) - Trinity Bay (TB) herring landings and TAC's (t), by gear, 1988-99.

				Gea	ar				
Year	Area	Purse Seine	Ringnet	Midwater Trawl	Bar Seine	Gillnet	Trap	Total	TAC
1988	SMB PB Combined	- 887 887	- -	-	12 12	25 176 201	- -	25 1075 1100	8900
1989	SMB PB Combined	- 263 263	- -	-	- 1 1	8 131 139	2	8 397 405	1500
1990	SMB PB Combined	- 379 379	- -	- -	- -	18 144 162	- -	18 523 541	1500
1991	SMB PB Combined	- 742 742	- -	-	110 110	16 104 120	- 34 34	16 990 1006	1500
1992	SMB PB Combined	- 780 780	-	- -	2	1 123 124	- -	1 905 906	1500
1993	SMB PB Combined	262 681 943	- -	-	- 154 154	3 119 122	- -	265 954 1219	1500
1994	SMB PB Combined	- 680 680	-	-	- 77 77	0 195 195	10 10	0 962 962	1500
1995*	SMB PB Combined	219 349 568	-	-	76 76	135 135	-	219 560 779	1100
1996*	SMB PB Combined	217 229 446	-	-	15 15	38 38	-	217 282 499	700
1997*	SMB PB Combined	1587 2187 3774	-	- -	- 99 99	20 20	- -	1587 2306 3893	6600
1998*	SMB PB Combined	740 1570 2310	-	- -	- -	14 5 19	-	754 1575 2329	2000
1999*	SMB PB Combined	330 330	-	- -	-	- 1 1	-	- 331 331	2000

Table 4. St. Mary's Bay (SMB) - Placentia Bay (PB) herring landings and TAC's (t), by gear, 1988-99.

				Ge	ar					
Year	Area	Purse Seine	Ringnet	Midwater Trawl	Bar Seine	Gillnet	Trap	Total	TAC	35
1988		-	-	-	-	89	-	89	4700	
1989		-	-	-	3	104	2	109	1500	
1990		-	-	-	-	92	-	92	1500	
1991		-	-	-	-	123	-	123	1500	
1992		-	-	-	-	131	-	131	1500	
1993*		-	-	-	-	179	-	179	1500	
1994*		1	-	-	2	248	-	251	1500	
1995*		5	-	-	4	459	-	468	1500	
1996*		-	-	-	35	30	4	69	500	
1997*		-	-	-	91	28	23	142	5400	
1998*		-	-	-	-	1	-	1	5400	
1999*		-	-	-	338	29	89	455	5400	

Table 5. Fortune Bay (FB) herring landings and TAC's (t), by gear, 1988-99.

AREA	GEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
WB-NDB	Gillnet					1 50				1	30 50		
	Purse seine									Г	191	278 100	136
	Bar Seine										7		
	Trap					1			1	7	1 50		
BB-TB	Gillnet				24 100	26					60	60 100	1
	Purse seine										563 100	66	35
	Bar Seine				8 50						44	52	
	Trap										22 100		
SMB-PB	Gillnet		1		50	5			-			14	
	Purse seine	556 50	494	739	186	59 50						178	99 50
	Bar Seine												
	Trap												
FB	Gillnet					1 50							
	Purse seine												
	Bar Seine												
	Trap												

Table 6. Commercial catch (t) and number of fish sampled (bold print) for 1998, by stock area, gear type and month. Boxed areas indicate the catch - sample combinations used for calculating commercial catch at age.

Table 7. Commercial catch (t) and number of fish sampled (bold print) for 1999, by stock area, gear type and month. Boxed areas indicate the catch - sample combinations used for calculating commercial catch at age.

AREA	GEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
WB-NDB	Gillnet Purse seine				10	22 50	2				3	934	74
	Bar Seine										50	100	
	Trap												
BB-TB	Gillnet				95 100	39 50				1	26	33 50	3
	Purse seine										523 47	143 141	143 50
	Bar Seine				122	87 50					24	198 46	
	Trap												
SMB-PB	Gillnet												
	Purse seine			330 50									
	Bar Seine												
	Trap												
FB	Gillnet			12	18								
	Purse seine												
	Bar Seine			96 50	140 50	101							
	Trap					86							

Table 8. Commercial catch at age of spring and autumn spawning herring for White Bay - Notre Dame Bay, 1970-1999.

Spring Spawners

A sec I	1070	1091	1070	1070	1071	1.0.10.01	1000	4 40 100 100	1080		1000				
Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	10	1	5	1	1	2	56	50	1	1	115	445	76	1	6
3	1	129	290	727	4	128	24	1671	55	60	46	152	371	38	12
4	12	88	2396	1411	123	215	506	107	2034	50	1240	41	332	46	124
5	24	161	353	2825	3142	453	237	468	317	2928	92	1231	59	23	1218
6	24	64	69	761	5446	5438	868	184	1034	323	1080	63	268	14	73
7	972	425	122	719	1193	7069	10893	793	517	1410	17	805	34	93	114
8	11	10184	403	654	697	1123	17145	7363	2509	767	496	64	258	1	157
9	83	233	1363	416	1506	838	1328	12675	10807	2222	179	344	19	26	37
10	159	254	205	1685	858	810	3364	1055	11756	14413	1450	194	192	4	122
11+	275	3105	808	794	2378	3999	8535	15707	14379	27508	14653	10908	4059	805	1938
Total	1572	14645	6015	9994	15349	20076	42957	40074	43410	49683	19369	14248	5669	1052	3802
			b	С							а	а	а	а	а
Age	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	1	195	26	3113	1	1	2273	1	1	1	1	1	1	1	1
2	3	29	1105	407	23	1	29	940	1	1	1	159	2	1	1
3	187	975	324	1044	128	1936	386	207	96	1	96	1	698	802	81
4	350	2945	7201	291	613	285	16183	942	31	1054	609	3	2	871	1755
5	240	308	25843	2984	124	637	1542	8940	263	121	2747	484	63	21	1450
6	1486	667	1651	11819	3106	240	553	483	3614	1674	129	1194	3420	14	1
7	108	1258	1067	1036	10566	2451	103	371	75	2199	701	23	2939	359	3
8	275	198	2088	1137	370	7360	2145	211	199	108	1513	162	51	225	83
9	94	162	399	1454	1081	532	4432	722	70	192	183	474	209	219	180
10	81	179	442	315	844	1132	537	2796	544	49	127	1	359	42	3
11+	2110	1973	4566	2943	2178	1148	2201	3509	861	441	337	91	427	88	9
Total	4935	8889	44712	26543	19034	15723	30384	19122	5755	5841	6444	2593	8171	2643	3567
Autum	n Spawr	ners													
Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	1	1	1	1	1	1	1	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
3	1	1	53	1	1	6	1	1	1	1	71	1	72	1	1
4	1	1	17	7	11	64	31	45	6	1	13	13	26	74	60
5	26	6	74	22	124	3	35	35	24	10	13	86	62	25	409
6	10	14	79	25	10	25	51	85	155	267	23	11	16	23	66
7	39	11	67	60	48	16	20	54	171	172	272	1	12	1	30
8	60	26	1	25	2	21	40	1	24	160	4	100	9	1	8
9	20	17	164	13	46	3	46	94	2	133	19	1	42	6	7
10	11	19	81	97	7	2	4	1	130	1	1	4	1	1	3
11+	172	291	562	298	346	302	329	182	238	298	450	65	23		24
Total	342	388	1100	550	597	444	559	500	753	1045	868	284	265	134	610
											а	а	а	a	а
Age	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
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	11	1	1	1	1
3	1	10	2	1	1	1	1	1	1	1	1	19	1	1	1
4	29	67	297	92	65	130	188	109	1	7	11	1	56	97	204
5	94	69	469	115	12	65	450	187	48	70	37	1	72	22	123
6	333	79	156	45	5	52	98	172	78	80	2	80	20	1	163

3

21

659

3

113 79 42 21 349 4 1 9 10 23 1 19 613 74 735 29 953 2733 4005 11+ Total

7

Spring and Autumn Spawners

[1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	Total	1914	15033	7115	10544	15946	20520	43516	40574	44163	50728	20237	14532	3440	15	164
	% 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	99.4	93.3	0.6
	% 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	0.6	6.7	99.4
				b	С							а	а	а	а	а
		1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	Total	5670	9606	46650	27697	20326	16676	34389	20399	6489	6182	6859	2722	8660	2801	4226
	% SS	87.0	92.5	95.8	95.8	93.6	94.3	88.4	93.7	88.7	94.5	94.0	95.3	94.4	94.4	84.4
	% AS	13.0	7.5	4.2	4.2	6.4	5.7	11.6	6.3	11.3	5.5	6.0	4.7	5.6	5.6	15.6

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

Table 9. Commercial catch at age of spring and autumn spawning herring for Bonavista Bay-Trinity Bay, 1970-1999.

Spring Spawners

A mal															
Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	1	1	1	1	1	1	5	10	1	1	1	1	1	1	1
2	1	1	1	1	1	1	14	16	22		15	136	1	1	
2	4	600	10	1	1	202	77	249	22	200	10	130		1	4
2		690	10	1	1	392	11	240	20	280	13	246	8	4	22
4	1	311	1347	60	2	134	493	135	357	167	195	53	11	34	35
5	9	102	389	4887	235	163	123	759	122	765	43	256	2	7	210
6	55	64	91	126	4795	2564	166	227	251	19	293	26	30	2	9
7	808	361	75	96	424	14330	4897	50	112	436	52	288	5	15	5
8	35	1373	88	1	151	455	20697	6209	598	101	264	23	35	1	12
i i	126	161	490	40	204	400	20007	22200	4410	520	204	204	55		12
9	120	151	400	40	294	995	909	23200	4412	530	75	321	5	8	2
10	69	126	14	2/1	69	/2/	854	//4	13394	5575	967	88	65	2	2
11+	212	522	213	1	1849	1679	4306	5890	5956	19994	12259	11762	1186	159	154
Total	1318	3702	2709	5493	7822	21441	32541	37524	25251	27880	14177	13200	1349	234	456
	h		0								-	0	0	~	
Agel	1005	4000	1007	4000	4000	4000	4004	4000	4000	1001	4005	4000	d	a	B
Age	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	1	151	296	717	1	1	115	1	1	1	4	1	1	1	1
2	13	207	1352	6612	563	58	689	499	354	1	1	1	75	54	50
3	175	443	413	9910	1043	3094	210	1056	621	394	107	23	302	524	48
4	70	4445	2845	267	3323	422	13551	271	160	819	2645	63	13	543	922
5	97	261	16209	2674	264	2250	2596	12612	244	303	240	2639	06	170	GAA
0	07	404	10200	04700	4400	2000	2000	0400	0770	1070	049	2000	2000	170	044
6	351	161	334	21/39	1428	94	3859	2422	3779	1072	64	345	3230	128	11
7	37	262	359	782	8639	629	347	579	422	3878	152	46	182	1322	14
8	27	38	126	713	13	4439	1550	194	385	479	978	157	7	94	3175
9	13	10	33	8	216	235	7505	1394	132	471	172	430	1	4	922
10	22	31	6	55	100	325	447	2054	657	530	163	11	29	4	62
11+	797	657	956	1247	508	466	801	653	1092	2614	649	300	04	87	144
Tatal	4600	007	00000	45704	40000	400	0.1750	01705	7047	10500	E004	4045	4000	07	5000
Total	1593	6666	22928	45724	16098	12113	31750	21/35	/94/	10562	5284	4015	4030	2931	5993
Autumn	Snawn	ore													
Autunni	Spawn	613													
Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
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
3	1	1	1	1	1	1	10	1	1	1	14	6	3	1	1
					1	-	10		10	1	4.4	115	1	10	-
4	9	1	1	1	1	26	22	55	10	1	11	115	1	10	3
5	1	10	1	1	1	30	77	16	14	27	17	106	8	2	84
-								470	A 4	111	02	22			
6	1	1	1	1	1	1	23	1/6	61	114	03		10	5	14
6	1 4	1 4	1	1 1	1 16	1 22	23 66	86	61 58	30	188	83	10	5	14
6 7 8	1 4 17	1 4 23	1 2 2	1 1 48	1 16 2	1 22 41	23 66 34	176 86 112	58 28	30	188 45	83 283	10 3 8	5 2 1	14 17 3
6 7 8	1 4 17	1 4 23	1 2 2	1 1 48 1	1 16 2	1 22 41	23 66 34 62	176 86 112 30	61 58 28 23	30 175	188 45 112	83 283 36	10 3 8 25	5 2 1	14 17 3
6 7 8 9	1 4 17 18	1 4 23 3	1 2 5	1 1 48 1	1 16 2 1	1 22 41 6	23 66 34 62	176 86 112 30	58 28 23	30 175 13	188 45 112	83 283 36	10 3 8 25	5 2 1 1	14 17 3 5
6 7 8 9 10	1 4 17 18 17	1 4 23 3 21	1 2 5 1	1 48 1 1	1 16 2 1 1	1 22 41 6 19	23 66 34 62 8	176 86 112 30 73	61 58 28 23 82	30 175 13 16	188 45 112 3	33 83 283 36 4	10 3 8 25 1	5 2 1 1	14 17 3 5 1
6 7 8 9 10 11+	1 4 17 18 17 738	1 4 23 3 21 406	1 2 5 1 33	1 48 1 1 1	1 16 2 1 1 1216	1 22 41 6 19 259	23 66 34 62 8 1069	176 86 112 30 73 1069	61 58 28 23 82 417	30 175 13 16 800	188 45 112 3 463	33 83 283 36 4 230	10 3 25 1 37	5 2 1 1 3	14 17 3 5 1 9
6 7 8 9 10 11+ Total	1 4 17 18 17 738 808	1 4 23 3 21 406 472	1 2 5 1 33 49	1 48 1 1 1 58	1 16 2 1 1216 1242	1 22 41 6 19 259 407	23 66 34 62 8 1069 1373	176 86 112 30 73 1069 1620	61 58 28 23 82 417 702	30 175 13 16 800 1179	188 45 112 3 463 938	83 283 36 4 230 898	10 3 8 25 1 37 98	5 2 1 1 1 3 28	14 17 3 5 1 9 139
6 7 8 9 10 11+ Total	1 4 17 18 17 738 808	1 4 23 3 21 406 472	1 2 5 1 33 49	1 1 48 1 1 1 58	1 16 2 1 1216 1242	1 22 41 6 19 259 407	23 66 34 62 8 1069 1373	176 86 112 30 73 1069 1620	61 58 28 23 82 417 702	30 175 13 16 800 1179	188 45 112 3 463 938	83 283 36 4 230 898	10 3 8 25 1 37 98	5 2 1 1 1 3 28	14 17 3 5 1 9 139
6 7 8 9 10 11+ Total	1 4 17 18 17 738 808	1 4 23 3 21 406 472	1 2 5 1 33 49	1 1 48 1 1 1 58	1 16 2 1 1216 1242	1 22 41 6 19 259 407	23 66 34 62 8 1069 1373	176 86 112 30 73 1069 1620	61 58 28 23 82 417 702	30 175 13 16 800 1179	188 45 112 3 463 938	83 283 36 4 230 898	10 3 8 25 1 37 98	5 2 1 1 3 28	14 17 3 5 1 9 139
6 7 8 9 10 11+ Total	1 4 17 18 17 738 808	1 4 23 3 21 406 472	1 2 5 1 33 49	1 48 1 1 58	1 16 2 1 1 1216 1242	1 22 41 6 19 259 407	23 66 34 62 8 1069 1373	176 86 112 30 73 1069 1620	61 58 28 23 82 417 702	30 175 13 16 800 1179	188 45 112 3 463 938 a 1995	33 83 283 36 4 230 898 898 a	10 3 8 25 1 37 98 298	5 2 1 1 3 28 28 28	14 17 3 5 1 9 139 a 1999
6 7 8 9 10 11+ Total	1 4 17 18 17 738 808 1985	1 4 23 3 21 406 472	1 2 5 1 33 49 1987	1 1 48 1 1 58 1988	1 16 2 1 1216 1242 1989	1 22 41 6 19 259 407 1990	23 66 34 62 8 1069 1373	176 86 112 30 73 1069 1620	61 58 28 23 82 417 702	114 30 175 13 16 800 1179 1994	83 188 45 112 3 463 938 938 1995	33 83 283 36 4 230 898 898 1996	10 3 8 25 1 37 98 298 20 98	5 2 1 1 3 28 28 28 1998	14 17 3 5 1 9 139 139 a 1999
6 7 8 9 10 11+ Total	1 4 17 18 17 738 808 1985	1 4 23 3 21 406 472 1986	1 2 5 1 33 49 1987 1987	1 1 48 1 1 1 58 1988 1 1988	1 16 2 1 1216 1242 1989 1	1 22 41 6 19 259 407 1990	23 66 34 62 8 1069 1373 1991	176 86 112 30 73 1069 1620	61 58 28 23 82 417 702 1993	114 30 175 13 16 800 1179 1994	83 188 45 112 3 463 938 <u>a</u> 1995	33 83 283 36 4 230 898 898 1996	10 3 8 25 1 37 98 	5 2 1 1 3 28 28 1998 1	14 17 3 5 1 9 139 139 1999 1
6 7 8 9 10 11+ Total	1 4 17 18 17 738 808 1985 1 1	1 4 23 3 21 406 472 1986 1 1	1 2 5 1 33 49 1987 19 1	1 48 1 1 58 1988 1 253	1 16 2 1 1216 1242 1989 1 1	1 22 41 6 19 259 407 1990 1 1	23 66 34 62 8 1069 1373 1991 1 1	176 86 112 30 73 1069 1620 1992 1 1	61 58 28 23 82 417 702 1993 1	114 30 175 13 16 800 1179 1994 1	83 188 45 112 3 463 938 938 1995 1 13	33 83 283 36 4 230 898 230 898 1996	10 3 8 25 1 37 98 29 8 25 1 37 98 20 1 997	5 2 1 1 3 28 28 1998 1	14 17 3 5 1 9 139 a 1999 1 22
6 7 8 9 10 11+ Total	1 4 17 18 17 738 808 1985 1 1985	1 4 23 3 21 406 472 1986 1 1 1	1 2 5 1 33 49 1987 19 1 1	1 48 1 1 58 1988 1988 1 253 54	1 16 2 1 1216 1242 1989 1 1989	1 22 41 6 19 259 407 1990 1 1990 1 5	23 66 34 62 8 1069 1373 1991 1 1 1 6	176 86 112 30 73 1069 1620 1992 1 1 1 1	61 58 28 23 82 417 702 1993 1 1 1 1	114 30 175 13 16 800 1179 1994 1 1 1	83 188 45 112 3 463 938 2938 1995 1 13 6	33 83 283 36 4 230 898 230 898 1996 1 1 1	10 3 8 25 1 37 98 298 20 1 98 1997 1 1 33	5 2 1 1 3 28 28 28 1998 1 1998 1 1	14 17 3 5 1 9 139 139 1999 1 22 58
6 7 8 9 10 11+ Total	1 4 17 18 17 738 808 1985 1 1 1 1 5	1 4 23 3 21 406 472 1986 1 1 1 51	1 2 5 1 33 49 <u>1987</u> 19 1 1 2	1 48 1 1 58 1988 1988 1 253 54 22	1 16 2 1 1 1216 1242 1989 1 1 1 55	1 22 41 6 19 259 407 1990 1 1990 1 1 5 139	23 66 34 62 8 1069 1373 1991 1 1 1 6 140	176 86 112 30 73 1069 1620 1992 1 1992 1 1 1 1 1	61 58 28 23 82 417 702 1993 1 1993 1 1 11 11	114 30 175 13 16 800 1179 1994 1 1994 1 1 1	63 188 45 112 3 463 938 938 <u>1995</u> 1 13 6 39	33 83 283 36 4 230 898 898 1996 1 1 1 1 1	10 3 8 25 1 37 98 <u>98</u> <u>1997</u> 1 1 33 63	5 2 1 1 3 28 28 1998 1 998 1 1 1 261	14 17 3 5 1 9 139 139 1999 1 22 58 64
6 7 8 9 10 11+ Total	1 4 17 18 17 738 808 1985 1 1 1 1 1 5 18	1 4 23 3 21 406 472 1986 1 1 1 1 1 51 80	1 2 5 1 33 49 1987 19 1 1 1 2 391	1 1 48 1 1 58 1988 1 253 54 22 88	1 16 2 1 1216 1242 1989 1 1 1 1 1 55 76	1 22 41 6 19 259 407 1990 1 1 1 5 139 55	23 66 34 62 8 1069 1373 1991 1 1 1 6 440 837	176 86 112 30 73 1069 1620 1992 1 1 1 1 1 10 219	61 58 28 23 82 417 702 1993 1 1 1 1 1 1 1 146	114 30 175 13 16 800 1179 1994 1 1 1 1 1 53	188 45 112 3 463 938 <u>38</u> 1995 1 13 6 39 90	33 83 283 36 4 230 898 <u>898</u> 1996 1 1 1 1 1 1 1	10 3 8 25 1 37 98 <u>a</u> 1997 1 1 1 33 63 26	5 2 1 1 3 28 28 28 1998 1 1 1 261 270	14 17 3 5 1 9 139 1999 1 1 228 558 64 185
6 7 8 9 10 11+ Total	1 4 17 18 17 738 808 1985 1 1985 1 1 1 1 5 18 203	1 4 23 3 21 406 472 1986 1 1 1 1 1 50 80 59	1 2 5 1 33 49 1987 19 1 1 2 391 237	1 48 1 1 58 1988 1 253 54 22 88 8357	1 16 2 1 1 1216 1242 1989 1 1 1 55 76 136	1 22 41 6 19 259 407 1990 1 1990 1 1 5 5 139 55 9	23 66 34 62 8 1069 1373 1991 1 1 1 6 140 837 152	176 86 112 30 73 1069 1620 1992 1 1 1 1 1 1 1 219 205	61 58 28 23 82 417 702 1993 1 1993 1 1 1 1 1 1 1 46 205	114 30 175 13 16 800 1179 1994 1 1 1 1 1 53 168	63 188 45 112 3 463 938 <u>938</u> <u>1995</u> 1 13 6 39 90 4	33 83 283 36 4 230 898 1996 1 1 1 1 1 1 1 1 1 1 1 26	10 3 8 25 1 37 98 <u>98</u> <u>1997</u> 1 1 33 63 26 88	5 2 1 1 3 3 28 <u>a</u> 1998 1 1 1 261 270 118	14 17 3 5 1 9 139 139 1 9 1399 1 22 58 64 185 297
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6 7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total 5 5 6 7 7 8 9 10 11+	1 4 17 18 17 738 808 1985 1 1 1 1 1 5 18 203 96 54 22 20 96 54 22 10 29 440 and Aut	1 4 23 3 21 406 472 1986 1 1 1 1 1 51 80 59 292 24 149 244 1 30 689 292 249 249 249 149 249 249 11971	1 2 2 5 1 33 49 1987 19 1 1 2 391 237 87 87 87 87 87 87 87 138 2 156 1394	1 1 48 1 1 58 1 253 54 222 88 357 216 202 818 222 818 222 237 2250 S	1 16 2 1 1216 1242 1989 1 1 1 1 5 76 136 237 18 83 697 193 1498 1498	1 22 41 6 19 259 407 1 1 1 5 5 5 9 9 61 50 55 9 61 50 58 199 89 487	23 66 34 62 8 1069 1373 1 1991 1 1 1 1 6 140 837 152 17 99 104 125 481 1963	176 86 112 30 73 1069 1620 1 1 1 1 1 1 1 1 1 1 1 1 219 205 118 1 5 5 1 1 67 729	61 58 28 23 82 417 702 1993 1 1 1 1 1 1 1 1 1 1 1 1 1 46 205 163 121 39 4 376 1078	1994 1994 1994 1994 1 1 1 1 1 1 1 1 1 1 1 1 1	83 188 45 112 3 463 938 1995 1 1 13 6 39 90 4 1 48 24 1 206 433 1980 1980	33 83 283 36 4 230 898 1996 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	10 3 8 25 1 1 37 98 1997 1 1 1 33 63 26 88 89 3 6 19 4 283 1982 2020	5 2 1 1 1 3 28 1 998 1 1 1 261 270 118 134 75 2 3 3 3 16 912	14 17 3 5 1 9 139 1 1 22 58 64 185 297 422 56 64 185 297 422 56 61 904
6 7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total 5 5 6 7 7 8 9 10 11+ Total	1 4 17 18 17 738 808 1985 1 1 1 1 1 1 5 18 203 96 54 22 10 29 440 29 440 and Aut	1 4 23 3 21 406 472 1986 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 59 292 242 149 689 0 689 0 4471 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 2 5 1 33 49 1987 19 1 1 1 2 391 237 87 360 138 2 156 1394 2 156 1394	1 1 1 1 1 58 1988 1 253 54 225 88 357 216 202 818 2 237 2250 S 1973 5551	1 16 2 1 1216 1242 1989 1 1 1 1 1 1 5 5 5 5 5 5 5 76 136 237 183 697 193 1498 193 1498	1 22 41 6 19 259 407 1 1 1 5 5 9 61 55 9 61 55 9 61 50 58 19 89 487 487	23 66 34 1069 1373 1991 1 1 1 1 6 140 837 152 17 99 104 125 481 1963	176 86 112 30 73 1069 1620 1 1 1 1 1 1 1 1 1 1 219 205 118 1 1 5 1 1 67 729 1977 39144	61 58 28 23 82 417 702 1993 1 1 1 1 1 1 1 1 1 1 1 1 4 6 205 163 121 39 14 376 376 1078	1994 1994 1179 1994 1 1 1 1 1 1 1 1 1 1 1 1 1 5 3 168 27 114 1 1 1 7 9 446	188 188 45 112 3 463 938 938 1995 1 1 3 9 90 4 1 1 3 9 90 4 4 1 206 433 48 24 1 206 433 1980 15115	33 83 83 283 36 4 40 230 898 8 1996 1 1 1 119 126 16 29 11 1 200 3266 1981 4771	10 3 8 25 1 137 98 1997 1 1 3 3 26 88 39 3 26 88 39 3 4 283 1982 3318	5 2 1 1 1 3 28 1998 1 1 1 1 261 270 118 134 75 2 33 16 912 912 1983 2127	14 17 3 5 1 9 139 1999 139 1 22 58 64 185 297 42 56 61 98 200 904 1984 2127
6 7 8 9 10 11+ Total 2 3 4 5 6 7 7 8 9 10 11+ Total 5 6 7 7 8 9 10 11+ Total 2 3 4 5 6 7 7 8 9 10 10 11+	1 4 17 18 17 738 808 1985 1 1 1 1 5 18 203 96 54 22 203 96 54 22 203 96 54 22 203 96 54 22 203 96 54 22 203 96 54 22 203 96 54 22 203 29 440	1 4 23 3 21 406 472 1986 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 50 59 292 149 292 149 4 4 1 30 689 U	1 2 2 5 1 33 49 1987 1 1 1 2 391 237 87 360 138 2 256 1394 2 5 5 1 56 1394	1 1 1 1 1 1 1 1 1 1 1 1 58 1 1 253 54 225 225 216 202 818 2 237 2250 5 5 5 5 5 5 5 5 5 5 5 5 5	1 16 2 1 1216 1242 1989 1 1 1 1 1 5 5 76 136 237 188 833 697 1933 1498 1498 1974 9064 86.3	1 22 41 6 19 259 407 1 1 5 5 5 9 9 61 50 55 9 9 61 50 55 89 89 487 21848 21887 21875 21875 21875	23 66 34 62 8 9 1373 1 91 1 1 1 1 1 6 140 837 152 17 99 104 837 155 481 1963 1976 33914 96.0	176 86 112 30 73 1069 1620 1 1 1 1 1 1 1 1 1 1 1 1 205 118 1 1 5 118 1 1 67 729 1977 39144 95.9	61 58 28 23 82 417 702 1993 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1994 1994 1994 1179 1994 1 1 1 1 1 1 1 1 1 1 1 1 5 3 168 27 114 1 1 79 446	83 188 45 112 3 463 938 938 1995 1 1 3 3 9 90 4 4 1 48 24 4 1 206 433 9 90 0 4 39 90 0 4 1 1 82 2 4 3 39 938 938 1995 10 1955 10 10 1955 10 10 10 10 10 10 10 10 10 10 10 10 10	33 83 83 283 36 4 230 898 1996 1 1 1 119 126 29 11 1 20 326 1981 471 73.2	10 3 8 25 1 1 37 98 a 1997 1 1 33 63 26 8 8 39 3 6 199 4 283 1982 3318 97.3	5 2 1 1 3 28 1998 1 1 1 261 270 118 134 75 2 3 3 16 912 1983 2127 0.0	14 17 3 5 5 19 19 139 1 22 58 64 185 297 42 56 64 185 297 42 56 61 904 904 904
6 7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total 5 5 6 7 7 8 9 10 11+ 7 7 8 9 10 11+ 7 7 8 9 10 10 11+ 7 7 8 9 10 10 11+ 7 7 8 9 10 10 11+ 11+ 7 7 8 9 10 10 11+ 11+ 7 7 8 10 10 11+ 11+ 10 10 11+ 10 10 10 10 10 10 10 10 10 10 10 10 10	1 4 17 18 17 738 808 1985 1 1 1 1 1 1 5 18 203 96 54 22 10 29 440 and Aut 1970 2126 62.0 38.0	1 4 23 3 21 402 1986 1 1 1 1 1 1 1 51 80 59 292 249 249 249 249 249 249 249 249 149 689 0 689	1 2 2 5 1 33 49 1987 19 1 1 2 391 237 87 360 138 2 156 1394 1 972 2758 98.2 1.8	1 1 48 1 1 58 1 253 54 1 253 54 1 253 54 202 818 202 818 202 818 202 818 202 818 202 818 205 555 1973 5551 99.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1	1 16 2 1 1216 1242 1989 1 1 1 55 76 136 237 18 83 697 193 1498 1498 1974 9064 86.3 13.7	1 22 41 6 19 259 407 1 1 5 5 5 9 1 55 9 1 55 9 9 6 1 50 58 19 9 89 487 	23 66 34 1069 1373 1991 1 1 1 1 6 140 837 152 152 152 152 152 199 104 125 481 1963 1976 33914 96.0	176 86 112 30 73 1069 1620 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 219 205 118 205 118 5 1 1 67 729 1977 39144 95.9 4.1	61 58 28 23 82 417 702 1993 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1994 1179 1994 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 5 3 168 27 114 1 1 1 7 9 446 29059 95.9 4.1	188 188 45 112 3 463 938 938 1995 1 1 13 6 39 90 4 4 1 48 24 1 206 433 1980 15115 93.8 6.2	33 83 283 36 4 230 898 1996 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	10 3 8 25 1 17 98 1997 1 1 1 3 3 6 3 26 88 9 3 6 1997 3 6 1997 1 1 1 3 3 6 3 26 88 9 3 6 1997 1 1 1 1 1 3 3 26 88 9 3 6 1 1 1 1 1 1 1 3 3 26 88 9 3 6 1 1 1 1 1 1 1 3 3 26 88 9 3 6 1 1 1 1 1 1 3 3 6 3 26 88 9 3 6 1 1 1 1 1 1 3 3 6 3 26 88 9 3 6 1 1 1 1 1 3 3 26 88 9 3 6 1 1 1 1 1 3 3 26 88 9 3 6 1 1 1 1 1 1 3 3 26 88 9 3 3 6 1 1 1 1 1 1 3 3 1 1 1 1 1 1 1 1 1 3 3 1 1 1 1 1 1 1 1 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1	5 2 1 1 1 3 28 1 998 1 1 1 261 270 118 134 75 2 3 3 3 16 912 1983 2127 0.0 100.0	14 17 3 5 1 9 139 139 1 22 5 5 8 64 185 297 422 56 61 8 98 200 904 1984 2127 0.00
6 7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total 5 6 7 7 8 9 10 11+ Total 5 6 6 7 7 8 9 10 12 2 3 4 4 5 6 7 7 8 9 9 10 11+	1 4 17 18 17 738 808 1985 1 1 1 1 1 1 1 5 5 8 203 96 54 22 10 29 440 and Aut 1970 2126 62.0 38.0	1 4 4 23 3 21 406 472 1986 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 5 1 1 80 59 292 149 80 59 292 149 689 U 472 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 2 5 5 1 33 49 1 9 1 1 1 2 391 237 87 360 138 2 156 1394 2 391 237 87 360 138 2 2 55 1394	1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 16 2 1 1216 1242 1989 1 1 1 1 1 5 5 5 7 6 136 237 188 8 3 697 193 1498 1498 1974 9064 86.3 13.7	1 22 41 6 19 259 407 1 9 0 1 1 1 5 5 9 61 55 9 61 50 58 19 89 487 1975 21848 98.1 1.9	23 66 34 1069 1373 1991 1 1 1 1 1 1 1 1 1 1 1 1 25 481 1963 1976 33914 96.0 4.0	176 86 112 30 73 1069 1620 1 1 1 1 1 1 1 1 1 1 219 205 118 1 1 5 1 1 67 729 1977 39144 95.9 4.1	61 58 28 23 82 417 702 1993 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1994 1994 1994 1179 1994 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 5 3 168 27 1114 1 1 79 446	188 188 45 112 3 463 938 a 1995 1 1 3 6 39 90 4 4 1 48 24 1 206 433 1980 15115 93.8 6.2	33 83 283 36 4 230 898 a 1996 1 1 1 1 1 1 1 1 1 1 1 20 326 326 1981 471 73.2 26.8	10 3 8 25 1 17 98 1997 1 1 1 3 3 2 6 88 39 3 2 6 19 4 283 1997 1 1 3 3 2 6 88 39 3 2 5 1997 1 1 1 3 3 2 6 8 3 3 3 2 6 8 3 3 3 3 3 3 3 3 3 3 3 3 3	5 2 1 1 1 3 28 1998 1 1 1 1 261 270 118 134 134 75 2 33 3 16 912 1983 2127 0.0 100.0	14 17 3 5 1 9 139 1999 1 22 58 64 185 297 42 56 61 98 20 904 1984 2127 0.0 1084
6 7 8 9 10 11+ Total 2 3 4 5 5 6 7 8 9 10 11+ Total 5 5 6 7 8 9 10 11+ Total 5 5 6 7 7 8 9 10 11+	1 4 17 18 17 738 808 1985 1 1 1 1 5 5 4 203 96 54 22 203 96 54 22 10 29 440 29 440 29 440	1 4 4 23 3 21 406 472 1 986 1 1 1 1 51 80 59 292 2149 24 1 30 689 292 24 1 30 689 1971 4174 88.7 11.3	1 2 2 5 1 3 3 49 1 9 1 1 2 391 2 391 2 391 2 37 87 360 138 2 156 1394 1 972 2758 982 2758 982 1.8	1 1 48 1 1 58 1 253 54 1 253 54 222 88 357 216 202 818 202 818 2237 2250 S 1973 555.0 99.0 1.0 1.0	1 16 2 1 1216 1242 1989 1 1 1 1 5 76 136 237 18 83 697 193 1498 1498 1498 1974 9064 86.3 13.7	1 22 41 6 19 259 407 1 1 5 5 5 9 9 61 50 55 9 9 61 50 58 9 89 487 21848 98.1 1.9	23 66 34 62 8 8 1069 1373 1 91 1 1 1 1 6 140 837 152 17 99 104 125 481 1963 3914 96.0 4.0	176 86 112 30 73 1069 1620 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	61 58 28 23 82 417 702 1993 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1994 1994 1994 1 1 1 1 1 1 1 1 1 1 1 1 1	83 188 45 112 3 463 938 1995 1 1 3 6 39 90 4 1 1 3 6 39 90 4 1 1 206 433 1980 15115 93.8 6.2 2	33 83 283 36 4 230 898 1996 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	10 3 8 25 1 1 37 98 a 1997 1 1 3 3 63 26 88 89 3 3 6 9 3 6 1997 1 1 3 26 1997 1 1 3 26 8 8 9 3 6 25 1 1 1 1 1 1 1 1 1 1 1 1 1	5 2 1 1 1 3 28 1 998 1 1 1 261 270 118 134 75 2 3 3 3 16 912 1983 2127 0.0 0 100.0	14 17 3 5 5 19 139 139 1 22 58 6 64 185 297 42 56 64 185 297 42 56 64 1984 20 904
6 7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total Spring 3 Spring 3	1 4 17 18 17 738 808 1985 1 1 1 1 1 1 5 18 203 96 54 22 10 29 440 20 29 440 20 20 29 440 20 20 20 20 20 20 20 20 20 20 20 20 20	1 4 23 3 21 472 1986 472 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 59 292 292 149 24 1 30 689 0 292 149 8.4 7 1 130 689 0 292 149 14 24 14 15 14 14 14 15 14 14 15 14 14 15 15 15 16 16 16 16 16 17 11 17 16 16 16 16 16 16 17 17 17 17 17 17 17 17 17 17 17 17 17	1 2 2 5 1 33 49 1987 19 1 1 2 391 237 87 360 138 2 156 1394 1394 1394 1972 2758 98.2 1.8 0 000	1 1 1 1 1 1 1 1 58 1 2 58 1 2 58 1 2 58 1 2 2 88 357 216 202 818 2 2 237 2250 5 5 1 99.0 1.0 1 1 1 1 1 1 1 1 1 1 1 1 1	1 16 2 1 1216 1242 1989 1 1 1 55 76 136 237 18 83 697 193 1498 1498 1498 1974 9064 86.3 13.7	1 22 41 6 19 259 407 1 1 5 5 5 9 6 1 5 5 9 9 6 1 5 5 9 9 6 1 5 5 8 9 9 6 1 5 5 8 9 9 4 87 	23 66 34 62 8 1069 1373 1 91 1 1 1 6 8 37 152 17 7 99 104 125 481 1963 1976 33914 96.0 4.0	176 86 112 30 73 1069 1620 1 1 1 1 1 1 1 1 1 1 1 219 205 118 1 1 1 5 5 1 1 8 7 29 205 1187 7 29 205 1187 1077 39144 95.9 4.1	61 58 28 23 82 417 702 1993 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 46 205 163 121 39 14 376 1078 1978 25953 97.3 2.7	1994 1994 1179 1994 1 1 1 1 1 1 1 1 1 1 1 1 1	188 188 45 112 33 938 1995 1 1 39 90 4 1 1 39 90 4 4 1 1 8 24 1 206 433 1980 15115 93.8 6.2 2 93.8 9.2 1995	33 83 883 283 36 4 430 898 898 1996 1 1 119 126 129 11 110 120 326 326 19881 471 73.2 26.8 1006 20	10 3 8 25 1 1997 1 1 3 3 6 3 26 88 9 3 6 1997 3 6 1987 4 283 1982 3318 97.3 2.7 1982 3318 97.3 2.7 2.7 3318 97.3 2.7 2.7 3318 97.3 2.7 3.7 3.7 3.7 3.7 3.7 3.7 3.7 3	5 2 1 1 1 3 28 1 998 1 1 1 261 270 118 134 75 2 33 3 16 912 1983 2127 0.0 1000 1000	14 17 3 5 1 9 139 139 1 222 58 64 185 297 422 56 61 98 200 904 1984 2127 0.00 10.00 10.00
6 7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total 9 10 11+ Total 8 9 10 11+ Total	1 4 17 18 17 738 808 1985 1 1 1 1 1 1 1 5 5 8 203 96 54 22 10 29 440 29 440 and Aut 1970 2126 62.0 38.0 b	1 4 4 23 3 21 406 472 1 986 1 1 1 1 1 1 1 1 5 1 1 80 59 292 149 292 149 292 149 689 0 292 149 689 1971 4174 88.7 11.3	1 2 2 5 1 33 49 1987 19 1 1 2 391 237 87 360 138 2 156 1394 237 87 360 138 2 2 756 1394 2758 98.2 1.8 2758 98.2 1.8	1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 16 2 1 1216 1242 1989 1 1 1 1 1 5 5 7 6 136 237 18 8 3 697 193 1498 1498 1974 9064 86.3 13.7 1989	1 22 41 6 199 259 407 1 1 1 1 5 5 9 61 55 9 61 55 9 61 55 9 61 55 8 9 61 55 58 19 89 487 1975 21848 98.1 1.9	23 66 34 62 8 9 1373 1 99 1373 1 1991 1 1 1 6 140 837 152 17 99 104 837 155 481 1963 33914 96.0 4.0	176 86 112 30 73 1069 1620 1992 1 1 1 1 1 1 1 1 1 0 219 205 118 1 5 118 1 5 7 29 205 2 1977 39144 95.9 4.1	61 58 28 23 82 417 702 1993 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1994 1994 1994 1994 1 1 1 1 1 1 1 1 1 1 1 1 1	188 188 45 112 3 463 938 a 1995 1 1 3 3 6 39 90 4 4 1 48 24 4 1 206 433 1980 15115 93.8 6.2 1995 5 7777	33 83 83 283 36 4 230 898 a 1996 1 1 11 1 120 16 29 11 1 1 20 326 1981 4711 73.2 26.8 1996 40.5	10 3 8 25 1 1 7 98 a 1997 1 1 33 63 26 88 39 3 6 88 39 3 6 1997 4 283 21 1997 4 283 21 1997 4 283 25 1997 4 283 20 1997 1 1 1 1 1 1 1 1 1 1 1 1 1	5 2 1 1 1 3 28 1998 1 1 1 1 1 1 261 270 118 134 5 2 2 33 16 912 1983 2127 0.0 100.0 100.0 1998	14 17 3 5 5 19 19 139 1 22 58 64 1999 12 25 8 64 185 297 42 56 61 91 904 904 1984 2127 0.0 100.0
6 7 8 9 10 11+ Total 2 3 4 5 5 6 7 8 9 10 11+ Total \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1 4 17 18 17 738 808 1985 1 1 1 1 5 18 203 96 54 22 10 29 440 29 440 29 440 29 440 29 440 29 6 54 22 29 440 29 6 54 22 20 38.0 8 0 8 0 8 9 6 9 6 5 5 4 22 9 6 9 5 5 4 22 9 6 9 6 9 6 9 6 9 6 9 6 9 6 9 6 9 6	1 4 4 23 3 21 472 1986 1 1 1 1 1 51 80 59 292 2149 24 1 30 689 249 24 1 30 689 1971 4174 88.7 1971 4174 81.7 1986 7355	1 2 2 5 1 33 49 1987 19 1 1 2 391 237 87 87 87 87 87 87 87 138 2 156 1394 1972 2758 98.2 1972 2758 98.2 1977 24322	1 1 48 1 1 58 1 253 54 1 253 54 22 88 357 216 202 818 22 237 2250 S 1973 5551 99.0 1.0 1988 47974	1 16 2 1 1216 1242 1989 1 1 1 1 1 1 5 76 136 237 18 83 697 18 83 697 1939 1498 1498 1498 1974 9064 86.3 13.7 1975 1975 1975 1989	1 22 41 6 19 259 407 1 1 5 5 139 55 5 9 9 61 50 58 139 55 8 9 9 19 89 487 1975 21848 98.1 1.9 1990 12600	23 66 34 62 8 1069 1373 1991 1 1 1 6 6 140 837 152 17 7 99 104 125 481 1963 33914 963 33914 963 4.0 4.0	176 86 112 30 73 1069 1620 1 1 1 1 1 1 1 1 1 1 205 118 1 1 5 1 1 8 1 1 5 1 1 67 729 1977 39144 95.9 94.1	61 58 28 23 82 417 702 1993 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1994 1994 1994 1 1 1 1 1 1 1 1 1 1 1 1 1	188 188 45 112 3 463 938 1995 1 1 3 3 6 39 90 4 4 1 48 24 1 206 433 1980 15115 93.8 6.2 a 1995 5717	33 83 83 283 36 4 230 898 1996 1 1 1 119 126 16 29 11 1 200 326 1981 471 4771 73.2 26.8 8 1996 4341	10 3 8 25 1 1 37 98 28 1997 1 1 1 33 63 26 88 39 3 6 32 6 88 39 3 6 1997 4 283 1997 4 283 1997 4 283 1997 1 1 1 1 3 2 6 3 2 6 3 2 6 3 2 6 3 2 6 3 2 6 3 2 6 3 2 6 3 2 6 3 2 6 3 2 6 3 2 6 3 2 6 3 2 6 3 6 3 2 6 3 2 6 3 2 6 3 6 3 2 6 8 8 3 3 6 3 6 3 6 3 6 3 6 3 6 3 6 3 6 3 6 3 6 8 8 3 3 6 1997 1 1 1 3 3 6 3 6 3 6 8 8 3 9 3 6 19 4 2 8 3 3 6 19 4 2 8 3 3 6 19 7 7 8 8 9 7 3 19 4 4 2 8 3 8 9 7 3 7 19 4 4 2 8 3 7 19 4 4 2 8 3 8 9 7 3 2 7 7 7 8 9 7 7 7 7 8 9 7 8 9 7 7 7 7 7 8 9 7 7 7 7 7 8 7 7 7 7 7 8 7 7 7 7 7 7 7 7 7 7 8 7 7 7 7 7 7 7 7 7 7 7 7 7	5 2 1 1 1 3 28 1 998 1 1 1 261 270 118 134 75 2 3 3 3 16 912 1983 2127 0.0 0 100.0 100.0 1998 3843	14 17 3 5 19 139 1 1 22 58 64 185 297 42 25 8 64 185 297 42 25 8 80 80 904 1984 200 904
6 7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1 4 17 18 17 738 808 1985 1 1 1 1 1 1 5 18 203 96 54 22 10 29 440 29 440 29 440 29 440 29 440 29 440 29 440 29 29 440 29 203 38.0 8 8.0 8	1 4 23 3 21 406 472 1986 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 59 292 149 24 1 30 689 24 1 1 30 689 UMN S 1 924 1 1 30 59 292 149 86 7 292 1498 59 292 1498 6 80 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 2 2 5 1 33 49 1987 19 1 1 2 391 237 87 360 138 2 156 1394 237 87 360 138 2 156 1394 2 156 1394 2 2758 98.2 1.972 2758 98.2 1.972 2758 98.2 1.972 2758 98.2 1.972 2758 98.2 1.972 2758 98.2 1.972 2758 98.2 1.972 2758 98.2 1.972 2758 98.2 1.972 2758 98.2 1.972 2758 98.2 1.972 2758 98.2 1.972 2758 98.2 1.972 2758 98.2 2.943 2.943 2.943 2.943 2.943 2.943 2.943 2.943 2.944 2.943 2.9444 2.9444 2.9444 2.9444 2.9444 2.9444 2.9444 2.9444 2.9444 2.9444 2.9444 2.9444 2.9444 2.9444 2.94444 2.94444 2.94444 2.94444 2.94444 2.94444 2.944444 2.944444 2.944444 2.944444 2.9444444 2.94444444444	1 1 1 1 1 1 1 1 58 1 1 58 1 2 53 54 1 2 53 54 2 2 88 357 216 202 818 2 237 2250 S S S S S S S S	1 16 2 1 1216 1242 1989 1 1 1 1 1 5 5 76 136 237 18 8 3 697 193 1498 193 1498 1974 9064 86.3 13.7 1989 13.7 1989 13.7 1989 1974 1974 1974 1974 1974 1974 1974 1974 10774 10775 10775 10774 10774 10774 10774 10774 10775 10775 10774 10774 10774 10775 10775 10774 10774 10775 10775 10775 10774 10774 10775 1	1 22 41 6 19 259 407 1 1 5 5 9 61 55 9 61 55 9 61 50 58 19 89 487 487 1975 21848 98.1 1.9 1990 12600 96.1	23 66 34 1069 1373 1991 1 1 1 1 1 6 6 140 837 152 17 99 104 125 481 1963 1963 1976 33914 96.0 4.0	176 86 112 30 73 1069 1620 1 1 1 1 1 1 1 1 1 1 219 205 118 1 1 5 1 1 5 1 1 67 729 1977 39144 95.9 4.1	61 58 28 23 82 417 702 1993 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1994 1994 1179 1994 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 5 3 168 27 114 1 1 3 5 3 168 27 114 1 1 4 4 4 6 8 29059 95.9 4.1 1 994 10994	188 188 45 112 938 938 1995 1 1 3 9 90 4 1 1 3 9 90 4 4 1 1 3 9 90 4 4 1 1 206 433 9 90 90 4 1 1 5 15 15 93.8 6.2 1995 5717 92.4	33 83 83 283 36 4 40 230 898 8 1996 1 1 1 119 126 16 29 11 1 1090 3266 19881 4711 73.2 26.8 1996 4341 92.5	10 3 8 25 1 1997 1 1 3 3 3 3 3 2 6 88 9 3 2 6 88 3 9 3 2 6 88 3 9 4 2 83 8 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 3 2 6 88 9 7 7 7 8 8 8 9 7 7 8 8 9 7 8 8 9 7 8 8 9 7 8 8 9 7 7 7 8 8 8 9 7 8 8 8 9 7 8 8 9 7 8 8 9 7 8 8 9 7 7 7 7 8 8 9 7 8 8 9 7 8 8 9 7 8 8 9 7 8 8 9 7 8 8 9 7 8 8 9 7 8 8 9 7 8 9 7 8 9 7 8 9 7 8 9 7 8 9 7 8 9 7 8 9 7 8 9 7 8 9 7 8 9 7 9 7 9 7 9 7 9 7 9 3 9 7 9 3 9 7 9 3 4 9 9 3 4 9 9 3 4	5 2 1 1 1 3 28 1 998 1 1 1 1 1 261 270 118 134 75 2 33 16 912 912 912 1983 2127 0.0 100.0 1098 3843 26127 0.0	14 17 3 5 1 9 9 139 1 22 58 64 185 297 42 56 61 98 200 904 1984 2127 0.0 100.0 a 1999 6897 86.9
6 7 8 9 10 11+ Total 2 3 4 5 5 6 7 8 9 10 11+ Total Spring : Spring : Spring : Spring :	1 4 17 18 17 738 808 1985 1 1 1 1 5 5 4 203 96 54 22 10 29 440 29 440 29 440 29 2126 62.0 38.0 b 1985 2033 78.4 216	1 4 4 23 3 21 406 472 1 1 51 51 80 59 292 24 1 51 80 59 292 24 1 30 689 249 24 1 30 689 292 24 1 30 689 292 24 1 30 689 292 24 1 1 30 689 292 24 50 689 292 24 50 689 292 24 50 689 292 24 50 689 292 24 50 689 292 292 24 50 689 292 292 24 50 689 292 292 292 292 292 292 292 292 292 2	1 2 2 5 1 1 33 49 1 987 19 1 1 2 391 237 87 360 138 2 256 1394 1972 2758 98.2 2758 98.2 2.1.8 C 1987 24322 94.3 5 7	1 1 48 1 1 58 1 253 54 1 253 54 222 88 357 216 202 818 222 818 222 83 557 216 202 818 2237 2250 S 1973 5551 99.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1	1 16 2 1 1216 1242 1989 1 1 1 1 55 76 136 237 18 83 697 193 1498 193 1498 1974 9064 86.3 13.7 1959 91.5 8.5	1 22 41 6 19 259 407 1 1 5 5 309 55 9 9 61 50 58 9 9 61 50 58 89 487 21848 98.1 1.9 9 98.0 12600 96.1 3.9	23 66 34 62 8 1069 1373 1991 1 1 1 1 6 140 837 152 17 99 104 125 481 1963 33914 33916 33916 33916 33916 33713 96.0 4.0	176 86 112 30 73 1069 1620 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	61 58 28 23 82 417 702 1993 1 1 1 1 1 1 1 1 1 1 1 1 4 6 205 1 63 121 39 14 376 1078 25953 97.3 2.7 1993 9025 88.1 11.9	1994 1994 1994 1 1 1 1 1 1 1 1 1 1 1 1 1	83 188 45 112 3 463 938 1995 1 1 3 6 39 90 4 1 1 3 6 39 90 4 1 1 206 433 1980 15115 93.8 6.2 <u>a</u> 1995 5717 92.4 7.6	33 83 283 36 4 230 898 1996 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	10 3 8 25 1 1 37 98 a 1997 1 1 3 3 63 26 88 8 39 3 6 6 28 39 3 6 1997 4 283 1997 4 283 1997 1 3318 97.3 2.7 a 1997 4313 93.4 6.6 6.6 8.6 8.6 8.6 8.7 1997 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5	5 2 1 1 1 3 28 1 998 1 1 1 261 270 118 134 75 2 3 3 3 16 912 1983 2127 0.0 100.0 1998 3843 76.3 23.7	14 177 3 5 5 19 9 139 1 22 58 8 64 185 297 42 56 64 185 297 42 56 61 98 20 904 904 1984 2127 0.0 100.0 100.0 8 8 999 913.1

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

Table 10. Commercial catch at age of spring and autumn spawning herring for St. Mary's Bay - Placentia Bay, 1970-1999.

Spring Spawners

	10000														
Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	3	1	1	1	3	1	1	1	1	1	1	1	1002	1000	1504
2	476	1	1	76	005	74	265	50			1	1		1	1
3	100	667	207	200	000	0001	305	52	30	87	133	1	1	1	8
	103	557	207	326	280	2234	391	1423	175	663	332	193	1	5	9
4	4434	116	20375	11	234	471	1906	140	1817	279	133	42	2	2	24
5	59	2111	725	15470	126	147	208	736	123	2263	153	111	3	3	36
6	76	80	5154	566	14328	1591	267	87	596	96	1270	E 4		ő	50
7	645	251	365	6757	436	12050	207	50	550	50	1270	51	0	2	6
	66	45	650	0/07	430	13030	002	50	64	614	57	338	3	4	3
0	00	45	650	93	6049	146	5622	1039	106	85	470	28	14	1	24
9	72	13	352	224	138	3391	201	3830	512	66	38	80	4	9	1
10	37	22	73	193	238	350	2256	134	3827	501	237	6		1	10
11+	107	96	403	315	624	1323	1361	2448	2185	4795	2071	400	~	1	10
Total	6084	3293	28306	24008	22461	22526	1001	2440	2100	4/05	2971	466	69	39	44
rotar	0004	0200	20000	24090	23451	23586	13440	9940	9436	9440	5795	1317	110	68	166
											а	а	а	а	а
Age	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	1	1	1	1	1	1	1	1	1	13	1	1	1	1000	1000
2	1	1	34	1	22	1	37	68	5	24	1	10	225	154	
3	7	1	10	1	40	115	01	47		107		19	200	101	1
A A	10	142	10		40	115	1	47	62	137	333	19	125	486	21
4	10	143	2	22	9	189	222	7	34	5	1418	224	1	205	21
5	27	19	502	163	1	64	160	363	11	36	37	1187	1656	61	1
6	21	28	29	2457	24	15	170	231	187	6	1	94	8237	872	1
7	15	9	47	119	463	30	12	55	118	225		42	100	2012	
8	3	4	9	213	24	404	110	50	74	220		45	400	3213	84
6	26	4	2	210	400	454	110	55	14	60	63	32	134	299	293
9	20	1	3	16	100	45	493	74	63	98	1	51	76	185	42
10	5	5	1	36	5	172	88	383	56	172	16	16	50	43	21
11+	125	30	11	147	34	128	948	965	1174	1042	416	177	280	109	63
Total	248	242	658	3176	741	1254	2242	2247	1785	1818	2288	1863	11260	5625	540
										1010	2200	1000	11200	5025	049
A	0														
Autumn	i Spawn	ers													
Age	1970	1971	1972	1973	1974	1975	1076	1077	1079	1070	1000	1001	1000	4000	100.1
1	1	1	1	1010	1074	1070	1070	15/1	1570	1979	1900	1901	1902	1983	1984
		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
3	1	1	24	5	2	1	11	1	1	1	1	1	1	1	1
4	1	9	61	150	2	7	4	47	23	11	96	130	. 1	10	17
5	2	2	175	52	96	69	214	50	425	142	25	100	-	10	17
6	4	50	175	52	90	00	214	52	435	143	35	116	7	6	101
0	1	53	15	(1	146	182	67	209	92	598	52	10	1	10	20
						1					0 44		1	12	321
7	71	31	61	10	80	89	32	81	244	73	419	11	1	4	21
7	71 112	31 43	61 37	10 54	80 95	89 206	32 17	81 69	244 122	73 216	419	11	1	4	21
7 8 9	71 112 19	31 43 84	61 37 101	10 54 17	80 95 93	89 206	32 17 94	81 69 26	244 122 38	73 216 21	419 79	11 50	1	4	21 5
7 8 9	71 112 19 28	31 43 84	61 37 101 71	10 54 17	80 95 93	89 206 6	32 17 94	81 69 26	244 122 38	73 216 21	419 79 126	11 50 7	1 1	4	52 21 5 3
7 8 9 10	71 112 19 28	31 43 84 35	61 37 101 71	10 54 17 68	80 95 93 51	89 206 6 37	32 17 94 11	81 69 26 22	244 122 38 52	73 216 21 2	419 79 126 25	11 50 7 1	1 1 1 1	4 1 1 1	5 21 5 3 1
7 8 9 10 11+	71 112 19 28 202	31 43 84 35 314	61 37 101 71 539	10 54 17 68 737	80 95 93 51 970	89 206 6 37 677	32 17 94 11 329	81 69 26 22 526	244 122 38 52 561	73 216 21 2 348	419 79 126 25 492	11 50 7 1 29	1 1 1 2	12 4 1 1 1 4	52 21 5 3 1 8
7 8 9 10 11+ Total	71 112 19 28 202 439	31 43 84 35 314 574	61 37 101 71 539 1086	10 54 17 68 737 1166	80 95 93 51 970 1537	89 206 6 37 677 1275	32 17 94 11 329 781	81 69 26 22 526 1035	244 122 38 52 561 1570	73 216 21 2 348 1415	419 79 126 25 492 1327	11 50 7 1 29 366	1 1 1 2 18	4 1 1 1 4 50	32 21 5 3 1 8 191
7 8 9 10 11+ Total	71 112 19 28 202 439	31 43 84 35 314 574	61 37 101 71 539 1086	10 54 17 68 737 1166	80 95 93 51 970 1537	89 206 6 37 677 1275	32 17 94 11 329 781	81 69 26 22 526 1035	244 122 38 52 561 1570	73 216 21 2 348 1415	419 79 126 25 492 1327	11 50 7 1 29 366	1 1 1 2 18	12 4 1 1 1 4 50	32 21 5 3 1 8 191
7 8 9 10 11+ Total	71 112 19 28 202 439	31 43 84 35 314 574	61 37 101 71 539 1086	10 54 17 68 737 1166	80 95 93 51 970 1537	89 206 6 37 677 1275	32 17 94 11 329 781	81 69 26 22 526 1035	244 122 38 52 561 1570	73 216 21 2 348 1415	419 79 126 25 492 1327	11 50 7 1 29 366	1 1 1 2 18	4 1 1 4 50	32 21 5 3 1 8 191
7 8 9 10 11+ Total	71 112 19 28 202 439	31 43 84 35 314 574	61 37 101 71 539 1086	10 54 17 68 737 1166	80 95 93 51 970 1537	89 206 6 37 677 1275	32 17 94 11 329 781	81 69 26 22 526 1035	244 122 38 52 561 1570	73 216 21 2 348 1415	419 79 126 25 492 1327 a 1995	11 50 7 1 29 366 a 1996	1 1 1 2 18 18 1997	12 4 1 1 4 50 20 8	32 21 5 3 1 8 1991 a
7 8 9 10 11+ Total	71 112 19 28 202 439 1985	31 43 84 35 314 574 1986 1	61 37 101 71 539 1086 1987	10 54 17 68 737 1166 1988	80 95 93 51 970 1537 1989 1	89 206 6 37 677 1275 1990	32 17 94 11 329 781 1991	81 69 26 22 526 1035	244 122 38 52 561 1570 1993	73 216 21 2 348 1415	419 79 126 25 492 1327 a 1995	11 50 7 1 29 366 1996	1 1 1 2 18 1997	12 4 1 1 4 50 1998	32 21 5 3 1 8 191 199 1999
7 8 9 10 11+ Total	71 112 19 28 202 439 1985 1 1	31 43 84 35 314 574 1986	61 37 101 71 539 1086 1987 1 2	10 54 17 68 737 1166 1988 1	80 95 93 51 970 1537 1989 1	89 206 6 37 677 1275 1990 1	32 17 94 11 329 781 1991	81 69 26 22 526 1035 1992	244 122 38 52 561 1570 1993 1	73 216 21 2 348 1415 1994	419 79 126 25 492 1327 <u>a</u> 1995	11 50 7 1 29 366 1996 1	1 1 1 2 18 <u>a</u> 1997	12 4 1 1 4 50 a 1998	32 21 5 3 1 191 4 1999 1
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7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total Spring a	71 112 19 28 202 439 1985 1 1 1 1 1 9 20 86 46 36 10 3 24 237 and Autu 1970 6523 93.3	31 43 84 35 314 574 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	61 37 101 71 539 1086 1987 1 2 4 12 32 80 30 82 24 30 82 24 30 82 24 31 2 82 282 2 82 2 82 2 82 2 82	10 54 17 68 737 1166 1988 1 1 1 1 1 20 30 239 90 35 270 5 5 3 745 745	80 95 93 51 970 1537 1989 1 1 1 5 5 18 8 5 6 43 67 178 164 546 546	89 206 6 37 1275 1275 1 1990 1 1 1 7 37 61 54 24 47 58 17 173 480 1975 24861 94.9	32 17 94 11 329 781 1 1 1 1 1 1 1 1 4 87 40 23 5 98 40 495 865 865	81 69 26 22 526 1035 1 1 1 1 1 1 7 8 50 33 3 27 64 1 479 672 90.6	244 122 38 52 561 1570 1993 1 1 1 2 208 239 173 41 41 3 863 1573 1573	73 216 21 348 1415 1994 1 1 1 7 7 62 116 182 231 182 1 182 1 182 1 1201	419 79 126 25 492 1327 1 1 1 1 1 1 1 1 1 1 5 112 35 106 99 9 87 78 282 907	11 50 7 1 29 366 1 1996 1 1 1 9 40 82 102 100 82 102 100 9 9 1 7 4 358 1981 196 48.0	1 1 1 2 18 1997 1 1 1 76 295 188 1231 1361 229 306 50 730 4468 4468	12 4 4 1 1 50 2 1998 1 1 6 1 231 1 444 273 763 694 375 23 255 3121 1983 1145 762	22 21 5 3 1 8 1999 1 1 1 1 1 1 1 1 1 1 4 2 6 3 105 125 508 1984 4 3 2 3
7 8 9 10 11+ Total 2 3 4 4 5 6 7 8 9 10 11+ Total Spring a Spring a * SS * SS * SS * SS * SS	71 112 19 28 202 439 1985 1 1 1 1 1 9 20 86 46 36 10 3 24 237 and Autu 1970 6523 9.3.3 6.7	31 43 84 35 314 574 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 24 15 97 28 8 16 4 15 218 IIIIN Sp 1971 3867 8552 14.8	61 37 101 71 539 1086 1987 1 2 4 12 32 80 30 82 24 3 12 282 24 3 12 282 24 3 12 282 24 3 12 282 24 3 12 282 24 3 12 282 24 3 3 12 282 283 2 3 3 7	10 54 17 68 737 1166 1988 1 1 1 1 1 20 30 239 90 35 270 5 5 37 45 745	80 95 93 51 970 1537 1989 1 1 1 5 18 8 56 43 67 178 164 546 1974 24988 93.8 6.2	89 206 6 37 1275 1990 1 1 1 7 37 61 54 24 47 58 17 173 480 1975 24861 94.9 5.1	32 17 94 11 329 781 1 1 1 1 1 1 1 1 1 1 4 0 23 65 98 40 495 865 865 865	81 69 26 22 526 1035 1992 1 1 1 7 8 50 33 27 64 4 1 479 672 1977 10975 90.6 9.4	244 122 38 52 561 1570 1993 1 1 1 1 1 2 208 239 173 41 41 3 863 1573 1978 11006 85.7 14 3	73 216 21 2 348 1415 1994 1 1 1 7 7 7 62 116 182 231 182 231 182 11 1201 1979 10855 87.0 13.0	419 79 126 25 492 1327 1 1 1 1 1 1 1 1 1 1 1 1 5 112 35 106 99 7 7 8 282 907 1 1980 7122 81.4 8.6	11 50 7 1 29 366 1 996 1 1 1 9 40 82 102 10 19 9 9 1 74 358 1981 196 48.0 52.0	1 1 1 2 18 1997 1 1 1 76 295 188 1231 1361 229 306 50 730 4468 50 730 4468	12 4 4 1 1 1 4 50 20 1998 1 1 61 231 444 273 763 694 375 23 255 3121 1983 1145 76.2 38	22 21 5 3 1 8 1999 1 1 1 1 1 1 1 1 1 1 2 63 105 63 105 508 1984 43 2.3 27 7
7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total Spring a Spring a Spring a	71 112 19 28 202 439 1985 1 1 1 1 1 9 20 86 46 36 10 3 24 237 and Autu 1970 6523 93.3 6.7	31 43 84 35 314 574 1 1 1 1 1 6 24 15 97 28 16 4 5 5 218 IIMN Sp 1971 3867 85.2 14.8	61 37 101 71 539 1086 1987 1 2 4 12 32 80 30 82 24 30 82 24 30 82 24 31 2 282 Dawners 1972 29392 96.3 3.7	10 54 17 68 737 1166 1988 1 1 1 20 30 239 90 35 270 5 3 53 745 1973 25264 95,4 4,6	80 95 93 51 970 1537 1989 1 1 1 5 5 5 18 8 56 43 67 178 67 178 164 546 1974 24988 93.8 6.2	89 206 6 37 1275 1990 1 1 7 37 61 54 4 7 58 17 173 8 17 173 8 17 173 2480 480 1975 24861 94.9 5.1	32 17 94 11 329 781 1 1 1 1 1 1 1 1 1 4 87 40 23 865 98 40 495 865 865	81 69 26 22 526 1035 1992 1 1 1 1 7 8 50 33 27 64 1 479 672 1977 10975 90.6 9.4	244 122 38 52 561 1570 1993 1 1 1 2 208 239 173 41 41 41 3 863 1573 1573	73 216 21 2 348 1415 1 1 7 7 62 116 182 231 182 1 1201 1201 1979 10855 87.0 13.0	419 79 126 25 492 1327 1 1 1 1 1 1 1 05 112 35 106 99 87 78 282 907 907	11 50 7 1 29 366 1 1996 1 1 1 9 40 82 102 102 102 102 102 102 102 102 102 10	1 1 1 2 18 1997 1 1 1 76 295 188 1231 1361 229 306 50 730 4468 50 730 4468	12 4 4 1 1 50 2 30 1 98 1 98 1 98 1 231 444 273 763 694 375 23 255 3121 1983 1145 76.2 23.8	22 21 5 3 1 1 8 1999 1 1 1 1 1 1 1 1 1 1 1 1 1 2 6 3 105 125 508 1984 4 3 2.3 97.7
7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total Spring a Spring a Spring a	71 112 19 28 202 439 1985 1 1 1 1 1 9 20 86 46 36 10 3 24 237 and Autu 1970 6523 93.3 6.7	31 43 84 35 314 574 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	61 37 101 71 539 1086 1987 1 2 4 12 32 80 30 82 24 30 82 24 30 82 24 31 2 82 282 282 282 282 282 282	10 54 17 68 737 1166 1988 1 1 1 1 1 20 30 239 90 35 270 5 53 745 745	80 95 93 51 970 1537 1989 1 1 1 5 5 18 8 5 6 43 67 178 164 546 546	89 206 6 37 1275 1990 1 1 1 7 37 61 54 24 47 58 17 173 480 1975 24861 94.9 5.1	32 17 94 11 329 781 1 1 1 1 1 1 4 87 40 23 5 98 40 495 865 865	81 69 26 22 526 1035 1 1 1 1 1 1 1 7 8 50 33 27 64 1 479 672 1 977 10975 90.6 9.4	244 122 38 52 561 1570 1993 1 1 1 2 208 239 173 41 41 3 863 1573 1573	73 216 21 2 348 1415 1 1 1 7 7 62 116 182 231 182 1 182 1 1201 1979 10855 87.0 13.0	419 79 126 25 492 1327 1 1 1 1 1 1 1 1 1 1 1 5 112 35 106 99 9 907 1 282 907	11 50 7 1 29 366 1 1 99 40 1 1 1 9 40 82 102 100 82 102 100 9 9 1 7 4 358 358 1 981 196 48.0 0 52.0	1 1 1 2 18 1997 1 1 1 6 295 188 1231 1361 229 306 50 730 4468 4468	12 4 4 1 1 50 2 1998 1 1 6 1 444 273 763 694 375 23 255 3121 1983 1145 76.2 23.8	22 21 5 3 1 8 1999 1 1 1 1 1 1 1 1 1 1 1 1 1 4 2 6 3 105 125 508 1984 4 3 2,3 3 97,7
7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total \$ Spring a \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	71 112 19 28 202 439 1985 1 1 1 1 9 20 86 46 36 10 3 24 237 and Autu 1970 6523 93.3 6.7	31 43 84 35 314 574 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 24 15 97 28 8 16 4 15 218 IIIIN Sp 1971 3867 85.2 14.8	61 37 101 71 539 1086 1987 1 2 4 12 32 80 30 30 82 24 3 12 282 24 3 12 282 24 3 12 282 24 3 12 282 24 3 12 282 29392 96.3 3.7	10 54 17 68 737 1166 1988 1 1 1 1 20 239 90 35 270 5 53 745 745 1973 25264 95.4 4.6	80 95 93 51 970 1537 1989 1 1 1 5 5 18 8 56 43 67 178 164 546 546 1974 24988 93.8 6.2	89 206 6 37 1275 1990 1 1 1 7 37 61 54 24 4 7 58 17 173 480 1975 24861 94.9 5.1	32 17 94 11 329 781 1 1 1 1 1 1 1 1 1 1 4 87 40 23 65 98 40 23 65 98 40 23 65 98 40 5 5 55 5 55	81 69 26 22 526 1035 1992 1 1 1 7 8 50 0 33 27 64 1 479 672 1977 10975 90.6 9.4 1025	244 122 38 52 561 1570 1993 1 1 1 1 2 208 239 173 41 41 41 3 863 1573 1573	73 216 21 2 348 1415 1994 1 1 1 7 7 62 116 182 231 182 116 182 231 182 1 110 1979 10855 87.0 13.0	419 79 126 25 492 1327 a 1995 1 1 1 1 1 05 112 35 106 99 7 87 78 282 907 7122 81.4 18.6 31.4	11 50 7 1 29 366 1 996 1 1 1 9 9 1 1 74 358 1 981 196 48.0 52.0 8 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1	12 4 4 1 1 1 4 50 20 1998 1 1 61 231 255 3121 1983 1145 76.2 23.8 2145	22 21 5 3 1 8 1999 1 1 1 1 1 1 1 1 1 1 1 1 1 2 6 3 105 6 3 105 125 508 1984 4 3 2.3 97.7
7 8 9 10 11+ Total 2 3 4 4 5 6 7 8 9 10 11+ Total Spring a Spring a Spring a % SS % AS	71 112 19 28 202 439 1985 1 1 1 1 1 9 20 86 46 36 10 3 24 237 and Autu 1970 6523 93.3 6.7 1985	31 43 84 35 314 574 1 1 1 1 1 1 6 24 15 97 28 16 4 5 5 218 IIMN Sp 1971 3867 85.2 14.8 1986	61 37 101 71 539 1086 1987 1 2 4 12 32 80 30 82 24 30 82 24 30 82 24 31 2 282 Dawners 1972 29392 96.3 3.7	10 54 17 68 737 1166 1988 1 1 1 20 30 239 90 0 35 270 5 3 53 745 745	80 95 93 51 970 1537 1989 1 1 1 5 5 5 18 8 56 43 67 178 67 178 164 546 1974 24988 93.8 6.2	89 206 6 37 1275 1990 1 1 7 37 61 54 4 47 58 17 173 8 177 173 8 177 58 177 173 58 17 54 480 94.9 5.1	32 17 94 11 329 781 1 1 1 1 1 1 1 1 1 1 4 87 40 23 865 865 865 865 865 865	81 69 26 22 526 1035 1992 1 1 1 1 7 8 50 33 27 64 1 479 672 1977 10975 90.6 9.4 1992	244 122 38 52 561 1570 1993 1 1 1 2 208 239 173 41 41 41 3 863 1573 1573 1978 11006 85.7 14.3	73 216 21 2 348 1415 1994 1 1 7 7 62 116 182 231 182 1 1201 1201 1979 10855 87.0 13.0	419 79 126 25 492 1327 a 1995 1 1 1 1 105 112 35 106 99 87 78 282 907 907 1980 7122 81.4 18.6 295	11 50 7 1 29 366 1 1 99 1 1 1 9 40 82 102 102 102 102 102 102 102 102 102 10	1 1 1 1 2 18 1997 1 1 76 295 188 1231 1361 229 306 50 730 4468 1997 4468 87.0 13.0 a 1982 9468 87.0 13.0	12 4 4 1 1 50 2 30 1 98 1 444 273 763 694 375 23 255 3121 1983 1145 76.2 23.8 11998	22 21 5 3 1 1 8 1999 1 1 1 1 1 1 1 1 1 1 1 1 1 1
7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	71 112 19 28 202 439 1985 1 1 1 1 1 9 20 86 46 36 10 3 24 237 and Autu 1970 6523 93.3 6.7 1985 485 485 485	31 43 84 35 314 574 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	61 37 101 71 539 1086 1987 1 2 4 12 32 80 30 82 24 3 3 282 282 282 282 282 282 282 282 282	10 54 17 68 737 1166 1988 1 1 1 1 1 20 30 239 90 35 270 5 53 745 745 745	80 95 93 51 970 1537 1989 1 1 5 5 18 8 5 6 43 67 178 164 546 546 546 546 546 546	89 206 6 37 1275 1990 1 1 1 7 37 61 54 24 47 58 17 173 480 1975 24861 94.9 5.1	32 17 94 11 329 781 1 1 1 1 1 1 1 1 1 4 87 40 23 5 98 40 495 865 865 865	81 69 26 22 526 1035 1 1 1 1 1 7 8 50 33 3 27 64 1 479 672 90.6 9.4 992	244 122 38 52 561 1570 1993 1 1 1 2 208 239 173 41 41 3 863 1573 1573 1573 1978 11006 85.7 14.3	73 216 21 2 348 1415 1 1 1 7 7 62 116 182 231 231 231 232 182 1 411 1201 9999 10855 87.0 13.0	419 79 126 25 492 1327 1 1 1 1 1 1 1 1 1 1 1 1 5 112 35 106 99 9 907 1980 7122 81.4 18.6 1995 3195	11 50 7 1 29 366 1 1 99 40 1 1 1 9 40 82 102 100 9 9 1 7 4 358 358 1981 196 48.0 52.0 8 2221	1 1 1 1 2 18 1997 1 1 1 2997 188 1231 1361 229 306 50 730 4468 1982 9468 87.0 13.0 297 15728	12 4 4 1 1 1 50 2 1 998 1 4 44 273 763 694 375 23 255 3121 1 983 1145 76.2 23.8 1145 76.2 23.8 23.8 23.8 23.8 23.8 23.8 23.8 23	22 21 5 3 1 8 1999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total % SS % AS	71 112 19 28 202 439 1985 1 1 1 1 1 9 20 86 46 36 10 3 24 237 and Autu 1970 6523 93.3 6.7 1985 485 51.1	31 43 84 35 314 574 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 4 15 97 28 8 16 4 15 218 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	61 37 101 71 539 1086 1987 1 2 4 12 32 80 30 82 24 3 12 282 24 3 12 282 24 3 12 282 24 3 12 282 24 3 12 282 24 3 12 282 29392 96.3 3.7 7 940 70.0	10 54 17 68 737 1166 1988 1 1 1 1 1 20 239 90 35 270 5 53 745 745 745 1973 25264 95.4 4.6 1988 3921 81.0	80 95 93 51 970 1537 1 1989 1 1 1 5 5 18 8 56 43 67 178 164 546 67 178 164 546 546 93.8 6.2 1989 1287 57.6	89 206 6 37 1275 1990 1 1 7 37 61 54 24 4 7 58 17 7 37 61 54 24 8 47 58 1773 480 94.9 5.1 94.9 5.1	32 17 94 11 329 781 1 1 1 1 1 1 1 1 1 4 87 40 23 65 98 65 98 65 98 65 98 65 98 65 98 1976 14221 94.5 5.5 5.5	81 69 26 22 526 1035 1992 1 1 1 7 8 50 0 33 27 64 4 1 479 672 1977 10975 90.6 9.4 1992 2919 77.0	244 122 38 52 561 1570 1993 1 1 1 2 208 239 173 41 41 41 3 863 1573 1573 1978 11006 85.7 14.3 1993 3358 53.2	73 216 21 2 348 1415 1994 1 1 7 7 62 116 182 231 182 1 182 1 182 1 1201 1979 10855 87.0 13.0 1994 3019 60.2	419 79 126 25 492 1327 a 1995 1 1 1 1 105 112 35 106 99 87 78 282 907 7122 81.4 18.6 a 1995 3195 3195	11 50 7 1 29 366 1 1 996 1 1 9 40 82 102 100 19 9 9 1 1 74 358 1981 196 48.0 52.0 8 3996 2221 83.9	1 1 1 1 2 1997 1 1 1 7 6 295 188 1231 1361 229 306 50 730 4468 50 730 4468 87.0 13.0 13.0 13.0 15728 71.6	12 4 4 1 1 1 4 50 2 1998 1 1 61 231 1 444 273 763 694 375 23 255 3121 1983 1145 76.2 23.8 11983 1145 76.2 23.8 255 3121	221 21 5 3 1 8 1999 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
7 8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total % SS % AS	71 112 19 28 202 439 1985 1 1 1 1 1 9 20 86 46 36 10 3 24 237 and Autu 1970 6523 93.3 6.7 1985 485 51.1 48.9	31 43 84 35 314 574 1 1 1 1 1 6 24 15 97 28 16 4 5 218 218 218 1971 3867 85.2 14.8 1986 460 52.6 47.4	61 37 101 71 539 1086 1987 1 2 4 12 32 80 30 82 24 3 3 282 24 3 12 282 282 282 296.3 3.7 1987 940 70.0 30.0	10 54 17 68 737 1166 1988 1 1 1 20 30 239 90 35 270 5 5 35 270 5 5 35 270 5 5 3745 745 745 1973 25264 95.4 4.6 1988 3921 81.0	80 95 93 51 970 1537 1 1989 1 1 1 5 5 18 8 56 43 67 178 164 546 546 1974 24988 93.8 6.2 1989 1287 57.6 42.4	89 206 6 37 1275 1275 1990 1 1 7 7 37 61 54 4 47 58 17 173 480 1975 24861 94.9 5.1 1990 1734 72.3 27.7	32 17 94 11 329 781 1 1 1 1 1 1 1 4 87 40 23 865 865 865 865 865 865 1976 14221 94.5 5.5	81 69 26 22 526 1035 1 1 1 1 1 7 8 50 33 327 64 1 479 672 7 7 0075 90.6 9.4 1992 2919 77.0 23.0	244 122 38 52 561 1570 1993 1 1 1 2 208 239 173 41 41 3 863 1573 1573 1573 1573 1978 11006 85.7 14.3 1993 3358 53.2 46.8	73 216 21 2 348 1415 1 1 1 7 7 62 116 182 231 182 1 182 1 182 1 182 1 182 1 301 9 9 9 9 9 9 9 9 9 9 9 9 8 8 8	419 79 126 25 492 1327 a 1995 1 1 1 1 1 05 112 35 106 99 87 78 282 907 7122 81.4 18.6 28.4 995 3195 71.6 28.4	11 50 7 1 29 366 1 1 99 1 1 1 9 40 82 102 100 82 102 100 82 102 102 109 199 1 7 4 82 102 102 109 52.0 2221 83.9 161	1 1 1 1 1 2 18 1997 1 1 76 6 295 188 1231 1361 229 306 50 730 4468 50 730 4468 50 730 4468 50 730 4468 50 730 4468 57 50 730 4468 57 57 50 730 4468 57 57 50 730 730 730 730 730 730 730 73	12 4 4 1 1 1 50 2 30 1 1 4 4 4 4 2 7 3 7 6 3 1 2 3 5 5 3 121 1 983 1145 7 6.2 23.8 11983 1145 7 6.2 23.8 1998 357 6 46 6 4.3 357 6 7 6 9 8	221 21 5 3 1999 1999 1 1 1 1 1 1 1 1 1 1 1 1 1 1

a - preliminary

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Table 11. Commercial catch at age of spring and autumn spawning herring for Fortune Bay, 1970 - 1999.

Spring Spawners

Age	1970	1971	1972	1973	1074	1075	1076	4077	4070	4070	1000	1001			
1.95	1010	1071	TOTE	1070	10/4	1975	1970	1977	1976	1979	1980	1981	1982	1983	1984
1	1	1	617	23	1	1	1	1	1	1	1	1	1	1	4
2	29475	167	1515	2210	200									1	
	1.0410	107	1010	2210	309	2	8Z	27	1	1	25	1	1	1	2
3	5988	23223	256	925	1314	277	15	2103	12	1	16	1.4.4	4		
4	11050	0000	40000	010			10	2100	42		10	144	1	2	1
1 "	11900	0000	19690	67	552	581	318	25	2677	183	3	16	3	2	4
5	133	23525	2896	5694	130	112	228	307	62	2022	60	4		-	-
0	0.04	4405	40707	0001	100	112.	220	527	02	3033	69	4	3	1	3
6	281	1165	10767	475	4435	87	129	166	237	15	1122	3	1	4	0
7	7804	57/7	261	1710	250	1.400			207	10	1122	5			2
1 1	1004	0/4/	351	1712	250	1490	11	26	43	165	7	21	2	1	1
8	233	3514	4432	73	1094	16	338	13	120	E	100				
0	4.0	400	004	000	1001	10	000	40	100	5	103	2	30	1	21
9	16	132	991	282	36	142	36	188	52	24	1	23	1	10	4
10	225	148	34	EEO	117	20	100		000			20		10	
	660	140	24	556	117	22	188	4	326	1	11	1	5	1	2
11+	257	537	366	173	255	201	140	244	302	167	FO	10	<i>r</i>	4.0	
Total	FOAFO	04045	11015	10100	200	201	140	244	502	107	50	12	5	18	23
Total	56456	64245	41915	12192	8573	2931	1486	3154	3882	4396	1488	228	59	39	12
			the second s	The second s		and the second second designed and	And the second second second second		and the second sec		1100				42
											0	0		-	
A a a	1095	1092	1007	1000	1000	1000	1001	1000	1000		a	a	a	a	a
rige	1000	1000	1907	1900	1969	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	1	1	1	1	1	1	1	1	4	4	4	4	4	1000	1000
											1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	54	1	1	1	4	4									
	04		1	1	1	1	1	1	2	6	1	1	1	1	108
4	3	145	1	1	1	1	23	1	1	4	4	201	4		07
E	20		201				20	1				201	1	1	27
5	39	4	304	1	1	2	8	3	1	2	14	12	1	1	1
6	12	69	11	210	10	2	4	4	207	-					
		05		213	10	2	1	1	321	1	14	17	1	1	48
7	2	20	49	7	274	12	1	1	2	24	24	1	1	1	916
0	4	0	4.0			455				2.4	2.4			1	010
0	- · ·	0	10	26	1	155	6	1	3	9	569	1	1	1	152
9	1	1	4	6	17	17	274	2	8	22	20	47	4		100
1 10		,	-	·		17	£14	4	0	23	30	47	1	1	120
10	1	2	1	1	11	20	1	75	10	8	36	6	15	1	4
11+	15	1.4	20	10	0.4			000	0.17	c 1 -	200		10		
117	10	14	30	10	24	1	72	266	217	647	/28	38	355	1	477
Total	130	264	429	274	350	213	380	353	573	702	1405	200	270		4750
				A. 7 - 1	000	210	000		575	125	1420	320	3/9	11	1/52
Autum	n Snawn	OFC													
Autum	n əpawn	ers													
· · · · · · · · · · · · · · · · · · ·															
Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1070	1080	1091	1002	1002	1004
4			101.6	1010	1074	1010	1570	1311	1970	1979	1900	1901	1962	1983	1984
1 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	4	4	4	4	4								
~					1	1	1	1	1	1	1	1	1	1	11
3	1	1	1	1	7	1	7	1	1	1	1	E	1	1	4
4	4	500									1	0		1	
4	1	598	1	48	9	22	9	23	1	7	4	64	1	1	1
5	334	1	0.4	50	07	10	20	40					-		
5	0.04	1	04	50	07	12	38	19	36	5	3	16	7	1	9
6	1	136	25	79	65	39	26	19	6	50	2	1	0		
						2424		1.5	0						
/	113	4 77 47	105							00	0	1	2	2	4
	440	175	185	8	12	19	13	1	25	1	3	1	2	2	4
9	945	175	185	8	12	19	13	1	25	1	3	1	1	2	4
8	816	175 769	185 44	8 32	12 27	19 20	13 1	1	25 12	1 17	3 1	1 1	2 1 1	2 1 1	4 6 1
8	816 412	175 769 626	185 44 310	8 32 15	12 27	19 20	13 1 27	1	25 12	1 17 12	3 1	1	2 1 1 1	2 1 1	4 6 1
8 9	816 412	175 769 626	185 44 310	8 32 15	12 27 5	19 20 11	13 1 27	1 1 1	25 12 6	1 17 12	3 1 1	1 1 1	2 1 1 1	2 1 1 1	4 6 1 1
8 9 10	816 412 1	175 769 626 470	185 44 310 125	8 32 15 27	12 27 5 1	19 20 11 7	13 1 27 1	1 1 1	25 12 6 1	1 17 12 1	3 1 1	1 1 1 1	2 1 1 1 1	2 1 1 1	4 6 1 1
8 9 10	445 816 412 1	175 769 626 470	185 44 310 125 703	8 32 15 27	12 27 5 1	19 20 11 7	13 1 27 1	1 1 1	25 12 6 1	1 17 12 1	3 1 1	1 1 1 1	2 1 1 1 1	2 1 1 1	4 6 1 1
8 9 10 11+	816 412 1 2201	175 769 626 470 1956	185 44 310 125 793	8 32 15 27 97	12 27 5 1 85	19 20 11 7 45	13 1 27 1 9	1 1 1 2	25 12 6 1 18	1 17 12 1 12	3 1 1 1 1	1 1 1 1 1	2 1 1 1 1 1	2 1 1 1 1 1	4 6 1 1 1
8 9 10 11+ Total	816 412 1 2201 4212	175 769 626 470 1956 4734	185 44 310 125 793 1570	8 32 15 27 97 359	12 27 5 1 85 300	19 20 11 7 45	13 1 27 1 9	1 1 1 2 70	25 12 6 1 18	1 17 12 12 12 108	3 1 1 1 1	1 1 1 1 1	2 1 1 1 1 1	2 1 1 1 1	4 6 1 1 1 1
8 9 10 11+ Total	816 412 1 2201 4212	175 769 626 470 1956 4734	185 44 310 125 793 1570	8 32 15 27 97 359	12 27 5 1 85 300	19 20 11 7 45 178	13 1 27 1 9 133	1 1 1 2 70	25 12 6 1 18 108	1 17 12 12 12 108	3 1 1 1 1 20	1 1 1 1 1 93	2 1 1 1 1 1 18	2 1 1 1 1 1 12	4 6 1 1 1 1 27
8 9 10 11+ Total	816 412 1 2201 4212	175 769 626 470 1956 4734	185 44 310 125 793 1570	8 32 15 27 97 359	12 27 5 1 85 300	19 20 11 7 45 178	13 1 27 1 9 133	1 1 1 2 70	25 12 6 1 18 108	1 17 12 1 12 108	3 1 1 1 1 20	1 1 1 1 1 93	2 1 1 1 1 1 1 8	2 1 1 1 1 1 12	4 6 1 1 1 1 27
8 9 10 11+ Total	816 412 1 2201 4212	175 769 626 470 1956 4734	185 44 310 125 793 1570	8 32 15 27 97 359	12 27 5 1 85 300	19 20 11 7 45 178	13 1 27 1 9 133	1 1 1 2 70	25 12 6 1 18 108	1 17 12 1 12 12 108	3 1 1 1 1 20	1 1 1 1 1 93	2 1 1 1 1 1 18	2 1 1 1 1 1 12	4 6 1 1 1 1 27
8 9 10 11+ Total	816 412 1 2201 4212	175 769 626 470 1956 4734	185 44 310 125 793 1570	8 32 15 27 97 359	12 27 5 1 85 300	19 20 11 7 45 178	13 1 27 1 9 133	1 1 1 2 70	25 12 6 1 18 108	1 17 12 1 12 12 108	3 1 1 1 1 20 a	1 1 1 1 1 93 a	2 1 1 1 1 1 18 2	2 1 1 1 1 1 12 a	4 6 1 1 1 1 27 a
8 9 10 11+ Total	443 816 412 1 2201 4212	175 769 626 470 1956 4734	185 44 310 125 793 1570	8 32 15 27 97 359	12 27 5 1 85 300	19 20 11 7 45 178	13 1 27 1 9 133	1 1 1 2 70	25 12 6 1 18 108	1 17 12 1 12 108	3 1 1 1 1 20 a	1 1 1 1 1 93 8	2 1 1 1 1 1 1 8 	2 1 1 1 1 1 12 8	4 6 1 1 1 1 27 27 a
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8 9 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total Spring Total % SS % AS	1985 1 12201 1985 1 1 1 1 1 1 1 1 1 1 1 2 7 4 4 26 12 7 4 1 2 7 6 6 6 6 6 6 8 93.1 6.9 1985 206 6 206	175 769 626 470 1956 4734 1986 1 1 1 3 8 16 38 12 5 1 1 5 91 1971 68979 93.1 6.9 1986 355 755	185 44 310 125 793 1570 1 1987 1 1 1 1 1 1 1 1 4 7 7 1 1 1 25 10 5 14 80 Pawners 1972 43485 96.4 3.6	8 32 15 27 97 359 1988 1 1 1 2 1 5 5 1 1 3 1 2 5 5 1 1 3 1 1 0 0 41 1 2 5 5 5 1 1 3 1 2 5 5 5 1 1 3 1 2 7 1 97 359 97 1 97 1 97 1 97 1 97 1 97 1 97 1 97	12 27 5 1 85 300 1 1 1 1 1 1 3 6 1 1 3 1 7 5 75 75 1 974 8873 96.6 3.4	19 20 11 7 45 178 1990 1 1 1 1 1 1 1 5 12 17 7 5 4 1 5 5 4 1 5 5 4 1 5 5 4 1 1 4 9 9 4.3 5.7 1990 327	13 1 27 1 9 133 1 9 133 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 2 70 1992 1 1 1 1 1 4 5 3 1 1 1 5 24 97.8 2.2 1992 377	25 12 6 1 18 108 1993 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1	3 3 1 1 20 a 1995 1 1 1 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	2 1 1 1 1 1 1 1 1 1 1 1 1 1	4 6 1 1 1 27 27 1 1 1 1 1 1 1 1 27 1 1 1 1
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8 9 10 11+ Total 2 3 4 5 6 7 8 9 10 11+ Total 8 9 10 11+ Total 8 9 10 11+ Total 8 9 10 11+ Total 8 9 10 10 11+ 12 2 3 4 4 5 6 7 8 9 10 10 11+ 12 2 3 4 4 5 6 7 8 9 10 10 11+ 12 2 3 4 4 5 6 7 8 9 10 10 11+ 12 2 3 4 4 5 6 7 8 9 10 10 11+ 12 2 3 4 4 5 6 6 7 7 8 9 10 10 11+ 12 2 3 4 4 5 6 6 7 7 8 9 10 10 11+ 12 2 3 4 4 5 6 6 7 7 8 8 9 100 11+ Total 10 10 10 11+ 12 2 3 4 4 5 6 6 7 7 8 8 9 100 11+ Total 10 10 11+ 10 10 11+ 10 10 10 11+ 10 10 10 11+ 10 10 10 11+ 10 10 10 11+ 10 10 11+ 10 10 11+ 10 10 11+ 10 10 10 11+ 10 10 10 11+ 10 10 11+ 10 10 11+ 10 10 11+ 10 10 11+ 10 10 11+ 10 10 11+ 10 10 11+ 10 10 11+ 10 10 11+ 10 10 11+ 10 10 10 11+ 10 10 11+ 10 10 11+ 10 10 10 10 11+ 10 10 10 10 10 10 10 10 10 10 10 10 10	816 412 1 2201 4212 1985 1 1 1 1 1 1 1 1 1 1 1 4 26 12 7 4 1 2 7 6 6 6 6668 93.1 6.9 1985 206 63.1 2 6.9	175 769 626 470 1956 4734 1 1986 1 1 1 1 1 1 3 8 16 38 16 38 12 5 1 5 91 1 5 91 1 91 1 91 1 68979 93.1 6.9 93.1 6.9	185 44 310 125 793 1570 1 987 1 1 1 1 1 1 1 1 1 4 4 7 11 25 10 5 14 80 243485 96.4 3.6 1987 509 84.3 157	8 32 15 27 97 359 1988 1 1 1 1 2 1 5 5 1 1 3 1 2 5 5 1 1 3 1 10 41 1 2 5 5 1 13 1 10 41 2 5 5 1 13 1 2 5 5 1 7 7 97 359	12 27 5 1 85 300 1 1 1 1 1 1 3 6 1 1 6 1 3 17 5 75 75 75 75 75 1974 8873 96.6 3.4	19 20 11 7 45 178 1990 1 1 1 1 1 1 1 1 1 5 12 17 7 5 4 1 5 12 17 7 5 4 1 5 5 4 1 14 10 5 5 4 1 1 7 7 7 5 4 11 7 8 10 900 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	13 1 27 1 9 133 1 9 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 2 70 1992 1 1 1 1 1 1 1 1 1 1 1 1 1	25 12 6 1 18 108 1993 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1	3 3 1 1 1 20 a 1995 1 1 1 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	2 1 1 1 1 1 1 1 1 1 1 1 1 1	4 6 1 1 1 27 27 1 1 1 1 1 1 1 1 1 1 1 27 1 1 1 1

a - preliminary

Stock Area	Age	1994	1995	1996	1997	1998	1999	
WB-NDB	0 1 2 3 4 5 6 7 8 9 10 11+	74 (6) 132 (724) 187 (65) 210 (353) 238 (697) 271 (37) 283 (37) 304 (39) 330 (252)	125 (1) 131 (15) 166 (332) 200 (16) 226 (85) 249 (204) 286 (13) 288 (15) 324 (53)	154 (1) 167 (124) 201 (703) 239 (31) 254 (62) 274 (198) 289 (12) 371 (49)	106 (8) 230 (1) 192 (175) 223 (332) 250 (25) 259 (48) 292 (80) 354 (93)	112 (33) 147 (375) 170 (1) 201 (3) 227 (42) 237 (160) 248 (5) 283 (21) 363 (185)	155 (277) 176 (363) 216 (5) 245 (3) 254 (58) 259 (85) 294 (12) 340 (78)	
BB-TB	0 1 2 3 4 5 6 7 8 9 10 11+	181 (20) 144 (265) 198 (105) 224 (192) 255 (941) 295 (122) 308 (207) 306 (158) 345 (966)	101 (3) 133 (354) 172 (103) 218 (31) 237 (62) 270 (240) 291 (32) 289 (43) 331 (272)	161 (7) 189 (827) 215 (127) 258 (31) 271 (40) 280 (135) 308 (20) 345 (194)	115 (13) 203 (19) 214(1044) 235 (128) 272 (36) 287 (33) 301 (91 341 (179)	143 (12) 172 (60) 219 (2) 238 (18) 245 (746) 254 (59) 256 (2) 293 (16) 339 (74)	168 (1) 187 (262) 207 (108) 234 (6) 246 (12) 275 (574) 282 (26) 287 (4) 340 (34)	
SMB-PB	0 1 2 3 4 5 6 7 8 9 10 11+	59 (28) 115 (260) 168 (108) 219 (59) 249 (16) 291 (150) 322 (40) 332 (95) 330 (60) 384 (511)	107 (87) 171 (386) 229 (29) 264 (4) 278 (10) 324 (40) 347 (10) 334 (12) 381 (122)	- - 170 (179) 224 (499) 270 (34) 301 (16) 353 (4) 349 (21) 388 (2) 426 (97)	71 (4) 122 (19) 112 (1) 211 (134) 251 (562) 278 (64) 312 (16) 317 (8) 331 (4) 413 (126)	79 (7) 130 (161) 178 (37) 205 (4) 258 (37) 286 (376) 300 (57) 328 (14) 326 (7) 424 (68)	157 (4) 143 (266) 175 (72) 198 (27) 264 (50) 309 (147) 298 (17) 322 (8) 394 (57)	
FB	0 1 2 3 4 5 6 7 8 9 10 11+	114 (5) 157 (68) 195 (13) 214 (28) 257 (242) 279 (17) 294 (8) 320 (11) 362 (366)	23 (2) 90 (96) 150 (99) 185 (162) 218 (17) 237 (31) 265 (212) 311 (19) 311 (9) 359 (252)	167 (61) 205 (89) 237 (77) 256 (8) 292 (12) 309 (150) 337 (16) 391 (257)	121 (7) 168 (4) 190 (274) 226 (152) 262 (90) 285 (12) 287 (14) 317 (66) 384 (326)	99 (1) 186 (2) 227 (302) 250 (71) 281 (90) 292 (11) 320 (13) 360 (185)	79 (2) 103 (787) 152 (38) 185 (23) 217 (18) 249 (285) 279 (113) 303 (37) 323 (17) 373 (242)	

Table 12. Mean weights at age (g) of spring-spawning herring, by stock area, from samples collected January to June, 1994 – 1999. Sample sizes are in parenthesis.

Table 13. Spring research gillnet catch rates at age (numbers per days fished), spring spawners only, by stock area and year.

White Bay - Notre Dame Bay

2000	54.3		42.0 2000 2	2000 2000
1999 0.0 0.0 0.0 85.1 1.0 1.0 1.0 1.0 2.8 2.8 2.8 2.8	202.1	1333 0.0 0.1 7.6 0.4 0.8 29.8 29.8 2.3 2.3 2.3	59.9 1999 0.0 1.1 67.7 8.0 8.0 8.0 13.0 13.0 13.0 13.0 13.0 13.0 13.0 13	1999 1999 0.0 0.0 82.8 36.7 21.3 245.8 161.3 161.3 245.8 161.3 221.3 221.3 221.3 221.3 221.3 220.4
1998 0.0 0.0 0.0 117.6 117.6 12 1.2 13.3 43.3 43.3 43.3 43.3 6.9 6.9	246.0	0.0 0.0 0.2 1.7 6.3 2.1 1.3 2.1 5.9 5.9	83.0 0.6 0.6 0.6 0.3 5.5 5.5 5.5 7.1 1.0 7.1 7.0 7.3 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5	1998 0.0 2.4 3.7 161.6 161.6 161.6 161.6 161.6 161.6 161.6 161.6 15.2 25.2 25.2 25.2
1997 0.0 0.0 0.0 3.2 3.2 7771 139.5 139.5 317.6 317.6 317.6 317.6	320.0	1397 0.0 0.0 2.8 3.3 181.9 5.6 5.6 7.0 16.7 38.2	278.9 1997 0.0 0.0 0.0 0.3 20.4 20.4 2.2 2.2 2.2 2.2 2.2 2.2 2.2 2.2 2.2 2	1997 0.0 0.0 0.0 0.0 0.0 0.0 193.1 103.9 193.1 17.6 117.6 117.6 117.6 117.6 117.6 117.6
1996 0.0 0.0 0.0 0.0 0.0 1.2 7 286.0 74.2 5.2 5.2 5.2 5.2	469.5 1006	1330 0.0 0.0 0.0 5.3 5.3 5.3 3.7 3.7 3.7	229.1 1996 0.0 0.0 0.0 159.8 5.9 5.9 5.9 5.9 5.9 5.9 5.9 5.9 5.9 5.9	1996 0.0 0.0 0.0 0.0 112,1 111
1995 0.0 0.0 0.0 18.5 300.1 20.2 45.9 45.9 104.1 8.4 8.4 8.5 52.1	559.8 1005	1330 0.0 0.0 34.3 8.2 8.2 19.9 19.9 2.6 2.6 25.0	99.2 99.2 11.3 11.3 11.8 11.8 11.8 11.8 11.8 11.8	1995 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.
1994 1994 0.0 0.0 0.0 14.6 14.6 14.1 14.1 14.1 12.7 12.9 69.1	585.7	0.0 0.0 16.6 9.6 6.5 8.9 8.9 8.9 7.5 7.5	167.6 1994 0.0 0.0 0.0 0.4 15.6 25.4 2.9 2.9 2.9 2.9 2.9 2.9 2.1 3.2 3.2 3.2 3.2 3.2 4.5 5.1 10 6.0 10 6.0 10 6.0 10 6.0 10 6.0 10 6.0 10 6.0 10 6.0 10 6.0 10 6.0 10 6.0 10 6.0 10 6.0 10 6.0 10 6.0 10 10 6.0 10 10 10 10 10 10 10 10 10 10 10 10 10	1994 0.0 0.0 0.0 1.3 3.2,1 14.0 14.0 14.0 12.0 3.3 3.3 3.3 112.0 668.0
1993 0.0 1.2 10.9 51.0 359.9 18.8 18.8 18.8 13.4 29.7 115.9	606.9	0.0 0.0 0.0 0.0 50.6 6.4 6.4 6.4 7.0 7.0 20.2 20.2	113.5 1993 3.5 3.5 3.5 3.5 3.5 3.5 3.5 3.5 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1	1993 0.0 0.0 0.0 0.0 0.0 140.4 3.7 3.7 3.7 3.7 413.3 3.7 413.3
1992 0.0 0.0 0.0 21.5 493.7 33.5 13.7 13.7 13.7 10.3 110.3	858.6	0.0 0.0 0.0 0.3 0.3 0.3 8.1 2.3 2.3 2.3 2.3 2.3 17.6 34.8 34.8 34.8	137.6 1992 0.0 0.7 2.18 2.7 2.18 2.8 2.4 1.0 1.0 1.6 1.6 1.6 1.6 1.6 1.6 1.6	1992 0.0 0.0 0.3 3.6 6.1 1.1 6.3 1.7 6.3 70 3314 3315
1991 0.0 0.0 0.0 11.0 28.8 7.5 8.4.2 13.7 13.7 13.7 13.7 13.7 13.7 13.7 13.7	684.6	0.0 0.0 12.0 3.2 3.2 3.2 3.2 3.8 3.8 8.3	188.2 1991 1991 1991 1991 1991 1991 1991 19	1991 0.0 0.0 0.0 0.0 0.0 0.0 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7
1990 0.0 0.0 0.0 51.6 55.3 16.3 16.3 16.3 16.3 116.3 116.3 116.5 1	678.8	0.0 0.0 0.0 0.0 8.8 8.2 4.5 12.2 0.8 0.8 0.8 0.8 8.9	135.1 1990 0.0 0.0 0.0 0.0 0.0 11.2 5.7 5.7 5.7 5.7 5.7 5.7 5.7 13.6 5.8 13.6 5.8 13.6 5.8	1990 0.0 0.5 98.8 98.8 1.4 1.4 0.0 0.0 0.0 6.2 5.3 19.7 19.7 19.7 56.1 56.1
1989 0.0 0.0 16.0 11.2 11.2 126.9 18229 18229 16.0 16.0 26.4	486.4	21.3 21.3 57.7 0.9 0.6 0.6 0.7 5.5	96.1 1989 0.0 0.0 0.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0	1989 0.0 10.1 12.1 0.9 0.9 0.9 14.8 659.3 64.9 659.3 64.9 652.3 32.4
1988 0.0 0.0 1.9 1.9 5.6 5.6 5.6 5.6 1.2 1.8 7.4 1.8 34.1	146.4	29.2 0.1 0.5 0.5 0.5 0.6 0.6 0.6	51.2 1988 0.4 0.0 0.4 2.7 100.2 2.3 2.3 2.3 2.3 100.2 2.7 100.2 3.0 3.0 3.0 3.0	1988 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.1 1.4 1.1 1.2 1.1 2.1 1.2 1.1 2.1 1.2 1.1 2.1 1.2 1.2
1987	1987	50	1987 1987 13.7 13.7 11.6 11.6 11.6 11.6 11.6 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.1	1987 0.0 0.0 0.0 0.0 0.0 0.0 1.7 1.4 1.4 1.4 7.1.8 690.2 690.2 690.2
1986		200	1986 0.0 0.0 1.7.4 3.5 3.4 3.4 3.4 2.6 2.6 0.1 0.1 2.4 1.72 5 0.1	1986 0.0 0.0 0.0 224.0 8.8 8.8 8.8 8.8 8.8 8.3 9.3 35.9 0.8 35.9 335.3
1985	1005		1985 0.0 0.0 0.0 5.9 5.9 5.9 5.9 5.9 2.4 2.4 2.4 2.4 2.4 2.1 2.1 4.5.4 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.1	1985 0.0 14.3 14.3 2.45 15.7 15.7 15.7 4.6 8.8 8.8 8.8 8.8 8.6 5 461.6
1984	1984	- -	1984 0.0 0.0 0.0 21.9 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0	1984 0.0 0.0 0.0 15.0 15.0 15.0 0.3 0.3 0.3 102.5 150 0.3 155.0
1983	/ Bay 1983		tita Bay 1983 1983 10.0 10.0 10.2 10.3 2.2 0.9 4.7 4.7 4.7 4.3 8	1983 0.0 0.0 8.4 5.3 4.6 5.3 128.7 128.7
1982	ay - Trinity 1982		ay - Placer 1982 0.0 0.2 0.4 1.7 1.7 0.4 0.4 0.4 0.4 0.4 0.4 1.7 1.7	1982 0.0 0.0 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3
Page - 0 6 4 0 0 2 6 4 + 0 0 0 4 0 0 2 7 + 10 0 0 2 7 + 10 0 0 2 7 + 10 0	Total onavista B Age	- 0 0 4 0 0 7 0 0 0 + 1	Total Total 7 7 7 7 7 7 7 7 11+ 11+ 7 0 8 8 8 7 7 0 11+ 11+ 7 10	Ortune Bay Age 0 11+ 11+ 101 101

Stratum	Survey Date(s)	Sample Date	Sample Location	Gear Type	Sample #'s	n	Mean Lgt. (mm)	Mean Wgt. (g)
23B	Nov. 11 - 14	Nov. 11 Nov. 13	Shoal Bay Island Harbour	Comm. PS Res. PS	258, 259 211, 212	100 100	298 283	242 198
22	Nov. 14 - 15	Nov. 15	Twillingate	Res. PS	213, 214	100	282	188
18	Nov. 18 - 22	Nov. 18 Nov. 22	Hornet Gut Thwart Island	Res. PS Res. PS	241, 242 248, 249	100 100	279 240	183 121
17	Nov. 20 - 22	Nov. 21 Nov. 21	Botwood Run Botwood Run	Res. PS Res. PS	243, 244 246, 247	100 100	108 279	10 189
16	Nov. 23 - 28	Nov. 23 Nov. 23	Cottles Cove Beson Cove	Res. PS Res. PS	252, 253 250, 251	100 100	250 259	141 160
12	Nov. 29 - 30	Nov. 30	Robert's Arm	Res. PS	254, 255	100	141	24
10	Dec. 1 - 2	Dec. 2	Southern Arm	Res. PS	256, 257	100	286	200
9	Dec. 2 - 3	Dec. 3	King's Point	Res. PS	261, 262	100	194	66

Table 14. Biological sampling details of herring, Andrew and Nicholas Trip #3, White Bay - Notre Dame Bay, November - December, 1998.

Table 15. Mean lengths and weights, by stratum, used to calculate target strengths for 1998 White Bay - Notre Dame Bay acoustic survey.

Stratum	Combined Samples	Mean Lgt. Mean Wg (mm) (g)	t. TS / fish (dB)	TS/g					
23A, 23B	211, 212, 258, 259	290 220	-36.25	-59.68					
22, 21	213, 214	282 188	-36.50	-59.24					
18-1 18-2	241, 242 248, 249	279 183 240 121	-36.59 -37.90	-59.21 -58.72					
17-1 17-2	243, 244 246, 247	108 10 279 189	-44.83 -36.59	-54.83 -59.35					
16, 14	250, 251, 252, 253	255 150	-37.37	-59.13					
12	254, 255	141 24	-42.52	-56.32					
10	256, 257	286 200	-36.37	-59.38					
9	261, 262	194 66	-39.74	-57.94					
	STRATUM		TRANSECT	RANDOM		MEASURED	WEIGHTED	MEAN	STRATUM
---------	-----------	----------	----------	----------	-----------	------------	------------	----------	---------
	AREA	TRANSECT	LENGTH	SAMPLING	WEIGHTING	DENSITY	DENSITY	WEIGHTED	BIOMASS
STRATUM	(sq. m.)	NUMBER	(n.mi.)	UNIT	FACTOR	(g/sq. m.)	(g/sq. m.)	DENSITY	(t)
23B	2.27E+08	26	0.20						
		27	4.21						
		28	4.54						
		29	4.43						
		30	3.81						
		31	4.20	1	1.212	3.2199	3.9018		
		32	5.02						
		33	3.50						
		34	3.46						
		35	3.00						
		36	2.97						
		37	2.98	2	1.186	9.9387	11.7846		
		38	0.35						
		39	2.51						
		40	2.82						
		41	2.95						
		42	3.20						
		43	3.25	3	0.854	0.0000	0.0000		
		44	3.27						
		45	3.73						
		46	3.81						
		47	3.42						
		48	2.50		1.061	40.0000	40.0500		
		49	1.99	4	1.001	10.2308	10.8500		
		50	0.47						
		52	2.17						
		52	2.00						
		53	2.70						
		54	2.04	F	0.840	0.0000	0.0000		
		55	2.40	5	0.840	0.0000	0.0000		
		57	2.20						
		58	1.86						
		59	3.71						
		60	3.33						
		61	1.07	6	0.848	6 3294	5 3678	5 3174	1207
23A	5.00E+08	14	2.38		0.040	0.0204	0.0070	0.0114	12.07
	0.0011.00	15	4.41						
		16	4.00						
		17	6.00	1	0.950	0.0131	0.0124		
		18	5.30						
		19	5.13						
		20	4.90						
		21	4.85	2	1.142	0.0000	0.0000		
		22	4.89					1	
		23	5.12						
		24	5.02						
		25	1.03	3	0.909	0.0000	0.0000	0.0041	2
22	3.67E+08	62	5.29						
		63	5.05						
		64	4.62						
		65	5.40	1	1.300	6.9644	9.0565		
		66	5.13						
		67	4.81						
		68	4.54						
		69	3.36	2	1.139	0.0000	0.0000		
		70	1.88						
		71	2.00						
		72	2.89						
		73	2.00	3	0.560	4.6933	2.6289	3.8952	1430
21	1.64E+08	74	2.08						
		75	1.30						
		371	5.57						
		372	4.55						
		373	1.29	1	1.341	5.7407	7.7011		
		76	0.48						
		77	1.22						
		374	1.38						
		375	1.11						
		376	3.07	2	0.659	0.0000	0.0000	3.8506	631

Table 16. White Bay - Notre Dame Bay herring biomass estimate from the 1998 acoustic survey.

	0.000								
	STRATUM	TRANSFOT	TRANSECT	RANDOM	MERCUTING	MEASURED	WEIGHTED	MEAN	STRATUM
STRATUM	(sq.m.)	NUMBER	(n mi)	LINIT	FACTOR	(a/sa_m)	(also m)	DENSITY	BIOMASS
18	2.43E+08	86	1.00	UNIT	TACTOR	(9/34.111.)	(groq. m.)	DENGITT	()
		87	2.58						
		88	2.98						
		89	1.92						
		90	2.37	1	0.770	06 0040	00.7400		
		91	3.25		0.172	20.0219	20.7120	-	
		92	4.15						
		93	5.00						
		94	3.43						
		95	3.05						
		390	5.43	2	1.315	8.3605	10.9937		
		97	4.13						
		98	2.76						
		99	2.94						
		100	2.29						
		391	3.35	3	1.252	2.7117	3.3952		
		101	1.61						
		103	1.44						
		104	1.72						
		105	1.80						
47	1.25E±00	392	1.14	4	0.661	0.0000	0.0000	8.7752	2132
	1.202100	107	3.25						
		108	2.57						
		109	2.19						
		110	1.33						
		111	0.17						
		393	1.74						
		394	2.23	1	1.931	23.0542	44.5088		
		113	2.58]	
		114	2.29						
		115	1.57						
		117	0.96						
		118	0.16						
		119	0.30						
		395	2.60			100 0000			
		396	1.24	2	1.597	130.3286	208.1450		
		120	0.48						
		122	0.25						
		123	0.50						
		124	0.77						
		125	1.08						
		397	0.50						
		398	0.20	3	0.683	0.0000	0.0000		
		127	1.17						
		128	0.81						
		129	0.58						
		131	0.07						
		132	0.38						
		133	0.58						
		399	1.16		0.700	0.0000	0.0000		
		401	0.76	4	0.762	0.0000	0.0000	1	
		135	0.54						
		136	0.70						
		137	1.59						
		138	0.20						
		140	0.39						
		402	0.50						
		403	0.56	5	0.599	1.5715	0.9412		
		141	0.24						
		142	0.65						
		143	0.52						
		404	0.23						
		405	0.78	6	0.428	0.0000	0.0000	42.2658	5283

Table 16(cont.'). White Bay - Notre Dame Bay herring biomass estimate from the 1998 acoustic survey.

	OTDATUMA		TRANSFOT	DANDON		MEACUDED	WEIGHTED	MEAN	OTDATUM
	STRATUM	TRANSFORM	TRANSECT	RANDOM		MEASURED	WEIGHTED	MEAN	STRATUM
	AREA	TRANSECT	LENGTH	SAMPLING	WEIGHTING	DENSITY	DENSITY	WEIGHTED	BIOMASS
STRATUM	(sq. m.)	NUMBER	(n.mi.)	UNIT	FACTOR	(g/sq. m.)	(g/sq. m.)	DENSITY	(t)
16	1.53E+08	145	0.57						
		146	0.73		1				
		147	0.93						
		148	2.27						
		149	2.93						
		407	2.00						
		409	1 00	1	1.649	26 1522	42 0010		
		408	1.00	1	1.048	20.1033	43.0918	1	
		150	2.47						
		151	2.38						
		152	1.62						
		153	1.62						
		154	1.93						
		409	1.49						
		410	1.59	2	1.867	8,7580	16.3526		
		155	2.69					1	
		156	2.00						
		167	2.21						
		157	1.75						
		158	1.10						
		159	0.42						
		411	1.63						
		412	0.56	3	1.485	25.2287	37.4691		
		160							
		161							
		162							
		163							
		164							
		413							
		410			0.000	0.0000	0.0000		
		414		4	0.000	0.0000	0.0000	-	
		165							
		166							
		167							
		168							
		169							
		415							
		416		5	0.000	0.0000	0.0000	19.3827	2966
14	5.50E+07	174	3.92						
	0.002.01	175	2.42						
		425	2.42						
		425							
		426	0.19						
		427	2.28						
		428	1.92	1	1.503	0.6536	0.9822	-	
		176	0.53						
		177	0.23						
		429	1.24						
		430	0.62						
		431	0.80						
		432	0.13	2	0.497	0.0000	0.0000	0.4911	27
10	8 80F+07	250	0.10		0.107	0.0000			
	0.002.07	200							
		201							
		232							
		233							
		234	0.10	1 1	0.015	0.0000	0.0000	-	
		235	0.59						
		236	0.85						
		237	1.14						
		238	2.42						
		239	2.17	2	1.061	159.5792	169.3831		
		240	1.99]	
		241	2.47						
		2/0	2.4/						
		242	2.70		1				
		243	3.73		1.000	0.0000	0.0000		
		244	1.81	3	1.889	0.0000	0.0000	-	
		245	2.63						
		246	2.76						
		247	1.21						
		248	0.39						
		249		4	1.035	0.0000	0.0000	42.3458	3726

Table 16(cont.'). White Bay - Notre Dame Bay herring biomass estimate from the 1998 acoustic survey.

	STRATUM		TRANSECT	RANDOM		MEASURED	WEIGHTED	MEAN	STRATUM
	AREA	TRANSECT	LENGTH	SAMPLING	WEIGHTING	DENSITY	DENSITY	WEIGHTED	BIOMASS
STRATUM	(sq. m.)	NUMBER	(n.mi.)	UNIT	FACTOR	(g/sq. m.)	(g/sq. m.)	DENSITY	(t)
9	4.90E+07	251	0.36						
		459	0.96						
		460	1.21						
		252	1.35						
		253	0.47						
		254	0.21		1.021	127.3963	130.0583		
		255	0.15						
		461	0.26						
		462	0.17						
		256	0.21						
		257	0.85						
		258	1.34	2	0.667	0.0000	0.0000		
		259	2.22						
		463	0.60						
		464	0.82						
		260	0.89						
		261	0.74						
		262	0.59	3	1.312	0.0000	0.0000	43.3528	2124
Number of	Transects =	230					Tota	I Biomass =	19529
N. N	1i. Surveyed	433.80						S.E. =	3319
								C.V. =	0.170

Table 16(cont.'). White Bay - Notre Dame Bay herring biomass estimate from the 1998 acoustic survey.

Age	1983	1984	1985	1986	1987	1988	1989	1990
0	623.0	0.0	0.0	0.0	14.6	0.1		
1	979.1	187.7	0.0	12.6	0.4	29.6		
2	33.0	572.2	438.6	4.3	5.1	2.2		
3	4.5	4.6	832.5	27.1	1.6	1.3		
4	81.5	3.5	9.5	212.8	24.5	0.9		
5	4.2	34.2	0.0	17.6	65.4	9.5		
6	4.2	8.0	12.9	32.0	2.0	28.9		
7	22.2	6.1	0.0	36.2	1.8	2.0		
8	0.0	15.4	0.0	0.8	4.4	4.0		
9	9.1	0.0	0.0	0.3	1.3	5.2		
10	0.0	3.2	0.0	7.5	0.8	1.1		
11+	54.3	162.8	26.1	70.7	2.9	12.3		
Total	1815.1	997.7	1319.6	421.9	124.8	97.1		
Biomass (t)	136000	78700	198400	126200	30900	22500		

Table 17. Comparison of populations numbers at age (millions) and biomass estimates (t), spring spawners only, from acoustic surveys of White Bay - Notre Dame Bay.

Age	1991	1992	1993	1994	1995	1996	1997	1998
0		3226.3		0.0				28.6
1		0.0		0.0				29.0
2		70.7		0.0				1.9
3		2.1		0.4				53.0
4		7.2		4.2				34.1
5		191.5		0.1				0.0
6		22.5		0.1				0.0
7		10.1		2.9				1.0
8		9.3		0.1				1.9
9		16.4		0.2				0.8
10		57.2		0.2				0.4
11+		18.8		0.6				0.9
Total		3632.1		9.7				151.8
Biomass (t)		104500		2100				19200

 Stratum	Survey Date(s)	Sample Date	Sample Location	Gear Type	Sample #'s	n	Mean Lgt. (mm)	Mean Wgt. (g)
82	Mar. 11 - 16	Mar. 15	Bay L'Argent	Res. PS	001, 002	200	253	118
84	Mar. 14 - 18	Mar. 17	Long Harbour	Res. PS	003, 004	200	327	279
87	Mar. 20	Mar. 20	Belleoram	Res. PS	005, 006	200	244	104
90	Mar. 21 - 22	Mar. 21	Bay de L'Eau	Res. PS	007, 008	200	250	111

Table 18. Biological sampling details of herring, Sea Gem, Trip #2, Fortune Bay, March 1999.

Table 19. Mean lengths and weights, by stratum, used to calculate target strengths for 1999 Fortune Bay acoustic survey.

Stratum	Combined Samples	Mean Lgt. I (mm)	Vlean Wgt. (g)	TS / fish (dB)	TS / g
82	001, 002	253	118	-37.44	-58.16
84	003, 004	327	279	-35.21	-59.67
87	005, 006	244	104	-37.75	-57.92
90, 91	007, 008	250	111	-37.54	-57.99

	STRATUM		TRANSFOT	PANDOM		MEASUDED	WEIGHTED	MEAN	CTDATUM
	AREA	TRANSEC	LENGTH	START	WEIGHTIN	DENSITY	DENSITY	WEIGHTED	BIOMASS
STRATUM	(sq. m.)	NUMBER	(n mi)	NUMBER	FACTOR	(also m)	(also m)	DENSITY	(1)
82	4.20E+07	314	0.30	NOMBER	TAOTOR	(9/34.11.)	(g/sq. m.)	DENGITT	(0)
		315	0.39						
		316	0.31						
		317	0.28						
		318	0.29						
		319	0.36						
		320	0.32	1	0.509	0.0000	0.0000		
		321	0.24						
		322	0.13						
		323	0.10						
		324	0.09						
		325	0.11						
		326	0.09						
		327	0.11	2	0.197	0.0000	0.0000		
		328	0.19						
		329	0.11						
		330	0.12						
		331	0.17						
		332	0.25						
		333	0.19						
		334	0.17	3	0.271	0.0000	0.0000		
		335	0.51						
		336	0.64						
		337	1.54						
		338	1.97						
		339	1.41						
		340	1.35						
		341	1.18	4	1.946	117.6593	228.9299		
		342	1.56						
		343	1.51						
		344	0.91						
		345	1.15						
		346	1.26						
		347	1.35	E	2.002	070 4400	2047 6964		
		340	1.51	5	2.093	978.4138	2047.5854		
		349	0.31						
		351	0.31						
		352	0.27						
		353	0.44						
		354	0.49						
		355	1.19	6	0.984	0.0000	0.0000	379,4192	15936
84	2.90E+07	242	0.68						
		243	1.02						
		244	1.06						
		245	1.24						
		246	1.41						
		247	1.33	1	2.169	0.4707	1.0208		
		248	1.19						
		249	0.27						
		250	0.82						
		251	0.53						
		252	0.07						
	,	253	0.10	2	0.959	0.0000	0.0000		
		254	0.20						
		255	0.12						
		256	0.53						
		257							
		258	0.14						
		259	0.38	3	0.441	0.0000	0.0000	-	
		260	0.42						
		261	0.35						
		262	0.26						
		203	0.23						
		204	0.32	A	0.640	827 6084	529 9037		
		205	0.43	4	0.040	521.0004	520.0001	1	
		267	0.38						
		268	0.31						
		269	0.54						
		270	0.46						
		271	0.34	5	0.792	1877.0206	1485.6727	403.3194	11696

Table 20. Fortune Bay herring biomass estimate from the 1999 acoustic survey.

	STRATUM		TRANSECT	RANDOM		MEASURED	WEIGHTED	MEAN	STRATUM
	AREA	TRANSEC	LENGTH	START	WEIGHTIN	DENSITY	DENSITY	WEIGHTED	BIOMASS
ŞTRATUM	(sq. m.)	NUMBER	(n.mi.)	NUMBER	FACTOR	(g/sq. m.)	(g/sq. m.)	DENSITY	(t)
87	9.10E+07	130	and the second se	de currencerente de pro				The second s	
		131							
		132	1.09						
		102	1.08						
		133	1.47						
		134	1.51						
		135	1.92	1	1.177	0.0000	0.0000		
		136							
		137							
		138	2.13						
		139	2.33						
		140	2.26						
		141	2.20	2	1 896	0.0000	0.0000		
		142	2.01		1.050	0.0000	0.0000		
		142							
		143							
		144	2.69						
		145	1.38						
		146	1.07						
		147	0.99	3	1.207	70.1668	84.6698		
		148							
		149							
		150	1.26						
		151	1.48						
		152	1.40						
		152	0.01		0.544	0.0000	0.0000		
		153	0.01	4	0.541	0.0000	0.0000		
		154							
		155							
		156	1.04					·	
		157	1.07						
		158	0.81						
1		159	0.62	5	0.697	0.0000	0.0000		
		160							
		161							
		162	1.90						
		102	1.05						
		163	0.43						
		164	0.04						
		165	0.09	6	0.482	0.0000	0.0000	14.1116	1284
90	7.30E+07	85	0.62						
		86	0.66						
1		87	0.64						
1		88	0.79						
		89	0.81	1	0.668	0.0000	0.0000		
		90	2.02						
		91	1 79						
		01	1.75						
1		02	1.77						
		93	1.70						
		94	1.73	2	1./24	0.0000	0.0000		
		95	2.59						
		96	2.72						
		97	1.95						
		98	1.06						
		99	1.03	3	1.774	57.6016	102.1576		
		100	0.97						
		101	0.59						
		102	0.00						
		102	0.35						
		103	0.58						
		104	1.15	4	0.690	0.0000	0.0000		
		105	0.27						
		106	0.29						
		107	0.06						
		108	0.14						
		109		5	0.144	0.0000	0.0000	20.4315	1492

Table 20 cont'. Fortune Bay herring biomass estimate from the 1999 acoustic survey.

	070 171 111	I			I				
	STRATUM		TRANSECT	RANDOM		MEASURED	WEIGHTED	MEAN	STRATUM
	AREA	TRANSEC	LENGTH	START	WEIGHTIN	DENSITY	DENSITY	WEIGHTED	BIOMASS
STRATUM	(sq. m.)	NUMBER	(n.mi.)	NUMBER	FACTOR	(g/sq. m.)	(g/sq. m.)	DENSITY	(t)
91	7.10E+07	21	0.79					Contract of the local division of the local	
		22	0.61						
		23	0.75						
		24	1 14						
		24	1.14						
		20	1.00						
		26	2.49						
		27	2.63						
		28	2.70	1	1.447	0.0000	0.0000		
		29	2.66						
		30	2.29						
		31	2.15						
		32	2.67						
		33	2.73						
		34	2.81						
		35	2.01						
		30	3.01		0.000	0.0000	0.0000		
		36	2.69	2	2.380	0.0000	0.0000		
		37	1.94						
		38	2.18						
		39	2.09						
		40	1.92						
		41	1.58						
		42	1.58						
		43	1.11						
		44	1.27	3	1.549	0.0000	0.0000		
		45	0.55						
		46	0.80						
		40	0.00						
		47	0.92						
		48	1.07						
		49	1.12						
		50	1.20						
		51	1.28						
		52	1.00	4	0.900	0.0000	0.0000		
		53	0.82						
		54	0.77						
		55	0.79						
		56	0.71						
		57	0.84						
		59	0.92						
		50	1.00						
		59	1.00						
		60	0.91	5	0.756	0.0000	0.0000		
		61	0.62						
		62	0.87						
		63	0.50						
		64	0.42						
		65	0.50						
		66	0.42						
		67	0.55						
		68	0.31	6	0.475	0.0000	0.0000		
		69	0.18						
		70	0.00						
		70	0.03						
		/1	0.17						
		72	0.18						
		73	0.13						
		74	0.24						
		75	0.52						
		76	0.35		0.211	951.9431	200.6078		
		77	0.31						
		78	0.38						
		79	0.43						
		80	0.40						
		81	0.32						
		80	0.32						
		02	0.35						
		03	0.11		0.000	0.0000	0.0000	05 0700	4700
		84	0.20	8	0.283	0.0000	0.0000	25.0760	1/80
							Tota	Biomass =	30408
								S.E. =	17448
1								C.V. =	0.574

Table 20 cont'. Fortune Bay herring biomass estimate from the 1999 acoustic survey.

Age	1986	1987	1988	1989	1990	1991	1992
0	0.0				0.0		0.0
1	0.0				0.0		0.2
2	0.0				0.0		5.1
3	0.0				22.4		0.1
4	18.4				2.2		0.7
5	. 0.6				0.3		9.2
6	2.1				0.3		0.7
7	1.8				7.3		0.0
8	0.9				19.3		0.4
9	0.6				0.8		5.6
10	1.5				0.8		22.8
11+	3.5				2.2		13.0
Total	29.4				55.6		57.8
Biomass (t)	9100				14400		18400

Table 21. Comparison of population numbers at age (millions) and biomass estimates (t), spring spawners only,from acoustic surveys of Fortune Bay.

Age	1993	1994	1995	1996	1997	1998	1999
0			0.0		0.0		0.0
1			0.6		0.0		0.0
2			0.0		0.0		0.0
3			14.2		1.3		161.3
4			1.9		1.1		5.4
5			4.4		47.2		2.4
6			0.0		9.3		1.1
7			0.0		6.7		23.7
8			0.0		0.2		4.6
9			0.0		0.8		1.7
10			0.0		1.1		0.8
11+			0.3		5.3		10.0
Total			21.4		72.9		211.1
Biomass (t)			2500		15500		30000

Stratum	Survey Date(s)	Sample Date	Sample Location	Gear Type	Sample #'s	n	Mean Lgt. (mm)	Mean Wgt. (g)
40	Nov. 14 - 15	Nov. 14	Northwest Arm, T.B.	Res. PS	233	100	113	11
39	Nov. 13 - 17	Nov. 13	Traytown, T.B.	Comm. PS	234, 235	100	318	294
36	Nov. 17	Nov. 18	Catalina, T.B.	Res. Jiggers	236	6	337	333
34	Nov. 19 - 20	Nov. 19 Nov. 21	Princeton, B.B. Great Chance Hr., B.B.	Res. PS Res. PS	237, 238 239, 240	100 100	172	46
31	Nov. 21 - 22	Nov. 22	Newman Sound, B.B.	Res. PS	241	10	78	3
29	Nov. 25 - 30	Nov. 25 Nov. 27	Northwest Arm, B.B. Long Reach, B.B.	Res. PS Res. PS	256, 257 258	100 12	207	83
28	Nov. 29 - Dec. 3	Dec. 1	Cat Bay, B.B.	Res. PS	259, 260	100	326	324
27	Dec. 4 - 6	Dec. 5 Dec. 7 Dec. 7	Lewis Island, B.B. Indian Island, B.B. Trinity Gut, B.B.	Res. PS Res. PS Res. PS	261, 262 263, 264 265, 266	100 100 100	306	253

Table 22. Biological sampling details of herring, Three T's 1, Trip #1, Bonavista Bay - Trinity Bay, November - December 1999.

Table 23. Mean lengths and weights, by stratum, used to calculate target strengths for 1999 Bonavista Bay - Trinity Bay acoustic survey.

Stratum	Combined Samples	Mean Lgt. (mm)	Mean Wgt. (g)	TS / fish (dB)	TS/g
40	233	113	11	-44.44	-54.85
39	234, 235	318	294	-35.45	-60.13
36	236	337	333	-34.95	-60.17
34	237, 238, 239, 240	172	46	-40.79	-57.42
31	241	78	3	-47.66	-52.43
29	256, 257, 258	207	83	-39.18	-58.37
28	259, 260	326	324	-35.24	-60.34
27	261, 262, 263, 264, 265, 266	306	253	-35.79	-59.82

	STRATUM AREA	TRANSECT	TRANSECT LENGTH	RANDOM	WEIGHTING	MEASURED	WEIGHTED	MEAN	STRATUM
STRATUM	(sq. m.)	NUMBER	(n.mi.)	UNIT	FACTOR	(g/sq. m.)	(g/sq. m.)	DENSITY	(t)
44	1.64E+08	9	1.91				and the second second second second	and the same of th	
		10	2.75						
		11	3.48						
		12	4.17						
		13	4.21	1	1.116	3.1573	3.5224		
		14	4.10						
		16	4.55						
		17	5.03						
		18	3.40	2	1.475	9.6803	14,2777		
		19	3.93						
		20	3.64						
		21	2.88						
		22	1.91						
		23	1.50	3	0.936	18.3159	17.1439		
		24	0.67						
		25	1.55						
		20	1.74						
		28	1.54	4	0.473	0.0000	0.0000	9 7260	1422
41	5.40E+07	58	0.32	*4	0.473	0.0000	0.0000	0.7300	1433
		59	0.18						
		60	0.07						
		61	0.17						
		62	0.11	1	0.483	0.0000	0.0000		
		63	0.43						
		64	0.42						
		65	0.33						
		66	0.32						
		67	0.31	2	1.028	0.0000	0.0000		
		60	0.31						
		70	0.31						
		71	0.31						
		72	0.49	3	1 051	0.0000	0 0000		
		73	0.44		1.001	0.0000	0.0000		
		74	0.26						
		75	0.36						
		76	0.29						
		77	0.33	4	0.955	58.3645	55.7116		
		78	0.29						
		79	0.32						
		80	0.37						
		81	0.93		4 400		0.0000		
40	7 70E+07	82	0.70	5	1.483	0.0000	0.0000	11.1423	602
-10	1.102.01	84	0.10						
		85	0.41						
		86	0.17						
		87	0.10						
		88	0.08	1	0.243	0.0000	0.0000		
		89	0.33						
		90	0.67						
		91	0.35						
		92	0.57						
		93	1.41						
		94	0.55	2	1.024	0.0000	0.0000		
		95	0.29						
		90	0.32						
		97	0.35						
		99	0.98						
		100	1.00	3	0.969	1.0108	0,9793		
		101	1.04		5.000				
		102	1.23						
		103	1.26						
		104	1.22						
		105	0.91						
		106	0.88	4	1.727	0.5514	0.9520		
		107	0.95						
		108	1.15						
		109	1.06						
		111	0.38						[
		112	0.19	5	1.037	1 9566	2 0200	0 7023	61
		7.1.65	0.6.0			1.0000	2.02.00	0.1020	01

Table 24. Bonavista Bay - Trinity Bay herring biomass estimate from the 1999 herring acoustic survey.

	STRATUM		TRANSECT	RANDOM		MEASURED	WEIGHTED	MEAN	STRATUM
	AREA	TRANSECT	LENGTH	SAMPLING	WEIGHTING	DENSITY	DENSITY	WEIGHTED	BIOMASS
STRATUM	(sq. m.)	NUMBER	(n mi)	LINIT	EACTOR	(also m)	(also m)	DENCITY	DIOWASS
34	1345+08	160	1.01	UNIT	FACTOR	(g/sq. m.)	(g/sq. m.)	DENSITY	(ť)
54	1.54E+00	109	1.01			1			
		170	1.55						
		171	0.43	1	0.664	0.0000	0.0000		
		172	2.69						
		173	2.52						
		174	0.81	2	1,336	29,8660	39,9097	19.9549	2674
32	7.20E+07	181	0.40						
		182	1.22						
		102	0.20	4	0.000	0.0000	0.0000		
		103	0.30		0.823	0.0000	0.0000		
		184	0.68						
		185	0.58						
		186	1.60	2	1.177	0.2253	0.2652	0.1326	10
31	1.20E+08	187	0.60						
		188	1.62						
		189	1.43	1	1.053	0.5576	0.5874		
		190	2.03						
		191	0.68						
		102	0.57	2	0.047	0.0000	0.0000	0.0007	0.5
20	0.005.00	192	0.57	2	0.947	0.0000	0.0000	0.2937	
30	2.00E+08	193	1.76						
		194	1.30						
		195	3.54						
		196	4.41						
		197	3.52	1	1.154	0.0074	0.0085		
		198	1.05						
		199	2.36						
		200	2.48						
		200	2.40						
		201	3.39						
		202	2.09	2	0.903	0.0000	0.0000		
		203	3.23						
		204	3.86						
		205	2.97						
		206	3.70						
		207	2.41	3	1.285	0.0000	0.0000		
		208	3.47						
		209	1.15						
		210							
		211							
		212	6.56	4	0.888	0.0000	0.0000		
		213	2 42		0.000	0.0000	0.0000		
		210	2.42						
		214	2.00						
		215	4.70						
		216							
		217		5	0.769	0.0000	0.0000	0.0017	0
29	2.08E+08	218	0.87						
		219	0.78						
		220	0.89						
	v	221	1.06						
		222	3.25	1	0.603	13.4974	8.1446		
		223	3.00						
		224	1 73						
		224	4.40						
		220	1.16						
		226	1.91						
		227	2.52	2	0.909	8.9667	8.1515		
		228	3.02						
		229	4.64						
		230	4.35					,	
		231	3.81						
		232	4.83	3	1.819	8.4500	15.3711		
		233	4 03			5.1000			
		224	2.00						
		204	2.07						
		235	2.45						
		236	2.63				1.5		
		237	2.18	4	1.247	0.0000	0.0000		
		238	1.14						
	,	239	1.35						
		240	0.49						
		241	0.85						
		242	0.95	5	0.421	0.0000	0.0000	6.3334	1317

Table 24 (cont.') Bonavista Bay - Trinity Bay herring biomass estimate from the 1999 herring acoustic survey.

	STRATUM		TRANSECT	RANDOM		MEASURED	WEIGHTED	MEAN	STRATUM
	AREA	TRANSECT	LENGTH	SAMPLING	WEIGHTING	DENSITY	DENSITY	WEIGHTED	BIOMASS
STRATUM	(sq. m.)	NUMBER	(n.mi.)	UNIT	FACTOR	(g/sq. m.)	(g/sq. m.)	DENSITY	(t)
28	2.00E+08	243	0.48				and the second second second	Contract resource or search restore	1-1
		244	0.54						
		245	0.61						
		246	0.75						
		247	0.47						
		248	0.34	1	0.258	0.0000	0.0000		
		249	0.82						
		250	0.08						
		252	0.45						
		253	0.86						
		254	1.32	2	0.355	0.3204	0.1137		
		255	1.06			0.0101	0.1101		
		256	1.18						
		257	0.68						
		258	0.68						
		259	1.72						
		260	1.53	3	0.554	0.0000	0.0000		
		261	1.72						
		262	2.90						
		263	3.53						
		264	4.65						
		205	4.12	А	1 607	2 6914	4 2707		
		267	3.61	4	1.09/	2.0011	4.3/9/		
		268	3.40						
		269	3.50						
		270	3.79						
		271	3.74						
		272	3.60	5	1.749	6.2432	10.9218		
		273	4.36						
		274	4.46						
		275	3.58						
		276	2.36						
		277	1.40						
27	2 775+09	278	1.00	6	1.387	0.0000	0.0000	2,5692	514
21	2.17 5+00	279							
		281							
		282	0.94						
		283	2.01						
		284	1.41	1	0.367	0.0000	0.0000		
		285	1.41						
		286	1.01						
		287	1.54						
		288	1.72						
		289	1.99						
	}	290	2.41	2	0.847	269.7715	228.6084		
]	291	3.24						
		292	3.10						
		293	3.03						
		294	3.27						
		295	2.08	2	1 566	75 7097	118 5760		
		297	3.07		1.550	10.1001	110.0705		
		298	3.26						
		299	2.96						
		300	2.75						
		301	2.88						
		302	2.58	4	1.471	0.0000	0.0000		
		303	5.13						
		304	4.07						
		305	3.86						
	,	306	4.18						
		307	3.56	_	1 7 10	0.0000	0.0000		
		308		5	1./49	0.0000	0.0000		
		310							
		311							
		312							
		313							
		314		6	0.000	0.0000	0.0000	57.8642	16028
							Total	Biomass =	22674
								S.E. =	4103
1								C V =	0.101

Table 24 (cont.'). Bonavista Bay - Trinity Bay herring biomass estimate from the 1999 herring acoustic survey.

Age	1984	1985	1986	1987	1988	1989	1990	1991
0	172.5	93.2	64.1	0.4	0.0		0.0	
1	63.6	0.0	171.5	0.0	0.3		9.3	
2	409.4	244.2	3.9	1.8	8.3		16.9	
3	1.8	378.2	6.3	0.3	26.4	1	56.8	
4	4.1	5.2	47.9	6.7	1.5		7.4	
5	11.7	0.0	1.7	26.6	10.0		3.2	
6	0.4	9.6	0.4	0.2	60.1		0.7	
7	0.0	0.0	0.4	0.1	1.1		1.6	
8	0.3	0.0	0.0	0.3	0.8		46.8	
9	0.0	0.0	0.0	0.1	0.0		0.2	
10	1.7	0.0	0.4	0.0	0.5		2.6	
11+	17.5	1.7	7.1	1.3	3.9		2.7	
Total	683.0	732.1	303.7	37.8	112.9	2	48.2	
Biomass (t)	59800	99900	25700	10400	29700	5	1900	

Table 25. Comparison of population numbers at age (millions) and biomass estimates (t), spring spawners only, from acoustic surveys of Bonavista Bay - Trinity Bay.

			the second s					
Age	1992	1993	1994	1995	1996	1997	1998	1999
0		0.0		133.1	0			14.2
1		1.5		0.2	0			0
2		197.3		0.0	6.1			4.2
3		20.8		2.9	0.2			2.6
4		0.6		31.0	2.3			15.8
5		2.1		5.4	106.6			9.8
6		12.7		0.5	14.6			0.9
7		1.0		1.3	1.4			0.2
8		1.2		5.8	2.2			19.1
9		0.4		1.1	10.2			0.8
10		2.1		0.4	0.8			0.2
11+		1.6		2.0	4.1			1.4
Total		241.3		183.8	148.4			69.4
Biomass (t)		23100		12300	33000			15200

	STRATUM	70.00000	TRANSECT	RANDOMIZED		MEASURED	WEIGHTED	MEAN	STRATUM
STRATUM	AREA (sq. m.)	TRANSECT NUMBER	LENGTH (n.mi.)	SAMPLING UNIT	WEIGHTING FACTOR	DENSITY (g/sq. m.)	DENSITY (g/sq. m.)	WEIGHTED DENSITY	BIOMASS (t)
68	9.00E+07	131	0.26						
		112	1.41						
		113	2.34						
		115	2.22	1	1.049	0.0000	0.0000		
		116	1.63					1	
		117	0.86						
		118	1.44						
		119	1.76		1 0 2 2	100 7004	105 0707		
		120	3.19	Z	1.025	102.7204	105.0727		
		122	2.55						
		123	1.57						
		124	1.38						
		125	1.40	3	1.181	0.0000	0.0000		
		120	2.28						
		128	1.69						
		129	0.65						
		130	0.75	4	0.748	0.0000	0.0000	26.2682	2364
60	2.23E+08	265							
		266	0.01						
		268	1 90						
		269	1.72						
		270	5.04	1	0.510	0.0000	0.0000		
		271	4.99						
		272	4.66						
		273	3.62						
		274	2.87						
		275	2.37	2	1 129	0 0000	0 0000		
		277	3.66			0.0000	0.0000		
		278	2.83						
		279	3.22						
		280	5.04						
		281	4.90	3	1 3/8	0.0000	0.0000		
		283	4.60	5	1.540	0.0000	0.0000		
		284	4.77						
		285	5.31						
		286	6.49						
		287	3.19		4 000	47 7400	04.0040		
		200	2.14	4	1.392	17.7138	24.6640		
		290	1.93						
		291	2.20						
		292	2.49						
		293	2.36	_	0.000	0.000	0.000-		
		294	2.05	5	0.702	0.0000	0.0000		
		295	3.28						
		297	3.72						
		298	3.43						
		299	3.25						
	0.005.00	300	0.34	6	0.919	0.0000	0.0000	4.1107	918
55	2.38E+08	345	2.52						
		340	6 15						
		348	5.32	1	1.133	5.8550	6.6343		
		349	6.00						
		350	3.18						
		351	3.00	_					
		352	3.93	2	1.024	0.0000	0.0000		
		353	4.38						
		355	4.64						
		356	0.55	3	0.843	0.0000	0.0000	2.2114	527
							Total E	Biomass =	3810
								S.E. =	409
								$C = M \equiv$	0.107

Table 26. St. Mary's Bay - Placentia Bay herring biomass estimate from the 2000 acoustic survey.

Table 27. Comparison of population numbers at age (millions) and biomass estimates (t), spring spawners only, from acoustic surveys of St. Mary's Bay - Placentia Bay.

Age	1986	1987	1988	1989	1990	1991	1992	1993
0	0.0				0.0		0.0	
1	0.0				1.8		17.0	
2	0.0				3.0		1.0	
3	1.7				17.6		0.9	
4	136.6				13.2		0.3	
5	1.7				2.5		7.8	
6	1.7				0.9		5.0	
7	0.0				4.5		1.3	
8	0.0				50.3		0.4	
9	0.0				4.6		1.4	
10	0.0				4.5		7.5	
11+	0.0				7.1		5.9	
Total	141.7				110.0		48.5	
Biomass (t)	42200				32700		10200	

Age	1994	1995	1996	1997	1998	1999	2000
0	0.0		0.0		0.0		0.0
1	0.0		0.0		0.0		0.0
2	20.7		0.0		0.0		0.0
3	94.8		0.0		0.5		0.2
4	9.6		0.0		0.2		0.8
5	6.0		29.3		0.2		2.3
6	0.7		5.5		5.6		0.3
7	8.2		0.0		12.1		0.3
8	0.7		0.0		1.9		1.1
9	0.0		1.8		0.0		1.9
10	1.5		0.0		0.1		0.6
11+	26.2		18.3		1.1	2.3	0.6
Total	168.4		55.0		21.9		8.0
Biomass (t)	29300		17700		6300		2000

Table 28. Biological sampling details of herring from bottom trawl sets, Teleost Trip #87, northeast Newfoundland coast, January 2000.

Date	Time	Geographical Location	Latitude	Longitude	Set #	Depth (m)	Number Caught	Number Sampled	Mean Length (cm)	Min. Length (cm)	Max. Length (cm)
Jan. 5	0615 h	Smith Sound, Trinity Bay	48.10.5	53.37.3	1	189	5	5	20	14	31
Jan. 6	0730 h	Smith Sound, Trinity Bay	48.10.1	53.38.5	2	217	7	7	30	16	36
Jan. 7	2045 h	Bloody Reach, Bonavista Bay	48.44.6	53.52.8	5	125	4088	200	14	9	35
Jan. 9	0715 h	Roberts Arm, Green Bay	49.34.0	55.45.8	6	183	2143	200	13	8	34
Jan. 9	1115 h	Halls Bay, Green Bay	49.29.8	56.02.2	7	295	859	200	11	8	31
Jan. 13	1445 h	offshore Bonavista Bay	48.54.7	53.22.4	15	287	14	14	16	10	31

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Current Year Spawning Index	7.00 3.91 3.40	8.33 7.33 3.50 3.67	4.50 4.83 1.83 2.00	8.43 7.22 7.14 8.25
Previous Year Abundance Index	5.75 5.85 3.33 5.5	6.17 5.80 6.00 4.83	5.5 3.29 3.38 7	7.33 6.55 8.38 8
Current Year Abundance Index	5.00 3.00 5.83 2.40	8.00 5.00 6.00 5.14	3.50 2.57 2.75 6.50	7.60 7.40 8.14 8.50
Catch / Std. Net / Night Fished (kg)	38.4 36.7 14.9 6.3 6.3	52.6 27.9 13.5 27.8 48.9	31.4 20.7 12.0 10.1	37.5 39.4 54.7 37.9 55.0
Total Comm. (t)	229 20 31 34	378 201 170 195	38 19 1	30 28 29 -
Total Logbook Catch (t)	68.5 9.2 8.7 9.7	51.5 39.4 16.3 28.7 25.7	45.3 15.4 11.9 2.7 2.7	60 68.9 41.3 36.1 28.7
Mean Panel Size (sq m)	299 205 237 363 334	214 312 245 330 349	261 265 257 319 334	304 271 218 313 243
Mean Mesh Size (mm)	64.7 63.8 62.6 63.3 62.2	65.3 66.1 66.0 66.0 65.4	67.1 68.3 68.2 65.6 66.7	68.6 66.9 65.2 65.8 68.3
Total Nights Fished	440 265 486 214 142	252 287 191 173 249	499 334 1046 577 56	837 1350 898 498 356
Total Nets Fished	108 35 49 11	94 52 33 33	54 39 31 5	40 57 34 23 15
Dates End	18-Jun 30-Jun 30-Jun 30-Jun 29-Jun	05-Jun 27-Jun 21-Jun 29-Jun 16-Jun	15-Jun 24-Jun 25-Jun 29-May 26-May	10-Jun 28-Jun 17-Jun 15-Jun 12-Jun
Fishing Start	01-Apr 10-May 15-Apr 20-Apr 27-Apr	02-Apr 07-Apr 02-Apr 02-Apr 08-Apr	19-Mar 12-Feb 17-Mar 21-Feb 01-Apr	08-Apr 29-Mar 01-Apr 21-Mar 25-Mar
Mean Age of ⁻ishers	45.3 46.7 38.2 46.6	45.0 45.0 51.0 49.6	50.3 52.4 51.0 66.0	49.8 49.3 50.0
Number of Fishers	000004 00004	70007	€ 0000−	<u>+ + + + + + + + + + + + + + + + + + + </u>
Year	1996 1997 1998 1999 2000	1996 1997 1998 1999 2000	1996 1997 1998 1999 2000	1996 1997 1998 1999 2000
Stock Area	WBNDB	BBTB	SMBPB	B

	1996 1997					1998			1999			2000			
Area	Fished	Respond	%	Fished	Respond	%	Fished R	espond	%	Fished	Respond	%	Fished F	Respond	%
WB	7	7	100	2	2	100	2	2	100	2	2	100	-	-	-
NDB	11	10	91	13	12	92	4	4	100	5	5	100	-	-	-
WB-NDB	18	17	94	15	14	93	6	6	100	7	7	100	-	-	-
BB	13	13	100	8	7	88	7	6	86	8	8	100	-	-	_
TB	8	8	100	8	8	100	6	5	83	6	6	100	-	-	-
BB-TB	21	21	100	16	15	94	13	11	85	14	14	100	-	-	-
SMB	5	4	80	5	5	100	6	5	83	0	0		0	0	
PB	5	5	100	10	10	100	9	8	89	3	2	67	1	1	100
SMB-PB	10	9	90	15	15	100	15	13	87	3	2	67	1	1	100
Overall	49	47	96	46	44	96	34	30	88	24	23	96	1	1	100

Table 30. Number of herring purse seine fishers who participated in the fishery and number of respondants to the questionnaire, by year, bay, and stock area.

Table 31. Herring purse seine fleet characteristics, average vessel length (ft.), average vessel capacity (lbs.), average seine lengths and depths (fathoms), by year and stock area.

and it is not in our	Internet starting of the local division in the second start water and the second start is the second start							
				116				
-	Area	Parameter	1996		1997	1998	1999	2000
				2				
	WB-NDB	Vessel Length	54.3	12	51.6	50.5	47.8	-
		Vessel Capacity	91353	14	70867	67500	82000	-
		Seine Length	150		149	145	146	-
		Seine Depth	23	~	22	24	21	-
				0				
	BB-TB	Vessel Length	46.2	12	45.5	43.1	45.4	_
		Vessel Capacity	58095		56133	48364	59124	_
		Seine Length	150	-5	141	137	136	_
		Seine Depth	24	10	22	22	23	-
				15	No. No.	6-6-	20	-
	SMB-PB	Vessel Length	49.9		50.1	50 G	12 5	42.0
		Vessel Canacity	74556	44	69800	64022	40.0	42.0
		Soing Longth	190		400	04923	37500	38000
		Sellie Length	109		198	194	163	165
		Seine Depth	33		32	30	30	25

in the second

Table 32. Landings, discards, and total removals (landings plus dead discards) by stock area and year (all amounts are in metric tons).

	1006			international and proceedings in particular international		
Area	Parameter	1996	1997	1998	1999	2000
WB-NDB	Total Landings	391.9	1800.5	301.9	882.4	-
	Discarded at Sea	445.5	2045.0	540.0	115.8	-
	Survival of Discards (%)	48.8	96.8	93.3	39.4	-
	Total Removals	620.0	1865.6	338.4	952.8	_
	Ratio (Removals : Landings)	1.58	1.04	1.12	1.08	_
BB-TB	Total Landings	737.5	736.0	621.0	893.5	-
	Discarded at Sea	209.0	47.0	8.5	219.0	-
	Survival of Discards (%)	50.0	59.8	50.0	68.8	-
	Total Removals	842.0	754.9	625.3	961.8	_
	Ratio (Removals : Landings)	1.14	1.03	1 01	1 08	_
					1.00	_
SMB-PB	Total Landings	459.5	4400.9	1726.9	186.0	400.0
	Discarded at Sea	225.0	403.0	790.0	0.0	105.0
	Survival of Discards (%)	50.0	81.9	98.8	0.0	00.0
	Total Removals	572.0	4474 0	1736 1	186.0	410.5
	Ratio (Removals : Landings)	1.24	1 02	1 01	1 00	1 02
	(· · due · ·	1.02	1.01	1.00	1.05

Table 33. White Bay - Notre Dame Bay catch numbers at age and catch weights at ages 2 to 11+ (columns), from 1971 to 1999 (rows), used as input for integrated catch at age analysis.

WBNDB HERRI	NG - CATCH	I NUMBERS	AT AGE							
1971	2 1999									
2	11		Sene							
2 1 1 5 1 1 2 56 50 1 1 115 445 76 1 6 3 29 1105 407 23 1 29 940 1 1 15 15 2	11 129 290 727 4 128 24 1671 55 60 46 152 371 38 12 187 975 324 1044 128 1936 386 207 96 1 96 1 698	88 2396 1411 123 215 506 107 2034 50 1240 1240 2945 7201 2945 7201 2945 7201 2945 7201 2945 16183 942 31 1054 609 3 2	1 3 28% 314 23 44 23 44 33 29% 122 122 122 24 258% 29% 258% 29% 258% 29% 258% 29% 258% 29% 258% 29% 20% 258% 29% 20% 20% 20% 20% 20% 20% 20% 20% 20% 20	61 53 25 53 53 53 68 17 28 31 59 23 18 40 23 11 28 24 31 59 23 18 40 23 13 34 24 37 12 28 23 14 24 37 12 53 23 14 24 53 53 54 25 54 26 54 26 54 27 54 27 54 28 29 23 14 24 24 24 24 24 24 24 24 24 24 24 24 24	64 69 761 5438 868 184 1034 323 1080 63 268 14 73 1486 667 1651 1819 3106 240 553 483 3614 1674 129 1194 3420	425 122 719 1193 7069 10893 793 517 1410 17 805 34 93 114 108 1258 1067 1036 10566 2451 1036 10566 2451 1036 10566 2451 1036 10566 2451 1036	10184 403 654 697 1123 17145 7363 2509 767 496 64 258 1 157 275 198 2088 1137 370 7360 2145 211 199 108 1513 162 51	233 1363 416 1506 838 1328 12675 10807 2222 179 344 19 26 37 94 162 399 1454 1081 532 4432 722 70 192 183 474 209	254 205 1685 858 810 3364 1055 11756 14413 1450 194 192 4 122 81 179 442 315 844 1132 537 2796 544 49 127 1 359	3105 808 794 2378 3999 8535 15707 14379 27508 14653 10908 4059 805 1938 2110 1973 4566 2943 2178 1148 2201 3509 861 441 337 91 427
2	698 802	2 871	- 2	53 21	3420 14	2939 359	51 225	209 219	359 42	427 88
WBNDB HERRIN 1 3 1971 1999 2 11	NG - WEIGH	TS AT AGE								
$\begin{array}{c} 1 \\ 0.050 \\ 0.0$	0.133 0.133 0.133 0.133 0.133 0.133 0.133 0.133 0.133 0.133 0.160 0.160 0.160 0.160 0.160 0.160 0.138 0.231 0.150 0.150 0.150 0.144 0.124 0.122 0.122 0.122 0.122 0.122 0.122 0.125 0.106 0.112	0.201 0.201 0.201 0.201 0.201 0.201 0.201 0.201 0.201 0.199 0.197 0.256 0.252 0.197 0.201 0.201 0.202 0.197 0.256 0.252 0.197 0.201 0.201 0.252 0.197 0.214 0.195 0.179 0.172 0.164 0.159 0.154 0.154 0.155	0.242 0.242 0.242 0.242 0.242 0.242 0.242 0.242 0.242 0.242 0.297 0.297 0.233 0.298 0.241 0.262 0.223 0.233 0.235 0.223 0.235 0.223 0.234 0.212 0.234 0.212 0.199 0.187 0.166 0.167 0.230 0.176	0.253 0.253 0.253 0.253 0.253 0.253 0.253 0.253 0.282 0.282 0.264 0.313 0.343 0.263 0.263 0.269 0.256 0.249 0.259 0.247 0.229 0.2259 0.247 0.229 0.226 0.249 0.251 0.220 0.221 0.201 0.201 0.210	0.266 0.266 0.266 0.266 0.266 0.266 0.266 0.295 0.295 0.295 0.295 0.295 0.295 0.295 0.295 0.295 0.295 0.295 0.293 0.279 0.273 0.279 0.278 0.279 0.278 0.279 0.278 0.261 0.252 0.238 0.226 0.238 0.226	0.271 0.271 0.271 0.271 0.271 0.271 0.271 0.271 0.271 0.299 0.299 0.299 0.300 0.356 0.357 0.325 0.316 0.316 0.296 0.287 0.277 0.279 0.277 0.279 0.271 0.279 0.271 0.249 0.254	0.275 0.275 0.275 0.275 0.275 0.275 0.275 0.275 0.275 0.275 0.307 0.305 0.307 0.305 0.367 0.322 0.323 0.349 0.323 0.311 0.329 0.323 0.311 0.296 0.283 0.286 0.274 0.259 0.259	0.279 0.279 0.279 0.279 0.279 0.279 0.279 0.279 0.279 0.279 0.279 0.305 0.305 0.305 0.305 0.305 0.305 0.305 0.349 0.353 0.328 0.333 0.332 0.333 0.332 0.331 0.322 0.304 0.304 0.288 0.289 0.292 0.283 0.294	0.311 0.311 0.311 0.311 0.311 0.311 0.311 0.311 0.311 0.328 0.328 0.345 0.398 0.345 0.376 0.371 0.399 0.414 0.412 0.418 0.393 0.373 0.343 0.330 0.324 0.354 0.340	

Table 34. Bonavista Bay - Trinity Bay catch numbers at age and catch weights at ages 2 to 11+ (columns), from 1971 to 1999 (rows), used as input for integrated catch at age analysis.

BBTB HERRIN	G - CATCH	NUMBERS A	AT AGE							
1 1971 2 1	2 1999 11									
$\begin{array}{c} & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 1 \\ & 3 \\ & 207 \\ & 1352 \\ & 6612 \\ & 563 \\ & 58 \\ & 689 \\ & 499 \\ & 354 \\ & 1 \\ & 1 \\ & 75 \\ & 54 \\ & 50 \end{array}$	690 10 1 392 248 286 286 13 246 8 4 22 175 443 413 3094 210 1043 3094 210 1043 3094 210 105 621 394 107 23 302 524 48	31: 134' 60 134' 493 135 167 195 53 70 4445 2845 267 3323 422 13551 271 160 819 2645 63 543 922		102 389 887 235 163 123 759 122 765 43 256 27 210 87 261 208 674 264 350 586 512 344 303 349 538 96 170 544	64 91 126 4795 2564 166 227 251 19 293 26 30 2 9 351 161 334 21739 1428 94 3859 2422 3779 1072 64 345 3230 128 11	361 75 96 424 14330 4897 50 112 436 52 288 5 15 5 37 262 359 782 8639 629 347 579 422 3878 152 46 182 1322 14	$1373 \\ 88 \\ 1 \\ 151 \\ 455 \\ 20697 \\ 6209 \\ 598 \\ 101 \\ 264 \\ 23 \\ 35 \\ 1 \\ 12 \\ 27 \\ 38 \\ 126 \\ 713 \\ 13 \\ 4439 \\ 1550 \\ 194 \\ 385 \\ 479 \\ 978 \\ 157 \\ 7 \\ 94 \\ 3175 \\ \end{cases}$	151 480 48 294 995 909 23206 4412 530 75 321 5 8 2 13 10 33 8 216 235 7505 1394 132 471 172 430 1 4 922	$126 \\ 14 \\ 271 \\ 69 \\ 727 \\ 854 \\ 774 \\ 13394 \\ 5575 \\ 967 \\ 88 \\ 65 \\ 2 \\ 22 \\ 31 \\ 65 \\ 100 \\ 325 \\ 447 \\ 2054 \\ 657 \\ 530 \\ 163 \\ 11 \\ 29 \\ 4 \\ 62 \\ 163 \\ 11 \\ 29 \\ 4 \\ 62 \\ 163 \\ 11 \\ 29 \\ 4 \\ 62 \\ 163 \\ 11 \\ 29 \\ 4 \\ 62 \\ 163 \\ 11 \\ 29 \\ 4 \\ 62 \\ 163 \\ 11 \\ 29 \\ 4 \\ 62 \\ 163 \\ 11 \\ 29 \\ 4 \\ 62 \\ 163 \\ 11 \\ 29 \\ 4 \\ 62 \\ 100 \\ 1$	522 213 1 1849 1679 4306 5890 5956 19994 12259 11762 1186 159 154 797 657 956 1247 508 466 891 653 1092 2614 649 300 94 87 144
BBTB HERRING 1 3 1971 1999 2 11	G - WEIGHT	TS AT AGE								
1 0.065 0.0	0.133 0.133 0.133 0.133 0.133 0.133 0.133 0.145 0.145 0.165 0.224 0.13 0.118 0.121 0.136 0.129 0.147 0.144 0.132 0.133 0.108 0.081 0.101 0.101 0.143 0.101 0.143 0.101	0.199 0.199 0.199 0.199 0.199 0.199 0.21 0.205 0.245 0.245 0.245 0.245 0.245 0.258 0.193 0.199 0.205 0.196 0.212 0.212 0.219 0.205 0.196 0.212 0.212 0.174 0.171 0.144 0.133 0.161 0.172 0.187	0.215 0.215 0.215 0.215 0.215 0.25 0.25 0.266 0.292 0.292 0.304 0.241 0.234 0.241 0.234 0.222 0.233 0.248 0.262 0.257 0.216 0.211 0.198 0.272 0.203 0.219 0.207	0.238 0.238 0.238 0.238 0.238 0.238 0.238 0.238 0.275 0.275 0.302 0.32 0.32 0.32 0.32 0.32 0.288 0.255 0.265 0.272 0.265 0.272 0.265 0.272 0.224 0.224 0.218 0.215 0.214	0.254 0.254 0.254 0.254 0.254 0.254 0.255 0.315 0.315 0.325 0.325 0.325 0.325 0.35 0.315 0.301 0.299 0.299 0.285 0.285 0.285 0.285 0.286 0.287 0.284 0.255 0.284 0.255 0.2237	0.273 0.273 0.273 0.273 0.273 0.273 0.273 0.273 0.37 0.337 0.337 0.337 0.337 0.337 0.328 0.343 0.327 0.318 0.328 0.318 0.328 0.318 0.293 0.314 0.293 0.311 0.295 0.271 0.271 0.254 0.275	0.296 0.296 0.296 0.296 0.296 0.296 0.35 0.35 0.352 0.352 0.352 0.352 0.384 0.333 0.352 0.323 0.323 0.353 0.323 0.353 0.323 0.322 0.282 0.299 0.308 0.291 0.280 0.282	0.306 0.306 0.306 0.306 0.306 0.306 0.37 0.296 0.312 0.359 0.359 0.359 0.359 0.359 0.359 0.365 0.366 0.327 0.326 0.327 0.326 0.327 0.326 0.327 0.326 0.327 0.327 0.326 0.327 0.327 0.327 0.327 0.327 0.327 0.327 0.327 0.327 0.327 0.327 0.327 0.327 0.327 0.327 0.327 0.329 0.329 0.329 0.329 0.329 0.329 0.329 0.329 0.329 0.329 0.329 0.329 0.329 0.329 0.329 0.329 0.329 0.329 0.329 0.300 0.309 0.2293 0.300 0.2293 0.2293 0.2293 0.2293 0.2293 0.2293 0.2293 0.2293 0.2293 0.2293 0.2293 0.2293 0.2293 0.2293	0.343 0.343 0.343 0.343 0.343 0.343 0.343 0.343 0.399 0.335 0.348 0.365 0.441 0.387 0.399 0.397 0.421 0.411 0.421 0.387 0.343 0.345 0.345 0.345 0.345 0.341 0.345 0.341 0.345 0.340 0.345 0.340 0.345 0.340 0.345 0.340 0.345 0.340 0.345 0.340 0.345 0.340 0.345 0.340 0.345 0.340 0.345 0.340 0.345 0.339 0.340 0	

Table 35. St. Mary's Bay - Placentia Bay catch numbers at age and catch weights at ages 2 to 11+ (columns), from 1970 to 1999 (rows), used as input for integrated catch at age analysis.

SMBPB HERRI	NG (AS+SS)) - CATCH	NUMBERS AT	AGE					
1970 2 1	2 1999 11								
477 2 2 77 996 75 365 52 30 87 133 1 1 1 3 6 8 1 1 36 1 22 1 37 68 5 24 1 19 235 151 1	110 558 231 331 282 2235 402 1423 175 663 332 193 1 5 7 7 1 23 122 144 333 122 144 333 201 547 21	4435 125 20436 227 236 478 1910 187 1840 290 229 181 2 20 41 27 159 14 42 226 236 14 36 21 523 264 295 436 21	61 2113 900 15522 222 215 422 788 558 2406 188 227 10 9 137 47 43 534 193 19 125 247 371 219 9 8 149 1269 1844 505 1	$\begin{array}{c} 77\\ 133\\ 5169\\ 637\\ 14474\\ 1773\\ 334\\ 296\\ 688\\ 694\\ 1322\\ 61\\ 8\\ 14\\ 38\\ 107\\ 43\\ 109\\ 2696\\ 32\\ 69\\ 210\\ 281\\ 426\\ 122\\ 35\\ 196\\ 9468\\ 1145\\ 42\end{array}$	716 282 426 6767 516 13947 894 131 3008 687 476 349 3 8 24 61 106 77 209 519 54 35 88 291 406 106 53 1826 3976 147	178 88 687 147 6144 352 5639 108 228 301 549 78 14 1 29 39 32 91 248 77 541 175 80 115 291 162 51 363 993 398	91 97 453 241 231 3397 295 3856 550 87 164 87 4 9 3 35 16 27 286 167 103 591 138 104 279 87 60 382 560 105	$\begin{array}{c} 65\\ 57\\ 144\\ 261\\ 289\\ 387\\ 2267\\ 156\\ 3879\\ 503\\ 262\\ 6\\ 4\\ 1\\ 11\\ 8\\ 9\\ 3\\ 41\\ 183\\ 189\\ 128\\ 383\\ 59\\ 172\\ 94\\ 16\\ 100\\ 66\\ 126\\ \end{array}$	309 410 942 1052 1594 2000 1690 2974 2746 5133 3463 495 71 43 52 149 45 23 200 198 301 1443 1444 2037 1455 698 251 1010 364 188
SMPB HERRING 1 3 1970 1999 2 11 1	G (AS+SS)	- WEIGHTS	AT AGE						
$\begin{array}{c} 0.065\\ 0.$	0.163 0.163 0.163 0.163 0.163 0.163 0.154 0.155 0.154 0.155 0.154 0.164 0.164 0.164 0.164 0.164 0.164 0.162 0.183 0.162 0.183 0.162 0.163 0.162 0.137 0.13 0.115 0.107 0.122 0.130 0.143	0.236 0.236 0.236 0.236 0.236 0.236 0.236 0.242 0.242 0.242 0.242 0.235 0.218 0.237 0.237 0.237 0.237 0.237 0.237 0.237 0.232 0.211 0.215 0.222 0.221 0.242 0.212 0.221 0.242 0.212 0.242 0.215 0.221 0.242 0.216 0.216 0.216 0.236 0.242 0.235 0.237 0.237 0.237 0.237 0.237 0.237 0.237 0.237 0.237 0.237 0.237 0.237 0.218 0.218 0.218 0.218 0.236 0.236 0.242 0.235 0.218 0.237 0.237 0.237 0.237 0.237 0.237 0.211 0.215 0.212 0.191 0.168 0.171 0.170 0.171 0.170 0.171 0.170 0.172 0.172 0.171 0.170 0.171 0.170 0.172 0.172 0.171 0.170 0.172 0.171 0.170 0.172 0.171 0.172 0.172 0.171 0.172 0.172 0.172 0.171 0.172	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.273 0.262 0.273 0.262 0.273 0.262 0.273 0.262 0.273 0.262 0.273 0.262 0.273 0.262 0.273 0.262 0.273 0.262 0.273 0.262 0.273 0.262 0.273 0.262 0.315 0.322 0.321 0.342 0.312 0.342 0.312 0.342 0.312 0.342 0.324 0.342 0.282 0.316 0.284 0.301 0.285 0.302 0.291 0.312 0.292 0.291 0.276 0.292 0.267 0.292 0.267 0.292 0.264 0.276 0.251 0.276 0.258 0.268	2 0.282 2 0.282 2 0.282 2 0.282 2 0.282 2 0.282 2 0.282 2 0.282 2 0.282 3 0.392 2 0.392 2 0.371 3 0.375 3 0.375 3 0.375 3 0.375 3 0.375 3 0.375 3 0.375 3 0.375 3 0.374 5 0.328 1 0.328 2 0.328 1 0.322 2 0.322 3 0.322 3 0.322 3 0.324 1 0.300 1 0.300	0.302 0.302 0.302 0.302 0.302 0.302 0.31 0.335 0.386 0.408 0.373 0.378 0.378 0.378 0.378 0.372 0.348 0.353 0.343 0.362 0.315 0.315 0.317 0.322 0.347 0.349 0.328 0.228	0.325 0.325 0.325 0.325 0.325 0.325 0.325 0.323 0.35 0.377 0.37 0.395 0.374 0.395 0.374 0.386 0.391 0.378 0.347 0.367 0.347 0.367 0.347 0.346 0.331 0.33 0.331 0.334 0.388 0.331 0.322	0.349 0.349 0.349 0.349 0.349 0.349 0.351 0.38 0.391 0.437 0.419 0.431 0.431 0.431 0.431 0.431 0.431 0.431 0.431 0.431 0.431 0.431 0.431 0.431 0.431 0.431 0.431 0.431 0.431 0.431 0.433 0.411 0.432 0.362 0.362 0.362 0.362 0.362 0.362 0.362 0.362 0.362 0.384 0.381 0.426 0.413 0.424 0.394	

Table 36. White Bay - Notre Dame Bay age-disaggregated spring (1988 - 99) and fall (1981 - 91) research gill net catch rates (where columns are ages 3 to 10 and rows are years) and age-aggregated acoustic biomass estimates (1983-98) used as input for integrated catch at age analysis.

WBND	B HERRI	NG - TUNIN	g data					
102								
Spri	ng Rese	arch Gill	Net Catch	Rates				
1988		1999						
1		1 0	.25 0.	50				
3		10						
1	4.7	1.9	22.2	59.6	5.6	4.7	12.0	1.8
1	16.0	43.3	11.2	126.9	182.9	9.7	16.0	24.3
1	83.5	51.6	52.9	16.3	144.6	195.5	11.5	26.5
1	11.0	247.1	28.8	13.7	7.5	84.2	164.3	21.9
1	0.1	21.5	493.7	33.5	13.7	10.3	47.2	127.9
1	1.2	10.9	51.0	359.9	18.8	6.7	13.4	29.7
1	0.6	232.0	14.6	52.1	182.7	14.1	7.6	12.9
1	0.1	18.5	300.1	20.2	45.9	104.1	8.4	9.5
1	0.1	0.9	47.9	286.0	12.7	21.6	74.2	5.2
1	3.2	0.6	3.2	77.1	139.5	8.6	17.6	31.0
1	7.9	117.6	0.2	1.2	10.3	43.3	1.7	6.9
1	6.5	70.3	85.1	1.0	0.4	9.5	15.0	2.8
Fall	Resear	ch Gill Ne	t Catch R	ates				
1981		1999						
1		1 0	.75 1.	00				
1	5.0	1 0	25 2	1 0	5 0	0 F		
1	20.1	1.2	23.2	1.0	5.3	0.5	1.9	0.8
1	50 1	91 /	3.5	1.9	10.8	9.3	0.1	15.5
1	6.4	19 1	01.0	14.1	19.0	2.0	22.4	5.2
1	134 5	19.0	11 6	4.2	0.0	14.U 6 7	0.8	8.5
1	9 0	107 3	12 5	00.1	20 2	2.0	1.5	0.2
1	0.6	38.8	352 0	35 1	16.0	573	2.0	2.1
1	3.9	3.6	18.0	90.4	7 8	6.6	13 3	1.2
1	10.8	20.1	7.6	39.2	123.8	4 1	12 2	25 6
1	120.9	21.1	7.0	3.5	12.1	51.8	7 3	10.8
1	5.2	262.1	15.8	2.4	3.1	10.3	32 3	1 7
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11 0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0

WBNDB	HERRING	- 5	runing	DATA '
	1	18	3	2
'YEAR'	'VPA	,	'ACC	UU'
19	983	-10	l 136	5000
19	984	-10	L 78	3700
19	985	-11	198	3400
19	986	-11	126	5200
19	87	-11	30	900
19	88	-11	1 22	2500
19	989	-11		-11
19	90	-11	l	-11
19	91	-11	l	-11
19	92	-11	104	1500
19	93	-11		-11
19	94	-11	2	2100
19	95	-11		-11
19	96	-11		-11
19	97	-11		-11
19	98	-11	19	200
19	99	-11		-11
20	00	-11	-	-11

Table 37. Bonavista Bay - Trinity Bay age-disaggregated spring (1988 - 99) and fall (1980 - 91) research gill net catch rates (where columns are ages 3 to 10 and rows are years) and age-aggregated acoustic biomass estimates (1984-99) used as input for integrated catch at age analysis.

BBTB	HERRING	G - TUNING	G DATA					
Spri: 1988	ng Res.	Gill Net. 1999	Catch Rat	es				
1		1 0	.25 0.	50				
3		10		00				
1	5.6	0.3	2.3	29.2	0.5	0.4	0 6	0 1
1	2.3	21.8	0.9	5.5	57 7	0.4	0.0	0.1
1	8.8	8.2	27.7	4.5	12 2	60.8	0.0	2.2
1	0.9	50.1	12.0	27.9	3 2	19.8	62.3	3.2
1	0.3	1.2	46.2	8 1	10.3	2.3	17 6	24.0
1	2.6	1.7	8.2	50.6	6.4	7.0	27	34.0 12.1
1	0.7	16.6	9.6	12.6	65 0	6.5	0.0	13.1
1	0.1	34.3	8.2	1.7	4 6	19 9	2.6	7.5
1	0.1	0.9	140.9	20.8	5.3	55	20.8	3.0
1	2.8	0.1	3.3	181.9	23.7	5.6	20.0	167
1	1.2	5.7	0.2	1.7	62 3	4 6	2 1	1 3
1	0.1	17.6	7.2	0.4	0.8	29.8	1 4	1.3
Fall	Res. Gi	ill Net Ca	tch Rates	0.1	0.0	20.0	1.1	0.5
1980		1999						
1		1 0	.75 1.	00				
3		10						
1	1.3	12.8	0.9	4.3	0.3	0.9	0.1	1.9
1	1.9	0.2	0.8	0.2	1.6	0.1	1.2	0.1
1	73.0	19.8	5.0	14.6	0.1	3.0	0.1	0.6
1	8.1	101.9	11.0	4.3	11.5	0.2	4.5	1.0
1	7.6	7.4	57.3	2.3	1.3	2.0	0.1	1.9
1	50.3	4.0	1.8	8.0	5.1	0.1	0.6	0.1
1	5.8	109.9	2.1	2.2	4.6	0.6	0.1	0.8
1	0.3	4.4	43.9	1.9	1.7	1.6	0.5	0.2
1	14.7	1.5	6.3	50.9	1.9	1.6	1.1	0.2
1	3.0	10.3	1.1	4.2	20.8	0.5	1.0	1.0
1	39.9	10.2	8.3	0.5	2.9	13.4	1.3	1.2
1	2.2	56.4	8.1	14.0	1.1	7.5	33.2	2.1
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0

1	BBTB	HERF	ING		TUN	ING	DATA'
		1			17		2
1	YEAR		'VPA	1		'AC	OU '
	1	L984		-	-11	5	9800
	1	L985		-	-11	9	9900
	1	1986		-	-11	2	5700
	1	1987		-	11	1	0400
	1	1988		-	11	2	9700
	1	1989		-	11		-11
	1	1990		-	11	5	1900
	1	1991		-	11		-11
	1	1992		-	11		-11
	1	993			11	2	3100
	1	994		-	11		-11
	1	995			11	1	2300
	1	996		-	11	3	3000
	1	997			11		-11
	1	998			11		-11
	1	.999			11	1	5200
	2	2000			11		-11

Table 38. St. Mary's Bay - Placentia Bay age-disaggregated spring (1982 - 99) research gill net catch rates (where columns are ages 3 to 10 and rows are years) and age-aggregated acoustic biomass estimates (1986-2000) used as input for integrated catch at age analysis.

SMPB	HERRING	(AS+SS)	- TUNING	DATA				
Rese	arch Gil	1 Net Cat	ch Pates					
1982	uren orr	1999	CH Rates					
1		1 0	25 0	5.0				
3		10	.25 0.	50				
1	0.8	1 2	23	16	0.2	1 0	0 5	0.4
ĩ	10.7	11 1	2.5	5.0	4.0	1.9	0.5	0.4
1	24.0	22.7	2.1 CD C	10.7	4.0	0.8	5.4	0.9
1	24.0	32.7	60.6	18./	23.8	8.9	4.4	10.9
T	60.2	42.7	24.1	45.8	16.9	14.3	10.0	5.2
1	1.0	133.6	25.1	27.6	45.7	13.0	3.7	3.9
1	15.7	6.3	160.3	26.5	26.2	24.6	9.6	1 3
1	2.3	5.3	3.9	103.1	11 4	193	11 2	1 3
1	23.6	7.8	5.6	4 9	68 1	6 1	11 6	1.0
1	11 2	20 6	10.0	5 1		20.1	14.0	0.0
1	11.5	20.5	10.2	5.I	1.9	13.2	9.0	18.7
1	1.2	18.8	15.2	4.3	1.4	3.4	9.7	2.0
1	2.8	1.8	25.5	9.1	4.0	1.8	3.6	8.5
1	3.6	4.7	5.3	15.9	6.2	4.1	1.7	2.7
1	15.8	30.8	5.1	2.5	9.7	6.2	5.7	3.9
1	11.6	54.7	4.3	0.4	1.6	3.2	1.8	0.4
1	0.1	55.7	173.6	27.1	9.4	7.6	11.6	3.4
1	8.3	3.8	23.1	75.5	26.3	4.6	6.2	3.5
1	23.4	17.5	5.0	12.6	31.3	12.3	3.4	2.3
1	71.3	32.2	23.6	19.8	18.1	35.7	11.3	3.9

'SMPB	HERRING		TUNING	DATA'
	1		15	2
'YEAR	' 'VP#	7.	'A	COU '
1	1986	-	-11	42200
1	1987		11	-11
1	1988		11	-11
1	1989	-	-11	-11
1	1990	-	-11	39800
1	L991	-	11	-11
1	L992		11	12000
1	1993		11	-11
1	1994		11	43900
1	1995	-	-11	-11
1	1996		11 :	29400
1	1997	-	11	-11
1	1998		11	11600
1	1999	-	-11	-11
	2000		.11	3800

Table 39. White Bay - Notre Dame Bay population numbers at age from integrated catch at age analysis.

		Populati	on Abund	ance (1	January)											
AGE	+	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2	+	934.42	100.33	17.14	25.95	5.14	46.92	10.24	18.58	9.41	8.35	49.54	45.74	19.36	203.88	78.63
m		608.58	765.04	82.14	14.04	21.25	4.20	38.37	8.33	15.21	7.70	6.73	40.16	37.38	15.85	166.92
4	Records	38.69	498.15	626.10	66.59	11.49	17.28	3.42	29.90	6.77	12.40	6.26	5.37	32.55	30.57	12.97
ß		182.82	31.60	405.69	511.33	54.41	9.21	13.69	2.70	22.65	5.50	9.04	5.09	4.10	26.60	24.92
9		52.86	149.53	25.55	329.60	415.80	44.14	7.33	10.79	1.93	15.90	4.42	6.29	4.12	3.34	20.68
5		122.55	43.22	122.37	20.23	264.93	335.52	35.35	5.83	7.90	1.29	12.05	3.56	4.91	3.36	2.67
00		104.77	99.95	35.28	99.53	15.49	210.53	264.87	28.23	4.31	5.20	1.04	9.14	2.89	3.93	2.65
σ		36.97	76.60	81.47	28.29	80.86	11.67	156.90	210.21	20.85	2.84	3.81	0.79	7.25	2.36	3.08
10	-	20.79	30.06	61.48	66.33	21.80	65.45	8.36	117.03	162.35	15.07	2.16	2.81	0.63	5.91	1.90
11		254.20	118.47	28.97	183.83	107.65	166.05	124.41	143.14	309.85	152.27	121.57	59.37	127.14	93.89	49.51
	+ :															

6 x 10 Population Abundance (1 January)

	-															
AGE	·	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	200(
5		5.05	11.19	7.05	83.68	12.72	2.93	32.26	7.23	0.80	0.24	144.65	73.18	15.59	12.00	7.3
m		64.37	4.11	8.16	5.40	68.49	10.42	2.37	25.56	5.92	0.65	0.19	118.40	59.89	12.76	9.8
4		136.49	51.82	3.07	5.74	4.31	54.33	8.18	1.76	20.82	4.81	0.52	0.16	96.16	48.75	10.43
ŝ		10.30	109.09	35.94	2.25	4.15	3.27	29.96	5.85	1.41	16.57	3.54	0.42	0.13	77.07	39.62
9		20.19	8.16	66.09	26.73	1.73	2.82	1.30	16.51	4.42	1.02	8.56	2.69	0.30	60.0	61.13
2		15.59	15.92	5.19	43.47	19.09	1.20	1.81	0.63	11.99	3.01	0.42	6.28	1.82	0.22	0.0
00		2.08	11.63	12.07	3.32	26.09	13.42	0.89	1.15	0.46	8.20	1.26	0.31	4.28	1.31	0.1
0		1.92	1.53	7.64	8.86	2.38	14.76	9.06	0.54	0.83	0.31	3.32	0.92	0.21	3.04	1.02
10		2.44	1.42	0.89	4.95	6.28	1.47	8.10	6.76	0.33	0.43	0.05	2.07	0.47	0.12	2.23
11		26.85	14.71	8.34	12.77	6.37	6.04	10.17	12.34	4.16	1.00	1.41	3.95	1.09	0.32	0.35
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Table 40. Bonavista Bay - Trinity Bay population numbers at age from integrated catch at age analysis.

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AGE		1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2	-	191.66	32.32	3.45	13.29	1.32	4.64	1.95	3.29	0.54	2.03	7.15	21.03	14.75	264.94	55.64
m		588.20	156.92	26.46	2.82	10.88	1.08	3.79	1.58	2.68	0.44	1.65	5.73	17.22	12.08	216.91
4		21.02	480.96	128.46	21.66	2.31	8.55	0.82	2.88	1.27	1.93	0.35	1.13	4.69	14.09	9.87
ſ		22.18	16.93	392.56	105.12	17.73	1.77	6.56	0.55	2.03	0.89	1.41	0.24	0.91	3.81	11.51
9		21.04	18.07	13.51	316.99	85.85	14.37	1.34	4.68	0.34	0.98	0.69	0.92	0.19	0.74	2.93
2		7.90	17.17	14.71	10.95	255.20	67.98	11.62	0.89	3.61	0.26	0.54	0.54	0.73	0.16	0.60
00		66.63	6.14	13.99	11.96	8.58	196.01	51.24	9.46	0.63	2.56	0.17	0.19	0.44	0.58	0.12
σ		1.92	53.32	4.95	11.45	9.65	6.61	141.82	36.35	7.21	0.42	1.86	0.11	0.12	0.36	0.47
10		3.70	1.44	43.22	4.01	9.11	7.01	4.60	95.22	25.79	5.42	0.28	1.23	60.0	60.0	0.29
11		15.35	21.87	0.16	107.44	21.04	35.33	34.97	42.34	92.49	68.77	37.30	22.50	7.12	7.02	10.59
	+ ×	10 ^ 6														

Population Abundance (1 January)

AGE		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
2		10.37	56.95	32.39	132.31	8.08	7.90	38.53	157.45	4.29	2.18	24.82	102.01	18.90	53.92	18.62
m		45.54	8.30	45.40	20.57	107.81	6.60	6.41	31.35	128.53	3.50	1.78	20.31	83.48	15.46	44.10
4		177.43	36.89	6.42	28.26	15.90	85.95	4.95	4.93	24.93	102.18	2.83	1.45	16.56	67.79	12.53
ഹ		8.02	141.26	27.64	5.02	20.14	12.38	59.67	3.60	3.82	19.30	81.41	2.28	1.18	13.35	54.45
0		9.34	6.33	101.04	19.32	3.87	14.93	7.31	38.67	2.65	2.80	14.97	65.00	1.84	0.94	10.53
L-		2.08	7.50	4.88	63.18	14.53	2.82	8.32	4.54	27.84	1.90	2.15	11.90	52.31	1.46	0.73
00		0.46	1.47	5.82	3.29	43.94	11.06	1.82	5.74	3.44	21.04	1.50	1.73	9.64	41.88	1.16
σ		0.08	0.34	1.09	4.12	2.68	33.02	6.83	1.22	4.28	2.56	16.44	1.20	1.40	7.69	33.19
10		0.37	0.05	0.25	0.88	3.18	2.04	21.33	4.72	0.92	3.24	2.01	13.22	0.97	1.12	6.12
11		7.84	8.57	5.63	4.49	5.43	3.51	3.44	11.66	27.59	13.64	13.40	7.14	3.18	4.29	4.27
	++															

x 10 ^ 6

Table 41. St. Mary's Bay - Placentia Bay population numbers at age from integrated catch at age analysis.

	Populati	on Abund	lance (1	January)											
4GE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
0	259.11	21.81	6.79	5.71	18.67	6.41	18.98	3.52	6.37	2.22	6.62	55.00	32.80	13.06	58.72
m	9.59	211.71	17.86	5.56	4.60	14.38	5.18	15.21	2.84	5.19	1.74	5.30	45.03	26.86	10.69
4	84.80	7.76	172.83	14.41	4.25	3.52	9.76	3.88	11.17	2.17	3.65	1.12	4.17	36.86	21.98
ŝ	5.34	65.43	6.24	123.08	11.60	3.27	2.45	6.28	3.01	7.49	1.51	2.78	0.76	3.41	30.16
9	6.01	4.32	51.66	4.30	86.79	9.29	2.48	1.62	4.43	1.96	3.97	1.07	2.07	0.61	2.78
5	5.10	4.85	3.42	37.63	2.94	58.02	6.01	1.73	1.06	3.01	0.98	2.07	0.82	1.69	0.49
00	1.79	3.53	3.72	2.41	24.72	1.95	34.97	4.12	1.30	0.59	1.84	0.38	1.38	0.67	1.38
n	2.15	1.31	2.81	2.43	1.84	14.72	1.28	23.55	2.38	0.86	0.22	1.02	0.24	1.12	0.55
10	0.94	1.68	0.98	1.90	1.77	1.30	9.00	0.78	15.81	1.45	0.62	0.03	0.75	0.19	0.90
11	4.48	12.08	6.44	7.64	9.76	6.72	6.71	14.86	11.19	14.81	8.26	2.82	13.38	8.34	4.28
1	-+														

6 X 10 Population Abundance (1 January)

AGE		1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
2	-	7.45	5.45	9.13	14.96	18.41	3.40	7.02	14.39	59.95	33.27	4.83	15.78	38.48	31.97	19.40
m		48.07	6.10	4.46	7.44	12.25	15.07	2.78	5.74	11.77	49.03	27.21	3.95	12.91	31.34	26.04
4		8.74	39.35	4.99	3.63	6.09	10.01	12.29	2.26	4.67	9.58	39.91	22.17	3.22	10.29	24.9
S		17.96	7.13	32.07	4.08	2.93	4.96	8.12	9.95	1.83	3.78	7.75	32.33	18.00	2.49	7.95
0		24.57	14.66	5.80	25.78	3.16	2.36	3.94	6.40	7.74	1.44	2.96	6.12	25.71	12.10	1.6
2		2.24	20.02	11.97	4.65	18.67	2.54	1.87	3.10	4.96	6.08	1.12	2.33	4.85	16.97	7.9
00		0.38	1.78	16.30	9.73	3.62	14.96	2.00	1.46	2.38	3.86	4.71	0.88	1.84	3.08	10.76
n		1.10	0.27	1.43	13.26	7.74	2.89	11.69	1.54	1.10	1.83	2.96	3.64	0.69	1.10	1.85
10		0.44	0.87	0.21	1.15	10.60	6.15	2.24	8.93	1.15	0.84	1.39	2.27	2.83	0.39	0.63
11		8.28	4.35	1.61	5.60	13.13	11.40	42.16	32.35	59.59	38.32	21.59	9.60	6.21	0.22	0.43
	+															

x 10 ^ 6

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Table 42 . Calculation of Fortune Bay research gillnet catchability coefficient where population numbers are calculated from integrated catch at age (ICA)and adjusted population numbers (Adj. Nos.) exclude the catch; the catchability coefficient (75.20) is then applied to current and historical research gillnet catch rates to calculate population siz

Year	Age	ICA Nos.	Catch	Adj. Nos.	RGN C.R.
1970	5	2640	133	2507	5.6
	6	15930	281	15649	16.7
	7	16670	7894	8776	236.5
	8	500	233	267	2.8
	9	260	16	244	5.6
	10	410	225	185	0.0
	11	470	257	213	8.3
1971	5	47580	23525	24055	168.3
	6	2040	1165	875	15.2
	7	12790	1598	11192	31.5
	8	6600	3514	3086	86.4
	9	200	132	68	0.0
	10	200	148	52	6.2
	11	720	537	183	13.8

Regression Out	tput:
Constant	0
Std Err of Y Est	6283.729
R Squared	0.286
No. of Observations	14
Degrees of Freedom	13
X Coefficient(s)	75.204
Std Err of Coef.	20.540

	Age 5+RGN	Age 5+	Mean	Age 5+	5+ Acous.
	Catch Rate	Pop'n. Nos.	Wgt	Biomass	Biomass
1983	114.4	8602	0.404	3476	
1984	133.7	10052	0.410	4120	
1985	444.5	33432	0.322	10756	
1986	175.7	13211	0.338	4463	4177
1987	690.9	51959	0.280	14529	
1988	517.3	38907	0.290	11279	
1989	913.3	68688	0.325	22330	
1990	377.8	28409	0.342	9727	9984
1991	506.0	38052	0.331	12580	
1992	327.5	24626	0.323	7966	16221
1993	413.0	31060	0.310	9628	
1994	634.6	47724	0.309	14748	
1995	661.0	49710	0.290	14440	
1996	844.2	63486	0.317	20149	
1997	980.0	73700	0.311	22950	15762
1998	1218.2	91614	0.278	25497	
1999	735.7	55329	0.297	16432	12369
2000	641.5	48244	0.31	14964	

Table 43. Catch projections, by stock area, for 2001 and 2002, assuming fixed catches in 2000; also risk analysis of the probability that spawning stock biomass will be less than the respective reference biomass levels of the stock status classification system.

F	Year	Catch (t)	Probability Mature Biomass < Zone 2
~0.00	2001	<100	46%
	2002	<100	44%
0.05	2001	1300	52%
	2002	1180	53%

White Bay - Notre Dame Bay

Bonavista Bay - Trinity Bay

F	Year	Catch (t)	Probability Mature Biomass < Zone 4
0.1	2001	2430	27%
	2002	2020	32%
0.2	2001	4650	32%
	2002	3580	40%

St. Mary's Bay - Placentia Bay

F	Year	Catch (t)	Probability Biomass < Zone 3	Probability Biomass < Zone 4
0.1	2001	1380	29%	82%
	2002	1300	34%	85%
0.2	2001	2620	38%	86%
	2002	2200	46%	88%

Fortune Bay

Year	Catch (t)	Probability Biomass < Zone 3	Probability Biomass < Zone 4
2001	1000	32%	62%
2002	1000	35%	64%
2001	2000	36%	64%
2002	2000	43%	68%



Figure 1. Area map indicating herring stock complexes within the Newfoundland Region.



Figure 2. East and southeast Newfoundland herring landings, 1966-99, for White Bay -Notre Dame Bay (WB-NDB), Bonavista Bay - Trinity Bay (BB-TB), St. Mary's Bay -Placentia Bay (SMB-PB), and Fortune Bay (FB).



Figure 3. Age distribution of herring from the commercial fishery, White Bay - Notre Dame Bay, Bonavista Bay - Trinity Bay, St. Mary's Bay - Placentia Bay, and Fortune Bay, 1997 - 1999.

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Figure 4. Mean weights at age of spring spawning herring, by stock area, and year, from samples collected Janauary to June.

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Figure 6. Age distribution (by number) of herring from the spring research gillnet program, White Bay - Notre Dame Bay, Bonavista Bay - Trinity Bay, St. Mary's Bay - Placentia Bay, and Fortune Bay, 1997 - 1999.

5 6 Agé (years)

AS=4.0% SS=96.0%

efetage 15

10

5 6 Age (years)

AS=20.0% SS=80.0%

age:

0 2 20

10

0

Age (years)



Figure 7. Spring research gillnet catch rates (numbers per days fished), spring spawners only, by stock area and year.



Figure 8. Herring age distributions (by number), 1997-1999, and catch rates (numbers per days fished), 1988-2000, from the spring research gillnet program for White Bay and Notre Dame Bay separately.



Figure 9. Herring age distributions (by number), 1997-1999, and catch rates (numbers per days fished), 1988-2000, from the spring research gillnet program for Bonavista Bay and Trinity Bay separately.



Figure 10. Herring age distributions (by number), 1997-1999, and catch rates (numbers per days fished), 1982-2000, from the spring research gillnet program for St. Mary's Bay and Placentia Bay separately.



Figure 11. Mean fish lengths (mm) by sample and stratum, from the 1998 White Bay - Notre Dame Bay acoustic survey.



Figure 12. Length distributions of biological samples, by stratum, from the 1998 White Bay - Notre Dame Bay acoustic survey.



Figure 13. Area map of Notre Dame Bay indicating survey strata and transects for the 1998 inshore acoustic survey.



Figure 14. Area map of White Bay and Green Bay indicating survey strata and transects for the 1998 inshore acoustic survey.



Figure 15. Distribution and density of herring on transects during the 1998 inshore acoustic survey of White Bay - Notre Dame Bay. Relative densities of herring are represented by expanding black symbols.



Figure 16. Distribution and density of herring on transects during the 1998 inshore acoustic survey of White Bay - Notre Dame Bay. Relative densities of herring are represented by expanding black symbols.



Figure 17. Age distributions of herring from the 1998 and 1994 White Bay - Notre Dame Bay acoustic surveys.



Samples

Figure 18. Mean fish lengths (mm) by sample and stratum, from the 1999 Fortune Bay acoustic survey.



Figure 19. Length distributions of biological samples, by stratum, from the 1999 Fortune Bay acoustic survey.







Figure 21. Distribution and density of herring on transects during the 1999 inshore acoustic survey of Fortune Bay. Relative densities of herring are represented by expanding black symbols.



Figure 22. Age distributions of herring from the 1999 and 1997 Fortune Bay acoustic survey



Figure 23. Mean fish lengths (mm) by sample and stratum, from the 1999 Bonavista Bay - Trinity Bay acoustic survey.



Figure 24. Length distributions of biological samples, by stratum, from the 1999 Bonavista Bay - Trinity Bay acoustic survey.



Figure 25. Area map of Bonavista Bay - Trinity Bay indicating survey strata and transects for the 1999 inshore acoustic survey.



Figure 26. Distribution and density of herring on transects during the 1999 inshore acoustic survey of Bonavista Bay - Trinity Bay. Relative densities of herring are represented by expanding black symbols.



Figure 27. Age distributions of herring from the 1999 and 1996 Bonavista Bay - Trinity Ba acoustic surveys.



Figure 28. Area map of St. Mary's Bay - Placentia Bay indicating survey strata and transects for the 2000 inshore acoustic survey.



Figure 29. Distribution and density of herring on transects during the 2000 inshore acoustic survey of St. Mary's Bay - Placentia Bay. Relative densities of herring are represented by expanding black symbols.



Figure 30. Age distributions of herring from the 2000 and 1998 St. Mary's Bay - Placentia Bay acoustic surveys.



Figure 31. Length distributions of biological samples, by set location, from a 2000 acoustic survey of selected locations along the northeast Newfoundland coast.



Figure 32. Distribution and relative densities of herring during an acoustic survey of selected locations along the northeast Newfoundland coast, January 2000.



Figure 33. Annual parameters derived from commercial gill net logbooks for White Bay - Notre Dame Bay.



Figure 34. Commercial herring gill net set locations, by year, for White Bay - Notre Dame Bay, from commercial gill net logbooks.





Figure 35. Annual abundance indices derived from commercial gill net logbooks for White Bay - Notre Dame Bay.



Figure 36. Annual parameters derived from commercial gill net logbooks for Bonavista Bay -Trinity Bay.



Figure 37. Commercial herring gill net set locations, by year, for Bonavista Bay - Trinity Bay, from commercial gill net logbooks.









Figure 39. Annual parameters derived from commercial gill net logbooks for St. Mary's Bay - Placentia Bay.





Figure 40. Commercial herring gill net set locations, by year, for St. Mary's Bay - Placentia Bay and Fortune Bay from commercial gill net logbooks.



Figure 41. Annual abundance indices derived from commercial gill net logbooks for St. Mary's Bay - Placentia Bay.



Figure 42. Annual parameters derived from commercial gill net logbooks for Fortune Bay.


Figure 43. Annual abundance indices derived from commercial gill net logbooks for Fortune Bay.



Figure 44. Responses to questions regarding abundance (numbers) of herring in home bay in current and previous year (left panels) compared to when you first started fishing herring (right panels). Solid circles represent means for the current year; x's represent means for the previous year as estimated during the current year. Vertical lines represent range of responses; samples sizes are listed above each vertical line and bar.

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Figure 45. Age range and fishing experience of purse seine fishers. Solid circles represent means for the current year, vertical lines represent the range of responses, and sample sizes are listed above each line.

White Bay - Notre Dame Bay







Bonavista Bay - Trinity Bay















Figure 46. Responses to questions regarding bays fished (left panels) and months fished (right panels). Solid circles (right panels) represent means, horizontal bars represent the range of responses, and sample sizes are listed at the top.



Figure 47. Responses to questions regarding the number (left panels) and size (middle panels) of herring schools detected (per day) during the fishery in the current year compared to the previous year, and abundance during current fishery compared to when you firs started fishing herring (right panels). Sample sizes are listed above each bar.



Figure 48. Responses to question regarding locations of successful sets (sets in which herring were caught) in White Bay - Notre Dame Bay (WB-NDB).



Figure 48 (cont.'). Responses to question regarding locations of successful sets (sets in which herring were caught) in Bonavista Bay - Trinity Bay (BB-TB).



Figure 48 (cont.'). Responses to question regarding locations of successful sets (sets in which herring were caught) in St. Mary's Bay - Placentia Bay (SMB-PB).

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Figure 49. Responses to question regarding why herring were discarded during the fishery; sample sizes are listed by each bar.



Figure 50. Responses to questions regarding the amount of herring discarded during the fishery in the current year compared to the previous year (left panels), and responses regarding the seasonal timing of herring migration in the current year compared to the previous year (right panels). Sample sizes are listed above each bar.

White Bay - Notre Dame Bay



Bonavista Bay - Trinity Bay







Figure 51. Comparison of age 5+ integrated catch at age biomass estimates for WB-NDB, BB-TB, and SMB-PB from this assessment and 1998 assessment.



		CONTRACTOR OF A DESCRIPTION OF A DESCRIP	and the second distance of the second s			
Zone	Stock Status	F	Type of Fishery			
1	Very Poor	0.00 - 0.05	Scientific			
2	Poor to Moderate	0.05 - 0.10	Restricted			
3	Moderate to Good	0.10 - 0.20	Commercial			
4	Good to Very Good	>=0.20	Accelerated			

Figure 52. Definition of zones, descriptors, and exploitation rates for east and southeast Newfoundland herring stock status classification system.

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White Bay - Notre Dame Bay Stock Status Classification System

Β



Figure 53. Panel A: Comparison of age 5+ biomass estimates from ICA with abundance indices. Panel 2: Stock status classification zones and projected 2001 mature biomass estimate.



Bonavista Bay - Trinity Bay Stock Status Classification System

Β



Figure 54. Panel A: Comparison of age 5+ biomass estimates from ICA with abundance indices. Panel 2: Stock status classification zones and projected 2001 mature biomass estimate.



Β

St. Mary's Bay - Placentia Bay Stock Status Classification System



Figure 55. Panel A: Comparison of age 5+ biomass estimates from ICA with abundance indices. Panel 2: Stock status classification zones and projected 2001 mature biomass estimate.





Β

Fortune Bay Stock Status Classification System



Figure 56. Panel A: Comparison of age 5+ biomass estimates with abundance indices. Panel 2: Stock status classification zones and projected 2001 mature biomass estimate.

1000 800 600 400 200 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 Year Class

White Bay - Notre Dame Bay









Figure 57. Estimates of recruitment of spring spawning herring at age 2, by stock area, from integrated catch at age analysis.

Appendix 1. Commercial gill net logbook, revised in 1998.

Newfoundland East and Southeast Coast 2001 Herring Fixed Gear Logbook Program

Fishing Logsheets for the Enhanced Collection of Scientific Data

Name:	
Mailing Address:	
Community:	
Postal Code:	
Phone No.:	
F.I.N. #:	
Location Fished:	

Net	Number of Nets Fished	Size of Each Net						
Mesh Size	per Mesh Size	Length (fathoms)	Depth (fathoms)					
2 1/4"								
2 1/2"								
2 5/8"								
2 3/4"								
2 7/8"								
3"								

Comments:		

Please answer the following questions as accurately as possible:

	1. Using a scale of 1 to 10, with 1 being the lowest and 10 being the highest, how abundant (fish numbers) were herring in your fishing area in 2001 ? (Check one box)
	1 2 3 4 5 6 7 8 9 10 ?
	2. Using a scale of 1 to 10, with 1 being the lowest and 10 being the highest, how abundant (fish numbers) were herring in your fishing area in 2000 ? (Check one box)12345678910?
	3. Do herring spawn each year in your area? If so, in what geographical location(s)?
	4. Using a scale of 1 to 10, with 1 being the lowest and 10 being the highest, how intense was herring spawning in your fishing area in 2001 ? (Check one box)
	1 2 3 4 5 6 7 8 9 10 ?
Ple	ase complete and return to: John Wheeler Science, Oceans, and Environment Branch Dept. Fisheries and Oceans P. O. Box 5667 St. John's NF A1C 5X1

Appendix 1 (cont.'). Commercial gill net logbook, revised in 1998.

Newfoundland East and Southeast Coast 2001 Herring Fixed Gear Logbook Program

		1	,	lumbo	r of Not			Nisshta	Fisher		ah Oʻ	_	
		21	2 1/4" 2 1/		72" 2 5/8"		2 3/4"		Dy Mesh Size		3		
Month	Day	# of Nets Hauled	# of Nights Fished										
										-			
										-			
					1								
					-								
	1												

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F.I.N.#

Appendix 2. Assessment Review Proceedings

Assessment Deliberations

Prior to the assessment meetings, the Herring Working Group of the Small Pelagics Advisory Committee met on October 16, 2000. An overview of all information available for the assessment was presented to the group for their review and comments. There was general agreement among members of the Working Group that the information provided reflected their views of stock status. There were several comments and questions. It was noted by fishers that small herring were abundant in White Bay in 1999 but disappeared in 2000. This has been the case for several years, ie. good evidence of small herring but never materalizing as large herring. It was suggested both by fishers and the assessment biologist that increased predation by seals may be a factor limiting herring stock sizes along the northeast coast. With regard to the commercial gill net logbook program, it was suggested by a fisher to check on the number of fixed gear licences by bay to better understand why logbook return rates have been so low. The assessment biologist recommended to fishers to stress the importance of these logbooks to other fishers in their respective areas. Another fisher suggested that commercial gill net fishers be contacted after the fishery each year to record their views regarding abundance in a similar manner to the purse seine questionnaires. The assessment biologist indicated that this may not be possible due to limited resources within Science. There was a general comment that too many conclusions were being drawn from limited data from both the commercial gill net logbooks and from the research gill net program. A specific point was raised regarding the commercial gill net fishery in Trinity Bay. Information from the commercial gill net logbooks indicated increased catch rates in the area in 1999 and 2000. This was contrary to research gill net trends in the same area. It was suggested that prior to 1999, there was little interest in the gill net fishery in the area due to poor market conditions. However, in 1999 and 2000, markets were available and there was increased interest. Consequently, in these years, the fixed gear fishery became more mobile, with fishers moving their gear to target known concentrations of herring. The research gill net program, fixed in location, would not necessarily detect similar trends.

An ad hoc Regional Assessment Review Committee met on October 16th, 19th, and 27th, 2000 to review the status of east and southeast Newfoundland herring and to prepare a Stock Status Report. There was no Chair assigned by the Branch for the assessment; consequently, the meetings were coordinated by the assessment biologist, John Wheeler. Participants at the meetings included representatives from Science, Oceans and Environment Branch (Jim Carscadden, Brian Nakashima, Fran Mowbray, Brad Squires, Paul Williams, and Dale Parmiter) and from Fisheries Management Branch (Bruce Mayne).

During the first meeting on October 16, 2000, John Wheeler presented five working papers: 1) Description of the east and southeast Newfoundland 1998 and 1999 commercial herring fisheries and commercial catch at age, 2) Results from east and southeast Newfoundland herring commercial fixed gear logbooks for 1998 - 2000, 3) Results of east and southeast Newfoundland herring purse seine questionnaires for 1998 to 2000, 4) Results of the east and southeast Newfoundland herring research gill net program for 1998 - 2000, and 5) Distribution and abundance of Atlantic herring from acoustic surveys of: White Bay - Notre Dame Bay in November - December 1998, Fortune Bay in March 1999, Bonavista Bay - Trinity Bay in November - December 1999, northeast Newfoundland coast in January 2000, and St. Mary's Bay - Placentia Bay in March - April 2000. These papers formed the basis of the assessment and have been incorporated in Research Document 2001/018. John Wheeler also presented ecological information from Hammill and Stenson (2000) on the increased consumption of herring in Atlantic Canada from 1990 to 1996.

There was a general discussion of the five working papers during the first meeting. It was noted that landings for bait purposes are not included with commercial catch statistics. It was questioned (but not resolved) whether the percentage of bait landings had increased in recent years due to the increased requirements for bait in the crab fishery. With regard to the commercial gill net log books, it was suggested that average soak time would be a better indicator of effort than nights fished. There were also guestions regarding how many logs were from fishers who fished commercially rather than for bait only and if differences existed in the catch rates between the two. It was concluded that it would be difficult to use commercial gill net catch rates in a guantitative analysis due to the limited sample sizes. There were suggestions on how to increase the sample size of commercial gill net logbooks, including a directed phone survey or contacting selected fishers each month to remind them. With regard to the research gill net program, it was suggested that fishers be asked for perceptions of abundance in a similar manner to commercial gill net log books. A general discussion ensued regarding how stock sizes should be estimated. It was suggested that a more general approach could be taken and use the various abundance indices as indicators of stock status. It was concluded that, if possible, stock specific mature biomass estimates should be derived in a similar manner to the 1998 assessment of these stocks.

At the second meeting on October 19, 2000, a working paper was presented on the estimation of stock sizes of east and southeast Newfoundland herring to 2000. It was noted that changes had to be made to the input parameters of the integrated catch at age analysis for White Bay - Notre Dame Bay from the 1998 assessment for the model to run. Similarly, for St. Mary's Bay - Placentia Bay, the integrated catch at age analysis was possible to 1999 but not to 2000. There was a discussion of the impacts of these changes; however, the expertise was not available fully assess these changes. It was suggested that changes should be contemplated for future assessments of these stocks as the current model is marginalized and constricted by the available catch and effort data. There was a discussion regarding the increased consumption of herring by seals and the effect of this on mortality estimates in the integrated catch at age model. It was not possible to quantify these changes so mortality estimates were unchanged in the model. It was decided to include a section on the consumption estimates for seals in the stock status report. It was concluded to use the integrated catch at age analysis to estimate stock sizes for White Bay - Notre Dame Bay, Bonavista Bay - Trinity Bay, and St. Mary's Bay - Placentia Bay, and to use a catchability coefficient analysis to estimate Fortune Bay stock size. This follows the methods used in 1998.

A draft stock status report was circulated to assessment committee members on October 24, 2000 for their comments and review. At the third meeting on October 27, 2000, a final stock status report was drafted. This was submitted to the Director's office on October 31, 2000 for release to the general public. Editorial changes were requested by the Director on October 13, 2000. These were incorporated prior to the release of the stock status report on October 20, 2000.

Management Deliberations

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The Herring Working Group of the Small Pelagics Advisory Committee met on October 16th to review the stock status report. As it had not yet been released by the Director's office (Science), a draft report only could be reviewed. The working group expressed some concern regarding the implications of quota reductions in White Bay - Notre Dame Bay and in Fortune Bay. The group concluded its meeting with a series of stock specific recommended catch levels, consistent with the stock status classification system.

The Small Pelagics Advisory Committee met in Gander on December 11, 2000 to provide recommendations for the 2001 - 2002 Integrated Herring Management Plan. An overview of the stock assessment process was provided by John Wheeler. The recommendations of the Herring Working Group were then presented for review.

A draft 2001 - 2002 Integrated Herring Management Plane was formulated based upon the recommendations of the Herring Working Group and the Small Pelagics Advisory Committee. Up to the time of publication of this Research Document, the final management plan had not been released.