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An Assessment of Newfoundland East and South Coast Herring Stocks to the Spring of 2011

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Foreword

This series documents the scientific basis for the evaluation of aquatic resources and ecosystems in Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

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ABSTRACT

Results of an assessment to the spring of 2011 are presented for four herring stocks along the east and southeast coasts of Newfoundland: White Bay-Notre Dame Bay, Bonavista Bay-Trinity Bay, St. Mary's Bay-Placentia Bay and Fortune Bay. Commercial landings decreased from 7405 t in 2009 to 6285 t in 2010; this represented approximately 47 % of the 2010 total Allowable Catch (TAC). Complete landings data were not available for 2011 at the time of the assessment. Where spring spawners were historically predominant in these stocks, over the past decade autumn spawners have accounted for an increasing proportion of the catch in all stock areas except Fortune Bay, and in 2010 composed more than 75 % of commercial landings. The 2002 year class was dominant in 2010 catches in all areas except St. Mary's Bay-Placentia Bay. In all four stock areas the 2010 catch rates of most of mature autumn spawning year classes were average or above, where those for spring spawning year classes were largely below average. The recruiting 2006 year class was at or above average for all stock areas except Fortune Bay. Five series of abundance indices were available for most of the stock areas: research gill net catch rates, commercial gill net catch rates, gill net fisher observations from logbooks, gill net fisher observations from phone surveys, and purse seine fisher observations. No quantitative modeling of the stocks was done due to limited data. Stock status and future prospects were summarized for each stock area in a performance report. These reports were based upon a standardized interpretation of abundance indices and biological characteristics. For White Bay and Notre Dame Bay, stock status improved from 2002 to 2008, but deteriorated since. For Bonavista Bayand Trinity Bay, stock status improved from 2002 to 2007, deteriorated from 2008 to 2010 and improved slightly in 2011. For St. Mary's Bay–Placentia Bay, stock status deteriorated from 2001 to 2004, remained stable to 2010 and increased slightly in 2011. For Fortune Bay, stock status deteriorated from 2001 to 2004, increased slightly in 2005, declined in 2006 and remained stable to 2010, then decreased again in 2011. For all areas, current abundance is substantially lower than peak estimates, most of which occurred in the 1970's. Future prospects of all stock areas are uncertain, except Fortune Bay, which is negative.

Une évaluation des stocks de hareng des côtes est et sud de Terre-Neuve jusqu'au printemps 2011

RÉSUMÉ

Les résultats d'une évaluation jusqu'au printemps 2011 sont présentés pour quatre stocks de hareng le long des côtes est et sud de Terre-Neuve : baie Blanche – baie Notre Dame, baie de Bonavista – baie de la Trinité, baie St. Mary's – baie Placentia, et baie de Fortune. Les débarquements commerciaux sont passés de 7 405 t en 2009 à 6 285 t en 2010, représentant environ 47 % du total autorisé des captures (TAC) de 2010. Les données complètes sur les débarquements de 2011 n'étaient pas disponibles au moment de l'évaluation. Aux endroits où les reproducteurs de printemps prédominaient autrefois dans ces stocks, au cours de la dernière décennie, les reproducteurs d'automne ont constitué une proportion croissante des prises dans toutes les zones de stock, à l'exception de la baie de Fortune; en 2010, ils représentaient plus de 75 % des débarquements commerciaux. La classe d'âge de 2002 était dominante dans les prises de 2010 dans toutes les zones, sauf dans la zone baie St. Mary's – baie Placentia. Dans les quatre zones de stock, en 2010, les taux de prise de la majorité des classes d'âge de reproducteurs d'automne matures se situaient dans la moyenne ou au-delà de la moyenne, tandis que les classes d'âge des reproducteurs de printemps se situaient bien en dessous de la moyenne. Le recrutement de la classe d'âge de 2006 se situait dans la moyenne ou sous la moyenne dans toutes les zones de stock, sauf dans la baie de Fortune. Cinq séries d'indices de l'abondance étaient disponibles pour la plupart des zones de stock : taux de prise lors d'activités de recherche au filet maillant, taux de prises lors de la pêche commerciale au filet maillant, observations de pêcheurs au filet maillant tirées de journaux de bord, observations de pêcheurs au filet maillant dérivées de relevés téléphoniques, et observations de pêcheurs à la senne coulissante. Aucune modélisation quantitative des stocks n'a été réalisée en raison des données limitées. L'état du stock et les perspectives futures ont été résumés pour chaque zone de stock dans un rapport sur le rendement. Ces rapports étaient basés sur une interprétation normalisée des indices de l'abondance et des caractéristiques biologiques. En ce qui concerne la zone baie Blanche – baie Notre Dame, l'état du stock s'est amélioré de 2002 à 2008, mais s'est détérioré depuis. Dans la zone baie de Bonavista – baie de la Trinité, l'état du stock s'est amélioré de 2002 à 2007, s'est détérioré de 2008 à 2010, puis s'est légèrement amélioré en 2011. En ce qui a trait à la zone baie St. Mary's – baie Placentia, l'état du stock s'est détérioré de 2001 à 2004, est demeuré stable jusqu'en 2010, puis a légèrement augmenté en 2011. L'état du stock de la baie de Fortune, quant à lui, s'est détérioré de 2001 à 2004, a augmenté légèrement en 2005, a décliné en 2006, est demeuré stable jusqu'en 2010, puis a diminué de nouveau en 2011. Dans toutes les zones, l'abondance actuelle est beaucoup plus faible que les sommets des estimations, qui ont pour la plupart été atteints dans les années 1970. Les perspectives futures de toutes les zones de stock sont incertaines, sauf celles de la baie de Fortune, qui sont négatives.

INTRODUCTION

There are five herring stocks in the coastal waters of east and south Newfoundland (Fig. 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). These stock complexes were defined from tagging experiments conducted in the 1970's and early 1980's (Wheeler and Winters 1984). In addition, herring occur along the south coast from Cape Ray to Pass Island; the affinities of these herring are uncertain. This document provides an assessment of four stocks to the spring of 2011. Conception Bay-Southern Shore was excluded due to a lack of scientific data; landings data only are provided for that area.

In recent years, the WB-NDB, BB-TB, SMB-PB and FB stocks have been assessed bi-annually, most recently in the autumn of 2009 as part of an assessment framework and review was held to review the state of scientific knowledge of the stocks and develop an assessment framework for the five-year period of 2010-14 (Wheeler et al. 2010). The same data sources were available for this assessment as in 2009. As in the previous assessment, a shift from historically predominant spring spawners to fall spawners has been observed in both commercial and research samples in most areas. This necessitated the calculation of catch rates for both spawning components. The apparent change in stock composition has led to the recommendation that another assessment framework and review be held in the coming year to re-evaluate assessment methods, as those currently used are focused largely on the spring spawning component and do not adequately account for fall spawners at their current levels.

During the 2009 framework assessment, over 40 research recommendations were made based on the assessment meeting and a report produced by the Fisheries Resource Conservation Council's report in the same year (FRCC 2009). Many of these recommendations have been addressed in this assessment, particularly those regarding the investigation of the spring and autumn spawning components. Some recommendations were not addressed in this assessment due to insufficient resources and data availability (e.g., reinstituting acoustic surveys).

This document is divided into several sections. The first section examines commercial fishery data and the biological sampling used to calculate 2009 and 2010 commercial landings at age. The second section examines the Research Gill Net program to date, and the impacts of potential changes to the program in the future. The following section examines abundance indices; including research gill net catch rates, commercial gill net catch rates, and gill net and purse seine fisher observations. The fourth section examines biological data, including lengths and weights at age, and recruitment. The fifth section includes performance reports on the current status and future prospects of each stock; an analytical assessment has not been attempted to estimate stock biomass. The document concludes with a section on sources of uncertainty.

THE 2009 AND 2010 COMMERCIAL FISHERIES AND LANDINGS AT AGE

COMMERCIAL LANDINGS AND BIOLOGICAL SAMPLING

Policy and Economics Branch provides commercial landings data (t), by bay, month and gear type (Tables 1–5 and Fig. 2). Data for 2009-11 are considered preliminary, as statistics have not yet been finalized. For 2011, landings are available to November 14th only and are provided only as an indicator of commercial landings for the year, not total landings.

Commercial statistics since 1996 do not include landings for bait purposes (largely for the lobster fishery) or discards from the commercial fishery. In 2009 it was decided that estimates of

bait landings and discards should be included in commercial landings data, as the exclusion of these numbers represented a significant source of uncertainty. The annual herring fixed gear phone survey (Table 6), which was implemented in 2006, gathers information from fixed gear licence and/or bait permit holders, including estimates of gill net bait catch. In 2009 the estimates provided by this survey were applied directly to commercial landings for 2007 and 2008. As it was recommended that this practice continue (Wheeler et al. 2010), bait estimates from the 2009 and 2011 surveys (there was no survey in 2010) were directly applied to commercial landings for this assessment.

For the years prior to the 2009 assessment without bait statistics or phone surveys (1996-2006), bait estimates were back-calculated by averaging the estimates taken from the 2007 and 2008 surveys by stock area, and applying them to the numbers of active lobster fishers each year to estimate total bait catches (Wheeler et al. 2010). Because there was no fixed gear phone survey in 2010, the same procedure was applied to derive bait estimates for each stock area, this time using the mean estimate from the 2007, 2008, 2009 and 2011 phone surveys.

All bait estimates were applied to the month of May for one bay in each stock area (WB, BB, SMB and FB), as this is the primary month of the lobster fishery. However, there were indications in the 2011 phone survey and through commercial logbooks that some fishers feel herring are arriving in their areas later than usual (after the lobster season) so they have been or will be fishing for bait in the fall. This will need to be considered for the application of future bait estimates to commercial landings.

It was recommended in 2009 that an analysis be conducted to determine the impact of using mean bait estimates from more phone surveys (vs. 2 years, as was done for the 2009 assessment). This was done using 4 years of data. For FB, bait estimates did not change; in BB-TB and SMB-PB bait estimates were lower, but not more than 6 %. In WB-NDB however, the estimates were 27 % lower when the 4 year average was used (Table 7). This may be due to lower than usual bait estimates for that area in 2009 and 2011 (Table 8). Other sources of information on bait catches are being investigated, including lobster logbooks and the potential of instituting mandatory herring logbooks.

Biological samples, collected each year from random samples of the commercial herring fisheries, provide age distributions of the commercial landings. In 2009, 1445 herring were sampled and aged to calculate numbers at age for 7400 t of landings; in 2010, 1599 herring were sampled and aged to calculate numbers at age for 6285 t of landings (Tables 9-12). In the year 2011 samples were still being collected at the time of the assessment.

THE 2009 FISHERY

Prior to the 2009 fishery, Fisheries and Aquaculture Management Branch formulated a new one year integrated management plan for east and south coast Newfoundland herring (DFO 2009). Total Allowable Catches (TAC's) increased in WB-NDB and BB-TB, and decreased in SMB-PB and FB (Tables 1, 2, 4 and 5). Landings increased slightly from 7500 t in 2008 to 7520 in 2009; 60 % of the overall TAC was landed in 2009 (Tables 1, 2, 4, and 5, and Fig. 2). Allocations for certain gears (purse seines, bar seines and traps) were met and/or exceeded in some areas; allocations for gill nets were not met in any area.

In WB-NDB landings decreased from 714 t in 2008 t to 425 t in 2009; 19 % of the TAC was taken in 2009 (Table 1). The 2001 and 2002 year classes accounted for 20 % of the total landing numbers each (Table 9 and Fig. 3). The age distribution was extensive, as 6 year classes (includes fish age 11+) each accounted for greater than 5 % of the landings. Spring spawners accounted for 50 % of the landings, up 8 % from 2008 (Table 9, Fig. 7).

In BB-TB landings increased from 2829 t in 2008 to 3183 t in 2009; 70 % of the TAC was taken in 2009 (Table 2). The 2002 year class accounted for 25 %of landing numbers, followed by the 2000 and 2001 year classes with 15 % each (Table 10 and Fig. 4). The age distribution was extensive, as 5 year classes (includes fish age 11+) each accounted for greater than 5 % of the landings. Spring spawners accounted for 29 % of landings, a decrease of 21 % from 2008 (Table 10 and Fig. 8)

In SMB-PB landings increased slightly from 1148 t in 2008 to 1407 t in 2009; 63 % of the TAC was taken in 2009 (Table 4). The 2000 and 2001 year classes each accounted for 25 % of the total landings, followed by the 1999 and 2002 year classes with 15 % each (Table 11 and Fig. 5). The age distribution was extensive, as 5 year classes (includes fish age 11+) each accounted for greater than 5 % of the total landings. Spring spawners accounted for 16 % of landings, only a 1 % increase from 2008 (Table 11 and Fig. 9).

In FB landings decreased from 2550 t in 2008 to 2361 t in 2009; 82 % of the TAC was taken in 2009 (Table 5). The 2002 year class accounted for 45 % of landings, with fish aged 11+ accounting for a further 30 % (Table 12 and Fig. 6). The age distribution was truncated, as only 3 year classes (includes fish age 11+) each accounted for greater than 5 % of the landings. Spring spawners constituted 86 % of the total landings, down 7 % from 2008 (Table 12 and Fig. 10).

THE 2010 FISHERY

Prior to the 2010 fishery, Fisheries and Aquaculture Management Branch formulated a new 2 year (2010 and 2011) integrated management plan for east and south coast Newfoundland herring (DFO 2010). The TAC's increased in WB-NDB and BB-TB, and remained the same in SMB-PB and FB (Tables 1, 2, 4 and 5). Landings decreased from 7500 t in 2009 to 6300 t in 2010; approximately 47 % of the total TAC was taken in 2010 (Tables 1, 2, 4 and 5, and Fig. 2). Allocations for certain gears (purse seines, tuck seines, bar seines and traps) were met and/or exceeded in some areas; allocations for gill nets were not met in any area.

In WB-NDB, landings increased from 425 t in 2009 to 524 t in 2010; 20 % of the TAC was taken in 2010 (Table 1). The landings attributed to traps were 89 t in 2010, the highest reported landing for this gear type since 2005. Preliminary results for 2011 suggest that trap catches will be even higher for this year when finalized (Table 1). The 2002 year class accounted for 18 % of the 2010 catch, and the 1999 year class 17 % (Table 9 and Fig. 3). The age distribution was extensive, with 7 year classes (including fish age 11+) each accounting for greater than 5 % of the landings. Spring spawners accounted for 23 % of landings, a decrease of 26 % from 2009 (Table 9 and Fig. 7).

In BB-TB, landings decreased from 3183 t in 2009 to 2131 t in 2010; 43 % of the TAC was taken in 2010 (Table 2). The 2000 and 2005 year classes accounted for 20 % of the catch each (Table 10 and Fig. 4). The age distribution was extensive as 6 year classes (includes fish age 11+) each accounted for greater than 5 % of the landings. Spring spawners accounted for 27 % of landings, a decrease of 19 % from 2009 (Table 10 and Fig. 8).

In SMB-PB, landings decreased from 1407 t in 2009 to 1006 t in 2010; 45 % of the TAC was taken in 2010 (Table 4). The 1999, 2000, 2001 and 2002 year classes each accounted for about 15 % of the landings, with fish aged 11+ accounting for 20 % (Table 11 and Fig. 5). The age distribution was extensive, as 6 year classes (includes fish age 11+) each accounted for greater than 5 % of the landings. Spring spawners accounted for 29 % of landings, an increase of 12 % from 2009 (Table 11 and Fig. 9).

In FB, landings increased from 2361 t in 2009 to 2624 t in 2010; 91 % of the TAC was taken in 2010 (Table 5). Fish aged 11+ accounted for 45 % of landings, and the 2002 year class

accounted for almost 50 % (Table 12 and Fig. 6). The age distribution was truncated, as only 2 year classes (includes fish age 11+) each accounted for greater than 40 % of the landings. Spring spawners accounted for 98 % of landings, an increase of 12 % from 2009 (Table 12 and Fig. 10).

CONCEPTION BAY – SOUTHERN SHORE

Landings data are available for CB-SS (Table 3). Biological sampling data for this area is not presented in this assessment. In CB-SS, 29 t was landed in 2009; this represented approximately 5 % of the TAC, and in 2010 40 t were landed, representing 7 % of the TAC.

RESEARCH GILL NET PROGRAM

This program, initiated in 1980, provides standardized age disaggregated abundance indices independent of the commercial fishery. In the current program, 27 commercial fishers are contracted each spring to provide catch rate data and biological samples of their catch. Each fisher is provided with a standardized fleet of 5 herring gill nets; the stretched mesh size of these nets measuring 50.8 mm, 57.2 mm, 63.5 mm, 69.9 mm, and 76.2 mm respectively. Each net is 32 m long and 9 m deep, with the exception of the 50.8 mm mesh net, which is 5 m deep. These nets are set in a fixed location and until 2009, were fished for a period of 30 days each spring. From 2009 onward, this period was extended to 45 days to compensate for suspected changes in spawning times. Fishers are required to haul the nets once a day (weather permitting) for the duration of the contract, to maintain an accurate daily log record of their catch, and to collect and freeze specified samples of their catch at 8 regular intervals during the month. Multiple locations are fished annually in each stock area. Over time, some locations have been changed; however, spatial coverage has been maintained to ensure an adequate distribution of effort throughout each stock area.

The spring research gill net program provides the only abundance index which is standardized and independent of the commercial fishery. It is also the index with the longest time series. Options to align/modify this program so that it produces the minimum necessary data and is run in the most efficient manner were discussed.

It was determined that the only scenario where a reduction could be implemented without considerably compromising the validity of the index would be to reduce the fishing period from 45 days back to 30 days (the period used up to 2009). Based on current data, it was found that doing so would not significantly impact the research gill net catch rates ($x^2 = 5.2281$, $p = 0.8140$), however the sample size was small. In addition, this action would not make the program any more cost efficient to run and may discourage fisher participation. To determine if there had been a significant change in catch or effort over the course of the research gill net program, the mean weighted day of catch and effort were examined for the time series, by bay (Fig. 11 and 12). There were no significant long term trends observed in either parameter.

The other scenarios put forward included reducing the number of fishers in some or all stock areas, reducing the number of stock areas included in the program, and eliminating the program entirely. None of these were considered to be viable options as the number of current fishers cannot be lowered without increasing uncertainly in catch rates to an unacceptable level, and all stock areas need to be monitored to provide advice for the commercial fishery. Eliminating the program completely would mean the loss of the only standardized abundance index available, without which assessments could not be conducted.

ABUNDANCE INDICES

RESEARCH GILL NET PROGRAM

Since 2008, 27 fishers participated in the program (Table 13 and Fig. 13), 8 in WB-NDB, 9 in BB-TB, 6 in SMB-PB and 4 in FB. Catch rates (numbers per nights fished) are available from 1988 to 2011 for WB-NDB and BB-TB and from 1982 to 2011 for SMB-PB and FB (Fig. 14). Catch rates at age are available up to and including 2010 only (Tables 14-17 and Figs. 15-18), as biological samples for 2011 were not processed at the time of the assessment.

In WB-NDB, catch rates of spring and autumn spawners combined decreased from 218 (fish per nights fished) in 2009 to 114 in 2010 and then 30 in 2011 (Table 13). The 2011 catch rate for both spawning components combined was well below average (Fig. 14); just 5 % of the long-term mean (1988-2011). Catch rates decreased significantly from 1992 to 2002, and then increased again until 2007 to reach the long-term mean, they have decreased steadily since with 2011 having the lowest catch rate in the time series. Though the spring research gill net program was meant to target spring spawning herring, over the past decade there has been an increase in the catch rate of fall spawners, as well as the proportion in the catch (Fig. 15 and 19). In 2010 the 2002 year class accounted for 22 % of catch numbers (Table 14 and Fig. 15). The age distribution was extensive, as 7 year classes (includes fish age 11+) each accounted for greater than 5 % of the catch. Spring spawners accounted for 59 % of the catch, an increase of 31 % from 2009 (Fig. 19).

In BB-TB, catch rates of spring and autumn spawners combined decreased from 147 (fish per nights fished) in 2009 to 117 in 2010, then increased to 123 in 2011 (Table 13). The 2011 catch rate was below average (Fig. 14), at 82 % of the long-term mean (1988 – 2011). Catch rates of both spring and fall spawners increased significantly from 2002 to 2007, with fall spawners making up an increasing proportion of the catch (Fig. 16). In 2010, the 2002 year class accounted for 20 % of catch numbers, followed by the 2000 and 2003 year classes with 15 % of the catch each (Table 15 and Fig. 16). The age distribution was extensive, as 7 year classes (includes fish age 11+) each accounted for greater than 5 % of the catch. Spring spawners accounted for 48 % of the catch, an increase of 9 % from 2009 (Fig. 20).

In SMB-PB, catch rates of spring and autumn spawners combined decreased from 127 (fish per nights fished) in 2009 to 81 in 2010, and again to 65 in 2011 (Table 13). The 2011 catch rate was below average (Fig. 14), 38 % of the long-term mean (1982 – 2011). In 2010, the 2003 and 2006 year classes accounted for 20 % of catch numbers each (Table 16 and Fig. 17). The age distribution was extensive, as 7 year classes (includes fish age 11+) each accounted for greater than 5 % of the catch. Spring spawners accounted for 57 % of the catch, a decrease of 8 % from 2009 (Fig. 21).

In FB, catch rates of spring and autumn spawners combined decreased from 375 (fish per nights fished) in 2009 to 276 in 2010, and to 63 in 2011 (Table 13). The 2011 catch rate was below average (Fig. 14), 11 % of the long-term mean (1982 – 2011). In 2010, the 2002 year class accounted for over 25 % of catch numbers (Table 17 and Fig. 18). The age distribution was extensive, as 5 year classes (includes fish age 11+) each accounted for greater than 5 % of the catch. Spring spawners accounted for 63 % of the catch (Fig. 22).

COMMERCIAL GILL NET LOGBOOK PROGRAM

This program, initiated in 1996, provides a time series of CPUE data from the commercial gill net and bait fisheries. Fishers are asked to provide information regarding the number and dimensions of their gill nets, by mesh size. They are also asked to complete a logbook entry for each day that a net or nets are hauled. This entry includes the date, the number of nets hauled

by mesh size, the number of nights that the nets had fished, and the approximate catch weight. Fishers are also asked questions to obtain their perceptions of herring abundance.

Each year, logbooks are sent to approximately 2500 licensed fishers and/or bait permit holders from WB to FB, including CB-SS. The return of logbooks is voluntary and the numbers returned are generally low. In 2011, as of late November, 26 logbooks were returned (Table 18) – based on estimates provided by the annual telephone survey (Table 19), this represented only 4 % of active fishers. Of the logbooks returned, there were a number with data issues which excluded them from being included in catch rate analysis (e.g., fisher records number of fish, not weight; fisher does not provide net size or number of nets); whenever possible fishers were contacted to correct these errors, but in 2011, 5 logbooks were excluded from analysis due to data issues. Logbooks from fall fisheries are typically very limited and are not included in analysis.

In most areas and years, the number of logbook returns is small, generally less than 15 (Fig. 23). Given inherent variability and small sample sizes, these data provide very limited information as an abundance index. In an effort to increase commercial gill net logbook return rates, reminder letters were sent to fishers each summer starting in 2007. Subsequently, logbook returns decreased in 2008, but increased in both 2009 and 2010. Fewer logbooks were returned in 2011, however at the time of the assessment (November 2011) logbooks were still being received.

Each year a cumulative abundance index is calculated based upon fisher's perception of abundance. The cumulative index is similar to that calculated for Div. 4T herring (LeBlanc et al. 2007). It is a comparison of the current year perception of abundance with the previous year perception of abundance. The 1-10 scale of abundance, where 5.5 is the average (used in assessments previous to 2007), is converted to a scale of -4.5 to +4.5, where 0.0 is the average. A fisher's perception of change in abundance from year "n-1" to year "n" is recorded as a "plus" or "minus" on this scale. An average is then derived for all fishers (by stock area); this is added to or subtracted from the previous year's estimate.

In WB-NDB, 12 logbooks were returned in both 2009 and 2010, this decreased to 4 in 2011 – the fewest returns in the series which usually averages 10 logbooks (Table 18). Effort (net nights per fisher) increased by 50 % from 2009 to 2011, then decreased again by 50 % in 2011; effort was substantially lower than the research gill net program in 2011 (Table 18, Fig. 24). Catch rates (kilograms per standard net per nights fished) decreased sharply from 96.4 in 2009 to 36.5 in 2010, and again in 2011 to 15.1 (Table 18, Fig. 25). The 2011 catch rate was below average at 38 % of the long-term mean (1988–2011). Catch rates increased significantly from 2002 to 2008, but have declined since then. Fishers indicated (cumulative index) that herring abundance in 2011 was below average and less than in 2010, which was slightly above average (Fig. 25). Comments submitted by fishers along with logbooks in 2010 indicated that weather and water conditions were poor and that herring were late arriving; in 2011 fishers commented that abundance was higher, herring were late arriving and that seals and purse seiners were an issue.

In BB-TB, logbook returns increased from 10 in 2009 to 12 in 2010, but decreased to only 2 in 2011 (Table 18). Effort increased by 30 % from 2009 to 2010, then decreased by 86 % in 2011; effort was substantially lower in 2011 than for the research gill net program (Table 18, Fig. 24). Catch rates decreased from 43.7 in 2009 to 31.4 in 2010 and then to 3.4 in 2011, the lowest in the time series (Table 18, Fig. 25) – note that the 2011 rates are based on only 2 logbooks. The 2011 catch rate was below average at 10 % of the long-term mean (1988–2011). Catch rates increased significantly from 2002 to 2007 and have fluctuated since. Fishers indicated (cumulative index) that herring abundance in 2011 was below average and less than 2010 (Fig. 25). Comments made by fishers who returned logbooks in 2010 indicated that weather and conditions were poor in the spring, herring seemed to arrive later and were more abundant in

the fall than in the past. There were also complaints that purse seiners were removing too many herring from the stock. Similar concerns were voiced in 2011.

In SMB-PB, logbook returns increased from 3 in 2009 to 5 in both 2010 and 2011, which is the average number of returns for the time series (Table 18). Effort increased by 38 % from 2009 to 2010, then decreased by 50 % in 2011; effort in 2011 was less than that for the research gill net program (Table 18, Fig. 24). Catch rates decreased slightly from 42.7 in 2009 to 40.4 in 2010, and then to 33.6 in 2011 (Table 18, Fig. 25). The 2011 catch rate was above average at 32 % above the long-term mean (1988-2011). Fishers indicated (cumulative index) that herring abundance in 2011 was below average and lower than in 2010 (Fig. 25). Comments received by fishers who completed logbooks in 2010 indicated that herring were abundant in the area. Only one fisher commented in 2011, remarking that herring were abundant and large.

In FB, logbook returns increased from 12 in 2009 to 14 in 2010, and then decreased to 10 in 2011 – which is the average number of returns for the area (Table 18). Effort increased by 5 % from 2009 to 2010, and decreased by 32 % in 2011; effort was higher in 2011 than for the research gill net program (Table 18, Fig. 24). Catch rates decreased, but not significantly, from 35.8 in 2009 to 22.6 in 2010, and then increased to 28.6 in 2011 (Table 18, Fig. 25). The 2011 catch rate was below average, 76 % of the long-term mean (1988–2011). Catch rates decreased significantly from 2002 to 2006, decreased until 2010 and increased slightly in 2011. Fishers indicated (cumulative index) that herring abundance in 2011 was below average and lower than in 2010, the cumulative index for FB has declined consistently since 2000 (Fig. 25). The majority of fishers who sent comments along with their logbooks in both 2010 and 2011 stated that abundance was low and that they feel this is due to overfishing in Long Harbour by bar seines and traps. Several fishers had to purchase bait because they could not catch enough in their own nets in 2010.

FIXED GEAR TELEPHONE SURVEY

The fixed gear telephone survey was first conducted in the fall of 2006 and has continued to 2011, excluding 2010 when it was not done due to budgetary constraints. The objectives of the survey are to determine how many herring fixed gear licence and/or bait permit holders fished in the current year, to obtain perceptions of herring abundance and other information from those that did fish, and to estimate the amount of herring used as bait in the lobster fishery.

Policy and Economics Branch provided a list of all herring licence and/or bait permit holders in each of the stock areas. Within each stock area, sample sizes were determined to provide a 10 % margin of error, assuming an 80 % response rate (Gower and Kelly 1993). A 10 % margin of error was deemed to be acceptable as it would indicate that survey results are accurate 90 % of the time.

The names of fishers to be contacted were chosen randomly. Each fisher was telephoned a maximum of three times (at different times and on different days). If a fisher could not be contacted after three attempts, it was considered a ‘nil’ response.

During the phone survey, each fisher was asked:

- Did you fish herring for either commercial or bait purposes in 2011?
- In 2011, did you fish herring for commercial sale or for bait purposes (or both)?
- In 2011, did you fish herring using gill nets, bar seine, and/or tuck seine?
- In 2011, how many nets did you fish?
- In 2011, approximately how many times did you haul your net(s)?

- In 2011, approximately how much herring (lbs.) did you catch?
- Using a scale of 1 to 10, with 1 being the lowest, 5½ being average, and 10 being the highest, how abundant were herring in your fishing area in 2011 compared to 2010?
- Do you have any comments regarding the herring stock in your area?

Cumulative abundance indices, based upon responses to question 7, were calculated for the time series (2006-11, excluding 2010), as described earlier for perception data from commercial gill net logbooks.

There were 2110 licence and/or bait permit holders within the four stock areas in 2011 (Table 6). Attempts were made to contact 314 fishers. Of these, 253 were successfully contacted, representing a 81 % response rate. Of those who were contacted, 113 (45 %) fished in 2011. Of those who fished, a large majority (90 %) fished for bait purposes only.

In WB-NDB, attempts were made to contact 83 fishers in 2011, representing 9 % of all licence and bait permit holders (Table 6). The response rate was 71 %, and of the 59 fishers contacted, 19 fished in 2011, all for bait purposes. Most respondents fished in NDB, with abundance estimates in the bay being average and above average, but lower around Fogo Island (Fig. 27). Fishers indicated (cumulative index) that herring abundance in 2011 was above average but lower than 2009 (Table 19); this agreed with the index from gill net logbooks, though that estimate was below average (Fig. 26). Comments made by fishers indicated that 2011 was a poor fishing year, with herring either arriving late in the season or not at all. Some fishers also indicated that in general, herring in 2011 were large and abundant, although late.

In BB-TB, attempts were made to contact 95 fishers, 18 % of all licence and bait permit holders (Table 6). The response rate was 83 %, and of the 79 fishers contacted, 35 fished in 2011, most for bait purposes (83 %). Fishing was fairly evenly distributed in both bays (Fig. 28). Fishers indicated (cumulative index) that herring abundance in 2011 was above average but lower than the last phone survey in 2009 (Table 19); the gill net logbook index also showed lower abundance in 2011, but below average (Fig. 26). Comments made by fishers largely indicated that herring were scarce early in the season and have been arriving later in recent years, and that abundance toward the end of the season was good.

In SMB-PB, attempts were made to contact 62 fishers, 17 % of all licence and bait permit holders (Table 6). The response rate was 77 %, and of the 48 fishers contacted, only 16 fished in 2011, all for bait purposes. Most fishers were active in Placentia Bay, particularly near Arnold's Cove where abundance estimates were above average, and Placentia where abundance estimates were low (Fig. 29). Fishers indicated (cumulative index) that herring abundance in 2011 was above average but lower than the last survey in 2009 (Table 19). This differed substantially from the cumulative index derived from gill net logbooks which indicated that abundance in 2011 was well below average (Fig. 26). Comments made by fishers in SMB indicated that herring are arriving later; comments from PB were very mixed with some fishers feeling that fish were scarce while others indicated good abundance.

In FB, attempts were made to contact 71 fishers, 27 % of all licence and bait permit holders (Table 6). The response rate was 90 %, and of the 67 fishers contacted, 43 fished in 2011, 88 % of them for bait purposes. Fishers were distributed throughout Fortune Bay, but concentrated near Hr. Mille, Recontre East and Belleoram. Abundance estimates varied throughout the bay (Fig. 29). Fishers indicated (cumulative index) that herring abundance in 2011 was below average and lower than in 2009 (Table 19). This agreed with the cumulative index derived from gill net logbooks (Fig. 26). A large majority of fishers indicated in their comments that they are very concerned about the quantity of fish being removed in Long

Harbour by bar seines, that mortality and effort in this fishery are too high and doing damage to the stocks. Many felt that the stock was in decline.

As indicated earlier, official statistics do not include landings for bait purposes for most years. Consequently, based upon results of the 2006-11 telephone surveys, landings of 90 % or more of active gill net fishers are not included in annual landings data. For BB-TB, SMB-PB and FB, bait estimates derived from telephone surveys have been equal to or very near those used by Fisheries and Aquaculture Management Branch for the Integrated Fish Management Plans for the corresponding years; for WB-NDB estimates from the phone survey have been much lower in the past two surveys (Table 8).

COMMERCIAL PURSE SEINE PHONE QUESTIONNAIRE

This program, initiated in 1996, provides a quantitative evaluation of biological and fishery related information from herring purse seine fishers, including a cumulative abundance index and estimates of dead discards for incorporation into total landings. Each year, attempts are made to contact all active fishers by telephone after the spring and fall purse seine fisheries and each fisher is asked a series of standardized questions (Wheeler et. al. 1999). Response rates are high for most areas and years; in 2011, 27 of 31 fishers (87 %) responded to the survey (Table 20). For WB-NDB, BB-TB and SMB-PB survey results include the 2010 fishery only. There are no results for 2011 as the usual winter/spring purse seine fishery in SMB-PB did not occur this year due to a scarceness of herring. There is no purse seine fishery in FB.

For WB-NDB, 5 of 6 active fishers responded to the questionnaire in 2011. Their estimate of landings represented 62 % of reported purse seine landings in 2010 (Fig. 30) – this may have been low due to one fisher not being contacted. The fishers indicated (cumulative index) that herring abundance in the fall of 2010 was above average and slightly higher than 2009 (Table 20 and Fig. 31). There were no reported dead discards in 2010 (Table 20). Comments made by fishers during the survey indicated that there was a high proportion of small herring in 2010.

For BB-TB, 17 of 19 active fishers responded to the questionnaire in 2010. The majority fished in BB (Fig. 30). Their estimate of landings represented 107 % of reported purse seine landings in 2010 (Fig. 30). Fishers indicated (cumulative index) that herring abundance in the fall of 2010 was above average but lower than in 2009 (Table 20 and Fig. 31). There were no reported dead discards in 2010 (Table 20). Comments made by fishers indicated that herring arrived late in 2010 and the season opened too early. There were also complaints about quota allocations.

For SMB-PB, 5 of 6 active fishers responded to the questionnaire in 2010. Their estimate of landings represented 70 % of reported purse seine landings in 2010 (Fig. 30). They indicated (cumulative index) that herring abundance in the spring of 2010 was above average and higher than in 2009 (Table 20 and Fig. 31). There were 0.2 t dead discards reported for 2010 (Table 20). Two fishers requested a tagging survey, the third commented that there is no market and it would be good to be able to sell herring outside of Newfoundland.

Information from the purse seine questionnaires provides another source of uncertainty regarding commercial landings statistics. For approximately 42 % of the records (area x year), estimated landings from the purse seine questionnaire were greater than the official reported purse seine landings. The differences were variable and ranged from 3 % to 200 %, but were most often within 15 %. In addition, the estimate of removals (landings plus dead discards) from the questionnaire was greater than the estimated landings from the questionnaire for 73 % of the records. These differences were also variable and ranged from 1 % to over 200 %. It has also been suggested that removal estimates are low, as fishers are unable to visually determine the extent of mortality while purse seining.

BIOLOGICAL AND ECOLOGICAL DATA

GROWTH

Mean lengths and weights at age of spring and autumn spawning herring from 1970 to 2010 were calculated (Tables 21-24 and Fig. 32). Lengths and weights at age were calculated from samples collected from January to June to minimize the impact of seasonal growth. The mean lengths and weights at age of herring decreased in all areas during the 1980's and 1990's. In recent years, growth rates have increased and/or stabilized. However, the mean weights of both spring and autumn spawners in 2010 were still below the long term mean (1970 –2010) in all areas. The implications of these changes in growth on fisheries management are described in Wheeler et al. 2009.

RECRUITMENT

Estimation of recruiting year class strength is important in evaluating the future prospects of these herring stocks. The strength of age 4 fish (recruiting year class) was estimated using the catch rate of age 4 fish in the current year from the research gill net data series. The strength of the other 6 mature year classes was estimated using the mean research gill net catch rate of ages four, five and six fish (Fig. 33). These estimates may be biased due to systematic changes in growth, i.e. cue to changes in weight and girth over time, the selection pattern of ages 4-6 fish may also have changed over time. These age groups are also highly selected by the fishery in some years. Variable exploitation rates may also impact estimates of year class strength.

For SMB-PB and FB, the time series included the 1976-2006 year classes. For WB-NDB and BB-TB, it included the 1982-2006 year classes. For each area and spawning type, there are seven mature year classes (2000-2006) that can be estimated. Based upon age at maturity analysis (Wheeler et al. 2009), fish age 4+ are considered to be fully mature. The 2006 year class (at age 4 in 2010) is the most recent recruiting year class that can be estimated. Unlike previous assessments in which year class strength and recruitment were examined without considering spawning component, in 2011 data was also split by spring and autumn spawners to examine differences between the two.

In WB-NDB, 4 of 7 mature year classes were above average for spawning types combined, however 6 of 7 autumn spawning year classes were above average versus only 2 for spring spawners. The recruiting year class, based on 2010 catch rates only, was average for spring spawners and above average for autumn spawners. In BB-TB, all mature year classes were at or above average for both spawning types combined. The autumn spawning year classes were all well above average, compared to the spring where 2 were well above and 5 were at or just below. The recruiting year class was average for both spawning components. In SMB-PB, 3 of 7 current mature year classes were above average for both spawning types combined. Only 2 were above average for spring spawners, and 5 of 7 fall spawning year classes were at or above average. The 2006 recruiting year class was above average for both spawning components. In FB, 2 of 7 mature year classes were at or above average for both spawning types combined. Five of seven were above average for fall spawners, but six were well below average for spring spawners. The 2006 recruiting year class was below average for spring spawners, and no 2006 fall spawners were observed (Fig. 33).

SPAWNING TYPE

In recent years there has been a shift in dominance from spring to autumn spawners in all stock areas except FB, where spring spawners still account for a large majority of the catch. This trend continued in 2009 and 2010, with the percentage of autumn spawners in WB-NDB and BB-TB being well above historical levels (Fig. 36). In WB-NDB, the percentage of autumn

spawners in the research gill net fishery was at an historical high in 2009 (72 %) and in commercial samples in 2010 (70 %). In BB-TB, 2009 also saw the highest recorded proportion of autumn spawners (62 %) and in the commercial fishery 2010 (73 %). In SMB-PB, commercial samples have also showed a greater proportion of autumn spawners in recent years (2007-10); research gill net samples in 2007 and 2008 had the highest proportions of autumn spawners for the stock area from the time series (67 and 69 %, respectively). There is no observable trend in changing spawning type for fish in FB.

STOCK STATUS

METHODOLOGY

As with all the assessments since 2003, performance reports were used to summarize current status and prospects of each stock (Tables 25-28). Observations from abundance indices, biological characteristics and ecological considerations were interpreted and evaluated using a traffic light method (Caddy 1998). This method uses a system of red (-), yellow (?) and green (+) 'lights' to categorize indicators as 'cause of concern', 'uncertain' or 'positive.' In this assessment, 'uncertain' was defined as 'uncertainty of an interpretation rather than precautionary uncertainty.

For each stock area, four series of abundance indices were evaluated: research gill net catch rates (spring and autumn spawners both combined and separate), commercial and/or bait fixed gear catch rates (from logbooks), gill net fisher observations (from logbooks and telephone survey), and purse seine fisher observations (from questionnaires). Purse seine fisher observations are not available for FB as there is no purse seine fishery in that area.

Current stock status was described based on a standardized (but arbitrary) evaluation of all abundance indices and age composition of mature age groups (Table 29). These were all weighted by their perceived importance and reliability in assessing current status, as per previous assessments (e.g., Wheeler et al. 2010). Research gill net catch rates were given the most weight, followed by research gill net age compositions, and then commercial gill net catch rates, gill net fisher observations and purse seine fisher observations. For the purpose of calculating stock status, spring and fall spawners were grouped together as was done for previous assessments – a practice which may change in the future given the perceived shift in spawning type.

Future prospects for each stock were described by evaluating the strengths of fishery dependant year classes (2004 and 2005), other mature year classes (1999-2003) and the 2006 recruiting year class, as estimated from research gill net catch rates at age (Table 30). Weights were assigned in the same order (fishery dependant year class, then mature year classes, then recruiting year class).

The calculation of standardized and weighted performance report indices (Fig. 35) allowed for inter-annual comparisons from 1997 to 2011. Research gill net catch rates were also compared to historical population estimates (Wheeler et al. 2001) to evaluate current vs. historical status (Fig. 36).

WHITE BAY – NOTRE DAME BAY

The Fishery

In WB-NDB, landings increased from 425 t in 2009 to 524 t in 2010; 20 % of the TAC was taken in 2010. The majority of landings in 2010 were taken by purse seines, as usual, but there was also an increase in the proportion taken by traps (Table 1). An estimated 167 t of herring were

landed for bait in 2010, and 165 t in 2011 (Table 8). There was no reported mortality from the 2010 purse seine survey (Table 20).

Documented effort in the stock area has declined since the 1980's. Purse seine effort (total sets) was 92 % lower in 2010 than the peak year of 1997 (Table 20) and only 32 % of gill net fishers contacted in the 2010 telephone survey were active, the lowest portion since the survey began in 2006 (Table 6).

Abundance Indices

Research gill net catch rates (number of fish per nights fished) of spring and autumn spawners decreased by 50 % from 2009 to 2010, and by another 75 % in 2011 to give the lowest catch rate in the time series (Table 13, Fig. 14). Catch rates for the spring and autumn spawning components have been about equal since 2006 (Table 13, Fig. 15).

Only 4 fixed gear logbooks were returned in 2011(Fig. 23). Catch rates (kilograms per standard net per nights fished) have decreased for the past 3 years and were below average in 2011 (Table 18, Fig. 25). Fishers indicated that abundance has decreased since 2009 and is below average (Table 18, Fig. 26).

There were 19 active fishers contacted in the 2011 fixed gear telephone survey (Table 6, Fig 27). They indicated that herring abundance in 2011 was below average and lower than the last telephone survey in 2009 (Table 19, Fig. 26).

Five of six active purse seine fishers responded to the 2011 purse seine questionnaire (Table 20, Fig. 30). They indicated that herring abundance in 2010 was above average and slightly higher than 2010 (Fig. 31).

Biological Characteristics

The age distribution of the 2010 research gill net catch was extensive, with the 2002 year class accounting for 23 % of the catch numbers, and the 2004 and 2005 year classes each accounting for over 15 % (Table 14, Fig. 19). For both spawning components combined, 4 of 7 mature year classes were above average; for the autumn spawning component 6 of these were above average. The recruiting 2006 year class was average for both spawning components combined and well above average for autumn spawners (Fig. 33). Mean weight of herring (ages 3-10) decreased during the 1980's and 1990's, increased to 2002 and has been fairly consistent through the 2000's (Table 21, Fig. 32).

Stock Status and Outlook

A standardized performance index has been calculated since 1998 and indicates that stock status has declined steadily since 2009, following a period of improvement from 2002 to 2008 (Fig. 35). A comparison between research gill net catch rates and biomass estimates up to 2001 indicates that current stock abundance is substantially lower that historical estimates in the 1970's (Fig. 36). Short term prospects for the stock are uncertain (Table 25); the 2006 recruiting year class is average and most mature year classes are average compared to those produced since 1982 (Fig. 33). A perceived shift from predominant spring to autumn spawners (Fig. 34) has created additional uncertainty in assessments which currently focus on the spring spawning component.

BONAVISTA BAY – TRINITY BAY

The Fishery

In BB-TB, landings decreased from 3183 t in 2009 to 2131 t in 2010; 43 % of the TAC was taken in 2010. The largest proportion of landings was taken by purse seines, followed by tuck

seines, which have accounted for an increasingly large portion of landings each year (Table 2). An estimated 261 t of herring were landed for bait in 2010, and 309 t in 2011 (Table 8). There was no reported mortality from the 2010 purse seine survey (Table 20).

Documented effort in the stock area has declined since the 1980's. Purse seine effort (total sets) was 25 % lower in 2010 than the peak year of 1997 (Table 20) and only 44 % of gill net fishers contacted in the 2010 telephone survey were active, the lowest portion since the survey began in 2006 (Table 6).

Abundance Indices

Research gill net catch rates (number of fish per nights fished) of spring and autumn spawners have been relatively stable for the past 3 years (Table 13, Fig. 14). Autumn spawners have been most abundant in the catches since 2007 (Table 13, Fig. 16).

Only 2 fixed gear logbooks were returned in 2011, the fewest in the time series (Fig. 23). Catch rates (kilograms per standard net per nights fished) have decreased for the past 2 years and were the lowest in the time series in 2011 (Table 18, Fig. 25). Fishers indicated that abundance has decreased since 2007 and is below average (Table 18, Fig. 26).

There were 35 active fishers contacted in the 2011 fixed gear telephone survey (Table 6, Fig. 28). They indicated that herring abundance in 2011 was below average and lower than the last telephone survey in 2009 (Table 19, Fig. 26).

Seventeen of 19 active purse seine fishers responded to the 2011 purse seine questionnaire (Table 20, Fig. 30). They indicated that herring abundance in 2010 was above average but lower than 2010 (Fig. 31).

Biological Characteristics

The age distribution of the 2010 research gill net catch was extensive, with the 2002 year class accounting for 19 % of the catch numbers, and the 2000, 2001 and 2003 year classes each accounting for over 10 % (Table 15, Fig. 20). All 7 mature year classes were above at or above average and the autumn spawning component was well above. The recruiting 2006 year class was about average for both spawning components (Fig. 33). The mean weight of herring (ages 3-10) decreased during the 1980's and 1990's, but has been relatively stable through the 2000's (Table 21, Fig. 32).

Stock Status and Outlook

A standardized performance index has been calculated since 1998 and indicates that stock status improved from 2002 to 2007, then deteriorated from 2008 to 2010 and improved slightly in 2011 (Fig. 35). A comparison between research gill net catch rates and biomass estimates up to 2001 indicates that current stock abundance is substantially lower that historical estimates in the 1970's (Fig. 36). Short term prospects for the stock are uncertain (Table 26); the 2006 recruiting year class is average and all mature year classes are near or above average compared to those produced since 1982 (Fig. 33). A perceived shift from predominant spring to autumn spawners (Fig. 34) has created additional uncertainty in assessments which currently focus on the spring spawning component.

ST. MARY'S BAY – PLACENTIA BAY

The Fishery

In SMB-PB, landings decreased from 1407 t in 2009 to 1006 t in 2010; 45 % of the TAC was taken in 2010. Purse seine landings accounted for the vast majority of the 2010 catch in the stock area (Table 4). An estimated 167 t of herring were landed for bait in 2010, and 165 t in

2011 (Table 8). Estimated mortality of purse seine discards in 2010 was 5 %, less than 1 t (Table 20).

Documented effort in the stock area has declined since the 1980's. Purse seine effort (total sets) was 85 % lower in 2010 than the peak year of 1997 (Table 20); 33 % of gill net fishers contacted in the 2010 telephone survey were active, the highest portion since the survey began in 2006 (Table 6).

Abundance Indices

Research gill net catch rates (number of fish per nights fished) of spring and autumn spawners decreased 2009 to 2010, and again in 2011 to give one of the lowest catch rates in the time series (Table 13, Fig. 14). Catch rates for autumn spawners have increased over the past 4 years (Table 13, Fig. 17).

Five fixed gear logbooks were returned in 2011, which is average for the area (Fig. 23). Catch rates (kilograms per standard net per nights fished) went down slightly in both 2010 and 2011 but are still above the average for the time series (Table 18, Fig. 25). Fishers indicated that abundance has decreased slightly since 2010 and is below average (Table 18, Fig. 26).

There were 16 active fishers contacted in the 2011 fixed gear telephone survey (Table 6, Fig. 29). They indicated that herring abundance in 2011 was below average and lower than the last telephone survey in 2009 (Table 19, Fig. 26).

Five of Six active purse seine fishers responded to the 2011 purse seine questionnaire (Table 20, Fig. 30). They indicated that herring abundance in 2010 was above average and higher than 2010 (Fig. 31).

Biological Characteristics

The age distribution of the 2010 research gill net catch was extensive, with the 2003 and 2006 year classes each accounting for 20 % of the catch numbers (Table 16, Fig. 21). For both spawning components combined, 4 of 7 mature year classes were below average, but 5 of 7 autumn spawning year classes were average or above. The recruiting 2006 year class was above average for both spawning components (Fig. 33). Mean weight of herring (ages 3-10) decreased during the 1980's and 1990's/early 2000's and seems to have stabilized since (Table 21, Fig. 32).

Stock Status and Outlook

A standardized performance index has been calculated since 1998 and indicates that stock status improved slightly in 2011 after deteriorating from 2001 to 2004 and remaining stable to 2010 (Fig. 35). A comparison between research gill net catch rates and biomass estimates up to 2001 indicates that current stock abundance is substantially lower that historical estimates in the 1970's (Fig. 36). Short term prospects for the stock are uncertain (Table 27); the 2006 recruiting year class is above average but more than half of the mature year classes are below average compared to historical levels (Fig. 33). A perceived potential shift from predominant spring to autumn spawners (Fig. 34) has created additional uncertainty in assessments which currently focus on the spring spawning component.

FORTUNE BAY

The Fishery

In FB, landings increased from 2361 t in 2009 to 2624 t in 2010; 91 % of the TAC was taken in 2010. The largest proportion of the landings was taken by purse seines in 2010, followed by traps (Table 5). An estimated 608 t of herring were landed for bait in 2010, 50 % more than the

estimate used by Fisheries Management, and in 2011 the estimate was 271 t (Table 8). Of the gill net fishers contacted in the 2010 telephone survey, 42.5 % were active (Table 6).

Abundance Indices

Research gill net catch rates (number of fish per nights fished) of spring and autumn spawners decreased by 30 % from 2009 to 2010, and by another 77 % in 2011 to give the second lowest catch rate in the time series (Table 13, Fig. 14). The spring spawning component continues to dominate the catch (Table 13, Fig. 18).

In 2011 there were 13 returned fixed gear logbooks, which is average for the area (Fig. 23). Catch rates (kilograms per standard net per nights fished) increased slightly after declining in 2009 and 2010 but are still below the average for the time series (Table 18, Fig. 25). Fishers indicated that abundance has decreased consistently since 2000 and is below average (Table 18, Fig. 26).

There were 43 active fishers contacted in the 2011 fixed gear telephone survey (Table 6, Fig. 29). They indicated that herring abundance in 2011 was below average and continues to decline, as has been reported in every telephone survey conducted (Table 19, Fig. 26).

Biological Characteristics

The age distribution of the 2010 research gill net catch was extensive, with the 2002 year class accounting for 27 % of the catch numbers (Table 17, Fig. 22). For both spawning components combined, 3 of 7 mature year classes were average or above; 5 of 7 spring spawning year classes were well below average. The recruiting 2006 year class was below average, no recruiting autumn spawners were detected (Fig. 33). Mean weight of herring (ages 3-10) decreased during the 1980's and 1990's, but has stabilized through the 2000's (Table 21, Fig. 32).

Stock Status and Outlook

A standardized performance index has been calculated since 1998 and indicates that after remaining stable from 2006 to 2010, following a period of deterioration from 2001 to 2004, stock status deteriorated again in 2011 (Fig. 35). A comparison between research gill net catch rates and biomass estimates up to 2001 indicates that current stock abundance is substantially lower that historical estimates in the 1970's (Fig. 36). Short term prospects for the stock are negative (Table 28); the 2006 recruiting year class is below average, as are most mature year classes (Fig. 33).

SOURCES OF UNCERTAINTY

The major uncertainty in this assessment continues to be the inability to estimate current stock sizes and exploitation rates, and to place these estimates within an historical context using current data sources. An absolute abundance index (e.g., acoustic survey) is needed to estimate biomass for these stocks.

The percentage of autumn spawning herring has increased substantially in commercial and research gill net catches in three of four stock areas in recent years. The ratio of spring to autumn spawners in the spring research gill net catch may not be representative of the population. Consideration should be given to adding an autumn component to the research gill net program, especially in WB-NDB and BB-TB stock areas, to better estimate the proportion of the fall spawning component. Biological samples should be collected between the spring and autumn fishing seasons to develop a more comprehensive picture of spring and autumn stock components across the entire spawning season.

The evaluation of trends within abundance indices is dependent, among other things, upon the uncertainties associated with each index. This has been further complicated by the additional uncertainly associated with the change in stock composition (spring and fall spawners), as the abundance indices do not distinguish between spawning type. Due to the limited fishery and research data, sample sizes for most indices in these assessments, with the exception of the gill net fisher index from telephone surveys, are generally small resulting in higher uncertainties. Increasing the sample size for the research gill net program would lower uncertainty, given that variability in catch rates has been reduced in recent years in those areas where more fishers have been added.

There is concern about the utility of the commercial gill net catch rates estimated from the voluntary fixed gear logbook program. Sample sizes are extremely low resulting in high variability surrounding the estimates making interpretation difficult.

There continues to be concerns regarding how to quantify the observations of abundance of gill net and purse seine fishers in estimating current abundance.

Estimation of recruiting year class strength is important in evaluating the future prospects of these stocks. Recruitment data are available from the research gill net data set, and may be biased by systematic changes in growth. In addition, the timing of this program may not adequately capture the ratio of spring and fall spawners, and the recruits of each spawning component. Strong recruiting year classes are normally seen across stock areas and quickly become dominant in most data sources. However, it is more difficult to predict the future prospects of weak and moderately strong year classes.

There is concern as to how to evaluate the relative size of mature year classes. The current method compares year classes against an average baseline that uses all year classes in the series. The average changes at each assessment as recent year classes are added. A method to have a fixed rather than a changing baseline for comparison should be explored.

Standardization of performance reports requires the combination of several indices which combine spring and autumn spawners. In this assessment, as in the past, indices were weighted subjectively based upon the perceived degree to which each data source provides an index of abundance.

The inability to estimate population sizes has precluded (to date) the calculation of stock status zones and reference points. This severely limits the implementation of the precautionary approach in fisheries management decisions.

A lack of data regarding herring mortality in the fishery and bait landings also adds uncertainly to assessments. The annual purse seine survey provides estimates of dead discards and bait landings are currently estimated based on fixed gear telephone surveys. These are taken from fisher observations and may need to be independently verified. In addition, there is only limited data on seal predation on herring, and unquantified information on herring bycatch from other fisheries.

RESEARCH RECOMMENDATIONS

The RAP review committee identified several analyses to help reduce some of the uncertainties for the next assessment:

1. Develop a strategy to collect samples outside time period of Research Gillnet Program and the commercial herring fishery, such that data collected can be used to examine the spatial and temporal distribution of the different spawning components.
2. Test the minimum data required for RGN program in order to give a statistically valid index.

3. Conduct a Framework meeting in 2012 to present and discuss methods for analyzing and presenting data by spawning stock component.
4. Take steps to make logbooks mandatory for all fixed gear in 2012. Revise and simplify logbooks so that mesh size and number of nets is no longer required.
5. Explore environmental factors affecting relative strength/success of spawning components.
6. Investigate standardization of reference period for the calculation of historical means.
7. Explore appropriate age(s) for use as index of recruitment.
8. Catch statistics should include season of catch and spawning stock composition.
9. Observer data should be investigated as potential source of discard information.
10. Reinstate fall Research Gillnetter Program.
11. Reinstate acoustic surveys.

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Table 1. White Bay (WB)–Notre Dame Bay (NDB) herring landings and TAC's (t), by gear, 1997–2011 (up to November 14, 2011). Landings are from Policy and Economics Branch and do not include herring discards or herring used as bait.

Year	Area	Purse Seine	Bar Seine	Tuck Seine	Gill Net	Trap	Total	TAC	% TAC Landed
1997	WB	11	0	-	10	57	78		
	NDB	2364	0	-	11	7	2382		
	Combined	2375	0	-	21	64	2460	4900	50
1998	WB	106	0	-	6	27	139		
	NDB	484	7	-	30	1	522		
	Combined	606	7	-	36	28	661	2500	26
1999	WB	0	0	-	4	30	34		
	NDB	931	0	-	53	0	984		
	Combined	931	0	-	57	30	1018	2500	41
2000	WB	74	0	-	3	2	79		
	NDB	997	0	-	16	1	1014		
	Combined	1071	0	-	19	3	1093	2500	44
2001	WB	13	0	-	7	5	25		
	NDB	0	0	-	0	1	1		
	Combined	13	0	-	7	6	26	1100	2
2002	WB	0	13	-	6	5	23		
	NDB	303	0	-	7	23	333		
	Combined	300	13	-	13	28	357	1100	32
2003	WB	0	0	-	22	0	22		
	NDB	195	87	-	24	4	310		
	Combined	195	87	-	46	4	332	1100	30
2004	WB	11	2	-	4	28	45		
	NDB	152	48	-	8	13	220		
	Combined	163	50	-	12	40	265	1100	24
2005	WB	39	174	115	2	174	505		
	NDB	97	259	2	10	17	386		
	Combined	136	433	117	12	190	891	1100	81
2006	WB	56	16	21	8	49	150		
	NDB	83	58	0	19	0	159		
	Combined	139	74	21	27	49	309	1100	28
2007	WB	13	8	0	0	9	31		
	NDB	320	7	0	0	4	331		
	Combined	333	15	0	0	13	362	1700	21
2008	WB	211	0	3	0	2	216		
	NDB	228	246	19	4	1	498		
	Combined	439	246	22	4	3	714	1700	42
2009*	WB	4	0	0	0	6	10		
	NDB	414	0	0	1	0	415		
	Combined	418	0	0	1	6	425	2200	19
2010*	WB	203	0	0	0	82	285		
	NDB	210	22	0	2	7	239		
	Combined	413	22	0	2	89	524	2640	20
2011*	WB	721	0	75	43	415	1255		
	NDB	43	0	0	0	1	44		
	Combined	764	0	75	43	416	1299	2640	49

** provisional*

Table 2. Bonavista Bay (BB)–Trinity Bay (TB) herring landings and TAC's (t), by gear, 1997–2011 (up to November 14, 2011). Landings are from Policy and Economics Branch and do not include herring discards or herring used as bait.

Year	Area	Purse Seine	Bar Seine	Tuck Seine	Gill Net	Trap	Total	TAC	% TAC Landed
1997	BB	321	0	-	72	1	394		
	TB	329	211	-	129	41	710		
	Combined	650	211	-	201	42	1104	1600	69
1998	BB	352	62	-	148	0	562		
	TB	356	10	-	22	22	410		
	Combined	708	72	-	170	22	972	2500	39
1999	BB	563	222	-	94	0	879		
	TB	245	208	-	100	0	553		
	Combined	808	430	-	194	0	1432	2500	57
2000	BB	493	195	-	135	8	831		
	TB	2	190	-	67	0	259		
	Combined	495	385	-	202	0	1090	2500	44
2001	BB	241	16	-	37	0	294		
	TB	18	155	-	19	0	192		
	Combined	259	171	-	56	0	486	3500	14
2002	BB	0	297	-	25	7	329		
	TB	200	4	-	13	20	237		
	Combined	200	301	-	38	27	566	3500	16
2003	BB	343	1	-	48	90	482		
	TB	0	0	-	8	0	8		
	Combined	343		-	56	90	490	3000	16
2004	BB	188	139	-	3	2	322		
	TB	134	19	-	21	2	177		
	Combined	322	158	-	24	5	509	3000	17
2005	BB	910	456	21	154	82	1623		
	TB	604	103	142	163	5	1017		
	Combined	1515	559	162	317	87	2640	3000	88
2006	BB	703	467	63	33	4	1270		
	TB	340	129	62	103	0	636		
	Combined	1043	596	125	136	4	1906	3000	64
2007	BB	465	381	301	22	0	1169		
	TB	784	197	473	132	23	1608		
	Combined	1249	578	774	154	23	2777	4000	69
2008	BB	1138	197	405	10	0	1750		
	TB	777	21	221	34	0	1079		
	Combined	1915	218	626	44	0	2829	4000	71
2009*	BB	1276	37	720	254	23	2310		
	TB	452	182	215	24	0	873		
	Combined	1728	219	935	278	23	3183	4500	71
2010*	BB	1104	31	853	29	43	2060		
	TB	40	0	25	5	0	70		
	Combined	1144	31	878	34	43	2131	4950	43
2011*	BB	74	0	82	8	40	204		
	TB	4	0	56	63	0	123		
	Combined	78	0	138	71	40	327	4950	7

** provisional*

Table 3. Conception Bay (CB)–Southern Shore (SS) herring landings and TAC's (t), by gear, 1997–2011 (up to November 14, 2011). Landings are from Policy and Economics Branch and do not include herring discards or herring used as bait.

Year	Area	Purse Seine	Bar Seine	Tuck Seine	Gill Net	Trap	Total	TAC	% TAC Landed
1997	CB	177	0	-	0	0	177		
	SS	0	0	-	0	0	0		
	Combined	177	0	-	0	0	177	600	30
1998	CB	32	0	-	5	2	40		
	SS	0	0	-	0	0	0		
	Combined	32	0	-	5	2	40	600	7
1999	CB	0	0	-	0	0	0		
	SS	0	0	-	0	0	0		
	Combined	0	0	-	0	0	0	600	0
2000	CB	0	0	-	0	0	0		
	SS	0	0	-	0	0	0		
	Combined	0	0	-	0	0	0	600	0
2001	CB	0	0	-	0	0	0		
	SS	0	0	-	0	0	0		
	Combined	0	0	-	0	0	0	600	0
2002	CB	0	0	-	0	0	0		
	SS	0	0	-	0	0	0		
	Combined	0	0	-	0	0	0	600	0
2003	CB	0	0	-	0	0	0		
	SS	0	0	-	0	0	0		
	Combined	0	0	-	0	0	0	600	0
2004	CB	0	0	-	0	0	0		
	SS	0	0	-	0	0	0		
	Combined	0	0	-	0	0	0	600	0
2005	CB	1	3	0	3	1	8		
	SS	0	0	0	0	3	3		
	Combined	1	3	0	3	4	11	600	2
2006	CB	0	0	0	7	0	7		
	SS	0	0	0	0	0	0		
	Combined	0	0	0	7	0	7	600	1
2007	CB	94	0	0	0	0	94		
	SS	0	0	0	0	0	0		
	Combined	94	0	0	0	0	94	600	16
2008	CB	258	0	0	0	0	258		
	SS	0	0	0	0	0	0		
	Combined	258	0	0	0	0	258	600	43
2009*	CB	29	0	0	0	0	29		
	SS	0	0	0	0	0	0		
	Combined	29	0	0	0	0	29	600	5
2010*	CB	24	0	15	1	0	40		
	SS	0	0	0	0	0	0		
	Combined	24	0	15	1	0	40	600	7
2011*	CB	9	0	0	0	0	9		
	SS	0	0	0	0	0	0		
	Combined	9	0	0	0	0	9	600	2

** provisional*

Table 4. St. Mary's Bay (SMB)–Placentia Bay (PB) herring landings and TAC's (t), by gear, 1997-2011 (up to November 14, 2011). Landings are from Policy and Economics Branch and do not include herring discards or herring used as bait.

Year	Area	Purse Seine	Bar Seine	Tuck Seine	Gill Net	Trap	Total	TAC	% TAC Landed
1997	SMB	1650	0	-	1	0	1651		
	PB	2186	100	-	20	0	2306		
	Combined	3836	100	-	21	0	3957	6600	60
1998	SMB	707	0	-	14	0	721		
	PB	1574	0	-	4	0	1578		
	Combined	2281	0	-	18	0	2299	2000	115
1999	SMB	0	0	-	0	0	0		
	PB	330	0	-	1	0	331		
	Combined	330	0	-	1	0	331	2000	17
2000	SMB	0	0	-	0	0	0		
	PB	447	41	-	4	0	492		
	Combined	447	41	-	4	0	492	2000	25
2001	SMB	57	0	-	0	0	57		
	PB	394	213	-	38	0	645		
	Combined	451	213	-	38	0	702	2000	35
2002	SMB	100	0	-	0	0	100		
	PB	1297	0	-	135	36	1468		
	Combined	1398	0	-	135	36	1568	2000	78
2003	SMB	0	0	-	11	0	11		
	PB	925	19	-	74	0	1018		
	Combined	925	19	-	84	0	1029	2500	41
2004	SMB	342	0	-	79	0	421		
	PB	897	71	-	1	0	968		
	Combined	1240	71	-	179	0	1389	2500	56
2005	SMB	1101	43	0	0	2	1146		
	PB	146	0	0	134	0	280		
	Combined	1247	43	0	134	2	1426	2500	57
2006	SMB	729	0	0	0	0	729		
	PB	649	0	0	150	0	799		
	Combined	1378	0	0	150	0	1528	2500	61
2007	SMB	528	0	34	0	0	562		
	PB	30	0	0	167	0	197		
	Combined	558	0	34	167	0	759	2500	30
2008	SMB	236	0	0	0	0	236		
	PB	831	0	0	79	2	912		
	Combined	1067	0	0	79	2	1148	2500	46
2009*	SMB	700	0	0	0	0	700		
	PB	605	0	0	102	0	707		
	Combined	1305	0	0	102	0	1407	2250	63
2010*	SMB	264	0	0	0	0	264		
	PB	740	0	0	2	0	742		
	Combined	1004	0	0	2	0	1006	2250	45
2011*	SMB	0	0	0	0	0	0		
	PB	0	0	0	19	0	19		
	Combined	0	0	0	19	0	19	2250	1

** provisional*

Table 5. Fortune Bay (FB) herring landings and TAC's (t), by gear, 1997–2011 (up to November 14, 2011). Landings are from Policy and Economics Branch and do not include herring discards or herring used as bait.

Year	Purse Seine	Bar Seine	Tuck Seine	Gill Net	Trap	Total	TAC	% TAC Landed
1997	0	92	-	28	23	143	5400	3
1998	0	0	-	0	0	0	5400	0
1999	0	337	-	30	88	455	5400	8
2000	0	791	-	16	35	842	5400	16
2001	0	1592	-	0	190	1782	2700	66
2002	0	1895	-	0	364	2259	2700	84
2003	0	2427	-	0	880	3307	3700	89
2004	0	1655	-	54	1221	2930	3700	79
2005	0	2084	0	4	564	2652	3700	72
2006	0	2027	0	4	310	2341	3700	63
2007	0	1987	0	2	459	2448	3200	77
2008	29	1760	133	2	626	2550	3200	80
2009*	0	1857	0	6	498	2361	2880	82
2010*	0	1708	0	7	909	2624	2880	91
2011*	0	1469	0	1	55	1525	2880	53

* provisional

Table 6. Results of the telephone survey of herring commercial fixed gear licence and/or bait permit holders, by stock area and year (2006-11).*

Stock Area	Year	Licences and Bait Permits		Fishers Phoned		Fishers Contacted		Active Fishers		Fished for Bait		Fished Commercially	
		#	% of total	#	% within	#	% within	#	% within	#	% within	#	% within
WBNDB	2006	989	42.5	113	11.4	84	74.3	40	47.6	39	97.5	1	2.5
	2007	969	42.5	113	11.7	103	91.2	42	40.8	42	100.0	0	0.0
	2008	959	42.3	113	11.8	92	81.4	32	34.8	32	100.0	0	0.0
	2009	930	42.5	113	12.2	95	84.1	37	38.9	37	100.0	0	0.0
	2011	876	42.6	83	8.9	59	71.1	19	32.2	19	100.0	0	0.0
BBTB	2006	577	24.8	106	18.4	88	83.0	49	55.7	44	89.8	5	10.2
	2007	562	24.6	106	18.9	88	83.0	50	56.8	44	88.0	6	12.0
	2008	560	24.7	106	18.9	92	86.8	43	46.7	41	95.3	2	4.7
	2009	547	25.0	106	19.4	89	84.0	44	49.4	41	93.2	3	6.8
	2011	527	25.0	95	18.0	79	83.2	35	44.3	29	82.9	6	17.1
SMBPB	2006	453	19.5	103	22.7	79	76.7	22	27.8	21	95.5	1	4.5
	2007	445	19.5	102	22.9	83	81.4	19	22.9	17	89.5	2	10.5
	2008	444	19.6	102	23.0	78	76.5	17	21.8	17	100.0	0	0.0
	2009	415	18.9	101	24.3	86	85.1	19	22.1	17	89.5	2	10.5
	2011	375	17.8	62	16.5	48	77.4	16	33.3	16	100.0	0	0.0
FB	2006	307	13.2	95	30.9	79	83.2	57	72.2	55	96.5	2	3.5
	2007	304	13.3	94	30.9	81	86.2	52	64.2	51	98.1	1	1.9
	2008	304	13.4	94	30.9	84	89.4	50	59.5	50	100.0	0	0.0
	2009	298	13.6	94	31.5	76	80.9	47	61.8	45	95.7	2	4.3
	2011	278	13.2	74	26.6	67	90.5	43	64.2	38	88.4	5	11.6
All	2006	2326	100.0	417	17.9	330	79.1	168	50.9	159	94.6	9	5.4
	2007	2280	100.0	415	18.2	355	85.5	163	45.9	154	94.5	9	5.5
	2008	2267	100.0	415	18.3	346	83.4	142	41.0	140	98.6	2	1.4
	2009	2190	100.0	414	18.9	346	83.6	147	42.5	140	95.2	7	4.8
	2011	2110	100.0	314	14.9	253	80.6	113	44.7	102	90.3	11	9.7

*there was no phone survey in 2010

Table 7. Comparison of total bait estimates (t) back-calculated in 2009 using a 2 year phone survey estimate mean, versus those calculated in 2011 using a 4 year mean.

	WB-NDB		BB-TB		SMB-PB		FB	
	2009 estimate	**2011 estimate**	**2009 estimate**	**2011 estimate**	**2009 estimate**	**2011 estimate**	**2009 estimate**	**2011 estimate**
1998	1437	1096	760	719	773	756	516	516
1999	1087	829	728	689	669	654	452	452
2000	1002	764	685	648	556	544	456	456
2001	966	737	634	600	633	619	438	438
2002	935	713	580	549	522	510	442	442
2003	868	663	565	535	348	340	451	451
2004	795	607	509	481	285	278	452	452
2005	849	648	555	526	316	309	455	455
2006	790	603	522	494	285	278	459	459
% difference		*-27*		*-5.5*		*-2.2*		*0*

Table 8. Estimation of herring used for bait, by stock area; data from the 2008-11 gill net fisher phone surveys.*

2008	WBNDB	BBTB	SMBPB	FB
Number of licences and bait permits	959	560	444	304
Percentage active fishers from 2008 phone survey	34.8	46.7	21.8	59.5
Estimated number of active fishers by stock area	334	262	97	181
Number of active bait fishers from 2008 phone survey	32	41	17	50
Total bait fisher landings (lb) from survey	100210	155955	49290	240690
Total bait fisher landings (kg) from survey	45455	70741	22358	109177
Landings per bait fisher (kg)	1420	1725	1315	2184
Estimated bait landings (t) by stock area	474	451	127	395
Bait landings estimate (t) used by Fisheries Management	500	300	150	400

2009	**WBNDB**	**BBTB**	**SMBPB**	**FB**
Number of licences and bait permits	930	547	415	298
Percentage active fishers from 2009 phone survey	38.9	49.4	22.1	61.8
Estimated number of active fishers by stock area	362	270	92	184
Number of active bait fishers from 2009 phone survey	37	41	17	45
Total bait fisher catches (lb) from survey	91950	183120	56250	169500
Total bait fisher catches (kg) from survey	41709	83063	25515	76885
catches per bait fisher (kg)	1127	2026	1501	1709
Estimated bait catches (t) by stock area	167	261	137	608
Bait estimate (t) used by Fisheries Management	500	300	150	400

2011	**WBNDB**	**BBTB**	**SMBPB**	**FB**
Number of licences and bait permits	876	527	375	278
Percentage active fishers from 2009 phone survey	32.2	44.3	33.3	64.2
Estimated number of active fishers by stock area	282	233	125	178
Number of active bait fishers from 2009 phone survey	19	31	16	40
Total bait fisher catches (lb) from survey	24510	90485	48670	133745
Total bait fisher catches (kg) from survey	11118	41044	22077	60667
catches per bait fisher (kg)	585	1324	1380	1517
Estimated bait catches (t) by stock area	165	309	172	271
Bait estimate (t) used by Fisheries Management	500	300	150	400

*there was no phone survey in 2010

Table 9. Catch-at-age of spring and autumn spawning herring from commercial samples in White Bay-Notre Dame Bay, 1970-2010; includes estimates of herring caught for use as lobster bait (1996 onward).

Autumn Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
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
3	1	129	290	727	4	128	24	1671	55	60	46	152	371	38
4	12	88	2396	1411	123	215	506	107	2034	50	1240	41	332	46
5	24	161	353	2825	3142	453	237	468	317	2928	92	1231	59	23
6	24	64	69	761	5446	5438	868	184	1034	323	1080	63	268	14
7	972	425	122	719	1193	7069	10893	793	517	1410	17	805	34	93
8	11	10184	403	654	697	1123	17145	7363	2509	767	496	64	258	1
9	83	233	1363	416	1506	838	1328	12675	10807	2222	179	344	19	26
10	159	254	205	1685	858	810	3364	1055	11756	14413	1450	194	192	4
11+	275	3105	808	794	2378	3999	8535	15707	14379	27508	14653	10908	4059	805
Total	**1572**	**14645**	**6015**	**9994**	**15349**	**20076**	**42957**	**40074**	**43410**	**49683**	**19369**	**14248**	**5669**	**1052**

Age	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	1	1	195	26	3113	1	1	2273	1	1	1	1	1	1
2	6	3	29	1105	407	23	1	29	940	1	1	1	252	106
3	12	187	975	324	1044	128	1936	386	207	96	1	96	0	3337
4	124	350	2945	7201	291	613	285	16183	942	31	1054	609	5	106
5	1218	240	308	25843	2984	124	637	1542	8940	263	121	2747	1559	65
6	73	1486	667	1651	11819	3106	240	553	483	3614	1674	129	3008	3558
7	114	108	1258	1067	1036	10566	2451	103	371	75	2199	701	163	3161
8	157	275	198	2088	1137	370	7360	2145	211	199	108	1513	727	54
9	37	94	162	399	1454	1081	532	4432	722	70	192	183	1215	217
10	122	81	179	442	315	844	1132	537	2796	544	49	127	1	687
11+	1938	2110	1973	4566	2943	2178	1148	2201	3509	861	441	337	599	2116
Total	**3802**	**4935**	**8889**	**44712**	**26543**	**19034**	**15723**	**30384**	**19122**	**5755**	**5841**	**6444**	**7530**	**13406**

Age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*	2010*
1	1	1	1	1	1	1	1	83	1	1	1	0	0
2	1	1	1	121	1	1	510	90	1	1	15	0	18
3	885	81	404	713	516	517	1045	1063	40	3	253	104	0
4	1128	1838	175	2127	298	5350	1794	1685	953	349	37	178	198
5	23	2272	3811	120	90	142	2956	819	513	1058	240	138	49
6	17	1	3103	2716	266	226	0	2465	302	563	582	109	65
7	1304	95	96	1	315	1	22	169	348	30	826	521	32
8	3440	1465	0	1	29	1	1	5	1	92	81	344	610
9	237	2021	151	1	1	1	1	1	1	1	1	103	0
10	160	95	28	1	1	1	1	89	47	27	22	34	142
11+	1354	285	55	1	376	1	4	10	1	1	1	138	34
Total	**8550**	**8154**	**7825**	**5804**	**1894**	**6242**	**6334**	**6478**	**2207**	**2126**	**2059**	**1669**	**1148**

*catch data preliminary.

Table 9 (Cont'd.).

Autumn Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
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
3	1	1	53	1	1	6	1	1	1	1	71	1	72	1
4	1	1	17	7	11	64	31	45	6	1	13	13	26	74
5	26	6	74	22	124	3	35	35	24	10	13	86	62	25
6	10	14	79	25	10	25	51	85	155	267	23	11	16	23
7	39	11	67	60	48	16	20	54	171	172	272	1	12	1
8	60	26	0	25	2	21	40	1	24	160	4	100	9	1
9	20	17	164	13	46	3	46	94	2	133	19	1	42	6
10	11	19	81	97	7	2	4	1	130	1	1	4	1	1
11+	172	291	562	298	346	302	329	182	238	298	450	65	23	1
Total	342	388	1099	550	597	444	559	500	753	1045	868	284	265	135

Age	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
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	11	1	1
3	1	1	10	2	1	1	1	1	1	1	1	1	30	1
4	60	29	67	297	92	65	130	188	109	1	7	11	0	163
5	409	94	69	469	115	12	65	450	187	48	70	37	0	284
6	66	333	79	156	45	5	52	98	172	78	80	2	1083	21
7	30	137	373	112	20	574	84	36	48	113	137	120	16	243
8	8	32	68	630	7	70	37	128	46	79	25	3	142	1
9	7	23	6	152	560	1	1	249	80	42	4	24	142	72
10	3	10	1	10	6	533	4	120	19	21	1	1	142	1
11+	24	74	42	108	306	29	577	2733	613	349	14	204	1	36
Total	610	735	717	1938	1154	1292	953	4005	1277	734	341	415	1558	824

Age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*	2010*
1	1	1	1	1	1	1	1	1	1	1	1	0	0
2	1	1	1	1	1	1	1	9	1	1	1	0	0
3	1	1	28	7	1	1	40	3	1	1	95	33	0
4	117	203	176	118	194	255	289	331	47	55	130	231	177
5	28	122	613	0	149	611	40	1635	852	178	179	169	493
6	1	162	263	119	720	36	134	130	1991	1224	359	355	519
7	1	41	139	1	1021	142	16	14	202	914	868	229	271
8	128	1	96	1	262	36	12	5	1	130	1232	393	132
9	23	1	28	1	59	36	1	37	6	1	1	228	367
10	1	1	1	1	61	1	1	8	6	1	1	32	527
11+	1	122	28	1	407	1	1	5	47	130	1	32	380
Total	303	655	1373	251	2875	1121	535	2177	3154	2637	2866	1702	2866

**catch data preliminary.*

Table 9 (Cont'd.)

Spring and Autumn Spawners

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Total	1914	15033	7114	10544	15946	20520	43516	40574	44163	50728	20237	14532	5934	1187
% SS	82.1	97.4	84.6	94.8	96.3	97.8	98.7	98.8	98.3	97.9	95.7	98.0	95.5	88.6
% AS	17.9	2.6	15.4	5.2	3.7	2.2	1.3	1.2	1.7	2.1	4.3	2.0	4.5	11.4
	1984	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Total	4412	5670	9606	46650	27697	20326	16676	34389	20399	6489	6182	6859	9087	14231
% SS	86.2	87.0	92.5	95.8	95.8	93.6	94.3	88.4	93.7	88.7	94.5	94.0	82.9	94.2
% AS	13.8	13.0	7.5	4.2	4.2	6.4	5.7	11.6	6.3	11.3	5.5	6.0	17.1	5.8
	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	
Total	8853	8809	9198	6055	4769	7363	6869	8655	5361	4763	4925	3371	4014	
% SS	96.6	92.6	85.1	95.9	39.7	84.8	92.2	74.8	41.2	44.6	41.8	49.5	28.6	
% AS	3.4	7.4	14.9	4.1	60.3	15.2	7.8	25.2	58.8	55.4	58.2	50.5	71.4	

Table 10. Catch-at-age of spring and autumn spawning herring from commercial samples for Bonavista Bay-Trinity Bay, 1970–2010; includes estimates of herring caught for use as lobster bait (1996 onward).

Spring Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	1	1	1	1	1	1	5	10	1	1	1	1	1	1
2	1	1	1	1	1	1	14	16	22	6	15	136	1	1
3	1	690	10	1	1	392	77	248	26	286	13	246	8	4
4	1	311	1347	60	2	134	493	135	357	167	195	53	11	34
5	9	102	389	4887	235	163	123	759	122	765	43	256	2	7
6	55	64	91	126	4795	2564	166	227	251	19	293	26	30	2
7	808	361	75	96	424	14330	4897	50	112	436	52	288	5	15
8	35	1373	88	0	151	455	20697	6209	598	101	264	23	35	1
9	126	151	480	48	294	995	909	23206	4412	530	75	321	5	8
10	69	126	14	271	69	727	854	774	13394	5575	967	88	65	2
11+	212	522	213	1	1849	1679	4306	5890	5956	19994	12259	11762	1186	159
Total	1318	3702	2709	5492	7822	21441	32541	37524	25251	27880	14177	13200	1349	234

Age	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	1	1	151	296	717	1	1	115	1	1	1	4	1	0
2	4	13	207	1352	6612	563	58	689	499	354	1	1	1	79
3	22	175	443	413	9910	1043	3094	210	1056	621	394	107	31	310
4	35	70	4445	2845	267	3323	422	13551	271	160	819	2645	71	14
5	210	87	261	16208	3674	264	2350	2586	12612	344	303	349	5181	98
6	9	351	161	334	21739	1428	94	3859	2422	3779	1072	64	766	6169
7	5	37	262	359	782	8639	629	347	579	422	3878	152	115	616
8	12	27	38	126	713	13	4439	1550	194	385	479	978	162	7
9	2	13	10	33	8	216	235	7505	1394	132	471	172	518	1
10	2	22	31	6	55	100	325	447	2054	657	530	163	11	101
11+	154	797	657	956	1247	508	466	891	653	1092	2614	649	432	95
Total	456	1593	6666	22928	45724	16098	12113	31750	21735	7947	10562	5284	7288	7488

Age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*	2010*
1	1	1	51	1	1	1	1	1	1	1	1	0	2
2	58	50	367	446	1	1	260	47	1	1	88	0	2
3	538	48	212	531	596	401	406	3159	365	37	385	1648	90
4	511	889	223	406	412	2403	237	2337	3003	530	359	1845	417
5	94	701	909	64	250	267	848	678	489	2502	504	500	336
6	136	11	663	129	138	121	247	3209	315	2050	2430	679	263
7	3826	14	49	397	157	1	99	352	1686	559	1658	7133	92
8	272	3576	23	115	160	1	172	76	182	2145	573	442	2140
9	4	1251	2259	1	2	1	118	63	48	256	234	467	92
10	4	63	112	5	1	1	8	87	1	93	193	432	1110
11+	146	108	539	453	1149	7	45	139	318	204	325	1721	1198
Total	5590	6712	5407	2548	2867	3205	2442	10148	6408	8377	6752	14867	5742

**catch data preliminary.*

Table 10 (Cont'd.).

Autumn Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
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
3	1	1	1	1	1	1	10	1	1	1	14	6	3	1
4	1	1	1	1	1	26	22	55	16	1	11	115	1	10
5	1	10	1	1	1	30	77	16	14	27	17	106	8	2
6	1	1	1	1	1	1	23	176	61	114	83	33	10	5
7	4	4	2	1	16	22	66	86	58	30	188	83	3	2
8	17	23	2	48	2	41	34	112	28	175	45	283	8	1
9	18	3	5	1	1	6	62	30	23	13	112	36	25	1
10	17	21	1	1	1	19	8	73	82	16	3	4	1	1
11+	738	406	33	1	1216	259	1069	1069	417	800	463	230	37	3
Total	800	472	49	58	1242	407	1373	1620	702	1179	938	898	98	28

Age	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	1	1	1	19	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	253	1	1	1	1	1	1	13	1	1
3	1	1	1	1	54	1	5	6	1	11	1	6	1	34
4	3	5	51	2	22	55	139	140	10	1	1	39	1	65
5	84	18	80	391	88	76	55	837	219	146	53	90	265	27
6	14	203	59	237	357	136	9	152	205	205	168	4	265	161
7	17	96	292	87	216	237	61	17	118	163	27	1	83	111
8	3	54	149	360	202	18	50	99	1	121	114	48	95	3
9	5	22	24	138	818	83	58	104	5	39	1	24	11	6
10	1	10	1	2	2	697	19	125	1	14	1	1	1	19
11+	9	29	30	156	237	193	89	481	167	376	79	206	21	76
Total	139	440	689	1394	2250	1498	487	1963	729	1078	446	433	744	503

Age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*	2010*
1	1	1	1	1	1	1	1	1	1	1	1	0	0
2	1	22	1	1	1	1	1	1	1	1	1	0	0
3	1	58	42	168	1	63	140	35	136	1	268	254	13
4	240	65	77	60	159	125	427	746	262	76	173	1409	715
5	326	193	137	119	153	454	123	1498	1776	146	271	1677	3826
6	122	265	111	735	555	156	335	220	3010	1638	524	1645	2113
7	254	42	265	459	246	269	119	1047	99	2323	2406	1637	563
8	135	59	130	628	259	53	175	170	138	309	1815	4845	758
9	2	61	54	228	120	1	156	92	45	85	222	4775	2531
10	35	62	81	58	120	1	195	85	1	64	99	523	3176
11+	73	180	167	742	308	291	139	128	123	213	250	1050	1990
Total	1191	1007	1067	3197	1923	1414	1810	4024	5593	4856	6031	17815	15685

**catch data preliminary.*

Table 10 (Cont'd.).

Spring and Autumn Spawners

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Total	2118	4174	2758	5550	9064	21848	33914	39144	25953	29059	15115	14098	1447	262
% SS	62.2	88.7	98.2	99.0	86.3	98.1	96.0	95.9	97.3	95.9	93.8	93.6	93.2	89.3
% AS	37.8	11.3	1.8	1.0	13.7	1.9	4.0	4.1	2.7	4.1	6.2	6.4	6.8	10.7

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Total	595	2033	7355	24322	47974	17596	12600	33713	22464	9025	11008	5717	8032	7991
% SS	76.6	78.4	90.6	94.3	95.3	91.5	96.1	94.2	96.8	88.1	95.9	92.4	90.7	93.7
% AS	23.4	21.6	9.4	5.7	4.7	8.5	3.9	5.8	3.2	11.9	4.1	7.6	9.3	6.3

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	6782	7719	6474	5745	4790	4619	4252	14172	12001	13233	12784	32682	21427
% SS	82.4	87.0	83.5	44.3	59.9	69.4	57.4	71.6	53.4	63.3	52.8	45.5	26.8
% AS	17.6	13.0	16.5	55.7	40.1	30.6	42.6	28.4	46.6	36.7	47.2	54.5	73.2

Table 11. Catch-at-age of spring and autumn spawning herring from commercial samples for St. Mary's Bay-Placentia Bay, 1970-2010; includes estimates of herring caught for use as lobster bait (1996 onward).

Spring Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	3	1	1	1	3	1	1	1	1	1	1	1	1	1
2	476	1	1	76	995	74	365	52	30	87	133	1	1	1
3	109	557	207	326	280	2234	391	1423	175	663	332	193	1	5
4	4434	116	20375	77	234	471	1906	140	1817	279	133	42	2	2
5	59	2111	725	15470	126	147	208	736	123	2263	153	111	3	3
6	76	80	5154	566	14328	1591	267	87	596	96	1270	51	8	2
7	645	251	365	6757	436	13858	862	50	64	614	57	338	3	4
8	66	45	650	93	6049	146	5622	1039	106	85	470	28	14	1
9	72	13	352	224	138	3391	201	3830	512	66	38	80	4	9
10	37	22	73	193	238	350	2256	134	3827	501	237	6	4	1
11+	107	96	403	315	624	1323	1361	2448	2185	4785	2971	466	69	39
Total	6084	3293	28306	24098	23451	23586	13440	9940	9436	9440	5795	1317	110	68

Age	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	1	1	1	1	1	1	1	1	1	1	13	1	1	1
2	8	1	1	34	1	22	1	37	68	5	24	1	24	235
3	9	7	1	19	1	48	115	1	47	62	137	333	24	125
4	24	18	143	2	22	9	189	222	7	34	5	1418	276	1
5	36	27	19	502	163	1	64	160	363	11	36	37	1509	2055
6	6	21	28	29	2457	24	15	170	231	187	6	1	115	9606
7	3	15	9	47	119	463	30	12	55	118	225	1	52	636
8	24	3	4	9	213	34	494	110	53	74	60	63	40	134
9	1	25	1	3	16	100	45	493	74	63	98	1	69	76
10	10	5	5	1	36	5	172	88	383	56	172	16	20	50
11+	44	125	30	11	147	34	128	948	965	1174	1042	416	229	508
Total	166	248	242	658	3176	741	1254	2242	2247	1785	1818	2288	2358	13427

Age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*	2010*
1	1	1	1	1	1	1	1	1	1	1	1	0	0
2	204	1	1	1	1	1	6	379	136	1	1	0	0
3	535	63	11	1	299	74	72	587	31	3	10	0	0
4	186	63	594	29	90	657	67	4	1043	1	1	0	269
5	59	1	160	412	196	20	3039	96	153	104	17	48	0
6	1043	1	65	511	1444	75	943	3383	161	129	194	15	0
7	5036	253	62	169	274	1243	407	77	1201	38	228	415	0
8	294	885	300	80	125	40	382	4	73	30	1	199	993
9	357	126	131	390	20	1	198	4	40	3	10	48	0
10	39	63	36	314	204	73	135	59	128	30	134	0	305
11+	110	190	403	1199	1441	481	245	69	297	51	134	158	374
Total	7864	1648	1764	3106	4093	2666	5495	4664	3265	390	729	883	1941

*catch data preliminary.

Table 11 (Cont'd.).

Autumn Spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	0	0	0	0	1	1	1	1	1	1	1	1	1	1
2	0	0	0	0	1	1	1	1	1	1	1	1	1	1
3	0	0	24	5	2	1	11	1	1	1	1	1	1	1
4	0	9	61	150	2	7	4	47	23	11	96	139	1	18
5	2	2	175	52	96	68	214	52	435	143	35	116	7	6
6	0	53	15	71	146	182	67	209	92	598	52	10	1	12
7	71	31	61	10	80	89	32	81	244	73	419	11	1	4
8	112	43	37	54	95	206	17	69	122	216	79	50	1	1
9	19	84	101	17	93	6	94	26	38	21	126	7	1	1
10	28	35	71	68	51	37	11	22	52	2	25	1	1	1
11+	202	314	539	737	970	677	329	526	561	348	492	29	2	4
Total	434	571	1084	1164	1537	1275	781	1035	1570	1415	1327	366	18	50

Age	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	2	1	1	1	1	1	1	1	1	1	1
3	1	1	1	4	1	5	7	1	1	1	7	1	23	76
4	17	9	16	12	20	5	37	14	7	2	7	105	50	295
5	101	20	24	32	30	18	61	87	8	208	62	112	101	188
6	32	86	15	80	239	8	54	40	50	239	116	35	130	1403
7	21	46	97	30	90	56	24	23	33	173	182	106	12	1419
8	5	36	28	82	35	43	47	65	27	41	231	99	26	343
9	3	10	16	24	270	67	58	98	64	41	182	87	14	420
10	1	3	4	3	5	178	17	40	1	3	1	78	1	50
11+	8	24	15	12	53	164	173	495	479	863	411	282	111	958
Total	191	237	218	282	745	546	480	865	672	1573	1201	907	470	5153

Age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*	2010*
1	1	1	1	1	1	1	1	1	1	1	1	0	0
2	1	1	1	1	1	1	1	1	1	1	1	0	0
3	59	1	12	1	1	1	1	1	92	3	10	0	0
4	233	1	59	20	327	37	54	616	193	3	36	0	113
5	544	1	201	118	90	727	230	1108	1222	43	168	97	621
6	268	126	89	211	277	148	1205	360	2085	317	322	49	457
7	933	190	858	187	752	906	460	369	170	1658	926	580	282
8	752	316	115	444	453	558	431	7	159	273	1928	1206	218
9	605	190	321	42	157	36	374	110	236	124	46	1390	1203
10	20	316	136	47	113	112	209	53	125	182	67	499	876
11+	258	379	725	594	498	326	459	177	250	794	441	691	1040
Total	3674	1522	2518	1665	2669	2851	3425	2804	4532	3397	3945	4512	4810

*catch data preliminary.

Table 11 (Cont'd).

Spring and Autumn Spawners

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Total	6518	3864	29390	25262	24988	24861	14221	10975	11006	10855	7122	1683	128	118
% SS	93.3	85.2	96.3	95.4	93.8	94.9	94.5	90.6	85.7	87.0	81.4	78.3	85.9	57.6
% AS	6.7	14.8	3.7	4.6	6.2	5.1	5.5	9.4	14.3	13.0	18.6	21.7	14.1	42.4

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Total	357	485	460	940	3921	1287	1734	3107	2919	3358	3019	3195	2828	18580
% SS	46.5	51.1	52.6	70.0	81.0	57.6	72.3	72.2	77.0	53.2	60.2	71.6	83.4	72.3
% AS	53.5	48.9	47.4	30.0	19.0	42.4	27.7	27.8	23.0	46.8	39.8	28.4	16.6	27.7

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	11538	3170	4281	4771	6763	5517	8920	7468	7797	3787	4675	5395	6751
% SS	68.2	52.0	41.2	65.1	60.5	48.3	61.6	62.5	41.9	10.3	15.6	16.4	28.8
% AS	31.8	48.0	58.8	34.9	39.5	51.7	38.4	37.5	58.1	89.7	84.4	83.6	71.2

Table 12. Catch-at-age of spring and autumn spawning herring from commercial samples for Fortune Bay, 1970-2010; includes estimates of herring caught for use as lobster bait (1996 onward).

Spring Spawners

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

Age	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
3	1	54	1	1	1	1	1	1	1	2	6	1	1	1
4	4	3	145	1	1	1	1	23	1	1	1	1	232	1
5	3	39	4	304	1	1	2	8	3	1	2	14	12	1
6	2	12	69	11	219	18	2	1	1	327	1	14	49	1
7	1	2	20	49	7	274	12	1	1	2	24	24	1	1
8	2	1	6	18	26	1	155	6	1	3	9	569	1	1
9	1	1	1	4	6	17	17	274	2	8	23	36	741	1
10	2	1	2	1	1	11	20	1	75	10	8	36	100	68
11+	23	15	14	38	10	24	1	72	266	217	647	728	700	1638
Total	42	130	264	429	274	350	213	389	353	573	723	1425	1839	1715

Age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*	2010*
1	1	1	1	1	1	1	1	1	1	1	1	0	0
2	1	1	1	703	1	1	1	1	1	1	1	195	137
3	1	108	0	162	1	1	1	1125	1	1	39	226	377
4	1	27	544	192	1	882	1	143	1631	51	78	344	195
5	1	1	49	4907	1	0	750	214	38	2359	1	0	127
6	1	49	62	328	4029	76	20	1456	22	17	4922	149	0
7	1	864	99	195	157	7132	152	6	582	43	25	8660	6266
8	1	176	1339	385	144	314	6506	58	199	193	78	479	13332
9	1	191	201	932	122	3	264	4925	1	156	158	214	623
10	1	1	230	367	688	67	243	399	1963	829	53	77	509
11+	1337	1491	1450	1448	4456	3459	3815	1632	4928	6597	5229	5188	17438
Total	1347	2910	3976	9620	9601	11937	11754	9960	9367	10248	10583	15532	39007

**catch data preliminary.*

Table 12 (Cont'd.).

Autumn Spawners

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

Age	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
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
3	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	1	17	3	1	2	3	10	1	1	1	1	1	1	1
5	9	4	8	4	1	6	5	1	4	1	1	1	1	1
6	4	26	16	7	5	1	12	8	5	3	1	1	1	1
7	6	12	38	11	5	6	17	1	3	11	1	25	1	1
8	1	7	12	25	1	31	7	3	1	1	1	31	1	1
9	1	4	5	10	13	3	54	1	1	1	1	10	65	1
10	1	1	1	5	1	17	1	3	1	1	1	1	1	1
11+	1	2	5	14	10	5	5	1	5	26	14	1	1	1
Total	27	76	91	80	41	75	114	22	24	48	24	74	75	11

Age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*	2010*
1	1	1	1	1	1	1	1	11	1	1	1	0	0
2	1	1	1	1	1	1	1	1	1	1	1	0	0
3	1	1	1	29	1	1	1	1	1	1	88	0	0
4	1	1	10	1	1	38	1	249	1	77	88	344	123
5	1	1	26	109	1	1522	1	451	82	78	1	314	0
6	1	1	65	357	1	228	30	337	82	52	1	195	0
7	1	27	124	138	11	270	81	373	55	182	412	0	263
8	1	1	114	109	11	304	30	6	153	122	155	455	0
9	1	1	86	0	1	114	81	207	1	17	1	344	258
10	1	1	17	167	1	152	20	22	44	1	1	306	0
11+	1	25	148	409	135	193	101	611	437	164	78	654	264
Total	11	61	591	1320	165	2824	350	2270	859	697	827	2612	908

*catch data preliminary.

Table 12 (Cont'd.).

Spring and Autumn Spawners

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Total	60668	68979	43485	12551	8873	3109	1619	3224	3990	4504	1508	321	77	51
% SS	93.1	93.1	96.4	97.1	96.6	94.3	91.8	97.8	97.3	97.6	98.7	71.0	76.6	76.5
% AS	6.9	6.9	3.6	2.9	3.4	5.7	8.2	2.2	2.7	2.4	1.3	29.0	23.4	23.5

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Total	69	206	355	509	315	425	327	411	377	621	747	1499	1913	1726
% SS	60.9	63.1	74.4	84.3	87.0	82.4	65.1	94.6	93.6	92.3	96.8	95.1	96.1	99.4
% AS	39.1	36.9	25.6	15.7	13.0	17.6	34.9	5.4	6.4	7.7	3.2	4.9	3.9	0.6

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	1358	2971	4568	10941	9766	14761	12104	12230	10226	10945	11409	18144	39917
% SS	99.2	97.9	87.1	87.9	98.3	80.9	97.1	81.4	91.6	93.6	92.8	85.6	97.7
% AS	0.8	2.1	12.9	12.1	1.7	19.1	2.9	18.6	8.4	6.4	7.2	14.4	2.3

Table 13. Parameters, catch data, catch rates, and effort, by stock area and year, for spring research gill net data.

Stock Area	Year	Number of Fishers	Fishing Dates		Total Catch (numbers)	Catch Rate (no/nights fished)			Net Nights per Fisher
			Start	End		AS	SS	Comb.	
WBNDB	1988	5	14 May	17 June	17759	9	146	156	570
	1989	7	25 April	24 June	99614	61	486	547	910
	1990	7	25 April	22 June	121218	27	679	706	859
	1991	7	8 May	31 July	117333	25	685	709	827
	1992	6	6 May	7 July	139253	28	859	887	785
	1993	6	3 May	9 July	104251	67	607	674	773
	1994	7	2 May	18 July	110697	72	586	658	841
	1995	7	15 May	27 July	103011	53	560	613	840
	1996	7	7 May	11 July	114465	71	470	541	1058
	1997	7	13 May	11 July	70338	32	320	352	998
	1998	7	5 May	10 July	53055	26	246	272	975
	1999	7	5 May	16 July	46465	14	202	216	1075
	2000	6	25 April	22 July	10681	9	49	58	920
	2001	7	8 May	20 July	29934	29	107	136	1100
	2002	9	21 April	31 July	10768	10	29	39	1372
	2003	9	19 April	31 July	31444	20	91	111	1412
	2004	8	23 April	31 July	30881	45	76	121	1278
	2005	8	22 April	31 July	76674	95	207	301	1273
	2006	8	24 April	31 July	75281	155	152	307	1227
	2007	7	14 May	25 July	70388	143	198	341	1033
	2008	8	5 May	31 July	57306	126	109	233	1229
	2009	8	29 April	30 July	74184	116	101	218	1705
	2010	8	16-Apr	29-Jul	41809	47	67	114	1825
	2011	8	12-Apr	19-Jul	10474	NA	NA	30	1760
BBTB	1988	7	9 May	17 June	6554	1	51	53	622
	1989	8	18 April	12 June	25250	10	96	106	1189
	1990	7	10 April	6 June	28748	11	135	146	982
	1991	8	30 April	26 June	40320	20	188	209	966
	1992	8	20 April	18 June	35196	15	138	153	1152
	1993	8	23 April	15 June	28373	17	113	130	1090
	1994	8	18 April	21 June	45863	19	168	187	1227
	1995	7	9 May	27 June	20836	10	99	110	950
	1996	7	11 April	18 June	58278	29	229	259	1127
	1997	8	16 April	26 June	73135	33	279	312	1172
	1998	8	21 April	29 June	25564	19	83	102	1257
	1999	8	15 April	26 June	23290	21	60	81	1440
	2000	8	3 April	26 June	15579	16	41	57	1373
	2001	8	4 May	20 July	14303	18	32	50	1436
	2002	10	15 April	18 July	9859	4	23	27	1814
	2003	10	9 April	12 July	37597	36	72	108	1747
	2004	9	14 April	17 July	54260	82	99	181	1499
	2005	9	14 April	17 July	46422	87	75	162	1430
	2006	9	5 April	15 July	78838	115	138	253	1557
	2007	9	13 April	23 July	101092	218	147	364	1387
	2008	8	18 April	14 July	52531	108	78	186	1411
	2009	9	19 April	8 July	61376	85	62	147	2090
	2010	9	3-Apr	16-Jul	47478	60	57	117	2020
	2011	9	7-Apr	12-Jul	52446	NA	NA	123	2120

Table 13 (Cont'd.).

Stock Area	Year	Number of Fishers	Fishing Dates		Total Catch (numbers)	Catch Rate (nos. per nights fished)			Net Nights per Fisher
			Start	End		AS	SS	Comb.	
SMBPB	1982	4	17 April	15 May	1905	4	12	16	595
	1983	5	6 April	3 June	9174	21	44	65	708
	1984	4	5 April	14 June	34405	129	116	246	700
	1985	4	10 April	6 June	35835	133	143	276	650
	1986	5	10 April	13 June	37840	98	172	270	700
	1987	5	1 April	31 May	43693	72	211	282	774
	1988	5	2 April	29 May	23140	29	141	170	681
	1989	5	4 April	7 June	21634	25	123	148	730
	1990	5	9 April	6 June	28591	53	139	192	743
	1991	5	3 April	12 June	9971	25	42	67	745
	1992	5	8 April	10 June	13264	32	55	87	765
	1993	5	5 April	11 June	10727	25	46	72	750
	1994	5	7 April	7 June	22350	36	106	142	785
	1995	5	5 April	3 June	12861	14	70	84	765
	1996	5	2 April	12 June	54047	61	266	328	825
	1997	5	4 April	4 June	30290	55	136	191	795
	1998	5	1 April	5 June	19392	41	80	121	803
	1999	5	1 April	27 May	38665	82	164	246	785
	2000	5	4 April	3 June	36152	107	125	232	780
	2001	5	5 April	8 June	37536	63	168	232	810
	2002	6	1 April	14 June	85521	145	262	407	1050
	2003	6	4 April	12 June	37122	45	147	192	965
	2004	6	5 April	18 June	22115	33	77	110	1009
	2005	6	5 April	14 June	24036	70	84	154	780
	2006	6	1 April	2 June	22020	28	79	107	1030
	2007	6	2 April	13 June	14294	48	24	72	1000
	2008	6	8 April	7 June	12553	45	20	65	965
	2009	6	4 April	13 June	33919	88	39	127	1340
	2010	6	1-Apr	16-Jul	21329	35	46	81	1310
	2011	6	1-Apr	4-Jul	17224	NA	NA	65	1330

Table 13 (Cont'd.).

Stock Area	Year	Number of Fishers	Fishing Dates Start	Fishing Dates End	Total Catch (numbers)	Catch Rate (nos. per nights fished) AS	Catch Rate (nos. per nights fished) SS	Catch Rate (nos. per nights fished) Comb.	Net Nights per Fisher
FB	1982	2	16 April	22 May	799	2	10	12	325
	1983	2	11 April	16 May	10653	49	129	178	300
	1984	1	19 April	18 May	5908	71	156	227	130
	1985	2	16 April	17 May	38301	175	462	636	301
	1986	3	15 April	6 June	44175	65	399	464	476
	1987	3	8 April	22 May	63850	70	690	760	420
	1988	3	13 April	23 May	46435	37	517	554	419
	1989	3	11 April	23 May	84066	81	927	1008	417
	1990	3	17 April	24 May	48466	47	479	527	460
	1991	3	9 April	28 May	50778	36	561	597	425
	1992	3	16 April	12 June	30235	51	331	383	395
	1993	3	13 April	5 June	39774	49	413	462	430
	1994	3	13 April	10 June	62870	46	668	714	440
	1995	3	18 April	23 June	56079	74	684	758	370
	1996	3	3 April	27 May	93868	58	862	920	510
	1997	3	7 April	31 May	96821	91	980	1071	452
	1998	3	7 April	30 May	111464	51	1224	1275	437
	1999	3	1 April	26 May	90685	213	854	1067	425
	2000	3	1 April	30 May	76734	159	727	886	433
	2001	3	6 April	1 June	110487	97	1131	1228	450
	2002	4	3 April	31 May	60195	93	447	540	557
	2003	4	23 April	31 May	61701	78	463	541	570
	2004	4	3 April	31 May	40159	97	194	291	690
	2005	4	3 April	31 May	50777	105	349	453	560
	2006	4	1 April	6 June	38232	83	264	348	550
	2007	4	2 April	11 June	27116	37	181	218	622
	2008	4	13 April	16 June	42305	75	263	338	625
	2009	4	4 April	24 June	67497	83	292	375	900
	2010	4	1-Apr	4-Jul	49867	101	175	276	900
	2011	4	2-Apr	14-Jun	11141	NA	NA	63	880

Table 14. Spring research gill net catch rates at age (numbers per nights fished), of spring and autumn spawning herring, for White Bay–Notre Dame Bay, 1988-2010.

Spring Spawners

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.8	0.0	0.0	0.0
3	4.7	16.0	83.5	11.0	0.0	1.2	0.6	0.0	0.0	3.2	7.9	6.5	0.3	0.5	11.0	3.6	5.5	7.0	0.3	0.2	32.8	2.4	1.1
4	1.9	43.3	51.6	247.1	21.5	10.9	232.0	18.5	0.9	0.6	117.6	70.3	2.6	44.2	3.0	65.9	11.3	30.6	69.4	6.9	6.7	7.1	16.6
5	22.2	11.2	52.9	28.8	493.7	51.0	14.6	300.1	47.9	3.2	0.2	85.1	14.8	8.1	4.7	2.7	43.9	41.5	10.0	137.1	1.3	5.1	8.4
6	59.6	126.9	16.3	13.7	33.5	359.9	52.1	20.2	286.0	77.1	1.2	1.0	16.8	37.5	3.6	9.5	2.8	85.3	8.3	17.0	54.2	15.7	23.3
7	5.6	182.9	144.6	7.5	13.7	18.8	182.7	45.9	12.7	139.5	10.3	0.4	0.2	15.5	2.1	1.3	2.0	1.4	36.5	7.3	2.4	52.5	12.9
8	4.7	9.7	195.5	84.2	10.3	6.7	14.1	104.1	21.6	8.6	43.3	9.5	0.9	0.1	0.7	4.6	1.7	0.8	2.3	17.4	2.9	5.0	25.5
9	12.0	16.0	11.5	164.3	47.2	13.4	7.6	8.4	74.2	17.6	1.7	15.0	0.4	0.2	0.2	1.5	1.5	6.8	0.0	0.0	2.5	4.5	4.6
10	1.8	24.3	26.5	21.9	127.9	29.7	12.9	9.5	5.2	31.0	6.9	2.8	0.6	0.6	0.5	1.2	0.6	3.3	1.1	5.3	2.3	4.4	3.0
11+	34.1	56.4	97.1	106.1	110.8	115.9	69.1	52.1	21.1	39.4	56.8	18.0	12.1	0.1	3.0	0.7	6.1	29.7	23.3	5.7	3.5	3.3	4.7
Total	**146.4**	**486.4**	**678.8**	**684.6**	**858.6**	**606.9**	**585.7**	**559.8**	**469.5**	**320.0**	**246.0**	**202.1**	**48.7**	**106.8**	**28.9**	**91.1**	**75.6**	**206.6**	**151.5**	**197.6**	**108.6**	**58.9**	**64.7**

Autumn Spawners

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
4	0.0	0.0	2.3	1.6	0.0	0.0	0.6	2.3	0.0	0.6	1.2	0.2	0.0	1.5	2.0	2.4	13.6	5.3	1.4	9.3	0.5	5.1	7.0
5	0.7	6.8	2.5	2.7	1.7	6.8	1.8	13.1	3.4	0.9	5.0	3.2	2.0	12.8	1.7	6.1	4.6	52.6	17.9	30.2	21.7	15.3	26.5
6	1.3	1.8	2.3	1.4	14.2	17.9	9.1	6.9	29.6	2.6	2.4	5.5	2.7	10.3	2.1	0.7	10.4	4.8	88.5	34.1	12.9	8.3	9.2
7	0.7	4.4	0.9	1.6	2.2	13.8	12.0	7.9	3.4	14.5	0.7	0.4	1.5	1.8	2.7	7.2	2.7	5.6	5.7	37.8	42.2	13.9	6.5
8	0.6	4.4	1.4	1.0	0.2	2.4	11.1	4.3	10.4	2.0	8.9	0.2	1.3	1.8	1.3	1.5	3.5	2.4	8.1	6.2	37.3	26.7	14.2
9	4.5	6.3	1.9	2.9	1.2	1.3	4.0	3.9	8.8	2.6	1.7	2.8	0.4	0.3	0.1	1.0	1.9	0.5	0.2	0.1	7.0	22.5	12.0
10	0.1	19.9	0.2	0.0	0.3	0.3	0.1	4.1	4.1	1.2	1.7	0.6	0.6	0.1	0.1	0.7	5.3	4.1	4.2	10.4	1.0	5.1	20.1
11+	1.4	17.1	16.0	13.6	8.6	25.0	33.8	10.9	11.7	8.1	4.5	1.1	0.8	0.6	0.4	0.6	3.3	19.5	29.2	14.7	1.7	3.2	4.4
Total	**9.4**	**61.0**	**26.8**	**24.8**	**28.4**	**67.4**	**72.4**	**53.3**	**71.4**	**32.4**	**26.1**	**14.0**	**9.3**	**29.3**	**10.4**	**20.3**	**45.2**	**94.6**	**155.2**	**143.1**	**124.5**	**158.6**	**47.1**

Spring and Autumn Spawners

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	155.8	547.3	705.6	709.4	887.0	674.3	658.1	613.2	541.0	352.4	272.1	216.1	58.1	136.1	39.2	111.4	120.8	301.2	306.8	340.7	233.1	217.5	111.8
% SS	94.0	88.9	96.2	96.5	96.8	90.0	89.0	91.3	86.8	90.8	90.4	93.5	83.9	78.5	73.6	81.8	62.6	68.6	49.4	58.0	46.6	27.1	57.9
% AS	1.4	11.1	3.8	3.5	3.2	10.0	11.0	8.7	13.2	9.2	9.6	6.5	16.1	21.5	26.4	18.2	37.4	31.4	50.6	42.0	53.4	72.9	42.1
Total	**155.8**	**547.3**	**705.6**	**709.4**	**887.0**	**674.3**	**658.1**	**613.2**	**541.0**	**352.4**	**272.1**	**216.1**	**58.1**	**136.1**	**39.2**	**111.4**	**120.8**	**301.2**	**306.8**	**340.7**	**233.1**	**217.5**	**111.8**

Table 15. Spring research gill net catch rates at age (numbers per nights fished), of spring and autumn spawning herring, for Bonavista Bay–Trinity Bay, 1988-2010.

Spring Spawners

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
3	5.6	2.3	8.8	0.9	0.3	2.6	0.7	0.0	0.0	2.8	1.2	0.1	0.1	3.4	11.0	2.5	1.1	11.6	1.1	2.2	4.6	0.0	0.2
4	0.3	21.8	8.2	50.1	1.2	1.7	16.6	34.3	0.9	0.0	5.7	17.6	2.6	3.3	5.8	47.3	9.3	4.6	53.5	6.8	4.1	4.6	7.0
5	2.3	0.9	27.7	12.0	46.2	8.2	9.6	8.2	140.9	3.3	0.2	7.2	11.9	2.0	2.3	12.2	68.3	6.3	11.1	69.6	1.7	2.8	10.4
6	29.2	5.5	4.5	27.9	8.1	50.6	12.6	1.7	20.8	181.9	1.7	0.4	5.8	10.0	0.6	2.9	13.1	40.6	8.0	14.1	37.3	14.7	5.9
7	0.5	57.7	12.2	3.2	10.3	6.4	65.0	4.6	5.3	23.7	62.3	0.8	0.4	3.0	1.5	0.4	2.5	5.1	52.4	9.5	4.4	36.7	21.1
8	0.4	0.9	60.8	19.8	2.3	7.0	6.5	19.9	5.5	5.6	4.6	29.8	0.2	0.5	0.5	1.5	0.8	2.5	2.8	38.9	2.5	6.7	28.8
9	0.6	0.6	0.8	62.3	17.6	3.7	8.9	2.6	20.8	7.0	2.1	1.4	12.7	0.9	0.1	0.6	0.3	0.1	1.7	1.5	13.3	8.8	5.9
10	0.0	0.7	3.2	3.8	34.8	13.1	7.5	3.0	3.7	16.7	1.3	0.3	4.1	3.8	0.0	0.9	0.8	1.5	1.9	0.9	5.5	13.0	12.4
11+	12.2	5.5	8.9	8.3	16.8	20.2	40.1	25.0	31.4	38.2	5.9	2.3	2.6	5.1	1.2	3.7	2.6	2.9	5.9	3.7	4.7	12.7	8.3
Total	**51.2**	**96.1**	**135.1**	**188.2**	**137.6**	**113.5**	**167.6**	**99.2**	**229.1**	**278.9**	**83.0**	**59.9**	**40.5**	**32.1**	**23.0**	**72.1**	**98.6**	**75.1**	**138.2**	**146.9**	**78.0**	**56.6**	**47.8**

Autumn Spawners

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.0	1.9	0.3	0.0
4	0.0	0.1	0.0	0.1	0.0	0.1	0.2	0.6	0.0	0.7	0.8	0.6	0.2	0.1	0.7	1.6	7.9	19.2	1.3	0.0	5.7	2.7	1.4
5	0.3	0.3	0.4	3.8	0.5	1.7	1.9	2.1	2.7	0.2	3.6	4.0	2.4	3.7	0.9	7.3	11.5	31.9	21.6	5.9	5.7	7.1	8.8
6	0.2	0.3	0.2	2.1	2.5	5.0	3.7	1.3	12.3	5.1	0.7	5.9	2.9	5.5	0.8	3.3	28.9	8.7	51.6	71.8	9.1	9.8	14.0
7	0.2	1.9	0.9	1.1	1.0	3.9	5.4	1.6	1.7	13.3	2.9	1.4	4.3	2.1	1.0	8.6	12.4	12.0	8.6	105.1	34.5	13.8	11.5
8	0.0	1.3	1.2	0.7	0.5	0.8	3.2	2.0	3.6	2.7	7.1	2.5	2.7	1.5	0.3	5.3	6.3	2.9	13.9	10.4	38.3	31.4	12.1
9	0.5	0.5	1.2	2.2	0.7	0.4	0.8	0.2	3.0	2.2	0.7	4.3	0.5	0.6	0.3	2.4	3.0	3.9	2.5	7.8	4.8	23.7	24.0
10	0.0	3.3	0.1	0.7	0.4	0.1	0.4	0.1	1.9	2.0	0.8	1.0	1.3	1.5	0.1	1.6	3.3	2.1	2.5	7.6	2.8	6.8	19.6
11+	0.3	2.4	7.3	9.8	9.5	4.6	3.7	2.6	4.2	6.9	2.2	1.3	2.0	2.7	0.1	5.3	8.9	6.4	12.8	8.7	5.1	4.4	8.6
Total	**1.5**	**10.1**	**11.3**	**20.5**	**15.1**	**16.7**	**19.2**	**10.4**	**29.5**	**33.1**	**18.7**	**20.9**	**16.2**	**17.7**	**4.2**	**35.5**	**82.4**	**87.2**	**114.9**	**217.6**	**108.2**	**90.3**	**52.2**

Spring and Autumn Spawners

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	52.7	106.2	146.4	208.7	152.8	130.2	186.9	109.7	258.6	312.0	101.7	80.9	56.7	49.8	27.2	107.6	181.0	162.3	253.2	364.4	186.2	146.9	27.2
% SS	97.2	90.5	92.3	90.2	90.1	87.2	89.7	90.5	88.6	89.4	81.6	74.1	71.4	64.4	84.5	67.0	54.5	46.3	54.6	40.3	41.9	38.5	84.5
% AS	0.8	9.5	7.7	9.8	9.9	12.8	10.3	9.5	11.4	10.6	18.4	25.9	28.6	35.6	15.5	33.0	45.5	53.7	45.4	59.7	58.1	61.5	15.5

Table 16. Spring research gill net catch rates at age (numbers per nights fished), of spring and autumn spawning herring, for St. Mary's Bay-Placentia Bay, 1982-2010.

Spring spawners

Age	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.2	1.6	0.7	0.0	0.0	0.0	0.4	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0
3	0.2	10.2	18.6	59.3	0.3	13.7	2.3	23.5	11.2	0.9	2.7	3.5	15.6	11.3	0.0
4	0.6	1.8	21.9	5.9	125.6	1.7	4.2	6.0	19.5	16.5	0.7	3.3	25.4	49.2	54.9
5	0.4	0.9	7.0	9.9	8.5	152.1	2.7	1.8	5.7	7.1	21.8	1.5	2.9	1.8	159.8
6	1.4	1.0	2.7	6.9	17.4	11.6	100.2	3.5	2.4	1.9	3.8	12.1	0.4	0.4	9.3
7	0.2	3.2	0.9	2.4	3.4	17.7	6.2	64.3	5.0	0.5	2.4	2.4	6.9	0.8	5.9
8	1.7	0.4	7.3	2.1	2.6	4.0	14.4	3.3	69.9	1.1	1.0	2.7	2.1	1.8	1.9
9	0.4	4.7	0.2	8.6	0.1	2.1	3.0	12.6	2.4	8.3	1.6	1.1	3.8	1.2	5.9
10	0.4	0.5	10.1	2.7	2.4	0.6	0.1	3.1	16.7	1.1	7.5	2.1	3.2	0.3	0.8
11+	6.5	19.4	47.0	45.4	12.1	7.4	7.2	4.9	6.8	4.8	13.1	17.2	45.6	3.5	28.0
Total	**11.9**	**43.8**	**116.3**	**143.1**	**172.5**	**210.7**	**140.7**	**123.2**	**139.5**	**42.3**	**54.8**	**46.2**	**105.9**	**70.3**	**266.3**

Age	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
2	0.0	0.6	1.1	0.2	0.3	0.8	1.2	0.9	0.4	0.4	0.0	0.0	0.8	3.1
3	4.1	22.6	67.7	11.6	5.4	106.3	1.0	1.3	14.8	0.5	0.2	0.1	6.4	12.3
4	0.3	5.5	21.4	74.2	5.9	1.8	117.4	3.0	0.3	41.2	1.2	0.1	2.3	26.8
5	20.4	0.3	8.0	13.8	98.2	6.0	3.1	60.5	2.0	0.2	17.4	0.7	1.1	5.7
6	66.7	10.1	0.0	6.1	21.4	46.1	0.3	3.4	36.0	2.4	0.6	12.3	13.3	6.1
7	12.6	26.2	13.0	0.1	9.8	7.9	10.9	0.8	1.4	21.5	1.9	3.5	58.3	27.6
8	2.4	4.4	31.2	2.2	6.6	1.8	2.6	2.5	3.8	0.2	1.9	2.0	7.3	11.7
9	2.2	1.3	4.4	3.2	8.6	0.8	3.5	2.7	19.3	2.7	0.2	0.6	7.0	2.6
10	0.5	1.0	2.1	1.5	9.8	7.1	0.1	0.5	1.9	3.1	0.2	0.7	2.7	2.9
11+	26.8	7.9	15.1	11.6	2.5	83.3	6.8	0.9	4.3	4.7	0.0	0.0	0.8	0.8
Total	**135.8**	**79.8**	**164.3**	**124.7**	**168.4**	**261.9**	**147.1**	**76.5**	**84.1**	**79.0**	**23.7**	**19.9**	**82.5**	**46.5**

Table 16 (Cont'd.).

Autumn spawners

Age	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
3	0.6	0.4	6.2	0.9	0.7	2.0	0.0	0.1	0.1	0.3	0.0	0.1	0.3	0.3	0.0
4	0.6	9.3	10.9	36.8	8.0	4.6	1.1	1.8	1.0	2.3	1.1	1.4	5.4	5.6	0.9
5	2.0	1.7	53.6	14.2	16.6	8.2	1.2	3.8	4.5	8.1	3.7	3.8	2.2	2.6	13.8
6	0.2	4.8	16.0	39.0	10.2	14.9	2.9	1.5	2.8	2.3	5.4	3.8	2.0	0.1	17.8
7	0.0	0.9	22.9	14.4	42.2	8.5	5.2	3.8	2.9	0.9	1.6	3.8	2.8	0.8	3.6
8	0.2	0.4	1.6	12.2	10.4	20.6	5.0	2.8	3.3	2.3	0.8	1.4	4.1	1.4	5.8
9	0.1	0.7	4.1	1.5	3.6	7.5	8.3	2.0	6.7	1.5	1.9	0.6	1.9	0.6	5.8
10	0.0	0.4	0.8	2.5	1.5	0.7	1.2	5.0	2.0	0.9	1.0	0.6	0.7	0.1	2.6
11+	0.5	2.4	13.6	10.9	4.5	4.6	4.4	4.3	29.7	6.0	16.4	9.7	16.9	2.3	11.1
Total	**4.1**	**21.0**	**129.4**	**132.5**	**97.8**	**71.6**	**29.2**	**24.9**	**52.9**	**24.6**	**31.9**	**25.3**	**36.4**	**13.8**	**61.3**

Age	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	4.3	0.8	3.6	1.1	0.1	0.3	0.5	0.4	0.1	0.1	0.5	2.1	0.0	0.7
4	3.5	12.0	10.8	22.4	3.6	3.3	1.5	5.3	9.5	2.0	6.7	2.7	20.1	10.8
5	2.7	4.7	15.6	20.2	11.0	6.0	13.7	2.6	11.0	7.6	8.0	5.9	11.3	24.0
6	8.9	2.6	19.8	22.8	12.9	47.7	2.0	15.1	5.1	9.3	13.8	5.3	8.0	17.0
7	13.7	5.2	5.1	25.2	12.4	54.7	7.2	2.8	7.3	1.1	15.2	15.8	18.0	9.5
8	2.1	7.9	4.5	8.5	18.7	11.9	11.7	3.0	4.3	4.8	3.0	12.2	23.9	11.3
9	4.0	2.1	6.9	3.3	2.3	9.7	2.6	2.3	5.8	0.5	0.1	0.2	14.1	10.3
10	3.0	1.3	1.8	1.4	2.0	8.4	0.3	0.5	25.0	1.3	0.3	0.8	4.1	15.9
11+	12.6	4.4	13.8	2.2	0.4	3.2	5.8	1.1	1.7	1.3	0.1	0.2	0.5	0.5
Total	**54.7**	**40.9**	**82.0**	**107.1**	**63.3**	**145.4**	**45.2**	**33.1**	**70.0**	**27.9**	**47.8**	**45.1**	**44.1**	**34.9**

Spring and autumn spawners

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Total	16.0	64.8	245.8	275.7	270.3	282.3	169.9	148.2	192.4	66.9	86.7	71.5	142.4	84.1	327.6
% SS	74.4	67.6	47.3	51.9	63.8	74.6	82.8	83.2	72.5	63.2	63.2	64.6	74.4	83.6	81.3
% AS	25.6	32.4	52.7	48.1	36.2	25.4	17.2	16.8	27.5	36.8	36.8	35.4	25.6	16.4	18.7

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	190.5	120.8	246.3	231.7	231.7	407.2	192.3	109.6	154.1	106.9	71.5	65.0	126.6	81.4
% SS	71.3	66.1	66.7	53.8	72.7	64.3	76.5	69.8	54.6	73.9	33.1	30.6	65.2	57.1
% AS	28.7	33.9	33.3	46.2	27.3	35.7	23.5	30.2	45.4	26.1	66.9	69.4	34.8	42.9

Table 17. Spring research gill net catch rates at age (numbers per nights fished), of spring and autumn spawning herring, for Fortune Bay, 1982-2010.

Spring Spawners

Age	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
3	0.6	8.4	0.0	14.3	0.0	0.0	0.0	12.1	98.8	0.6	0.3	0.0	1.3	0.0	0.0
4	0.8	6.0	22.1	2.8	224.0	0.0	0.0	0.9	1.4	54.4	3.6	0.0	32.1	22.6	19.0
5	0.6	3.9	15.0	204.5	8.8	532.2	3.1	0.9	0.0	16.8	61.3	9.1	14.0	85.4	134.5
6	0.1	3.1	6.1	69.2	69.9	11.7	420.7	15.8	0.0	2.2	11.6	140.4	21.4	8.9	112.1
7	0.2	2.4	1.4	15.7	48.3	48.3	9.8	659.3	6.2	1.7	1.3	5.0	252.5	19.8	12.1
8	6.0	2.7	4.1	4.6	10.0	20.7	50.6	14.8	236.8	21.9	1.7	3.7	3.3	258.4	19.0
9	0.3	44.0	0.3	8.8	0.8	4.8	11.4	64.9	19.7	283.8	6.3	0.0	12.0	39.0	187.1
10	0.8	4.6	4.4	6.5	2.0	1.4	2.1	33.4	59.0	38.1	70.3	9.5	12.0	12.3	19.0
11+	0.8	53.7	102.5	135.3	35.9	71.8	19.6	124.3	56.1	141.4	175.0	245.3	319.3	237.2	360.4
Total	**10.3**	**128.7**	**156.0**	**461.6**	**399.3**	**690.2**	**516.8**	**927.3**	**479.4**	**560.9**	**331.4**	**413.0**	**668.0**	**683.6**	**862.3**

Age	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	2.4	82.8	0.0	0.0	8.1	0.0	2.9	44.6	3.4	0.5	0.0	0.2	0.3
4	0.0	3.7	36.7	124.2	1.1	0.9	19.0	3.1	0.7	167.5	2.9	0.0	0.0	6.0
5	89.2	0.0	21.3	40.7	235.2	4.9	0.9	44.8	2.1	9.0	102.6	0.0	11.1	8.9
6	193.1	514.2	15.4	8.7	49.7	194.2	5.6	7.0	40.1	2.9	2.2	108.5	15.2	5.9
7	103.9	144.5	245.8	10.9	65.6	23.3	246.2	2.3	3.1	15.6	3.4	9.0	41.4	7.7
8	19.6	161.6	161.3	124.2	75.8	6.3	16.7	62.1	3.8	1.8	4.2	15.5	15.9	39.6
9	17.6	19.6	40.1	109.7	122.1	5.8	3.7	3.9	107.0	6.9	1.4	1.8	4.1	5.4
10	104.9	28.2	21.3	55.9	117.6	11.6	0.9	2.3	9.8	16.1	0.9	3.2	10.4	12.2
11+	451.8	350.2	230.4	251.4	463.6	192.8	169.4	65.0	137.4	40.9	62.6	125.9	1.7	14.1
Total	**980.0**	**1224.3**	**853.5**	**726.6**	**1130.6**	**447.4**	**462.8**	**194.1**	**348.6**	**264.1**	**180.9**	**263.3**	**309.4**	**175.0**

Table 17 (Cont'd.).

Autumn Spawners

Age	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	7.4	2.2	0.0	0.0	0.0	0.7	0.0	0.0
4	0.3	18.0	0.0	13.8	8.5	0.1	0.2	0.2	6.6	1.9	1.1	0.1	0.1	0.0	0.0
5	1.4	6.0	31.1	7.9	5.0	3.3	0.1	3.6	1.0	4.4	6.3	3.5	2.8	9.5	4.7
6	0.2	20.6	11.8	73.9	9.3	4.0	3.0	1.4	2.0	1.7	9.2	5.8	7.6	3.9	11.0
7	0.0	2.0	19.5	38.6	28.2	4.5	3.8	11.1	1.4	1.2	5.2	17.5	8.0	16.8	3.1
8	0.0	1.1	4.1	17.5	9.0	25.6	3.0	8.8	4.7	1.4	3.7	3.3	15.2	14.2	7.8
9	0.0	0.5	1.0	13.8	2.0	10.0	12.2	3.1	9.4	1.6	5.8	0.9	0.5	10.9	3.1
10	0.0	0.0	0.2	3.3	1.0	5.2	1.1	20.6	0.5	5.5	2.1	0.0	0.0	0.2	1.6
11+	0.1	0.7	3.5	5.9	1.7	17.3	13.9	24.6	19.6	18.5	17.9	18.4	11.5	18.7	26.6
Total	**2.0**	**48.9**	**71.3**	**174.6**	**64.8**	**69.9**	**37.3**	**80.7**	**47.4**	**36.4**	**51.3**	**49.5**	**46.4**	**74.3**	**58.0**

Age	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	4.2	0.0	11.2	0.0	7.4	0.4	14.8	15.9	4.7	2.8	0.7	7.9	0.0
5	0.0	2.1	7.7	8.1	5.3	3.4	12.6	12.1	27.3	13.9	3.3	7.8	2.0	14.8
6	5.4	12.8	26.9	2.1	12.8	24.5	0.5	43.6	21.7	28.4	11.0	1.2	3.8	23.9
7	32.1	4.2	28.8	53.9	9.3	23.2	19.1	1.9	15.4	9.9	10.7	9.9	5.9	11.5
8	10.7	17.0	53.8	5.4	13.2	1.9	11.5	5.5	2.6	5.9	4.2	36.3	46.4	4.2
9	10.7	2.1	34.6	14.4	34.6	7.5	5.5	10.1	5.9	2.7	1.0	2.1	13.6	12.9
10	7.1	0.0	15.4	3.3	10.8	1.9	4.0	3.2	1.9	5.8	1.1	3.0	15.7	18.8
11+	25.0	8.5	46.1	60.9	11.0	23.0	24.1	5.6	14.0	12.2	3.0	14.1	4.7	14.0
Total	**91.0**	**51.0**	**213.4**	**159.5**	**97.0**	**92.9**	**78.5**	**96.9**	**104.7**	**83.4**	**37.1**	**75.1**	**65.6**	**101.4**

Spring and Autumn Spawners

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Total	12.3	177.6	227.2	636.2	464.0	760.1	554.1	1008.0	526.8	597.4	382.7	462.5	714.4	757.8	920.3
% SS	83.7	72.5	68.6	72.6	86.0	90.8	93.3	92.0	91.0	93.9	86.6	89.3	93.5	90.2	93.7
% AS	16.3	27.5	31.4	27.4	14.0	9.2	6.7	8.0	9.0	6.1	13.4	10.7	6.5	9.8	6.3

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	1071.0	1275.3	1066.9	886.1	1227.6	540.4	541.2	291.0	453.4	347.6	218.0	338.4	375.0	276.4
% SS	91.5	96.0	80.0	82.0	92.1	82.8	85.5	66.7	76.9	76.0	83.0	77.8	82.5	63.3
% AS	8.5	4.0	20.0	18.0	7.9	17.2	14.5	33.3	23.1	24.0	17.0	22.2	17.5	36.7

Table 18. Parameters, catch data, catch rates, effort, and abundance indices, by stock area and year, from commercial gill net logbook data.

Area	Year	Number of Fishers	Mean Fisher Age	Fishing Dates		Mean mesh size (mm)	Mean panel size (sq m)	Total Logbook catch (t)	Total Comm. Landings (t)	Catch/ Std, Net/ night fished (kg)	Effort (total net nights)	Current year abundance e-index	Cummulative abundance e-index
				Start	End								
WBNDB	1996	16	-	01-Apr	18-Jun	64.7	299	68.5	229	38.4	2970	-	-
	1997	9	45	10-May	30-Jun	63.8	205	9.2	21	36.7	1031	5.00	-0.60
	1998	13	47	15-Apr	30-Jun	62.6	237	8.7	36	14.9	1832	3.00	-3.45
	1999	5	38	20-Apr	30-Jun	63.3	363	9.7	57	17.3	1027	5.83	-0.95
	2000	8	47	15-Apr	10-Jul	63.4	310	6.8	19	22.5	727	2.69	-1.78
	2001	10	45	05-May	12-Jul	60.8	201	8.2	7	25.3	910	4.60	-1.11
	2002	8	49	30-Apr	05-Jul	60.0	243	0.8	13	2.2	719	2.30	-2.00
	2003	9	52	29-Apr	01-Jul	59.2	175	9.4	46	24.3	1405	4.00	-1.00
	2004	8	51	22-Apr	30-Jun	62.2	161	4.9	12	21.4	710	3.86	-0.75
	2005	8	50	30-Apr	18-Jun	61.9	175	6.5	12	34.3	731	5.47	0.00
	2006	10	52	02-May	12-Jul	62.9	249	17.5	27	65.9	1361	5.67	0.22
	2007	15	53	03-May	14-Jul	60.8	177	18.6	0	41.0	1515	5.45	0.70
	2008	10	56	2-May	7-Jul	62.4	241	31.1	4	117.9	713	6.39	2.48
	2009	12	56	2-May	9-Jul	61.5	205	19.7	1	96.4	597	5.31	2.74
	2010	12	56.4	4-May	9-Jul	62.3	182	14.2	2	36.5	1223	3.81	-1.40
	2011	4	52.6	28-Aprr	2-Jul	62.6	141	2.38	42	15.1	543	3.17	-3.16
BBTB	1996	11	-	02-Apr	05-Jun	65.3	214	51.5	378	52.6	2153	-	-
	1997	6	45	07-Apr	27-Jun	66.1	312	39.4	201	27.9	1818	8.00	0.93
	1998	6	45	02-Apr	21-Jun	66.0	245	16.3	170	13.5	1655	5.00	-1.07
	1999	5	51	02-Apr	29-Jun	66.0	330	28.7	194	27.8	657	6.00	-1.07
	2000	9	49	08-Apr	30-Jun	65.3	349	23.6	202	36.7	1018	4.27	-0.67
	2001	10	46	13-Apr	30-Jun	66.3	298	22.3	56	33.2	964	3.82	-1.31
	2002	10	53	20-Apr	21-Jun	66.5	309	6.0	38	10.2	574	2.50	-2.19
	2003	4	57	01-May	30-Jun	66.7	210	4.9	56	23.4	358	4.80	-0.94
	2004	5	63	21-Apr	30-Jun	64.3	169	6.8	24	16.6	608	3.57	-0.61

Table 18 (Cont'd.).

Area	Year	Number of Fishers	Mean Fisher Age	Fishing Dates Start	Fishing Dates End	Mean mesh size (mm)	Mean panel size (sq m)	Total Logbook catch (t)	Total Comm. Landings (t)	Catch/ Std, Net/ night fished (kg)	Effort (total net nights)	Current year abundance e-index	Cummulative abundance e-index
BBTB	2005	6	52	22-Apr	22-Jun	64.9	276	14.0	315	39.5	716	5.60	0.19
	2006	12	54	11-Apr	30-Jun	65.0	223	31.6	136	46.4	890	6.31	1.32
	2007	13	54	04-Apr	30-Jun	63.0	247	54.3	154	85.6	887	7.19	2.03
	2008	5	54	26-Apr	30-Jun	64.7	295	11.1	44	29.4	270	5.72	1.59
	2009	10	52	21-Apr	30-Jun	64.1	190	15.0	146	43.7	677	4.38	0.65
	2010	12	54	1-Apr	1-Jul	63.3	215	22.8	34	31.4	972	4.26	-0.57
	2011	2	54	30-Apr	23-Jun	67.8	485	0.39	72	3.4	128	4.25	-2.5
SMBPB	1996	13	-	19-Mar	15-Jun	67.1	261	45.3	37	31.4	2073	-	-
	1997	6	50	12-Feb	24-Jun	68.3	265	15.4	21	20.7	2171	3.50	-2.00
	1998	8	52	17-Mar	25-Jun	68.2	257	25.9	18	20.2	5361	2.57	-2.71
	1999	6	51	21-Feb	29-May	65.6	319	11.9	1	12.0	2981	2.75	-3.34
	2000	1	57	01-Apr	26-May	66.7	334	2.7	4	10.1	280	4.00	-3.84
	2001	3	52	28-Apr	23-Jun	65.3	226	2.0	38	10.2	235	3.00	-3.64
	2002	4	56	20-Feb	08-Jun	66.3	241	75	135	39.4	1692	5.00	-2.24
	2003	4	56	20-Mar	17-Jun	65.7	240	9.2	84	23.9	658	3.60	-2.04
	2004	2	57	08-Apr	15-Jun	64.8	259	1.1	179	5.4	332	3.67	-2.71
	2005	3	57	07-Apr	10-Jun	63.3	268	1.2	134	7.9	210	5.00	-1.51
	2006	5	56	03-Apr	05-Jun	64.6	292	3.2	150	9.1	432	3.00	-1.68
	2007	9	55	10-Mar	15-Jun	66.3	336	17.3	167	17.4	836	4.63	-1.99
	2008	7	55	15-Mar	13-Jun	65.9	223	53.4	79	36.8	1440	4.80	-3.24
	2009	3	57	4-Mar	10-Jun	65.5	263	16.7	101	42.7	537	5.00	-4.38
	2010	5	52	3-Mar	25-Jun	64.2	241	21.6	2	40.4	874	5.40	0.20
	2011	5	50	24-Mar	25-Jun	62.2	247	10.1	19	33.6	418	4.5	-0.10

Table 18 (Cont'd.).

Area	Year	Number of Fishers	Mean Fisher Age	Fishing Dates		Mean mesh size (mm)	Mean panel size (sq m)	Total Logbook catch (t)	Total Comm. Landings (t)	Catch/ Std, Net/ night fished (kg)	Effort (total net nights)	Current year abundance e-index	Cummulative abundance e-index
				Start	End								
FB	1996	11	-	08-Apr	10-Jun	68.6	304	60	31	37.5	3044	-	-
	1997	13	50	29-Mar	28-Jun	66.9	271	68.9	28	39.4	5919	7.60	0.45
	1998	11	49	01-Apr	17-Jun	65.2	218	41.3	0	54.7	2776	7.40	1.35
	1999	8	49	21-Mar	15-Jun	65.8	313	36.1	30	37.9	1432	8.14	1.06
	2000	11	50	25-Mar	12-Jun	66.5	263	96.5	16	83.5	2364	8.45	1.56
	2001	8	54	28-Mar	21-Jun	65.6	311	54.6	0	38.2	1668	6.75	0.68
	2002	7	53	28-Mar	29-Jun	65.5	297	35.7	0	50.6	1093	6.71	0.54
	2003	7	53	08-Apr	18-Jun	66.1	283	16.3	0	36.6	581	5.00	-0.46
	2004	5	53	30-Mar	23-Jun	68.1	305	10.7	54	24.6	728	4.33	-0.79
	2005	6	55	06-Apr	19-Jun	67.4	303	8.6	5	16.0	552	5.08	-2.02
	2006	6	55	03-Apr	21-Jun	65.9	313	7.4	4	11.6	707	3.33	-3.24
	2007	15	52	9-Apr	22-Jun	64.4	302	27.7	2	30.3	1746	4.26	-3.66
	2008	13	53	2-Apr	20-Jun	64.1	224	28.8	2	49.3	1452	3.94	-4.54
	2009	12	55	2-Apr	19-Jun	62.8	238	30.2	6	35.8	1624	3.90	-5.62
	2010	14	55	4-Apr	21-Jun	62.6	256	33.5	7	22.6	1709	2.92	-1.80
	2011	10	54	7-Apr	15-Jun	65.5	287.0	14.6	1.0	28.6	1149	2.5	-3.2

Table 19. Perception of abundance from telephone survey of herring commercial fixed gear licence and/or bait permit holders, by stock area and year (2006-11).*

Stock Area	Year	Number of Respondents Who Fished	Current Year Abundance Index	Cumulative Index
WBNDB	2005	-	-	-
	2006	40	5.68	0.45
	2007	42	5.99	0.90
	2008	32	5.63	1.45
	2009	37	5.80	1.75
	2011	19	4.66	0.52
BBTB	2005	-	-	-
	2006	49	5.48	0.51
	2007	50	7.09	1.89
	2008	43	6.13	2.02
	2009	44	5.33	1.85
	2011	35	4.92	1.16
SMBPB	2005	-	-	-
	2006	22	5.00	0.22
	2007	19	6.39	1.25
	2008	17	7.00	2.28
	2009	19	7.21	3.99
	2011	16	4.78	3.09
FB	2005	-	-	-
	2006	57	5.34	-0.65
	2007	52	3.75	-2.48
	2008	50	3.67	-4.02
	2009	46	4.17	-5.35
	2011	43	3.84	-7.01

*there was no survey in 2010

Table 20. Parameters, landings data, discard data, effort, and abundance indices, by stock area and year, from commercial purse seine questionnaires.

Stock area	Year	Number who Fished	Number to Respond	Mean Fisher Age	Total Estimate of Landings (t)	Total Comm. Landings (t)	Total Estimate of Discards (t)	Estimate of Discard Survival (%)	Total Estimate of Removals (t)	Removal to Landing Ratio	Effort (total sets)	Current Year Abundance Index	Cumulative Abundance Index
WBNDB	1996	18	17	43	392	435	446	49	620	1.58	26	7.88	1.33
	1997	15	14	49	1801	2375	2045	97	1866	1.04	294	6.92	0.83
	1998	6	6	46	302	606	540	93	338	1.12	108	6.75	0.58
	1999	7	7	52	882	931	116	39	953	1.08	70	8.50	6.08
	2000	12	9	50	651	1071	130	100	651	1.00	29	5.88	6.08
	2001	0	0	-	-	13	-	-	-	-	0	-	-
	2002	3	3	51	260	300	25	93	262	1.01	12	8.67	8.41
	2003	4	4	53	201	195	193	40	317	1.58	8	9.00	8.41
	2004	5	4	51	109	163	13	0	121	1.11	4	8.25	8.41
	2005	4	4	48	84	136	12	35	92	1.10	4	9.00	8.08
	2006	6	4	49	160	139	15	10	174	1.09	4	8.00	11.33
	2007	2	2	50	325	333	0	-	325	1.00	17	6.50	11.83
	2008	7	7	42	575	439	25	90	577.5	1.00	37	8.07	14.58
	2009	4	4	47	545	417.9	215	45	663.3	1.22	26	8.00	14.83
	2010	6	5	64	260	413.1	50	100	260	1.00	17	7.40	15.43
BBTB	1996	21	21	46	738	358	209	50	842	1.14	93	8.62	1.12
	1997	16	15	45	736	650	47	60	755	1.03	136	6.93	0.74
	1998	13	11	48	621	708	9	50	625	1.01	111	7.55	0.11
	1999	14	14	47	894	808	219	69	962	1.08	123	5.79	-1.64
	2000	7	5	50	344	495	264	95	358	1.04	73	5.00	-3.44
	2001	5	4	54	260	259	2030	83	615	2.37	126	7.75	-3.94
	2002	5	4	55	200	200	225	100	200	1.00	15	6.75	-3.94
	2003	2	2	55	378	343	25	20	398	1.05	34	6.00	-3.94
	2004	4	1	49	100	322	0	-	100	1.00	8	8.00	-1.94
	2005	10	7	50	1315	1515	59	30	1356	1.03	59	9.29	-0.19
	2006	12	10	47	1100	1043	765	86	1209	1.10	74	8.60	2.71
	2007	18	15	47	1474	1249	0	-	1474	1.00	83	8.30	5.79
	2008	18	15	51	2077	1915	25	70	2084	1.00	109	7.50	8.25
	2009	29	27	50	1822	1728.8	668	86	1918	1.05	127	7.64	8.60
	2010	19	17	58	1242	1144.75	62.5	100	1242	1.00	104	6.06	7.43

Table 20 (Cont'd).

Stock area	Year	Number who Fished	Number to Respond	Mean Fisher Age	Total Estimate of Landings (t)	Total Comm. Landings (t)	Total Estimate of Discards (t)	Estimate of Discard Survival (%)	Total Estimate of Removals (t)	Removal to Landing Ratio	Effort (total sets)	Current Year Abundance Index	Cumulative Abundance Index
SMBPB	1996	10	9	47	460	446	225	50	572	1.24	16	8.67	0.50
	1997	15	15	48	4401	3836	403	82	4474	1.02	316	8.19	0.50
	1998	15	13	47	1727	2281	790	99	1736	1.01	141	2.60	-4.94
	1999	3	2	47	186	330	0	-	186	1.00	26	5.00	-5.94
	2000	1	1	57	400	447	105	90	411	1.03	24	5.00	-2.94
	2001	2	2	59	430	451	100	95	435	1.01	11	7.67	-2.64
	2002	8	8	49	1440	1398	1050	98	1458	1.01	55	9.13	-2.64
	2003	9	4	50	467	925	165	98	471	1.01	30	6.00	-1.64
	2004	11	10	51	1272	1240	2	100	1272	1.00	87	8.38	-0.93
	2005	14	9	52	975	1247	572	98	984	1.01	73	8.67	-0.26
	2006	9	7	48	1005	1378	58	100	1005	1.00	47	8.29	0.24
	2007	3	3	39	601	558	25	65	610	1.01	30	8.33	2.24
	2008	6	4	59	1044	1067	50	95	1046	1.00	32	8.75	5.99
	2009	6	6	51	1440	1305.4	16	92	1441	1.00	51	7.90	6.49
	2010	6	5	53	704	1004.9	2.5	95	704	1.00	40	8.00	7.89

Table 21. Mean weights-at-age (g) of spring and autumn spawning herring, from samples collected January-June, for White Bay-Notre Dame Bay, 1970-2010.

Spring spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1																					
2						66		54											81		
3		105				143		93	99	99		138	131				144		148	122	124
4		143	149		179	177	208		201	181	199	197	205	204	252	197	201	207	213	179	195
5	209	161	181		189	222	237	225	243	254	297	233	217	240	242	262	223	234	236	234	227
6	214	198	192		203	230	222	236	253	274	282	264	278	265	341	263	273	272	256	259	249
7	231	201	207		217	241	240	247	266	283		290	314	330	305	300	281	297	294	279	273
8	280	220	218		236	255	260	252	271	287	299	337	323		355	325	319	319	316	296	296
9	282	275	243		249	274	261	270	269	281	307	306	322	357	367	332	331	346	323	329	311
10	301	278	280		258	284	278	281	279	291	305	305	324		391	353	338	338	333	336	332
11+	327	309	300		291	311	305	317	311	323	328	345	350	394	388	376	375	399	414	418	412

Age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1														30						
2		42	27								106		78	65		111	141		110	91
3	122	130	79	74	125		106	112		116	134	126	134	127	134	152	148	167	156	132
4	171	165	159	132	131	154		145	155	170	149	195	162	155	174	179	190	189	189	180
5	212	199	189	187	166	167	230	170	176	193	185	206	198	189	208	207	218	211	213	209
6	247	229	221	210	200	201	192	196	216	214	215	260	217	235	234	242	235	248	231	233
7	278	261	253	238	226	239	223	228	245	261	238	276	245	250	253	256	268	264	257	259
8	287	277	280	271	249	254	250	242	245	302	265	283	258	244	271	289	275	281	269	273
9	312	296	300	283	286	274	259	257	259	300	330	341	266	287	291		332	307	292	281
10	330	321	305	304	288	289	292	288	294	320	327	299	272	288	300	301		313	276	297
11+	393	373	345	330	324	371	354	362	340	378	336	397	332	376	415	365	352	327	325	316

Autumn spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1																					
2																					
3																					86
4								198					201	253						149	
5		125				244		214		232		251	225	229	277	213		238	217	211	201
6		279	205			240			246	267		297	254	262	314	261	264	288	233	236	224
7		300						257	274	271	295		354		375	281	308	279	263	255	257
8		351				312	333		289	315		310	330		491	342	359	309	289	274	291
9		335	249					203	211	296			319	370	426	336		323	317	299	314
10		371	263		272				254			353			308	312	414		346	303	325
11+	323	432	300		345	363	481	350	278	325	328	374	338		440	385	465	442	375	362	393

Age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1																				
2		16																		
3																132	174	129	157	
4	160		123	126			116	146	137	139	141	191	163	158	165	160	194	172	174	170
5	193	199	164	155	151	173	168	181	191	220	202	211	195	180	188	186	198	192	190	183
6	199	210	201	192	200	210	180	202	193	226	228	250	210	211	210	209	226	214	207	207
7	257	253	247	212	234	249	213	255	254	257	243	285	217	242	247	222	241	237	226	232
8	303	215	274	256	216	269	209	264	280	267	270	294	248	265	273	283	255	255	245	251
9	294	291	295	284	308	284	221	237	242	343	345	300	268	264	297	228	266	282	254	259
10		324	298	326	299	290		310	297	312		335	269	279	283	295	285	281	287	265
11+	358	348	375	370	296	400	332	355	388	356	343	392	274	326	355	336	370	332	306	292

Table 22. Mean weights-at-age (g) of spring and autumn spawning herring, from samples collected January-June, for Bonavista Bay-Trinity Bay, 1970-2010.

Spring spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1								13						9			10				
2		40					67		49	58	59	49			53		59	69	83	67	82
3		92	103		143	152		127		124		149	125	137	130	118	121	136	129	141	147
4		146	151			183	215	221	212	204	216	244	215	211	193	198	189	205	194	216	212
5		183	184		258	225	221	242	253	255	269	275	236	284	241	249	235	222	232	259	248
6		214	237		229	234	243	262	272	310	307	313	283		289	274	281	268	255	271	264
7	260	238	231		227	254	253	265	305	304	307	329	276	339	315	300	301	324	290	282	280
8	266	255	256		274	276	272	259	271	288	311	350	323		328	343	329	344	320	312	293
9	298	287	274		291	306	293	283	286	297	317	343	332	378	333	340	371	418	353	352	323
10	307	284	303		294	320	312	296	300	308	311	331	324	399	342	365	377	326	359	361	347
11+	353	329	327		311	356	341	332	338	339	349	366	348	433	383	393	408	416	421	417	411

Age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1		2																		
2		34	22							101	97			84						88
3	132	127	108	81	101		115	143	168	139	145	136	147	129	132	163	169	167	168	163
4	202	173	171	144	133	161		172	187	186	164	186	183	175	178	187	186	196	187	186
5	257	214	211	198	172	189	203	219	207	225	194	196	218	202	212	202	214	218	209	210
6	287	254	240	224	218	215	214	238	234	243	243	239	227	233	234	245	233	263	230	237
7	286	287	284	255	237	258	235	245	246	251	261	269	284	256	262	265	266	273	268	254
8	289	284	311	295	270	271	272	254	275	276	283	277	280	291	277	292	276	305	278	280
9	322	280	299	308	291	280	287	256	282	312	288	288	294	281	284	294	296	319	314	280
10	339	308	309	306	289	308	301	293	287	325	304	301	323	303	298	302	323	327	319	303
11+	387	340	343	345	331	345	341	339	340	332	328	328	353	365	363	331	340	346	338	332

Autumn spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1																	12				
2																					
3												125		161						82	
4								186			180	229		199	143	174	215	154	190	163	198
5		160					210		243	254	252	265	215	269	221	224	232	231	211	218	218
6		231					250	255	232	269	279	320	271	297	244	259	261	261	241	246	242
7	268	251	259			255	227	257	227	293	299	335	290	366	266	288	290	266	273	288	278
8	233	259	277			299	295	270	288	325	313	342	301	403	305	323	312	349	302	291	289
9	287		307				295	267	265	339	327	345	331	454	293	324	319	367	323	318	298
10	284	264	317						276	264	282	401		426	354	337	348		397	315	318
11+	353	342	353		345	380	363	364	344	389	379	403	374	416		393	364	535	372	373	366

Age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1																				
2		14			13															
3	80	79	89	66	81										117	117	140	122	137	
4	172	112	130	119	140		139	166	183	176	153	170	166	165	161	177	180	176	183	155
5	210	214	190	166	186	194	152	196	206	192	188	189	200	193	193	194	187	209	198	199
6	236	228	210	202	197	213	218	214	231	221	213	213	216	220	221	208	213	220	216	211
7	274	250	256	225	233	237	237	248	259	239	242	228	234	240	235	235	234	240	236	242
8	309	297	277	247	246	270	259	265	292	253	260	242	249	257	275	256	259	253	250	238
9	308	291	306	286	265	296	293	282	288	273	273	270	268	280	279	288	282	267	259	250
10	294	286	314	293	264	289	295	293	294	302	311	285	272	303	299	279	309	292	271	260
11+	356	335	360	337	349	366	368	331	330	330	318	294	308	314	332	332	330	345	319	310

Table 23. Mean weights-at-age (g) of spring and autumn spawning herring, from samples collected January to June, for St. Mary's Bay–Placentia Bay, 1970-2010.

Spring spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1	17				28										32				14	30	30
2	51			83	71	86	73	81	79	99	106	81	111	99	78		89	80	120	87	97
3	162	101	154	151	159	153	163	154	154	155	182	168	163	164	177	133	172	183	164	162	163
4	197	127	190	208	213	210	236	242	234	243	235	218	243	237	230	215	216	222	232	242	221
5	231	205	229	217	229	243	250	288	286	293	311	300	290	280	263	241	263	264	261	273	266
6	269	208	258	233	242	245	273	298	327	326	338	321	324	312	301	283	300	291	285	291	271
7	285	267	278	260	269	272	262	305	326	360	362	256	349	349	343	316	316	310	305	311	309
8	308	179	294	255	290	287	282	294	330	391	392	371	365	377	361	332	378	340	320	343	328
9	314	286	309	280	307	307	302	321	319	376	408	373	394	378	372	347	374	362	330	362	343
10	341	227	326	312	310	314	322	331	341	340	377	370	383	395	375	386	389	378	350	367	347
11+	383	303	351	318	338	345	349	373	393	386	437	419	414	430	434	410	453	447	419	406	430

Age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1		22																		23
2	77	59	39	59			71	79	157	113	79	94	120	96	95	105			117	102
3	140	137	130	115	107		122	130	143	135	138	136	148	127	136	143	146	126	143	140
4	211	191	189	168	171	170	112	178	175	170	166	175	181	166	186	181	197	166	176	169
5	258	242	215	219	229	224	211	205	198	192	189	202	208	218	229	220	216	213	208	212
6	278	275	267	249	264	270	251	258		228	244	230	240	234	269	242	230	235	240	233
7	297	294	292	291	278	301	278	286	264	239	266	257	246	266	280	277	268	263	258	241
8	302	301	305	322	324	353	312	300	309	271	289	278	274	277	287	275	280	280	268	271
9	331	315	317	332	347	349	317	328	298	300	280	304	309	297	291	271	288	313	283	283
10	346	331	330	330	334	388	331	326	322	306	312	301	322	315	310	272	298	297	304	305
11+	362	362	372	384	381	426	413	424	394	352	341	354	368	362	359	317	318	326	321	332

Autumn spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1																					
2															45			46			
3			115	112		297	113			119		168	113	119	119	113	118	127	98	114	97
4	174	148	183	171			188	193	195	187	212	195	200	195	198	156	212	202	203	193	189
5	244	186	196	216	228	209	227	242	240	257	244	243	240	243	243	209	219	233	236	245	235
6	244	195	230	216	237	250	257	271	269	287	290	263	285	292	278	242	266	254	260	274	273
7	285	223	242	255	266	261	277	289	302	320	310	302	292	303	318	268	299	290	282	290	279
8	284	241	289	287	279	271	271	306	311	339	339	355	344	330	326	291	335	318	315	322	300
9	311	258	317	278	290	286	293	299	329	364	338	358	356	397	353	307	354	349	328	337	328
10	342	306	331	325	293	301	289	312	313	325	355		366	393	393	331	368	336	342	343	333
11+	370	330	361	240	358	365	368	371	367	399	400	406	400	408	410	385	417	396	379	383	378

Age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1																				
2			17																	
3	121	85	71	88	86		103	105	102	112	106	141	116	99	169	127	105	110		
4	175	162	143	144	149	147	154	165	159	148	160	159	167	154	162	170	173	167	164	163
5	216	210	192	180	195	196	186	202	194	171	184	189	194	184	195	199	184	196	195	202
6	248	232	220	212	211	222	218	221	215	201	200	208	218	212	218	214	209	211	207	214
7	273	273	255	239	259	250	244	256	247	228	231	231	242	238	246	242	239	230	239	243
8	300	295	275	273	274	290	259	272	274	247	255	261	259	251	266	265	261	252	244	253
9	319	306	299	292	297	308	279	297	293	273	265	274	279	274	279	255	298	258	261	270
10	336	310	313	292	297	322	308	312	302	283	274	293	292	292	290	283	312	282	294	284
11+	366	350	365	364	372	403	371	371	377	332	322	332	336	325	336	304	340	316	299	301

Table 24. Mean weights-at-age (g) of spring and autumn spawning herring, from samples collected January to June, for Fortune Bay, 1970-2010.

Spring spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1			21																		
2	74	100	75	13	78	127	58	55			112		104		73					102	112
3	133	137	158	88	153	159	131	118	154		212	145	157	164	170	148				145	144
4	191	194	206	153	205	221	202	206	209	226	234	291	221	238	221	202	209			215	180
5	256	236	234	167	230	253	249	260	263	261	272		277	264	258	251	251	247	236	252	212
6	269	278	274	194	277	289	285	294	299	257	307		354	316	307	287	287	293	275	268	261
7	309	316	323	229	276	322	322	297	318	324	377	353	359	363	333	317	318	323	295	292	293
8	342	328	350	279	310	316	343	309	330	370	343		384	360	372	368	370	352	331	322	328
9	340	357	352	250	276	350	377	324	350	345	344	353	386	400	435	373	415	375	353	339	348
10	460	367	352	269	353	355	376	348	359		368		398	412	401	387	412	424	390	356	378
11+	408	417	397	304	374	417	419	375	396	397	399		420	426	443	439	474	460	462	421	463

Age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1		15			23															
2		61							79		79			69					106	92
3	134	138	120	114	90		121	99	103		128	138	134	122	126	129	151	88	153	137
4	186	170	177	157	150	167	168	186	152	148	177	162	171	135	176	162	159	171	183	175
5	233	209	222	195	185	205	190		185	186	179	175	197	193	214	186	191		200	186
6	244	254	240	214	218	237	226	227	217	218	214	221	210	213	235	219	254	205	225	207
7	276	288	281	257	237	256	262	250	249	226	251	264	241	221	272	252	254	239	232	230
8	289	295	297	279	265	292	285	281	279	255	260	284	268	256	266	260	247	265	272	249
9	319	309	284	294	311	309	287	292	303	296	278	307	305	282	275	260	287	259	270	294
10	338	329	287	320	311	337	317	320	323	311	303	300	307	308	301	273	262	263	313	295
11+	372	367	355	362	359	391	384	360	373	361	338	357	347	354	365	326	317	329	328	328

Autumn spawners

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1																					
2																					
3					104		97					110	98			114				117	118
4		165		204	208	192	181	179		240	210	180	205	200	193	173	184	149	166	177	162
5	200		220	202	222	228	233	236	236	231	224	255	246	251	241	210	222	240	237	230	203
6		269	251	175	227	263	276	261	391	305	257		279	290	270	252	269	254	265	261	242
7	246	272	278	292	290	273	264	260	271		303		300	318	299	286	303	295	288	281	276
8	294	286	290	232	272	300		335	313	336				337	342	314	320	324	300	322	280
9	282	332	312		306	391	326		287	317				345	340	340	345	338	318	303	313
10		321	347	97		341								405	307	326	357	332	334	312	328
11+	375	359	407	350	337	359	426	396	388	383	430		414		369	386	395	389	372	383	385

Age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1																				
2																				
3				94			110		94		172		102					101		
4	173	160	121	161	120		148	165		143		159	161	149	151	161	189	147	160	144
5	207	205	190	158	187	213	186	204	194	171	192	192	190	166	182	185	177	182	187	175
6	240	221	242	202	208	223	237	219	217	191	191	204	206	198	206	201	199	182	214	195
7	268	256	251	221	239	239	236	226	232	221	223	236	238	226	226	230	227	215	238	229
8	295	279	283	265	257	281	256	268	229	221	239	281	239	235	270	248	246	227	253	234
9	294	282	304	285	289	298	295	221	256	244	243	278	269	246	264	251	265	260	265	267
10	322	311	296		309	243	304		301	251	277	305	281	285	248	241	256	258	281	268
11+	370	351	336	330	380	353	385	361	340	317	312	337	314	305	309	283	285	307	309	308

Table 25. White Bay – Notre Dame Bay performance table to the spring of 2011.

The Fishery	*Observation*	
Reported Landings: 2009-2010	Reported landings increased from 425 t in 2009 to 542 t in 2010; 19% of the TAC was taken in 2010; average landings of 2800 t during 1990's and 480 t in 2000's; peak landings of 15,700 t in 1979. The proportion of autumn spawners has increased since 2000 and has predominated since 2008.	
Total Removals: 2010	In addition to reported landings in 2010, 115 t were estimated to have been taken for bait purposes; fishers reported no discard mortality in the purse seine fishery.	
Effort: 2010 and 2011	Documented purse seine effort (total sets) in 2010 was 92% lower than the peak year in 1997; 32% of fishers contacted in the 2011 fixed gear phone survey were active, the lowest proportion since the survey began in 2006.	
Geographic Distribution of Fishery	The 2010 purse seine fishery, from September to December, was mostly in the Fogo Island area of Notre Dame Bay and in White Bay. The 2011 gill net fishery,in May, October and November was mostly in Notre Dame Bay.	
Abundance Indices	***Observation***	***Interpretation***
Research Gill Net Catch Rates 1988-2011 (numbers / nights fished); rates by spawning type 1988-2010	Rates for both spawning types combined decreased by 75% from 2010 to 2011. The 2011 overall catch rate is the lowest in the time series. Catch rates of spring and autumn spawning components have been about equal from 2006-2010.	Current abundance below average,.
Commercial Gill Net Catch Rates 1996-2011 (kg / net / nights fished)	4 logbooks in 2011; decreased from 2010 to 2011	Current abundance below average.
Gill Net Fisher Observations 1996-2011 from logbooks	13 observations in 2011; increasing trend from 2002-09, then decreasing in 2010 and 2011.	Decreasing trend in abundance.
Fixed Gear Fisher Observations 2006-2011 from telephone surveys (no survey in 2010)	19 observations in 2011; increasing trend in abundance from 2006-09, then a decrease in 2011.	Decrease in abundance.
Purse Seine Fisher Observations 1996-2010	5 observations in 2010; increasing trend in abundance over past 5 years; 2010 higher than 2009.	Increasing trend in abundance.
Biological Characteristics	***Observation***	***Interpretation***
2010 Research Gill Net Age Compositions (ages 3+)	The 2002 year class accounted for 23% of the catch; 2004 and 2005 year classes both over 15% of catch, other year classes <10% of the catch.	Population age structure considered to be stable.
Current Year Classes: 1999 to 2005 Series: 1982-2006 year classes	4 of 7 current mature year classes above average (spring and fall spawners combined); 6 of 7 autumn spawning year classes are above average.	Most mature year classes above average.
Recruitment: 2006 year class Series: 1982 to 2006 year classes	Overall, 2006 year class is about average; 2006 autumn spawners are well above average.	Average recruitment of the most recent estimable year class.

Stock Status	***Interpretation***	***Evaluation***	***Status Definitions***
Current vs. Historical	Current abundance is substantially lower than historical estimates in the 1970's.	-	- Concern for Current Status or Prospect
Current vs. Recent	Stock status has deteriorated since 2008.	-	? Uncertainty of Interpretation
Short Term Prospects	Uncertain; average recruitment of 2006 year class; most current mature year classes are above average..	?	+ Positive Evaluation

The standardized performance index indicates that stock status has declined steadily since 2009, following a period of improvement from 2002 to 2008. Current abundance is substantially lower than historical estimates in the 1970's. Short term prospects are uncertain; the 2006 year class is average and most mature year classes are above average compared to year classes produced since 1982. All year classes since 1982 are weak compared to historical levels.

Table 26. Bonavista Bay – Trinity Bay performance table to the spring of 2011.

The Fishery	*Observation*
Reported Landings: 2009-2010	Reported landings decreased from 3188 t in 2009 to 2131 t in 2010; 43% of the TAC was taken in 2010; average landings of 2600 t during 1990's and 1600 t during the 2000's; peak landings of 12,000 t in 1977. Proportion of autumn spawners has been increasing since 2000 and predominated in 2009 and 2010.
Total Removals: 2010	In addition to reported landings in 2010, approximately 437 t were estimated to have been taken for bait purposes; fishers reported no discard mortality in the purse seine fishery.
Effort: 2010 and 2011	Documented purse seine effort (total sets) in 2010 was 25% lower than the peak year of 1997; 44% of fishers contacted in the 2011 fixed gear phone survey were active, the lowest proportion since the survey began in 2006.
Geographic Distribution of Fishery	The 2010 purse seine fishery, from September to November, was in northern Bonavista Bay and southern Trinity Bay. The spring 2011 gill net fishery, from mid April to May, was mainly in Bonavista Bay. The tuck seine fishery in April, May and October,and the trap fishery in November, was in Bonavista Bay.

Abundance Indices	***Observation***	***Interpretation***
Research Gill Net Catch Rates 1988-2011 (numbers / nights fished)	Unchanged from 2010 to 2011; autumn spawners have predominated from 2007 to 2010.	Current abundance below average.
Commercial Gill Net Catch Rates 1996-2011 (kg / net / nights fished)	2 logbooks in 2011; decreased from 2010 to 2011	Current abundance below average.
Gill Net Fisher Observations 1996-2011 from logbooks	13 observations in 2011; decreasing trend in abundance over past 5 years; 2011 much lower than 2010.	Decreasing trend in abundance.
Fixed Gear Fisher Observations 2006-2011 from telephone surveys (no survey in 2010)	35 observations in 2011; increasing trend in abundance from 2006 to 2008; decreasing in 2009 and 2011.	Decreasing trend in abundance.
Purse Seine Fisher Observations 1996 – 2010	17 observations in 2010; increasing trend in abundance from 2002 to 2009, but decreased in 2010.	Decrease in abundance.

Biological Characteristics	***Observation***	***Interpretation***
2010 Research Gill Net Age Compositions (ages 3+)	The 2002 year class accounted for 19% of the catch; the 2000, 2001 and 2003 year classes accounted for more than 10% each, the remaining year classes were <10% of the catch.	Population age structure considered to be stable.
Current Year Classes: 1999 to 2005 Series: 1982 – 2006 year classes	All 7 mature year classes are average or above. All 7 autumn spawner year classes are well above average.	All current mature year classes are average or above.
Recruitment: 2006 year class Series: 1982 to 2006 year classes	2006 year class is about average for both spawning components.	Average recruitment of the most recent estimable year class.

Stock Status	***Interpretation***	***Evaluation***	***Status Definitions***
Current vs. Historical	Current abundance is substantially lower than historical estimates in the 1970's.	-	- Concern for Current Status or Prospect
Current vs. Recent	Stock status improved from 2002 to 2007 then deteriorated from 2008 to 2010; status improved slightly in 2011.	-	? Uncertainty of Interpretation
Short Term Prospects	Uncertain; average recruitment of 2006 year class; all current mature year classes are average or above.	?	+ Positive Evaluation

The standardized performance index indicates that stock status improved slightly in 2011, after decline from 2008 to 2010, and a period of improvement from 2002 to 2007. Current abundance is substantially lower than historical estimates in the 1970's. Short term prospects are uncertain; the 2006 year class is average and all mature year classes are near or above average compared to year classes produced since 1982. However, all year classes since 1982 are weak compared to historical levels.

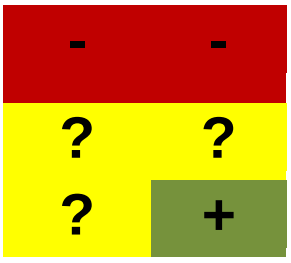
Table 27. St. Mary's Bay–Placentia Bay performance table to the spring of 2011.

The Fishery	*Observation*
Reported Landings: 2009-2010	Reported landings decreased from 1407 t in 2009 to 1006 t in 2010; 45% of the TAC was taken in 2010; average landings of 1200 t during 1990's and 2000's; peak landings of 4000 t in 1997 (since large mobile purse seine fishery in 1960's). Autumn spawners predominated since 2007 .
Total Removals: 2010	In addition to reported landings in 2010, 197 t were estimated to have been taken for bait purposes; fishers reported <1 t of discard mortality in the purse seine fishery.
Effort: 2010 and 2011	Documented purse seine effort (total sets) was 85% lower in 2010 than the peak in 1997; 33% of fishers contacted in the 2011 fixed gear phone survey were active, the highest proportion since the survey began in 2006.
Geographic Distribution of Fishery	The 2010 purse seine fishery,was along the eastern side of St. Mary's Bay in June and occurred throughout Placentia Bay,in April, November and December. The 2011 gill net fishery was in Placentia Bay in April.

Abundance Indices	***Observation***	***Interpretation***
Research Gill Net Catch Rates 1982-2011 (numbers / nights fished)	Decreased by 20% from 2010 to 2011; spawning components were equal in 2010.	Current abundance below average.
Commercial Gill Net Catch Rates 1996-2011 (kg / net / nights fished)	5 logbooks in 2011; slight decrease from 2010 to 2011 – but not significant.	Current abundance below average.
Gill Net Fisher Observations 1996-2011 from logbooks	11 observations in 2011; overall, decreasing trend in abundance since 2005.	Decreasing trend in abundance.
Fixed Gear Fisher Observations 2006-2011 from telephone surveys (no survey in 2010)	16 observations in 2011; increasing trend in abundance from 2006 to 2009. Decrease in 2011.	Decrease in abundance.
Purse Seine Fisher Observations 1996-2011	5 observations in 2011; increasing trend in abundance since 2000	Increasing trend in abundance.

Biological Characteristics	***Observation***	***Interpretation***
2010 Research Gill Net Age Compositions (ages 3+)	The 2003 and 2006 year classes each accounted for 20% of the catch; 5 other year classes accounted for <5% each.	Population age structure is considered to be stable.
Current Year Classes: 1999-2005 Series: 1976 – 2006 year classes	4 of 7 current mature year classes are below average; 5 of 7 autumn spawning year classes are average or above.	Most current mature year classes below average.
Recruitment: 2006 year class Series: 1976 to 2006 year classes	2006 year class above average for both spawning components.	Above average recruitment of the most recent estimable year class.

Stock Status	***Interpretation***	***Evaluation***	***Status Definitions***
Current vs. Historical	Current abundance is substantially lower than historical estimates in the 1970's.	-	Concern for Current Status or Prospect
Current vs. Recent	Stock status deteriorated from 2001 to 2004; remained stable to 2010 and improved slightly in 2011.	?	Uncertainty of Interpretation
Short Term Prospects	Uncertain; above average recruitment of 2006 class; most current mature year classes are below average.	?	Positive Evaluation



The standardized performance index indicates that stock status improved slightly in 2011, after deteriorating from 2001 to 2004 and remaining stable to 2010. However, current abundance is substantially lower than historical estimates in the 1970's. Short term prospects are uncertain; the 2006 year class is above average but more than half of the mature year classes are below average compared to historical levels.

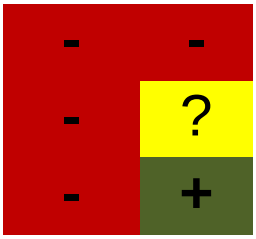
Table 28. Fortune Bay performance table to the spring of 2011.

The Fishery	*Observation*
Reported Landings: 2009-2010	Reported landings increased from 2361 t in 2009 to 2624 t in 2010; 91% of the TAC was taken in 2010; average landings of 200 t during 1990's and 2300 t in 2000's; peak landings in 2003 (since large mobile purse seine fishery in 1960's). Spring spawners predominate throughout the time series.
Total Removals: 2010	In addition to reported landings in 2010, approximately 323 t were estimated to have been taken for bait purposes.
Effort: 2011	Documented effort in 1980's and 1990's was very low; 45% of fishers contacted in the 2011 fixed gear survey were active, the highest proportion since 2007.; there is no purse seine fishery in Fortune Bay. The current fishery is primarily by bar seines and traps for which no effort information is available. However, combined bar seine and trap landings have increased from 0 t in 1998 to 2617 t in 2011.
Geographic Distribution of Fishery	The 2010 spring bar seine fishery was concentrated in the Long Harbour area; the gill net fishery was distributed throughout Fortune Bay. All landings were in April.

Abundance Indices	***Observation***	***Interpretation***
Research Gill Net Catch Rates 1982-2011 (numbers / nights fished)	Decreased by 77% from 2010 to 2011; spring spawners predominate throughout time series.	Current abundance below average.
Commercial Gill Net Catch Rates 1996-2011 (kg / net / nights fished)	Increased slightly from 2010 to 2011.;	Current abundance average.
Gill Net Fisher Observations 1996-2011 from logbooks	13 observations in 2011; decreasing trend in abundance over past 11 years; 2011 lowest in the series	Decreasing trend in abundance.
Fixed Gear Fisher Observations 1996-2011 from telephone surveys	43 observations in 2011; decreasing trend in abundance since 2006	Decreasing trend in abundance.

Biological Characteristics	***Observation***	***Interpretation***
2010 Research Gill Net Age Compositions (ages 3+)	2002 year class accounted for 27% of the catch; 6 remaining year classes 15% or less.	Population age structure considered to be stable.
Current Year Classes: 1999 to 2005. Series: 1976-2006 year classes	3 of 7 year classes average or above. 5 of 7 spring spawning year classes well below average.	Most current mature year classes below average.
Recruitment: 2006 year class Series: 1977 to 2006 year classes	2006 year class below average. Spring spawners are average and no 2006 autumn spawners were observed.	Below average recruitment of the most recent estimable year class.

Stock Status	***Interpretation***
Current vs. Historical	Current abundance is lower than peak estimates in the late 1990's.
Current vs. Recent	Stock status deteriorated from 2001 to 2004, improved slightly in 2005, deteriorated again in 2006, remained poor from 2006 to 2010 and further deteriorated in 2011.
Short Term Prospects	Negative; below average recruitment of 2006 year class; most current mature year classes are below average.



Evaluation ***Status Definitions***

Concern for Current Status or Prospect

Uncertainty of Interpretation

Positive Evaluation

The standardized performance index indicates that after remaining stable from 2006 to 2010, following a period of deterioration from 2001 to 2004 and slight increase in 2005, stock status deteriorated again in 2011 Current abundance is substantially lower than peak estimates in the mid to late 1990's. Short term prospects are negative; the 2006 year class is below average, as are most mature year classes.

Table 29. Performance report standardization parameters, ranks, and weighting factors.

Data Source	Calculation of Ranks	Minimum Rank	Maximum Rank	Weighting Factor	Indicator of:
Research Gill Net Catch Rates (year = n) - spring and autumn spawners combined	<= 20% of mean = 1 21-40% of mean = 2 41- 60% of mean = 3 61-80% of mean = 4 81-100% of mean = 5 101-120% of mean = 6 121-140% of mean = 7 141-160% of mean = 8 161-180% of mean = 9 > 180% of mean = 10	1	10	2.0	Current
Commercial Gill Net Catch Rates (year = n) - from logbooks	<= 20% of mean = 1 21-40% of mean = 2 41- 60% of mean = 3 61-80% of mean = 4 81-100% of mean = 5 101-120% of mean = 6 121-140% of mean = 7 141-160% of mean = 8 161-180% of mean = 9 > 180% of mean = 10	1	10	0.5	Current
Gill Net Fisher Cumulative Index (year = n) - from logbooks (1997 – 2009)	<= -4 = 1 -4 to -3 = 2 -3 to -2 = 3 -2 to -1 = 4 -1 to 0 = 5 0 to 1 = 6 1 to 2 = 7 2 to 3 = 8 3 to 4 = 9 >= 4 = 10	1	10	0.5	Current
Gill Net Fisher Cumulative Index (year = n) - from phone survey (2006 – 2009)	<= -4 = 1 -4 to -3 = 2 -3 to -2 = 3 -2 to -1 = 4 -1 to 0 = 5 0 to 1 = 6 1 to 2 = 7 2 to 3 = 8 3 to 4 = 9 >= 4 = 10	1	10	0.5	Current
Purse Seine Fisher Cumulative Index (year = n – 1)* * except SMBPB where year = n	<= -4 = 1 -4 to -3 = 2 -3 to -2 = 3 -2 to -1 = 4 -1 to 0 = 5 0 to 1 = 6 1 to 2 = 7 2 to 3 = 8 3 to 4 = 9 >= 4 = 10	1	10	0.5	Current
Research Gill Net Age Compositions (year = n-1) (number of age 3+ groups >= 5% of catch) - spring and autumn spawners combined	very poor if n = 1 average if n = 5 very good if n = 9	1	9	1.0	Current

Table 29 (Cont'd.)

Data Source	Calculation of Ranks	Minimum Rank	Maximum Rank	Weighting Factor	Indicator of:
Strength of Fishery Dependent Year Classes (year classes = n – 6 and n – 7) - spring and autumn spawners combined	<= 20% of mean = 1 21-40% of mean = 2 41- 60% of mean = 3 61-80% of mean = 4 81-100% of mean = 5 101-120% of mean = 121-140% of mean = 141-160% of mean = 161-180% of mean = > 180% of mean = 10	1	10	1.0	Prospects
Strength of Other Mature year Classes (year classes = n – 8, n – 9, and n – 10) - spring and autumn spawners combined	<= 20% of mean = 1 21-40% of mean = 2 41- 60% of mean = 3 61-80% of mean = 4 81-100% of mean = 5 101-120% of mean = 121-140% of mean = 141-160% of mean = 161-180% of mean = > 180% of mean = 10	1	10	0.5	Prospects
Recruitment (year class = n – 5) - spring and autumn spawners combined	<= 20% of mean = 1 21-40% of mean = 2 41- 60% of mean = 3 61-80% of mean = 4 81-100% of mean = 5 101-120% of mean = 121-140% of mean = 141-160% of mean = 161-180% of mean = > 180% of mean = 10	1	10	0.5	Prospects

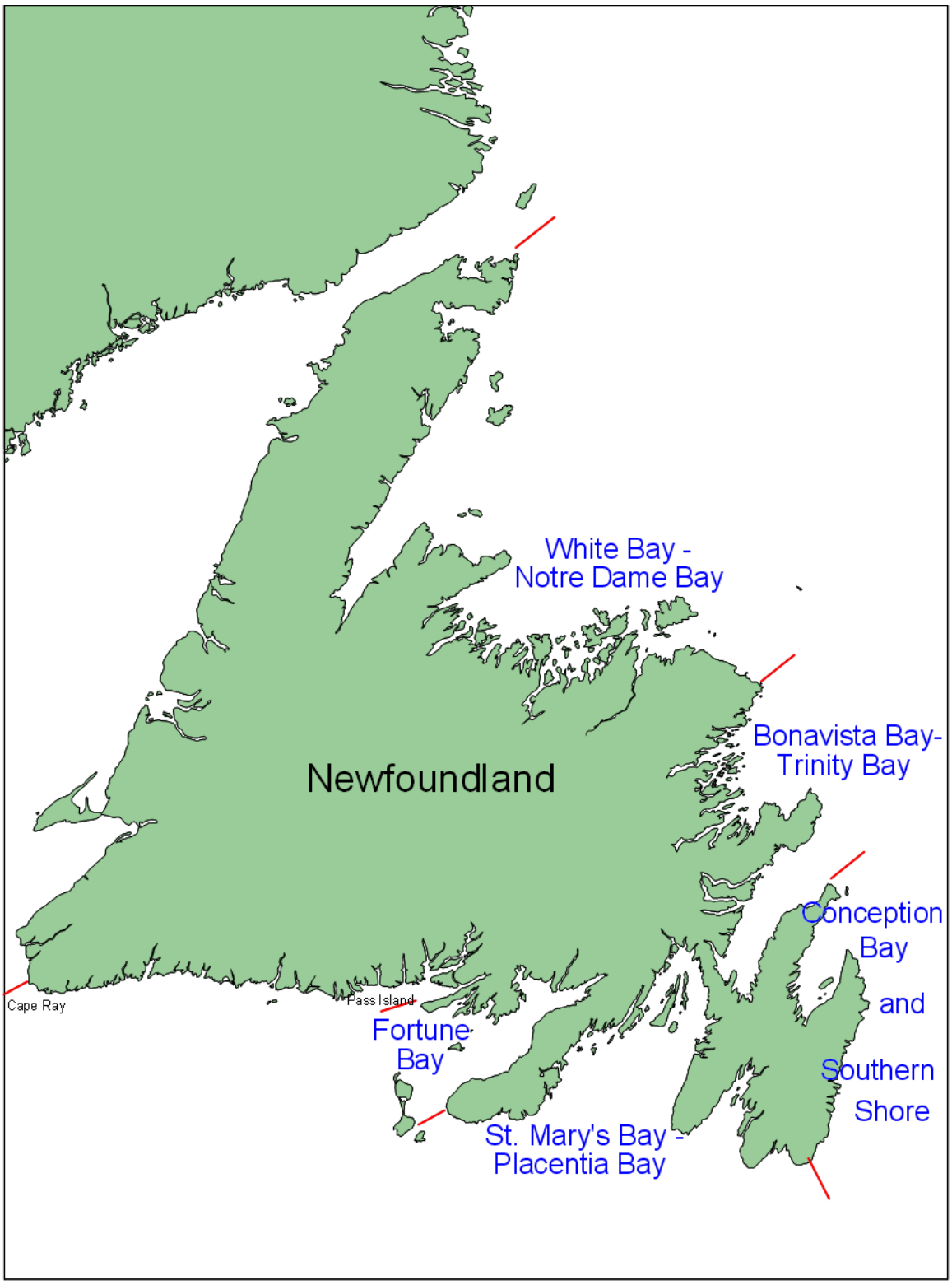


Figure 1. Area map indicating herring stock complexes within the Newfoundland and Labrador Region.

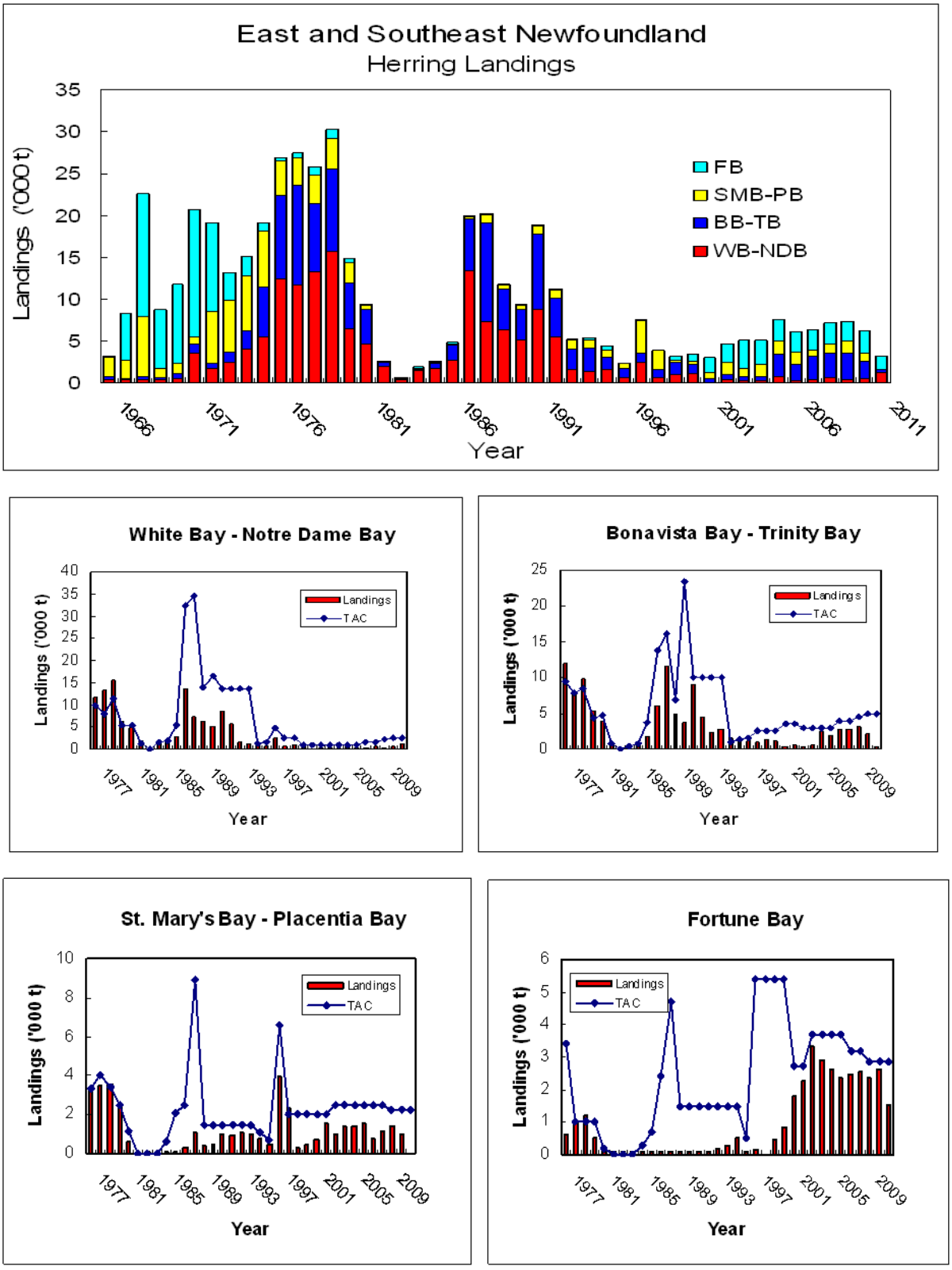


Figure 2. East and southeast Newfoundland herring landings and TAC's (upper panel), by stock area (lower panels), 1966-2011. Landings are from Policy and Economics Branch and do not include herring discards or herring used as bait. 2011 Landings are as of November 14, 2011.

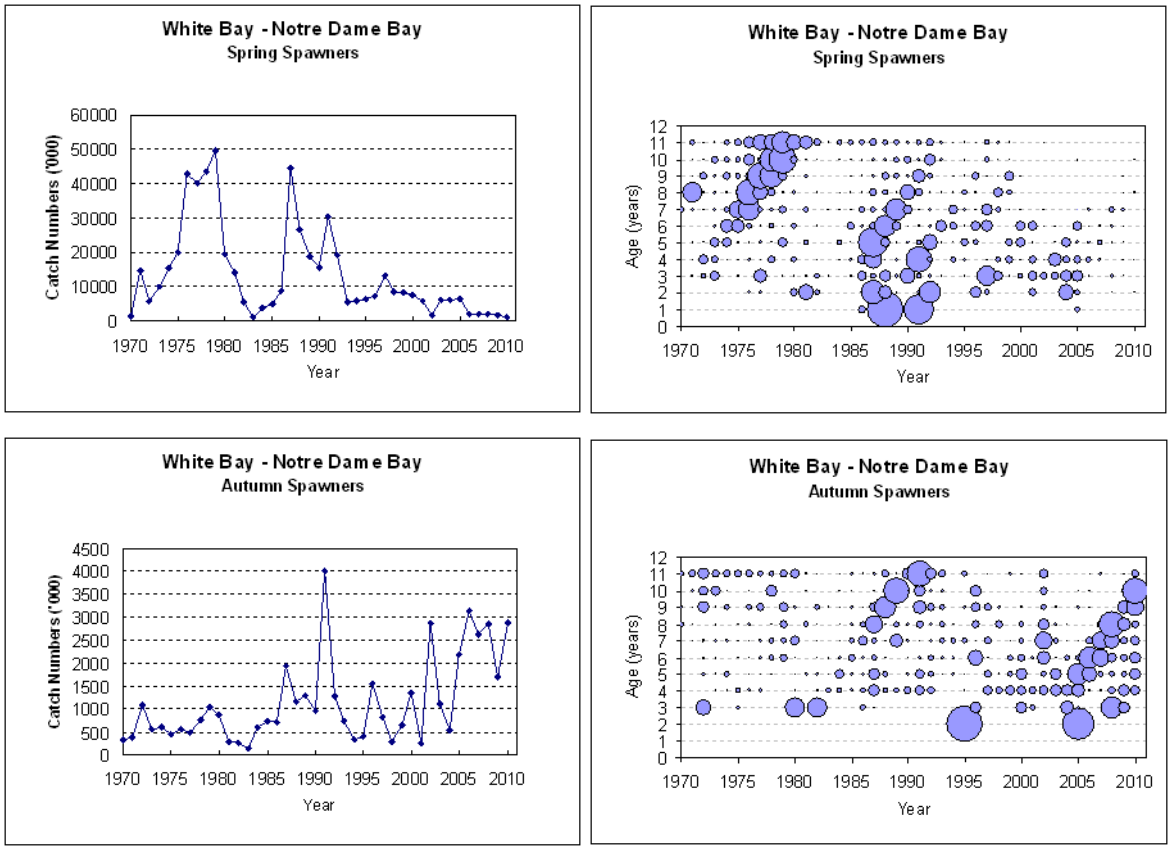


Figure 3. Commercial catch numbers (left panels) and numbers at age normalized by age (right panels), by spawning type, White Bay – Notre Dame Bay, 1970-2010. Catch numbers and numbers at age include estimates of herring used as bait.

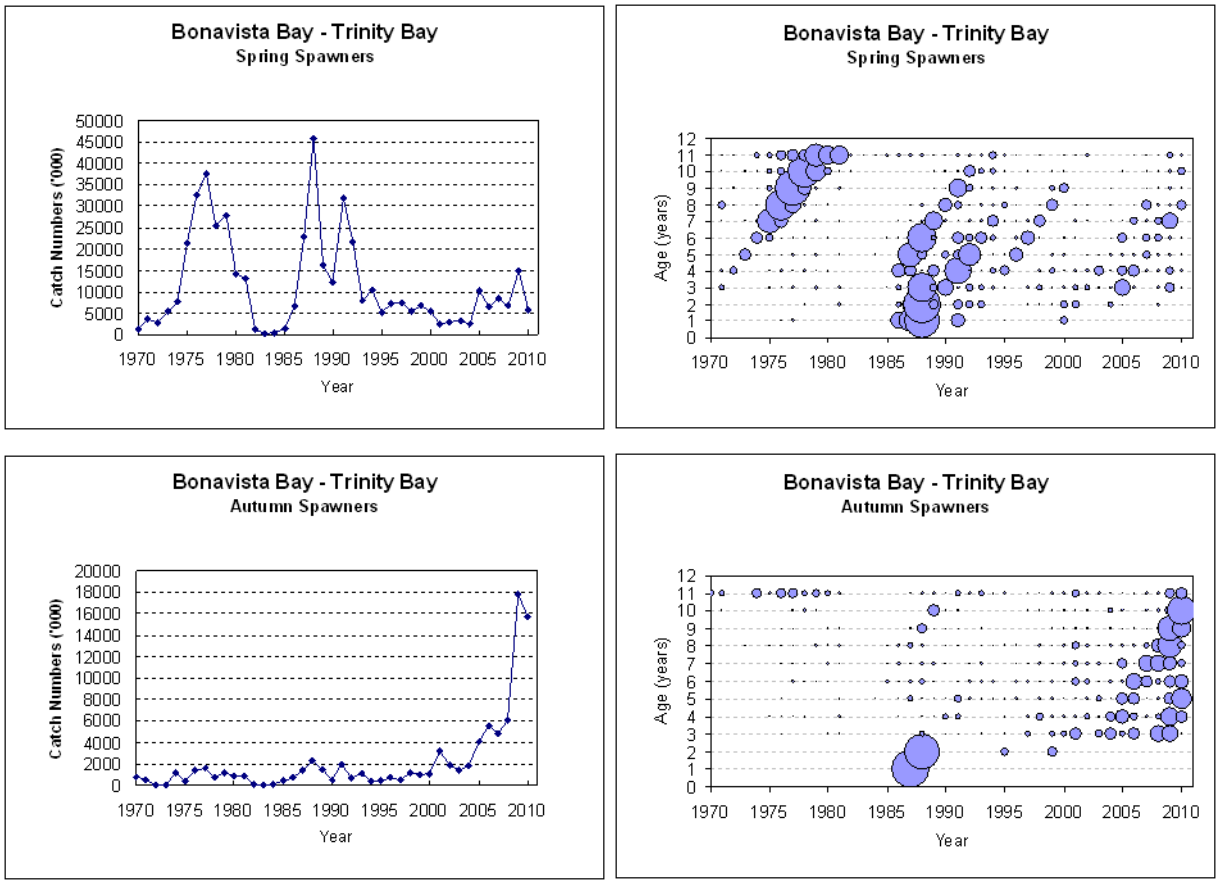


Figure 4.Commercial catch numbers (left panels) and numbers at age normalized by age (right panels), by spawning type, Bonavista Bay-Trinity Bay 1970-2010. Catch numbers and numbers at age include estimates of herring used as bait.

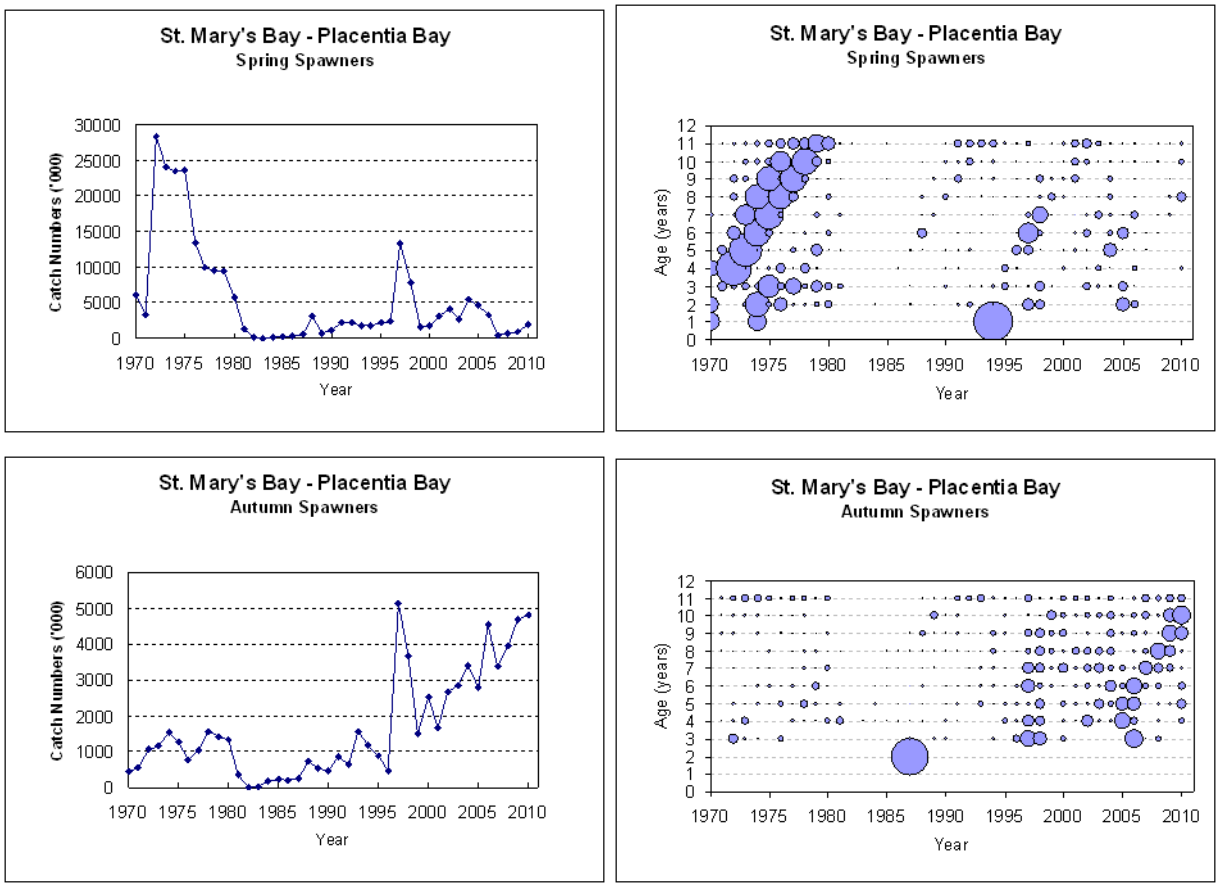


Figure 5. Commercial catch numbers (left panels) and numbers at age normalized by age (right panels), by spawning type, St. Mary's Bay-Placentia Bay 1970-2010. Catch numbers and numbers at age include estimates of herring used as bait.

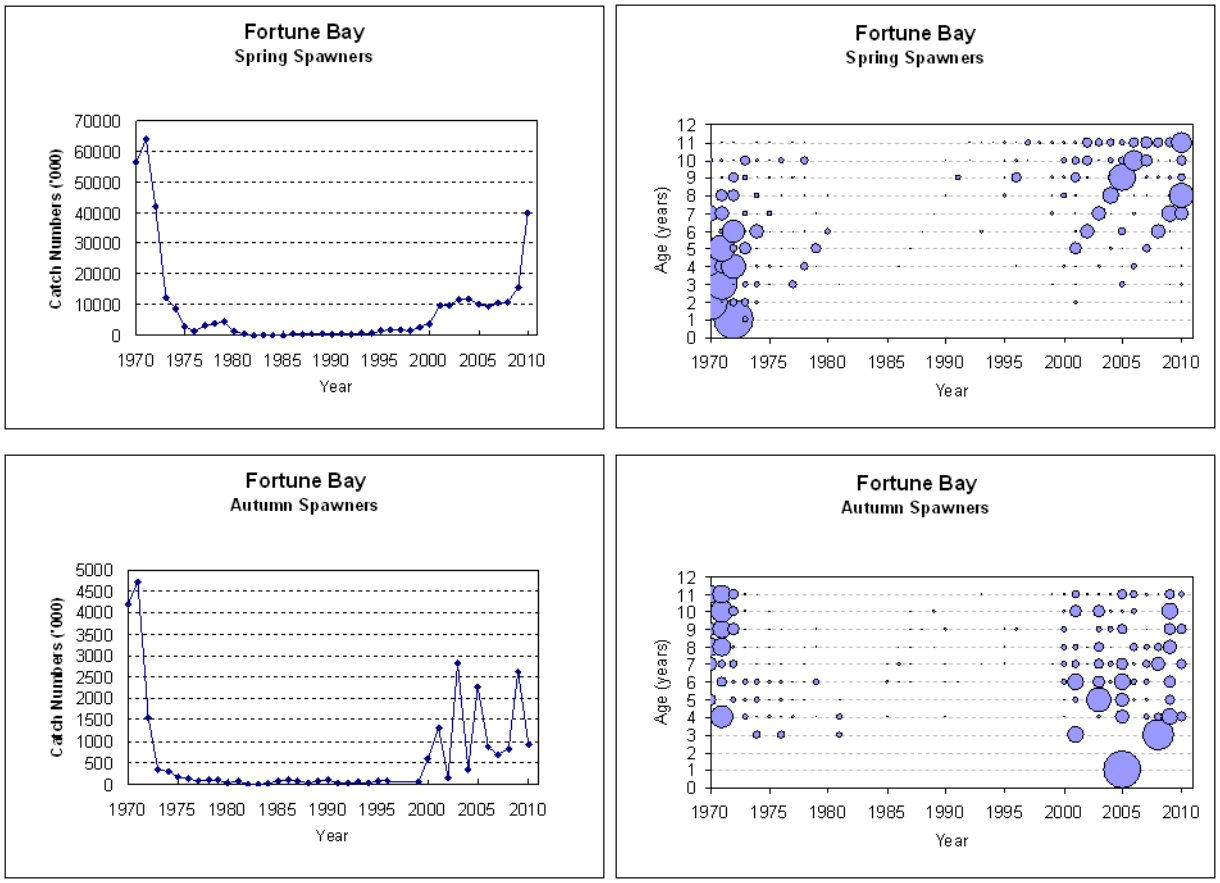


Figure 6. Commercial catch numbers (left panels) and numbers at age normalized by age (right panels), by spawning type, Fortune Bay, 1970-2010. Catch numbers and numbers at age include estimates of herring used as bait.

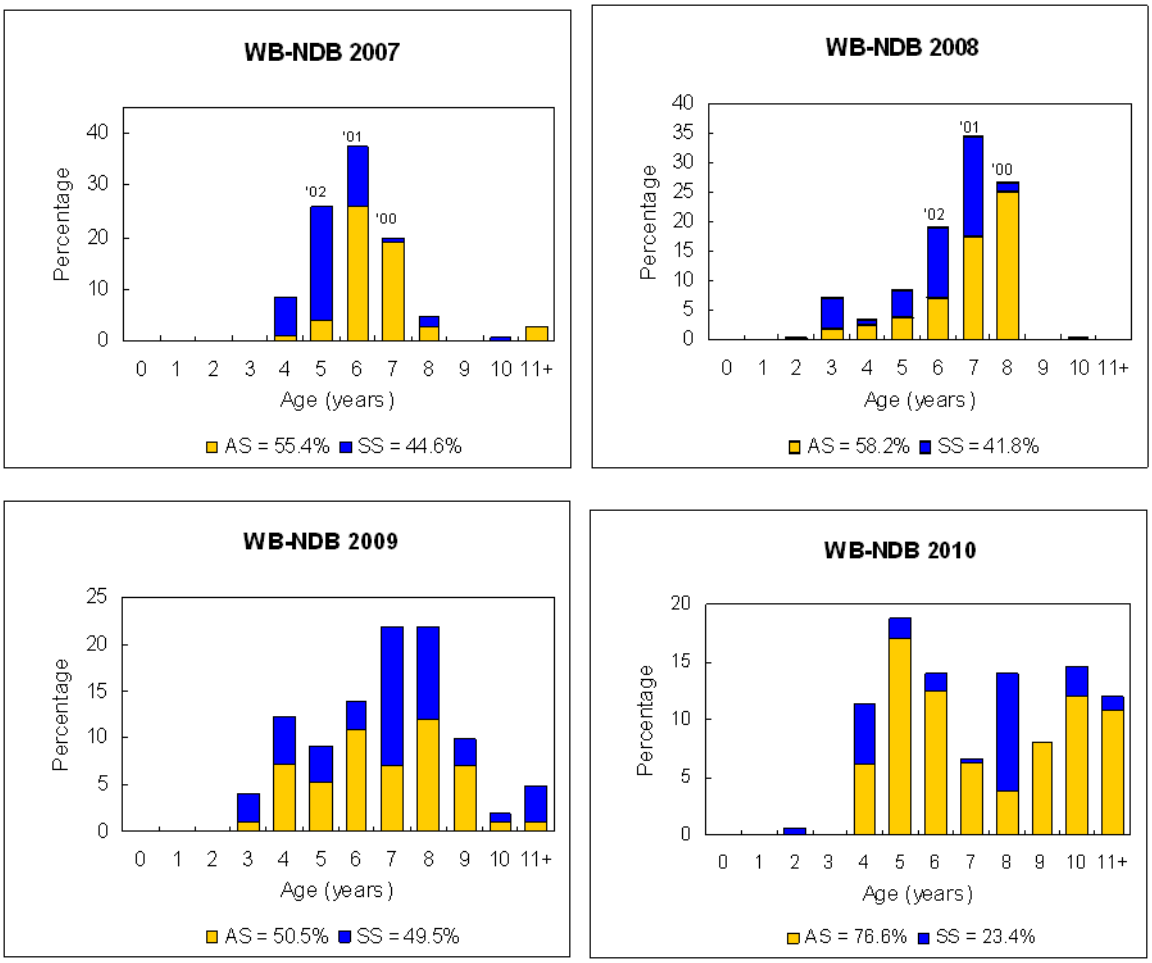


Figure 7. Age distribution of herring from the commercial fishery, by spawning type (AS = autumn spawners, SS = spring spawners), White Bay–Notre Dame Bay, 2007-10, including estimates of herring used as bait.

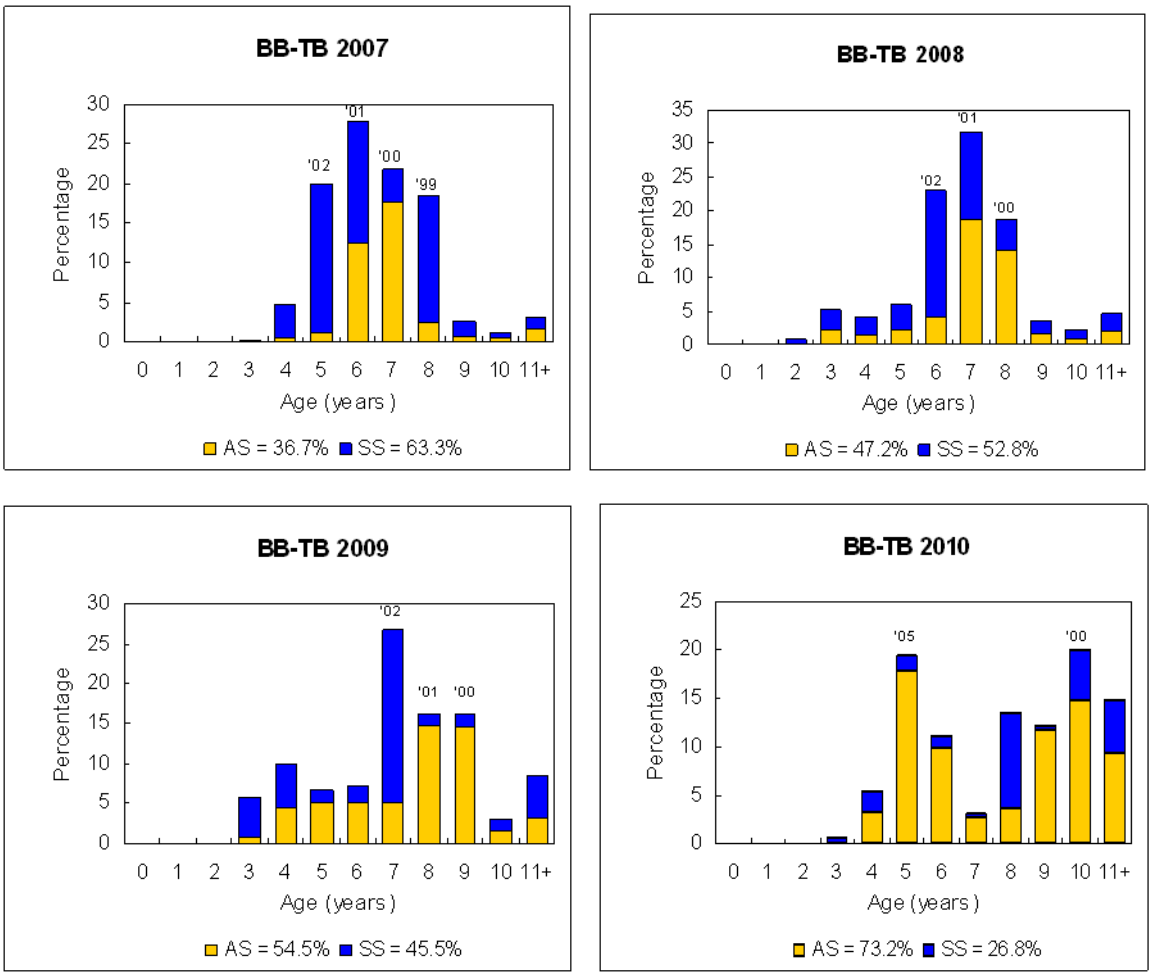


Figure 8. Age distribution of herring from the commercial fishery, by spawning type (AS = autumn spawners, SS = spring spawners), Bonavista Bay-Trinity Bay 2007-10 including estimates of herring used as bait.

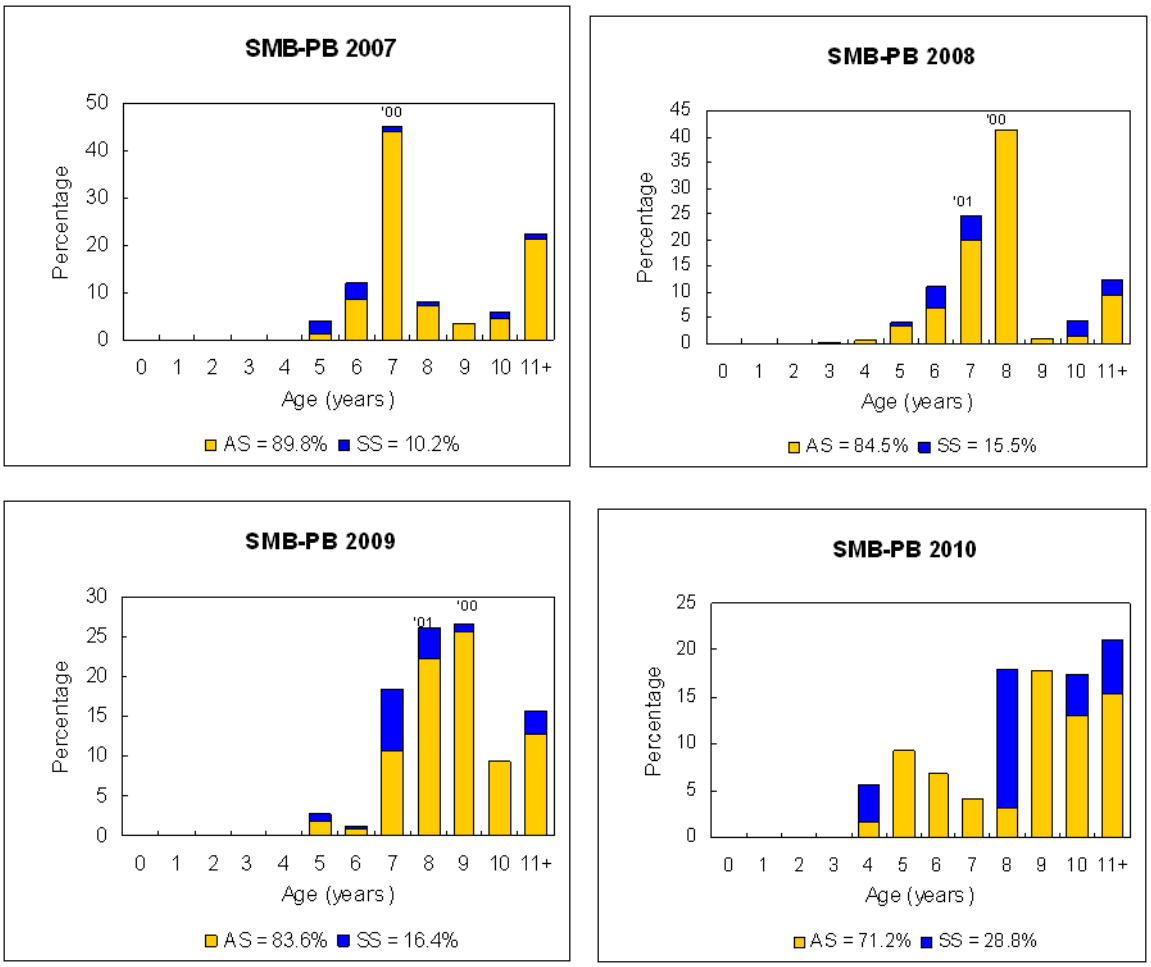


Figure 9. Age distribution of herring from the commercial fishery, by spawning type (AS = autumn spawners, SS = spring spawners), St. Mary's Bay-Placentia Bay, 2007-2010 including estimates of herring used as bait.

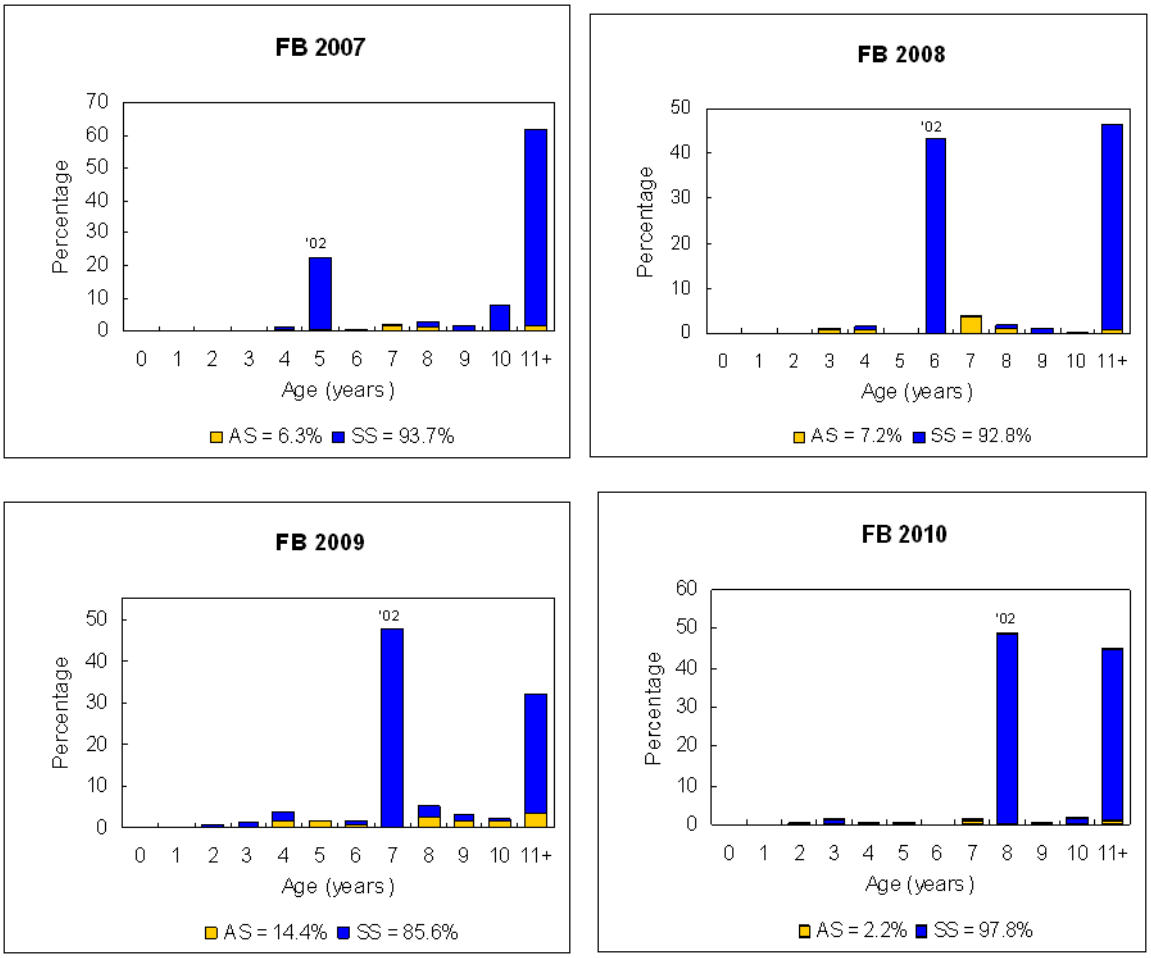


Figure 10. Age distribution of herring from the commercial fishery, by spawning type (AS = autumn spawners, SS = spring spawners), Fortune Bay, 2007-2010 including estimates of herring discards and herring used as bait.

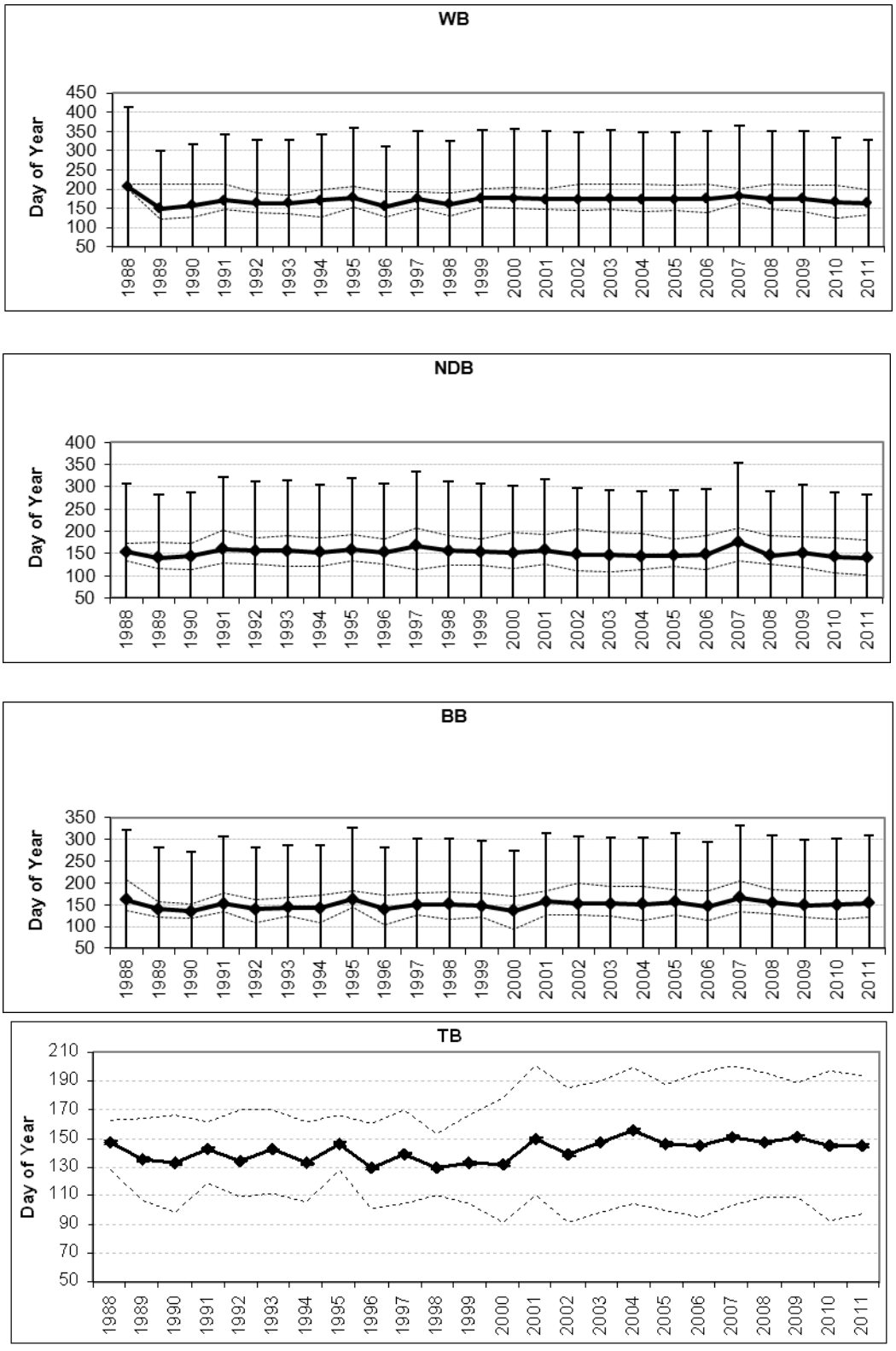


Figure 11. Minimum, maximum and mean day of fishing effort by research gill net fishers from 1988 to 2011, by bay (WB=White Bay, NDB = Notre Dame Bay, BB=Bonavista Bay, TB=Trinity Bay).

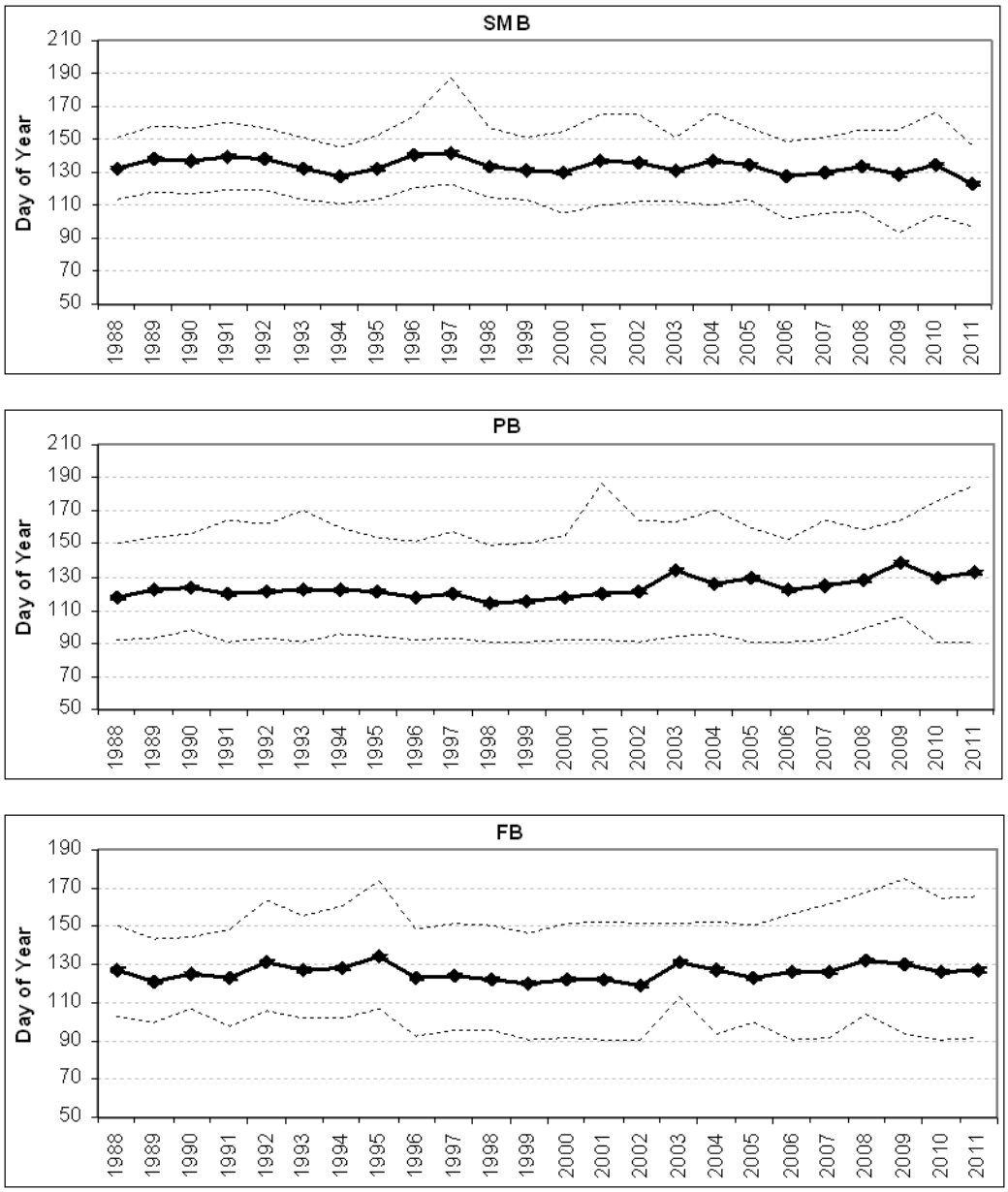


Figure 11 (Cont'd.)

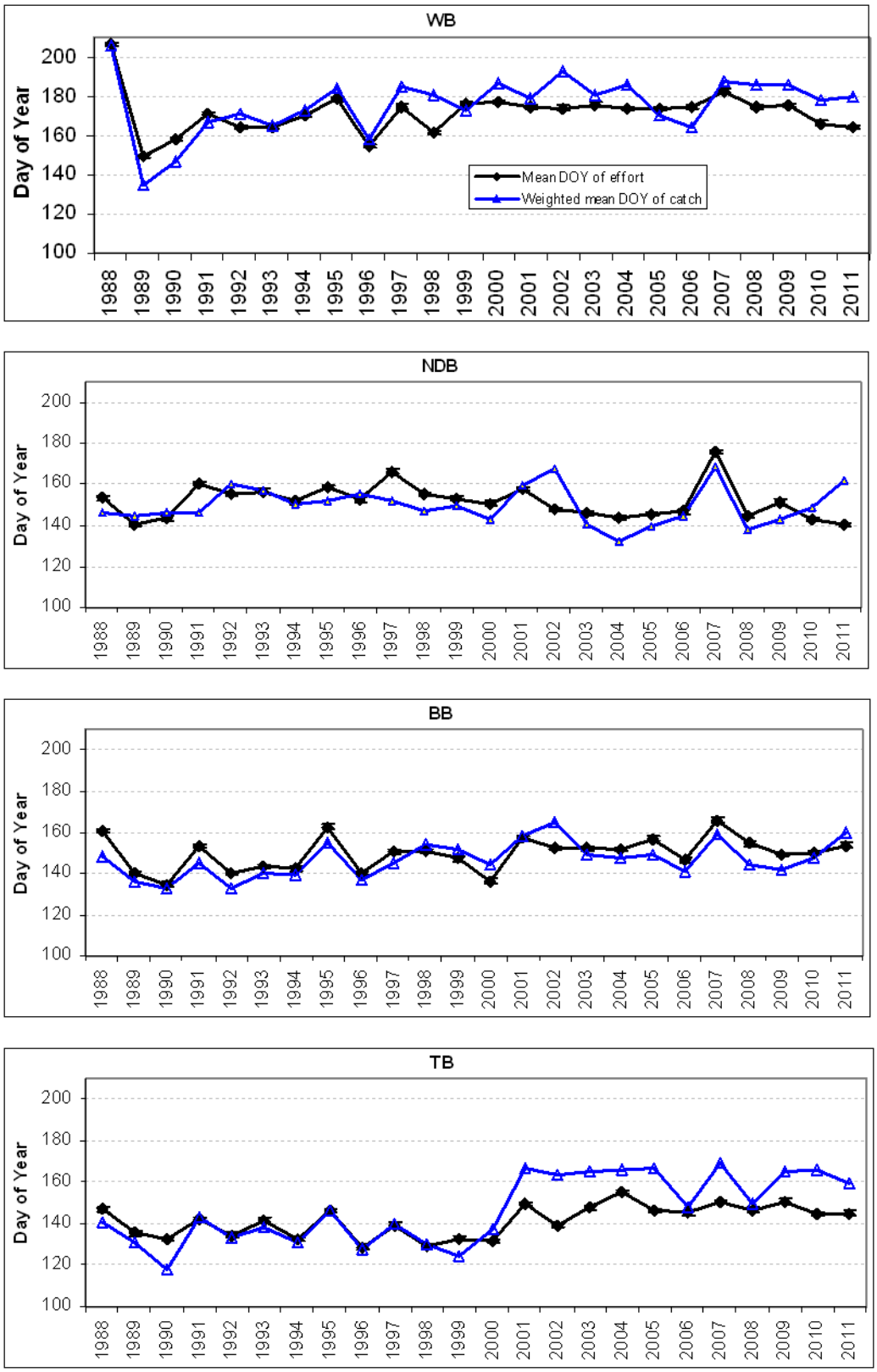


Figure 12. Mean day of fishing effort and weighted mean day of catch of research gill net fishers, by bay (WB=White Bay, NDB=Notre Dame Bay, BB=Bonavista Bay, TB=Trinity Bay), from 1988 to 2011.

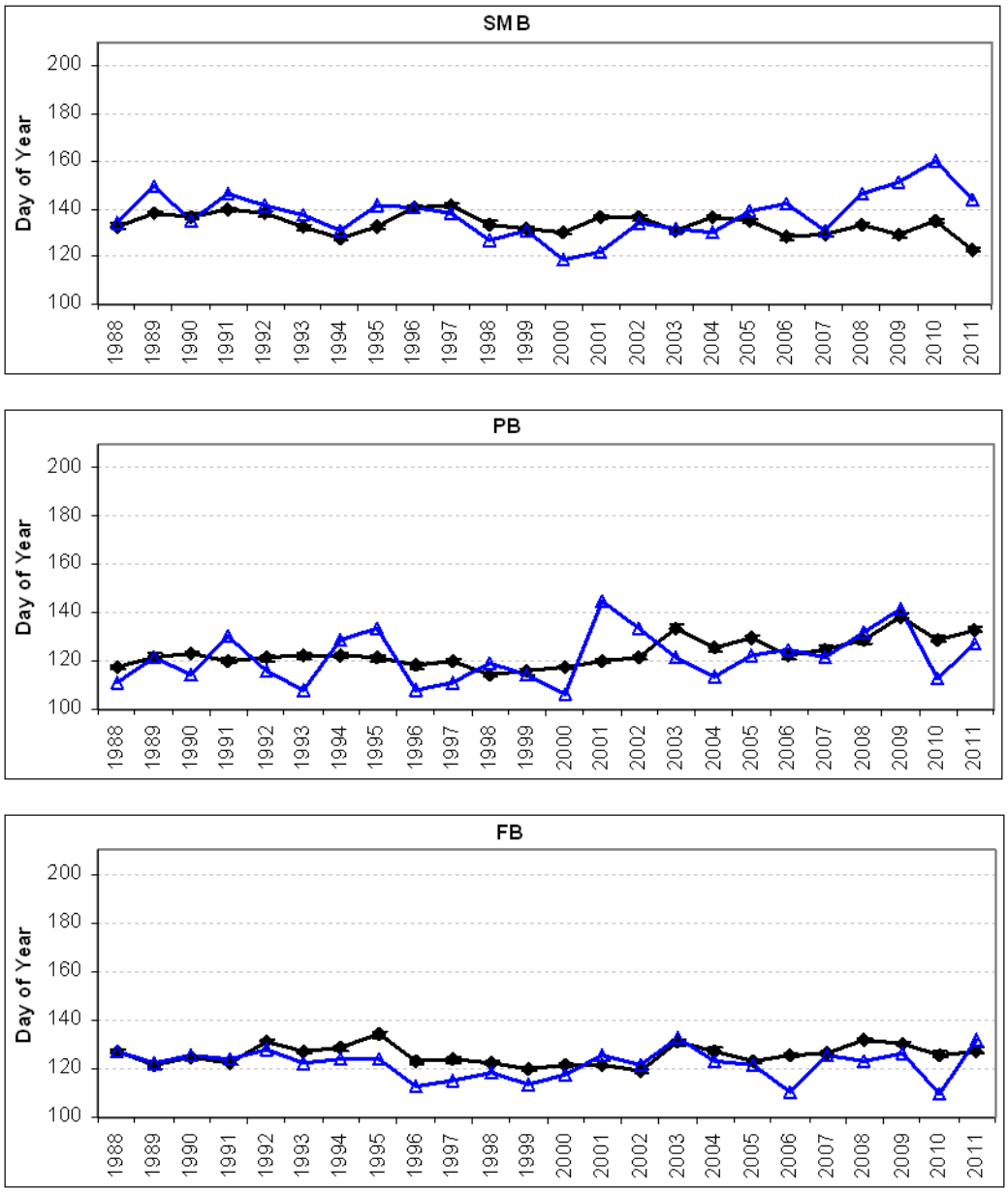


Figure 12 (Cont'd.).

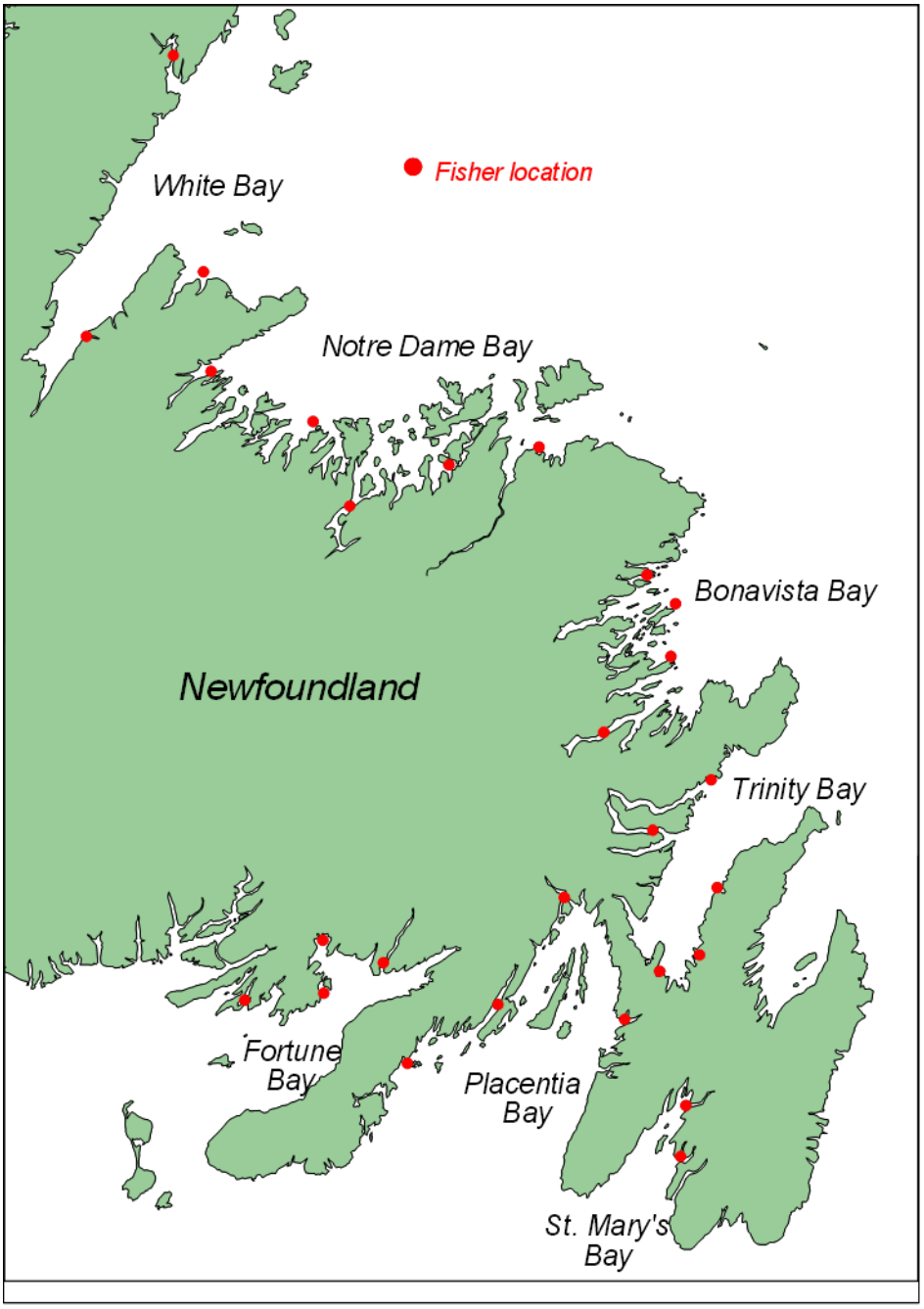


Figure 13. Herring research gill net locations, by stock area, in 2010 and 2011.

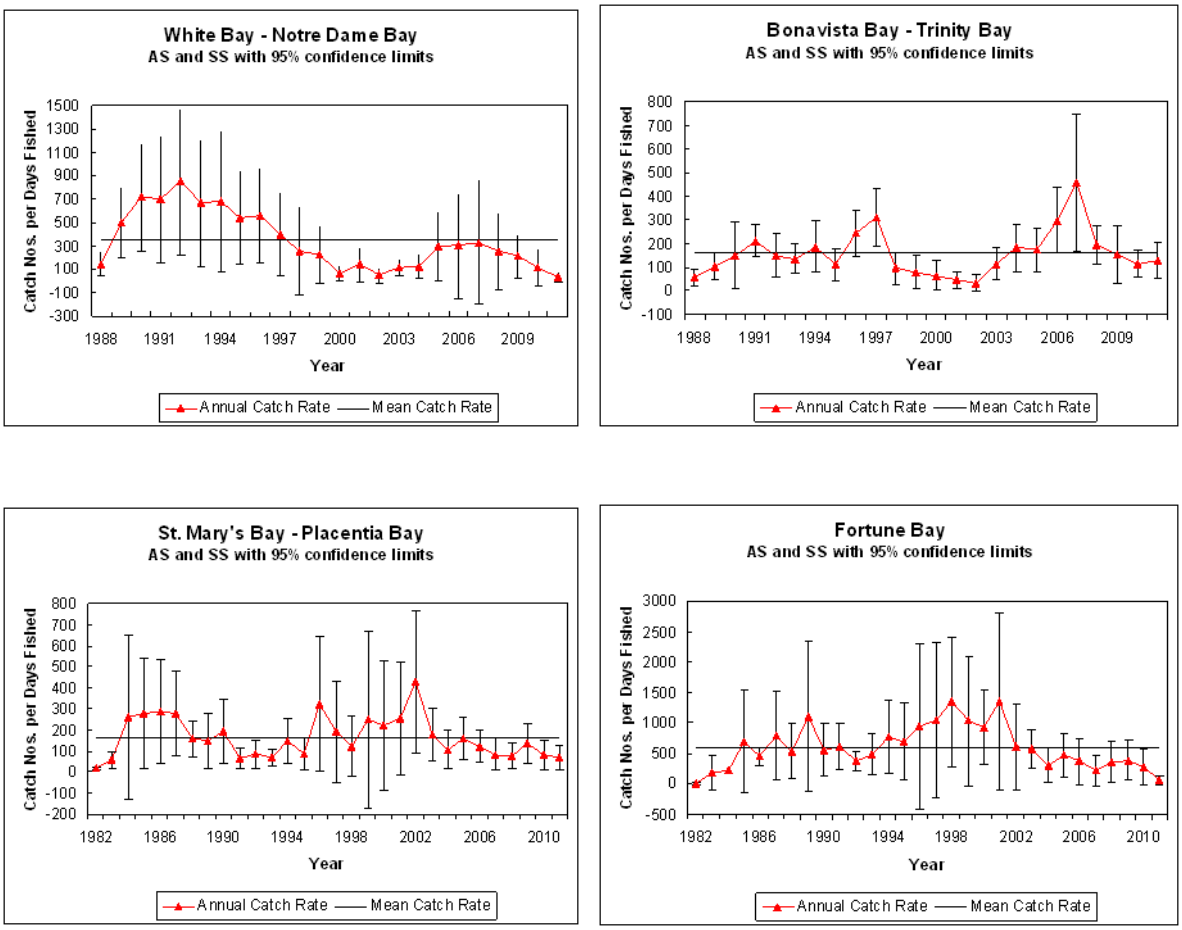


Figure 14. Research gill net catch rates (numbers per nights fished), by stock area and year, spring and autumn spawners combined (with 95% confidence limits); long term means based on entire time series.

Figure 15. Research gill net catch rates (numbers per nights fished) and indices at age (normalized by age) for White Bay – Notre Dame Bay, by spawning type, 1988-2010.

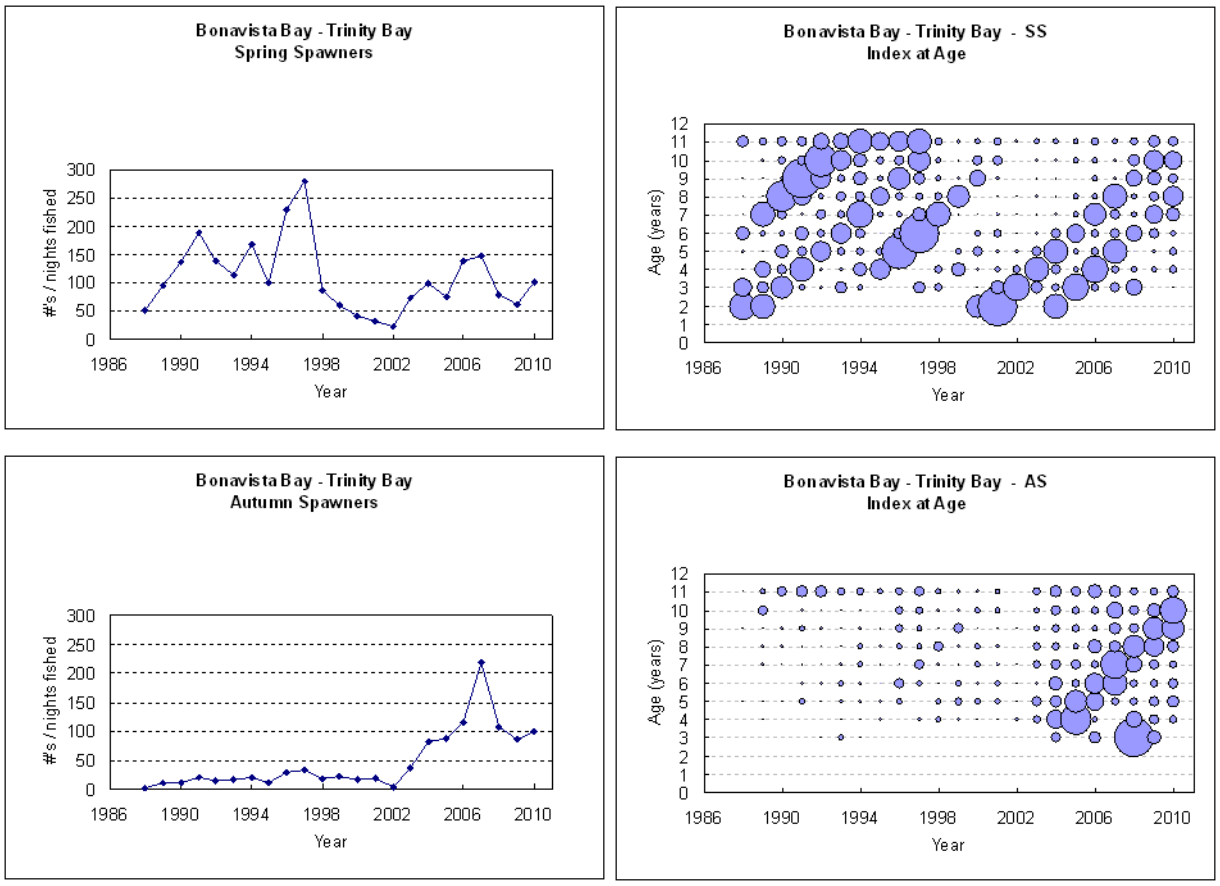


Figure 16. Research gill net catch rates (numbers per nights fished) and indices at age (normalized by age) for Bonavista Bay-Trinity Bay, by spawning type, 1988-2010.

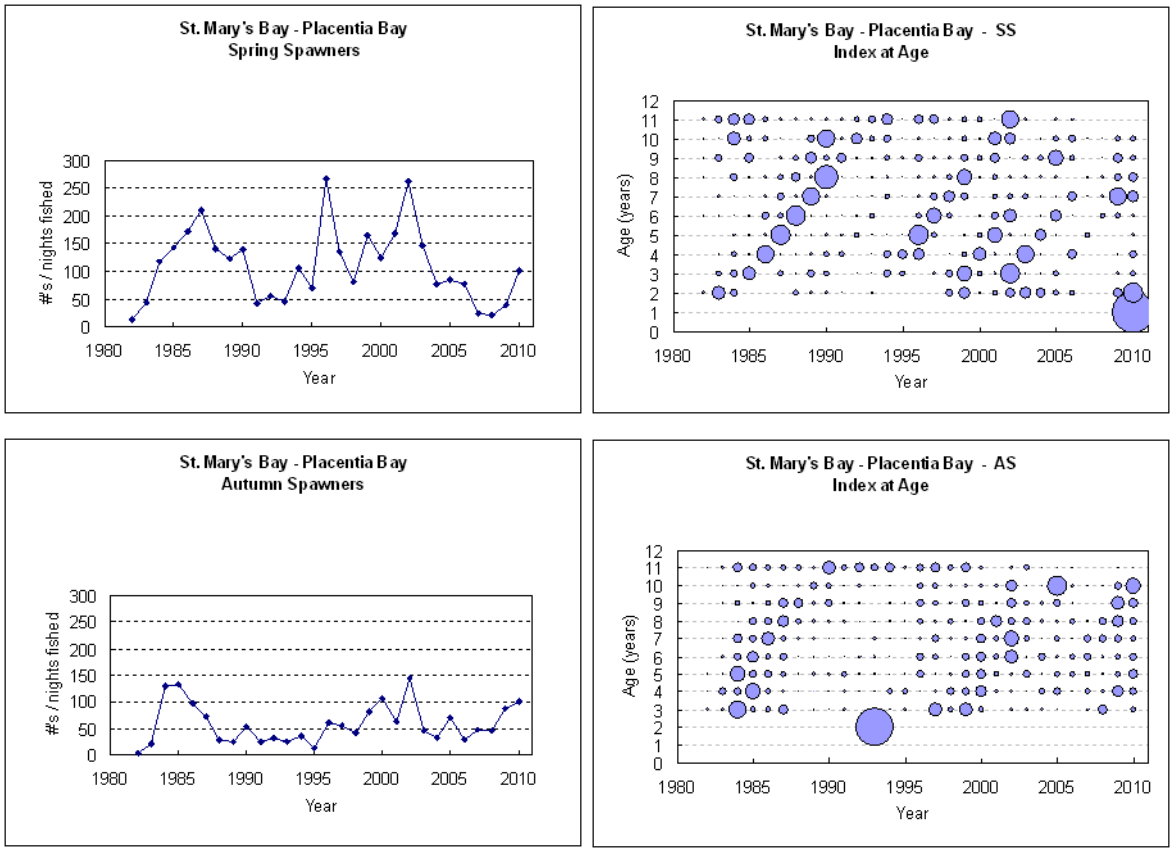


Figure 17. Research gill net catch rates (numbers per nights fished) and indices at age (normalized by age) for St. Mary's Bay–Placentia Bay, by spawning type, 1982-2010.

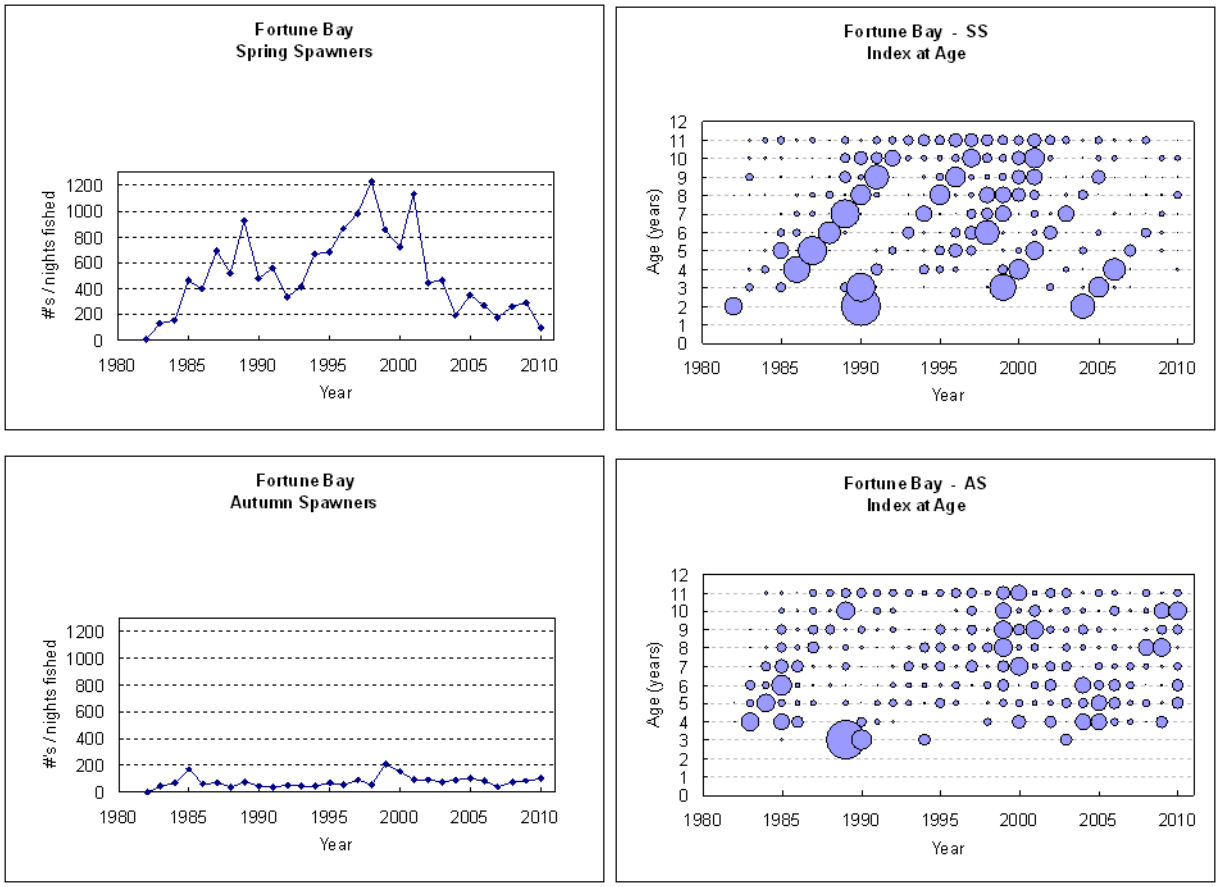


Figure 18. Research gill net catch rates (numbers per nights fished) and indices at age (normalized by age) for Fortune Bay, by spawning type, 1982-2010.

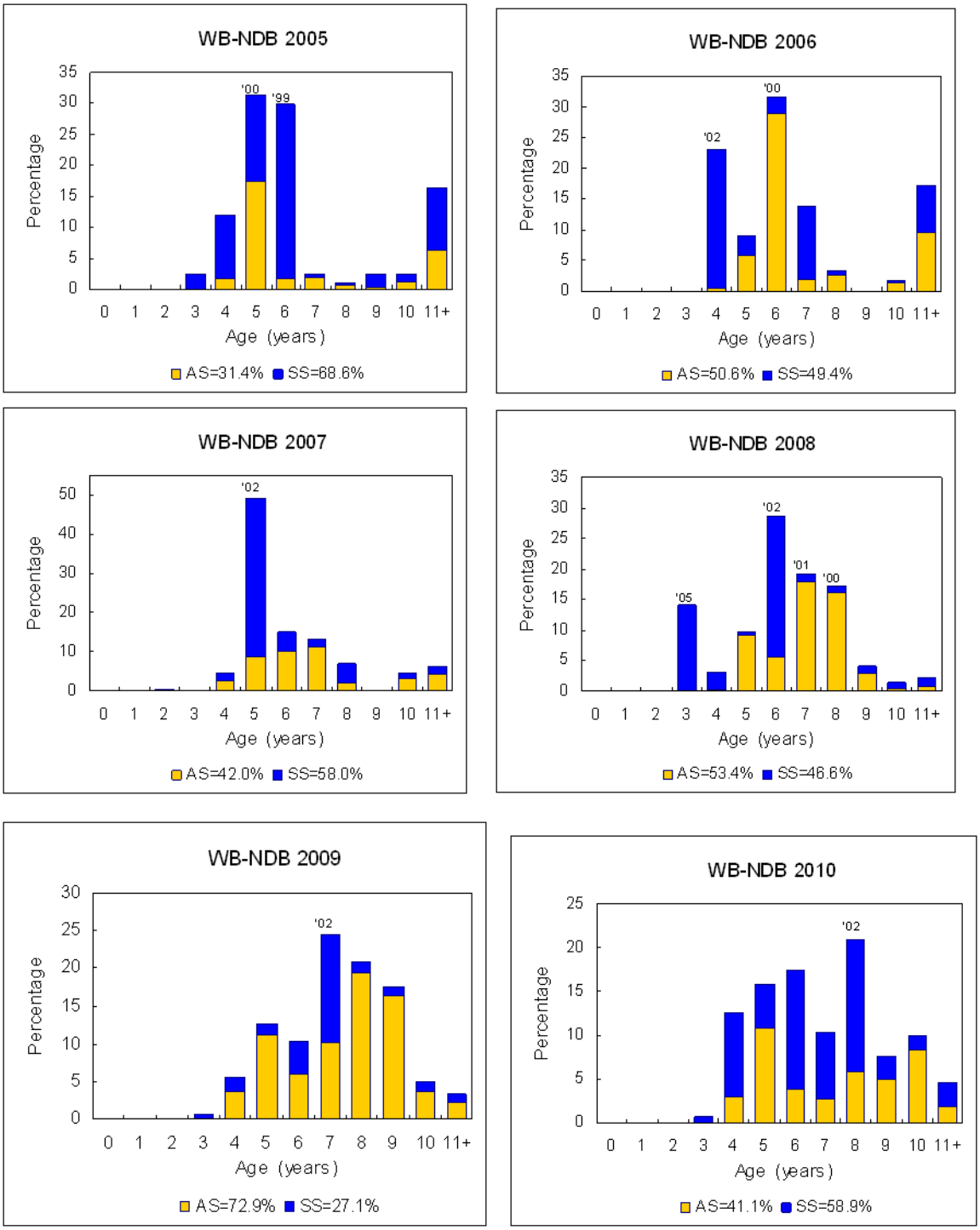


Figure 19. Age distribution of herring from the spring research gill net program, by spawning type, White Bay–Notre Dame Bay 2005-10.

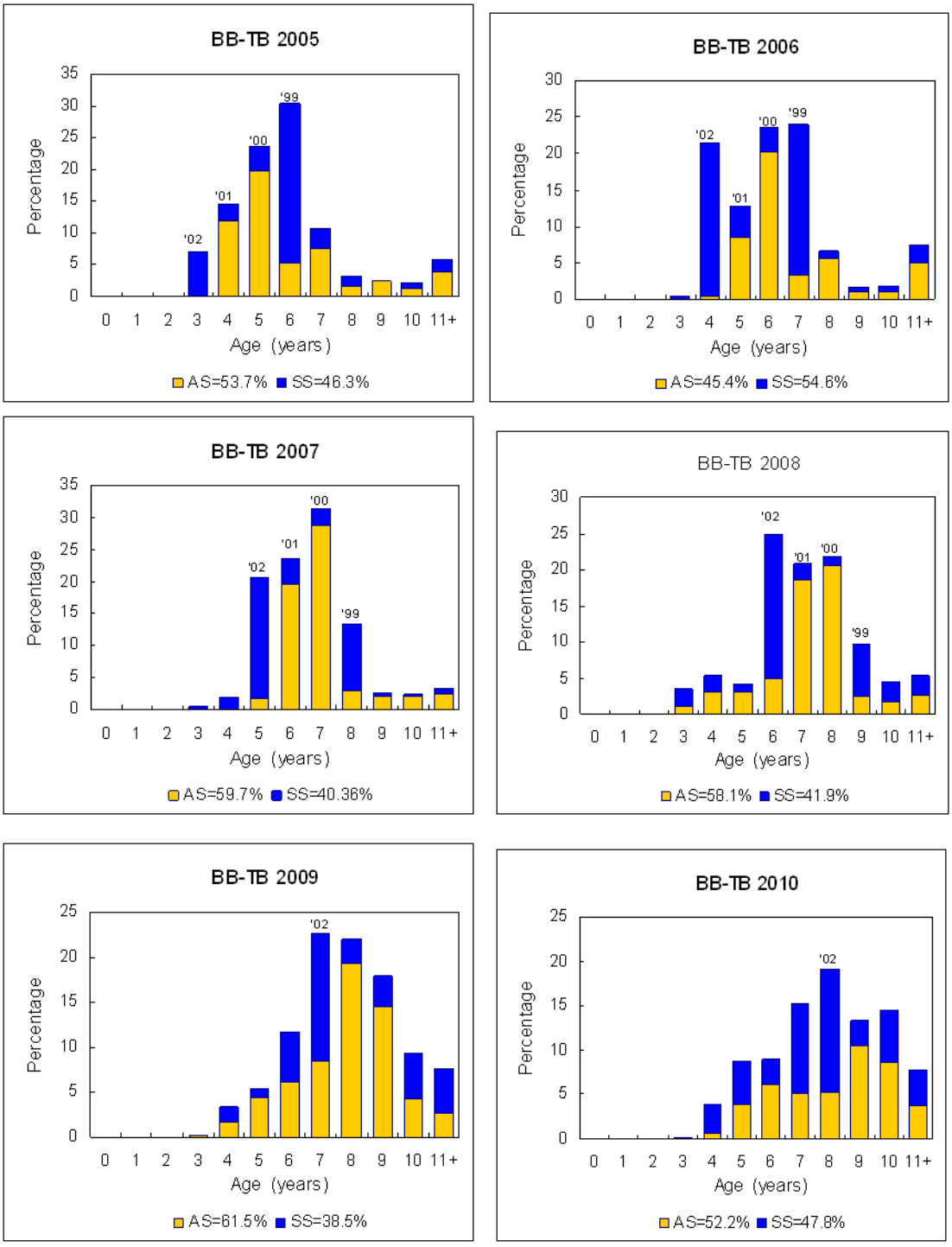


Figure 20. Age distribution of herring from the spring research gill net program, by spawning type, Bonavista Bay-Trinity Bay 2005-10

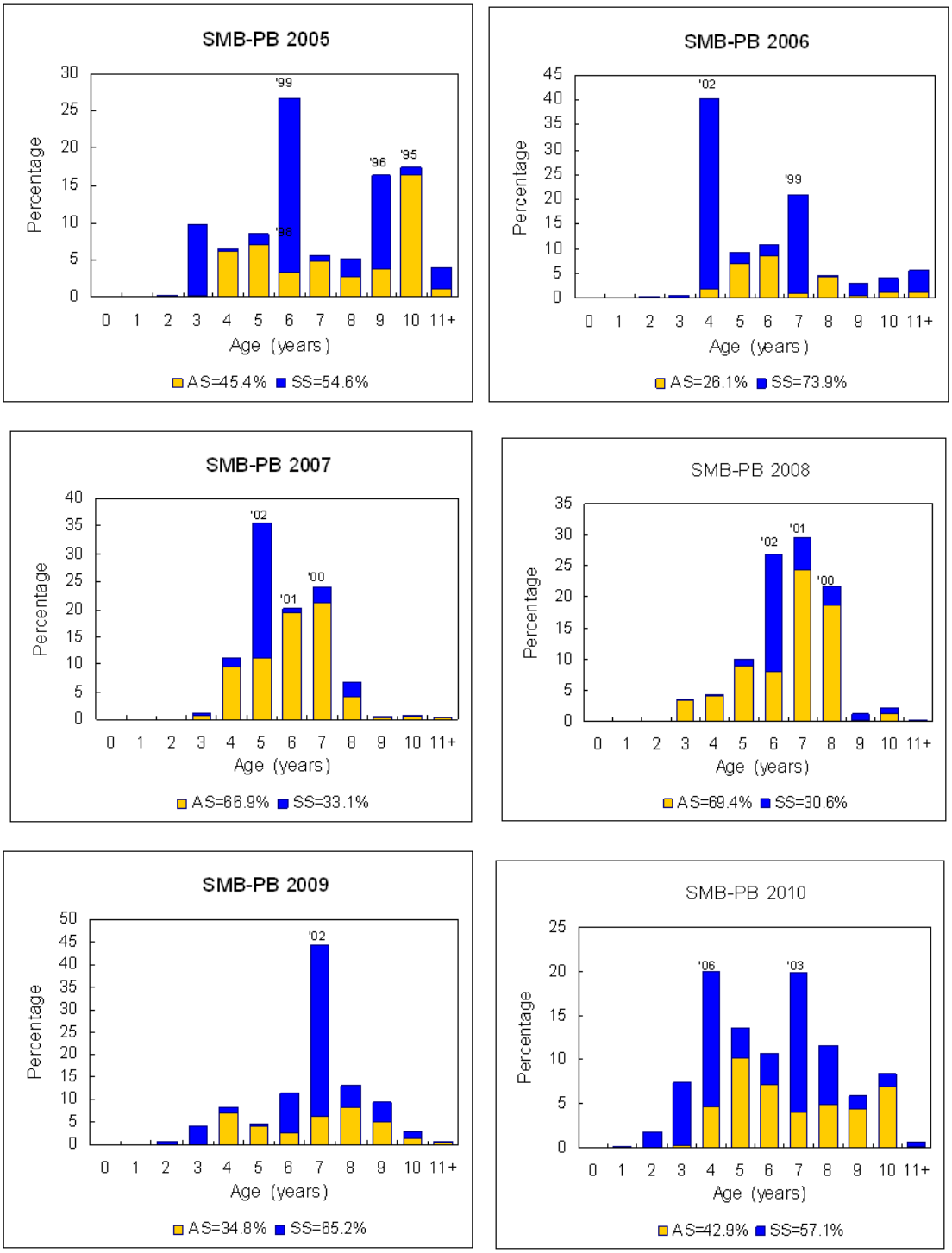


Figure 21. Age distribution of herring from the spring research gill net program, by spawning type, St. Mary's Bay–Placentia Bay 2005-10.

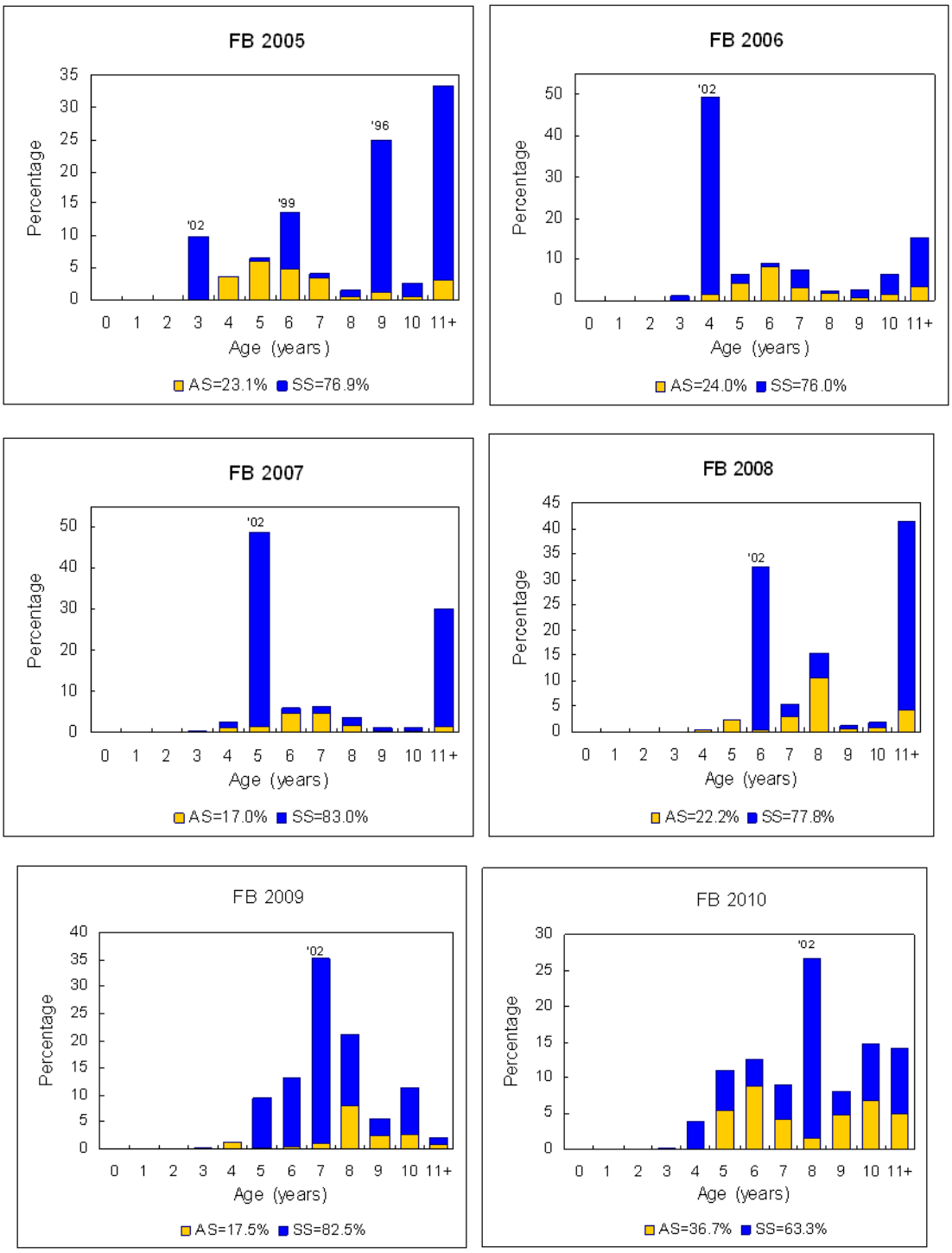


Figure 22. Age distribution of herring from the spring research gill net program, by spawning type, Fortune Bay, 2005-10.

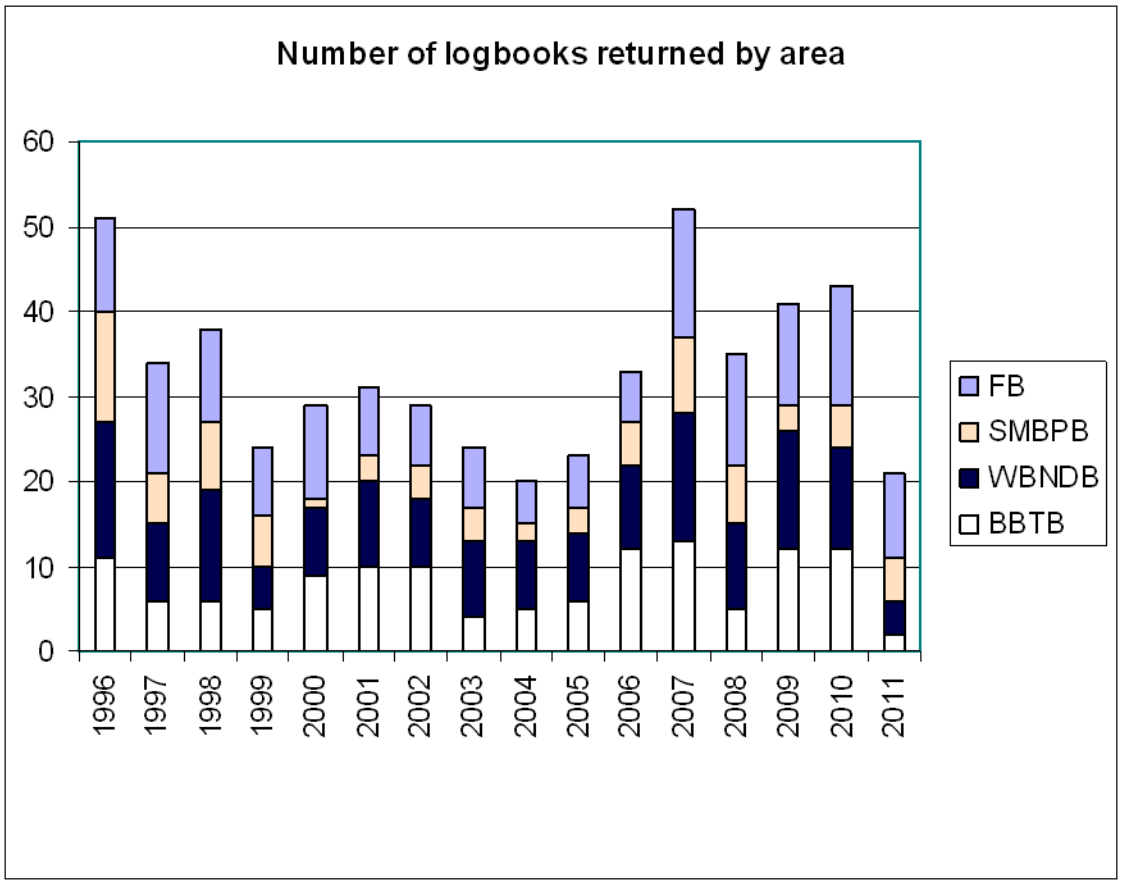


Figure 23. Number of commercial gill net log books returned by stock area and year (2011 returns as of November 25).

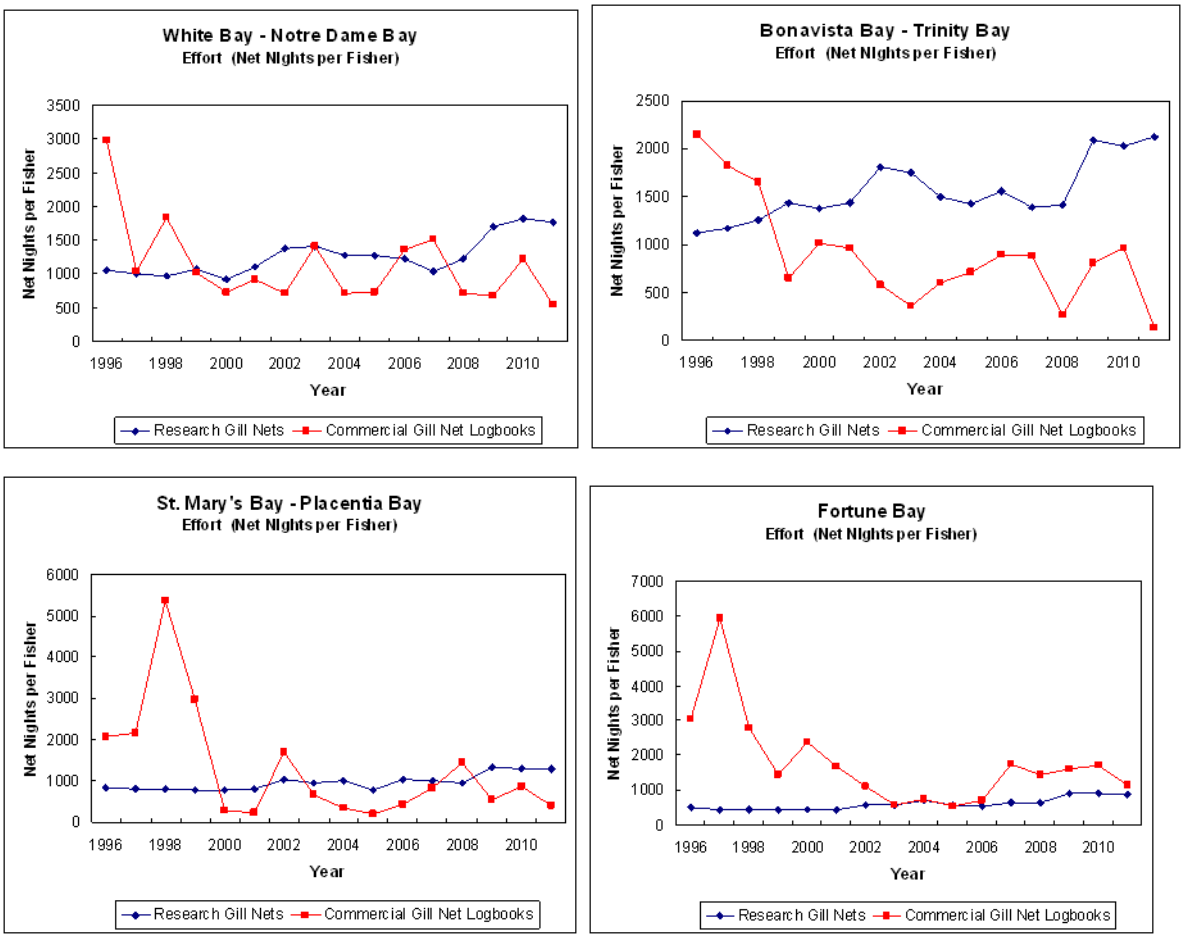


Figure 24. Comparison of total effort (net nights per fisher) for research gill net and commercial gill net logbook data, by stock area and year.

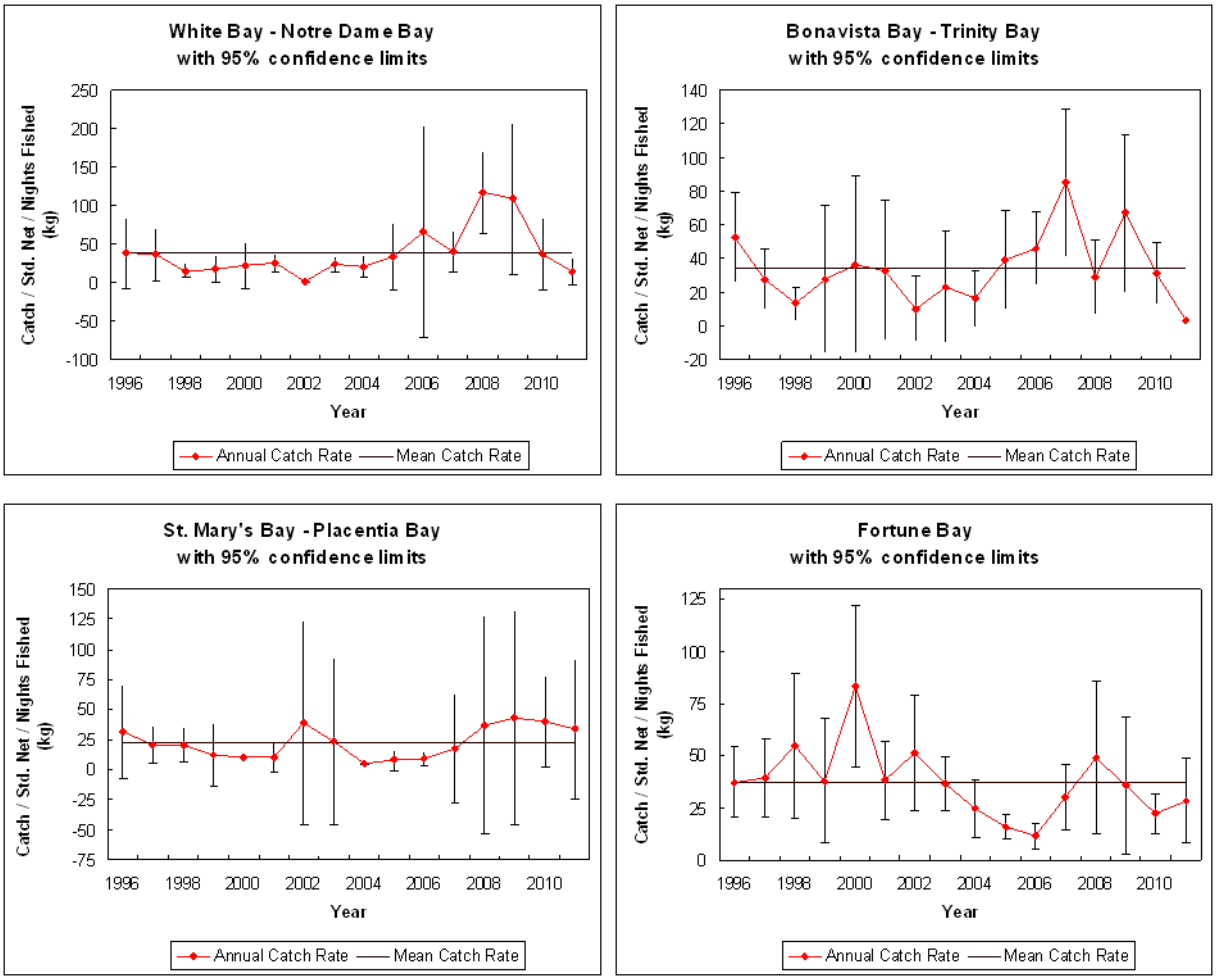


Figure 25. Catch rates from commercial gill net log books (spring only)

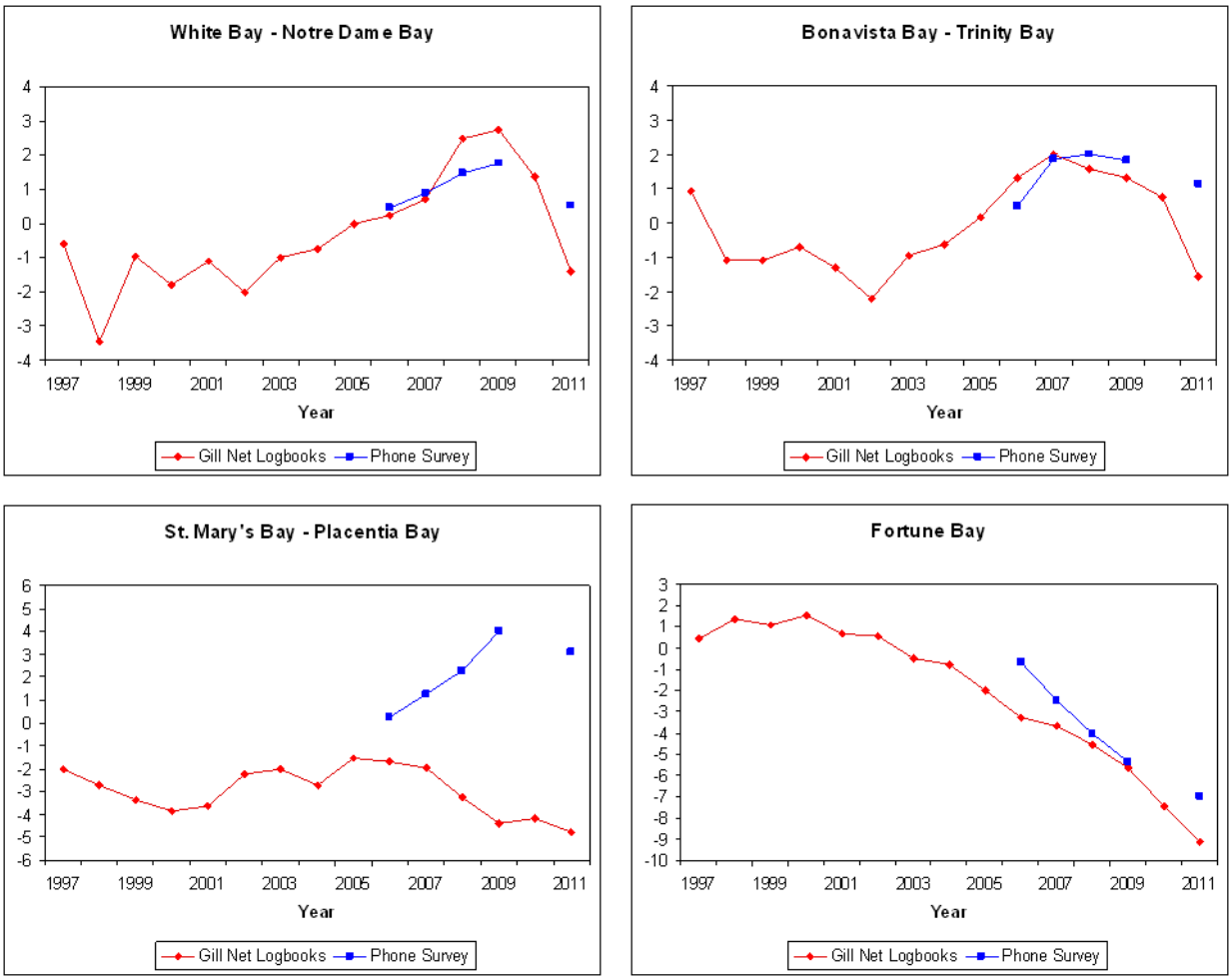


Figure 26. Cumulative abundance indices from gill net fisher telephone surveys compared to similar indices from commercial gill net logbooks. Zero is considered to be average abundance.

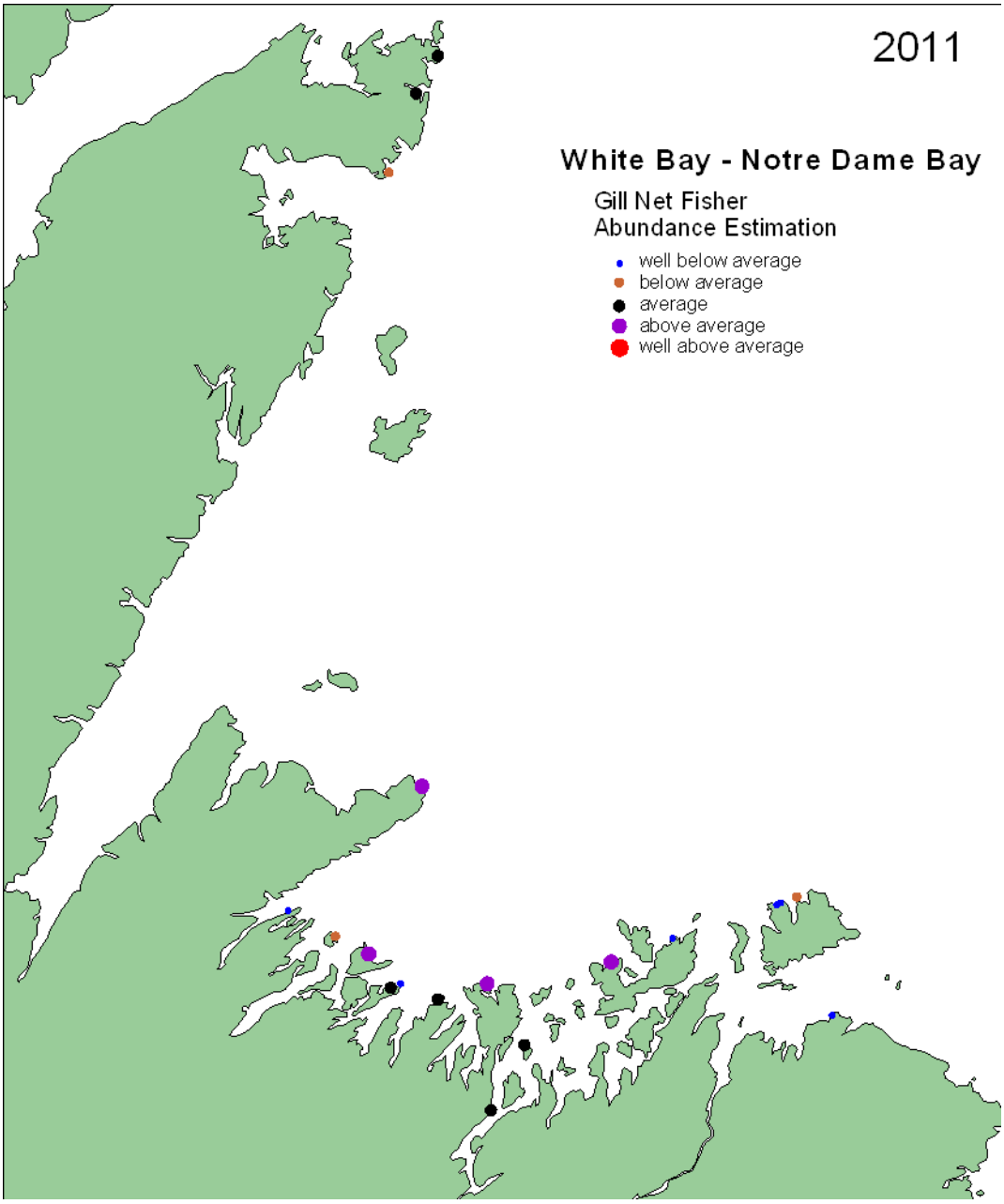


Figure 27. White Bay – Notre Dame Bay bait and commercial fixed gear fisher locations and abundance estimation from 2011 telephone survey.

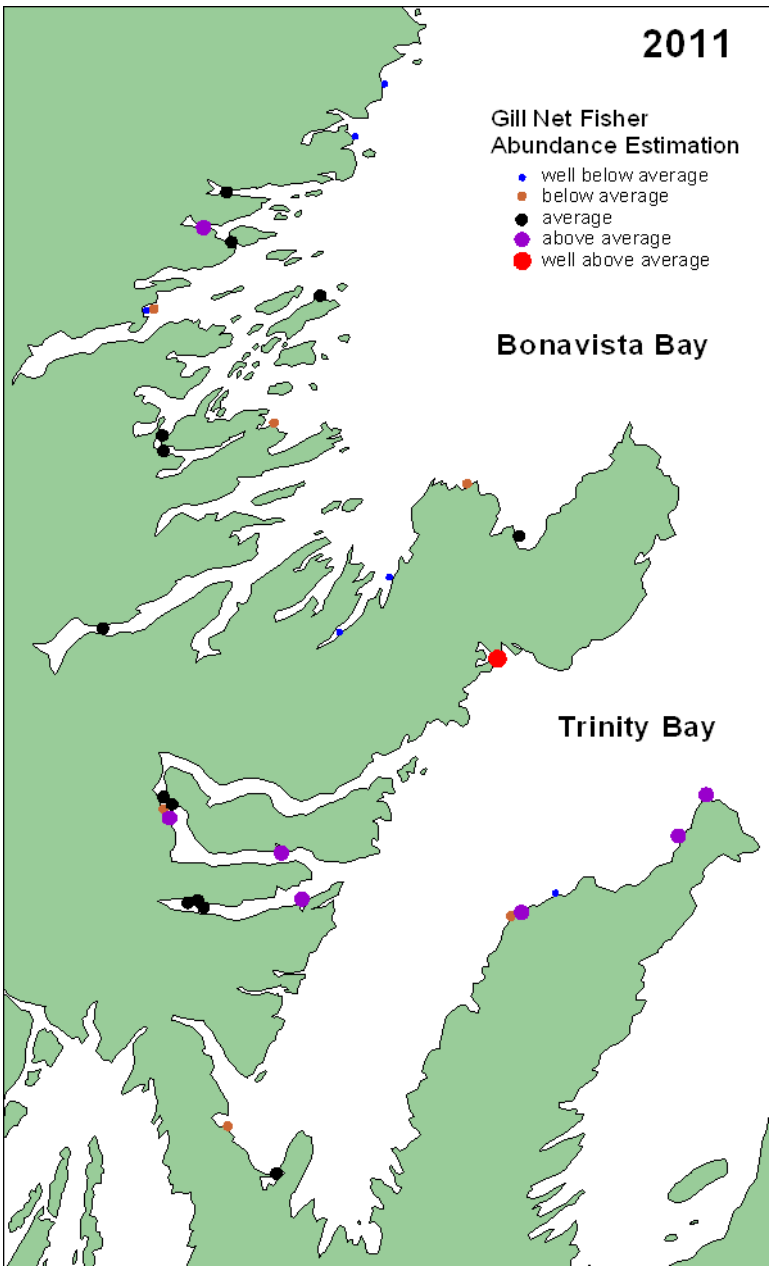


Figure 28. Bonavista Bay–Trinity Bay bait and commercial fixed gear fisher locations and abundance estimation from 2011 telephone survey.

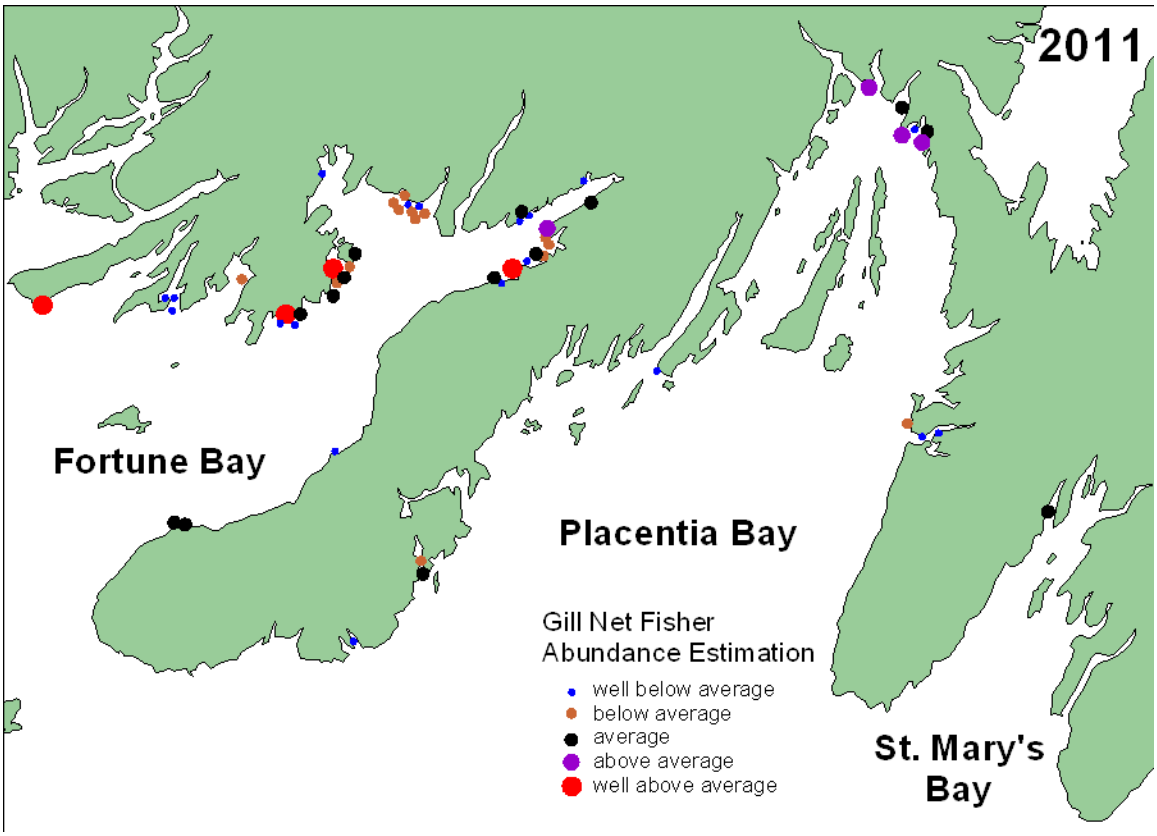


Figure 29. St. Mary's Bay – Placentia Bay and Fortune Bay bait and commercial fixed gear fisher locations and abundance estimation from 2011 telephone survey.

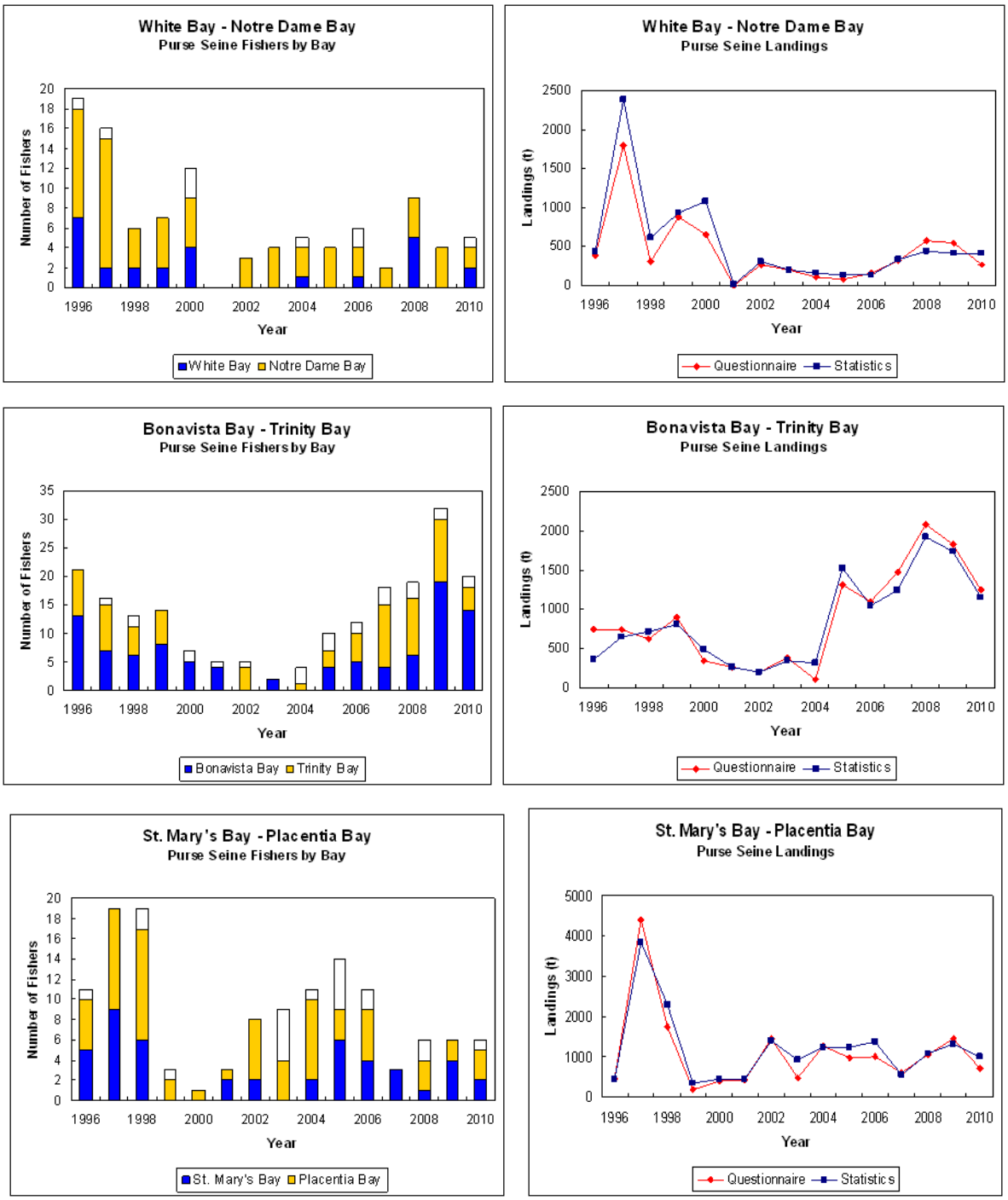


Figure 30. Total number of purse seine fishers who participated in the commercial fishery by year, bay and stock area (left panels), and commercial purse seine landings derived from telephone survey and from Policy and Economics Branch statistics (right panels).

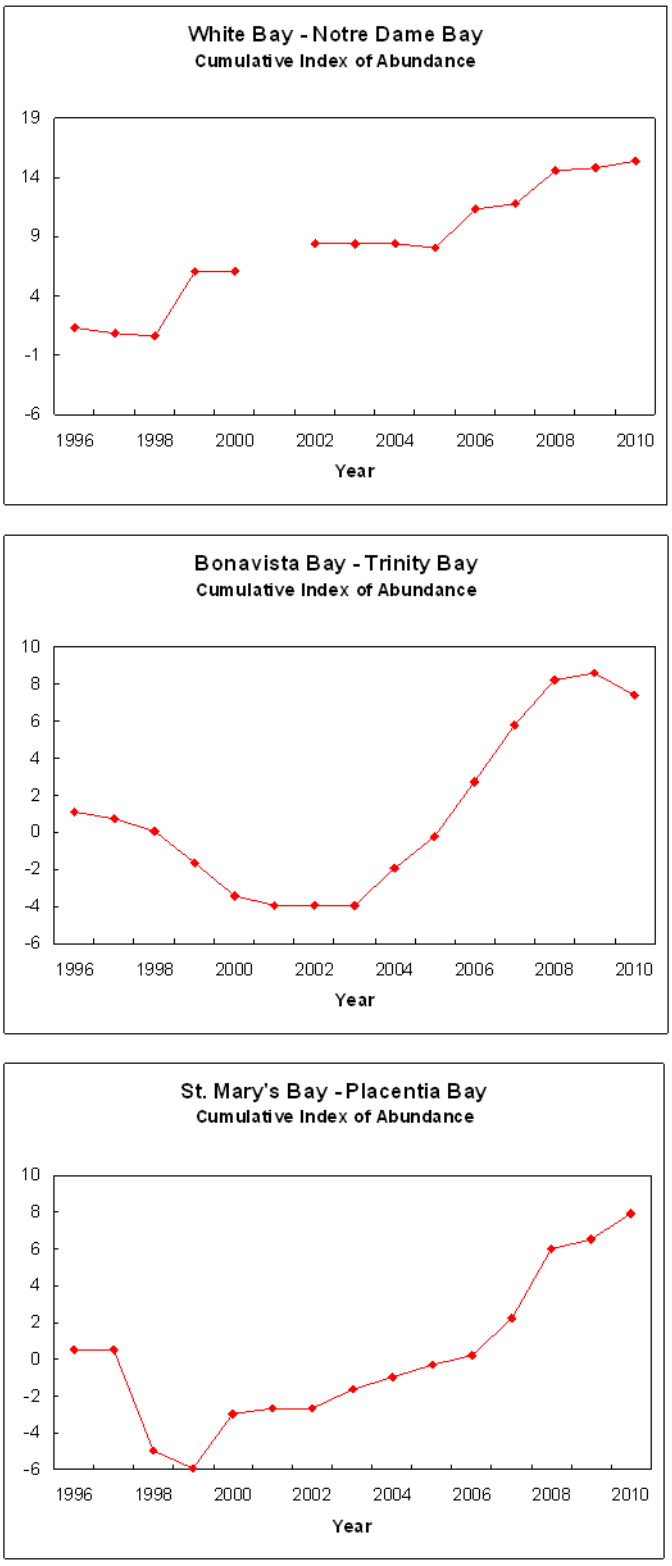


Figure 31. Cumulative abundance indices from purse seine fisher questionnaires, by stock area and year.

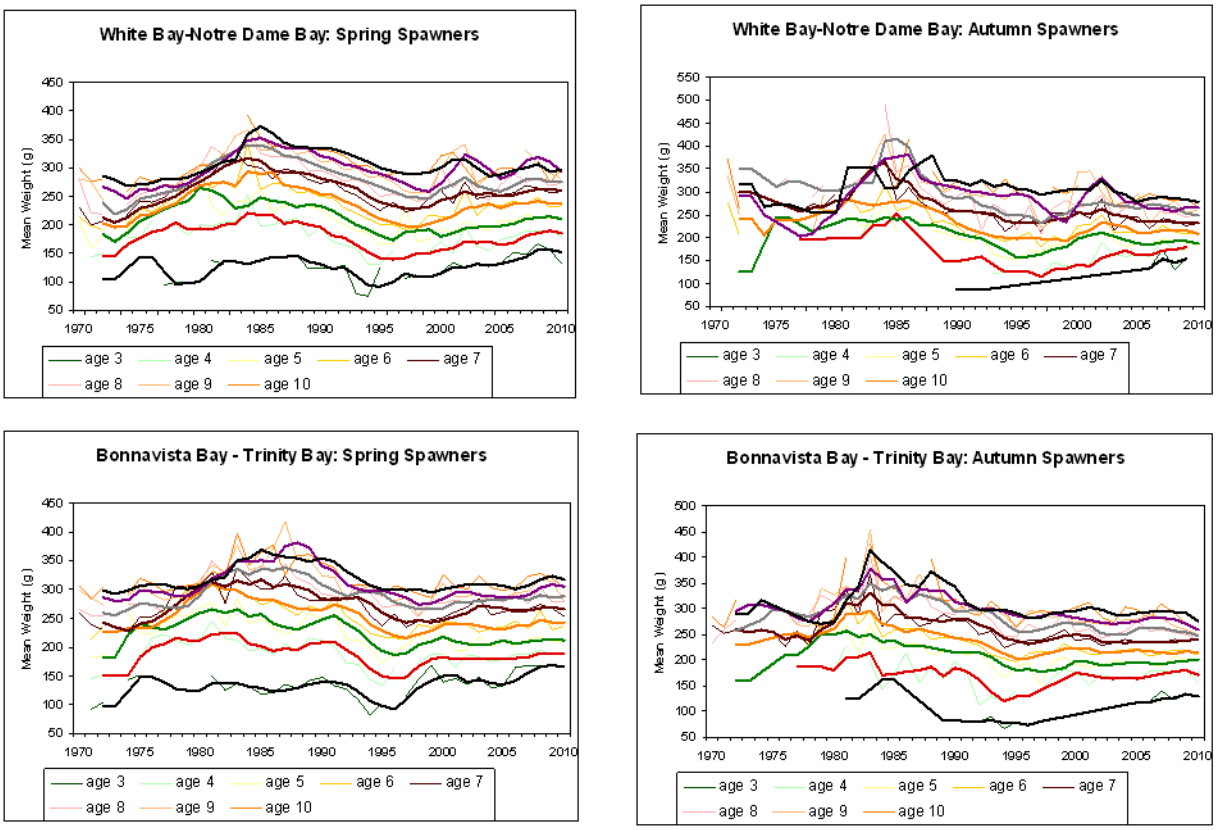


Figure 32. Mean weights-at-ages 3 to 10 (three year running average) of spring and autumn spawning herring, by stock area, from samples collected January to June, 1970-2010.

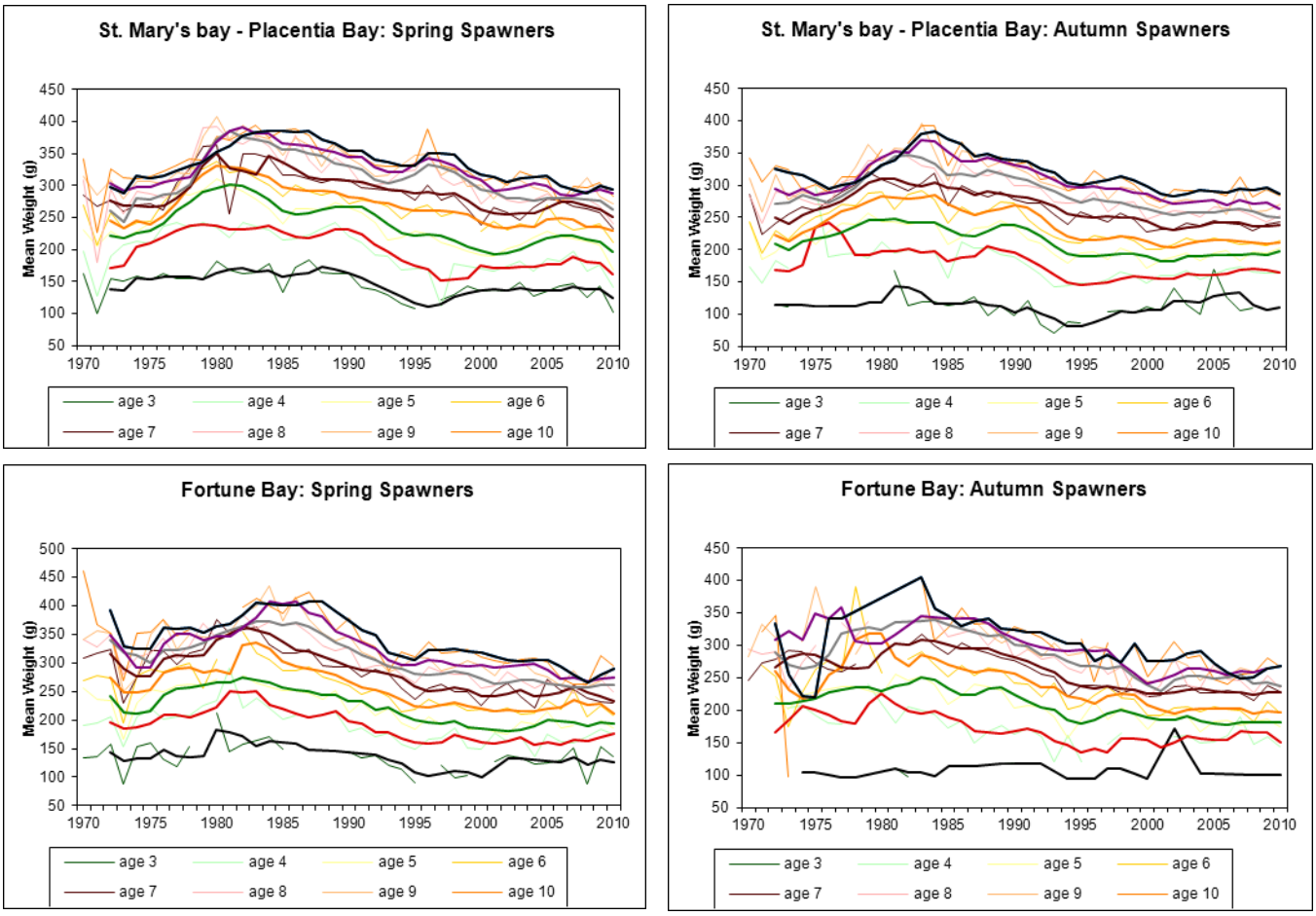


Figure 32 (Cont'd.). Mean weights-at-ages 3 to 10 (three year running average) of spring and autumn spawning herring, by stock area, from samples collected January to June, 1970-2010.

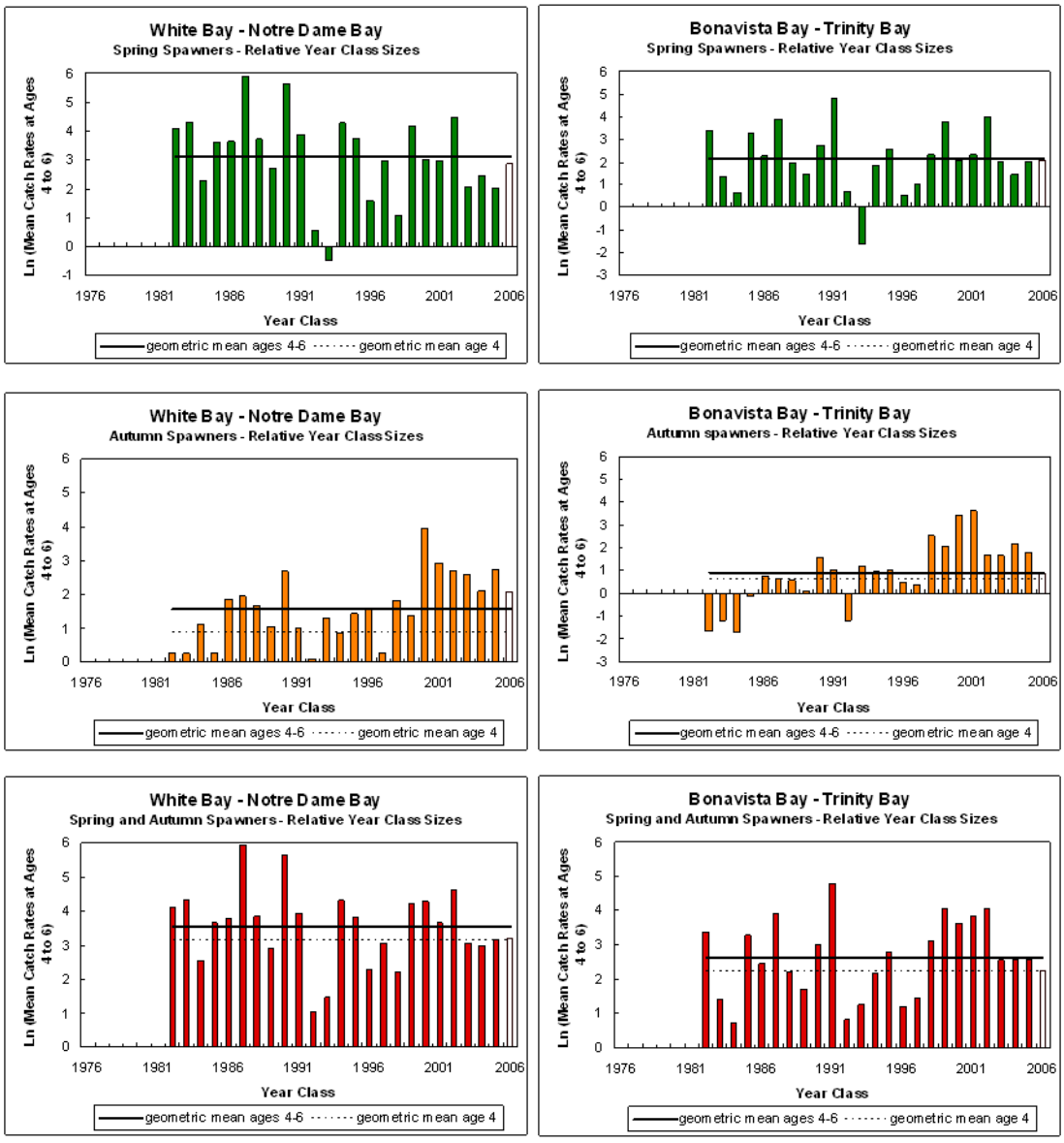


Figure 33. Relative year class sizes from research gill net catch rates at ages 4-6 (up to 2005 year class) and age 4 (for 2006 recruiting year class – white bar) for spring spawners (top), autumn spawners (middle) and both spawning types combined (below) for all four stock areas; geometric means are from entire time series.

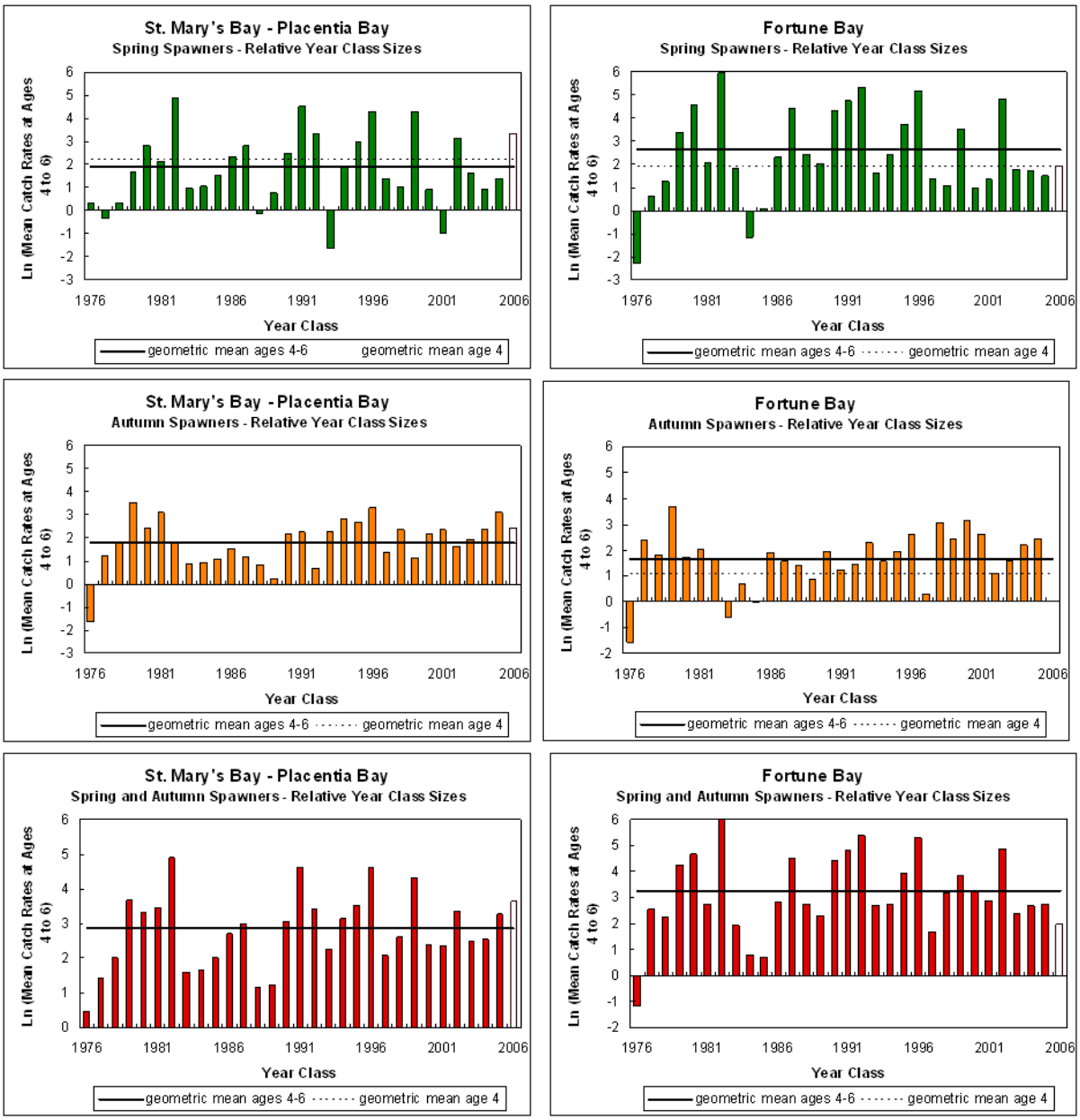


Figure 33 (Cont'd.). Relative year class sizes from research gill net catch rates at ages 4-6 (up to 2005 year class) and age 4 (for 2006 recruiting year class) for spring spawners (top), autumn spawners (middle) and both spawning types combined (below) for all four stock areas; geometric means are from entire time series.

commercial fishery samples

research gill net program samples

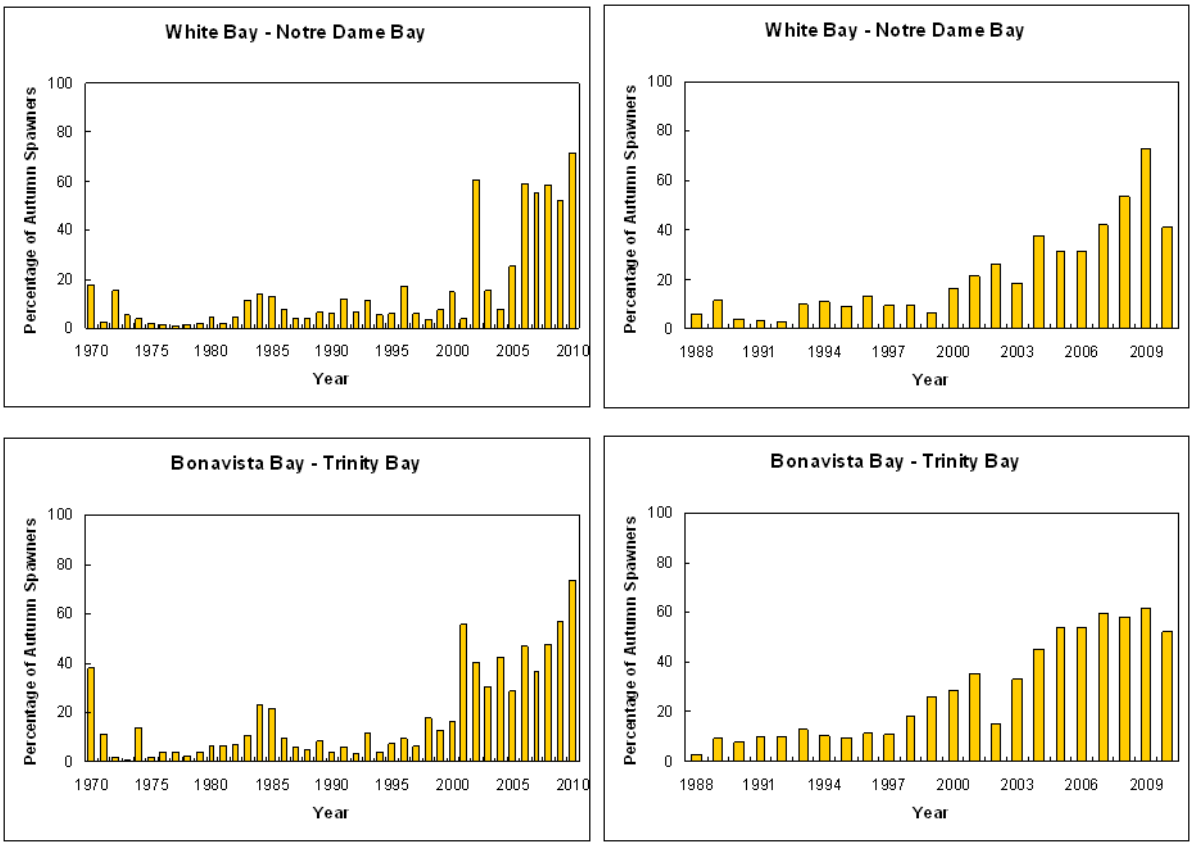


Figure 34. Percentage of autumn spawners in commercial catches (left panels) and research gill net catches (right panels), by stock area and year. Commercial catches include herring discards and herring used as bait.

commercial fishery samples

research gill net program samples

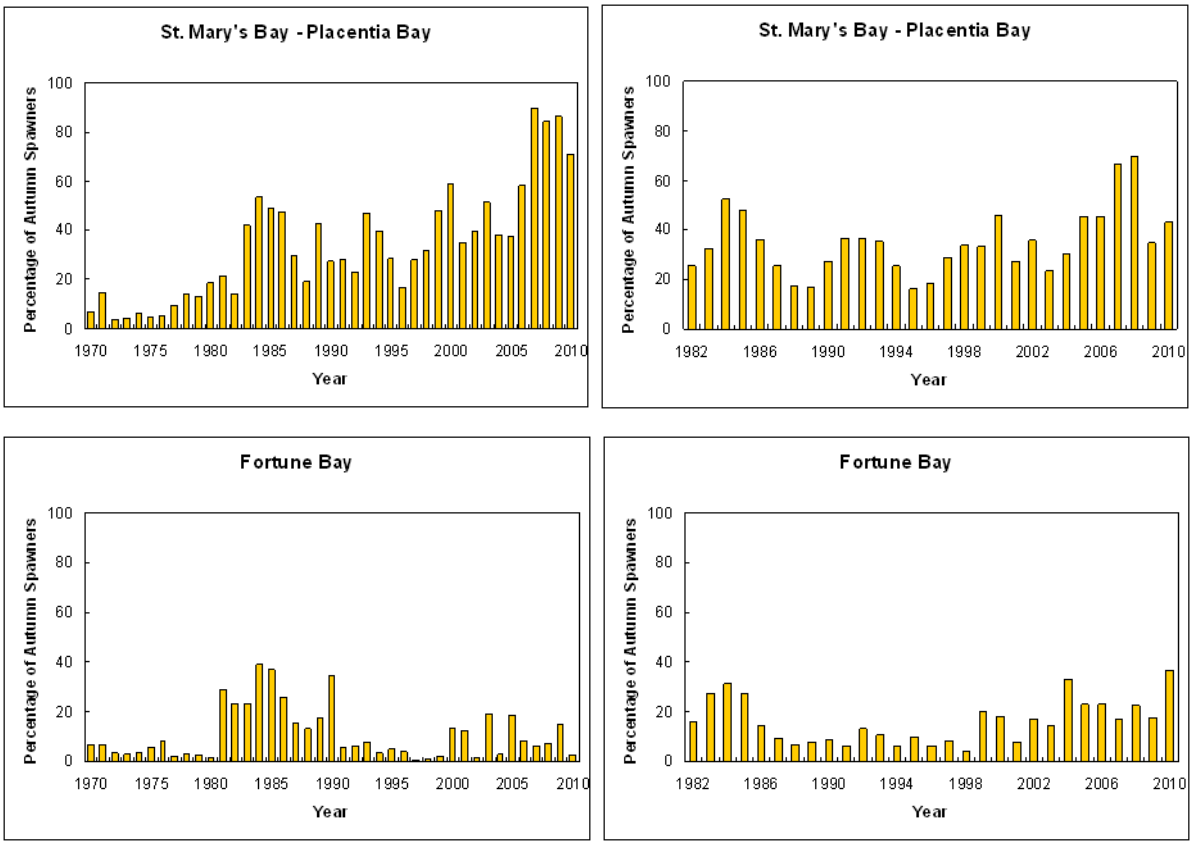


Figure 34 (Cont'd.). Percentage of autumn spawners in commercial catches (left panels) and research gill net catches (right panels), by stock area and year. Commercial catches include herring discards and herring used as bait.

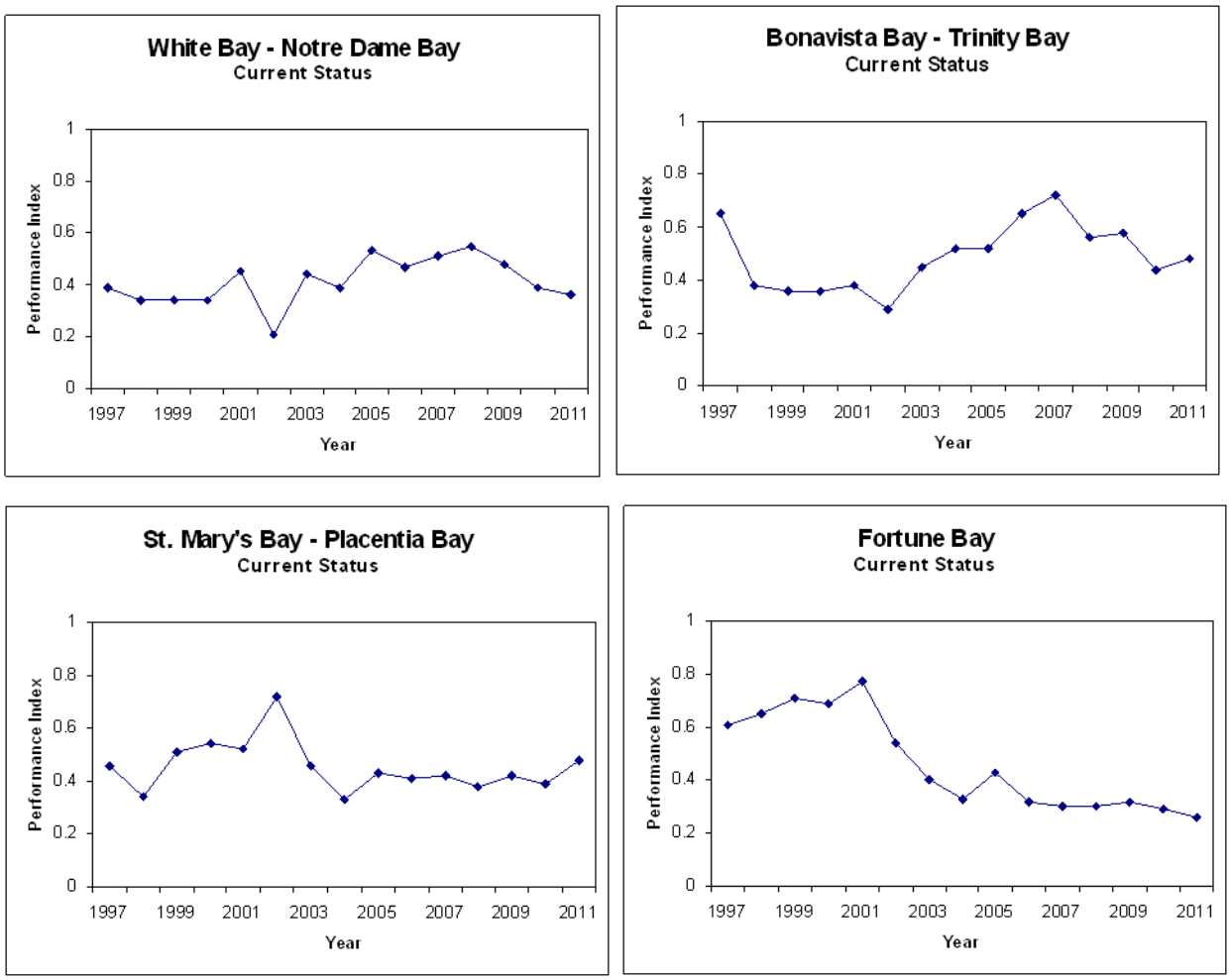


Figure 35. Performance report indices of current status, by stock area, 1997-2011.

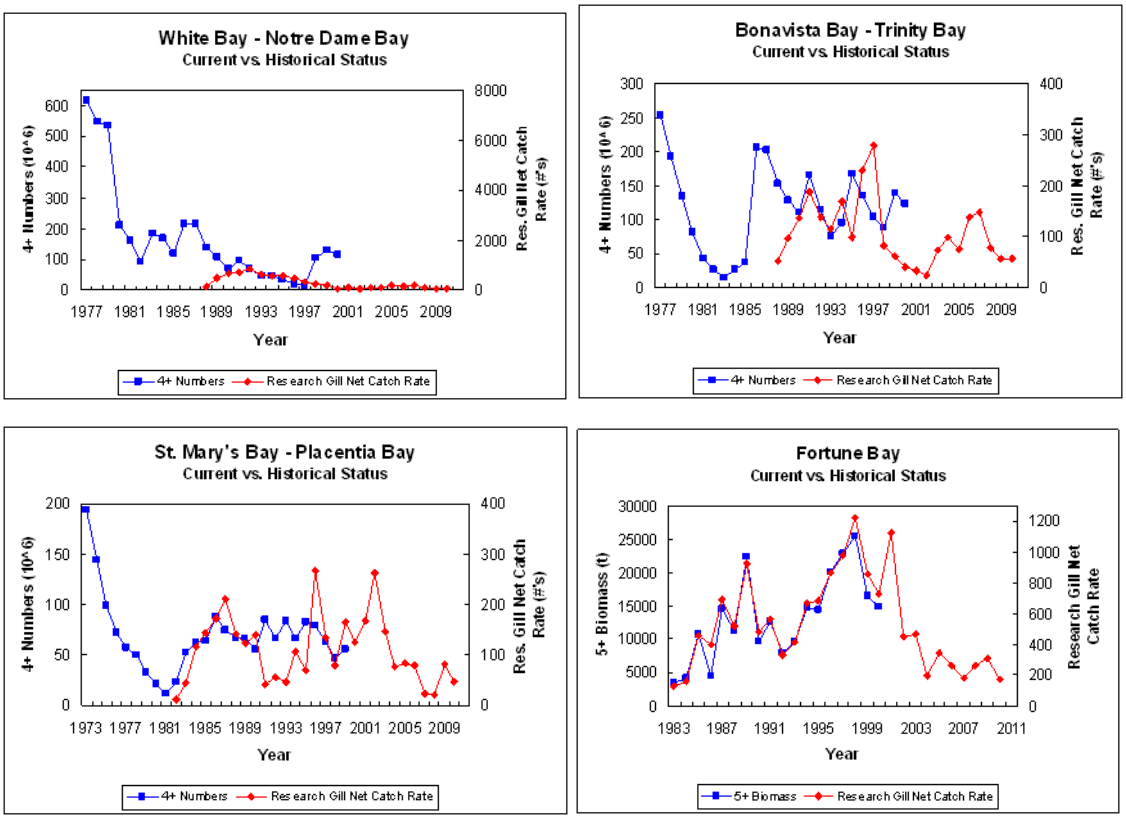


Figure 36. Comparison of research gill net catch rates and historical biomass estimates by stock area, 1997-2011.