



ASSESSMENT OF NEWFOUNDLAND EAST AND SOUTH COAST HERRING STOCKS TO SPRING OF 2011

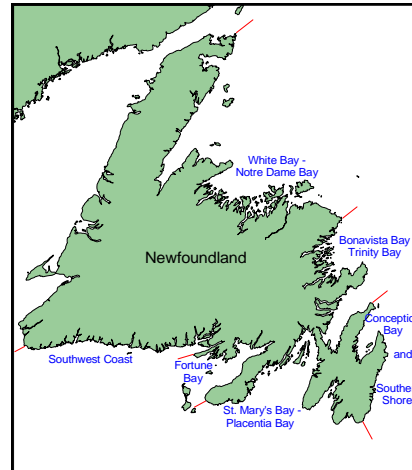
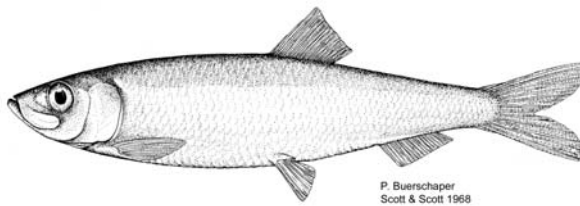


Figure 1: Area map indicating herring stock complexes within the Newfoundland and Labrador Region.

Context :

This Science Advisory Report is from the Fisheries and Oceans Canada, Canadian Science Advisory Secretariat, Regional Advisory Process meeting on November 30 and December 1, 2011 on the assessment of east and south coast herring stocks in Newfoundland. Participants included DFO scientists and technicians, fisheries managers, representatives from the Fish Food and Allied Workers Union, the provincial government and the commercial fishery.

There are five herring stocks distributed along the east and south coasts of Newfoundland: White Bay-Notre Dame Bay, Bonavista Bay-Trinity Bay, Conception Bay - Southern Shore, St. Mary's Bay-Placentia Bay, and Fortune Bay. In addition, herring occur along the southwest coast; the affinities of these herring are uncertain. Fishing seasons are dependant on area and gear, with total annual landings in the past five years (to 2010) averaging 6750 t. Principal gears used in the fishery include: purse seines, tuck seines, bar seines, traps, and gill nets. TAC management was established in 1977. The 2010 Integrated Management Plan for Herring on the East and South Coasts of Newfoundland (DFO 2010) established annual TAC's by stock area and gear sector for 2010 and 2011.

Stock assessments typically are conducted bi-annually in support of the bi-annual integrated fishery management plan. Since 2002, performance reports, including evaluation of abundance indices and biological characteristics, have been used to assess the current status and future prospects of four herring stocks (White Bay – Notre Dame Bay, Bonavista Bay – Trinity Bay, St. Mary's Bay – Placentia Bay, and Fortune Bay). These stocks were last assessed during the 2009 framework meeting.

Additional publications from this process will be posted as they become available on the DFO Science Advisory Schedule at <http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm>.

SUMMARY

White Bay-Notre Dame Bay

- Reported landings increased from 425 t in 2009 to 524 t in 2010; 20% of the TAC was taken in 2010. An estimated 115 t were caught in the bait fishery in 2010. Purse seine fishers reported no dead discards (bait and purse seine discard estimates based on annual phone surveys).
- A standardized performance index indicates that stock status improved from 2002 to 2008 but deteriorated from 2009 to 2011; stock abundance remains at a low level compared to historical estimates in the 1970's.
- The percentage of autumn spawners has increased significantly over the past decade; recruitment of the 2006 year class of autumn spawners is well above average.
- Short term prospects are uncertain; the recruiting 2006 year class is average and most mature year classes are above average compared to year classes produced since 1982. However, all year classes since 1982 are weak compared to historical levels.
- The status of this stock has deteriorated since the 2009 assessment.

Bonavista Bay-Trinity Bay

- Reported landings decreased from 3183 t in 2009 to 2131 t in 2010; 43% of the TAC was taken in 2010. An estimated 437 t were caught in the bait fishery in 2010. No dead discards were reported by purse seine fishers.
- A standardized performance index indicates that stock status improved from 2002 to 2007, deteriorated from 2008 to 2010, and improved slightly in 2011; stock abundance remains at a low level compared to historical estimates in the 1970's.
- The percentage of autumn spawners has increased significantly over the past decade; all 7 mature autumn spawner year classes are well above average.
- Short term prospects are uncertain; the recruiting 2006 year class and all mature year classes are at or above average, compared to year classes produced since 1982. However, all year classes since 1982 are weak compared to historical levels.
- The status of this stock has deteriorated since the 2009 assessment.

St. Mary's Bay-Placentia Bay

- Reported landings decreased from 1407 t in 2009 to 1006 t in 2010; 45% of the TAC was taken in 2010. An estimated 197 t were caught in the bait fishery in 2010. Discards from the purse seine fishery were estimated to be 0.2 t.
- A standardized performance index indicates that stock status deteriorated from 2001 to 2004, remained stable from 2005 to 2010, and increased slightly in 2011; stock abundance remains at a low level compared to historical estimates in the 1970's.
- The percentage of autumn spawners has increased over the past decade, with most mature autumn spawner year classes at or above the average in 2010.
- Short term prospects are uncertain; the recruiting 2006 year class is above average, and 3 of 7 mature year classes are also above average, but all are weak compared to historical levels.

- The status of this stock has improved since the last assessment in 2009.

Fortune Bay

- Reported landings increased from 2361 t in 2009 to 2624 t in 2010; 91% of the TAC was taken in 2010. An estimated 323 t were caught in the bait fishery in 2010.
- A standardized performance index indicates that stock status deteriorated from 2001 to 2004, increased slightly in 2005, declined in 2006 and remained stable to 2010, then decreased in 2011; stock abundance is lower than peak estimates in the late 1990's.
- Spring spawners remain dominant in Fortune Bay, but 5 of 7 spring year classes were below average in 2010.
- Short term prospects are negative; the 2006 year class is below average and most mature year classes are below average.
- The status of this stock has deteriorated since the last assessment in 2009.

BACKGROUND

Species Biology

Herring (*Clupea harengus*) are distributed in the northwest Atlantic from Cape Hatteras to southern Labrador. They are a schooling species that undertake extensive seasonal migrations in coastal waters. Historically, stocks within the Newfoundland and Labrador region have been characterized by the predominance of spring-spawning herring; however, in recent years, autumn spawning herring have formed an increasing component of the catch, particularly in White Bay-Notre Dame Bay and Bonavista Bay – Trinity Bay. The reason for this shift is not clear and requires further investigation.

Growth rates declined through the 1990's and have remained below average in all areas. Length at 50% maturity was variable but relatively stable for the 1965-89 year classes. However, there was a downward trend from 1990 to 1996. The length at 50% maturity of the 1996 year class (230 mm) was approximately 15% lower than that of the 1988 year class (272 mm). Length at 50% maturity showed an upward trend for year classes to 2002 but was still below average. Age at 50% maturity was also variable but relatively stable for the 1963-92 year classes. There was a downward trend from 1994 to 1998. The age at 50% maturity of the 1998 year class (2.45 years) was approximately 32% lower than that of the 1992 year class (3.60 years). The age at 50% maturity of the 2002 year class increased but was still below average (Wheeler et al. 2009). This analysis has not been updated using the most recent data, however weight and length at age data suggest that there has been no significant changes in the population.

Herring within the Newfoundland region are at the northern extent of their geographic range. Ideal conditions seldom exist and consequently strong recruitment is very sporadic. Winters and Wheeler (1987) reported that good survival of young spring spawning herring (i.e. recruitment) was largely influenced by suitable environmental conditions, principally warm over-wintering water temperatures and high salinities prior to spawning.

Large year classes of herring produced in 1968 and 1969 supported most of the stocks through the 1970's. The moderately large 1982 year class allowed stocks to rebuild in the 1980's. Since then, the 1987 and 1996 year classes have been of moderate strength, but in some areas

only. The 2002 year class currently dominates in most areas. However, year classes produced during the 1990's and 2000's are weak in relation to the large year classes of the 1960's. The 2006 year class, estimated from research gill net catch rates in 2010 only, is average or above average for both spawning types (spring and autumn spawners) in all areas except Fortune Bay, where it is below average for both spawning types. There are no estimates of recruitment beyond the 2006 year class.

Methodology to Describe Stock Status

Of the five herring stocks in the coastal waters of east and south Newfoundland, 4 were assessed to the fall of 2011; these were White Bay – Notre Dame Bay, Bonavista Bay – Trinity Bay, St. Mary's Bay – Placentia Bay, and Fortune Bay. Scientific data were insufficient to assess the Conception Bay–Southern Shore stock.

For each assessed stock area, the following abundance indices were evaluated: research gill net catch rates, commercial gill net catch rates, gill net fisher observations from logbooks, gill net fisher observations from telephone surveys, and purse seine fisher observations from telephone surveys (with the exception of Fortune Bay, where there is no purse seine fishery).

The spring research gill net program, initiated in 1982, provides standardized age disaggregated abundance indices independent of the commercial fishery and is the longest running herring research program. Each year, commercial fishers are contracted to provide catch rate data and biological samples of their catch. In 2011, 27 fishers participated in the program. Data are available from 1988 to 2011 for White Bay–Notre Dame Bay and Bonavista Bay–Trinity Bay and from 1982 to 2011 for St. Mary's Bay–Placentia Bay and Fortune Bay. Catch rates at age for spring and autumn spawning herring (numbers per nights fished) are available up to and including 2010. Catch rates only (for all ages and both spawning types combined) are available for 2011, as biological samples have not yet been processed.

The commercial gill net logbook program, initiated in 1996, provides a time series of standardized catch per unit effort data from the commercial gill net and bait fisheries. Each year, logbooks are sent to approximately 2200 licensed fishers and/or bait permit holders in the Newfoundland and Labrador region. The return of logbooks is voluntary and the numbers returned are generally very low. In 2011, 27 logbooks were returned (to November) and 5 of those could not be used in catch rate analysis due to data issues.

In addition to recording their catch, fishers who complete and return commercial gill net and research gill net logbooks are asked to provide their observations of herring abundance in the current year versus the previous, based on a scale of 1 to 10, with 1 being the lowest, 5½ being average, and 10 being the highest. A cumulative index is calculated for each stock area to compare current year observations of abundance with previous years. This index is based upon observations during the spring, as very few autumn logbooks are returned.

The gill net telephone survey, initiated in 2006, provides a cumulative index of abundance from a larger sample of fishers than the gill net logbooks. There was no phone survey in 2010 due to budgetary constraints. In 2011, 113 active fishers were contacted. In assessing observations of abundance, it is assumed that observations of all active fishers are equal, regardless of their level of effort. This index is based primarily upon observations during the spring and summer. Catch data from this survey have been used to estimate bait landings, which have not been reported as landings since 1995. Bait landings were estimated directly from the phone survey from 2007-2011 (excluding 2010), and in conjunction with lobster fishery data for 1996-2006, and 2010.

The purse seine fishery questionnaire, initiated in 1996, provides a qualitative evaluation of biological and fishery related information from herring purse seine fishers. Each year, attempts are made to contact all active fishers by phone after the purse seine fishery. Response rates are high for most areas and years; in 2011, 27 of 31 active fishers responded. Purse seine fishers are asked to provide their observations of herring abundance, on a ten point scale, similar to gill net fishers. Fishers are also asked to estimate discards and their percent survival; this is the only source of discard data for the fishery. Observations are available during the autumn to 2010 for White Bay–Notre Dame Bay and Bonavista Bay–Trinity Bay and during the winter/spring to 2010 for St. Mary's Bay–Placentia Bay. There is no purse seine fishery in Fortune Bay, and there was no winter/spring purse seine fishery in St. Mary's Bay-Placentia Bay in 2011 due to a low presence of herring in the area at that time.

Biological characteristics, including age compositions and year class sizes, were evaluated. Age compositions from research gill nets are considered to best represent population age structure and were available for each area to 2010. Estimates of relative year class size were derived from mean research gill net catch rates at ages 4, 5 and 6 for spring and for autumn spawners separately and combined. For each area, there are 7 mature year classes (1999-2005) that can be estimated. These year classes produced the 2010 population numbers at ages 4-10. The 2006 year class (at age 4 in 2010) is the most recent recruiting year class that can be estimated and was evaluated in each area by combining spring and autumn spawners, as well as separately.

No quantitative analysis of the stocks was undertaken during the 2011 assessment as previous attempts using the adaptive (ADAPT) framework (Gavaris 1988) and preliminary survey-based analysis (SURBA) (Cook 1997) were not successful (Wheeler et al. 2010). Other analyses will be investigated using R statistical software – specifically packages from FLR, including FLICA. However, given the limited data it is not known whether suitable analytical assessment methods can be applied to these stocks.

For each stock area, current stock status and future prospects were summarized in a performance report. Observations on abundance indices, and biological characteristics, were interpreted and then evaluated using the traffic light method (Caddy 1998). This method uses a system of red (-), yellow (?), and green (+) lights to categorize indicators as 'cause for concern', 'uncertain', or 'positive'. In this assessment, 'uncertain' was defined as 'uncertainty of an interpretation', rather than precautionary uncertainty.

To evaluate current vs. historical status, research gill net catch rates were compared to historical population estimates (Wheeler et al. 2001). Current vs. recent status, trends in stock status were examined based upon a standardized evaluation of all abundance indices and age composition data (range of mature age groups). Short term prospects were described by evaluating the strength of the mature year classes and of the 2006 recruiting year class.

Research Gill Net Program

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, although it would not make the program any more efficient to run and may discourage fisher participation.

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 uncertainty 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.

Fishery

TAC's for the 2010 fishery increased from 2009 in WB-NDB and BB-TB, but remained the same for SMB-PB and FB as the fishery was regulated by a two year (2010 and 2011) integrated management plan formulated by Fisheries and Aquaculture Management Branch.

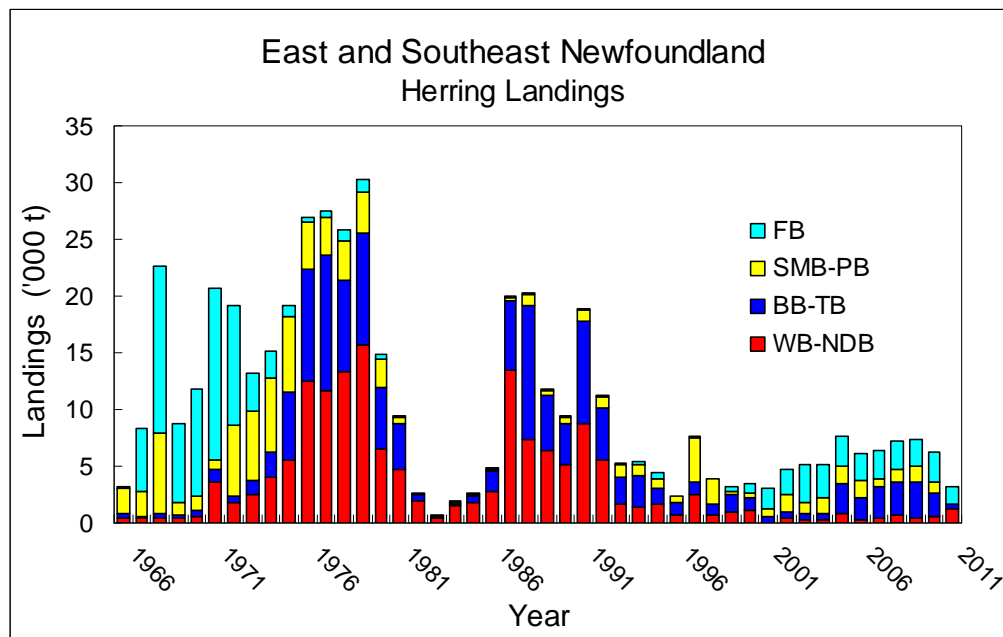


Figure 2. Total reported herring landings by stock area, 1966–2011 (2011 reported landings to November 17).

Total landings decreased from 7405 t in 2009 to 6285 t in 2010 (Fig. 2). The 6285 t represented approximately 47% of the overall TAC. For 2011, landings data are preliminary and, at the time of the assessment, were available to mid-November.

Reported landings are those recorded by Policy and Economics Branch; these do not include estimates of dead discards, and since 1996 have not included bait landings. To compensate for this, estimates of bait landings from the annual phone survey, and purse seine discards from the purse seine questionnaire, were included in total landings for the calculation of catch at age matrices in each stock area.

In White Bay–Notre Dame Bay, reported landings increased from 425 t in 2009 to 524 t in 2010; 19% of the TAC was taken in 2010. The 2005 year class accounted for 17% of commercial

catch numbers, followed by the 2000 and 2002 year classes at 13% and 14% respectively. Autumn spawners accounted for 77% of catch numbers, an increase of 26% from 2009 (Fig. 3).

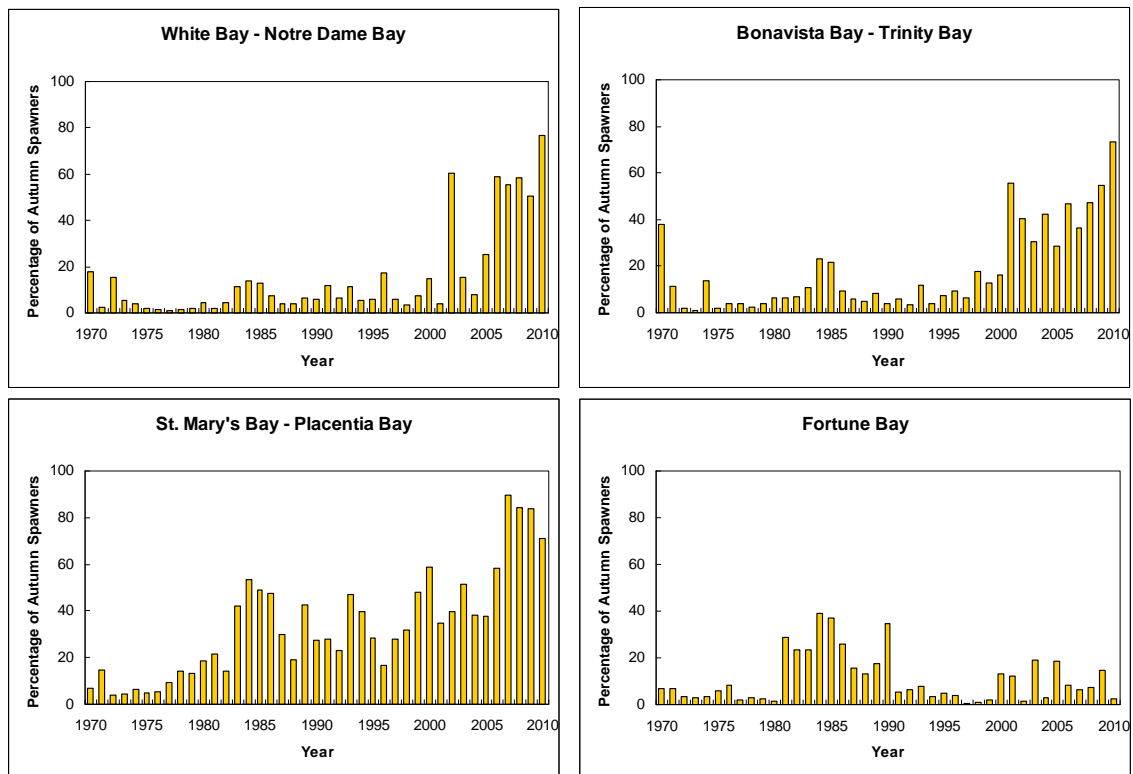


Figure 3. Percentage of autumn spawners in commercial landings, by stock area, 1970 – 2010.

In Bonavista Bay–Trinity Bay, reported landings decreased from 3183 t in 2009 to 2131 t in 2010; 43% of the TAC was taken in 2010. Each of the 2000 and 2005 year classes accounted for 20% of the catch numbers. Autumn spawners accounted for 73% of catch numbers, an increase of 19% from 2009 (Fig. 3).

In St. Mary's Bay–Placentia Bay, reported landings decreased from 1407 t in 2009 to 1006 t in 2010; 45% of the TAC was taken in 2010. Fish aged 11+ accounted for 22% of catch numbers. Each of the 2000, 2001 and 2002 year classes accounted for 18% of the catch numbers. Autumn spawners accounted for 71% of catch numbers, a decrease of 12% from 2009 (Fig. 3).

In Fortune Bay, reported landings increased from 2361 t in 2009 to 2624 t in 2010; 91% of the TAC was taken in 2010. The 2002 year class accounted for 48% of catch numbers, followed by 11+ year old fish at 45%. Spring spawners accounted for 98% of catch numbers, an increase of 12% from 2009 (Fig. 3).

ASSESSMENT

White Bay-Notre Dame Bay

Abundance Indices

Research gill net catch rates (fish per days fished) of spring and autumn spawners combined decreased from 114 in 2010 to 30 in 2011, the lowest in the time series at 9% of the long term

mean (Fig. 4, top left). Catch rates of autumn spawners declined from 2009 to 2010, while catch rates of spring spawners in 2009 and 2010 were at the lowest levels in the time series (Fig. 4, top right).

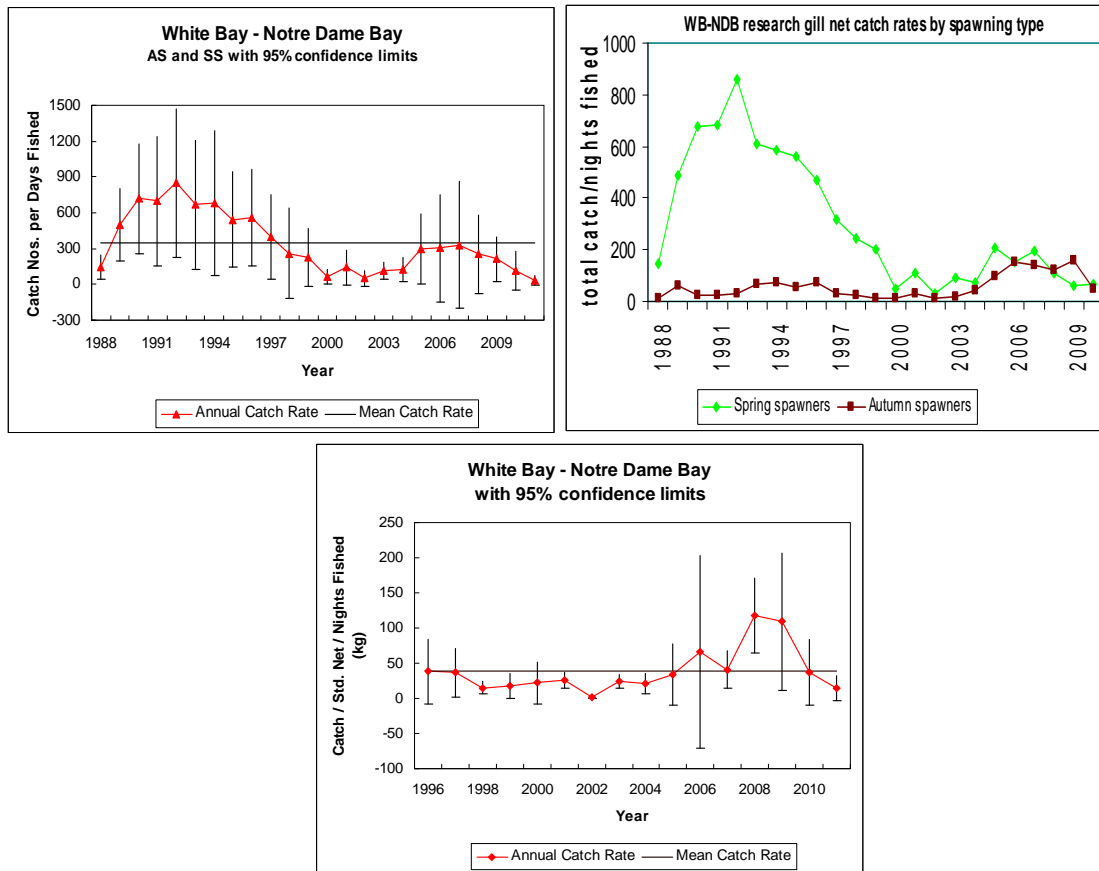


Figure 4. White Bay-Notre Dame Bay abundance indices (catch rates): top left - research gill net catch rates for spring and autumn spawners combined (1988-2011), top right – spring and autumn spawners separate (1988-2010, 2011 samples have not been collected/processed); bottom - commercial gill net logbook catch rates (1996–2011); long term means based on entire time series.

Four commercial gill net logbooks were returned in 2011, the fewest returns of the 16 year series, which averaged 10 logbooks per year. Catch rates (kilograms per standard net per nights fished) decreased from 36.5 in 2010 to 15.1 in 2011 (Fig. 4, bottom). The 2011 catch rate was below average, at 38% of the long term mean (1996-2011).

Fishers who completed commercial and research gill net logbooks indicated an increasing trend in abundance from 2002 to 2009, but decreasing in 2010 and 2011. There were 19 active fixed gear fishers contacted in the 2011 telephone survey. The telephone survey of fixed gear fishers indicated an increasing trend in abundance from 2006 to 2009 and a decrease in 2011 (Fig. 5, left).

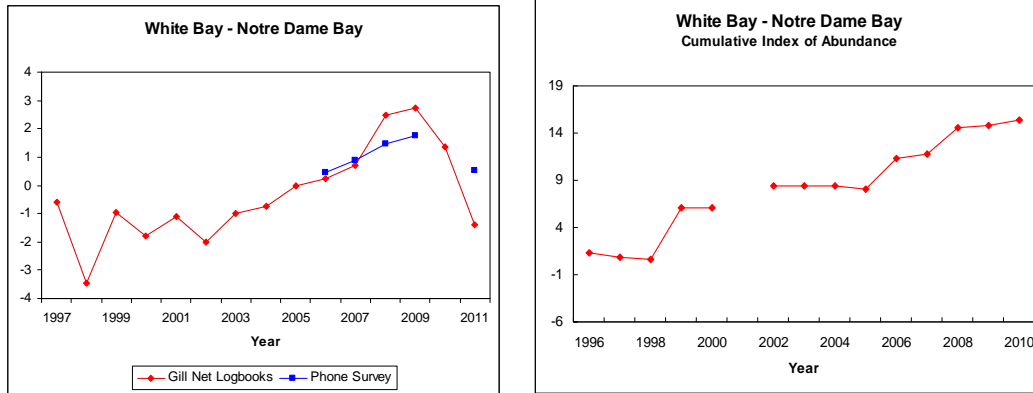


Figure 5. White Bay-Notre Dame Bay abundance indices (cumulative perceptions of abundance): left - gill net fisher abundance estimates (logbooks 1997–2011, telephone survey 2006–11, excluding 2010), right - purse seine fisher abundance estimates on a cumulative index (1996–2010).

Five of 6 active purse seine fishers in White Bay-Notre Dame Bay responded to the purse seine questionnaire in 2011. Abundance has been increasing since 2005 based on the purse seine fisher cumulative abundance index (Fig. 5, right).

Biological Characteristics

The 2002 year class accounted for 23% of the 2010 research gill net catch numbers (Fig. 6). The age distribution was extensive, as 7 year classes each accounted for greater than 5% of the catch. Autumn spawners comprised 41% of the catch, a decrease of 32% from 2009.

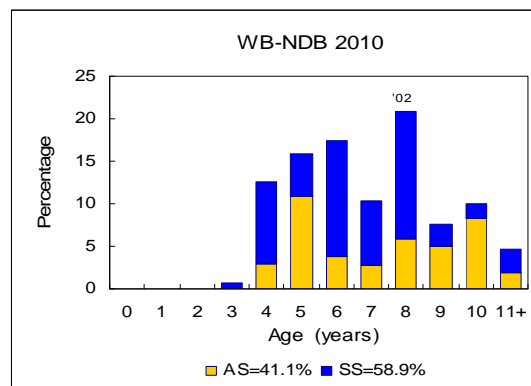


Figure 6. White Bay–Notre Dame Bay research gill net age composition by spawning type.

In comparison to year classes since 1982, 4 of 7 mature year classes (1999 to 2005) in 2010 were above average for spring and autumn spawners combined (Fig.7, bottom), however 6 of 7 autumn spawning year classes were above average versus only 2 spring spawning year classes (Fig. 7, top panels). The 2006 recruiting year class, based upon 2010 catch rates only, was average for spring spawners (2.87 (ln mean catch rate age 4) vs. a long term average of 2.98) and well above average for autumn spawners (2.08 vs. a long term average of 0.84). All year classes in this time series were weak in relation to the strong year classes of the late 1960’s (Wheeler et al. 2001).

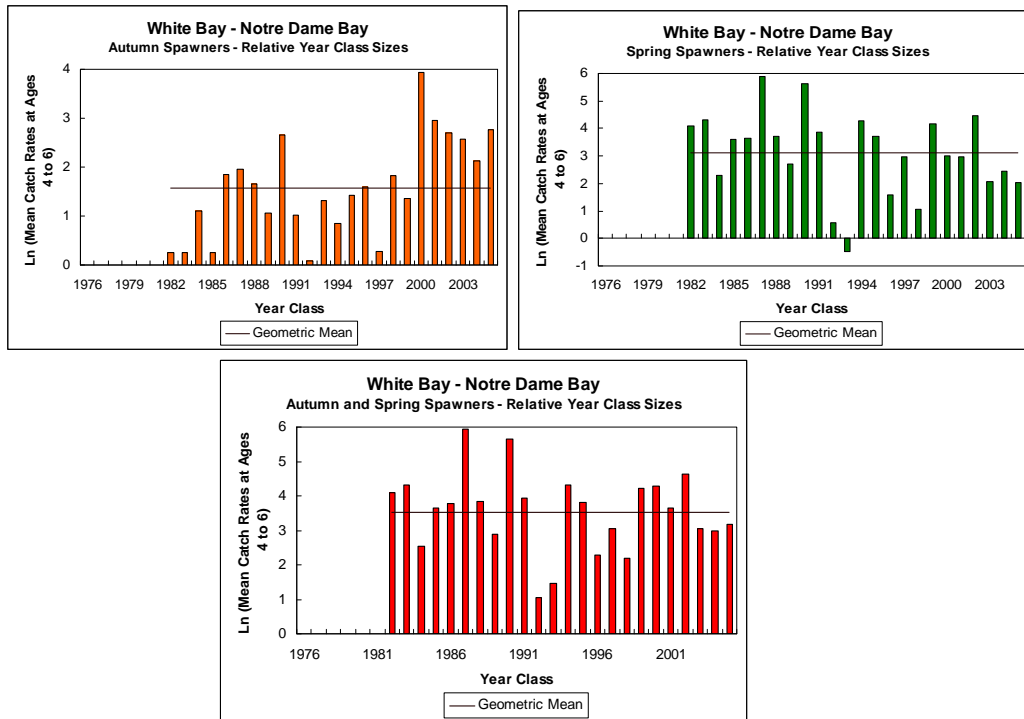


Figure 7. White Bay–Notre Dame Bay relative year class sizes (1982–2005) from research gill net catch rates at ages 4 to 6 for autumn spawners (top left) spring spawners (top right), and both spawning types combined (bottom); geometric mean from 1982 to 2005.

Current Status and Short Term Prospects

A standardized performance index is available for 1997 to 2011 (Fig. 8. left). This composite index indicates that stock status improved between 2002 and 2008, and deteriorated from 2009 onward.

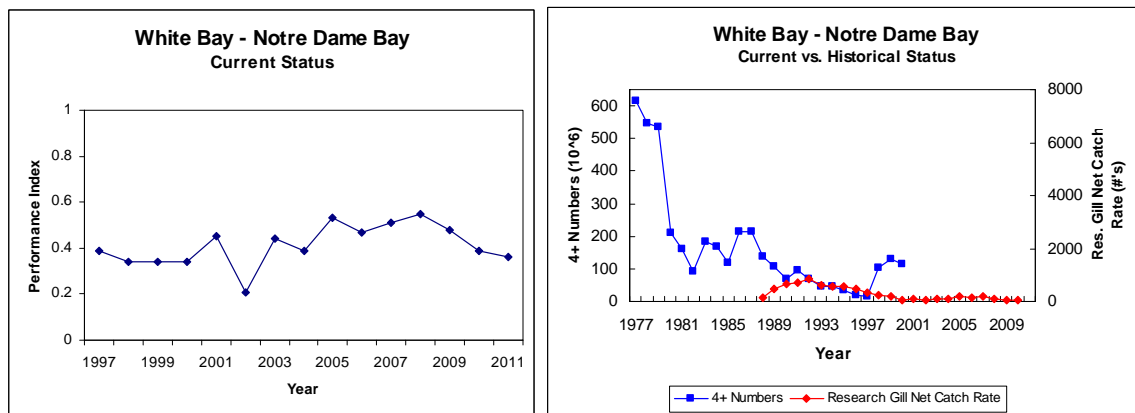


Figure 8. White Bay-Notre Dame Bay performance index for 1997 to 2011 (left) and comparison of research gill net catch rates and historical population estimates (right).

Short term prospects are uncertain; recruitment of the 2006 year class is average for spring spawners and well above average for autumn spawners and most mature year classes are above average for autumn spawners compared to year classes produced since 1982 (Fig. 7, top panels). However, all year classes since 1982 are weak compared to historical levels (Fig 8, right).

Assessment results are summarized in the following performance table (Table 1).

Table 1. 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.

Bonavista Bay-Trinity Bay

Abundance Indices

Research gill net catch rates (fish per days fished) of spring and autumn spawners combined showed little change from 2010 to 2011 (Fig. 9, top left). Catch rates of spring and autumn spawners remained stable from 2009 to 2010 (Fig. 9, top right).

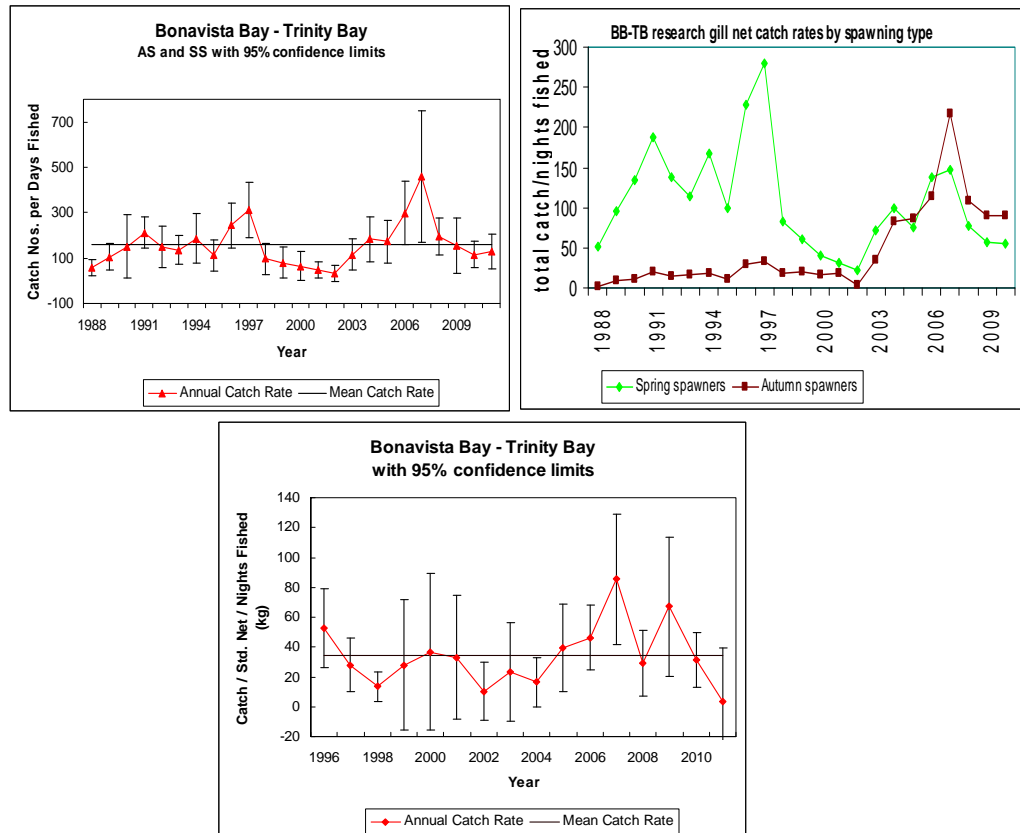


Figure 9. Bonavista Bay – Trinity Bay abundance indices (catch rates): top left - research gill net catch rates for spring and autumn spawners combined (1988-2011), top right – spring and autumn spawners separate (1988-2010, 2011 samples have not been collected/processed); bottom - commercial gill net logbook catch rates (1996–2011), long term means based on entire time series.

Two commercial gill net logbooks were returned in 2011, the lowest return rate for the 16 year time series, where an average of 8 logbooks were returned per year. Catch rates (kilograms per standard net per nights fished) decreased from 31.4 in 2010 to 3.4 in 2011 (Fig. 9, bottom). The 2011 catch rate was below average, at 10% of the long term mean (1996-2011).

Fishers who completed commercial and research gill net logbooks indicated an increasing trend in abundance from 2002 to 2007, a declining trend from 2007 to 2010 and a noticeable decrease in 2011. There were 35 active fixed gear fishers contacted in the 2011 telephone survey. They indicated an increasing trend in abundance from 2006 to 2008, but decreasing since (Fig. 10, left).

Seventeen of 19 active fishers responded to the purse seine questionnaire in 2011. The purse seine cumulative abundance index indicated that abundance increased from 2003 to 2009, but decreased in 2010 (Fig. 10, right).

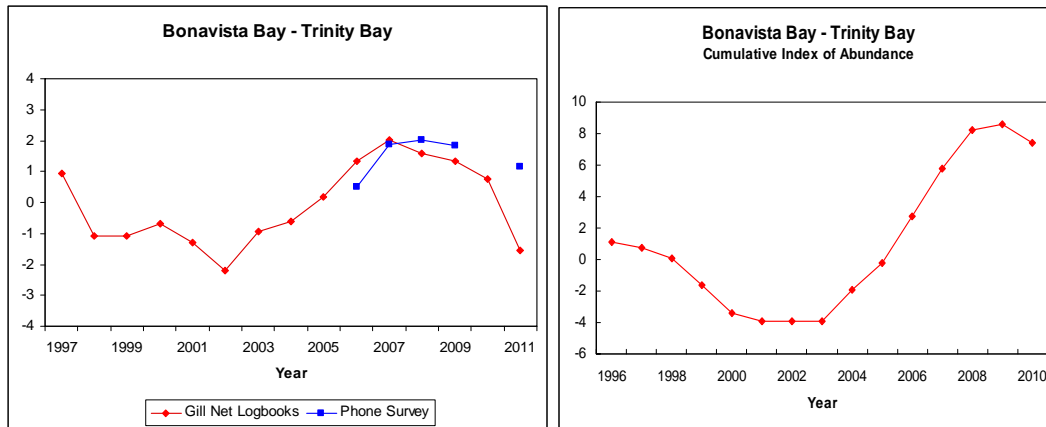


Figure 10. Bonavista Bay - Trinity Bay abundance indices (cumulative perceptions of abundance): left - gill net fisher abundance estimates (logbooks 1997–2011, telephone survey 2006–11, excluding 2010), and right - purse seine fisher abundance estimates on a cumulative index (1996–2010).

Biological Characteristics

The 2002 year class accounted for 19% of the 2010 research gill net catch numbers, followed by the 2000 and 2003 year classes with 15% each (Fig. 11). The age distribution was extensive, as 7 year classes (including fish age 11+) each accounted for greater than 5% of the catch. Autumn spawners were 52% of the catch, a decrease of 8% from 2009.

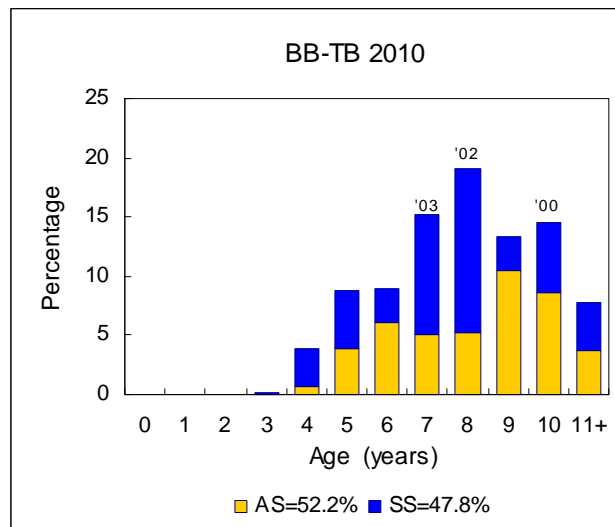


Figure 11. Bonavista Bay-Trinity Bay research gill net age composition, by spawning type.

In comparison to year classes since 1982, all 7 mature year classes (1999 to 2005) in 2010 were near or above average for spring and autumn spawners combined (Fig.12, bottom), and the autumn spawning year classes were all well above average, compared to the spring where 2 were well above average and 4 were at or just below average (Fig. 12, top panels). The 2006 recruiting year class, based upon 2010 catch rates only, was average for both spawning components (2.08 (In mean catch rate age 4) for spring spawners vs. a long term average of 2.06, and 0.88 for fall spawners vs. a long term average of 0.62). All year classes in this time series were weak in relation to the strong year classes of the late 1960's (Wheeler et al. 2001).

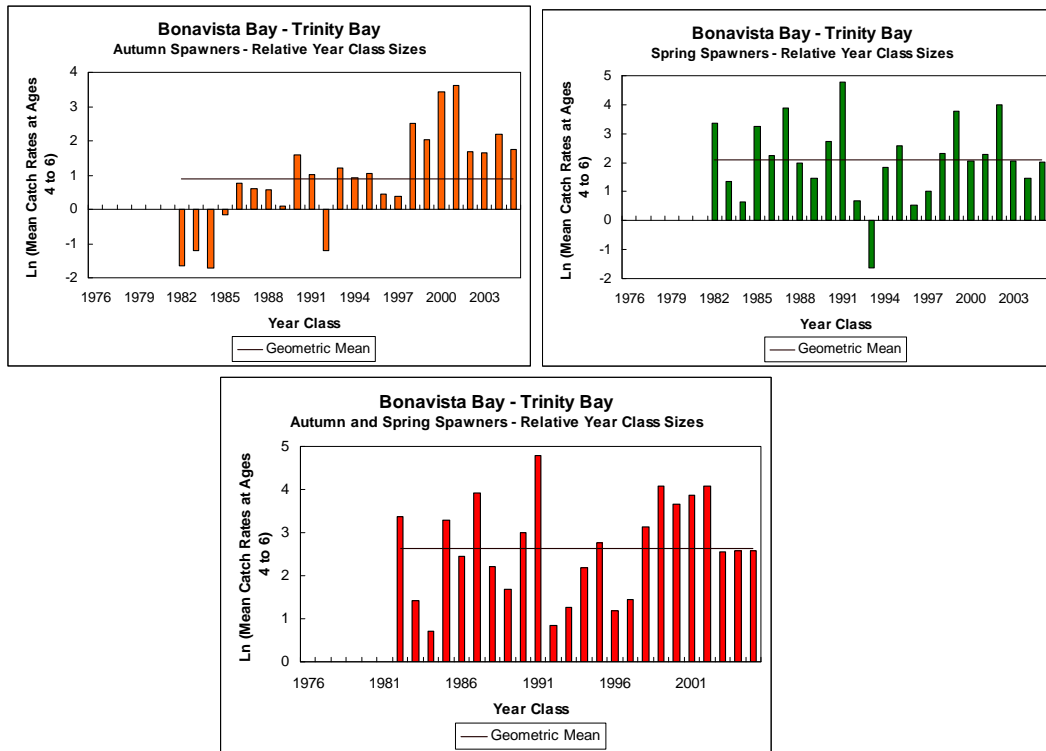


Figure 12. Bonavista Bay – Trinity Bay relative year class sizes (1982–2005) from research gill net catch rates at ages 4 to 6 for autumn spawners (top left) spring spawners (top right), and both spawning types combined (bottom); geometric mean for 1982 to 2005.

Current Status and Short Term Prospects

A standardized performance index is available for 1997 to 2011 (Fig.13, left). This composite index indicates that stock status improved between 2002 and 2007, but has since deteriorated with a slight improvement in 2011.

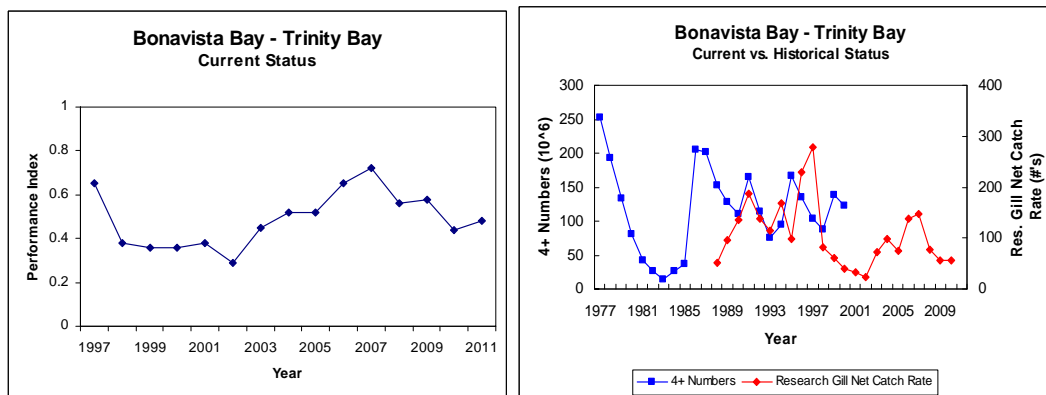


Figure 13. Bonavista Bay – Trinity Bay performance index for 1997 to 2011 (left) and comparison of research gill net catch rates and historical population estimates (right).

Short term prospects are uncertain; recruitment of the 2006 year class is average for both spawning components, and all mature year classes (spring and fall spawners combined) are above average (Fig. 12, bottom). However, all year classes since 1982 are weak compared to historical levels (Fig. 13, right).

Assessment results are summarized in the following performance table (Table 2).

Table 2. Bonavista Bay - Trinity Bay performance table to the spring of 2011

| <i>The Fishery</i> | <i>Observation</i> | |
|---|---|--|
| 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. | |
| <i>Abundance Indices</i> | <i>Observation</i> | <i>Interpretation</i> |
| 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. |
| <i>Biological Characteristics</i> | <i>Observation</i> | <i>Interpretation</i> |
| 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. |

| <i>Stock Status</i> | <i>Interpretation</i> | <i>Evaluation</i> | <i>Status Definitions</i> | |
|------------------------|--|-------------------|---------------------------|--|
| 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.

St. Mary's Bay-Placentia Bay

Abundance Indices

Research gill net catch rates (fish per days fished) of spring and autumn spawners combined decreased slightly from 2010 to 2011 (Fig. 14, top left). Catch rates of autumn spawners remained stable from 2007 to 2010, whereas catch rates of spring spawners declined in 2010 after a slight increase in 2009 (Fig. 14, top right).

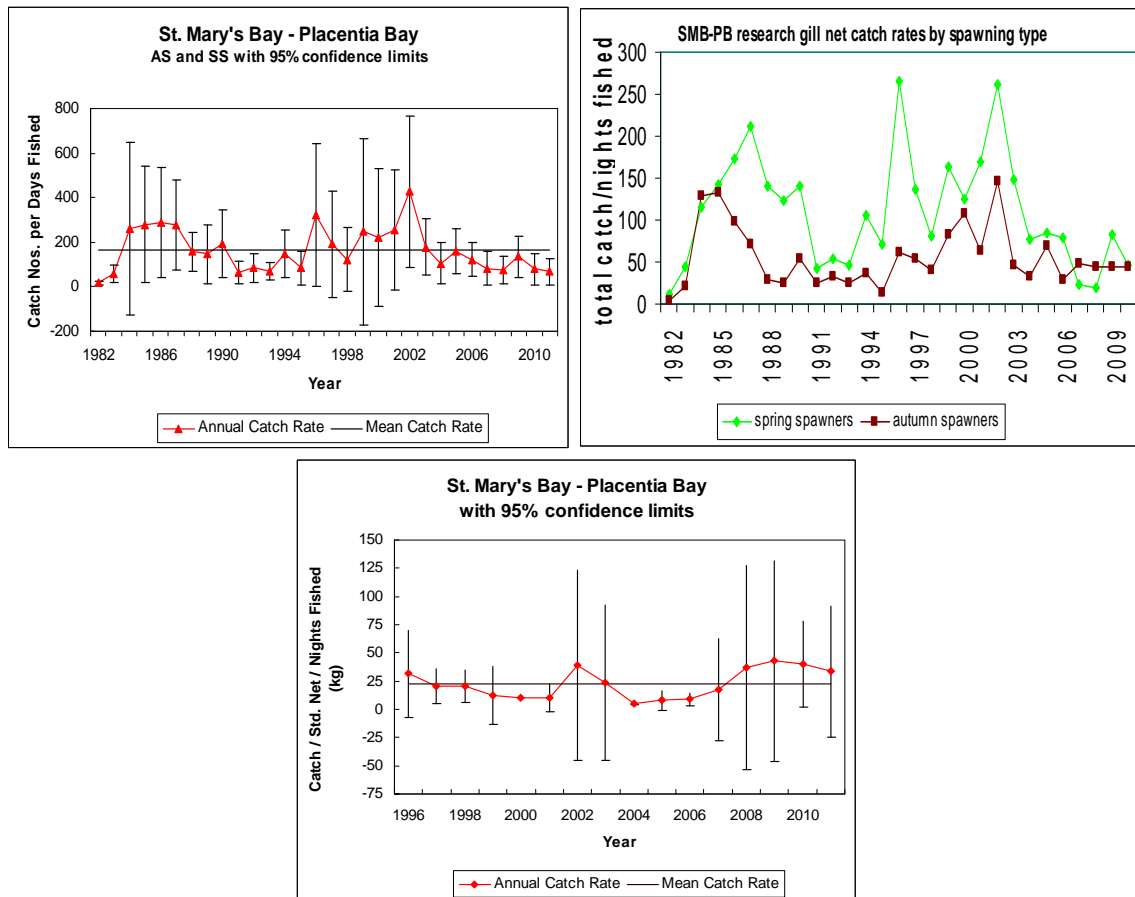


Figure 14. St. Mary's Bay – Placentia Bay abundance indices (catch rates): top left - research gill net catch rates for spring and autumn spawners combined (1982-2011), top right – spring and autumn spawners separate (1982-2010, 2011 samples have not been collected/processed); bottom - commercial gill net logbook catch rates (1996–2011); long term mean based on entire time series.

Five commercial gill net logbooks were returned in 2011, which is the average number of returns based on the 16 year time series. Catch rates (kilograms per standard net per nights fished) decreased slightly from 2010 to 2011, though the change was not significant (Fig. 14, bottom).

Fishers who completed commercial and research gill net logbooks indicated a decreasing trend in abundance since 2005. There were 16 active fixed gear fishers contacted in the 2011 telephone survey. They indicated an increasing trend in abundance from 2006 to 2009, then a decrease in 2011 (Fig. 15, left).

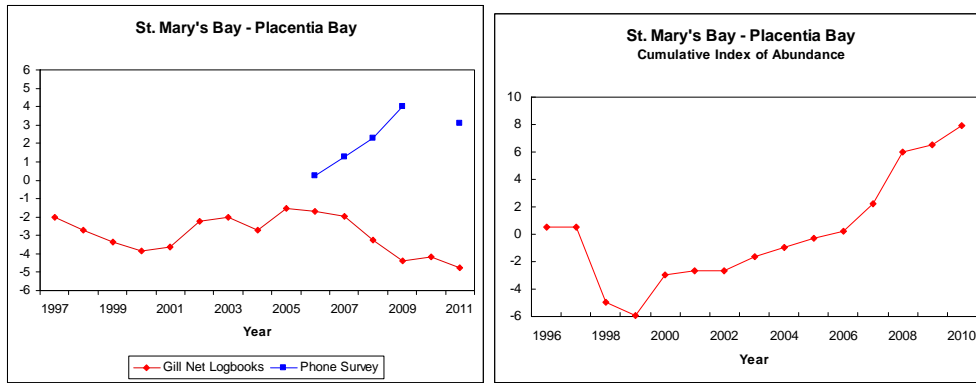


Figure 15. St. Mary's Bay – Placentia Bay abundance indices (cumulative perceptions of abundance): left - gill net fisher abundance estimates (logbooks 1997–2011, telephone survey 2006–11, excluding 2010), and right - purse seine fisher abundance estimates on a cumulative index (1996–2010).

Five of 6 active fishers responded to the purse seine questionnaire in 2011. They indicated an increasing trend in abundance since 1999 (Fig. 15, right).

Biological Characteristics

Each of the 2003 and 2006 year classes accounted for 20% of the 2010 research gill net catch numbers (Fig. 16). The age distribution was extensive, as 8 year classes each accounted for greater than 5% of the catch. Autumn spawners comprised 43% of the catch, an increase of 8% from 2009.

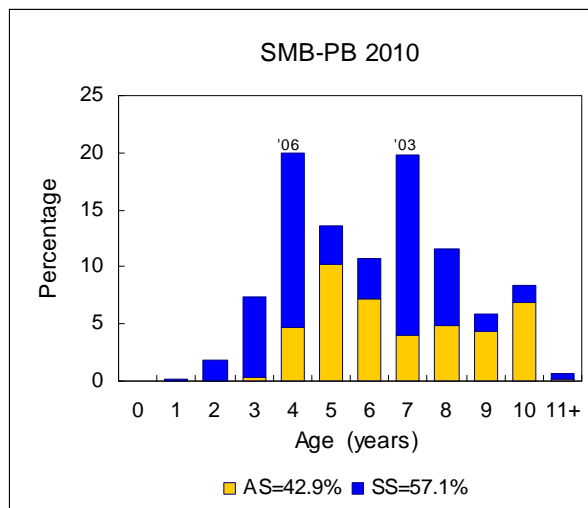


Figure 16. St. Mary's Bay - Placentia Bay research gill net age composition by spawning type.

In comparison to year classes since 1976, 3 of 7 current mature year classes (1999 to 2005) are above average for spring and autumn spawners combined (Fig. 17, bottom), and 5 of 7 are above average for the autumn spawning component (Fig. 17, top left). The 2006 recruiting year class, based upon 2010 catch rates only, is above average for both spawning components (2.47 (In mean catch rate age 4) for spring spawners vs. the long term average of 1.62; 3.29 for spring spawners vs. a long term average of 1.81). All year classes in this time series are weak in relation to the strong year classes of the late 1960's (Wheeler et al. 2001).

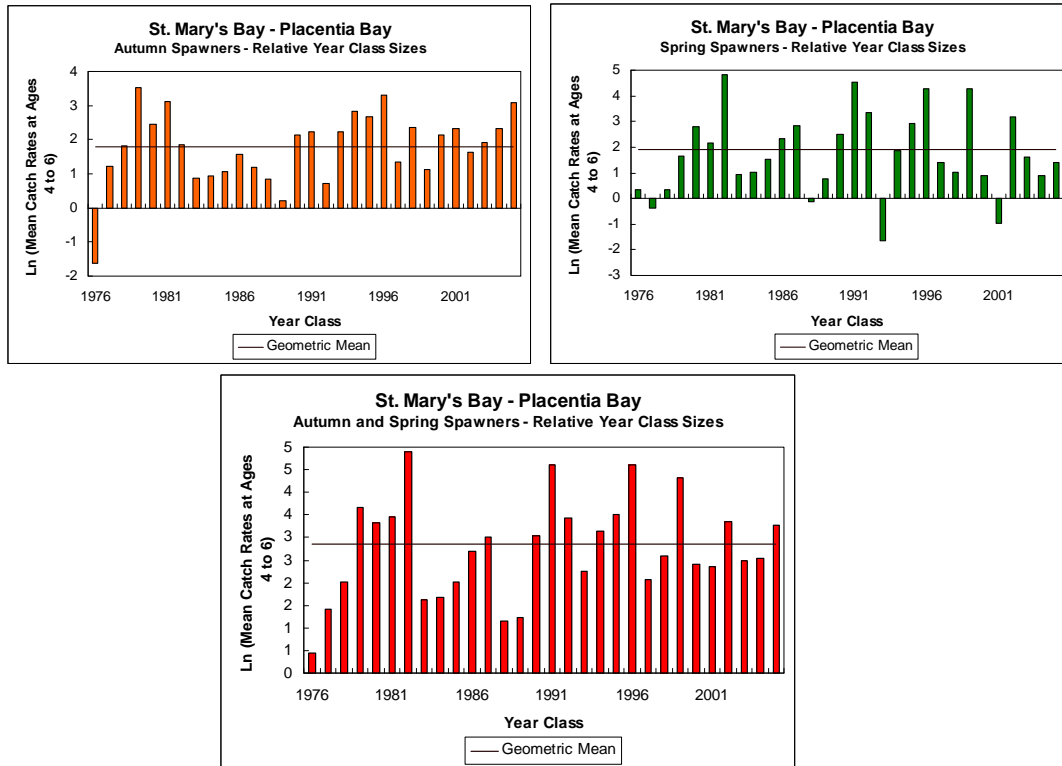


Figure 17. St. Mary's Bay – Placentia Bay relative year class sizes (1976–2005) from research gill net catch rates at ages 4 to 6 for autumn spawners (top left) spring spawners (top right) and both spawning types combined (bottom); geometric mean for 1976 to 2005.

Current Status and Short Term Prospects

A standardized performance index is available for 1997 to 2011 (Fig.18, left). This composite index indicates that stock status deteriorated from 2001 to 2004, remained stable to 2010, and increased slightly in 2011.

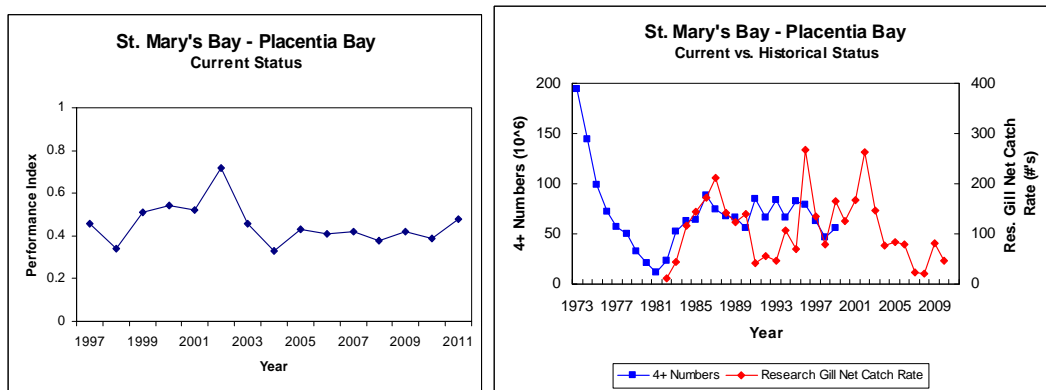


Figure 18. St. Mary's Bay – Placentia Bay performance index for 1997 to 2011 (left) and comparison of research gill net catch rates and historical population estimates (right).

Short term prospects are uncertain; recruitment of the 2006 year class is above average for both spawning components, but more than half of the mature year classes are below average (Fig. 17). All year classes since 1982 are weak compared to historical levels (Fig. 18, right).

Assessment results are summarized in the following performance table (Table 3).

Table 3. St. Mary's Bay-Placentia Bay performance table to the spring of 2011.

| <i>The Fishery</i> | <i>Observation</i> | |
|---|--|--|
| 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. | |
| <i>Abundance Indices</i> | <i>Observation</i> | <i>Interpretation</i> |
| 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. |
| <i>Biological Characteristics</i> | <i>Observation</i> | <i>Interpretation</i> |
| 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. |

| <i>Stock Status</i> | <i>Interpretation</i> | <i>Evaluation</i> | <i>Status Definitions</i> | |
|------------------------|---|-------------------|---------------------------|--|
| 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.

Fortune Bay

Abundance Indices

Research gill net catch rates (fish per days fished) of spring and autumn spawners combined decreased from 276 in 2010 to 63 in 2011, the second lowest since the series began in 1982 (Fig. 19, top left). Catch rates of both spring and autumn spawners remained stable from 2009 to 2010 (Fig. 19, top right).

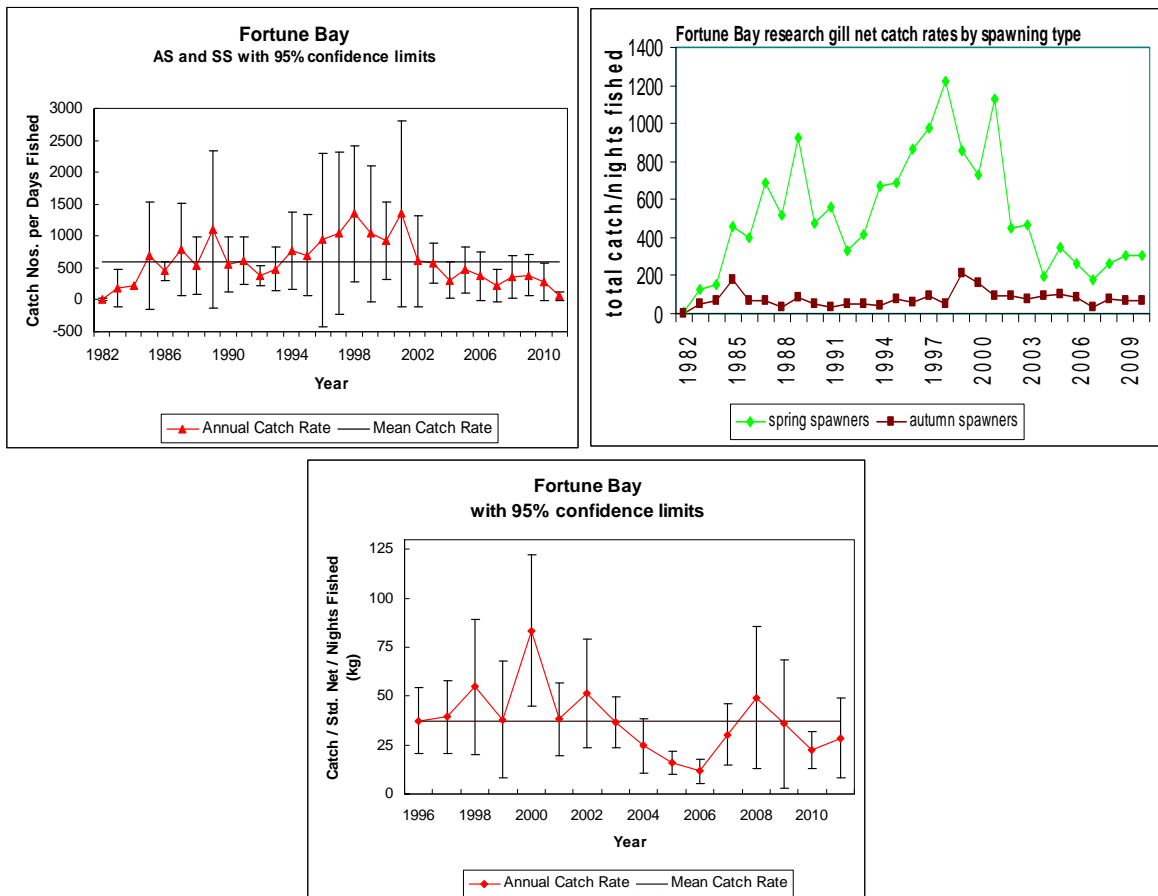


Figure 19. Fortune Bay abundance indices (catch rates): top left - research gill net catch rates for spring and autumn spawners combined (1982-2011), top right – spring and autumn spawners separate (1982-2010, 2011 samples have not been collected/processed); bottom - commercial gill net logbook catch rates (1996–2011), long term means from entire time series.

Ten commercial gill net logbooks were returned in 2011, which is the average number returned for the time series. Catch rates (kilograms per standard net per nights fished) increased from 2010 to 2011, but not significantly (Fig. 19, bottom). The 2011 catch rate was below average, at 76% of the long-term mean (1996-2011).

Gill net fishers who completed logbooks indicated a decreasing trend in abundance since 1999. There were 43 active fixed gear fishers contacted in the 2011 telephone survey. The cumulative perception of abundance from the telephone survey has been decreasing since the survey began in 2006 (Fig. 20).

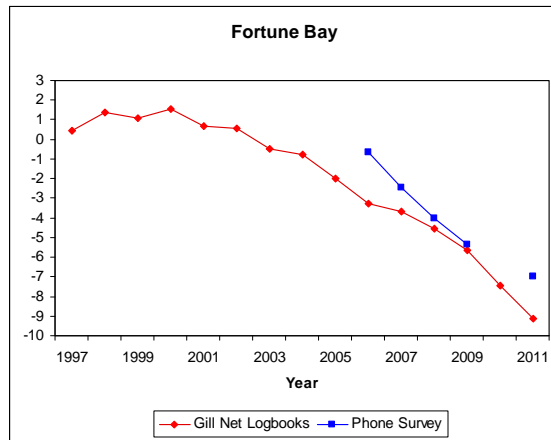


Figure 20. Fortune Bay abundance indices (cumulative perceptions of abundance): gill net fisher abundance estimates (logbooks 1997–2011, telephone survey 2006–11, excluding 2010).

Biological Characteristics

The 2002 year class accounted for 27% of the 2010 research gill net catch numbers (Fig. 21). The age distribution was extensive, as 7 year classes (including fish age 11+) each accounted for greater than 5% of the catch. Autumn spawners were 37% of the catch, an increase of 20% from 2009.

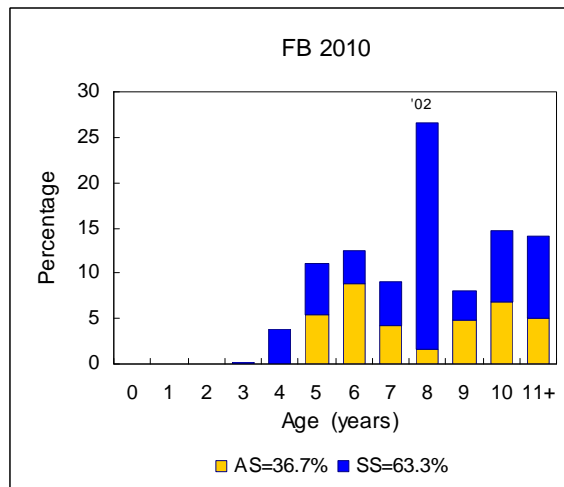


Figure 21. Fortune Bay research gill net age composition by spawning type.

In comparison to year classes since 1976, 2 of 7 current mature year classes (1999 to 2005) are at or above average for spring and autumn spawners combined (Fig. 22, bottom), and 5 of 7 are above average for the autumn spawning component (Fig. 22, top panels). The 2006 recruiting year class, based upon 2010 catch rates only, is average for the spring spawning component (1.95 (In mean catch rate of age 4) vs. a long term mean of 1.87), but no 2006 year class fall spawners were observed. All year classes in this time series are weak in relation to the strong year classes of the late 1960’s (Wheeler et al. 2001).

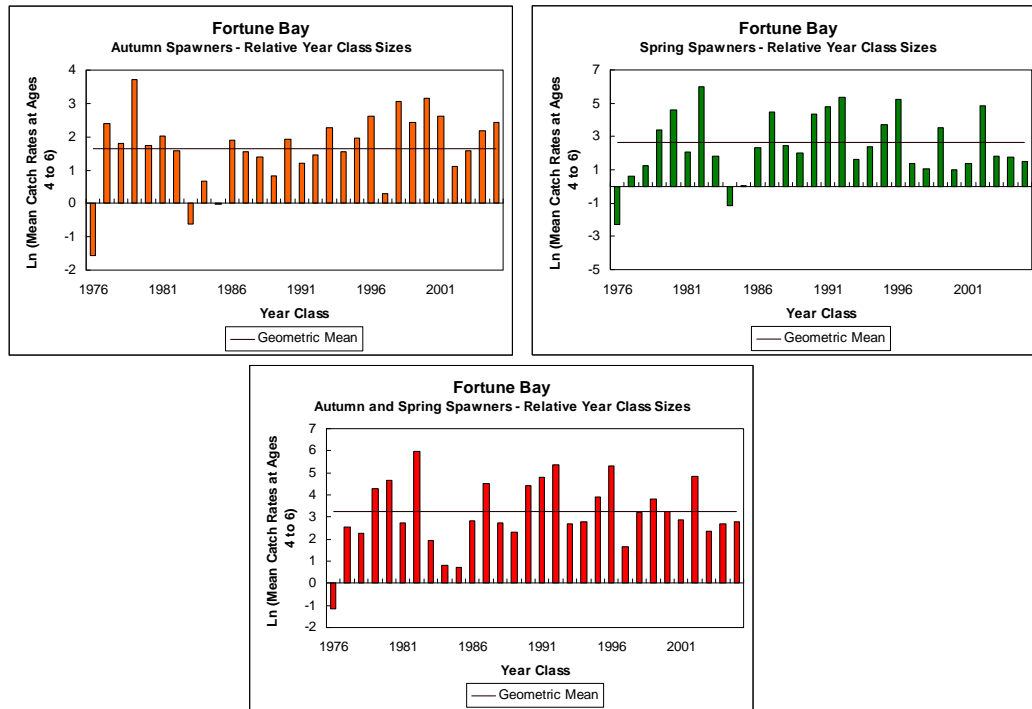


Figure 22. Fortune Bay relative year class sizes (1976–2005) from research gill net catch rates at ages 4 to 6 for autumn spawners (top left) spring spawners (top right), and both spawning types combined (bottom); geometric mean for 1975 to 2005.

Current Status and Short Term Prospects

A standardized performance index is available for 1997 to 2011 (Fig.23, left). This composite index indicates that stock status deteriorated from 2001 to 2004, recovered in 2005, declined in 2006 and was stable to 2010, then decreased slightly in 2011.

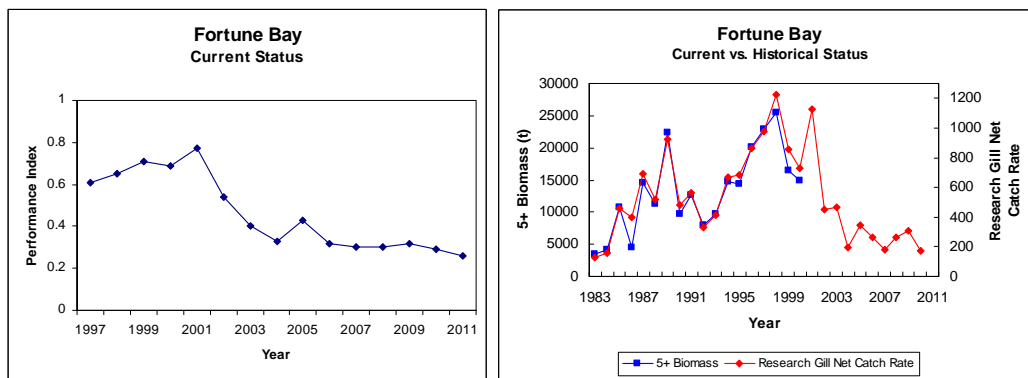


Figure 23. Fortune Bay performance index for 1997 to 2011 (left) and comparison of research gill net catch rates and historical population estimates (right).

Short term prospects are negative; recruitment of the 2006 year class is below average for both spawning components, and most mature year classes are below average (Fig. 22, bottom). All year classes since 1982 are weak compared to historical levels (Fig. 23, right).

Assessment results are summarized in the following performance table (Table 4).

Table 4. Fortune Bay performance table to the spring of 2011.

| <i>The Fishery</i> | <i>Observation</i> | |
|--|--|--|
| 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. | |
| <i>Abundance Indices</i> | <i>Observation</i> | <i>Interpretation</i> |
| 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. |
| <i>Biological Characteristics</i> | <i>Observation</i> | <i>Interpretation</i> |
| 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. |

| <i>Stock Status</i> | <i>Interpretation</i> | <i>Evaluation</i> | <i>Status Definitions</i> | |
|------------------------|---|-------------------|---------------------------|--|
| Current vs. Historical | Current abundance is lower than peak estimates in the late 1990's. | - | - | Concern for Current Status or Prospect |
| 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. | - | ? | Uncertainty of Interpretation |
| Short Term Prospects | Negative; below average recruitment of 2006 year class; most current mature year classes are below average. | - | + | 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.

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 uncertainty 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 uncertainty 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.

CONCLUSIONS AND ADVICE

White Bay-Notre Dame Bay

The stock improved from 2002 to 2008, but has since deteriorated. Current abundance is substantially lower than historical estimates in the 1970's.

Short term prospects are uncertain; the recruiting 2006 year class is average, with the autumn spawning component of the year class being well above average – the proportion of autumn spawners in the catch continues to increase beyond historical levels. Most mature year classes are above average compared to those produced since 1982. However, all year classes since 1982 are weak compared to historical levels.

Bonavista Bay-Trinity Bay

The status of this stock has deteriorated since the 2009 assessment. The stock improved from 2002 to 2007 but deteriorated from 2008 to 2010, and improved slightly in 2011. 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 below average or above those produced since 1982, with all mature autumn spawning year classes being well above average. The proportion of autumn spawners in the catch continues to increase beyond historical levels. However, all year classes since 1982 are weak compared to historical levels.

St. Mary's Bay-Placentia Bay

The status of this stock has improved since the 2009 assessment. The stock deteriorated from 2001 to 2004, remained stable to 2010 and improved slightly in 2011. Current abundance is substantially lower than historical estimates in the 1970's.

Short term prospects are uncertain; the 2006 year class is above average, most mature year classes are below average for both spawning types combined, but most mature autumn year classes are above average. All year classes are weak compared to historical levels.

Fortune Bay

The status of this stock has deteriorated since the 2009 assessment. The stock deteriorated between 2001 and 2006, remained stable to 2009 and deteriorated slightly in 2010 and 2011. Current abundance is substantially lower than peak estimates in the late 1990's.

Short term prospects are negative; the 2006 year and most mature year classes are below average.

SOURCES OF INFORMATION

This Science Advisory Report is from the Fisheries and Oceans Canada, Canadian Science Advisory Secretariat, Regional Advisory Process meeting of November 30 and December 1, 2011 on the assessment of east and south coast Newfoundland herring. Additional publications from this process will be posted as they become available on the DFO Science Advisory Schedule at <http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm>.

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