Fisheries and Oceans Canada | Pêches et Océans Canada
Science | Sciences

Canadian Science Advisory Secretariat (CSAS)

Research Document 2014/056

Maritimes Region

2013 Evaluation of Northwest Atlantic Fisheries Organization (NAFO) Divisions 4VWX Herring

R. Singh, D. Knox, M.J. Power, A. MacIntyre, and G.D. Melvin

Groundfish, Pelagics, Shrimp and Species at Risk Section
Population Ecology Division
Maritimes Region, Science Branch
St. Andrews Biological Station
531 Brandy Cove Road
St. Andrews, NB E5B 2L9

September 2014

Canada

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.

Research documents are produced in the official language in which they are provided to the Secretariat.

Published by:

Fisheries and Oceans Canada
Canadian Science Advisory Secretariat
200 Kent Street
Ottawa ON K1A 0E6

http://www.dfo-mpo.gc.ca/csas-sccs/
csas-sccs@dfo-mpo.gc.ca

ISSN 1919-5044

Correct citation for this publication:

Singh, R., Knox, D., Power, M.J., MacIntyre, A., and Melvin, G.D. 2014. 2013 Evaluation of Northwest Atlantic Fisheries Organization (NAFO) Divisions 4VWX Herring. DFO Can. Sci. Advis. Sec. Res. Doc. 2014/056. v + 109 p.

TABLE OF CONTENTS

ABSTRACT

The 2011 evaluation of the Northwest Atlantic Fisheries Organization divisions 4VWX herring considered the data from the 2009-2010 quota year. The 2013 evaluation evaluates the data from the 2010-2011 and 2011-2012 quota years. Quota landings of Atlantic Herring (*Clupea harengus*) in 2010-2011 were 50,010t and in 2011-2012 were 47,614t against a Total Allowable Catch of 50,000t for each quota year for the Southwest Nova Scotia/Bay of Fundy component. Acoustic biomass estimates increased by 44% in 2011 followed by a further 6% increase in 2012 for the major spawning ground survey areas in Scots Bay and on German Bank. Most of this increase occurred in Scots Bay. In 2011, the fishery catch at age composition by number was comprised of 12% fish at age 2, 46% fish at age 3, 22% at age 4, and 9% at ages older than age 5. In 2012, the fishery catch at age composition by number was comprised of 25% fish at age 2, 13% at age 3 years of age, 27% at age 4, and 15% at ages older than age 5. The lack of widespread distribution of 2 year olds and their absence from the weirs is a cause for concern about the expected numbers of 3 year olds in 2013.

Landings from the Offshore Scotian Shelf decreased from 11,862t in 2010 to 10,455t in 2011 and to 1,210t in 2012. There was no midwater trawl activity in the offshore area and only limited by-catch of herring from bottom trawl gear. No acoustic survey was completed for the offshore area in 2011 or 2012. Herring abundance in the 2011 summer bottom trawl research vessel survey decreased from the 2010 high level for all areas except the Bay of Fundy. In 2012, herring abundance fluctuated with some areas decreasing and other areas increasing. This survey has not been considered indicative of overall abundance due to changes in catchability for herring and a lack of year-class tracking.

The recorded landings in the gillnet and trap net fisheries along the coast of Nova Scotia decreased from 5,575t in 2010 to 3,606t in 2011 and to 3,007t in 2012. There were decreases in surveyed acoustic biomass in the Halifax/Eastern Shore area from the 27,000t in 2010 to 5,498t in 2011 and to 3,668t in 2012. In the Little Hope area, there was an increase in the acoustic biomass estimate in 2011 to 28,796t from the 26,700t in 2010, followed by a large decrease to 12,756t in 2012. Only one survey was completed near Glace Bay in 2011 (51t) and none in 2012. No catch was reported in 2011 and very little catch reported in 2012 (7t). No herring surveys took place in the Bras d'Or Lakes.

Landings in the New Brunswick weir and shut-off fishery were 10,958t in 2010. Landings decreased to 3,711t in 2011 and further decreased to a historic low of 504t in 2012. In 2007 landings were 30,944t, the highest in nearly 20 years. The age distribution of fish caught in the 2011 and 2012 New Brunswick weir and shutoff fishery were primarily juveniles, with 71% and 95% by numbers at age 2 in 2011 and 2012, respectively. The success of this passive trap fishery has been historically unpredictable, and catches are inherently susceptible to many natural variables in addition to abundance.

Évaluation des stocks de hareng des divisions 4VWX de l'Organisation des pêches de l'Atlantique Nord-Ouest (OPANO) en 2013

RÉSUMÉ

L'évaluation des stocks de hareng des divisions 4VWX de l'OPANO en 2011 portait sur les données de l'année de quota 2009-2010. Celle effectuée en 2013 porte sur les données des années de quota 2010-2011 et 2011-2012. Les quotas de débarquements du hareng de l'Atlantique (*Clupea harengus*) se chiffraient à 50 010 t en 2010-2011 et à 47 614 t en 2011-2012, par rapport à un total autorisé des captures de 50 000 t par année de quota pour la composante du sud-ouest de la Nouvelle-Écosse et de la baie de Fundy. Les estimations de la biomasse dans les relevés acoustiques ont augmenté de 44 % en 2011, puis de 6 % de plus en 2012 pour les principales zones de relevé des frayères dans la baie Scots et du banc German. La majeure partie de cette augmentation s'est produite dans la baie Scots. En 2011, la composition des captures (numériques) selon l'âge reflétait 12 % de poissons d'âge 2, 46 % de poissons d'âge 3, 22 % d'âge 4 et 9 % de poissons d'âge supérieur à 5. En 2012, la composition des captures (numériques) selon l'âge reflétait 25 % de poissons d'âge 2, 13 % de poissons d'âge 3, 27 % de poissons d'âge 4 et 15 % de poissons d'âge supérieur à 5. Le manque de répartition étendue des poissons âgés de 2 ans et leur absence des bordigues sont préoccupants pour ce qui est du nombre prévu de poissons de 3 ans en 2013.

Les débarquements à partir de la zone extracôtière du plateau néo-écossais ont diminué, passant de 11 862 t en 2010 à 10 455 t en 2011 et à 1 210 t en 2012. Il n'y avait pas d'activité de pêche au chalut pélagique dans la zone extracôtière et seulement quelques prises accessoires de hareng provenant de la pêche au chalut de fond. Aucun relevé acoustique n'a été effectué pour la zone extracôtière en 2011 ou 2012. L'abondance du hareng dans le relevé au chalut de fond effectué à l'été 2011 par navire scientifique a connu une baisse par rapport au niveau élevé de 2010 dans toutes les zones sauf dans la baie de Fundy. En 2012, l'abondance du hareng a fluctué avec certains secteurs à la baisse et d'autres à la hausse. Ce relevé n'a pas été considéré indicateur de l'abondance globale en raison des variations de la capturabilité du hareng et du manque de suivi de la classe d'âge.

Les débarquements enregistrés pour la pêche au filet-trappe et au filet maillant le long de la côte de la Nouvelle-Écosse ont diminué de 5 575 t en 2010 à 3 606 t en 2011 et à 3 007 t en 2012. Le relevé acoustique a fait état d'une diminution de la biomasse dans la région de Halifax/côte est, passant de 27 000 t en 2010 à 5 498 t en 2011 et à 3 668 t en 2012. Dans la région de Little Hope, l'estimation de la biomasse selon le relevé acoustique est passée de 26 700 t en 2010 à 28 796 t en 2011 pour ensuite diminuer de façon importante à 12 756 t en 2012. Un seul relevé a été effectué près de Glace Bay en 2011 (51 t) et aucun en 2012. Aucune capture n'a été signalée en 2011 et très peu en 2012 (7 t). Il n'y a pas eu de relevé sur le hareng dans les lacs Bras d'Or.

Les débarquements des parcs à hareng et des sennes de plage au Nouveau-Brunswick se sont chiffrés à 10 958 t en 2010. Les débarquements ont diminué à 3 711 t en 2011 et encore davantage en 2012, pour atteindre un creux historique de 504 t en 2012. En 2007, les débarquements se chiffraient à 30 944 t, soit le niveau le plus élevé depuis presque 20 ans. Il ressort de la répartition des âges dans les captures de hareng de 2011 et de 2012 provenant des parcs à hareng et des sennes de plage au Nouveau-Brunswick que ces captures étaient constituées essentiellement de juvéniles, dont 71 % et 95 % d'âge 2 en 2011 et 2012, respectivement. Le succès de cette pêche passive au casier est historiquement imprévisible et les prises ont une tendance inhérente à fluctuer en fonction de nombreuses variables naturelles, en plus de l'abondance.

INTRODUCTION

Atlantic Herring (*Clupea harengus*) is a pelagic species found on both sides of the North Atlantic. Herring spawn in discrete locations, to which they are presumed to home. Herring mature and spawn at three to four years of age (23 to 28cm or 9 to 11in), then begin a predictable annual pattern of spawning, over wintering, and summer feeding, which often involves considerable migration and mixing with members of other spawning groups. Fishing primarily occurs on dense summer feeding, over wintering, and spawning aggregations and has been dominated by purse seine, weir, and gillnet gear types, with relatively minor landings by shutoff, trap, and midwater trawl.

The Northwest Atlantic Fisheries Organization (NAFO) 4VWX management unit contains a number of spawning areas, separated to various degrees in space and time. Spawning areas in close proximity, with similar spawning times, and which share a larval distribution area, are considered part of the same component. Some spawning areas are large and offshore, whereas others are small and more localized, sometimes near shore or in small embayments. The situation is complicated further as herring migrate long distances and mix outside of the spawning period, both with members considered part of the same component and with members of other components. For the purposes of evaluation and management, the 4VWX herring fisheries are divided into four components (Figure 1):

1. Southwest Nova Scotia/Bay of Fundy (SWNS/BoF) spawning component (also '4WX' in management plan);
2. Offshore Scotian Shelf banks spawning component;
3. Coastal (South Shore, Eastern Shore and Cape Breton) Nova Scotia spawning component; and
4. Southwest New Brunswick (SWNB) migrant juveniles.

Each component has several spawning areas, and there is mixing of fish among spawning components. Industry and Fisheries and Oceans Canada (DFO) have explored means of managing the complexity within each component (e.g., distributing fishing effort among spawning areas according to their relative size) and accounting for interaction among components (e.g., fishing restrictions on some areas of mixing).

The Georges Bank spawning component is not included in this evaluation except to document Canadian fishing activity. There were no herring landings in 2011 and 2012 from the Canadian portion of Georges Bank, with the last recorded landings in 2004. This fishery is included in the Gulf of Maine stock complex and was last evaluated in 2006 (DFO 2003a; TRAC 2006).

OBJECTIVES AND MANAGEMENT

The 2003-2006 Scotia-Fundy Herring Integrated Fisheries Management Plan (IFMP) (DFO 2003b) states the principles, conditions, and management measures for the 4VWX herring fisheries. The main principle stated in the plan is "the conservation of the herring resource and the preservation of all of its spawning components". The background for the conservation objectives was first developed and reviewed by Sinclair (1997).

Three conservation objectives appear in the plan:

5. To maintain the reproductive capacity of herring in each management unit through:
    a. persistence of all spawning components in the management unit;
    b. maintenance of biomass of each spawning component above a minimum threshold;

   c. maintenance of a broad age composition for each spawning component; and
   d. maintenance of a long spawning period for each spawning component.
6. To prevent growth over fishing:
   a. continue to strive for fishing mortality at or below $F_{0.1.}$
7. To maintain ecosystem integrity/ecological relationships ("ecosystem balance"):
   a. maintain spatial and temporal diversity of spawning; and
   b. maintain herring biomass at moderate to high levels.

There is evidence that some of these conservation objectives are not being met, however, there has been some improvement from the low level of the spawning stock biomass (SSB) estimates noted in recent assessments (Power et al. 2006, 2007, 2008, 2010a, 2013). These objectives require better definition in terms of minimum thresholds and to should explicitly list the spawning components in terms of spatial and temporal expectations.

An "in-season" management process, first implemented in the SWNS fishery during 1995, continues to be used widely within the 4VWX management area (DFO 1997; Stephenson et al. 1996, 1999). The approach encourages surveying using the commercial fleet under scientific direction prior to fishing ("survey, assess, then fish" protocol) to ensure that effort is distributed appropriately among various components of the stock (particularly among spawning components) according to the relative size and current state of each component. The use of this approach in recent years has improved data collection and enabled management decisions to be modified through the involvement of participants and on the basis of up-to-date information.

Collaborative research efforts with the fishing industry have been important in recent years. A major portion of the herring industry (including the purse seine sector and major processors which form the Herring Science Council (HSC) and members of the fixed gear sector) has undertaken a separate Joint Project Agreement with DFO to conduct collaborative scientific projects. The herring industry continues to collect sample samples and conduct biological sampling while purse seine and gillnet sectors conducted key acoustic surveys. In 2011 and 2012, field activities were supervised by the HSC manager with assistance from St. Andrews Biological Station (SABS) / DFO staff, individual survey vessel captains, and plant managers. In addition, downloading and data editing services were contracted by the HSC through A. Clay from FEMTO Electronics.

SOUTHWEST NOVA SCOTIA/BAY OF FUNDY SPAWNING COMPONENT

THE FISHERY

In recent years, the herring fisheries in the 4VWX area have been dominated by purse seine, weir, and gillnet, with relatively minor landings by shutoff and trap. A variety of herring fishing locations, NAFO areas, and fishing ground areas are used to describe fishing activities and group the data for catch and sampling analysis (figures 2 to 4).

Quota landings for the SWNS/BoF stock component, the only component under Total Allowable Catch (TAC) control, were 50,010t against a TAC of 50,000t for 2010-2011 quota year (Table 1A). In 2011-2012, landings were 47,614t against a TAC of 50,000t (Table 1B). The quota year begins on October 15 and ends on October 15 of the following year. Landings in the fall 2011 purse seine fisheries for the 2011/2012 quota year were 1,077t (Table 2A), while the fall 2012 purse seine fisheries for the 2012/2013 quota year were 358t (Table 2B). There was no winter fishery in 2011 or 2012. There were additional landings of 17,799t (2011) and 4,767t (2012) from the non-stock components including Coastal Nova Scotia, the Offshore Scotian Shelf

banks, and SWNB. The landings from New Brunswick weirs and shutoffs fisheries decreased from 10,958t in 2010 to 3,711t in 2011 (3,711t) to 504t in 2012. Landings from the Coastal Nova Scotia gillnet fisheries also decreased from 5,575t in 2010 to 3,606t in 2011 and 3,007t in 2012. The landings from the Offshore Scotian Shelf banks component also decreased from 11,862t in 2010 to 10,482 in 2011 and then decreasing further to 1,255t in 2012 (tables 1A, 1B, 3).

Landings for SWNS/BoF stock component have recently tracked the TAC, with most of the quota being taken each year since 2002 (Figure 5). In the 2010-2011 quota year, landings were 10t above the TAC while in 2011-2012 landings were 2,386t below the TAC. As a result of the reduced quota since 2005, total landings from this component have remained low (Table 3). Table 4 (A, B) provide the purse seine catches (in t and in percentages) by fishing grounds from 1985-2012 for the 4WX stock component. Throughout the history of this fishery most catch has been caught by purse seine gear with the 4X summer purse seine fishery being the largest (Table 3; figures 6 and 7A,B). Landings by the purse seine sector accounted for 97% and 99% of the component catch in 2011 and 2012, respectively, with minimal landings by the gillnet sector (638t, 2011; 471t, 2012) and below average landings from the Nova Scotia weirs (1,004t, 2011; 149t, 2012; Table 1A and 1B, respectively). According to the IFMP, 80% of the TAC is initially allocated to the mobile gear sector and 20% to the fixed gear sector and, as in past years, a transfer of unused quota to the mobile fleet occurred near the end of the fishing season.

Purse seine catches are summarized by fishing grounds using definitions of the various grounds based on groupings of 10 minute boxes of latitude and longitude (Table 4A, B; Figure 4). The largest proportions of catches came from fishing grounds in the German Bank (45% in 2011, 65% in 2012) and Grand Manan (26% in 2011; and down to 9% in 2012) areas (Table 4B; Figure 8). Scots Bay catches increased from 9% in 2010 to 11% in 2011 and 2012. Catches from the Gannet/Dry Ledge area also increased from 771t in 2010 to 2,564t in 2011 and to 3,177t in 2012. Landings from the New Brunswick coastal area deceased from 2,864t in 2010 to 1,821t in 2011 to 132t in 2012. Catches were again below the long term average from Scots Bay and the Long Island shore areas; however, in 2011, landings from Scots Bay (5,130t) were above 2010 landings (4,165t). In 2012, landings amounted to 4,940t.

Purse seine landings of 1,584t were reported in the October/November 2010 fall fishery and 1,077t were reported in the October/November 2011 fall fishery. There was no winter fishery reported in 2011 or 2012. (Table 1A, B; Figure 9A, B). Fisheries which occur at the beginning of each quota year are usually concentrated on the New Brunswick side of the Bay of Fundy.

The largest single fishery of the SWNS/BoF stock component is the summer purse seine fishery, which occurs from May to October in the Bay of Fundy area. In 2011, this fishery occurred in similar areas and months as in previous years with total landings of 46,784t (Table 1A; Figure 10A). The 2012 fishery took place in similar areas and months with total landings of 45,918t (Table 1B; Figure 10B). A large portion of this fishery is directed toward pre-spawning, feeding aggregations in May and June. Catches on the major spawning grounds during the spawning period in Scots Bay and on German Bank are found primarily within the pre-defined acoustic survey areas (Melvin and Power 1999).

As in recent years, there was no winter fishery in Chedabucto Bay and the majority of the fall and winter herring landings come from the New Brunswick side of the Bay of Fundy.

Catches of non-stock component herring by purse seine, which primarily occurred from the Offshore banks and Western Hole areas on the Scotian Shelf, decreased from 11,837t in 2010 to 10,455t in 2011, and to 1,210t in 2012(Table 5, Figure 38A, B). There have been no catches from the Georges Bank area since 2000 when 265t were landed (Table 5).

Main Fishing Areas for the SWNS/BoF Component

The main fishing areas for the SWNS/BoF component are the German Bank, Scots Bay, and Trinity Ledge areas, which also include spawning grounds fisheries. Additional fishing occurs by the Nova Scotia weirs in St. Mary's Bay and along the Long Island shore. There is also an occasional small gillnet fishery in the spring on spawning herring near Spectacle Buoy, which is just southeast of Yarmouth.

German Bank

German Bank is one of the primary herring fishing grounds in the Bay of Fundy area. Since 1985, catches from this area have ranged from 9,003t to 35,977t during the main fishery period from early May to late October (Table 6). Catches during the pre-spawning period (defined as the period from January 1 to August 14) increased from 1,804t in 2010 to 5,512t in 2011 and decreased to 5,369t in 2012. The highest catches since 1999 during the pre-spawning period was in 2008 at 16,845t (Table 6). Catches during spawning period (defined as the period from August 15 to October 15) increased from 17,158t in 2010 to 19,175t in 2011 and to 29,582t in 2012. The contribution of German Bank catch to the overall TAC increased from 34% in 2010 to 49% in 2011 and up to 70% in 2012 (Table 6; Figure 11).

The distribution of catches on German Bank in the 2011 pre-spawning period (January 1 to August 14) is presented in Figure 12. Within the spawning box area, catches on German Bank during the spawning period are primarily of spawning "roe" fish (Figure 13). However, not all catches are spawners, with juvenile sized non-spawning groups often located to the north of the spawning box. In 2011 and 2012, catches of spawning herring were widespread with localized groups seen in both the northern and southern portions of the standard survey area on German Bank (Figure 13). As in 2010, the highest fishery catches during the spawning period in 2011 and 2012 occurred in September (Figure 14) with less catches occurring in the latter half of August. The total catch for German Bank area increased to 24,687t in 2011 and to 34,951t in 2012 from the low of 18,961t in 2010 (Table 6).

Scots Bay

The Scots Bay herring purse seine fishery has been an important component of the summer fishery. Since 1987, catches have ranged from 902t in 2009 to 24,388t in 2004 during the period of early July to late August-early September (Table 7; Figure 15). The 2006 fishery had catches scattered mainly within the defined spawning area, but there was a reduction in overall fishing activity with 3,350t landed and less than half of the number of daily landings (purchase slips) than in 2005 (Table 7; Figure 16). The 2004 fishing season peak year of 2004 was unusual in several aspects. For example, it had the highest recorded catch of 24,400t, the longest season extending to September 16 and the most days with catch recorded (Table 7; Figure 17). As in 2010, the Scots Bay fishery in 2011 and 2012 continued to be restricted by a 5,000t cap imposed due to the poor performance of the spawning component since 2005. Landings in 2011 increased from 4,086t in 2010 (over a 61-day fishing period) to 5,093t (over a 60-day fishing period) and then decreased slightly to 4,940t (over a 58-day fishing period) (Table 7; Figure 17).

Trinity Ledge

Catches for Trinity Ledge in increased from 202t in 2010 to 638t in 2011(between August 9 to September 20) and decreased to 448t in 2012 (between August 15 and September 18) (Table 8; figures 18A, 18B and 19). The 2012 decrease represents a decline over the steady increase since 2008. In 2011, the total estimated biomass (with the Calibration Integration Factor (CIF)) from the acoustic surveys followed a similar pattern increasing to 7,316t from the low of 516t in 2008. This increase was followed by a decrease to 2,754t in 2012 (Table 8; Figure

19). Additional work is required to monitor the status of this spawning area, which once supported a major portion of the overall stock catch (Table 4A, B; Figure 8).

Nova Scotia Weirs

Catches from Nova Scotia weirs (4Xr) located in St. Mary's Bay and along the Long Island shore decreased from 1,198t in 2010 to 1,004t in 2011 and 149t in 2012 (tables 3 and 9; Figure 20). In recent years, the seasonal timing of the Nova Scotia weir landings has shifted to the later months of the season, with most of the catch in July, August, and September in 2011 and 2012 (Table 9). Catches for the Nova Scotia weirs have been highly variable in recent years and are not consistent in their amount or timing, with catches occurring early in the season in the 1990's and then later in the season in the last decade. There has also been a decline in the total number of herring weirs to 14 active weirs in the last decade, down from 20 or more in the 1980's, with only two reporting catches in 2011 and 2012 (Table 10).

Spectacle Buoy

In recent years, the spring gillnet fishery for roe has occurred for a short period in June in the vicinity of Spectacle Buoy located southwest of Yarmouth, Nova Scotia. The fishery is dependent upon fish availability and to some extent market conditions, and may or may not occur in any given year. In 2008, only one landing of 6t was reported and very limited acoustic surveys were completed. In 2009, there was little fishing (less than 1t) and no survey activity in this area, while in 2010 there was no fishing and a survey biomass of 1,859t based on two properly conducted surveys. In 2011, only 1t catch was reported with an estimated survey biomass of 282t from one properly conducted survey. There was no fishery or surveys conducted in 2012 (Table 8).

RESOURCE STATUS

Commercial Catch Rate Indices

Catch and effort for gillnet data in the SWNS/BoF spawning component have been examined in previous assessments. The data indicated little trend and were considered unrepresentative due to the small amounts and variable timing and location of catch and effort (Table 3; Power et al. 2004). The 2011 catch from the gillnet fishery in the SWNS/BoF spawning component increased from 204t in 2010 to 638t in 2011 and then decreased to 471t in 2012.

Purse seine landings comprise the majority of the overall catch and are allocated 80% of the TAC for the SWNS/BoF component under the current IFMP. The purse seine catch has fluctuated between 44,476t and 103,537t since 1989, primarily reflecting changes in the TAC (Table 11; Figure 21). The number of boats fishing and days fished has dropped since 1990 due to fleet rationalization. This has resulted in increases in catch per boat and catch per day in recent years but the catch is also affected by the reduced TAC. In general, purse seine catch rates are not considered to reflect trends in population abundance due to the nature of herring schooling behavior and the acoustic technology used to find these concentrated schools. Catch rates can remain high or stable even at low stock levels. These data are reported to document the overall effort by the purse seine fleet (Table 11).

Acoustic Surveys

Automated acoustic recording systems deployed on commercial fishing vessels have been used since 1997 to document the distribution and abundance of herring. Scheduled surveys are now conducted annually with surveys completed every two weeks on each of the main spawning components. An index of SSB is estimated by summing these results (Melvin and Power 1999).

The 2008 biomass estimate in the traditional survey areas of Scots Bay, Trinity Ledge and

German Bank decreased 42% from 2007 and was the lowest recorded since acoustic surveys began in 1997. The biomass estimate for Scots Bay, Trinity Ledge, and German Bank (in and out of the box) increased to 486,900t in 2009 from 264,900t in 2008 (Table 12; figures 22 and 23) while the 2010 estimate showed a decrease in biomass to 312,100t. There was an increase in the estimate in 2011 to 448,771t (44% over 2010) and a further increase in 2012 to 476,026t (6% over 2011). Most of this increase is attributed to the large increase in biomass in Scots Bay (from 54,000t in 2010 to 140,712t in 2011 and then to 184,829t in 2012). The German Bank SSB increased from 253,800t in 2010 to 300,461t in 2011 and decreased to 288,443t in 2012.

Spawning Ground Turnover Rates from Tagging Studies

The current acoustic survey methodology on spawning grounds is dependent on the periodic turnover of spawning fish. Acoustic surveys are required to be separated by 10 to 14 days to allow for fish turnover and to prevent double counting (Power et al. 2002). A tagging study to examine herring turnover rate on the German Bank spawning grounds was conducted during the summer/fall of 2009 (Maxner et al. 2010). The results of this project which continued in 2012-2013 and was presented by Melvin et al. (2013), attempts to gain a better understanding of residency time of herring throughout the spawning season for this area.

Exploitation Rates on Spawning Grounds

The acoustic survey estimates and catches from individual spawning areas were examined to estimate relative exploitation rates on different spawning groups and the overall SWNS/BoF component. Exploitation was calculated as the ratio of catch divided by acoustic survey biomass. These estimates can be used to assess the impact of fishing and also to estimate the relative size of individual spawning units within the SWNS/BoF component. These rates are dependent on the assumptions that the acoustic survey SSB is complete, that catches have been properly allocated and, most critically, that the acoustic SSB provides an absolute measure of biomass. As a result of these uncertainties, the absolute fishing mortalities cannot be determined or inferred, but instead the trends over time may be used in a relative sense from year to year.

For this analysis, as in previous years (Power et al. 2013), the three main spawning areas of Scots Bay, German Bank, and Trinity Ledge, which have received relatively consistent survey effort since 1999, were used. The acoustic SSB for nearby Seal Island and Spectacle Buoy areas were allocated to the German Bank spawning area. All catches captured on each spawning ground throughout the year were assumed to be site specific (Table 13-C1), while catches from other non-spawning areas were allocated based on the relative spawning ground SSB proportions from annual acoustic surveys (Table 13-A2). The adjusted total catch was thus made equal to the reported stock catch (Table 13-C2). Exploitation rates were then calculated (Catch / SSB) for both the actual catch on the spawning grounds and the overall adjusted catch as proportions (Table 13-E1, E2).

The trends in spawning area proportions estimated from acoustic surveys (Table 13-A2) were stable between 2005 and 2010, with approximately 80-90% of survey SSB found in the German Bank area and 10-20% in the Scots Bay area; however, those proportions changed in 2011 and 2012. On German Bank, the proportions decreased to 67% in 2011 and 61% in 2012 while in Scots Bay the proportions increased to 31% in 2011 and 39% in 2012. There is an increase in Scots Bay and a 15-21% (compared to 2010) decline for German Bank.

Since 1999, calculation of exploitation rates by areas (Table 13-E2) indicated that larger grounds (Scots Bay and German Bank) have an average exploitation rate of 19% and 16%, respectively while the smaller ground (Trinity Ledge) had an average exploitation rate of 55%. The combined overall adjusted exploitation rate for these three areas ranged from 10-25% from

1999 to 2012 (Figure 24). These exploitation rates are useful for year to year comparisons and indicate that the overall adjusted estimate was stable from 14-18% between 1999 and 2004. There was an increase in the overall adjusted exploitation rate to 21% in 2005 coinciding with a large decrease in total survey biomass. The rate declined in 2006-2007 to a low of 13% followed by an increase to the series high of 25% in 2008. In 2009 the rate declined to 14% and increased to 18% in 2010. This rate had showed continued decline to 11% in 2011 and to 10% in 2012 (Table 13-E2; Figure 24).

Biological Sampling

Comprehensive biological sampling continued for this fishery with substantial involvement of the fishing industry, which provided length frequencies, maturity reports, and frozen fish samples for analysis by DFO personnel. In 2011, a total of 1,817 samples (284,340 fish) were measured for length, while 5,058 fish were sampled for sex, weight, maturity and age (Table 14A). In 2012, a total of 1,475 samples (227,776 fish) were measured for length, while 4,380 fish were sampled for sex, weight, maturity, and age (Table 14B). The sources of the samples are provided in Table 15, with the majority supplied by the processing industry since 1996. Additional samples were collected by DFO personnel, observers deployed on fishing vessels, and DFO research surveys. Sampling from the commercial fishery coincided to the spatial and temporal distribution of the fishery and additional sampling from research vessel surveys during the spring and summer resulted in widespread geographic coverage as in the past (figures 25A, B).

Catch at Age

Consistent with previous assessments, the catch at length and age was constructed using the ‘Catch at Age’ application (version 11.5), a program which computes catch at age statistics as part of the stock assessment process. Data files used by ‘Catch at Age’ were selected directly from biological sample data in the Pelagic Samples Database. These data included a 2% adjustment for the shrinkage due to freezing on the length measurements for frozen samples (Hunt et al. 1986).

The size and age composition was characterized by month, unit area, and gear type using all available length and age samples in 2011 (Table 16A) and 2012 (Table 16B). The required length-weight relationships were calculated on a monthly basis. The catch at age statistics were calculated from length frequency and age-length samples expanded to total catch using appropriate monthly length-weight relationships. The data were grouped and age-length keys were applied to length frequencies to produce catch at age statistics by NAFO unit area, gear-type and month.

Table 17A and 17B and Figure 26A and 26B present monthly and seasonal catch at age data for the 2011 and 2012 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock). Table 18A (2011) and 18B (2012) and figures 27A(2011) and 27B(2012) present catch at age by fishing ground for the 2011and 2012 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock). Table 19A and 19B and figures 28A and 28B present the catch at age data for the 2009-2010, 2010-2011, and 2011-2012 quota years for the purse seine, gillnet, and weir fisheries conducted on the SWNS/BoF spawning component (4WX stock).

The 2011 catch was dominated by the 2008 year-class (at age 3), representing approximately 46% of the numbers and 35% of the weight of herring landed in the SWNS/BoF component (Table 20A; Figure 29A). The 2007 year-class (at age 4) was the second most important by number at 22% and contributed 26% by weight of the landings. The proportion of the catch older than age five increased in 2011 to 9% (by numbers) from 2 in 2010. The total number of fish of

all ages removed by the fishery in 2011 was calculated to be 498 million, a decrease of 298 million or 37% from 2010.

The 2012 catch indicated the 2008 year-class (at age 4), represented approximately 27% of the numbers and 29% of the weight of herring landed in the SWNS/BoF component (Table 20B; Figure 29B). The 2010 year-class (at age 2) was the second most important by number at 25% and contributed 19% by weight of the landings. The proportion of the catch older than age five increased in 2012 to 15% (by numbers) from 9% in 2011. The total number of fish of all ages removed by the fishery in 2012 was calculated to be 432 million, a decrease of 66 million or 13% from 2011.

The number of age 2 fish increased from 12% in 2011 to 25% in 2012 (Figure 29A and 29B). Most of this increase is a result of catches on Trinity (85%), Gannet Dry Ledge (49%), Lurcher (46%) and Grand Manan banks (27%). The number of age 3 fish decreased from 46% in 2011 to 13% in 2012. Given the low catch of 2 year old fish in other areas and in weirs, the number of the 3 year old fish expected in 2013 is a cause for concern.

The historical time series of catch at age data indicates there have been few fish older than age 8 since 1995 and this time series continues to be dominated by ages 2 through 5 (Table 20A and 20B; Figure 30). Older ages had been a feature when strong year-classes (i.e., 1976 and 1983) were progressing through the fishery. These stronger year-classes had persisted in the catch to older ages in the 1970's through to early 1990's. In recent years, the rapid decline of year-classes in the catch and the continued lack of older fish imply a high total mortality (Power et al. 2006). The trend toward catches at younger ages results in reduced yield and is reflected in the increase in the number of individual fish caught as the landings have decreased (Figure 31).

Weight at Age

The average (fishery weighted) weight at age continues to be below the long term 1965-2012 average possibly reflecting changes in fishing patterns and timing (Table 21; Figure 32). There was a general decline in weight at age that occurred for all ages around 1987 (Figure 33). A further decline is also apparent for older ages (6 to 10) after 1997 with ages 8+ fish now consistently below 300g. Consistent with the data for 2010 in the previous assessment (Power et al. 2013), the 2011 and 2012 weights at age in particular are similar to the most recent five-year and ten-year averages, which are consistently less than the overall series average (Figure 32).

Total Mortality Estimates from Acoustic Data

Estimates of total mortality (Z = Fishing mortality + Natural mortality) were calculated using the acoustic catch at age data. When completed in this manner, Z calculations are typically quite variable, but can often be used to detect broad patterns. Total mortality was calculated using ages 4 to 8 combined compared with ages 5 to 9 in the following year (Table 22; Figure 34). The acoustic age composition for the German Bank component from 1999 to 2012 and the biological characteristics from sampling for German Bank acoustic surveys from 1999 to 2012 are shown in tables 23 and 24. The acoustic age composition is assumed to be representative of the overall spawning biomass at these ages. The results for 2000 to 2012 have highly variable Z values, ranging from 0 and 1.3 (Figure 35). There is no apparent trend as the series is very short, however, there appears to be a downward trend in the last two years.

Stock Trends

The 2008 acoustic biomass estimates decreased 42% for all survey areas in Scots Bay, Trinity Ledge, and German Bank and was the lowest recorded estimates since acoustic surveys began

in 1997 (Power et al. 2010a). There was an increase in 2009 to 486,900t and a decrease in 2010 to 312,1t. The acoustic SSB estimate for the overall SWNS/BoF component increased to 448,771t in 2011 and to 476,026t in 2012. This results in the SSB estimate increasing to above the long-term average of 462,217t.

In the past, industry and DFO Management have explored ways to manage the complexity within each component (e.g. distributing fishing effort among spawning areas according to their relative size) and accounting for the interaction among components (e.g. fishing restrictions on some areas of mixing). The total number of fish removals decreased in 2011 by 37% from 2010 and further decreased in 2012 by 13% from 2011. While the largest year-class in the 2011 catch was the 3 year olds (46%), the 2012 catch was primarily comprised of 4 years old (27%) and 2 year old (25%) fish. The large number of 2 year old fish in the 2012 catch came mostly from German Bank, Trinity, and Gannet Dry Ledge (Table 18B). However, it is important to note the increase in catch of 2 year old fish does not provide an indication of a strong year-class (Figure 30).

The overall acoustic biomass estimates increased for survey areas in Scots Bay, Trinity Ledge, and German Bank in 2011 to 448,771t (44% over 2010) and further increased in 2012 to 476,026t (Table 12).

Lower Limit Reference Point

In 2012, a lower conservation limit reference point for the SWNS/BoF herring spawning component (German Bank and Scots Bay) was identified as the 2005-2010 average acoustic survey biomass, below which, the risk of serious harm is unacceptable (Clark et al. 2012). Figure 36A presents the acoustic spawning biomass for the period 1999 to 2012 along with the three-year moving average, the long term average, and the limit reference point. Figure 36B presents the same data as a relative biomass index. The 2010 biomass estimate was below the limit reference point by 17%. The biomass estimates increased above the limit reference point by 19% in 2011 and by 28% in 2012. The 2011 estimate increased to reach the long-term average while the 2012 estimate also increased by 7% above the long-term average. The three-year moving average increased above the limit reference point in 2010 and changed very little in 2011 but then increased again in 2012.

SOURCES OF UNCERTAINTY

When using acoustic survey results as a measure of absolute abundance, there are numerous variables for which information is lacking (e.g. residence time on the spawning grounds and estimation of biomass in the acoustic dead/blind zones at the surface and close to bottom). Between 1999 and 2003, acoustic survey results were used as minimum estimates of absolute SSB abundance and the population was considered to be approximately 500,000t. An SSB of that size would have been expected to result in substantial growth of the population, improved age composition and low fishing mortality, given reasonable recruitment and the landings over that period. This has not occurred.

The assumption that surveys are additive continues to be a source of uncertainty (DFO 2007). Other significant issues relate to the completeness of coverage of the survey area on Trinity Ledge, inter-annual turn-over processes on each area, and factors that influence the target strength and acoustic backscatter (DFO 2007). Additionally, the mechanisms causing changes in fish condition is not understood.

The acoustic survey index provides fisheries independent information on the SSB but does not provide data on younger age classes. The size of recruiting herring year-classes is highly variable and with no index of recruitment, a large fraction of the catch is dependent on recruiting

year-classes of uncertain abundances. The size of the recruiting 2008 year-class is unknown but comprised 60% (by number) of the catch at age 2 in 2010, 46% of catch at age 3 in 2011 and 27% of catch at age 4 in 2012. There is no accepted herring population assessment model, thus, relative trends in SSB and exploitation rate were used in this assessment. Placing current SSB levels in a historical context is difficult when only using trend data from 1999-2012.

ECOSYSTEM CONSIDERATIONS

Herring is a keystone forage species prominent in the diet of many fish, seabirds, and marine mammals, and should be managed with these interactions in mind. At present, use of a natural mortality rate of 0.2 and maintenance of SSB at moderate to high levels are assumed to take these interactions into consideration.

Management initiatives to protect spawning components are intended to maintain the spatial and temporal diversity of herring spawning. Any increase in the fishing on juveniles, which are of mixed or unknown stock affinity, would be inconsistent with this objective.

MANAGEMENT CONSIDERATIONS

The in-season management approach, which spreads effort in the fishery spatially and temporally among spawning components, is seen as beneficial in achieving conservation objectives. The “survey, assess, then fish” protocol is effective in spreading the catch appropriately among spawning components in proportion to their relative size and is considered an important safeguard. Acoustic surveys have become critical to stock status evaluation. It is important that there be continued attention to coverage and survey design in order to assure year-to-year consistency in all spawning areas.

Evaluations of progress against the conservation objectives in the IFMP from 2006 to 2009 are documented in Power et al. (2010b). In the 2010 fishery evaluation, the assessment of SSB showed a 36% decrease from the 2009 levels in the main areas for Scots Bay and German Bank. However, 2011 and 2012 SSB estimates increased by 44% and 6% over the previous year’s estimates. The amount of spawning fish documented on Trinity Ledge in 2011 and 2012 was extremely low (7,300t and 2,800t, respectively). This assessment indicates that the SSB in Scots Bay has improved while on German Bank there been an increase in 2011 and a decrease in 2012. Scots Bay showed an increase in the length of spawning period in recent years while German Bank had a spawning period similar to previous years; the duration of spawning in the Trinity area was not as long as in Scots Bay or on German Bank. There was a change in spatial distribution in Scots Bay with more catches and biomass outside the survey area box, while German Bank showed a wider spawning distribution in 2011 and 2012, in comparison to recent historical distribution. As in 2010, the recorded spawning area was small in the Trinity area in 2011 and 2012.

The 2011 catch was dominated by age 3 fish (46% of catch, by number) and some age 5+ fish (10% of catch, by number). The majority of the 2012 catch, however, was comprised of age 4 and age 2 fish (27% and 25% of catch by number, respectively), with the 5+ group accounting for 15% of the catch. The mean age of the acoustic catch at age decreased from 4.8 in 2010 to 4.3 in 2011, increasing to 5.1 years in 2012. The acoustic catch at age is higher than the mean age in the catch in 2012 indicating that older fish are collected in acoustic samples than in the catch. The relative exploitation rate decreased in 2011 and 2012 in response to increased survey biomass in Scots Bay. There has been a trend of declining mean-weight at age. Declining trends in mean-weight at age since the 1970’s have reduced productivity of the stock, though the SSB appears to be rebuilding in Scots Bay. Lack of similar growth on German Bank is a cause for concern since, historically, German Bank was the main spawning area.

The overall biomass estimates have increased in 2011 and 2012, exceeding the lower limit reference point; however, most of this growth has occurred in Scots Bay only. Overall, there were some positive signs from the fishery in 2011 and 2012 and some of the conservation objectives appear to have been met (Table 25).

OTHER CONSIDERATIONS

Observer reports of by-catch in purse seine sets have reported low numbers of non-herring species, most of which are released unharmed.

OFFSHORE SCOTIAN SHELF BANKS SPAWNING COMPONENT

There continues to be little information on stock size, distribution, and spawning behavior for the offshore component of the fishery which currently supports a limited spring fishery on feeding herring. Recent information comes primarily from sampling of this fishery, as well as catches and samples from the summer research bottom trawl survey. There is no information on spawning timing or location for the offshore component of the fishery, however, spawning is presumed to occur in the fall based on the reproduction condition of sampled fish. There was no acoustic survey completed for the offshore area in 2011 and 2012.

THE FISHERY

From 1963-1973, foreign fishing boats are estimated to have removed an average of 28,000t per year (with a maximum of 121,000t in 1969) from the Offshore Scotian Shelf banks (Stephenson et al. 1987). Few herring were caught after the extension of jurisdiction in 1977 until 1996, when a fishery was initiated by the Scotia-Fundy purse seine fleet and 11,700t were taken (Table 3). Since 1996, a fishery has occurred on feeding aggregations on the offshore banks, primarily in May and June, with catches ranging from 1,000t to 20,000t (Figure 37). The variability in catch levels is often due to problems of fish being too deep, weather, and market conditions rather than a lack of herring abundance in these areas.

At-sea fishery observers were present on three trips to ‘The Patch’ area in 2011 while one trip had observers in 2012. Observers were present on trips in 4X in both 2011 (20 trips) and 2012 (27 trips). In 2011, by-catch consisted of small amounts of herring, thresher shark, shortfin mako and American Lobster. During the one observer trip to “The Patch” area in 2012, observers recorded by-catch of small amounts of mackerel, bluefin tuna, American lobster and haddock which were released (Appendix A).

In 2011, the landings were above average at 10,482t, down from the 11,862t in 2010. Most landings were caught by purse seine gear in May-June, in the vicinity of ‘The Patch’ and Emerald Bank (Figure 38A). Additional by-catch (27t) was reported from otter trawl fisheries for groundfish and silver hake on the Scotian Shelf. The age composition of the catch was primarily adult herring (age 3+) with substantial proportions at age 4 (20%), age 5 (21%) and age 6 (33%; Table 26A; Figure 39A).

In 2012, the landings were below average at 1,255t, down from the 10,482t in 2011. Most landings were caught by purse seine gear in April-June, in the vicinity of ‘The Patch’ and Western Hole (Figure 38B). Additional by-catch (45t) was reported from otter trawl fisheries for groundfish and silver hake on the Scotian Shelf. The age composition of the catch was primarily adult herring (age 3+) with substantial proportions at age 4 (19%), age 5 (20%), age 6 (27%) and age 7 (21%) (Table 26B; Figure 39B).

RESEARCH AND INDUSTRY SURVEYS

Industry Surveys

No industry survey was conducted in the Offshore Scotian Shelf area in 2011 or 2012.

July Bottom Trawl Survey

In recent years, summer research bottom trawl surveys have indicated a relatively widespread herring distribution on the Scotian Shelf (Power et al. 2013). There are several shortcomings to using bottom trawl data as an overall abundance for a schooling pelagic species like herring. The bottom trawl data, while useful for documenting size, maturity, and distribution, are not considered indicative of overall herring abundance (Power et al. 2013). Table 27 presents herring abundances from 1970-2012 summer bottom trawl surveys. The trawl survey abundance increased substantially from a 39 in 2009 to 300 in 2010, to 71 in 2011, and 108 per tow in 2012. Figure 40 presents herring catches from the 2003-2012 DFO summer bottom trawl surveys. Figure 41 presents the 2000-2012 herring size distribution from the summer bottom trawl research survey for the entire 4VWX area. Herring abundance (number per tow) in the summer bottom trawl research survey increased in the Bay of Fundy from 51 (2010) to 219 (2011) and then decreased to 139 (2012). The overall 4VWX area showed a decreased in abundance from 158 in 2010 to 87 in 2011. This was followed by a further decrease to 83 in 2012 (Table 27).

OUTLOOK AND MANAGEMENT CONSIDERATIONS

The industry has been encouraged to explore and undertake structured surveys of the offshore area. Industry and DFO Science and Management branches continue to work together to improve the biological basis for management. There is little new information to add and no reason to change the previous recommendation that the initial catch allocation for 2013 should not exceed the 12,000t as described in the fishing plan (DFO 2003b).

COASTAL (SOUTH SHORE, EASTERN SHORE AND CAPE BRETON) NOVA SCOTIA SPAWNING COMPONENT

There is no quota for the coastal Nova Scotia spawning component and, apart from three areas, the size and historical performance of spawning groups are poorly documented. A fourth area, the Bras d'Or Lakes, has had no research or surveys for herring since 2000, and this fishery remains closed. Since 1996, as the inshore gillnet roe fisheries off Glace Bay, East of Halifax and Little Hope have developed, participants have contributed to sampling and surveying, and the fisheries have attempted to follow the 'survey, assess, fish' protocol. In addition to the traditional bait and personal-use fisheries, directed roe fisheries have occurred on several spawning grounds since the 1990's (Clark et al. 1999).

THE FISHERY AND RESOURCE STATUS

The landings in the gillnet roe fisheries along the coast of Nova Scotia decreased from 9,780t in 2009 to 5,573t in 2010. There was continued declines in 2011 (3,604t) and in 2012 (2,956t) (Table 28, part a).

Little Hope/Port Mouton

The 2011 herring gillnet fishery in Little Hope/Port Mouton area extended to November 8, 2011. The total catch declined to 2,564t from 3,106t in 2010. The catches occurred in three main areas; off Port Mouton, near Liverpool, and Port Medway (Figure 42A). The 2012 herring gillnet fishery in Little Hope/Port Mouton area extended to October 31, 2012. The total catch was down

slightly to 2,150tt from 2,564t in 2011. The catches occurred in three main areas; off Port Mouton, near Liverpool, and Port Medway (Figure 42B).

In 2011, six acoustics surveys were conducted in the Little Hope/ Port Mouton area between September 27 and October 28. Only five surveys were used to determine the biomass estimate because one survey was conducted on the same school five days after it had been surveyed. Surveyed biomass increased in the Little Hope/Port Mouton area from 26,700t in 2010 to 28,796t in 2011. In 2012, there were four acoustics surveys conducted in the Little Hope/ Port Mouton area between September 27 and October 28, but only three were used to determine the biomass estimate because two surveys were on the same schools so only one was used. Surveyed biomass in the Little Hope/Port Mouton area decreased to 12,756t in 2012 and as a result, the SSB fell below the recent five-year average of 23,870t (Table 28, part b; Figure 43).

East of Halifax (4W Eastern Shore)

Landings decreased from 2,456t in 2010 to 1,040t in 2011 and 799t in 2012 in the Eastern Shore area (Table 28, part a; figures 44A, 44B and 45). This was primarily a herring roe fishery with catches reported from three main areas; near Halifax Harbour approaches, southwest of Jeddore Head, and south of Ship Harbour (Figure 44A and 44B). There were no catches in 2012 above Jeddore Head (Figure 44B).

In 2011, four surveys were completed in the area between September 22 and October 19, but only three surveys were used to estimate the biomass. The surveyed biomass in the Halifax/Eastern shore area deceased in from 27,700t in 2010 to 5,498t in 2011. In 2012, two surveys were completed in the area on October 3 and 28 and both were used to estimate the biomass. The surveyed biomass in the Halifax/Eastern shore area further deceased from 5,498t in 2011 to 3,668t 2012 and as a result the SSB fell below the recent five-year average of 24,273t observed for this area (Table 28, part b; Figure 45).

Glace Bay

There were no landings reported in 2011 and only 7t reported for Glace Bay in 2012 (Table 28 part a; Figure 46). Survey coverage for the Glace Bay area was poor in 2011 with only one survey September 15. Few spawning herring were documented in 2011 with an estimated biomass for the area at 51t (Figure 46). There were no surveys completed in 2012.

Bras d'Or Lakes

This fishery remained closed. No sampling or acoustic surveys have been undertaken in the Bras d'Or lakes to document the size distribution or abundance of herring since 2000. It has been noted since 1997 that the status of herring in the Bras d'Or Lakes is cause for concern. With no sampling or acoustic surveys in recent years, there is no evidence to support any change. It is, therefore, appropriate to reiterate, from a biological perspective, that no fishing should take place on this spawning component.

Age Composition

In 2011 and 2012, the age composition of the catch for the overall coastal Nova Scotia spawning component was primarily adult herring from this size selective gillnet fishery with a substantial proportion (99%, 2011 and 97%, 2012) at age 4 and older (Table 29A and 29B; Figure 47A and 47B).

OUTLOOK AND MANAGEMENT CONSIDERATIONS

Management approaches and recent research efforts have improved knowledge in three areas (Little Hope/Port Mouton, Halifax/Eastern Shore and Glace Bay), but there has been no

information for any adjacent areas. The lack of surveys in Glace Bay means that no biomass estimates can be identified for the area.

Individual spawning groups within the entire coastal component are considered vulnerable to fishing because of their relatively small size and proximity to shore. It has been recommended that no coastal spawning area experience a large effort increase in new areas until enough information is available to evaluate the status of the new group.

Since 1997, the status of herring in the Bras d'Or Lakes has been recognized as cause for concern. Since there has been no research or surveys in recent years, it is appropriate to reiterate that no fishing should take place on this spawning component.

The main areas for Little Hope/Port Mouton and Halifax/Eastern Shore use a five-year average of recent catches and/or 10% of surveyed acoustic biomass calculated with the CIF to set annual removals. The provision to document sufficient quantities of fish each year before the fishery begins was waived in some years due to substantial abundances. It is recommended that given the recent decreases in survey biomass from year to year, the "survey, assess, then fish" protocol should be adhered to.

SOUTHWEST NEW BRUNSWICK MIGRANT JUVENILES

The SWNB weir and shutoff fisheries have relied, for over a century, on the aggregation of large numbers of juvenile herring (ages 1-3) near shore at the mouth of the Bay of Fundy. These fish have been considered to be a mixture of juveniles, dominated by those originating from NAFO Subarea 5 spawning components, and have, therefore, been excluded from the 4WX quota.

The success of this passive fishery is historically unpredictable, and catches are inherently susceptible to many natural variables in addition to abundance. The number and distribution of active weirs have decreased over the past decade, due in part to the conversion of sites to aquaculture, as well as reduced landings in the past 30 years in the Passamaquoddy Bay area (Table 10). Figure 48A and 48B present the locations of the New Brunswick weirs and the corresponding catches for the 2011 and 2012 fishing seasons.

Landings in the New Brunswick weir and shut-off fishery decreased from 10,671t in 2010 to 2.643t in 2011. In 2012, landings further decreased to 494t, the lowest since 1963. It is notable that in 2007 landings were 30,944t, the highest in nearly 20 years and higher than the long term average of 19,832t (Table 30; Figure 49). The age distribution of fish caught in the New Brunswick weir and shutoff fishery were mostly juveniles, which are well suited to the sardine market, with 54% at age 2 in 2011 (Table 31A, Figure 50A) and 80% at age 1 in 2012 (Table 31B; Figure 50B). The number of weirs with catches (number of active weirs) decreased in the 2011 and 2012 seasons, decreasing from 77 in 2010 to 37 in 2011 and down to only 4 in 2012 (Table 10).

5Z GEORGES BANK

The activities of midwater trawlers and herring purse seiners on the Canadian portion of Georges Bank (area 5Z) are monitored using the Vessel Monitoring System (VMS) and there were no trips to the area and no reported landings in 2011 and 2012.

ACKNOWLEDGEMENTS

The authors would like to thank the following for their invaluable contributions to the provision of survey data and other assistance in the preparation of this report: Atlantic Herring Co-Op, Cape

Breeze Seafoods, Comeau's Sea Foods Ltd., Connors Bros. Ltd., Herring Science Council, Eastern Shore Fishermen's Protective Association, Fundy Weir Fishermen's Association, Glace Bay herring gillnet group, Little Hope Management Committee, Scotia Garden Seafood Inc., and South-West Seiners.

REFERENCES

Clark, D.S., K.J. Clark, R. Claytor, S. Leslie, G.D. Melvin, J.M. Porter, M.J. Power, H.H. Stone, C. Waters. 2012. Limit Reference Point for Southwest Nova Scotia / Bay of Fundy spawning component of Atlantic herring, *Clupea harengus* (German Bank and Scots Bay). DFO Can. Sci. Advis. Sec. Res. Doc. 2012/025. iii + 14 p.

Clark, K.J., D. Rogers, H. Boyd, and R.L. Stephenson. 1999. Questionnaire survey of the coastal Nova Scotia herring fishery, 1998. DFO Can. Stock Assess. Sec. Res. Doc. 99/137: 54 p.

DFO. 1997. In-season management in the 4WX herring fishery. DFO Mar. Reg. Sci. Fish. Status Rep. 97/2E: 5 p.

DFO. 2003a. Atlantic herring: Georges Bank, Nantucket Shoals, Gulf of Maine stock complex. DFO Sci. Stock Status Rep. 2003/028: 7 p.

DFO. 2003b. 2003-2006 Scotia-Fundy Fisheries Integrated Herring Management Plan, NAFO subdivisions 4WX, 4Vn and 5Z. Fisheries and Oceans Canada, Ottawa, Ontario.

DFO. 2007. Proceedings of the Maritimes Provinces Regional Advisory Process on the assessment framework for 4VWX herring stocks; 31 October–1 November 2006 and 9–11 January 2007. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2007/002: 52 p.

Hunt, J.J., G. Martin, and G.A. Chouinard. 1986. The effect of freezer storage on herring length and maturity stage determination. Can. Atl. Fish. Sci. Adv. Comm. Res. Doc. 86/89: 13 p.

Maxner, E.E., G.D. Melvin, and M.J. Power. 2010. The 2009 German Bank spawning ground tagging turnover rates. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/110: vi + 34 p.

Melvin, G.D., R. Martin, and M.J. Power. 2013. Estimating German Bank and Scots Bay spawning ground turnover rates from tag returns. Can. Sci. Advis. Sec. Res. Doc (in preparation).

Melvin, G.D., and M.J. Power. 1999. A proposed acoustic survey design for 4WX herring spawning components. DFO Can. Stock Assess. Sec. Res. Doc. 99/63: 15 p.

Power, M.J., R.L. Stephenson, G.D. Melvin, and F.J. Fife. 2002. 2002 evaluation of 4VWX herring. DFO Can. Sci. Advis. Sec. Res. Doc. 2002/057: 59 p.

Power, M.J., R.L. Stephenson, K.J. Clark, F.J. Fife, G.D. Melvin, and L.M. Annis. 2004. 2004 evaluation of 4VWX herring. DFO Can. Sci. Advis. Sec. Res. Doc. 2004/030: 123 p.

Power, M.J., K.J. Clark, F.J. Fife, D. Knox, G.D. Melvin, R.L. Stephenson, and L.M. Annis. 2006. 2006 evaluation of 4VWX herring. DFO Can. Sci. Advis. Sec. Res. Doc. 2006/049: 141 p.

Power, M.J., K.J. Clark, F.J. Fife, D. Knox, G.D. Melvin, and R.L. Stephenson. 2007. 2007 Evaluation of 4VWX herring. DFO Can. Sci. Advis. Sec. Res. Doc. 2007/040: 83 p.

Power, M.J., F.J. Fife, D. Knox, and G.D. Melvin. 2008. 2008 evaluation of 4VWX herring. DFO Can. Sci. Advis. Sec. Res. Doc. 2008/023: 80 p.

Power, M.J., F.J. Fife, D. Knox, and G.D. Melvin. 2010a. 2009 evaluation of 4VWX herring. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/111: vi + 89 p.

Power, M.J., G.D. Melvin, and A. Clay. 2010b. Summary of the 2009 herring acoustic surveys in NAFO divisions 4VWX. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/098: vi + 97 p.

Power, M.J., D. Knox, A. MacIntyre, G.D. Melvin, and R. Singh. 2013. 2011 Evaluation of 4VWX herring. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/085: iv + 85 p.

Sinclair, M. (Chair). 1997. Report of the Maritimes Region herring workshop, 18-19 February 1997. Can. Stock Assess. Proceed. Ser. 97/12: 58 p.

Stephenson, R.L., D.J. Gordon, and M.J. Power. 1987. Herring of the outer Scotian Shelf and Georges Bank: History of the fisheries, recent developments and management considerations. DFO Atl. Fish. Sec. Res. Doc. 87/76: 23 p.

Stephenson, R.L., M.J. Power, F.J. Fife, G.D. Melvin, K.J. Clark, and S. Gavaris. 1996. Evaluation of the stock status of 4WX herring. DFO Atl. Fish. Sec. Res. Doc. 96/28: 71 p.

Stephenson, R.L., K. Rodman, D.G. Aldous, and D.E. Lane. 1999. An in-season approach to management under uncertainty: The case of the SW Nova Scotia herring fishery. ICES J. Mar. Sci. 56: 1005-1013.

TRAC. 2006. Gulf of Maine-Georges Bank Herring Stock Complex. TRAC Status Rep. 2006/01: 6 p.

TABLES

Table 1A. 4VWX herring fishery landings (t) by month, gear sector, and management unit for 2010-2011 quota year.

			Month												
2010-2011 quota year	**Area**	**Gear**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
S.W. Nova Scotia	4X	Fall P. Seine (2010)										878	706		1,584
	4X	Winter P. Seine (2011)	NO WINTER FISHERY												-
	4X	Summer P. Seine (2011)					970	6,498	10,168	5,413	17,302	6,433			46,784
	4X	Gillnet "Stock" (2011)								81	558				638
	4X	N.S. Weirs (2011)						4	499	395	106				1,004
S.W. Nova Scotia total for 2010-2011 quota year							970	6,502	10,667	5,888	17,965	7,311	706		50,010
Coastal Nova Scotia (South Shore, Eastern Shore, Cape Breton)	4Vn, 4X	Trap					0	1	1	0			0		2
	4Vn	Glace Bay Gillnet					0	0	0						0
	4W	Eastern Shore Gillnet				0	1	0			883	156			1,040
	4X	Little Hope Gillnet						1			1,603	949	12		2,564
Coastal Nova Scotia total for 2011 calendar year			-	-	-	-	1	2	1	0	2,486	1,104	12		3,606
Offshore Scotian Shelf	4WX	Offshore P. Seine					8,579	1,876							10,455
	4WX	Bottom Trawl + Misc.	0	0	0	1	2	7	3	0	8	5	1	0	27
Offshore Scotian Shelf total for 2011 calendar year			0	0	0	1	8,581	1,883	3	0	8	5	1	0	10,482
S.W. New Brunswick Migrant Juveniles	4X	N.B. Weirs						250	656	1,097	500	140			2,643
	4X	N.B. Shutoff								291	648	129			1,068
S.W. New Brunswick Migrant Juveniles for 2011 calendar year							-	250	656	1,388	1,148	269			3,711
														Total 2010-2011	67,809

Table 1B. 4VWX herring fishery landings (t) by month, gear sector and management unit for 2011-2012 quota year.

			Month												
2011-2012 quota year	**Area**	**Gear**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
S.W. Nova Scotia	4X	Fall P. Seine (2011)										754	323		1,077
	4X	Winter P. Seine (2012)													-
	4X	Summer P. Seine (2012)					1,429	3,858	5,245	15,273	15,274	4,839			45,918
	4X	Gillnet "Stock" (2012)				0	0			92	378				471
	4X	N.S. Weirs (2012)					6		100	9	35				149
S.W. Nova Scotia total for 2011-2012 quota year							1,435	3,858	5,345	15,373	15,687	5,593	323	-	47,614
Coastal Nova Scotia	4Vn, 4X	Trap				49	2								52
(South Shore,	4Vn	Cape Breton Gillnet				0	3	2	1	-	-	1			7
Eastern Shore,	4W	Eastern Shore Gillnet									412	387			799
Cape Breton)	4X	Little Hope Gillnet					0			0	958	1,191			2,150
Coastal Nova Scotia total for 2012 calendar year							5	2	1	0	1,371	1,579			3,007
Offshore Scotian Shelf	4WX	Offshore P. Seine				26	869	315							1,210
	4WX	Bottom Trawl + Misc.	0	1	2	1	9	11	1	0	12	3	3	1	45
Offshore Scotian Shelf total for 2012 calendar year			0	1	2	27	878	326	1	0	12	3	3	1	1,255
S.W. New Brunswick	4X	N.B. Weirs					29	140	5	5	98	217			494
Migrant Juveniles	4X	N.B. Shutoff								10		0			10
S.W. New Brunswick Migrant Juveniles for 2012 calendar year							29	140	5	15	98	217			504
														Total 2011-2012	52,381

Table 2A. 4WX herring fishery landings (t) by month and gear sector for 2011-2012 quota year (as of December 20, 2011).

			Month												
Year	**Area**	**Gear**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
2011-2012 quota year	4X	Fall 2011 P. Seine										754	323		1,077
		Winter 2012 P. Seine													-
2012 Calendar year	4VWX	TBA													-
2011-2012 Total (from Oct. 15, 2011 to date)												754	323		1,077

Table 2B. 4WX herring fishery landings (t) by month and gear sector for 2012-2013 quota year (as of February 1, 2013).

			Month												
Year	**Area**	**Gear**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
2012-2013 quota year	4X	Fall 2012 P. Seine										247	111		358
		Winter 2013 P. Seine													-
2013 Calendar year	4VWX	Misc. Trawl	6												6
2012-2013 Total (from Oct. 15, 2012 to date)			6									247	111		364

Table 3. Historical series of nominal and adjusted annual landings (t) by major gear components and seasons of the 4WX herring fishery from 1963-2012. The 1963-1973 offshore Scotian Shelf landings are from Stephenson et al. (1987).

Year^	4W Winter Purse Seine	4Xs Fall & Winter Purse Seine	4Xqr Summer Purse Seine	4X Summer Gillnet	4Xr Nova Scotia Weir	4WX Stock Nominal Landings	4WX Stock Adjusted Landings*	4WX Stock TAC	Non-Stock 4Xs N.B. Weir & Shutoff	4VWX Coastal Nova Scotia	Offshore Scotian Shelf Banks	Total 4VWX Adjusted Landings
1963		6,871	15,093	2,955	5,345	30,264	30,264		29,366		3,000	62,630
1964		15991	24,894	4,053	12,458	57,396	57,396		29,432		2,000	88,828
1965		15,755	54,527	4,091	12,021	86,394	86,394		33,346		6,000	125,740
1966		25,645	112,457	4,413	7,711	150,226	150,226		35,805		2,000	188,031
1967		20,888	117,382	5,398	12,475	156,143	156,741		30,032		1,000	187,773
1968		42,223	133,267	5,884	12,571	193,945	196,362		33,145		18,000	247,507
1969	25,112	13,202	84,525	3,474	10,744	137,057	150,462		26,539		121,000	298,001
1970	27,107	14,749	74,849	5,019	11,706	133,430	190,382		15,840		87,000	293,222
1971	52,535	4,868	35,071	4,607	8,081	105,162	129,101		12,660		28,000	169,761
1972	25,656	32,174	61,158	3,789	6,766	129,543	153,449		32,699		21,000	207,148
1973	8,348	27,322	36,618	5,205	12,492	89,985	122,687		19,935		14,000	156,622
1974	27,044	10,563	76,859	4,285	6,436	125,187	149,670		20,602			170,272
1975	27,030	1,152	79,605	4,995	7,404	120,186	143,897		30,819			174,716
1976	37,196	746	58,395	8,322	5,959	110,618	115,178		29,206			144,384
1977	23,251	1,236	68,538	18,523	5,213	116,761	117,171	109,000	23,487			140,658
1978	17,274	6,519	57,973	6,059	8,057	95,882	114,000	110,000	38,842			152,842
1979	14,073	3,839	25,265	4,363	9,307	56,847	77,500	99,000	37,828			115,328
1980	8,958	1,443	44,986	19,804	2,383	77,574	107,000	65,000	13,525			120,525
1981	18,588	1,368	53,799	11,985	1,966	87,706	137,000	100,000	19,080			156,080
1982	12,275	103	64,344	6,799	1,212	84,733	105,800	80,200	25,963			131,763
1983	8,226	2,157	63,379	8,762	918	83,442	117,400	82,000	11,383			128,783
1984	6,336	5,683	58,354	4,490	2,684	77,547	135,900	80,000	8,698			144,598
1985	8,751	5,419	87,167	5,584	4,062	110,983	165,000	125,000	27,863			192,863
1986	8,414	3,365	56,139	3,533	1,958	73,409	100,000	97,600	27,883			127,883
1987	8,780	5,139	77,706	2,289	6,786	100,700	147,100	126,500	27,320			174,420
1988	8,503	7,876	98,371	695	7,518	124,653	199,600	151,200	33,421			233,021
1989	6,169	5,896	68,089	95	3,308	83,557	97,500	151,200	44,112			141,612
1990	8,316	10,705	77,545	243	4,049	102,627	172,900	151,200	38,778			211,678
1991	17,878	2,024	73,619	538	1,498	97,010	130,800	151,200	24,576			155,376
1992	14,310	1,298	80,807	395	2,227	100,227	136,000	125,000	31,967			167,967
1993	10,731	2,376	81,478	556	2,662	98,464	105,089	151,200	31,573			136,662
1994	9,872	3,174	64,509	339	2,045	80,099	80,099	151,200	22,241			102,340
1995	3,191	7,235	48,481	302	3,049	62,499	62,499	80,000	18,248			80,747
1996	2,049	3,305	42,708	6,340	3,476	58,068	58,068	57,000	15,913	1,450	11,745	87,176
1997	1,759	2,926	40,357	6,816	4,019	56,117	56,117	57,000	20,552	2,340	20,261	99,270
1998	1,405	1,494	67,433	2,231	4,464	77,027	77,027	90,000	20,091	4,120	5,591	106,829
1999	1,235	4,764	64,432	1,660	5,461	77,552	77,552	105,000	18,644	5,618	12,646	114,460
2000	1,012	4,738	78,010	823	701	85,284	85,284	100,000	16,829	4,283	2,182	108,578
2001	0	4,001	62,004	1,857	3,708	71,570	71,570	78,000	20,209	6,006	12,503	110,288
2002	367	5,257	69,894	393	1,143	77,054	77,054	78,000	11,874	10,375	7,039	106,342
2003	0	8,860	79,140	439	921	89,360	89,360	93,000	9,003	9,162	998	108,523
2004	0	5,659	69,015	225	3,130	78,029	78,029	83,000	20,686	6,924	4,165	109,804
2005	0	2,601	43,487	566	2,245	48,899	48,899	50,000	13,055	6,311	5,263	73,528
2006	0	930	45,002	719	2,508	49,159	49,159	50,000	12,863	6,566	9,809	78,397
2007	0	1,847	46,045	1,334	1,130	50,356	50,356	50,000	30,944	5,240	5,385	91,925
2008	0	2,000	50,022	15	2,524	54,561	54,561	55,000	6,447	3,704	918	65,631
2009	0	2,807	50,802	117	387	54,113	54,113	55,000	4,031	9,783	9,088	77,015
2010	0	2,787	41,345	204	1,198	45,534	45,534	55,000	10,958	5,575	11,862	73,929
2011	0	1,584	46,784	638	1,004	50,010	50,010	50,000	3,711	3,606	10,482	67,809
2012	0	1,077	45,918	471	149	47,614	47,614	50,000	504	3,007	1,255	52,381

^Annual landings by purse seiners are defined for the period from October 15 of the preceding year to October 14 of the current year.

*Adjusted totals includes misreporting adjustments for 1978-84 (Mace 1985) and for 1985-93 (Stephenson 1993; Stephenson et al 1994).

All landings by other gear types are for the calendar year.

Table 4A. Herring purse seine catches (t) by fishing ground areas (as identified from the 10-mile boxes shown in Figure 4) from 1985-2012 for the 4WX stock component. Note: The German Bank fishing ground area used in these tables is not the same as the catch box used to define the German Bank acoustic survey box used in Table 6.

a) Purse seine catches (t) by grounds for the stock area from 1985-2012 (with -ve deviations shaded).

Stock Areas	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Browns Bank		732						86		1,903	1,554	40	14	3,139	2,197	1,137	486
Chedabucto Bay	4,216	7,498	6,374	7,523	8,325	12,470	12,596	3,084	1,378	1,407	2,049	1,759		1,583	1,151	10	
Gannet,Dry Ledge	5,675	2,187	1,474	14,901	2,010	4,213	6,294	18,527	2,935	2,588	2,693	1,963	4,590	4,156	10,296	12,674	3,877
German Bank	15,522	13,346	16,547	18,392	8,087	11,744	23,193	3,235	4,045	9,662	19,549	15,898	13,576	20,556	24,660	25,631	24,139
Grand Manan	4,989	5,823	4,298	4,440	4,300	5,442	4,225	2,722	783	6,846	5,297	6,005	5,312	15,983	7,912	18,185	10,545
Long Island	974	3,365	7,499	10,722	21,719	18,484	9,470	3,213	2,814	7,666	7,906	4,385	3,557	12,360	18,286	11,199	12,904
Lurcher	476	132		2,928	18	65	151	2,141	1,560	530	382	243	599	57		715	227
N.B. Coastal	188	621	960	1,031	3,033	2,347	488	992	598	99	1,502	271	1,176	782	1,867	361	1,250
Pollock Point																	1,563
S.W. Grounds	558	1,108	184	181	276	56	521	225	2,961	3,444	6,205	3,035	797	1,239	3,241	1,879	53
Scots Bay		36	3,822	4,145	6,583	9,003	7,982	7,987	5,258	10,840	980	8,984	4,894	8,210	1,789	10,926	10,739
Seal Island	13,818	8,894	11,560	19,019	23,420	25,344	12,740	10,455	3,874	2,820	465	1,567	492	617	567	206	101
Trinity	35,860	13,505	18,744	18,539	266	1,113	3,259	4,612	1,348	2,366	370	3,448	5,308	2,825	1,220	103	113
Yankee Bank				194	250	3,647	817	119	10	175	323	9	4	159	82	133	8
Unknown	184	500	200			200	579	494	140		73			62	84	27	
Total Purse Seine	82,458	57,745	71,661	102,015	78,287	94,127	82,314	57,888	27,703	50,345	49,348	47,606	40,319	71,727	73,350	83,186	66,005

Stock Areas	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Recent 5 year	Recent Decade	All Year Avg	2012 vs 2011	2012 vs 5 year	2012 vs Decade	2012 vs Overall
Browns Bank			45		88	34					21	21	47	765			-26	-744
Chedabucto Bay														4,762				-4,762
Gannet,Dry Ledge	9,047	6,965	4,456	3,117	6,764	11,344	10,006	8,656	771	2564	3177	5,035	5,782	5,997	613	-1,857	-2,605	-2,820
German Bank	22,355	21,573	14,175	14,171	16,522	15,085	22,437	19,354	17,859	21513	30253	22,283	19,294	17,253	8,740	7,970	10,958	13,000
Grand Manan	17,753	17,258	7,542	5,740	7,716	10,011	10,493	12,368	15,602	12493	4106	11,012	10,333	8,364	-8,387	-6,906	-6,227	-4,258
Long Island	6,642	12,639	13,115	8,037	1,884	4,604	3,207	2,983	1,658	590	160	1,720	4,888	7,573	-430	-1,560	-4,728	-7,413
Lurcher	7,683	1,872	7,268	1,692	2,809	2,305	684	3,676	348	1823	2050	1,716	2,453	1,632	227	334	-403	418
N.B. Coastal	3,113	3,914	2,707	787	1,889	851	2,205	5,023	2,864	1821	132	2,409	2,219	1,531	-1,689	-2,277	-2,087	-1,399
Pollock Point														1,563				-1,563
S.W. Grounds	791	73		1,228	1,206	30	752	178	169			366	519	1,216		-366	-519	-1,216
Scots Bay	8,202	19,196	24,869	6,239	3,352	4,116	2,373	902	4,165	5130	4940	3,502	7,528	6,876	-190	1,438	-2,588	-1,936
Seal Island	238	1,096		1,358	209		15	12			161	63	475	5,794	161	99	-314	-5,632
Trinity	1,609		370	1,448	3,725	112		325	616	1927	1255	1,031	1,222	4,784	-672	224	33	-3,529
Yankee Bank	78			528	2	62	178	131				155	180	345		-155	-180	-345
Unknown		1,103	127	181	396	39		14			20	17	269	246	20	3	-249	-226
Total Purse Seine	77,511	85,689	74,674	44,526	46,561	48,594	52,350	53,621	44,052	47,861	46,276	48,832	54,420	62,779	-1,585	-2,556	-8,145	-16,503

Table 4B. Herring purse seine catches (%) by fishing ground areas (as identified from the 10-mile boxes shown in Figure 4) from 1985-2012 for the 4WX stock component.

b) Purse seine % by grounds for the stock area from 1985-2012 (with -ve deviations shaded).

Stock Areas	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Browns Bank		1%						0%		4%	3%	0%	0%	4%	3%	1%	1%
Chedabucto Bay	5%	13%	9%	7%	11%	13%	15%	5%	5%	3%	4%	4%		2%	2%	0%	
Gannet,Dry Ledge	7%	4%	2%	15%	3%	4%	8%	32%	11%	5%	5%	4%	11%	6%	14%	15%	6%
German Bank	19%	23%	23%	18%	10%	12%	28%	6%	15%	19%	40%	33%	34%	29%	34%	31%	37%
Grand Manan	6%	10%	6%	4%	5%	6%	5%	5%	3%	14%	11%	13%	13%	22%	11%	22%	16%
Long Island	1%	6%	10%	11%	28%	20%	12%	6%	10%	15%	16%	9%	9%	17%	25%	13%	20%
Lurcher	1%	0%		3%	0%	0%	0%	4%	6%	1%	1%	1%	1%	0%		1%	0%
N.B. Coastal	0%	1%	1%	1%	4%	2%	1%	2%	2%	0%	3%	1%	3%	1%	3%	0%	2%
Pollock Point																	2%
S.W. Grounds	1%	2%	0%	0%	0%	0%	1%	0%	11%	7%	13%	6%	2%	2%	4%	2%	0%
Scots Bay		0%	5%	4%	8%	10%	10%	14%	19%	22%	2%	19%	12%	11%	2%	13%	16%
Seal Island	17%	15%	16%	19%	30%	27%	15%	18%	14%	6%	1%	3%	1%	1%	1%	0%	0%
Trinity	43%	23%	26%	18%	0%	1%	4%	8%	5%	5%	1%	7%	13%	4%	2%	0%	0%
Yankee Bank				0%	0%	4%	1%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%
Unknown	0%	1%	0%			0%	1%	1%	1%		0%			0%	0%	0%	
Total Purse Seine	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Stock Areas	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Recent 5yr 5 year	Recent 10yr Decade	All Year Avg	2012 vs 2011	2012 vs 5 year	2012 vs Decade	2012 vs Overall
Browns Bank			0%		0%	0%					0%	0%	0%	1%	0%	0%	0%	-1%
Chedabucto Bay														4%				-4%
Gannet,Dry Ledge	12%	8%	6%	7%	15%	23%	19%	16%	2%	5%	7%	10%	11%	10%	2%	-3%	-4%	-3%
German Bank	29%	25%	19%	32%	35%	31%	43%	36%	41%	45%	65%	46%	37%	29%	20%	19%	28%	36%
Grand Manan	23%	20%	10%	13%	17%	21%	20%	23%	35%	26%	9%	23%	19%	14%	-17%	-14%	-11%	-5%
Long Island	9%	15%	18%	18%	4%	9%	6%	6%	4%	1%	0%	3%	8%	11%	-1%	-3%	-8%	-11%
Lurcher	10%	2%	10%	4%	6%	5%	1%	7%	1%	4%	4%	3%	4%	3%	1%	1%	0%	2%
N.B. Coastal	4%	5%	4%	2%	4%	2%	4%	9%	7%	4%	0%	5%	4%	3%	-4%	-5%	-4%	-2%
Pollock Point														0%				-0%
S.W. Grounds	1%	0%		3%	3%	0%	1%	0%	0%			0%	1%	2%		-0%	-1%	-2%
Scots Bay	11%	22%	33%	14%	7%	8%	5%	2%	9%	11%	11%	7%	12%	11%	-0%	3%	-2%	-0%
Seal Island	0%	1%		3%	0%		0%	0%			0%	0%	1%	7%	0%	0%	-0%	-6%
Trinity	2%		0%	3%	8%	0%		1%	1%	4%	3%	2%	2%	7%	-1%	1%	1%	-4%
Yankee Bank	0%			1%	0%	0%	0%	0%				0%	0%	0%		-0%	-0%	-0%
Unknown		1%	0%	0%	1%	0%		0%			0%	0%	0%	0%	0%	0%	-0%	-0%
Total Purse Seine	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%				

Table 5. Herring purse seine catches (t) and percentage by fishing ground for 1985 to 2012 from non-stock areas.

a) Purse seine catches (t) by grounds for non-stock areas from 1985-2012 (with -ve deviations shaded).

Non-stock Areas	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Georges Bank						91	64			266		2,491	79			265	
Liverpool							13		4,067	4,177							
Shelburne			59				64		526	161		56					
Halifax									652	1,945		585	455			1,002	472
Offshore Banks												11,800	18,770	4,284	8,669	1,645	3,977
Western Hole		41	154				213	3,451	2,255	1,495	108	127	691	1,012	1,057	47	7,712
Non-stock Total		41	213			91	353	3,451	7,500	8,044	108	15,058	19,995	5,296	9,726	2,958	12,161

Non-stock Areas	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Recent 5yr 5 year	Recent 10yr Decade	All Year Avg	2012 vs 2011	2012 vs 5 year	2012 vs Decade	2012 vs Overall
Georges Bank														542				-542
Liverpool														2,752				-2,752
Shelburne				29									29	128			-29	-128
Halifax	367												184	685			-184	-685
Offshore Banks	5,078	722	4,054	4,115	4,846	2,515	829	8,918	7,432	10,455	949	6,030	4,896	5,771	-9,506	-5,081	-3,947	-4,822
Western Hole	1,884	156		214	192	220	52	114	4,405		261	1,198	905	1,219	261	-937	-644	-958
Non-stock Total	7,329	878	4,054	4,358	5,038	2,735	881	9,032	11,837	10,455	1,210	6,988	5,660	11,097	-9,245	-5,778	-4,450	-9,887

b) Percentage by grounds for non-stock areas from 1985-2012 (with -ve deviations shaded).

Non-stock Areas	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Georges Bank						100%	18%			3%		17%	0%			9%	
Liverpool							4%		54%	52%							
Shelburne			28%				18%		7%	2%		0%					
Halifax									9%	24%		4%	2%			34%	4%
Offshore Banks												78%	94%	81%	89%	56%	33%
Western Hole		100%	72%				60%	100%	30%	19%	100%	1%	3%	19%	11%	2%	63%
Non-stock Total		100%	100%			100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Non-stock Areas	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Recent 5yr 5 year	Recent 10yr Decade	All Year Avg	2012 vs 2011	2012 vs 5 year	2012 vs Decade	2012 vs Overall
Georges Bank														6%				-6%
Liverpool														4%				-4%
Shelburne				1%									0%	2%			-0%	-2%
Halifax	5%												1%	3%			-1%	-3%
Offshore Banks	69%	82%	100%	94%	96%	92%	94%	99%	63%	100%	78%	90%	89%	56%	-22%	-11%	-11%	22%
Western Hole	26%	18%		5%	4%	8%	6%	1%	37%		22%	10%	10%	28%	22%	11%	11%	-6%
Non-stock Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%				

Table 6. German Bank acoustic catch area (dotted line large box) as shown in figures 12 and 13 herring catches (includes purse seines and gillnets) for 1985-2012 with start date, end date, catch before August 15 (pre-spawning period), catch after August 14 (defined as spawning period), and proportion of TAC.

Year	Start Date	End Date	Duration No. Days	Total No. Slips	Catch before Aug. 15 (prespawn)	Catch on/ after Aug. 15 (spawning)	Total Catch t	% Catch on/after Aug-14	TAC	German as % TAC
1985	22-Jun-85	08-Oct-85	109	428	8,856	14,228	23,084	62%	125,000	18%
1986	18-Jun-86	01-Oct-86	106	349	2,349	13,542	15,892	85%	97,600	16%
1987	26-May-87	14-Oct-87	142	403	5,138	13,218	18,357	72%	126,500	15%
1988	29-May-88	06-Oct-88	131	610	14,776	18,348	33,125	55%	151,200	22%
1989	28-May-89	15-Oct-89	141	313	2,061	12,087	14,148	85%	151,200	9%
1990	23-May-90	23-Oct-90	154	428	1,220	23,647	24,867	95%	151,200	16%
1991	02-Jun-91	15-Oct-91	136	621	11,800	18,328	30,127	61%	151,200	20%
1992	31-May-92	04-Oct-92	127	556	13,175	10,985	24,160	45%	125,000	19%
1993	24-May-93	29-Sep-93	129	192	7,912	1,092	9,003	12%	151,200	6%
1994	05-May-94	28-Sep-94	147	252	1,186	11,454	12,641	91%	151,200	8%
1995	05-Jun-95	06-Oct-95	124	301	434	21,339	21,773	98%	80,000	27%
1996	20-Jun-96	27-Oct-96	130	260	2,229	16,091	18,320	88%	57,000	32%
1997	11-Jul-97	14-Oct-97	96	327	2,009	17,110	19,119	89%	57,000	34%
1998	10-Jun-98	14-Oct-98	127	516	3,231	21,489	24,720	87%	90,000	27%
1999	20-Apr-99	20-Oct-99	184	666	18,508	16,401	34,909	47%	105,000	33%
2000	18-Apr-00	26-Oct-00	192	598	9,806	26,171	35,977	73%	100,000	36%
2001	22-May-01	20-Oct-01	152	521	5,312	22,156	27,468	81%	78,000	35%
2002	18-Apr-02	12-Oct-02	178	643	10,871	19,935	30,806	65%	78,000	39%
2003	05-May-03	15-Oct-03	164	392	8,900	20,070	28,970	69%	93,000	31%
2004	10-May-04	15-Oct-04	159	238	5,680	12,345	18,025	68%	83,000	22%
2005	16-May-05	13-Oct-05	151	364	8,069	12,039	20,107	60%	50,000	40%
2006	27-Jun-06	16-Oct-06	112	475	12,227	12,504	24,731	51%	50,000	49%
2007	15-May-07	05-Oct-07	144	540	13,948	13,307	27,255	49%	50,000	55%
2008	03-May-08	16-Oct-08	167	590	16,845	14,447	31,291	46%	55,000	57%
2009	05-May-09	13-Oct-09	162	502	12,092	16,454	28,546	58%	55,000	52%
2010	03-May-10	14-Oct-10	165	382	1,804	17,158	18,961	90%	55,000	34%
2011	03-May-11	13-Oct-11	164	421	5,512	19,175	24,687	78%	50,000	49%
2012	02-May-12	27-Oct-12	179	780	5,369	29,582	34,951	85%	50,000	70%

Table 7. Scots Bay herring purse seine catches for 1987-2012.

Year	Min. Date	Max. Date	Duration in Days	Days with Catch	Catch t	No. Slips	Catch/Day with Catch	Catch/Slip
1987	08-Jul-87	06-Aug-87	30	20	3,398	91	169.88	37.34
1988	20-Jul-88	29-Jul-88	10	9	3,780	65	419.99	58.15
1989	19-Jul-89	13-Sep-89	57	35	6,021	164	172.04	36.72
1990	22-Jul-90	14-Aug-90	24	11	8,088	108	735.24	74.89
1991	05-Jul-91	14-Aug-91	41	16	7,365	163	460.30	45.18
1992	25-Jul-92	11-Aug-92	18	18	7,960	189	442.22	42.12
1993	25-Jul-93	01-Sep-93	39	32	5,228	100	163.36	52.28
1994	10-Jul-94	25-Aug-94	47	36	10,610	286	294.72	37.10
1995	24-Jul-95	26-Jul-95	3	3	907	33	302.33	27.48
1996	25-Jul-96	20-Aug-96	27	13	8,939	151	687.58	59.20
1997	30-Jul-97	27-Aug-97	29	19	4,847	91	255.11	53.26
1998	20-Jul-98	10-Sep-98	53	29	7,880	163	271.72	48.34
1999	19-Jul-99	17-Aug-99	30	16	1,789	40	111.81	44.73
2000	25-Jul-00	30-Aug-00	37	26	10,853	171	417.44	63.47
2001	10-Jul-01	21-Aug-01	43	30	10,739	176	357.97	61.02
2002	22-Jul-02	09-Sep-02	50	36	7,994	160	222.06	49.96
2003	21-Jul-03	05-Sep-03	47	34	19,196	237	564.59	81.00
2004	19-Jul-04	16-Sep-04	60	42	24,388	330	580.67	73.90
2005	26-Jul-05	09-Sep-05	46	27	5,872	96	217.48	61.17
2006	24-Jul-06	04-Sep-06	43	16	3,352	43	209.50	77.95
2007	16-Jul-07	31-Aug-07	47	21	4,116	79	196.00	52.10
2008	14-Jul-08	27-Aug-08	45	14	2,373	43	169.50	55.19
2009	12-Jul-09	11-Aug-09	31	8	902	18	112.75	50.11
2010	09-Jul-10	07-Sep-10	61	17	4,086	70	240.35	58.37
2011	04-Jul-11	01-Sep-11	60	16	5,093	72	318.31	70.74
2012	02-Jul-12	28-Aug-12	58	10	4,940	78	494.00	63.33

Table 8. Summary of 1998- 2012 Spectacle Buoy and Trinity Ledge herring gillnet catches with start and end dates, catches, and overall amounts.

	Spec. Buoy catches and surveys				Trinity Ledge catches and surveys					Overall
Year	Start Day	End Day	Catch t	Survey SSB t*	Start Day	End Day	Catch t	Survey SSB t*	Exploitation Catch/ SSB	Stock Gillnet Catch(t)
1998	10-May-98	30-Jun-98	484	n/s	24-Aug-98	21-Sep-98	1,668	-	-	2,153
1999	10-May-99	16-Jul-99	355	n/s	12-Aug-99	15-Sep-99	1,257	3,885	32%	1,612
2000	11-Jun-00	14-Jun-00	80	n/s	30-Aug-00	12-Sep-00	734	621	118%	814
2001	11-Jun-01	10-Jul-01	699	1,110	21-Aug-01	26-Sep-01	1,012	14,797	7%	1,711
2002	15-May-02	01-Jul-02	137	n/s	02-Sep-02	30-Sep-02	256	8,096	3%	393
2003	04-Jun-03	06-Jun-03	69	1,420	21-Aug-03	18-Sep-03	369	12,117	3%	439
2004	17-Jun-04	15-Jul-04	5	n/s	02-Sep-04	15-Sep-04	225	12,022	2%	229
2005	09-Jun-05	11-Jul-05	124	290	05-Sep-05	20-Sep-05	447	10,701	4%	570
2006	03-Jun-06	22-Jun-06	2	n/s	23-Aug-06	21-Sep-06	717	16,076	4%	719
2007	07-May-07	22-Jun-07	243	310	27-Aug-07	20-Sep-07	1,091	3,113	35%	1,334
2008	29-May-08	19-Jun-08	6	0	21-Aug-08	25-Sep-08	7	516	1%	13
2009	11-Jun-09	25-Jun-09	0.2	n/s	01-Sep-09	11-Sep-09	116	1,575	7%	117
2010	02-Jun-10	19-Jun-10	-	1,859	09-Aug-11	24-Sep-10	202	2,405	8%	202
2011	22-Jun-11	29-Jun-11	1	282	09-Aug-11	20-Sep-11	638	7,316	9%	639
2012	31-May-12	31-May-12	-	n/s	15-Aug-12	18-Sep-12	448	2,754	16%	448
		Average	147	753	-	-	612	6,857	-	759

* Survey SSB calculated with CIF after 2003 inclusive.

Table 9. Monthly Nova Scotia weir landings (t) for 1978-2012.

YEAR	MONTH												Year Total
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
1978				1	490	3,704	2,990	239	46	111	198	79	7,858
1979					811	3,458	1,418	420	39	136	57		6,339
1980					69	647	1,271	395					2,383
1981					50	437	983	276	37		41		1,824
1982					16	267	468	195	172	12			1,130
1983				2	286	141	188	208	53		18		896
1984					113	1,032	736	602	220				2,702
1985					378	1,799	1,378	489			11		4,055
1986					385	403	71	704	390	5			1,957
1987					1,503	2,526	1,215	1,166	367				6,776
1988					1,217	2,976	1,696	1,204	386				7,480
1989					340	1,018	870	843	226				3,296
1990					208	973	1,482	879	538	52			4,132
1991				3	23	149	719	342	262				1,498
1992					35	659	405	754	371				2,224
1993					226	908	608	867	53				2,662
1994					111	736	499	519	180				2,045
1995					236	1,255	1,059	470	29				3,049
1996					430	1,267	1,232	358	188				3,476
1997					70	1,874	1,739	271	65				4,019
1998					1,304	1,677	390	359	317				4,048
1999					1,958	1,513	547	488	31				4,537
2000						16	151	326	191				683
2001					105	1,439	1,565	391	207				3,708
2002					23	95	240	558	228				1,143
2003					98	126	68	344	284				921
2004						667	873	1,370	219				3,130
2005				11	84	731	472	828	118				2,245
2006					195	138	414	1,447	182	115			2,491
2007					26	11	290	579	224				1,130
2008						1,136	381	836	171				2,524
2009						110	233	44	0				387
2010					89	391	320	398					1,198
2011						4	499	395	106				1,004
2012					6		100	9	35				149

YEAR	MONTH												Year Total
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
NS Average Catch (t)				5	363	1,008	788	559	185	72	65	79	2,831
NS Minimum Catch (t)				1	6	4	68	9	0	5	11	79	149
NS Maximum Catch (t)				11	1,958	3,704	2,990	1,447	538	136	198	79	7,858

Table 10. Annual catch (t), number of active weirs (defined here as weirs with catch), and the catch per weir (t) for New Brunswick and Nova Scotia weirs from 1978 to 2012.

	Annual Catch (t)			No. Active Weirs			Catch per weir (t)		
Year	NB	NS	Total Catch	NB	NS	Total No.	NB	NS	Average
1978	33,599	7,858	41,458	208	31	239	162	253	173
1979	32,579	6,339	38,918	210	27	237	155	235	164
1980	11,066	2,383	13,449	120	29	149	92	82	90
1981	14,968	1,824	16,793	147	28	175	102	65	96
1982	22,181	1,130	23,311	159	19	178	140	59	131
1983	12,568	896	13,464	143	23	166	88	39	81
1984	8,353	2,702	11,056	116	13	129	72	208	86
1985	26,718	4,055	30,774	156	14	170	171	290	181
1986	27,516	1,957	29,473	105	18	123	262	109	240
1987	26,621	6,776	33,397	123	21	144	216	323	232
1988	38,235	7,480	45,715	191	21	212	200	356	216
1989	43,520	3,296	46,817	171	20	191	255	165	245
1990	39,808	4,132	43,940	154	22	176	258	188	250
1991	23,717	1,498	25,216	143	20	163	166	75	155
1992	31,981	2,224	34,206	151	12	163	212	185	210
1993	31,328	2,662	33,990	145	10	155	216	266	219
1994	20,618	2,045	22,662	129	11	140	160	186	162
1995	18,228	3,049	21,277	106	10	116	172	305	183
1996	15,781	3,476	19,257	101	12	113	156	290	170
1997	20,396	4,019	24,415	102	15	117	200	268	209
1998	19,529	4,048	23,577	108	15	123	181	270	192
1999	19,063	4,537	23,600	100	14	114	191	324	207
2000	16,376	683	17,058	77	3	80	213	228	213
2001	20,064	3,708	23,772	101	14	115	199	265	207
2002	11,807	1,143	12,950	83	9	92	142	127	141
2003	9,003	921	9,924	78	8	86	115	115	115
2004	20,620	3,130	23,750	84	8	92	245	391	258
2005	12,639	2,245	14,884	76	10	86	166	225	173
2006	11,641	2,491	14,132	89	6	95	131	415	149
2007	30,145	1,130	31,275	97	8	105	311	141	298
2008	6,041	2,524	8,565	76	8	84	79	315	102
2009	3,603	387	3,990	38	7	45	95	55	89
2010	10,671	1,198	11,868	77	8	85	139	150	140
2011	2,643	1,004	3,647	37	2	39	71	502	94
2012	494	149	643	4	2	6	124	75	107
Average	19,832	2,831	22,663	114	14	129	167	216	171

Table 11. Annual effort with number of days fished, number of active boats, total catch (t), average catch per day, and average catch per boat for 1989 to 2012 herring purse seine boats from all areas in 4WX-5Y.

Year	No. Days Fished	No. of Boats Fishing	Total Catch t	CPUE (catch/day)	CPUE (catch/boat)	TAC
1989	2198	40	87,383	40	2185	151,200
1990	2390	42	103,537	43	2465	151,200
1991	2333	40	88,830	38	2221	151,200
1992	2431	39	95,072	39	2438	125,000
1993	2542	36	92,828	37	2579	151,200
1994	2227	36	75,652	34	2101	151,200
1995	1682	32	56,441	34	1764	80,000
1996	1781	32	60,038	34	1876	57,000
1997	1731	30	61,769	36	2059	57,000
1998	2290	28	70,931	31	2533	90,000
1999	1775	28	78,574	44	2806	105,000
2000	1572	28	78,727	50	2812	100,000
2001	1826	21	75,343	41	3588	78,000
2002	1838	19	76,210	41	4011	78,000
2003	1652	18	85,499	52	4750	93,000
2004	1358	18	76,361	56	4242	83,000
2005	945	16	48,517	51	3032	50,000
2006	789	16	44,476	56	2780	50,000
2007	914	16	50,667	55	3167	50,000
2008	923	15	53,019	57	3535	55,000
2009	1099	14	62,162	57	4440	55,000
2010	989	14	55,890	57	3992	55,000
2011	896	14	58,316	65	4165	50,000
2012	717	14	47,486	66	3392	50,000

Note: CPUE = catch per unit effort.

Table 12. Summary of the minimum observed SSB for each of the surveyed spawning grounds in the SWNS/BoF component of the 4WX stock complex. Total SSB is rounded to nearest 100t and all data was calculated with the use of the CIF (Singh et al. 2013) (n/s = no survey).

Location/Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average 2005-2010	Average 1999-2012
Scots Bay (inbox)	45,909	185,498	216,000	129,300	123,000	115,000	21,200	31,600	50,500	23,300	81,600	42,300	105,600	143,500	41,750	93,879
Scots Bay (outbox)	-	-	-	-	-	-	-	-	2,200	100	6,100	11,700	35,100	41,300	11,040	16,083
Scots Bay total	45,909	185,498	216,000	129,300	123,000	115,000	21,200	31,600	52,700	23,400	87,700	54,000	140,700	184,800	45,100	100,772
German Bank (inbox)	495,360	333,940	257,300	416,200	348,800	392,000	268,600	290,500	495,400	238,600	395,900	234,700	289,000	278,300	320,617	338,186
German Bank (outbox)	-	-	-	-	-	-	-	4,900	4,000	2,400	1,700	19,100	11,500	10,100	6,420	7,671
German Bank total	495,360	333,940	257,300	416,200	348,800	392,000	268,600	295,400	499,400	241,000	397,600	253,800	300,500	288,400	325,967	342,021
Trinity Ledge	4,061	1,336	14,800	8,900	12,100	12,000	10,700	16,100	3,100	500	1,600	2,400	7,300	2,800	5,733	6,978
Spec Buoy (spring)	-	-	1,100	-	1,200	n/s	600	n/s	300	0	-	1,900	300	n/s	700	771
Spec Buoy (fall)	-	-	87,500	-	-	-	-	30	-	-	-	-	-	-	30	43,765
Overall Stock Area	545,330	520,774	576,700	554,400	485,100	519,000	301,100	343,130	555,500	264,900	486,900	312,100	448,800	476,000	377,272	456,410
Seal Island	-	-	3,900	1,200	11,900	-	-	10,000	-	-	-	-	1,500	-	10,000	5,700
Browns Bank	-	-	45,100	-	-	-	-	7,700	-	-	-	-	-	-	7,700	26,400
Total All Areas	545,330	520,774	625,700	555,600	497,000	519,000	301,100	360,830	555,500	264,900	486,900	312,100	450,300	476,000	380,222	462,217
Overall SE t	89,024	70,347	30,539	65,978	86,276	79,366	82,593	57,484	132,719	38,284	94,294	39,863	60,406	44,705	-	69,420
Overall SE %	16	14	5	12	17	15	27	16	24	14	19	13	13	9	-	15
Long term Average since 1999	456,410	456,410	456,410	456,410	456,410	456,410	456,410	456,410	456,410	456,410	456,410	456,410	456,410	456,410		
Difference from Long Term	88,920	64,364	120,290	97,990	28,690	62,590	-155,310	-113,280	99,090	-191,510	30,490	-144,310	-7,610	19,590		
% difference from Long Term	19%	14%	26%	21%	6%	14%	-34%	-25%	22%	-42%	7%	-32%	-2%	4%		

Table 13. Relative exploitation rates (%) by major spawning grounds and for the overall SWNS/BoF component with (A1) acoustic survey SSB, (A2) acoustic survey proportion of total SSB, (C1) catch by spawning component areas, (C2) adjusted catch including non-spawning area catches, (E1) exploitation rate as percentage of acoustic SSB for spawning area catch, and (E2) adjusted catch.

A1) Acoustic Survey SSB (t)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Avg 99-12
Scots Bay	160,168	72,473	40,972	106,316	163,900	141,000	133,900	107,600	16,800	28,600	45,700	19,400	67,600	45,419	140,712	184,829	88,768
Trinity	23,000	6,762	3,885	621	14,800	8,100	14,500	6,500	5,100	8,500	1,400	300	700	1,026	7,316	2,754	5,393
German Bank	385,400	442,033	460,823	356,372	282,400	394,357	357,100	367,600	211,000	249,600	337,300	201,700	308,700	205,423	300,461	288,443	308,663
Total SSB	568,568	521,268	505,680	463,309	461,100	543,457	505,500	481,700	232,900	286,700	384,400	221,400	377,000	251,868	448,771	476,026	402,844
A2) Acoustic Survey Proportions	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Avg 99-12
Scots Bay	28%	14%	8%	23%	36%	26%	26%	22%	7%	10%	12%	9%	18%	18%	31%	39%	20%
Trinity	4%	1%	1%	0%	3%	1%	3%	1%	2%	3%	0%	0%	0%	0%	2%	1%	1%
German Bank	68%	85%	91%	77%	61%	73%	71%	76%	91%	87%	88%	91%	82%	82%	67%	61%	78%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
C1) Catch by Spawn Area	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Avg 99-12
Scots Bay	4,894	8,210	1,789	10,926	10,739	8,202	19,196	24,869	6,239	3,352	4,116	2,373	902	4,165	5,130	4,940	7,638
Trinity (purse seine+gillnet)	8,820	4,512	2,526	843	1,271	1,865	369	595	2,014	4,444	1,203	15	442	820	2,566	1,433	1,458
German Bank	13,576	20,556	24,660	25,631	24,139	22,355	21,573	14,175	14,171	16,522	15,085	22,437	19,354	17,859	21,513	30,253	20,695
Spawn Area Total	27,290	33,278	28,974	37,400	36,149	32,422	41,138	39,639	22,424	24,318	20,404	24,825	20,698	22,844	29,209	36,626	29,791
Overall SW Nova Catch	56,117	77,027	77,552	85,284	71,570	77,054	89,461	78,029	48,981	49,159	50,529	54,561	54,113	45,534	50,010	47,614	62,818
Non-spawning area catch remaining	28,827	43,749	48,578	47,884	35,421	44,632	48,323	38,390	26,557	24,841	30,125	29,736	33,415	22,690	20,802	10,988	33,027
C2) Adjusted Catch by Area	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Avg 99-12
Scots Bay	13,015	14,293	5,725	21,914	23,330	19,782	31,996	33,444	8,155	5,830	7,697	4,979	6,894	8,257	11,652	9,207	14,204
Trinity	9,986	5,080	2,899	907	2,408	2,530	1,755	1,113	2,596	5,181	1,313	55	504	913	2,905	1,497	1,898
German Bank	33,116	57,655	68,929	62,462	45,832	54,742	55,710	43,472	38,231	38,148	41,519	49,527	46,715	36,364	35,440	36,911	46,714
Adjusted Catch Total	56,117	77,027	77,552	85,284	71,570	77,054	89,461	78,029	48,981	49,159	50,529	54,561	54,113	45,534	49,997	47,614	62,817
E1) Exploitation rate (C1/SSB)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Avg 99-12
Scots Bay	3%	11%	4%	10%	7%	6%	14%	23%	37%	12%	9%	12%	1%	9%	4%	3%	11%
Trinity	38%	67%	65%	136%	9%	23%	3%	9%	39%	52%	86%	5%	63%	80%	35%	52%	47%
German Bank	4%	5%	5%	7%	9%	6%	6%	4%	7%	7%	4%	11%	6%	9%	7%	10%	7%
Overall (C1/SSB)	5%	6%	6%	8%	8%	6%	8%	8%	10%	8%	5%	11%	5%	9%	7%	8%	7%
E2) Exploitation rate adjusted (C2/SSB)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Avg 99-12
Scots Bay	8%	20%	14%	21%	14%	14%	24%	31%	49%	20%	17%	26%	10%	18%	8%	5%	19%
Trinity	43%	75%	75%	146%	16%	31%	12%	17%	51%	61%	94%	18%	72%	89%	40%	54%	55%
German Bank	9%	13%	15%	18%	16%	14%	16%	12%	18%	15%	12%	25%	15%	18%	12%	13%	16%
Overall Adjusted (Catch/Acoustic SSB)	10%	15%	15%	18%	16%	14%	18%	16%	21%	17%	13%	25%	14%	18%	11%	10%	16%

Table 14A. Summary of biological samples by gear and month as collected during the 2011 4VWX herring fisheries. '# LF Samples' is the number of length frequency samples collected, '# Measured' is the number of lengths taken, and '# Processed' is the number of detail fish with sex and maturity determined.

		Month										
Gear Name	Data	1	2	3	5	6	7	8	9	10	11	Total
4W Purse Seine	# LF Samples				105	20						125
	# Measured				12,223	2,336						14,559
	# Aged				239	59						298
	# Processed				241	61						302
5Y CAN P.Seine	# LF Samples				6	113	16		31		12	178
	# Measured				864	21,590	3,218		5,544		2,064	33,280
	# Aged				0	213	41		68		44	366
	# Processed				0	214	41		68		44	367
5Y USA P.Seine/MWT	# LF Samples						5	8	4	14		31
	# Measured						806	1,356	667	2,188		5,017
	# Aged						0	0	0	0		0
	# Processed						0	0	0	0		0
5Z USA P.Seine/MWT	# LF Samples	12	5	5			1	1				24
	# Measured	1,400	632	613			161	179				2,985
	# Aged	0	0	0			0	0				0
	# Processed	0	0	0			0	0				0
Gillnet	# LF Samples							4	11	5		20
	# Measured							558	1,428	558		2,544
	# Aged							85	227	60		372
	# Processed							85	228	61		374
N.B. Purse Seine	# LF Samples					15	107	66	51	102	7	348
	# Measured					2,837	21,381	11,688	8,881	18,030	1,229	64,046
	# Aged					19	108	116	25	151	13	432
	# Processed					19	108	117	25	151	13	433
N.B. Shut-off	# LF Samples							16	9	10		35
	# Measured							2,708	1,417	1,620		5,745
	# Aged							8	15	35		58
	# Processed							8	15	36		59
N.B. Weirs	# LF Samples					2	17	33	33	10		95
	# Measured					396	2,858	5,701	5,609	1,623		16,187
	# Aged					0	63	84	90	61		298
	# Processed					0	63	86	92	61		302
N.S. Purse Seine	# LF Samples				16	89	158	114	296	91		764
	# Measured				2,526	15,222	27,608	20,791	55,044	16,672		137,863
	# Aged				21	151	294	316	405	88		1,275
	# Processed				21	151	346	368	405	88		1,379
N.S. Weirs	# LF Samples						4	3	1			8
	# Measured						708	505	149			1,362
	# Aged						37	15	0			52
	# Processed						37	15	0			52
Resrch. Otter Trawl	# LF Samples		11	34			116	24	2			187
	# Measured							169	406			575
	# Aged		72	306			1,241	175	76			1,870
	# Processed		72	306			1,260	176	76			1,890
Resrch. MW Trawl	# LF Samples								2			2
	# Measured								177			177
	# Aged								37			37
	# Processed								38			38
Total # LF Samples		12	16	39	127	239	424	269	440	232	19	1,817
Total # Measured		1,400	632	613	15,613	42,381	56,740	43,655	79,322	40,691	3,293	284,340
Total # Aged		0	72	306	260	442	1,784	799	943	395	57	5,058
Total # Processed		0	72	306	262	445	1,855	855	947	397	57	5,196

Table 14B. Summary of biological samples by gear and month as collected during the 2012 4VWX herring fisheries. '# LF Samples' is the number of length frequency samples collected, '# Measured' is the number of lengths taken, and '# Processed' is the number of detail fish with sex and maturity determined.

		Month										
Gear name	Data	1	2	3	5	6	7	8	9	10	11	Total
4W Purse Seine	# LF Samples				13	2						15
	# Measured				1,707	300						2,007
	# Aged				51	59						110
	# Processed				51	59						110
5Y CAN P.Seine	# LF Samples				28	66	92	20				206
	# Measured				5,110	11,594	15,976	3,622				36,302
	# Aged				116	85	159	50				410
	# Processed				118	85	160	50				413
5Y USA P.Seine/MWT	# LF Samples		2				15	10	4	4		35
	# Measured		317				2,405	1,638	645	696		5,701
	# Aged		0				0	10	0	0		10
	# Processed		0				0	10	0	0		10
5Z USA P.Seine/MWT	# LF Samples	22	42				6	4	1	1		76
	# Measured	3,471	6,640				922	640	172	187		12,032
	# Aged	0	0				0	4	0	0		4
	# Processed	0	0				0	4	0	0		4
Gillnet	# LF Samples							2	8	8		18
	# Measured							300	1,240	808		2,348
	# Aged							100	70	271		441
	# Processed							100	70	271		441
N.B. Purse Seine	# LF Samples				4	41	7			2	6	60
	# Measured				726	7,161	1,332			342	1,053	10,614
	# Aged				0	0	19			0	0	19
	# Processed				0	0	19			0	0	19
N.B. Weirs	# LF Samples				1	7	1	2	1	6		18
	# Measured				161	1,127	155	290	162	974		2,869
	# Aged				0	0	0	0	0	10		10
	# Processed				0	0	0	0	0	10		10
N.S. Purse Seine	# LF Samples				28	84	79	289	278	89		847
	# Measured				5,594	15,703	13,998	52,931	51,317	16,032		155,575
	# Aged				61	147	380	639	210	133		1,570
	# Processed				61	147	393	641	210	133		1,585
N.S. Weirs	# LF Samples						2					2
	# Measured						328					328
	# Aged						0					0
	# Processed						0					0
Resrch. Otter Trawl	# LF Samples		26	41			120	11				198
	# Measured											
	# Aged		117	309			1,337	43				1,806
	# Processed		156	321			1,371	43				1,891
Total # LF Samples		22	70	41	74	200	322	338	292	110	6	1,475
Total # Measured		3,471	6,957		13,298	35,885	35,116	59,421	53,536	19,039	1,053	227,776
Total # Aged		0	117	309	228	291	1,895	846	280	414	0	4,380
Total # Processed		0	156	321	230	291	1,943	848	280	414	0	4,483

Table 15. Number of herring samples from 4VWX-5Y collected by DFO personnel from commercial fisheries (Commercial), by members of the fishing industry (Industry), observer program (Observer), independent observers on foreign vessels for Over-the-Side Sales or from newly implemented Dockside Monitoring Program (OSS/DMP), and DFO research surveys (Research).

	Sample Source					
Year	DFO	Industry	Observer*	OSS/DMP^	Research	Total
1990	422			185		607
1991	448			167	1	616
1992	330			205	1	536
1993	183			421		604
1994	223			228	14	465
1995	138			244	108	490
1996	127	868	49		69	1,113
1997	78	1,443			114	1,635
1998	225	1,376			98	1,699
1999	49	1,388	89		198	1,724
2000	34	1,387	108		177	1,706
2001	47	1,455	96		190	1,788
2002	17	1,339	84		181	1,621
2003	58	1,292	56		199	1,605
2004	50	1,270	60		105	1,485
2005	48	1,017	23		152	1,240
2006	33	1,049	70		99	1,251
2007	10	1,139	29		137	1,315
2008	16	781	17		130	944
2009	26	980	21		135	1,183
2010	29	947	38	146	209	1,553
2011	21	862	15	743	191	2,590
2012	6	594	30	668	204	2,200
Average	114	1,129	52	334	129	1,303

*2009-2012 Observer samples in observer database only.
^DMP with 100% coverage for purse seine in the Bay of Fundy began Aug. 2010.

Table 16A. Herring catch at age by gear component and overall for the quota year for the 2010-2011 fisheries conducted on the SWNS/BoF spawning component (4WX stock). There was no purse seine winter fishery.

2010 fall purse seine-Q10-11	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	59	34,609	4,191	215	52	1	0	2	3	2	2	39,135
% numbers	0%	88%	11%	1%	0%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	2	1,311	241	21	6	0	0	0	1	1	1	1,584
% catch wt.	0%	83%	15%	1%	0%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	16.5	18.0	20.5	24.4	26.1	29.6	30.3	32.2	32.7	33.0	33.3	18.3
Avg. wt. (g)	27.9	37.9	57.5	99.0	122.3	181.6	194.1	236.0	249.1	255.7	259.0	40.5
4X BOF summer purse seine	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	402	50,569	183,765	105,829	48,574	36,478	4,582	1,894	1,745	2,140	629	436,608
% numbers	0%	12%	42%	24%	11%	8%	1%	0%	0%	0%	0%	100%
Catch wt. (t)	12	2,826	15,640	12,545	7,061	6,210	898	437	440	545	172	46,784
% catch wt.	0%	6%	33%	27%	15%	13%	2%	1%	1%	1%	0%	100%
Avg. len (cm)	16.1	19.8	22.4	24.9	26.5	27.9	29.1	30.7	31.6	31.7	32.5	23.8
Avg. wt. (g)	28.7	55.9	85.1	118.5	145.4	170.2	195.9	230.8	252.0	254.7	274.0	107.2
4X BOF stock gillnet	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	3	536	1,086	1,034	1,092	135	85	56	51	14	4,092
% numbers	0%	0%	13%	27%	25%	27%	3%	2%	1%	1%	0%	100%
Catch wt. (t)	-	0	55	146	165	195	28	19	13	13	4	639
% catch wt.	0%	0%	9%	23%	26%	31%	4%	3%	2%	2%	1%	100%
Avg. len (cm)	-	21.7	23.9	25.9	27.4	28.4	29.8	30.5	31.1	31.4	32.0	27.1
Avg. wt. (g)	-	75.5	103.1	134.2	159.9	178.5	210.1	224.9	238.9	246.4	261.0	156.1
Nova Scotia weirs	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	9,654	8,185	598	51	10	1	-	-	-	-	18,499
% numbers	0%	52%	44%	3%	0%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	-	449	493	54	6	1	0	-	-	-	-	1,004
% catch wt.	0%	45%	49%	5%	1%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	-	18.6	20.1	22.7	25.1	26.1	26.1	-	-	-		19.4
Avg. wt. (g)	-	46.6	60.2	89.8	123.5	139.7	140.2	-	-	-		54.3
SW NS Component Q10-11	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	402	60,284	227,096	111,704	49,875	37,632	4,719	1,979	1,803	2,194	648	498,335
% numbers	0%	12%	46%	22%	10%	8%	1%	0%	0%	0%	0%	100%
Catch wt. (t)	8	3,038	17,543	12,971	7,228	6,529	937	559	469	552	177	50,011
% catch wt.	0%	6%	35%	26%	14%	13%	2%	1%	1%	1%	0%	100%
Avg. len (cm)	-	19.6	21.6	24.7	26.5	27.9	29.1	30.7	31.6	31.7	32.5	23.2
Avg. wt. (g)	28.7	54.4	77.1	116.2	145.4	170.4	196.3	230.5	251.5	254.5	273.6	100.4

Table 16B. Herring catch at age by gear component and overall for the quota year for the 2011-2012 fisheries conducted on the SWNS/BoF spawning component (4WX stock).

2011 fall purse seine-Q11-12	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	370	6,463	6,828	1,003	136	28	1	0	0	1	0	14,830
% numbers	2%	44%	46%	7%	1%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	9	378	569	100	17	4	0	0	0	0	0	1,077
% catch wt.	1%	35%	53%	9%	2%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	15.2	20.2	22.8	24.1	25.9	27.5	29.4	31.5	32.0	30.3	32.0	21.6
Avg. wt. (g)	23.9	58.5	83.3	99.3	122.8	145.7	179.9	245.7	257.7	204.7	258.5	72.6
4X BOF summer purse seine	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	163	104,054	51,363	110,639	81,642	38,155	18,341	2,516	1,606	1,233	999	410,710
% numbers	0%	25%	13%	27%	20%	9%	4%	1%	0%	0%	0%	100%
Catch wt. (t)	4	5,372	4,469	13,148	11,709	6,281	3,404	554	394	318	266	45,918
% catch wt.	0%	12%	10%	29%	26%	14%	7%	1%	1%	1%	1%	100%
Avg. len (cm)	15.3	19.3	22.7	25.1	26.6	27.7	28.8	30.3	31.4	31.9	32.2	24.1
Avg. wt. (g)	24.0	51.6	87.0	118.8	143.4	164.6	185.6	220.4	245.5	257.6	266.0	111.8
4X BOF stock gillnet	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	-	44	701	999	645	320	42	49	45	42	2,888
% numbers	0%	0%	2%	24%	35%	22%	11%	1%	2%	2%	1%	100%
Catch wt. (t)	-	-	5	96	154	109	62	10	12	11	11	470
% catch wt.	0%	0%	1%	20%	33%	23%	13%	2%	3%	2%	2%	100%
Avg. len (cm)	-	-	24.9	26.2	27.1	28.0	29.1	31.0	31.6	31.9	32.3	27.6
Avg. wt. (g)	-	-	116.2	137.4	153.7	168.9	192.5	235.0	248.6	256.1	264.8	162.9
Nova Scotia weirs	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	17	3,781	73	1	-	-	-	-	-	-	-	3,873
% numbers	0%	98%	2%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	0	144	4	0	-	-	-	-	-	-	-	149
% catch wt.	0%	97%	3%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	13.5	17.7	20.2	21.0	-	-	-	-	-	-		17.7
Avg. wt. (g)	15.4	38.2	58.3	65.8	-	-	-	-	-	-		38.5
SW NS Component Q11-12	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	180	108,205	57,943	118,168	83,644	38,935	18,689	2,559	1,655	1,278	1,042	432,301
% numbers	0%	25%	13%	27%	19%	9%	4%	1%	0%	0%	0%	100%
Catch wt. (t)	4	5,525	4,856	13,813	11,963	6,406	3,469	565	407	329	277	47,614
% catch wt.	0%	12%	10%	29%	25%	13%	7%	1%	1%	1%	1%	100%
Avg. len (cm)	-	19.2	22.5	24.9	26.5	27.7	28.8	30.3	31.4	31.9	32.2	24.0
Avg. wt. (g)	23.2	51.1	83.8	116.9	143.0	164.5	185.6	220.6	245.6	257.6	265.9	110.1

Table 17A. Herring catch at age by month and overall for the season for the 2011 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock).

BOF Purse Seine May	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	2	380	12,694	979	318	203	31	5	2	1	-	14,615
% numbers	0%	3%	87%	7%	2%	1%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	0	12	781	100	39	30	5	1	0	0	-	970
% catch wt.	0%	1%	80%	10%	4%	3%	1%	0%	0%	0%	0%	100%
Avg. len (cm)	13.2	16.3	20.0	23.7	25.2	26.9	28.2	29.2	30.1	30.3		20.4
Avg. wt. (g)	17.0	32.9	61.5	102.2	123.3	150.1	172.4	191.2	210.3	213.6		66.4
BOF Purse Seine June	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	68	28,031	17,464	6,619	5,576	1,033	188	240	243	49	59,512
% numbers	0%	0%	47%	29%	11%	9%	2%	0%	0%	0%	0%	100%
Catch wt. (t)	-	2	2,443	1,925	868	905	194	38	52	56	14	6,498
% catch wt.	0%	0%	38%	30%	13%	14%	3%	1%	1%	1%	0%	100%
Avg. len (cm)	-	17.0	22.4	24.2	25.6	27.5	28.8	29.6	30.3	30.8	32.8	24.0
Avg. wt. (g)	-	36.9	87.2	110.2	131.2	162.2	187.6	202.8	218.7	231.1	281.3	109.2
BOF Purse Seine July	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	3,931	49,371	24,738	11,704	7,112	1,018	158	74	55	13	98,174
% numbers	0%	4%	50%	25%	12%	7%	1%	0%	0%	0%	0%	100%
Catch wt. (t)	-	208	4,153	2,791	1,604	1,162	181	35	17	14	4	10,168
% catch wt.	0%	2%	41%	27%	16%	11%	2%	0%	0%	0%	0%	100%
Avg. len (cm)	-	19.3	22.3	24.4	25.9	27.4	28.1	30.1	30.6	31.3	32.1	23.6
Avg. wt. (g)	-	52.9	84.1	112.8	137.1	163.4	177.4	221.6	234.3	253.7	274.7	103.6
BOF Purse Seine Aug	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	9,408	20,813	16,681	3,961	2,829	577	67	66	41	23	54,466
% numbers	0%	17%	38%	31%	7%	5%	1%	0%	0%	0%	0%	100%
Catch wt. (t)	-	506	1,765	1,950	565	474	103	16	17	11	7	5,413
% catch wt.	0%	9%	33%	36%	10%	9%	2%	0%	0%	0%	0%	100%
Avg. len (cm)	-	19.4	22.2	24.6	26.1	27.4	27.9	30.6	31.2	31.3	32.5	23.1
Avg. wt. (g)	-	53.8	84.8	116.9	142.7	167.5	179.2	240.7	255.4	260.1	294.1	99.4
BOF Purse Seine Sept	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	2	14,308	45,560	38,876	21,426	16,728	1,476	1,280	1,049	1,286	397	142,389
% numbers	0%	10%	32%	27%	15%	12%	1%	1%	1%	1%	0%	100%
Catch wt. (t)	0	780	4,045	4,954	3,283	2,915	321	300	270	328	106	17,302
% catch wt.	0%	5%	23%	29%	19%	17%	2%	2%	2%	2%	1%	100%
Avg. len (cm)	16.0	19.6	22.7	25.6	27.1	28.2	30.2	30.9	31.8	31.8	32.2	24.8
Avg. wt. (g)	28.3	54.5	88.8	127.4	153.2	174.3	217.5	234.3	257.1	255.3	266.5	121.5
BOF Purse Seine Oct	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	397	22,475	27,296	7,090	4,546	4,031	446	195	315	515	146	67,452
% numbers	1%	33%	40%	11%	7%	6%	1%	0%	0%	1%	0%	100%
Catch wt. (t)	11	1,316	2,454	825	700	724	93	47	83	136	42	6,433
% catch wt.	0%	20%	38%	13%	11%	11%	1%	1%	1%	2%	1%	100%
Avg. len (cm)	16.1	20.2	23.0	24.9	27.2	28.5	30.0	31.3	32.2	32.2	33.1	23.0
Avg. wt. (g)	28.7	58.6	89.9	116.4	154.1	179.6	209.5	239.6	263.8	264.4	288.5	95.4
4X BOF summer purse seine	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	402	50,569	183,765	105,829	48,574	36,478	4,582	1,894	1,745	2,140	629	436,608
% numbers	0%	12%	42%	24%	11%	8%	1%	0%	0%	0%	0%	100%
Catch wt. (t)	12	2,826	15,640	12,545	7,061	6,210	898	437	440	545	172	46,784
% catch wt.	0%	6%	33%	27%	15%	13%	2%	1%	1%	1%	0%	100%
Avg. len (cm)	16.1	19.8	22.4	24.9	26.5	27.9	29.1	30.7	31.6	31.7	32.5	23.8
Avg. wt. (g)	28.7	55.9	85.1	118.5	145.4	170.2	195.9	230.8	252.0	254.7	274.0	107.2

Table 17B. Herring catch at age by month and overall for the season for the 2012 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock).

BOF Purse Seine May	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	2,972	3,684	4,883	2,918	1,004	375	66	5	3	5	15,915
% numbers	0%	19%	23%	31%	18%	6%	2%	0%	0%	0%	0%	100%
Catch wt. (t)	-	120	252	500	340	142	60	12	1	1	1	1,429
% catch wt.	0%	8%	18%	35%	24%	10%	4%	1%	0%	0%	0%	100%
Avg. len (cm)	-	18.2	21.6	24.5	25.5	27.1	28.3	29.3	32.1	32.5	32.1	23.1
Avg. wt. (g)	-	40.3	68.5	102.3	116.6	141.1	161.0	179.3	238.6	249.0	239.8	89.8
BOF Purse Seine June	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	4,968	4,987	15,719	7,733	3,055	668	116	0	1	0	37,246
% numbers	0%	13%	13%	42%	21%	8%	2%	0%	0%	0%	0%	100%
Catch wt. (t)	-	237	388	1,704	962	438	108	21	0	0	0	3,858
% catch wt.	0%	6%	10%	44%	25%	11%	3%	1%	0%	0%	0%	100%
Avg. len (cm)	-	18.8	22.0	24.4	25.6	26.7	27.8	28.8	32.8	33.0	32.0	23.8
Avg. wt. (g)	-	47.6	77.9	108.4	124.4	143.4	161.5	180.7	270.8	274.9	249.6	103.6
BOF Purse Seine July	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	15,894	5,817	7,511	10,573	6,101	3,293	459	91	76	26	49,841
% numbers	0%	32%	12%	15%	21%	12%	7%	1%	0%	0%	0%	100%
Catch wt. (t)	-	735	464	884	1,468	978	576	93	22	18	7	5,245
% catch wt.	0%	14%	9%	17%	28%	19%	11%	2%	0%	0%	0%	100%
Avg. len (cm)	-	18.8	22.2	25.0	26.3	27.5	28.2	29.5	31.1	31.0	31.8	23.5
Avg. wt. (g)	-	46.3	79.8	117.6	138.8	160.2	175.0	203.5	239.9	237.7	258.1	105.2
BOF Purse Seine Aug	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	140	60,751	11,602	24,570	31,195	10,496	5,987	966	565	417	278	146,967
% numbers	0%	41%	8%	17%	21%	7%	4%	1%	0%	0%	0%	100%
Catch wt. (t)	3	3,276	954	3,031	4,601	1,750	1,112	218	140	111	74	15,273
% catch wt.	0%	21%	6%	20%	30%	11%	7%	1%	1%	1%	0%	100%
Avg. len (cm)	15.4	19.6	22.3	25.2	26.7	27.7	28.6	30.4	31.3	32.0	32.0	23.3
Avg. wt. (g)	24.5	53.9	82.2	123.4	147.5	166.8	185.8	226.0	248.0	266.7	266.6	103.9
BOF Purse Seine Sept	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	12	17,098	16,503	43,538	23,263	13,150	5,915	587	711	591	529	121,899
% numbers	0%	14%	14%	36%	19%	11%	5%	0%	1%	0%	0%	100%
Catch wt. (t)	0	876	1,609	5,377	3,456	2,217	1,136	137	174	150	142	15,274
% catch wt.	0%	6%	11%	35%	23%	15%	7%	1%	1%	1%	1%	100%
Avg. len (cm)	15.0	19.2	23.5	25.4	26.9	28.0	29.2	31.0	31.5	31.9	32.4	25.1
Avg. wt. (g)	23.1	51.2	97.5	123.5	148.5	168.6	192.0	233.8	245.3	254.1	268.0	125.3
BOF Purse Seine Oct	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	11	2,369	8,771	14,418	5,960	4,349	2,104	321	233	146	160	38,841
% numbers	0%	6%	23%	37%	15%	11%	5%	1%	1%	0%	0%	100%
Catch wt. (t)	0	129	801	1,652	882	756	411	72	56	37	42	4,839
% catch wt.	0%	3%	17%	34%	18%	16%	8%	1%	1%	1%	1%	100%
Avg. len (cm)	14.6	19.8	23.3	24.9	27.0	28.3	29.3	30.6	31.3	31.9	32.0	25.3
Avg. wt. (g)	19.3	54.3	91.3	114.6	148.0	173.8	195.3	225.6	242.4	256.7	260.3	124.6
4X BOF summer purse seine	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	163	104,054	51,363	110,639	81,642	38,155	18,341	2,516	1,606	1,233	999	410,710
% numbers	0%	25%	13%	27%	20%	9%	4%	1%	0%	0%	0%	100%
Catch wt. (t)	4	5,372	4,469	13,148	11,709	6,281	3,404	554	394	318	266	45,918
% catch wt.	0%	12%	10%	29%	26%	14%	7%	1%	1%	1%	1%	100%
Avg. len (cm)	15.3	19.3	22.7	25.1	26.6	27.7	28.8	30.3	31.4	31.9	32.2	24.1
Avg. wt. (g)	24.0	51.6	87.0	118.8	143.4	164.6	185.6	220.4	245.5	257.6	266.0	111.8

Table 18A. Herring catch at age by fishing ground for the 2011 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock).

Purse German Bank (21,776t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	146	4,367	43,555	50,089	30,685	24,952	2,636	1,557	1,429	1,831	559	161,807
% numbers	0%	3%	27%	31%	19%	15%	2%	1%	1%	1%	0%	100%
Catch wt. (t)	3	281	4,317	6,318	4,639	4,319	542	364	368	472	153	21,776
% catch wt.	0%	1%	20%	29%	21%	20%	2%	2%	2%	2%	1%	100%
Avg. len (cm)	15.1	20.7	23.6	25.4	26.9	28.1	29.6	30.9	31.9	31.9	32.5	25.8
Avg. wt. (g)	23.5	64.3	99.1	126.1	151.2	173.1	205.5	234.0	257.5	257.7	273.7	134.6
Purse GM Banks (4,881t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	2	683	30,987	13,541	3,494	1,675	223	42	47	43	6	50,745
% numbers	0%	1%	61%	27%	7%	3%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	0	31	2,637	1,446	434	262	42	9	10	10	2	4,881
% catch wt.	0%	1%	54%	30%	9%	5%	1%	0%	0%	0%	0%	100%
Avg. len (cm)	13.5	18.0	22.3	24.0	25.2	27.1	28.8	29.6	30.3	30.7	32.3	23.1
Avg. wt. (g)	18.2	45.1	85.1	106.8	124.1	156.2	186.5	203.4	219.9	227.5	266.0	96.2
Purse Grand Manan (6,482t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	0	11,632	52,808	13,391	1,956	397	51	7	3	2	0	80,246
% numbers	0%	14%	66%	17%	2%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	0	634	4,198	1,339	238	61	9	1	1	0	0	6,482
% catch wt.	0%	10%	65%	21%	4%	1%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	16.0	19.6	21.9	23.5	25.0	26.8	27.9	29.7	29.9	30.2	30.5	21.9
Avg. wt. (g)	28.3	54.5	79.5	100.0	121.5	153.1	174.5	210.9	214.1	221.3	231.2	80.8
Purse Scots Bay (5,130t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	112	9,081	16,864	7,197	5,207	896	129	78	58	14	39,636
% numbers	0%	0%	23%	43%	18%	13%	2%	0%	0%	0%	0%	100%
Catch wt. (t)	-	6	930	2,081	1,021	864	160	30	19	14	4	5,130
% catch wt.	0%	0%	18%	41%	20%	17%	3%	1%	0%	0%	0%	100%
Avg. len (cm)	-	19.8	23.7	25.1	26.2	27.4	28.0	30.3	30.8	31.2	31.9	25.3
Avg. wt. (g)	-	57.4	102.5	123.4	141.9	166.0	178.0	228.5	241.0	250.3	270.1	129.4
Purse Long Island (539t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	25	2,057	1,735	628	322	33	9	7	7	2	4,826
% numbers	0%	1%	43%	36%	13%	7%	1%	0%	0%	0%	0%	100%
Catch wt. (t)	-	1	193	198	83	52	6	2	2	2	1	539
% catch wt.	0%	0%	36%	37%	15%	10%	1%	0%	0%	0%	0%	100%
Avg. len (cm)	-	19.3	23.1	24.6	25.7	27.4	28.7	29.9	30.5	30.7	32.0	24.3
Avg. wt. (g)	-	53.3	93.8	114.2	132.5	160.5	186.9	211.1	224.2	228.0	259.5	111.8
Purse Gannet/Dry Ledge (2,564t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	1	1,981	7,859	4,956	3,057	2,815	572	118	151	162	32	21,703
% numbers	0%	9%	36%	23%	14%	13%	3%	1%	1%	1%	0%	100%
Catch wt. (t)	0	121	716	597	439	477	109	25	34	38	9	2,564
% catch wt.	0%	5%	28%	23%	17%	19%	4%	1%	1%	1%	0%	100%
Avg. len (cm)	12.5	20.4	23.0	25.0	26.4	27.8	28.8	29.8	30.4	31.0	32.6	24.6
Avg. wt. (g)	14.4	61.0	91.1	120.5	143.7	169.5	189.7	210.0	222.6	234.9	275.4	118.1
BOF Purse Trinity (1,978t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	30	13,704	14,265	1,647	353	152	14	5	4	5	2	30,181
% numbers	0%	45%	47%	5%	1%	1%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	1	739	989	173	46	23	3	1	1	1	0	1,978
% catch wt.	0%	37%	50%	9%	2%	1%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	16.9	19.5	21.0	23.8	25.6	27.0	28.5	30.9	31.5	31.8	32.1	Avg. Len
Avg. wt. (g)	32.7	54.0	69.3	104.8	130.5	154.1	184.4	233.5	249.1	256.9	263.0	0.0
Purse Lurcher (1,823t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	3,738	15,008	2,682	1,083	943	155	26	26	32	14	23,707
% numbers	0%	16%	63%	11%	5%	4%	1%	0%	0%	0%	0%	100%
Catch wt. (t)	-	195	984	299	144	150	28	5	6	8	4	1,823
% catch wt.	0%	11%	54%	16%	8%	8%	2%	0%	0%	0%	0%	100%
Avg. len (cm)	-	19.3	20.5	24.3	25.8	27.3	28.6	29.5	30.4	31.0	33.3	21.3
Avg. wt. (g)	-	52.2	65.6	111.4	133.4	159.0	182.9	201.8	220.4	236.1	294.0	76.9
BOF Purse N.B. Coastal (1,611t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	224	14,327	8,145	925	120	16	0	-	0	1	0	23,758
% numbers	1%	60%	34%	4%	1%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	7	817	675	94	16	2	0	-	0	0	0	1,611
% catch wt.	0%	51%	42%	6%	1%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	16.7	20.0	22.4	23.9	25.8	27.3	29.5	-	32.0	31.9	32.0	21.0
Avg. wt. (g)	31.6	57.0	82.8	101.8	129.9	154.5	198.7	-	258.5	256.3	258.5	67.8
4X BOF summer purse seine	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	402	50,569	183,765	105,829	48,574	36,478	4,582	1,894	1,745	2,140	629	436,608
% numbers	0%	12%	42%	24%	11%	8%	1%	0%	0%	0%	0%	100%
Catch wt. (t)	12	2,826	15,640	12,545	7,061	6,210	898	437	440	545	172	46,784
% catch wt.	0%	6%	33%	27%	15%	13%	2%	1%	1%	1%	0%	100%
Avg. len (cm)	16.1	19.8	22.4	24.9	26.5	27.9	29.1	30.7	31.6	31.7	32.5	23.8
Avg. wt. (g)	28.7	55.9	85.1	118.5	145.4	170.2	195.9	230.8	252.0	254.7	274.0	107.2

Table 18B. Herring catch at age by fishing ground for the 2012 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock).

Purse German Bank (30,387t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	26	39,960	29,855	77,331	54,127	25,764	12,617	1,665	1,385	1,077	908	244,714
% numbers	0%	16%	12%	32%	22%	11%	5%	1%	1%	0%	0%	100%
Catch wt. (t)	1	2,197	2,815	9,416	7,978	4,339	2,398	380	341	279	242	30,387
% catch wt.	0%	7%	9%	31%	26%	14%	8%	1%	1%	1%	1%	100%
Avg. len (cm)	15.1	19.7	23.3	25.2	26.8	27.9	29.0	30.6	31.4	31.9	32.2	25.0
Avg. wt. (g)	22.5	55.0	94.3	121.8	147.4	168.4	190.1	228.3	246.3	259.3	266.7	124.2
Purse GM Banks (3,794t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	3	10,869	5,841	12,696	7,755	2,495	634	74	5	4	2	40,378
% numbers	0%	27%	14%	31%	19%	6%	2%	0%	0%	0%	0%	100%
Catch wt. (t)	0	510	449	1,405	960	353	100	13	1	1	1	3,794
% catch wt.	0%	13%	12%	37%	25%	9%	3%	0%	0%	0%	0%	100%
Avg. len (cm)	15.5	18.9	22.0	24.7	25.6	26.7	27.6	28.9	31.9	32.0	32.5	23.1
Avg. wt. (g)	24.9	46.9	77.0	110.7	123.8	141.6	157.9	180.7	243.9	245.9	258.3	94.0
Purse Grand Manan (106t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	396	299	246	191	50	16	1	0	0	-	1,199
% numbers	0%	33%	25%	21%	16%	4%	1%	0%	0%	0%	0%	100%
Catch wt. (t)	-	20	24	28	24	7	3	0	0	0	-	106
% catch wt.	0%	19%	22%	26%	23%	7%	2%	0%	0%	0%	0%	100%
Avg. len (cm)	-	19.4	22.2	24.6	25.7	26.6	27.4	28.9	30.0	30.0		22.6
Avg. wt. (g)	-	51.4	80.0	111.6	128.0	144.8	159.2	188.6	212.8	212.8		88.6
Purse Scots Bay (4,940t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	8	35	1,505	7,644	12,702	6,928	3,895	551	139	94	42	33,543
% numbers	0%	0%	4%	23%	38%	21%	12%	2%	0%	0%	0%	100%
Catch wt. (t)	0	2	148	956	1,833	1,130	692	114	33	23	11	4,940
% catch wt.	0%	0%	3%	19%	37%	23%	14%	2%	1%	0%	0%	100%
Avg. len (cm)	13.7	20.6	23.6	25.4	26.6	27.6	28.3	29.6	31.0	31.0	31.5	26.7
Avg. wt. (g)	17.1	64.0	98.1	125.0	144.3	163.0	177.6	206.3	237.8	238.7	252.6	147.3
Purse Long Island (160t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	3	1,030	165	201	259	86	56	13	8	7	4	1,834
% numbers	0%	56%	9%	11%	14%	5%	3%	1%	0%	0%	0%	100%
Catch wt. (t)	0	51	12	25	38	14	11	3	2	2	1	160
% catch wt.	0%	32%	8%	16%	24%	9%	7%	2%	1%	1%	1%	100%
Avg. len (cm)	15.5	19.1	21.6	25.3	26.6	27.7	28.9	30.7	31.3	32.1	31.9	22.0
Avg. wt. (g)	24.9	49.3	73.8	124.6	147.1	168.4	192.9	233.4	249.7	271.2	266.1	87.1
Purse Gannet/Dry Ledge (3,177t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	25	18,264	5,935	6,244	4,008	1,737	832	152	67	49	42	37,356
% numbers	0%	49%	16%	17%	11%	5%	2%	0%	0%	0%	0%	100%
Catch wt. (t)	1	977	465	681	553	277	151	33	16	13	11	3,177
% catch wt.	0%	31%	15%	21%	17%	9%	5%	1%	1%	0%	0%	100%
Avg. len (cm)	15.5	19.5	22.0	24.4	26.3	27.6	28.7	30.3	31.3	31.7	32.1	22.1
Avg. wt. (g)	24.9	53.5	78.3	109.1	138.0	159.4	181.9	216.3	243.6	255.4	264.0	85.1
BOF Purse Trinity (1,255t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	6	20,708	3,141	378	29	8	1	-	-	-	-	24,272
% numbers	0%	85%	13%	2%	0%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	0	999	217	34	4	1	0	-	-	-	-	1,255
% catch wt.	0%	80%	17%	3%	0%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	15.2	18.9	21.2	23.0	25.3	26.9	28.0	-	-	-		19.3
Avg. wt. (g)	23.8	48.2	69.1	90.9	123.2	149.1	167.3	-	-	-		51.7
Purse Lurcher (2,050t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	92	12,357	4,577	5,817	2,521	1,064	280	58	1	1	0	26,768
% numbers	0%	46%	17%	22%	9%	4%	1%	0%	0%	0%	0%	100%
Catch wt. (t)	2	596	335	592	312	155	47	11	0	0	0	2,050
% catch wt.	0%	29%	16%	29%	15%	8%	2%	1%	0%	0%	0%	100%
Avg. len (cm)	15.5	18.9	21.7	24.0	25.6	26.9	28.1	29.1	32.4	33.0	31.5	21.5
Avg. wt. (g)	24.8	48.3	73.1	101.8	123.6	145.9	167.0	185.8	256.4	274.9	225.6	76.6
BOF Purse N.B. Coastal (21t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	435	27	1	-	-	-	-	-	-	-	463
% numbers	0%	94%	6%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	-	19	2	0	-	-	-	-	-	-	-	21
% catch wt.	0%	91%	9%	1%	0%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	-	18.7	21.2	22.7	-	-	-	-	-	-		18.8
Avg. wt. (g)	-	43.9	67.0	83.7	-	-	-	-	-	-		45.4
BOF Purse Seal Island (26t)	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	-	0	17	80	49	25	9	1	1	1	1	184
% numbers	0%	0%	9%	44%	26%	14%	5%	1%	1%	1%	0%	100%
Catch wt. (t)	-	0	2	10	7	4	2	0	0	0	0	26
% catch wt.	0%	0%	7%	39%	28%	16%	7%	1%	1%	1%	1%	100%
Avg. len (cm)	-	21.5	24.4	25.6	26.8	27.8	29.1	31.5	32.1	32.5	32.7	26.4
Avg. wt. (g)	-	72.6	109.1	126.6	147.5	164.9	190.2	244.8	261.3	269.8	275.5	141.5
4X BOF summer purse seine	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**	**Age 9**	**Age 10**	**Age 11+**	**Total**
Numbers (x1,000)	163	104,054	51,363	110,639	81,642	38,155	18,341	2,516	1,606	1,233	999	410,710
% numbers	0%	25%	13%	27%	20%	9%	4%	1%	0%	0%	0%	100%
Catch wt. (t)	4	5,372	4,469	13,148	11,709	6,281	3,404	554	394	318	266	45,918
% catch wt.	0%	12%	10%	29%	26%	14%	7%	1%	1%	1%	1%	100%
Avg. len (cm)	15.3	19.3	22.7	25.1	26.6	27.7	28.8	30.3	31.4	31.9	32.2	24.1
Avg. wt. (g)	24.0	51.6	87.0	118.8	143.4	164.6	185.6	220.4	245.5	257.6	266.0	111.8

Table 19A. Herring catch at age for the 2010-2011 quota year purse seine, gillnet, and weir fisheries conducted on the SWNS/BoF spawning component (4WX stock).

2010-2011 SWNS Stock Component - Catch at age in numbers and weight with average length and weight by age.

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total
Numbers (x1,000)	402	60,225	192,487	107,513	49,660	37,580	4,718	1,978	1,801	2,192	643	459,199
% numbers	0%	13%	42%	23%	11%	8%	1%	0%	0%	0%	0%	100%
Catch wt. (t)	12	3,275	16,188	12,744	7,232	6,406	926	456	453	558	176	48,427
% catch wt.	0%	7%	33%	26%	15%	13%	2%	1%	1%	1%	0%	100%
Avg. len (cm)	16.1	19.6	22.3	24.9	26.5	27.9	29.1	30.7	31.6	31.7	32.5	23.6
Avg. wt. (g)	28.7	54.4	84.1	118.5	145.6	170.5	196.3	230.5	251.5	254.6	273.7	105.5

Table 19B. Herring catch at age for the 2011-2012 quota year purse seine, gillnet, and weir fisheries conducted on the SWNS/BoF spawning component (4WX stock).

2011-2012 SWNS Stock Component - Catch at age in numbers and weight with average length and weight by age.

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total
Numbers (x1,000)	180	107,835	51,480	111,341	82,641	38,799	18,661	2,558	1,655	1,278	1,041	417,471
% numbers	0%	26%	12%	27%	20%	9%	4%	1%	0%	0%	0%	100%
Catch wt. (t)	4	5,516	4,478	13,244	11,863	6,389	3,465	564	406	329	277	46,537
% catch wt.	0%	12%	10%	28%	25%	14%	7%	1%	1%	1%	1%	100%
Avg. len (cm)	15.1	19.3	22.7	25.1	26.6	27.7	28.8	30.3	31.4	31.9	32.2	24.1
Avg. wt. (g)	23.2	51.2	87.0	118.9	143.5	164.7	185.7	220.6	245.6	257.6	265.9	111.5

Table 20A. Catch at age (millions) for the SWNS/BoF herring spawning component from 1965-2012. Some relatively strong year-classes that persisted in the fishery catch have been highlighted.

Historical Catch at age in millions (2012 Final as of 18 February 2013).

	Year											
Year	1	2	3	4	5	6	7	8	9	10	11+	Total
1965		1,085	35	234	50	11	2	1	0	0	0	1,417
1966	154	914	449	73	322	46	14	8	2	0	0	1,982
1967	722	614	154	266	110	159	58	4	0	0	0	2,089
1968	165	2,389	225	83	290	73	91	32	15	6	1	3,370
1969	109	290	532	132	162	113	63	23	6	3	1	1,433
1970	700	577	77	286	201	120	112	41	21	7	3	2,145
1971	88	404	184	107	114	76	94	50	37	8	6	1,165
1972	-	649	72	149	77	75	49	49	26	14	12	1,172
1973	1	167	781	131	40	30	22	20	24	12	13	1,242
1974	18	766	94	804	68	19	10	7	13	7	9	1,815
1975	3	318	240	125	515	66	12	4	5	4	6	1,298
1976	0	56	207	154	69	269	21	6	4	2	3	790
1977	1	154	32	218	119	51	177	14	3	1	4	775
1978	35	384	41	13	122	68	31	109	11	2	2	819
1979	0	184	250	55	5	23	18	12	41	5	2	596
1980	2	13	81	474	28	4	5	7	3	11	3	629
1981	-	103	51	103	451	33	2	3	2	1	2	751
1982	4	102	151	23	98	211	15	2	1	1	1	609
1983	5	192	150	244	24	61	90	10	2	1	1	781
1984	-	88	244	224	146	23	22	28	10	2	9	796
1985	9	217	338	303	148	42	14	18	8	1	0	1,098
1986	0	125	276	293	57	32	11	4	3	1	0	802
1987	2	83	126	527	243	46	19	7	3	3	1	1,062
1988	0	148	113	195	434	236	43	21	4	4	3	1,202
1989	0	102	114	62	79	169	77	18	8	4	3	636
1990	-	179	130	172	90	101	202	117	31	11	7	1,039
1991	-	97	179	184	88	41	50	81	46	18	14	798
1992	0	169	133	287	127	75	34	35	59	35	21	974
1993	0	76	44	194	131	68	34	21	22	21	11	622
1994	0	104	142	54	118	73	36	15	9	10	16	576
1995	2	113	220	112	37	36	22	6	4	3	4	560
1996	-	37	38	256	55	17	9	3	2	1	2	420
1997	0	57	87	78	131	19	5	4	1	1	1	384
1998	0	265	62	139	97	97	21	4	2	1	0	689
1999	9	151	253	72	104	63	26	6	2	0	1	686
2000	0	378	53	123	109	56	30	12	1	1	0	764
2001	0	81	311	54	64	31	17	5	3	0	0	566
2002	16	310	107	189	84	25	9	6	3	2	2	753
2003	0	479	255	81	109	19	10	3	3	2	1	961
2004	4	322	315	161	40	37	11	2	3	1	2	897
2005	1	66	131	174	59	12	9	4	1	0	1	457
2006	3	112	102	68	82	34	16	4	0	0	0	422
2007	0	186	56	34	39	71	25	7	1	0	0	419
2008	1	78	220	53	25	32	31	11	4	0	0	457
2009	1	263	118	139	22	12	11	13	6	1	0	587
2010	-	482	177	53	63	7	4	4	4	2	1	796
2011	0	60	227	112	50	38	5	2	2	2	1	498
2012	0	108	58	118	84	39	19	3	2	1	1	432

Table 20B. Catch at age (percent numbers) for the SWNS/BoF herring spawning component, 1965-2012. Proportions for some relatively strong year-classes that persisted in the fishery catch have been highlighted.

Historical catch at age in percentages.

	Age											
Year	1	2	3	4	5	6	7	8	9	10	11+	Total
1965	-	**77**	2	17	4	1	0	0	0	0	0	100
1966	8	46	23	4	16	2	1	0	0	0	0	100
1967	35	29	7	13	5	8	3	0	0	0	0	100
1968	5	**71**	7	2	9	2	3	1	0	0	0	100
1969	8	20	37	9	11	8	4	2	0	0	0	100
1970	33	27	4	13	9	6	5	2	1	0	0	100
1971	8	35	16	9	10	6	8	4	3	1	0	100
1972	-	**55**	6	13	7	6	4	4	2	1	1	100
1973	0	13	**63**	11	3	2	2	2	2	1	1	100
1974	1	42	5	44	4	1	1	0	1	0	0	100
1975	0	24	18	10	40	5	1	0	0	0	0	100
1976	0	7	26	19	9	34	3	1	0	0	0	100
1977	0	20	4	28	15	7	23	2	0	0	1	100
1978	4	47	5	2	15	8	4	13	1	0	0	100
1979	0	31	42	9	1	4	3	2	7	1	0	100
1980	0	2	13	75	4	1	1	1	0	2	0	100
1981	-	14	7	14	60	4	0	0	0	0	0	100
1982	1	17	25	4	16	35	2	0	0	0	0	100
1983	1	25	19	31	3	8	12	1	0	0	0	100
1984	-	11	31	28	18	3	3	4	1	0	1	100
1985	1	20	31	28	13	4	1	2	1	0	0	100
1986	0	16	34	36	7	4	1	1	0	0	0	100
1987	0	8	12	**50**	23	4	2	1	0	0	0	100
1988	0	12	9	16	36	20	4	2	0	0	0	100
1989	0	16	18	10	12	27	12	3	1	1	0	100
1990	-	17	13	17	9	10	19	11	3	1	1	100
1991	-	12	22	23	11	5	6	10	6	2	2	100
1992	0	17	14	29	13	8	4	4	6	4	2	100
1993	0	12	7	31	21	11	5	3	4	3	2	100
1994	0	18	25	9	20	13	6	3	2	2	3	100
1995	0	20	39	20	7	7	4	1	1	1	1	100
1996	-	9	9	**61**	13	4	2	1	0	0	0	100
1997	0	15	23	20	34	5	1	1	0	0	0	100
1998	0	38	9	20	14	14	3	1	0	0	0	100
1999	1	22	37	10	15	9	4	1	0	0	0	100
2000	0	49	7	16	14	7	4	2	0	0	0	100
2001	0	14	55	10	11	5	3	1	1	0	0	100
2002	2	41	14	25	11	3	1	1	0	0	0	100
2003	0	**50**	27	8	11	2	1	0	0	0	0	100
2004	0	36	35	18	4	4	1	0	0	0	0	100
2005	0	15	29	38	13	3	2	1	0	0	0	100
2006	1	26	24	16	19	8	4	1	0	0	0	100
2007	0	44	13	8	9	17	6	2	0	0	0	100
2008	0	17	48	12	5	7	7	2	1	0	0	100
2009	0	45	20	24	4	2	2	2	1	0	0	100
2010	-	**60**	22	7	8	1	0	1	0	0	0	100
2011	0	12	46	22	10	8	1	0	0	0	0	100
2012	0	25	13	27	19	9	4	1	0	0	0	100

Note - green bold highlight >= 50% by number for age group

Table 21. Average (fishery weighted) weights at age (g) for the SWNS/BoF component of the 4WX herring fishery for 1965-2012. Data for 1965-1967 and 1979-1983 are averages for the period 1968-1978.

	Average weight (kg)										
Year	1	2	3	4	5	6	7	8	9	10	11
1965	0.010	0.041	0.112	0.172	0.218	0.254	0.286	0.323	0.354	0.389	0.389
1966	0.010	0.041	0.112	0.172	0.218	0.254	0.286	0.323	0.354	0.389	0.389
1967	0.010	0.041	0.112	0.172	0.218	0.254	0.286	0.323	0.354	0.389	0.392
1968	0.010	0.033	0.112	0.148	0.185	0.244	0.276	0.399	0.338	0.410	0.409
1969	0.010	0.037	0.105	0.162	0.207	0.242	0.282	0.306	0.334	0.390	0.391
1970	0.010	0.032	0.119	0.169	0.211	0.257	0.292	0.332	0.369	0.389	0.389
1971	0.010	0.066	0.143	0.199	0.230	0.254	0.293	0.329	0.362	0.388	0.388
1972	0.010	0.044	0.138	0.192	0.223	0.262	0.292	0.322	0.345	0.380	0.380
1973	0.010	0.029	0.106	0.143	0.225	0.252	0.279	0.331	0.360	0.389	0.389
1974	0.010	0.048	0.110	0.175	0.206	0.240	0.277	0.322	0.342	0.352	0.344
1975	0.010	0.021	0.094	0.179	0.216	0.240	0.268	0.333	0.358	0.379	0.379
1976	0.010	0.033	0.114	0.159	0.233	0.249	0.277	0.317	0.382	0.404	0.404
1977	0.010	0.065	0.113	0.174	0.214	0.274	0.293	0.325	0.328	0.416	0.416
1978	0.010	0.028	0.112	0.181	0.229	0.259	0.302	0.330	0.351	0.397	0.397
1979	0.010	0.041	0.112	0.172	0.218	0.254	0.286	0.323	0.354	0.389	0.389
1980	0.010	0.041	0.112	0.172	0.218	0.254	0.286	0.323	0.354	0.389	0.389
1981	0.010	0.041	0.112	0.172	0.218	0.254	0.286	0.323	0.354	0.389	0.389
1982	0.010	0.041	0.112	0.172	0.218	0.254	0.286	0.323	0.354	0.389	0.389
1983	0.010	0.041	0.112	0.172	0.218	0.254	0.286	0.323	0.354	0.389	0.389
1984	0.010	0.038	0.132	0.191	0.229	0.259	0.280	0.296	0.309	0.364	0.364
1985	0.010	0.053	0.118	0.204	0.249	0.278	0.315	0.334	0.344	0.440	0.440
1986	0.010	0.055	0.124	0.182	0.239	0.271	0.306	0.329	0.360	0.400	0.399
1987	0.012	0.050	0.098	0.153	0.199	0.245	0.274	0.290	0.318	0.350	0.349
1988	0.013	0.021	0.088	0.154	0.196	0.242	0.281	0.304	0.327	0.341	0.371
1989	0.007	0.033	0.079	0.162	0.207	0.238	0.274	0.303	0.324	0.353	0.365
1990	0.010	0.031	0.092	0.161	0.200	0.234	0.255	0.287	0.319	0.336	0.364
1991	0.010	0.048	0.100	0.147	0.186	0.217	0.251	0.270	0.303	0.322	0.332
1992	0.009	0.025	0.100	0.148	0.181	0.216	0.252	0.275	0.295	0.313	0.333
1993	0.018	0.029	0.108	0.153	0.188	0.215	0.251	0.279	0.302	0.324	0.357
1994	0.012	0.037	0.079	0.131	0.175	0.203	0.223	0.253	0.289	0.304	0.326
1995	0.015	0.042	0.076	0.136	0.187	0.223	0.247	0.293	0.300	0.326	0.363
1996	0.010	0.033	0.098	0.137	0.168	0.228	0.266	0.308	0.332	0.355	0.384
1997	0.019	0.034	0.080	0.161	0.190	0.238	0.284	0.314	0.358	0.376	0.397
1998	0.010	0.038	0.076	0.131	0.177	0.210	0.251	0.296	0.308	0.337	0.376
1999	0.024	0.052	0.087	0.137	0.166	0.199	0.213	0.243	0.259	0.311	0.274
2000	0.023	0.062	0.095	0.139	0.173	0.198	0.214	0.232	0.270	0.295	0.311
2001	0.023	0.058	0.109	0.147	0.185	0.221	0.249	0.269	0.263	0.317	0.312
2002	0.019	0.045	0.107	0.149	0.176	0.215	0.243	0.251	0.238	0.252	0.274
2003	0.013	0.044	0.090	0.146	0.176	0.196	0.225	0.253	0.250	0.257	0.260
2004	0.011	0.035	0.084	0.136	0.178	0.195	0.204	0.242	0.228	0.249	0.253
2005	0.022	0.035	0.074	0.130	0.153	0.184	0.207	0.214	0.246	0.273	0.254
2006	0.023	0.056	0.091	0.141	0.164	0.181	0.204	0.222	0.252	0.267	0.307
2007	0.027	0.055	0.104	0.148	0.184	0.204	0.215	0.242	0.270	0.269	0.287
2008	0.025	0.050	0.095	0.146	0.175	0.207	0.228	0.240	0.254	0.293	0.325
2009	0.011	0.041	0.085	0.138	0.172	0.203	0.232	0.246	0.257	0.281	0.297
2010	0.010	0.030	0.060	0.119	0.149	0.181	0.209	0.234	0.245	0.253	0.260
2011	0.029	0.054	0.077	0.116	0.145	0.170	0.196	0.231	0.252	0.255	0.274
2012	0.023	0.051	0.084	0.117	0.143	0.165	0.186	0.221	0.246	0.258	0.266
Average 1965-2012	0.013	0.042	0.101	0.157	0.197	0.230	0.259	0.292	0.313	0.343	0.352
Minimum	0.007	0.021	0.060	0.116	0.143	0.165	0.186	0.214	0.228	0.249	0.253
Maximum	0.029	0.066	0.143	0.204	0.249	0.278	0.315	0.399	0.382	0.440	0.440
Avg 1970-79	0.010	0.041	0.116	0.174	0.221	0.254	0.286	0.326	0.355	0.388	0.387
Avg 1980-89	0.010	0.041	0.109	0.173	0.219	0.255	0.287	0.315	0.340	0.380	0.384
Avg 1990-99	0.014	0.037	0.090	0.144	0.182	0.218	0.249	0.282	0.307	0.330	0.351
Avg 2000-09	0.020	0.048	0.093	0.142	0.174	0.200	0.222	0.241	0.253	0.275	0.288
Prev 10yr: 2002-2011	0.019	0.044	0.087	0.137	0.167	0.193	0.216	0.238	0.249	0.265	0.279
Prev 5yr: 2007-2011	0.020	0.046	0.084	0.133	0.165	0.193	0.216	0.239	0.255	0.270	0.289

Note: Highlighted cells have average weights for 1967-2000 applied.

Table 22. Acoustic age composition for the overall SWNS/BoF component from 1999 to 2012.

Year and Area	Type Data	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total SSB
1999 Acoustics Overall (with CIF)	% catch wt.	0%	0%	4%	14%	35%	30%	11%	3%	1%	0%	0%	100%
2000 Acoustics Overall (with CIF)	% catch wt.	0%	0%	3%	25%	31%	19%	13%	7%	1%	1%	0%	100%
2001 Sub-total Stock Acoustic (with CIF)	% catch wt.	0%	2%	39%	14%	20%	13%	8%	2%	2%	0%	0%	100%
2002 Acoustics Stock Overall (with CIF)	% catch wt.	0%	1%	15%	44%	21%	7%	4%	3%	2%	1%	1%	99%
2003 Overall Acoustics (with CIF)	% catch wt.	0%	1%	28%	21%	34%	7%	4%	1%	1%	1%	1%	99%
2004 Acoustics Overall (with CIF)	% catch wt.	0%	0%	21%	43%	16%	11%	3%	1%	2%	0%	1%	99%
2005 Acoustics Overall (with CIF)	% catch wt.	0%	0%	10%	47%	20%	8%	8%	4%	1%	0%	1%	99%
2006 Acoustics Overall (with CIF)	% catch wt.	0%	0%	8%	21%	37%	19%	11%	3%	0%	0%	0%	100%
2007 Overall Acoustics (with CIF)	% catch wt.	0%	1%	8%	13%	17%	37%	19%	3%	1%	0%	0%	100%
2008 Overall Acoustics (with CIF)	% catch wt.	0%	0%	24%	12%	9%	14%	24%	12%	5%	1%	0%	100%
2009 Acoustics Overall (with CIF)	% catch wt.	0%	1%	17%	49%	8%	5%	7%	8%	4%	1%	0%	100%
2010 All Acoustics (with CIF)	% catch wt.	0%	0%	11%	21%	44%	6%	3%	6%	5%	2%	1%	99%
2011 Acoustics Overall (with CIF)	% catch wt.	0%	2%	18%	30%	23%	21%	2%	1%	1%	1%	0%	100%
2012 Acoustics Overall (with CIF)	% catch wt.	0%	0%	5%	25%	33%	19%	12%	2%	1%	1%	1%	99%
1999 Acoustics Overall (with CIF)	% numbers	0%	0%	6%	17%	37%	27%	9%	2%	1%	0%	0%	100%
2000 Acoustics Overall (with CIF)	% numbers	0%	1%	5%	31%	30%	16%	11%	5%	1%	0%	0%	100%
2001 Sub-total Stock Acoustic (with CIF)	% numbers	0%	4%	50%	14%	17%	9%	5%	1%	1%	0%	0%	100%
2002 Acoustics Stock Overall (with CIF)	% numbers	0%	4%	19%	46%	19%	5%	3%	2%	1%	0%	0%	100%
2003 Overall Acoustics (with CIF)	% numbers	0%	2%	37%	21%	28%	6%	3%	1%	1%	0%	0%	100%
2004 Acoustics Overall (with CIF)	% numbers	0%	1%	28%	44%	12%	9%	2%	1%	2%	0%	1%	99%
2005 Acoustics Overall (with CIF)	% numbers	0%	0%	14%	50%	19%	7%	6%	3%	1%	0%	0%	100%
2006 Acoustics Overall (with CIF)	% numbers	0%	0%	12%	23%	37%	17%	9%	2%	0%	0%	0%	100%
2007 Overall Acoustics (with CIF)	% numbers	0%	1%	13%	16%	17%	33%	17%	2%	1%	0%	0%	100%
2008 Overall Acoustics (with CIF)	% numbers	0%	0%	35%	14%	8%	12%	18%	9%	3%	0%	0%	100%
2009 Acoustics Overall (with CIF)	% numbers	0%	2%	23%	52%	7%	4%	4%	5%	2%	1%	0%	100%
2010 All Acoustics (with CIF)	% numbers	0%	0%	17%	24%	43%	5%	2%	3%	3%	1%	0%	100%
2011 Acoustics Overall (with CIF)	% numbers	0%	4%	26%	31%	20%	16%	2%	1%	0%	1%	0%	100%
2012 Acoustics Overall (with CIF)	% numbers	0%	0%	7%	29%	33%	17%	10%	1%	1%	1%	0%	100%
1999 Acoustics Overall (with CIF)	Catch wt. (t)	-	96	24,192	77,967	189,673	166,157	62,435	17,088	4,610	1,697	1,414	545,330
2000 Acoustics Overall (with CIF)	Catch wt. (t)	-	1,967	15,228	130,629	159,199	99,112	69,368	36,577	5,245	2,903	546	520,774
2001 Sub-total Stock Acoustic (with CIF)	Catch wt. (t)	-	8,962	226,129	78,412	117,923	77,160	47,004	11,357	8,874	925	8	576,753
2002 Acoustics Stock Overall (with CIF)	Catch wt. (t)	74	7,519	83,622	246,962	118,066	41,279	23,066	15,020	10,427	4,707	4,840	555,582
2003 Overall Acoustics (with CIF)	Catch wt. (t)	-	6,356	141,540	104,192	167,881	36,889	20,239	6,916	5,823	3,767	3,323	496,924
2004 Acoustics Overall (with CIF)	Catch wt. (t)	-	1,841	108,188	222,883	81,843	60,077	18,071	6,627	12,335	2,117	5,038	519,019
2005 Acoustics Overall (with CIF)	Catch wt. (t)	-	280	30,686	143,951	60,907	24,217	24,136	11,077	3,128	590	2,152	301,125
2006 Acoustics Overall (with CIF)	Catch wt. (t)	-	416	27,544	71,463	127,551	64,562	39,216	10,082	1,145	772	340	343,092
2007 Overall Acoustics (with CIF)	Catch wt. (t)	-	3,040	46,123	72,547	97,393	206,507	106,409	14,277	6,624	1,471	1,090	555,480
2008 Overall Acoustics (with CIF)	Catch wt. (t)	-	16	63,007	31,776	23,445	36,090	64,098	31,902	12,279	2,034	261	264,908
2009 Acoustics Overall (with CIF)	Catch wt. (t)	-	5,283	81,430	240,978	39,943	26,608	31,759	36,917	18,285	4,791	998	486,992
2010 All Acoustics (with CIF)	Catch wt. (t)	-	349	35,859	65,554	138,675	20,324	10,438	17,461	14,494	6,258	2,646	312,057
2011 Acoustics Overall (with CIF)	Catch wt. (t)	0	8,260	82,324	136,092	101,658	93,000	10,640	5,602	4,421	5,103	1,670	448,770
2012 Acoustics Overall (with CIF)	Catch wt. (t)	2	203	23,020	120,016	158,702	93,348	56,656	10,103	6,070	4,526	3,379	476,026
1999 Acoustics Overall (with CIF)	Numbers (x1,000)	-	972	183,418	489,829	1,062,907	786,929	263,817	62,824	15,293	5,294	3,652	2,874,933
2000 Acoustics Overall (with CIF)	Numbers (x1,000)	-	20,042	134,995	899,046	883,867	480,402	316,374	153,234	18,167	9,466	1,370	2,916,964
2001 Sub-total Stock Acoustic (with CIF)	Numbers (x1,000)	-	138,378	1,863,364	520,051	629,493	344,389	185,290	40,507	33,537	2,907	25	3,757,943
2002 Acoustics Stock Overall (with CIF)	Numbers (x1,000)	2,847	132,918	666,501	1,632,217	675,677	191,965	93,831	58,234	43,805	17,392	17,274	3,532,661
2003 Overall Acoustics (with CIF)	Numbers (x1,000)	-	75,899	1,280,141	716,456	968,658	192,680	91,717	27,831	23,605	14,876	13,196	3,405,060
2004 Acoustics Overall (with CIF)	Numbers (x1,000)	-	29,138	977,495	1,564,177	429,090	301,861	86,440	27,005	54,019	7,473	19,841	3,496,538
2005 Acoustics Overall (with CIF)	Numbers (x1,000)	-	5,743	270,611	989,364	375,723	128,849	112,316	50,960	12,657	2,161	8,707	1,957,092
2006 Acoustics Overall (with CIF)	Numbers (x1,000)	-	5,925	237,497	459,245	738,445	339,588	186,063	44,547	4,543	2,894	1,191	2,019,938
2007 Overall Acoustics (with CIF)	Numbers (x1,000)	-	30,745	378,840	471,617	523,359	1,008,862	506,663	54,973	25,067	5,177	3,699	3,009,003
2008 Overall Acoustics (with CIF)	Numbers (x1,000)	-	200	530,159	208,001	124,260	172,143	273,854	130,451	47,003	7,018	862	1,493,951
2009 Acoustics Overall (with CIF)	Numbers (x1,000)	-	80,153	748,194	1,675,788	228,794	128,524	135,293	147,571	69,756	17,166	3,339	3,234,577
2010 All Acoustics (with CIF)	Numbers (x1,000)	-	5,321	364,994	521,396	911,479	112,611	48,457	73,892	59,104	24,968	10,290	2,132,512
2011 Acoustics Overall (with CIF)	Numbers (x1,000)	0	144,094	886,891	1,083,801	675,731	543,019	54,854	24,559	17,249	19,710	6,191	3,456,098
2012 Acoustics Overall (with CIF)	Numbers (x1,000)	130	3,028	227,273	961,371	1,088,022	565,948	311,235	47,020	24,713	17,761	12,766	3,259,266

Table 23. Acoustic age composition for the German Bank component from 1999 to 2012 (with % by weight, % by number, catch/survey biomass(t) and numbers (thousands) by age).

Year and Area	Type Data	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total
1999 German Bank Acoustic Overall (with CIF)	% catch wt.	0%	0%	4%	14%	34%	30%	11%	3%	1%	0%	0%	100%
2000 German Bank Overall (with CIF)	% catch wt.	0%	1%	3%	26%	30%	17%	15%	7%	1%	1%	0%	100%
2001 German Bank Acoustic (with CIF)	% catch wt.	0%	3%	41%	12%	19%	13%	8%	2%	2%	0%	0%	100%
2002 German Bank Overall (with CIF)	% catch wt.	0%	1%	16%	42%	21%	7%	4%	3%	2%	1%	1%	99%
2003 German Bank Acoustics (with CIF)	% catch wt.	0%	1%	32%	20%	30%	8%	4%	1%	1%	1%	1%	99%
2004 Acoustics German Bank (with CIF)	% catch wt.	0%	0%	19%	46%	16%	10%	3%	1%	3%	0%	1%	99%
2005 German Bank Acoustics (with CIF)	% catch wt.	0%	0%	10%	47%	20%	8%	8%	4%	1%	0%	1%	99%
2006 German Bank Acoustics (with CIF)	% catch wt.	0%	0%	8%	20%	37%	19%	12%	3%	0%	0%	0%	100%
2007 German Bank Acoustics (with CIF)	% catch wt.	0%	1%	8%	12%	17%	38%	20%	2%	1%	0%	0%	100%
2008 German Bank Acoustics (with CIF)	% catch wt.	0%	0%	24%	12%	9%	13%	24%	12%	5%	1%	0%	100%
2009 German Bank Acoustics (with CIF)	% catch wt.	0%	1%	16%	49%	8%	5%	7%	8%	4%	1%	0%	100%
2010 German Bank Acoustics Overall (with CIF)	% catch wt.	0%	0%	10%	20%	44%	6%	3%	6%	5%	2%	1%	99%
2011 German Bank Overall (with CIF)	% catch wt.	0%	3%	19%	29%	22%	21%	2%	1%	1%	1%	0%	100%
2012 Acoustics German Bank (with CIF)	% catch wt.	0%	0%	6%	31%	32%	16%	9%	2%	2%	1%	1%	99%
1999 German Bank Acoustic Overall (with CIF)	% numbers	0%	0%	6%	17%	37%	27%	9%	2%	1%	0%	0%	100%
2000 German Bank Overall (with CIF)	% numbers	0%	1%	5%	31%	29%	15%	12%	5%	1%	0%	0%	100%
2001 German Bank Acoustic (with CIF)	% numbers	0%	8%	50%	12%	15%	9%	5%	1%	1%	0%	0%	100%
2002 German Bank Overall (with CIF)	% numbers	0%	4%	20%	44%	19%	5%	3%	2%	1%	0%	0%	100%
2003 German Bank Acoustics (with CIF)	% numbers	0%	2%	41%	20%	25%	6%	3%	1%	1%	0%	0%	100%
2004 Acoustics German Bank (with CIF)	% numbers	0%	1%	25%	48%	12%	7%	2%	1%	2%	0%	1%	99%
2005 German Bank Acoustics (with CIF)	% numbers	0%	0%	14%	50%	19%	7%	6%	3%	1%	0%	0%	100%
2006 German Bank Acoustics (with CIF)	% numbers	0%	0%	12%	22%	36%	17%	9%	2%	0%	0%	0%	100%
2007 German Bank Acoustics (with CIF)	% numbers	0%	1%	12%	15%	17%	34%	18%	2%	1%	0%	0%	100%
2008 German Bank Acoustics (with CIF)	% numbers	0%	0%	36%	14%	8%	11%	18%	9%	3%	0%	0%	100%
2009 German Bank Acoustics (with CIF)	% numbers	0%	2%	22%	52%	7%	4%	4%	5%	2%	1%	0%	100%
2010 German Bank Acoustics Overall (with CIF)	% numbers	0%	0%	16%	24%	43%	5%	2%	4%	3%	1%	1%	99%
2011 German Bank Overall (with CIF)	% numbers	0%	6%	27%	29%	19%	15%	1%	1%	1%	1%	0%	100%
2012 Acoustics German Bank (with CIF)	% numbers	0%	0%	9%	36%	31%	14%	7%	1%	1%	1%	1%	99%
1999 German Bank Acoustic Overall (with CIF)	Catch wt. (t)	-	94	22,020	71,969	170,866	150,058	56,609	16,095	4,580	1,666	1,403	495,360
2000 German Bank Overall (with CIF)	Catch wt. (t)	-	1,714	11,428	85,499	99,807	57,948	48,812	22,450	3,959	1,781	542	333,940
2001 German Bank Acoustic (with CIF)	Catch wt. (t)	-	8,709	105,329	31,035	47,725	33,793	21,101	4,622	4,485	512	-	257,310
2002 German Bank Overall (with CIF)	Catch wt. (t)	65	6,286	67,234	176,687	90,152	30,366	17,751	11,648	9,474	3,049	3,468	416,181
2003 German Bank Acoustics (with CIF)	Catch wt. (t)	-	4,120	111,880	70,453	105,752	28,232	14,854	4,812	3,817	2,258	2,597	348,776
2004 Acoustics German Bank (with CIF)	Catch wt. (t)	-	1,543	74,501	181,390	64,019	38,787	11,728	5,034	10,206	1,124	3,625	391,955
2005 German Bank Acoustics (with CIF)	Catch wt. (t)	-	253	28,259	127,632	53,781	22,164	21,719	9,605	2,690	537	1,939	268,580
2006 German Bank Acoustics (with CIF)	Catch wt. (t)	-	385	24,848	60,454	109,208	55,536	34,201	8,844	973	649	293	295,390
2007 German Bank Acoustics (with CIF)	Catch wt. (t)	-	2,626	38,067	61,417	85,462	188,827	102,160	12,151	6,359	1,334	957	499,361
2008 German Bank Acoustics (with CIF)	Catch wt. (t)	-	-	58,937	28,340	21,000	30,528	58,958	29,408	11,722	1,797	261	240,950
2009 German Bank Acoustics (with CIF)	Catch wt. (t)	-	3,753	64,068	196,736	32,188	21,514	26,020	31,485	16,399	4,519	978	397,660
2010 German Bank Acoustics Overall (with CIF)	Catch wt. (t)	-	224	26,819	52,092	113,756	15,750	8,461	15,402	13,099	5,679	2,487	253,769
2011 German Bank Overall (with CIF)	Catch wt. (t)	-	7,846	56,905	87,082	67,336	62,429	5,092	4,232	3,545	4,494	1,499	300,460
2012 Acoustics German Bank (with CIF)	Catch wt. (t)	-	134	17,915	88,968	92,271	45,791	27,105	5,077	4,732	3,500	2,951	288,443
1999 German Bank Acoustic Overall (with CIF)	Numbers (x1,000)	-	948	166,864	451,905	959,130	709,941	237,407	58,820	15,194	5,192	3,624	2,609,024
2000 German Bank Overall (with CIF)	Numbers (x1,000)	-	17,625	102,000	589,063	553,882	289,467	226,575	96,514	13,709	5,760	1,361	1,895,957
2001 German Bank Acoustic (with CIF)	Numbers (x1,000)	-	135,703	894,080	210,906	258,067	152,649	84,043	16,527	17,480	1,604	-	1,771,058
2002 German Bank Overall (with CIF)	Numbers (x1,000)	2,537	111,379	539,725	1,166,924	519,058	142,215	72,525	45,273	39,941	11,155	12,261	2,662,994
2003 German Bank Acoustics (with CIF)	Numbers (x1,000)	-	46,007	1,004,407	494,420	612,116	148,687	67,475	19,473	15,492	8,908	10,457	2,427,440
2004 Acoustics German Bank (with CIF)	Numbers (x1,000)	-	24,531	677,770	1,277,135	332,022	196,099	56,805	20,672	45,133	3,596	14,378	2,648,140
2005 German Bank Acoustics (with CIF)	Numbers (x1,000)	-	5,182	248,168	870,294	330,085	118,133	100,841	44,127	10,910	1,977	7,905	1,737,625
2006 German Bank Acoustics (with CIF)	Numbers (x1,000)	-	5,494	214,151	386,345	629,197	290,199	161,640	39,049	3,876	2,456	1,029	1,733,437
2007 German Bank Acoustics (with CIF)	Numbers (x1,000)	-	26,261	310,742	397,519	458,661	920,624	486,502	46,109	24,135	4,666	3,250	2,678,468
2008 German Bank Acoustics (with CIF)	Numbers (x1,000)	-	-	496,210	185,856	110,437	146,499	252,158	120,986	44,750	6,190	862	1,363,949
2009 German Bank Acoustics (with CIF)	Numbers (x1,000)	-	54,955	583,192	1,360,737	182,941	103,267	109,573	124,811	62,074	16,154	3,273	2,600,976
2010 German Bank Acoustics Overall (with CIF)	Numbers (x1,000)	-	3,316	272,314	414,147	744,621	86,016	39,053	64,928	53,120	22,533	9,635	1,709,683
2011 German Bank Overall (with CIF)	Numbers (x1,000)	-	136,458	624,134	684,168	434,182	360,193	24,543	18,531	13,595	17,288	5,549	2,318,639
2012 Acoustics German Bank (with CIF)	Numbers (x1,000)	-	1,946	174,959	711,646	623,273	271,374	142,452	22,099	18,998	13,364	11,056	1,991,166

Table 24. Biological characteristics from sampling for German Bank acoustic surveys from 1999 to 2012 with average length (cm) and average weight (g) by age.

Year and Area	Type Data	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total
1999 German Bank Acoustic Overall (with CIF)	Avg. len (cm)	-	23.2	25.4	26.9	27.9	29.4	30.5	31.9	33.0	33.5	-	28.3
2000 German Bank Overall (with CIF)	Avg. len (cm)	-	23.9	24.9	26.9	28.7	29.7	30.5	31.1	33.2	33.6	-	28.4
2001 German Bank Acoustic (with CIF)	Avg. len (cm)	-	20.9	25.1	26.7	28.6	30.2	31.4	32.4	31.5	33.7	-	26.3
2002 German Bank Overall (with CIF)	Avg. len (cm)	15.9	20.2	25.7	27.3	28.3	30.1	31.3	31.8	31.3	32.0	-	27.3
2003 German Bank Acoustics (with CIF)	Avg. len (cm)	-	23.1	24.7	26.5	28.2	29.0	30.3	31.4	31.4	31.6	-	26.5
2004 Acoustics German Bank (with CIF)	Avg. len (cm)	-	20.8	24.6	26.6	29.1	29.3	29.7	31.2	30.6	33.6	-	26.7
2005 German Bank Acoustics (with CIF)	Avg. len (cm)	-	19.2	24.8	26.8	27.6	28.9	30.1	30.2	31.4	32.3	-	27.1
2006 German Bank Acoustics (with CIF)	Avg. len (cm)	-	21.1	24.7	27.0	27.8	28.6	29.5	30.1	31.1	31.6	-	27.6
2007 German Bank Acoustics (with CIF)	Avg. len (cm)	-	23.8	25.2	27.0	28.5	29.3	29.4	31.4	31.5	32.2	-	28.4
2008 German Bank Acoustics (with CIF)	Avg. len (cm)	-	-	24.8	26.7	28.5	29.3	30.3	30.6	31.4	32.3	-	27.6
2009 German Bank Acoustics (with CIF)	Avg. len (cm)	-	21.2	24.3	26.3	27.9	29.2	30.4	31.0	31.4	32.0	32.7	26.5
2010 German Bank Acoustics Overall (with CIF)	Avg. len (cm)	-	21.6	24.0	25.8	27.3	28.7	30.2	31.0	31.4	31.6	31.9	26.9
2011 German Bank Overall (with CIF)	Avg. len (cm)	-	19.9	22.9	25.5	27.2	28.1	29.7	30.7	32.0	32.0	32.4	25.4
2012 Acoustics German Bank (with CIF)	Avg. len (cm)	-	21.3	23.9	25.4	26.8	27.9	28.9	30.6	31.5	32.0	32.2	26.5
1999 German Bank Acoustic Overall (with CIF)	Avg. wt. (g)	2.0	98.9	132.0	159.3	178.1	211.4	238.4	273.6	301.4	320.8	-	189.9
2000 German Bank Overall (with CIF)	Avg. wt. (g)	2.0	97.3	112.0	145.1	180.2	200.2	215.4	232.6	288.8	309.2	-	176.1
2001 German Bank Acoustic (with CIF)	Avg. wt. (g)	2.0	64.2	117.8	147.2	184.9	221.4	251.1	279.6	256.6	319.3	-	145.3
2002 German Bank Overall (with CIF)	Avg. wt. (g)	2.0	56.4	124.6	151.4	173.7	213.5	244.8	257.3	237.2	273.3	-	156.3
2003 German Bank Acoustics (with CIF)	Avg. wt. (g)	2.0	89.6	111.4	142.5	172.8	189.9	220.1	247.1	246.4	253.5	-	143.7
2004 Acoustics German Bank (with CIF)	Avg. wt. (g)	2.0	62.9	109.9	142.0	192.8	197.8	206.5	243.5	226.1	312.5	-	148.0
2005 German Bank Acoustics (with CIF)	Avg. wt. (g)	2.0	48.8	113.9	146.7	162.9	187.6	215.4	217.7	246.6	271.9	-	154.6
2006 German Bank Acoustics (with CIF)	Avg. wt. (g)	2.0	70.0	116.0	156.5	173.6	191.4	211.6	226.5	251.1	264.2	-	170.4
2007 German Bank Acoustics (with CIF)	Avg. wt. (g)	2.0	100.0	122.5	154.5	186.3	205.1	210.0	263.5	263.5	285.9	-	186.4
2008 German Bank Acoustics (with CIF)	Avg. wt. (g)	2.0	-	118.8	152.5	190.1	208.4	233.8	243.1	261.9	290.4	-	176.7
2009 German Bank Acoustics (with CIF)	Avg. wt. (g)	2.0	68.3	109.9	144.6	175.9	208.3	237.5	252.3	264.2	279.8	298.7	152.9
2010 German Bank Acoustics Overall (with CIF)	Avg. wt. (g)	2.0	67.5	98.5	125.8	152.8	183.1	216.7	237.2	246.6	252.0	258.1	148.4
2011 German Bank Overall (with CIF)	Avg. wt. (g)	2.0	57.5	91.2	127.3	155.1	173.3	207.5	228.4	260.7	260.0	270.1	129.6
2012 Acoustics German Bank (with CIF)	Avg. wt. (g)	2.0	69.0	102.4	125.0	148.0	168.7	190.3	229.7	249.1	261.9	266.9	144.9

Table 25. Progress against biological objectives in the management plan of the SWNS/BoF herring spawning component for the 2011-2012 fishery.

Objective	**2011 and 2012: Observations**
Persistence of all spawning components	Spawning observed in Scots Bay and German Bank. Spawning activity could not be determined on Seal Island or Browns due to a lack of fishing or survey effort. Trinity Ledge again had minimal spawning.
Maintain biomass of each component	Acoustic biomass estimates increased substantially for the Scots Bay survey area. German Bank SSB fluctuated up in 2011 and down in 2012. The SSB for Trinity remains low moving above the long-term average in 2011 and dipping below 2012. The overall SSB has been well below average for 5 of the past 6 years.
Maintain broad age composition	There is currently a broad range of ages in the commercial catch (1-9), as well as in the acoustic survey catch at age (3-11). However, the proportion of older aged fish (>7 years old) remains low.
Maintain long spawning period	Start of spawning in 2012 for German Bank was earlier than 2011 based on survey results. Spawning in Scots Bay appeared to start and end about the same time in both years. This is earlier than in previous years. Virtually no spawning occurred on Trinity Ledge. Spawning periods are being maintained on the two major spawning grounds.
Fishing mortality at or below $F_{0.1}$	Fishing mortality could not be determined. Relative exploitation rates based on acoustic SSB and catch decreased in 2011 and 2012.
Maintain spatial and temporal diversity of spawning	Similar spatial and temporal distribution of spawning on German Bank. Duration of spawning in Scots was extended and similar to 2009. Trinity spawning is very restricted in space and time. There is a lack of documented spawning in other areas. Spawning periods are being maintained both temporally and spatially on the two major spawning grounds.
Maintain biomass at moderate to high levels	In 2011, the overall SSB (Scots Bay and German Bank combined) was slightly below the long-term average (1999-2012) and in 2012 increased to above the average.
Maintain three-year moving average above the lower reference point	The three-year moving average increased above the lower reference point in 2010, changed very little in 2011, and increased again in 2012.

Table 26A. Herring catch at age for the 2011 Offshore Banks fisheries with numbers caught (thousands), weight (t) and percent, average length and average weight by age.

2011 Offshore Purse Seine Catch at age (numbers and weight).

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total
Numbers (x1,000)	-	-	2,358	12,742	13,448	20,985	5,736	2,130	2,786	2,659	1,396	64,241
% numbers	-	-	4%	20%	21%	33%	9%	3%	4%	4%	2%	100%
Catch wt. (t)	-	-	249	1,601	1,935	3,472	1,059	457	657	638	387	10,455
% catch wt.	-	-	2%	15%	19%	33%	10%	4%	6%	6%	4%	100%
Avg. len (cm)	-	-	24.0	25.4	26.5	27.7	28.8	30.2	31.2	31.3	32.9	27.5
Avg. wt. (g)	-	-	105.5	125.6	143.9	165.4	184.7	214.5	235.8	240.0	277.4	162.8

Table 26B. Herring catch at age for the 2012 Offshore Banks fisheries with numbers caught (thousands), weight (t) and percent, average length and average weight by age.

2012 Offshore Purse Seine Catch at age (numbers and weight).

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total
Numbers (x1,000)	-	-	160	1,464	1,536	2,061	1,583	511	159	124	90	7,688
% numbers	-	-	2%	19%	20%	27%	21%	7%	2%	2%	1%	100%
Catch wt. (t)	-	-	14	172	209	339	285	99	39	32	22	1,210
% catch wt.	-	-	1%	14%	17%	28%	24%	8%	3%	3%	2%	100%
Avg. len (cm)	-	-	22.9	25.2	26.6	28.4	29.2	29.9	32.2	32.7	32.2	27.8
Avg. wt. (g)	-	-	88.1	117.6	136.3	164.4	179.8	193.7	243.3	254.3	242.1	157.4

Table 27. Herring abundance indices from the July bottom trawl survey (stratified numbers per tow): 1970-2012. Note 2005 had duplicate coverage of the entire area with comparative surveys by the Alfred Needler and Templeman.

		4V only strata 440/452		4W Only strata 453/466		4X Only strata 470/495		4WX combined strata 453/495		4X BOF strata 480/495		4WX Offshore Banks strata 455/478		4VWX All Strata strata 440/498	
Year	Cruise	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
1970	A175/176	12.8	9.8	4.9	2.4	1.6	0.6	4.1	1.5	1.0	0.6	5.7	2.4	6.5	3.1
1971	A188/189	4.4	4.4	2.6	1.2	3.6	2.6	4.0	1.9	1.4	1.0	5.3	2.8	4.0	1.9
1972	A200/201	4.5	3.7	1.7	1.0	0.5	0.1	1.4	0.6	0.3	0.1	2.0	1.0	2.3	1.1
1973	A212/213	19.2	19.2	0.4	0.3	1.0	0.4	0.9	0.3	1.0	0.4	0.9	0.4	6.1	5.4
1974	A225/226	0.0	0.0	0.2	0.0	1.0	0.4	0.7	0.3	1.4	0.6	0.5	0.2	0.6	0.2
1975	A236/237	2.2	2.2	0.8	0.4	0.7	0.4	0.9	0.4	1.3	0.7	0.7	0.4	1.3	0.7
1976	A250/251	0.0	0.0	0.1	0.1	0.5	0.3	0.4	0.2	0.9	0.6	0.1	0.1	0.3	0.2
1977	A265/266	1.6	1.4	0.0	0.0	0.8	0.5	0.5	0.3	1.5	0.9	0.1	0.1	0.9	0.5
1978	A279/280	0.0	0.0	0.5	0.5	0.1	0.0	0.3	0.3	0.1	0.0	0.5	0.5	0.3	0.2
1979	A292/293	0.0	0.0	0.0	0.0	1.0	0.7	0.6	0.5	1.5	1.3	0.2	0.2	0.4	0.3
1980	A306/307	0.0	0.0	0.0	0.0	0.8	0.8	0.5	0.5	1.6	1.6	0.0	0.0	0.4	0.4
1981	A321/322	0.0	0.0	0.0	0.0	2.3	2.1	1.5	1.4	4.6	4.1	0.0	0.0	1.1	1.0
1982	H080/081	0.0	0.0	0.5	0.3	1.9	1.4	1.5	0.9	0.8	0.3	2.5	1.7	1.3	0.8
1983	N012/013	0.1	0.0	2.6	1.2	2.2	1.0	2.4	0.8	3.1	1.6	2.1	1.0	1.7	0.6
1984	N031/032	4.0	2.9	3.3	1.2	10.5	6.8	7.0	3.5	4.6	2.5	8.5	5.4	6.2	2.7
1985	N048/049	0.0	0.0	6.6	3.8	0.3	0.1	3.4	1.8	0.4	0.2	5.0	2.9	2.4	1.3
1986	N065/066	0.5	0.4	30.8	26.7	16.0	14.3	23.2	14.9	24.9	22.3	23.4	20.3	16.9	10.8
1987	N85/86/87	117.4	90.5	17.0	11.3	4.0	1.8	10.4	5.6	6.3	2.8	12.9	8.6	40.8	26.0
1988	N105/106	0.3	0.2	2.7	1.2	1.5	0.5	2.1	0.6	2.3	0.8	2.0	0.9	1.6	0.5
1989	N123/124	3.6	3.1	11.8	3.4	4.5	1.2	8.4	1.8	4.9	1.4	9.8	2.7	6.7	1.5
1990	N139/140	0.3	0.2	7.4	3.6	3.4	1.0	5.6	1.9	3.4	0.8	6.5	2.9	3.9	1.4
1991	N154/H231	10.2	9.9	13.0	8.8	5.0	1.8	10.6	5.8	4.9	2.3	14.3	9.0	10.7	5.1
1992	N173/174	0.2	0.1	16.2	6.6	40.8	15.7	16.5	4.9	41.8	22.2	23.6	7.4	20.9	6.3
1993	N189/190	1.0	0.6	6.3	2.5	30.4	8.5	18.7	4.5	27.6	10.3	15.0	4.7	13.8	3.3
1994	N221/222	25.7	22.0	108.4	58.9	45.9	18.4	76.4	30.2	51.1	26.0	91.1	45.1	61.6	22.7
1995	N226/227	7.9	6.1	100.5	47.9	28.4	12.8	63.5	24.2	11.4	5.4	92.7	37.6	46.8	17.2
1996	N246/247	0.2	0.1	53.2	24.5	27.1	14.1	40.2	14.2	32.1	20.8	46.5	19.5	27.5	9.9
1997	N726/734	0.2	0.1	34.6	10.1	51.3	39.3	31.8	15.3	72.8	60.9	29.3	7.7	30.2	14.5
1998	N827/832	0.8	0.3	147.6	39.9	54.8	14.5	99.5	20.7	45.6	19.4	130.3	30.3	69.7	14.6
1999	N925/929	24.9	15.2	264.2	101.0	199.4	130.2	229.8	83.8	251.4	203.6	226.2	74.4	163.7	58.6
2000	NED2000-426/431	2.0	0.6	146.3	40.6	38.7	7.4	90.6	20.0	29.5	9.1	124.7	30.5	63.8	13.9
2001	NED2001-032/037	53.9	49.2	152.7	81.3	139.5	52.5	145.9	47.7	181.3	80.9	132.4	60.9	116.7	36.0
2002	NED2002-037/040	4.9	2.6	172.7	81.3	151.9	55.6	161.9	48.6	170.9	85.3	162.6	61.1	114.4	34.0
2003	NED2003-036/042	4.9	2.0	207.8	145.4	58.7	14.5	130.6	70.5	50.3	14.0	175.8	108.6	92.5	49.2
2004t	TEL2004-529/530	1.4	0.4	307.6	134.5	285.0	147.4	295.9	100.2	198.0	170.9	355.6	127.6	209.2	70.7
2005t	TEL2005-605/633	7.4	2.2	13.7	8.7	130.5	23.1	74.1	13.7	51.8	34.4	88.0	6.6	53.9	9.1
2005n	NED2005-027/034	13.6	5.4	36.0	13.1	88.2	38.5	63.1	20.9	61.0	30.2	66.2	28.4	47.7	14.7
2006	NED2006-030/036	15.2	11.0	133.3	59.2	40.7	15.5	85.7	29.7	26.7	9.8	118.6	45.6	66.4	21.0
2007	TEL2007-745	0.9	0.5	20.0	8.0	59.9	17.3	40.7	9.8	85.8	26.9	19.0	6.2	29.1	6.9
2008	TEM2008-830	2.0	0.8	46.8	24.7	40.9	10.1	43.7	12.9	50.8	14.3	40.2	18.1	31.1	9.1
2009	NED2009-027	6.1	4.8	44.6	21.0	61.4	12.1	53.3	11.9	85.4	18.1	38.6	15.9	40.7	8.4
2010	NED2010-027	38.4	31.2	163.4	60.8	256.4	215.5	211.5	115.4	50.8	10.2	300.5	178.0	158.3	81.0
2011	NED2011-025	15.4	10.6	83.8	21.5	151.3	83.9	118.7	44.9	219.0	131.1	71.3	16.2	87.1	31.4
2012	NED2012-022	8.7	3.5	108.3	40.0	122.8	31.6	115.8	25.3	139.2	40.3	107.7	33.1	83.3	17.7
Overall Mean		9.5	7.2	56.2	25.0	49.2	23.1	52.2	18.5	45.6	24.8	58.2	23.3	39.6	14.0
Minimum		0.0	0.0	0.0	0.0	0.1	0.0	0.3	0.2	0.1	0.0	0.0	0.0	0.3	0.2
Maximum		117.4	90.5	307.6	145.4	285.0	215.5	295.9	115.4	251.4	203.6	355.6	178.0	209.2	81.0

Table 28. Coastal Nova Scotia spawning component summary of a) herring landings (t) from gillnet fisheries 1996-2012, b) spawning biomass from acoustic surveys in the Coastal Nova Scotia spawning component from 1996-2012, and c) estimated exploitation as calculated as catch/SSB.

a - Landings by spawning area for Coastal Nova Scotia with 5 year and overall averages.

Landings (t)		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average Catch Last 5 yr.	Average Catch All Years
Little Hope/Port Mouton	Catch		490	1,170	2,919	2,043	2,904	3,982	4,526	1,267	2,239	3,133	1,506	1,108	3,731	3,106	2,564	2,150	2,532	2,427
	Allocation					1,495	1,170	1,410	2,248	3,028	3,162	3,952	4,008	2,944	2,172	2,454	2,094	2,188		
Halifax/Eastern Shore	Catch	1,280	1,520	1,100	1,628	1,350	1,898	3,334	2,727	4,176	3,446	3,348	3,727	2,381	6,045	2,456	1,040	799	2,544	2,486
	Allocation					1,425	1,313	1,403	1,952	3,638	3,802	4,323	5,367	5,103	3,857	4,373	4,188	2,920		
Glace Bay			170	1,730	1,040	834	1,204	3,058	1,905	1,481	626	85	45	12	4	11	0	7	7	763
Bras d'Or Lakes		170	160	120	31	56	0	1	4	0	0	0	0	0	0	0	0	0	0	32
Total		1,450	2,340	4,120	5,618	7,203	8,489	13,187	13,362	13,590	13,275	14,841	14,653	11,547	15,809	12,400	9,886	8,064	11,541	9,990

b - Acoustic SSB for coastal Nova Scotia with 5 year and overall averages (with CIF).

Survey SSB (t)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	SSB Average Last 5 yr.	SSB Average All years
Little Hope/Port Mouton			14,100	15,800	5,200	21,300	56,000	**53,100**	22,500	44,700	24,100	2,800	14,500	36,600	26,700	28,796	12,756	23,870	25,263
Halifax/Eastern Shore			8,300	20,200	**10,900**	16,700	**41,500**	92,600	28,400	36,950	68,900	28,300	30,300	54,200	27,700	5,498	3,668	24,273	31,608
Glace Bay				2,000		21,200	7,700	31,500	n/s	3,180	n/s	240	500	100	8	51	n/s	165	6,648
Bras d'Or Lakes				530	70	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	300

Note 1: shaded cells include mapping surveys which estimated biomass based on visual sounder estimates; bold cells include mapping and acoustic surveys.
Note 2: data prior to 2003 calculated with the CIF are not available and estimates of exploitation were not made for these years.

c - Exploitation estimates for coastal Nova Scotia spawning components with 5 year and overall averages (with CIF).

Survey SSB (t) with CIF	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average Last 5 yr.	Average All years
Little Hope/Port Mouton			8%	18%	39%	14%	7%	**9%**	6%	5%	13%	54%	8%	10%	12%	9%	17%	11%	15%
Halifax/Eastern Shore			13%	8%	12%	11%	8%	3%	15%	9%	5%	13%	8%	11%	9%	19%	22%	14%	11%
Glace Bay				52%		6%	40%	6%		20%		19%	2%	4%				3%	18%
Bras d'Or Lakes																			

Table 29A. Herring catch at age for the 2011 Coastal Nova Scotia gillnet fisheries with numbers caught (thousands), weight (t) and percent, average length and average weight by age.

Coastal Gillnet 2011 Catch at age (numbers and weight).

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total
Numbers (x1,000)	-	18	235	1,301	3,578	6,610	1,355	1,229	1,323	1,588	466	17,703
% numbers	-	0%	1%	7%	20%	37%	8%	7%	7%	9%	3%	100%
Catch wt. (t)	-	1	25	192	627	1,280	303	296	346	410	126	3,606
% catch wt.	-	0%	1%	5%	17%	35%	8%	8%	10%	11%	3%	100%
Avg. len (cm)	-	19.7	24.2	26.8	28.3	29.2	30.5	31.2	32.0	31.9	32.4	29.5
Avg. wt. (g)	-	55.7	107.9	147.8	175.3	193.6	223.6	240.8	261.2	257.9	270.5	203.7

Table 29B. Herring catch at age for the 2012 Coastal Nova Scotia gillnet fisheries with numbers caught (thousands), weight (t) and percent, average length and average weight by age.

Coastal Gillnet 2012 Catch at age (numbers and weight).

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total
Numbers (x1,000)	0	108	296	1,156	2,167	3,878	3,926	991	1,027	735	812	15,096
% numbers	0%	1%	2%	8%	14%	26%	26%	7%	7%	5%	5%	100%
Catch wt. (t)	0	5	25	160	364	735	819	234	257	188	219	3,007
% catch wt.	0%	0%	1%	5%	12%	24%	27%	8%	9%	6%	7%	100%
Avg. len (cm)	12.0	19.1	22.8	26.4	28.0	29.1	29.9	31.1	31.6	31.9	32.4	29.4
Avg. wt. (g)	10.8	48.1	85.0	138.6	168.2	189.5	208.7	235.7	249.9	256.0	270.2	199.2

Table 30. Monthly landings (t) from weirs located in New Brunswick from 1978 to 2012.

YEAR	MONTH												Year Total
	Jan	Feb	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec	
1978	3				512	802	5,499	10,275	10,877	4,972	528	132	33,599
1979	535	96			25	1,120	7,321	9,846	4,939	5,985	2,638	74	32,579
1980					36	119	1,755	5,572	2,352	1,016	216		11,066
1981					70	199	4,431	3,911	2,044	2,435	1,686	192	14,968
1982		17			132	30	2,871	7,311	7,681	3,204	849	87	22,181
1983					65	29	299	2,474	5,382	3,945	375		12,568
1984					6	3	230	2,344	2,581	3,045	145		8,353
1985					22	89	4,217	8,450	6,910	4,814	2,078	138	26,718
1986	43				17		2,480	10,114	5,997	6,233	2,564	67	27,516
1987	39	21	6	12	10	168	2,575	10,893	6,711	5,362	703	122	26,621
1988		12	1	90	657	287	5,993	11,975	8,375	8,457	2,343	43	38,235
1989		24		95	37	385	8,315	15,093	10,156	7,258	2,158		43,520
1990					93	20	4,915	14,664	12,207	7,741	168		39,808
1991					57	180	4,649	10,319	6,392	2,028	93		23,717
1992				15	50	774	5,477	10,989	9,597	4,395	684		31,981
1993					14	168	5,561	14,085	8,614	2,406	470	10	31,328
1994				18		55	4,529	10,592	3,805	1,589	30		20,618
1995					15	244	4,517	8,590	3,956	896	10		18,228
1996					19	676	4,819	7,767	1,917	518	65		15,781
1997				8	153	1,017	6,506	7,396	5,316				20,396
1998					560	713	3,832	8,295	5,604	525			19,529
1999					690	805	5,155	9,895	2,469	48			19,063
2000					10	7	2,105	7,533	4,940	1,713	69		16,376
2001					35	478	3,931	8,627	5,514	1,479			20,064
2002					84	20	1,099	6,446	2,878	1,260	20		11,807
2003					257	250	1,423	3,554	3,166	344	10		9,003
2004					21	336	2,694	8,354	8,298	913	3		20,620
2005						213	802	7,145	3,729	740	11		12,639
2006					8	43	1,112	3,731	3,832	2,328	125	462	11,641
2007	182		20	30	84	633	3,241	11,363	7,637	6,567	314	73	30,145
2008						81	1,502	2,479	1,507	389	49	32	6,041
2009					5	239	699	1,111	1,219	330			3,603
2010				6	64	1,912	2,560	3,903	1,933	247	46		10,671
2011						250	656	1,097	500	140			2,643
2012					29	140	5	5	98	217			494
NB Average Catch (t)	160	34	9	34	124	367	3,365	7,606	5,118	2,751	659	119	19,832
NB Minimum Catch (t)	3	12	1	6	5	3	5	5	98	48	3	10	494
NB Maximum Catch (t)	535	96	20	95	690	1,912	8,315	15,093	12,207	8,457	2,638	462	43,520

Table 31A. Herring catch at age for the 2011 New Brunswick juvenile fisheries (weir and shutoff combined) with numbers caught (thousands), weight (t) and percent, average length and average weight by age.

2011 SWNB non-stock component Catch at age (numbers and weight).

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11+	Total
Numbers (x1,000)	14,254	44,743	21,030	2,153	263	61	4					82,509
% numbers	17%	54%	25%	3%	0%	0%	0%					100%
Catch wt. (t)	272	1,830	1,350	217	33	9	1					3,711
% catch wt.	7%	49%	36%	6%	1%	0%	0%					100%
Avg. len (cm)	14.1	17.8	20.5	23.6	25.2	26.4	26.5					18.0
Avg. wt. (g)	19.1	40.9	64.2	101.0	125.0	144.1	149.6					45.0

Table 31B. Herring catch at age for the 2012 New Brunswick juvenile fisheries (weir and shutoff combined) with numbers caught (thousands), weight (t) and percent, average length and average weight by age.

2012 SWNB non-stock component Catch at age (numbers and weight).

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age11+	Total
Numbers (x1,000)	23,399	4,309	468	611	232	62	17	3	1	1	0	29,104
% numbers	80%	15%	2%	2%	1%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	274	92	36	62	28	9	3	1	0	0	0	504
% catch wt.	54%	18%	7%	12%	5%	2%	1%	0%	0%	0%	0%	100%
Avg. len (cm)	12.3	14.7	22.0	24.0	25.3	26.5	28.2	29.6	32.0	31.9	31.5	13.2
Avg. wt. (g)	11.7	21.4	77.0	101.8	119.0	138.6	168.9	195.5	265.8	263.9	252.4	17.3

FIGURES

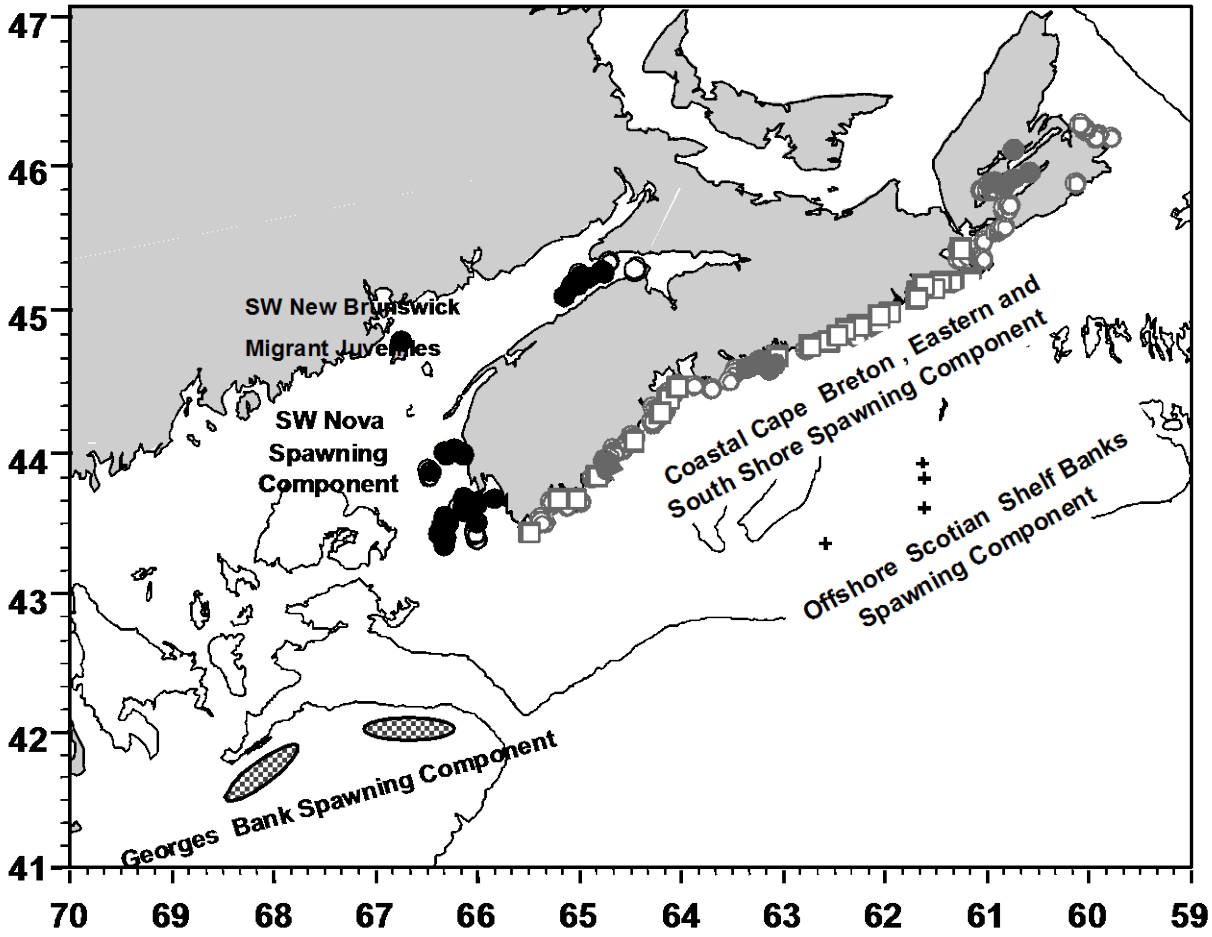


Figure 1. Management units for herring in NAFO Divisions 4VWX and 5YZ showing locations of known current (solid) and historical (open) spawning locations.

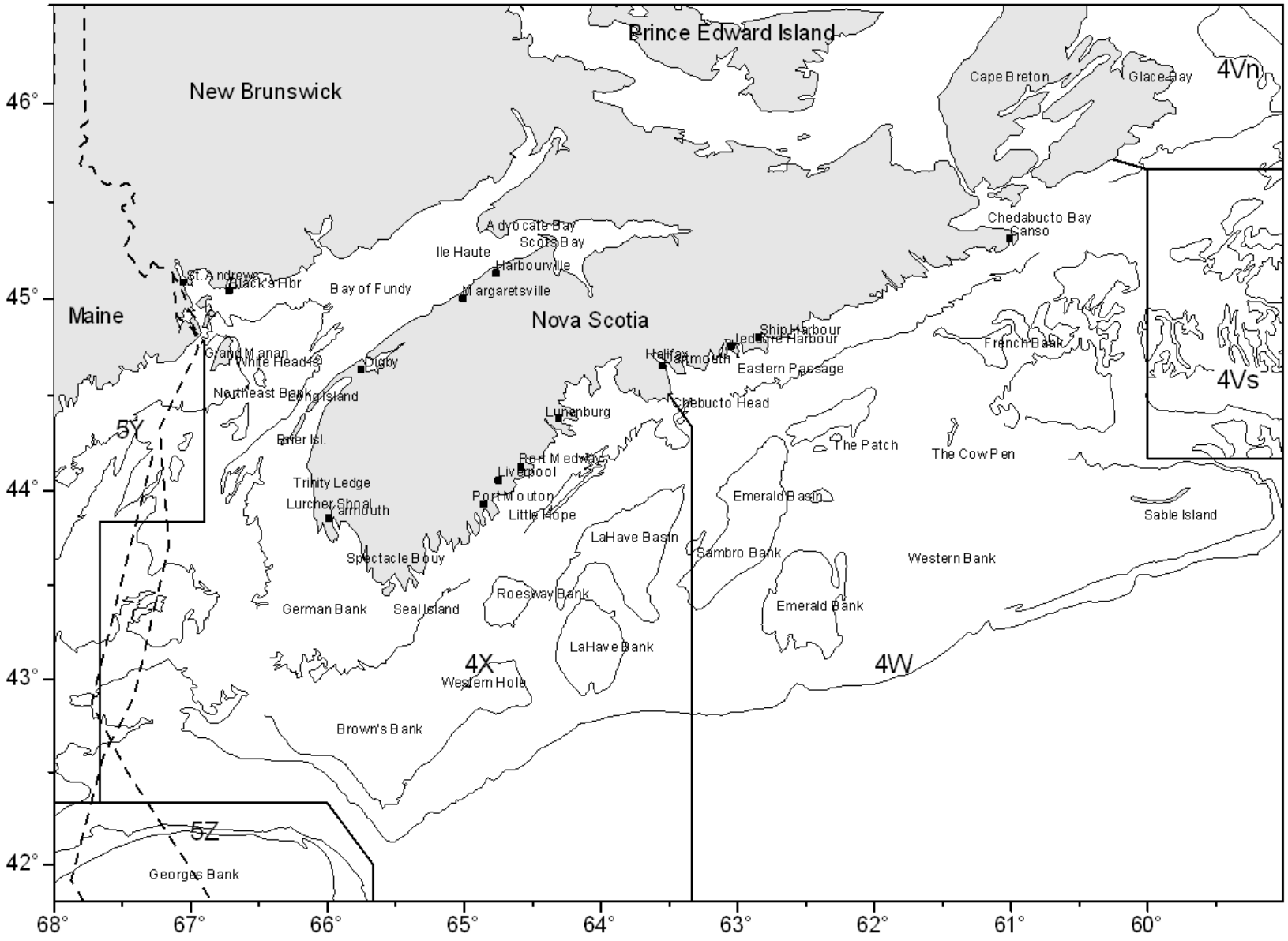


Figure 2. Place names and fishing locations for SWNB, Coastal Nova Scotia and Scotian Shelf.

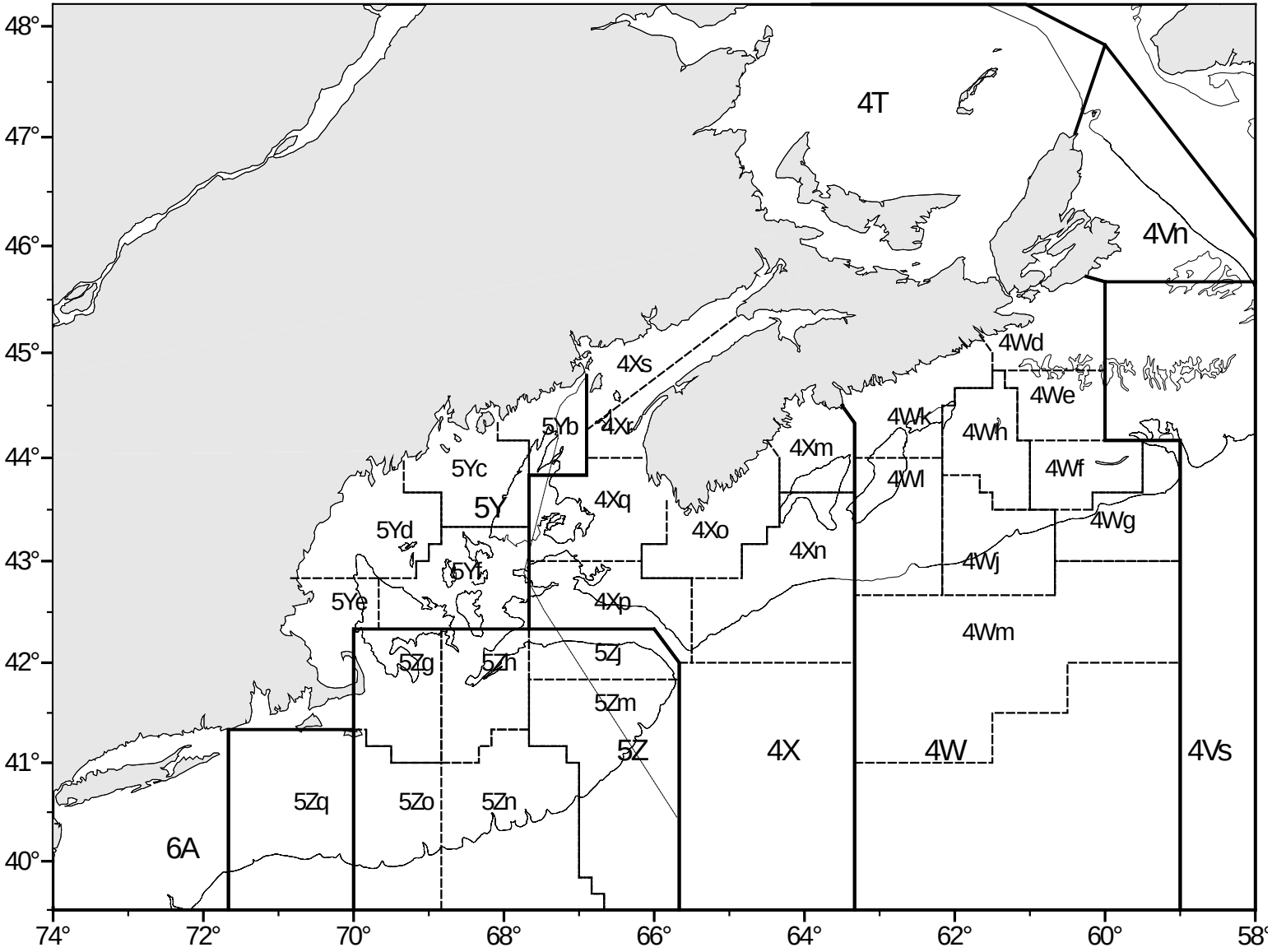


Figure 3. NAFO divisions, subareas, and unit areas used for sample and catch data aggregation.

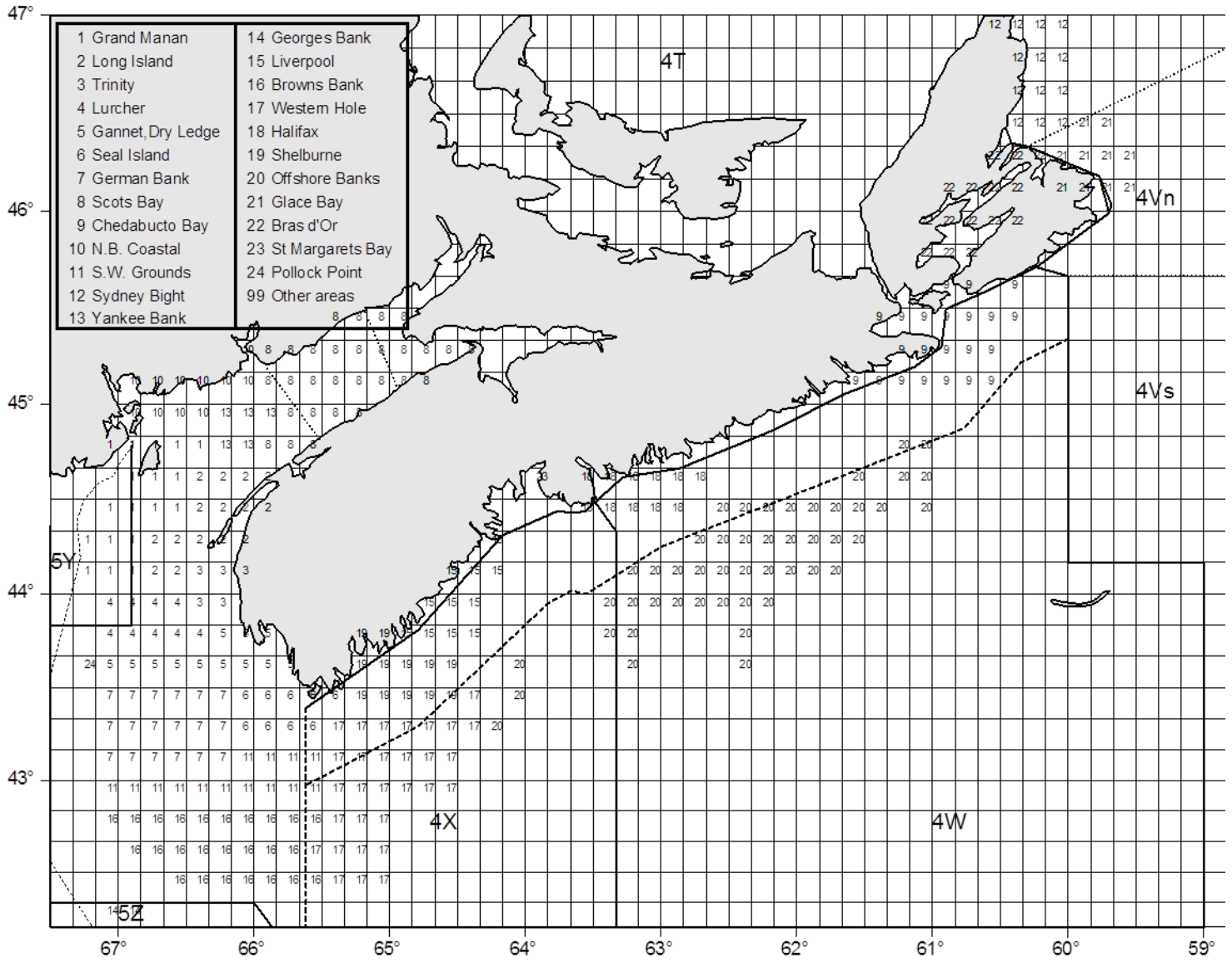


Figure 4. Herring fishing ground areas by 10 mile boxes and management lines for NAFO divisions, 25 mile offshore line, coastal embayment line, and herring area lines.

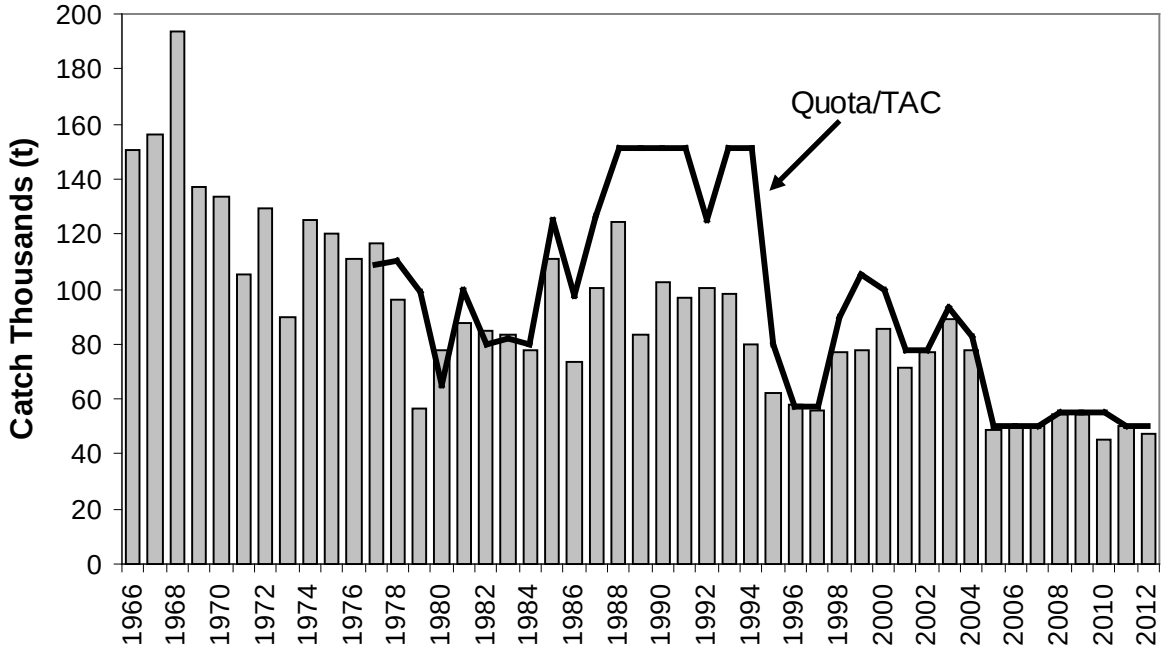


Figure 5. Annual adjusted herring landings [bars] and TAC [solid line] (quota) for the SWNS spawning component (4WX stock).

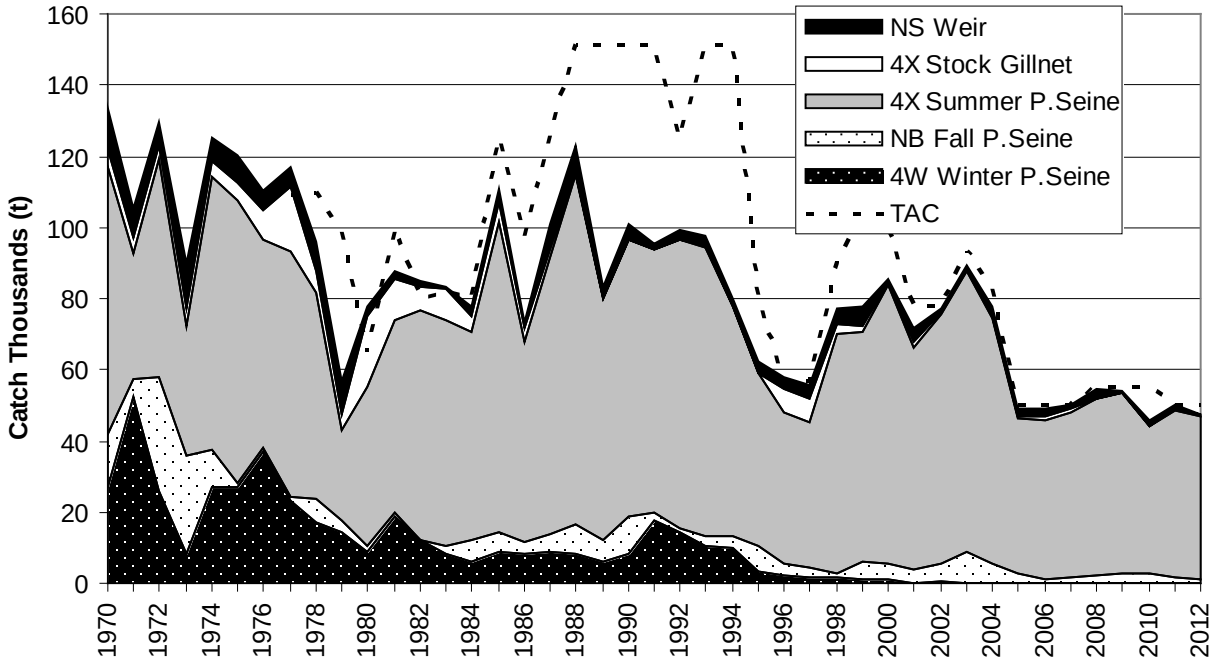


Figure 6. Annual herring landings by gear component for the SWNS spawning component (4WX stock).

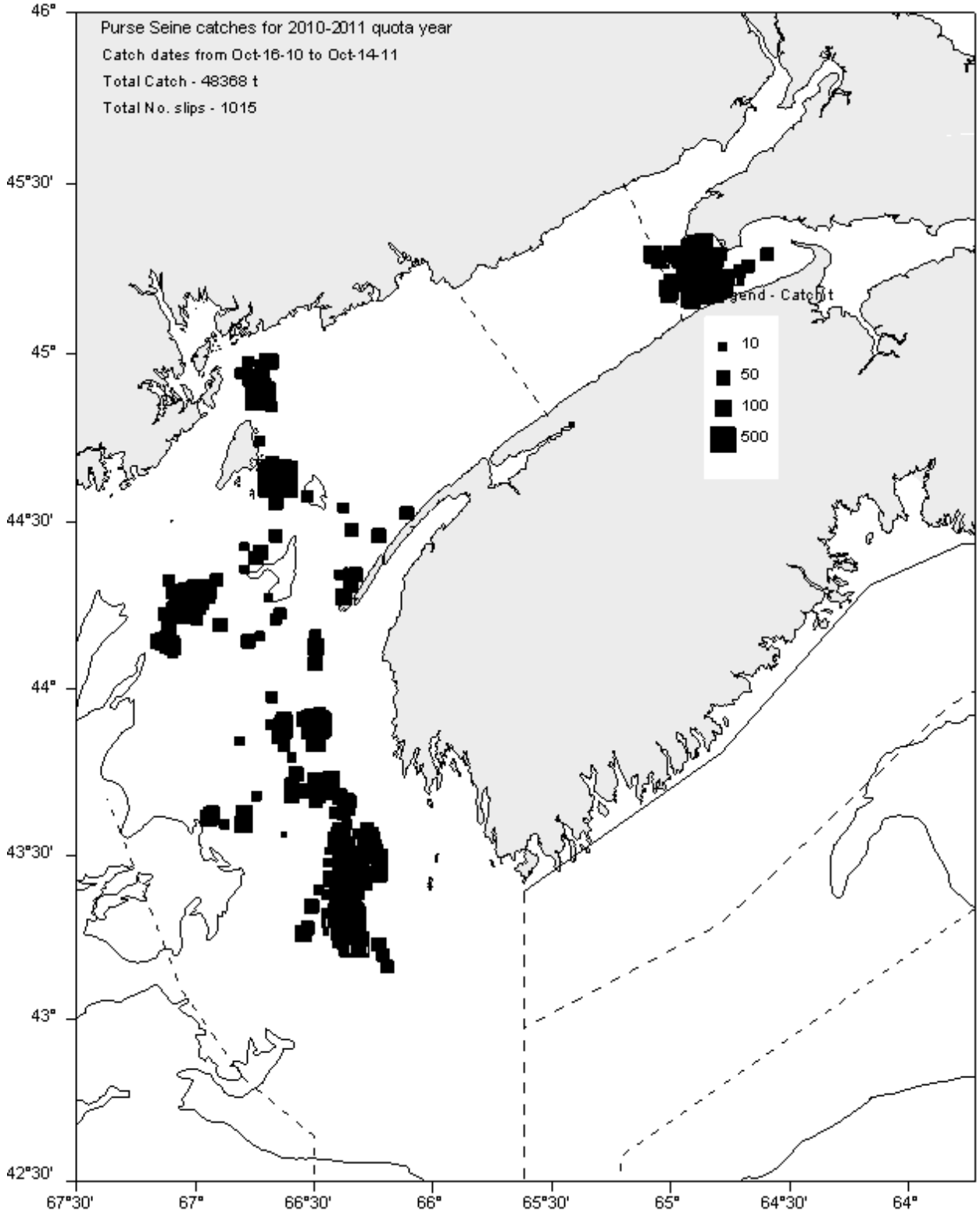


Figure 7A. The 2010-2011 quota year herring purse seine catches (t) for NAFO Division 4X (from Statistics Division MARFIS database).

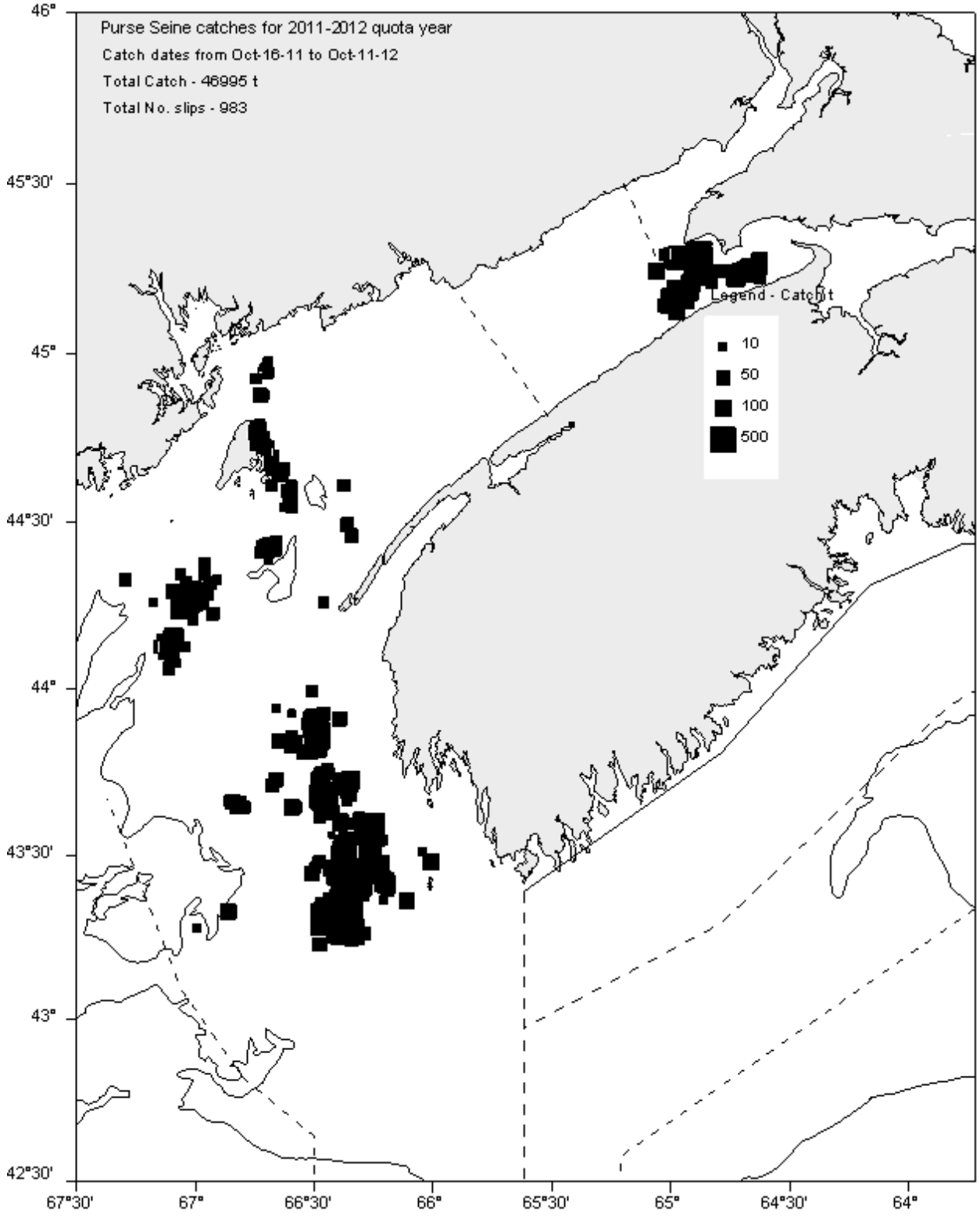


Figure 7B. The 2011-2012 quota year herring purse seine catches (t) for NAFO Division 4X (from Statistics Division MARFIS database).

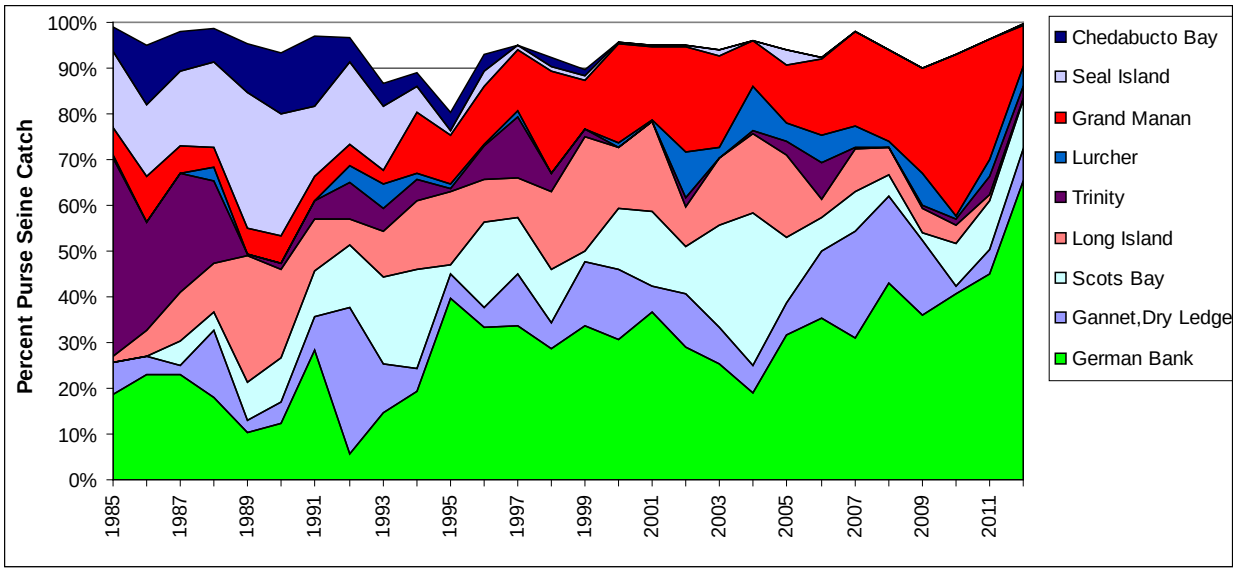


Figure 8. Herring purse seine catches as a proportion of overall landings for selected fishing grounds in the SWNS spawning component from 1985-2012.

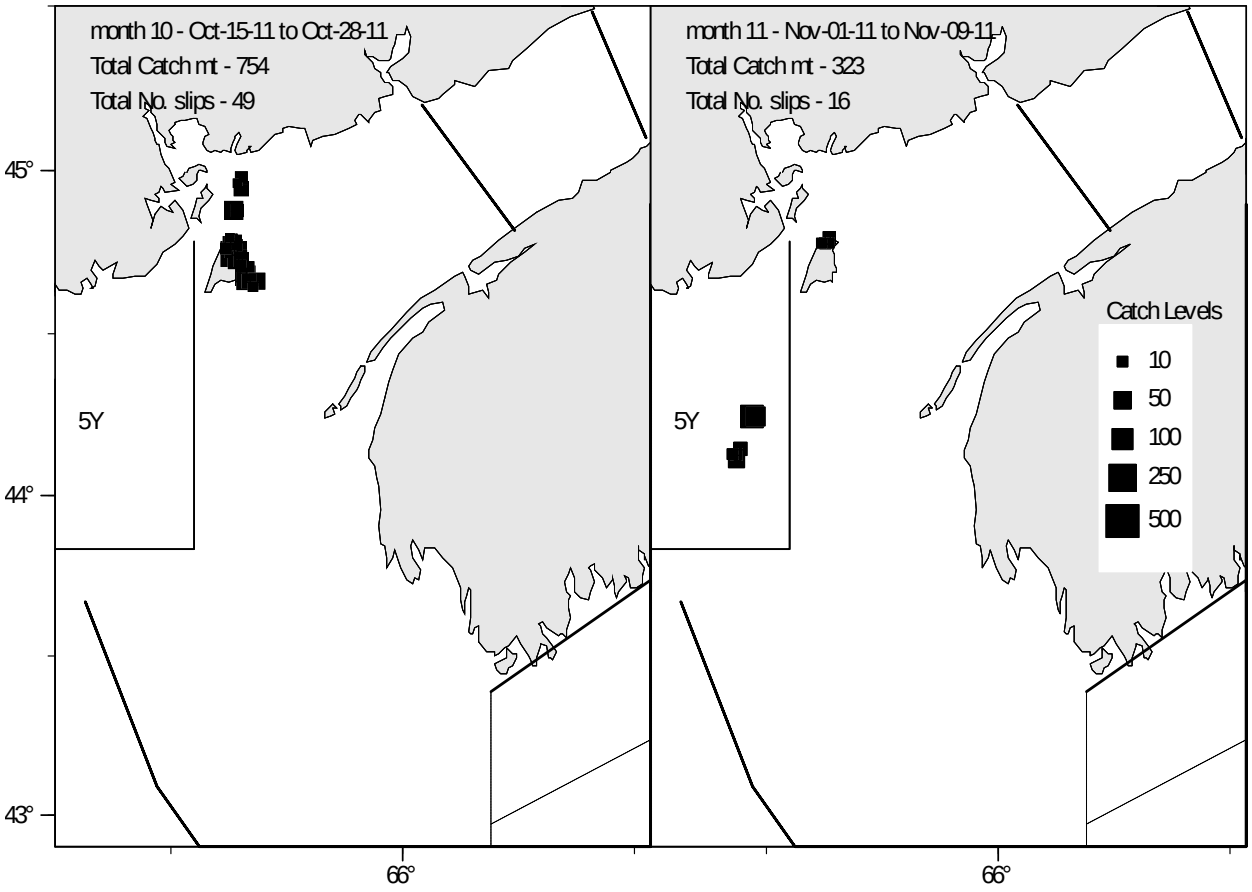


Figure 9A. Fall 2011 herring purse seine catches by month in NAFO Division 4X (part of 2011-2012 quota year).

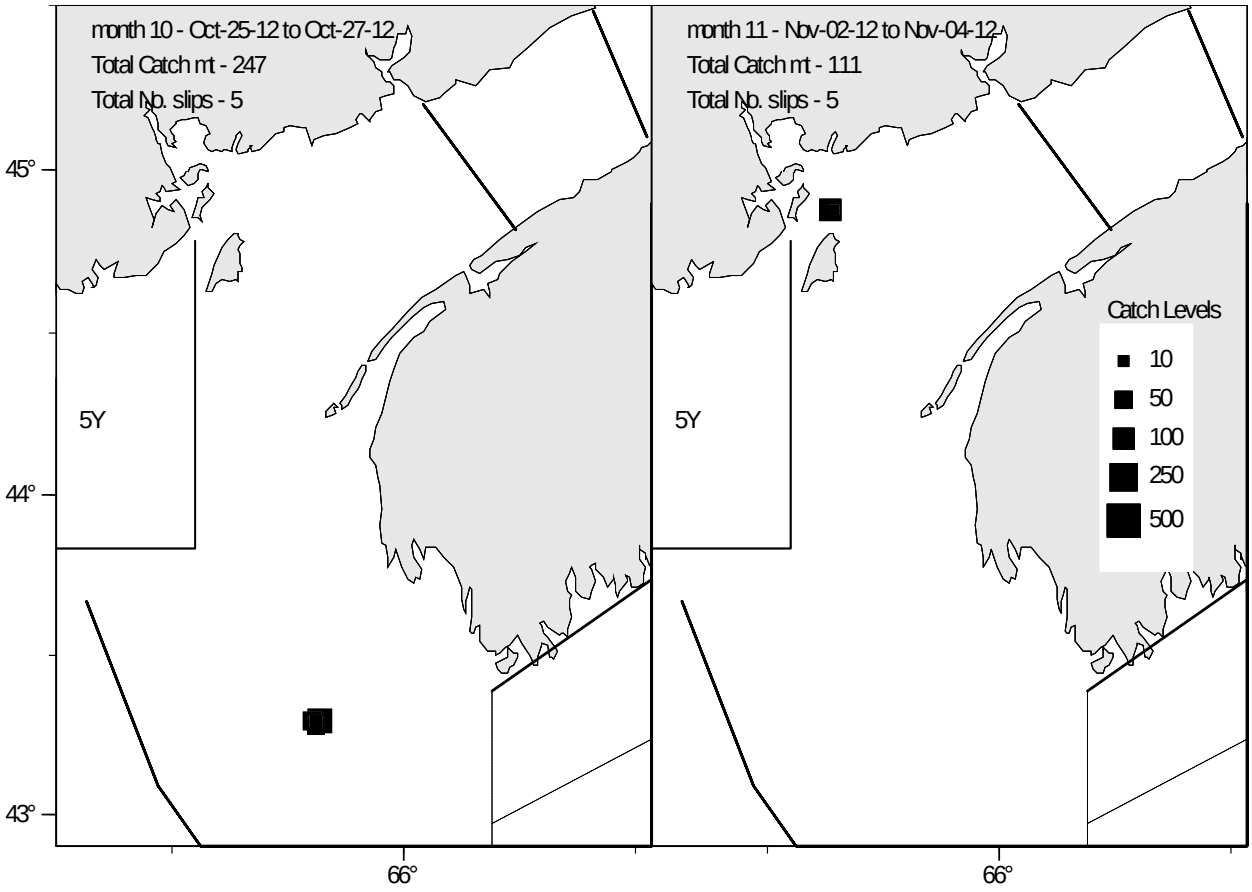


Figure 9B. Fall 2012 herring purse seine catches by month in NAFO Division 4X (part of 2012-2013 quota year).

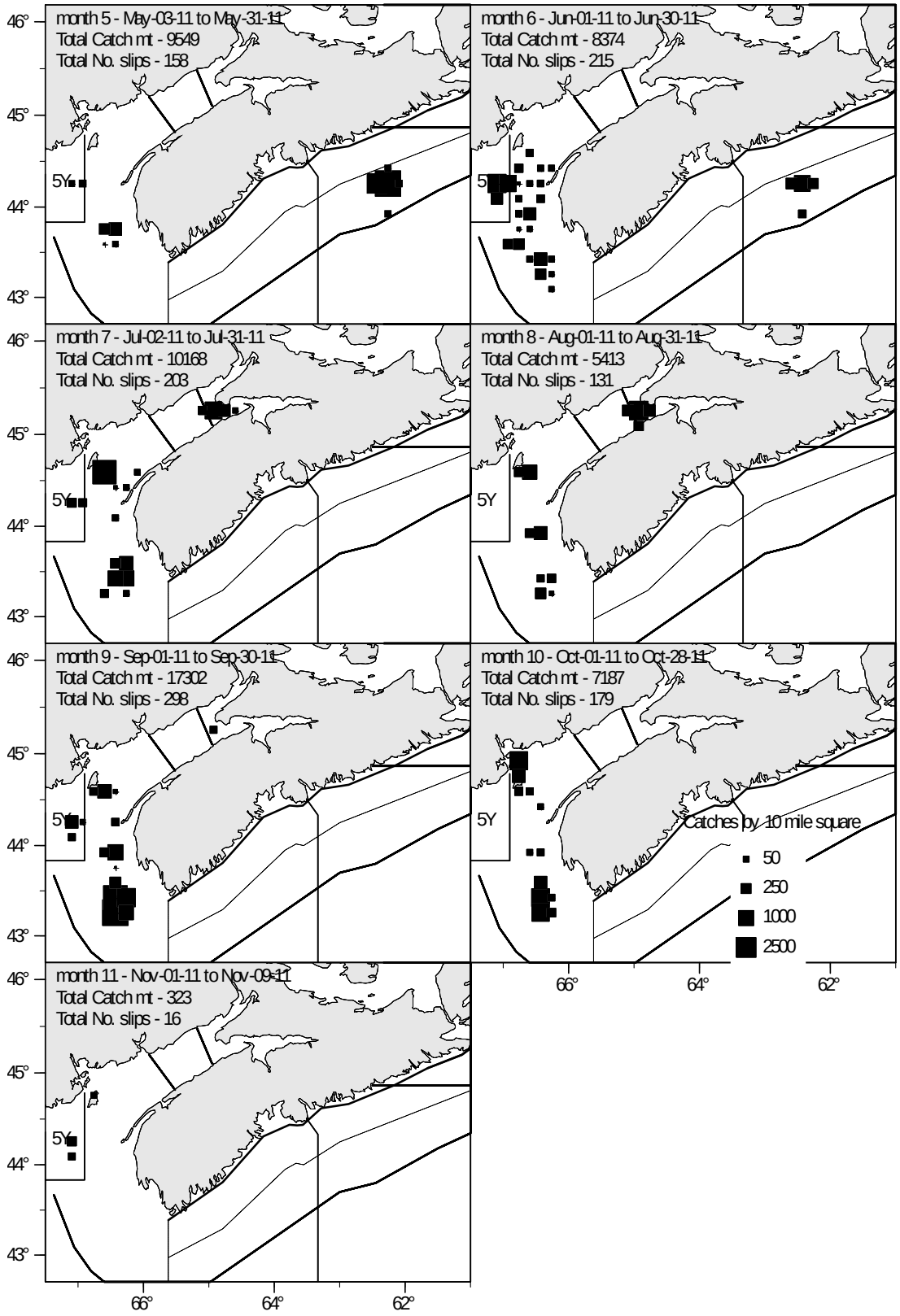


Figure 10A. 2011 herring purse seine catches by month in NAFO Divisions 4WX for calendar year 2011 (from Statistics Division MARFIS database).

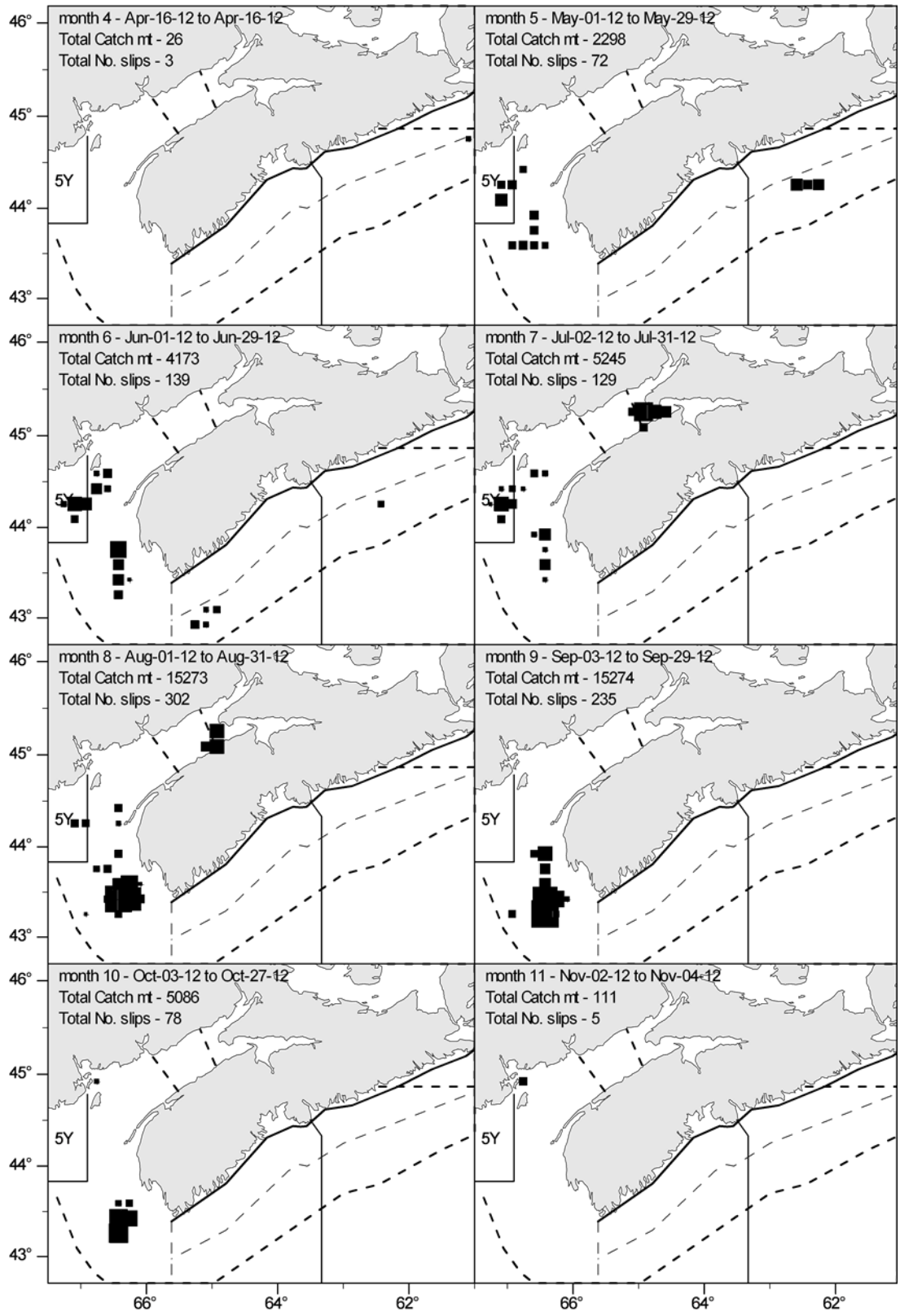


Figure 10B. 2012 herring purse seine catches by month in NAFO Divisions 4WX for calendar year 2012 (from Statistics Division MARFIS database).

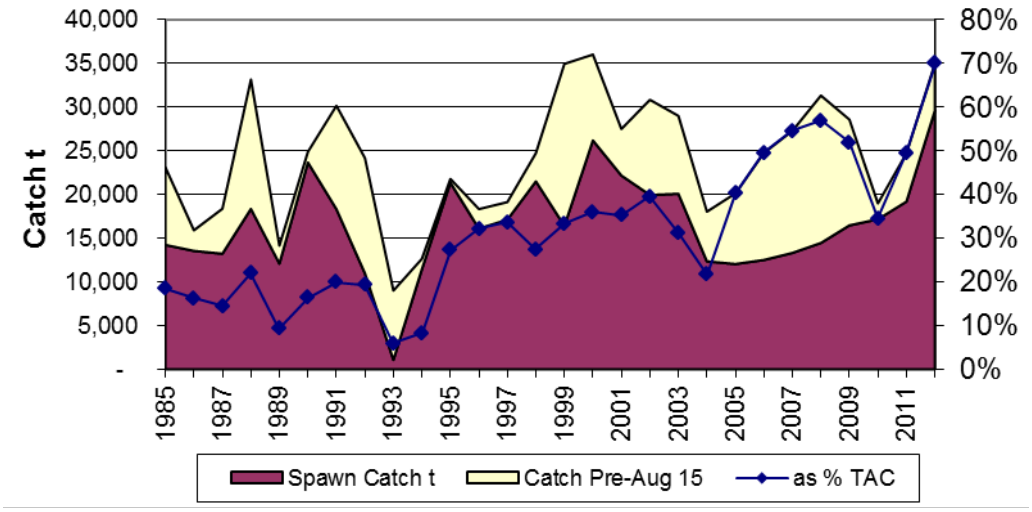


Figure 11. Annual herring purse seine catches for the German Bank area from 1985-2012 with pre-spawning and spawning period catches based on an August 15 start date for the defined spawning period and overall German Bank catches as a proportion of the TAC.

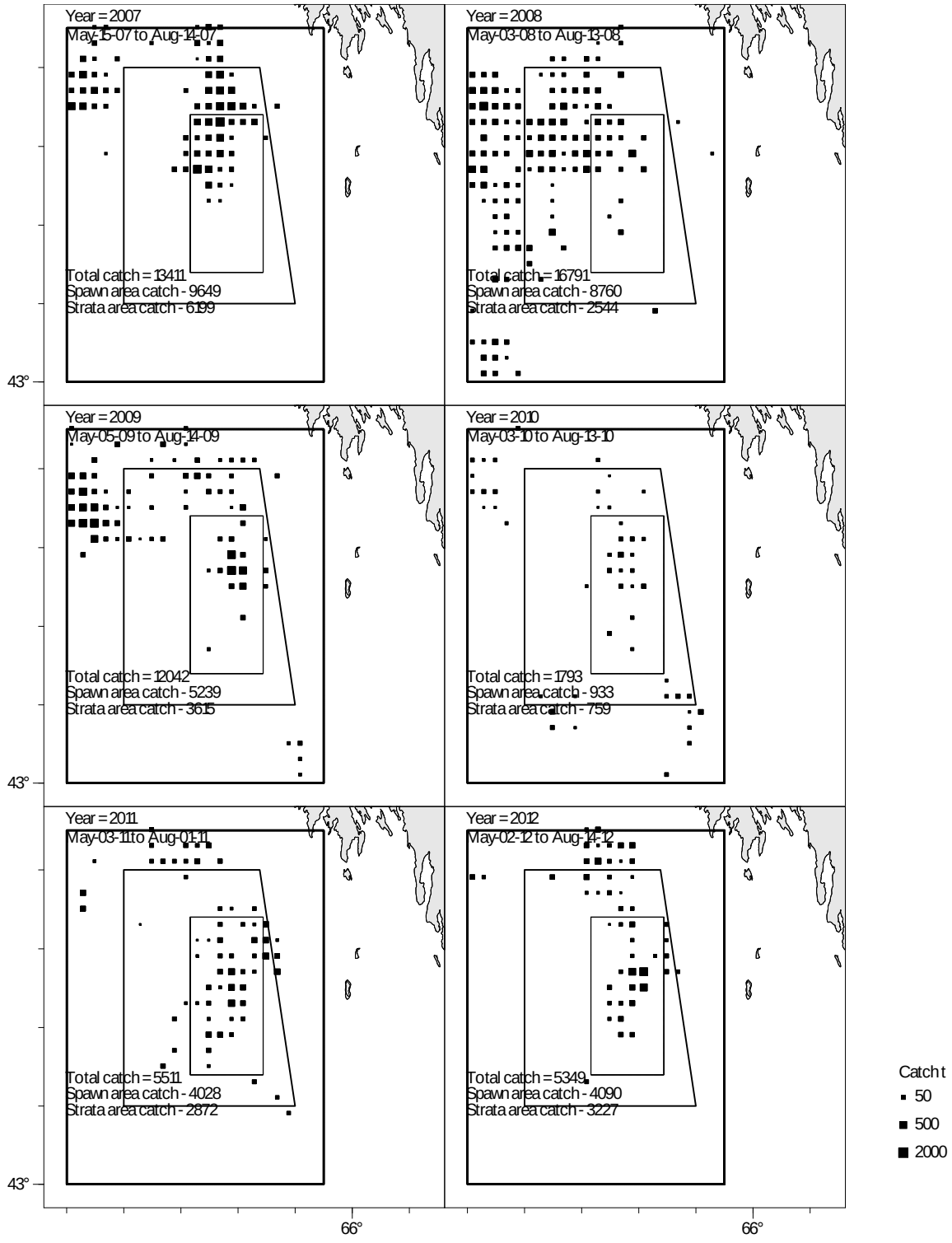


Figure 12. Herring purse seine pre-spawning period catches (January 1 to August 14) for German Bank from 2007-2012 with catch totals for the overall catch area, the middle 'Spawn Box' and the inner 'Strata Box', which was used as the primary search area in acoustic surveys.

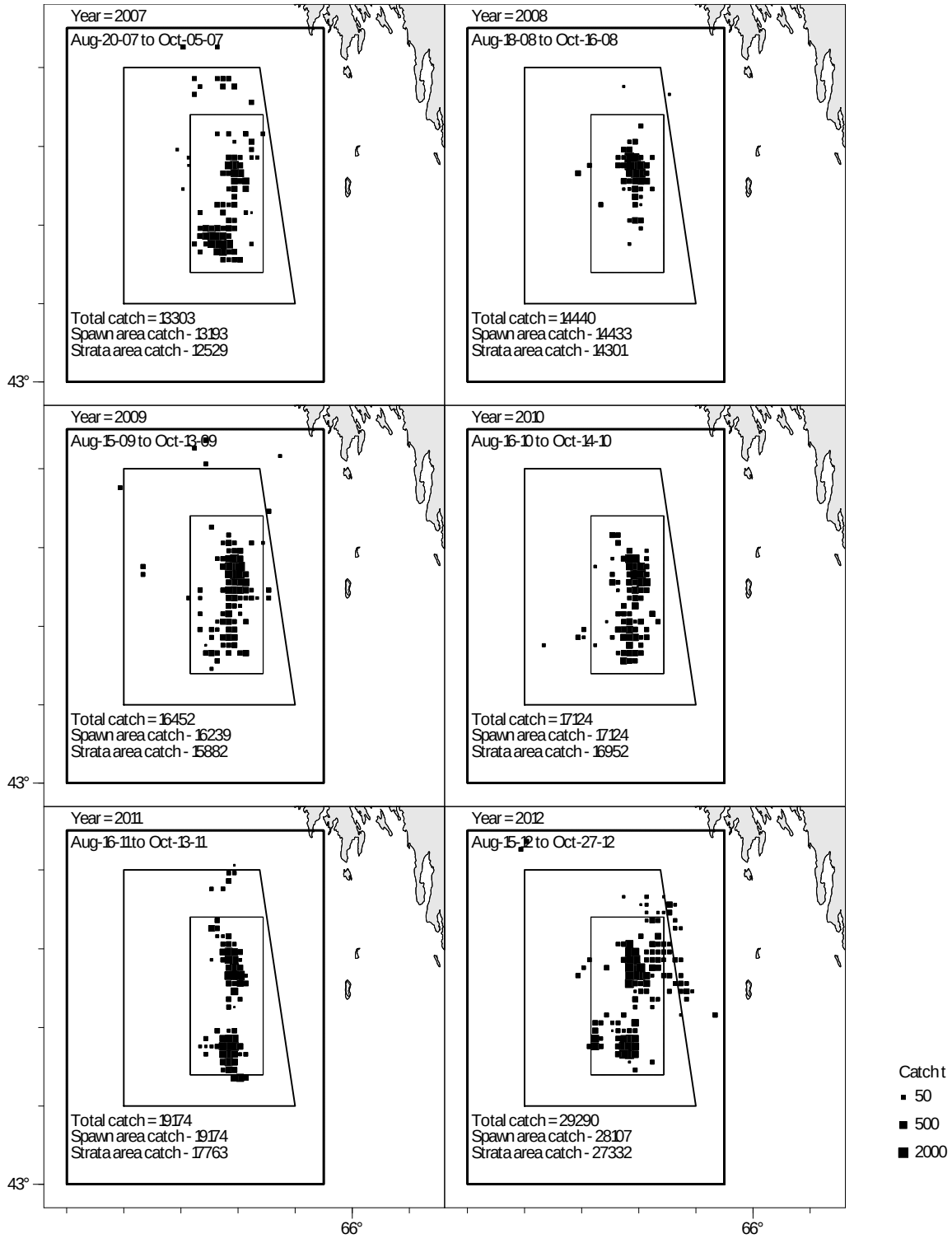


Figure 13. Herring purse seine spawning period catches (August 15 to October 31) for German Bank from 2075-2012 with catch totals for the overall catch area, the middle 'Spawn Box' and the inner 'Strata Box', which was used as the primary search area in acoustic surveys.

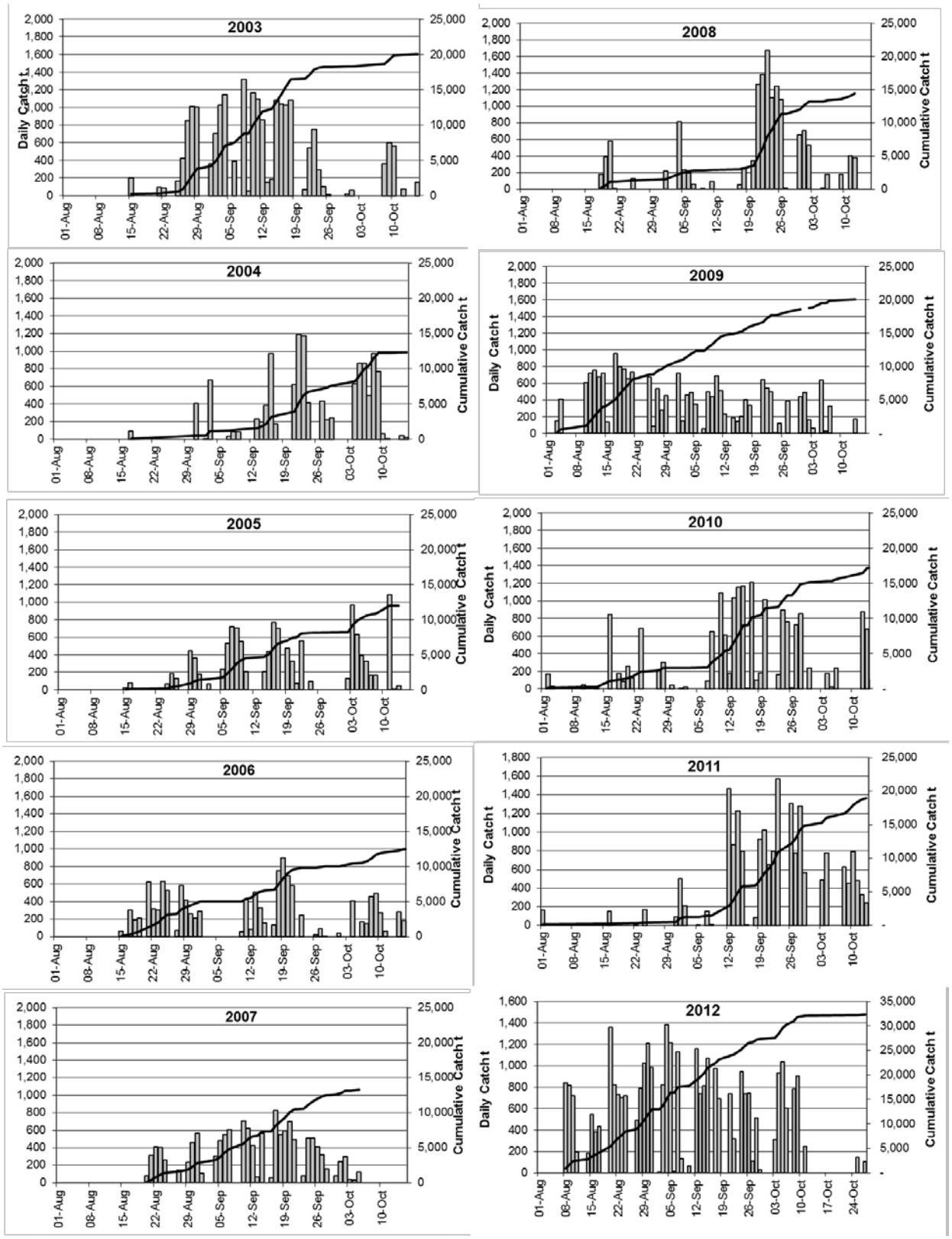


Figure 14. The 2003 to 2012 daily purse seine herring catches (t) [bars] for German Bank with the cumulative total catch [solid line] over the defined spawning season from August 15 to October 30 (note 2009-2012 include catch from August 1 to August 14).

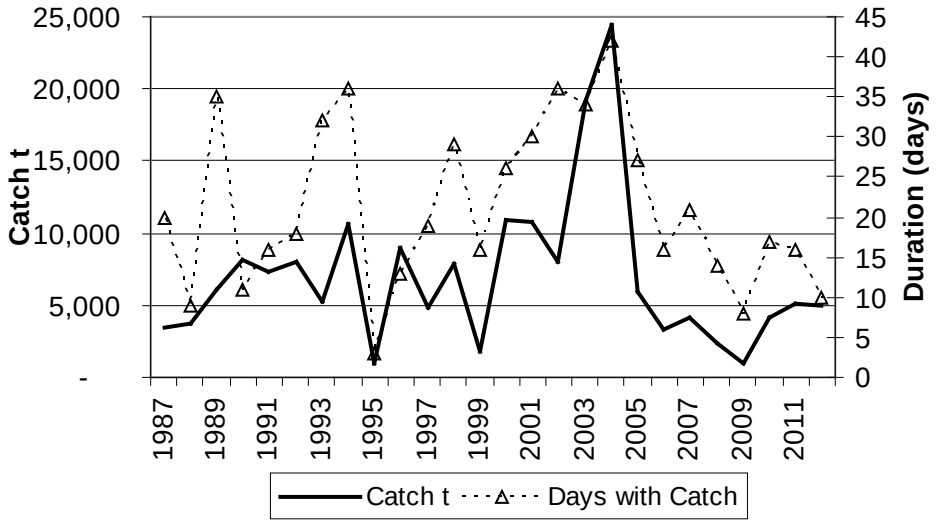


Figure 15. Annual herring purse seine catches for the Scots Bay area from 1987-2012 with duration of fishery in days (start date to end date).

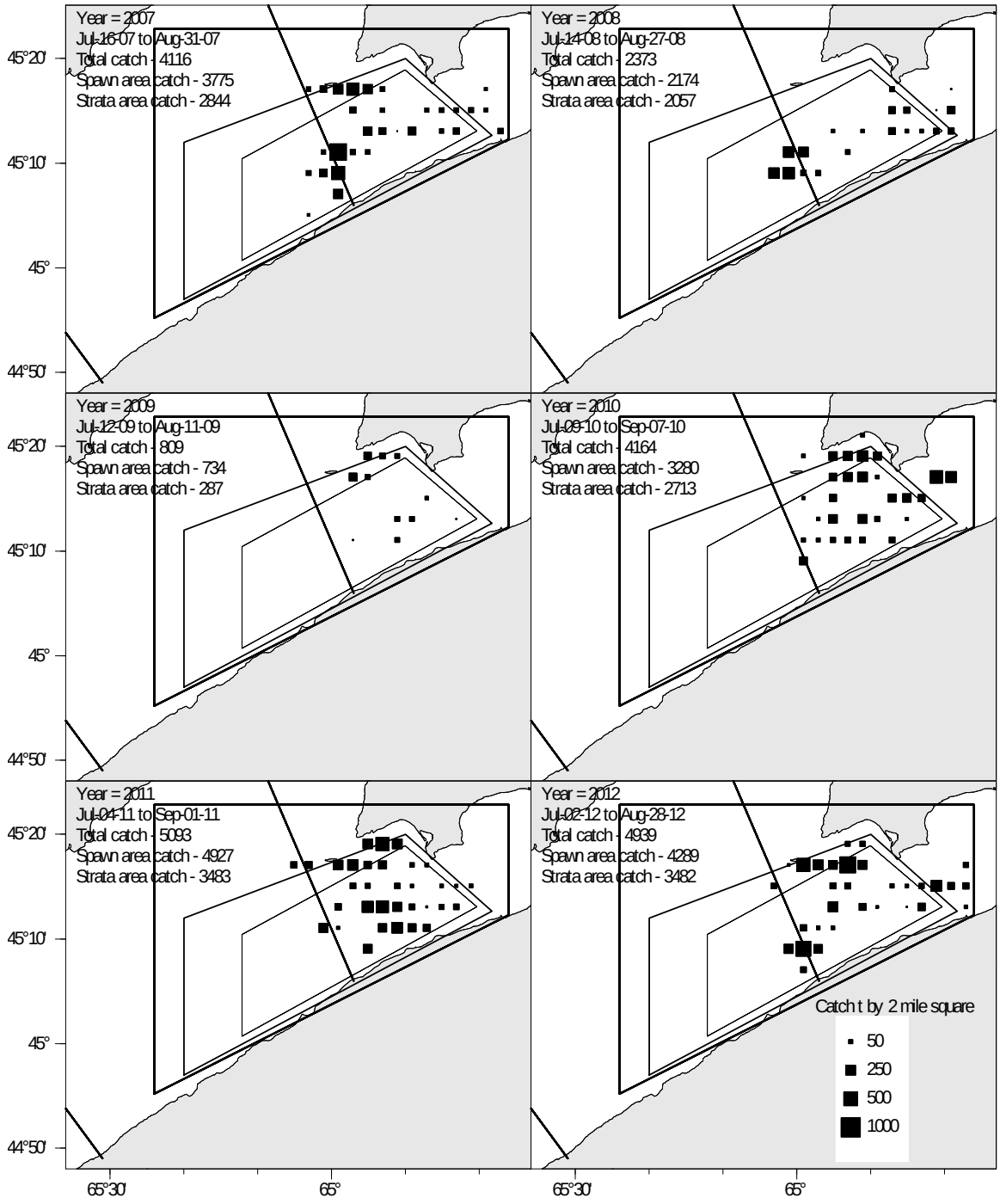


Figure 16. Herring purse seine catches for the Scots Bay area from 2007-2012 with catch totals for the overall area, the middle 'Spawning' area, and the inner 'Strata' area, which is used as the primary search area in acoustic surveys.

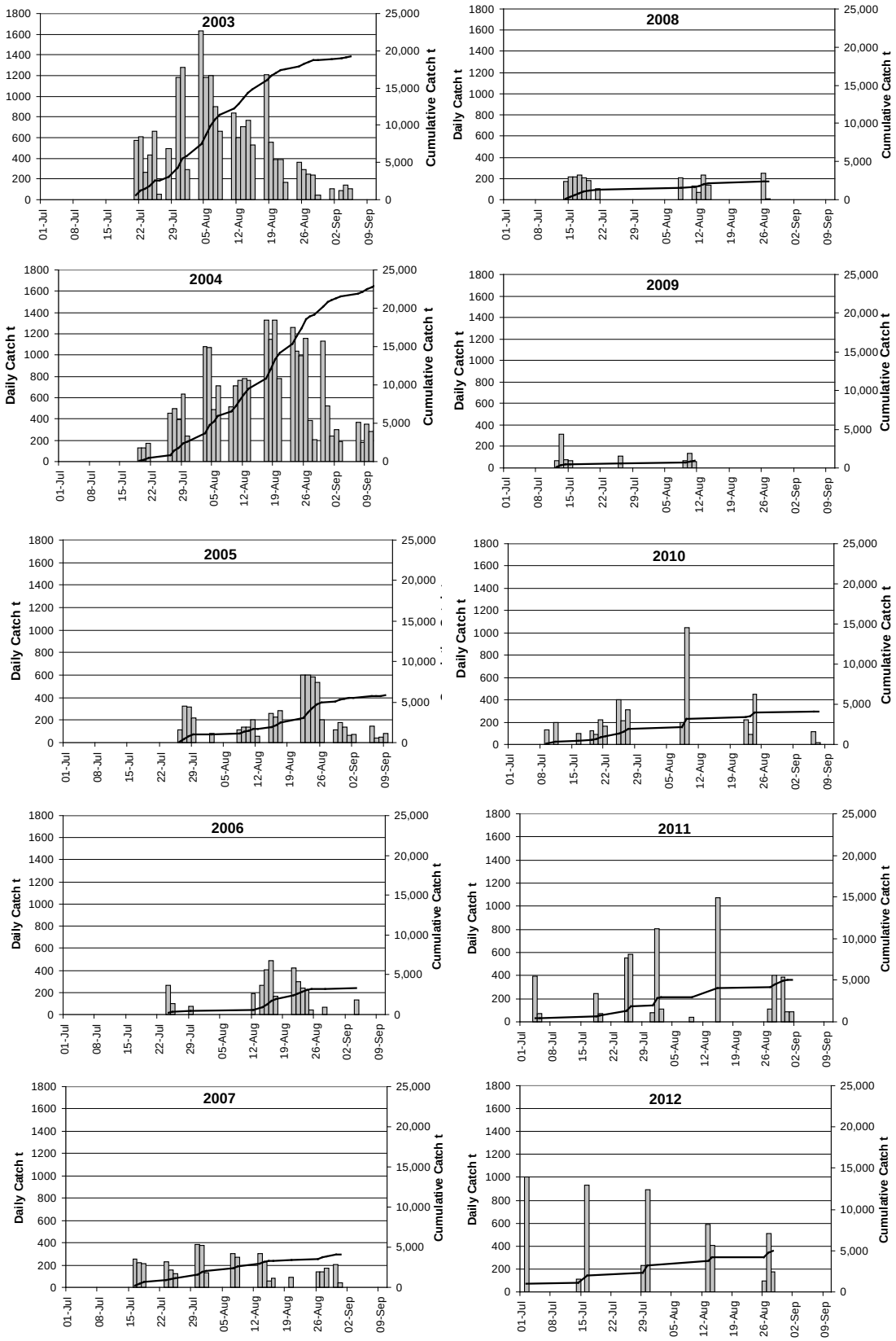


Figure 17. The 2003-2012 Scots Bay daily purse seine herring catches (t) [bars] for Scots Bay with the cumulative total catch [solid line] over the entire fishing season.

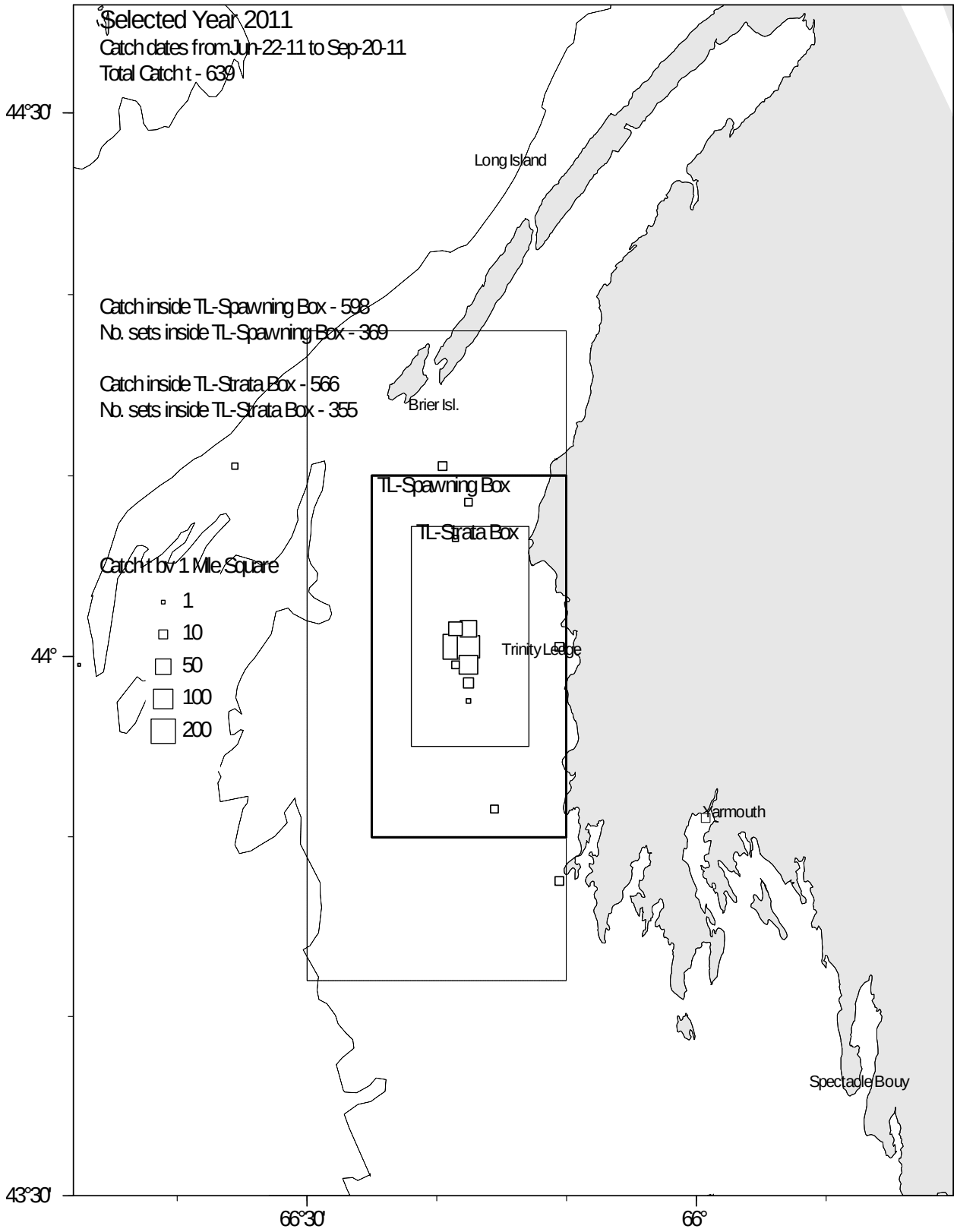


Figure 18A. The 2011 Trinity Ledge herring gillnet catches in the survey strata box and spawning area box areas.

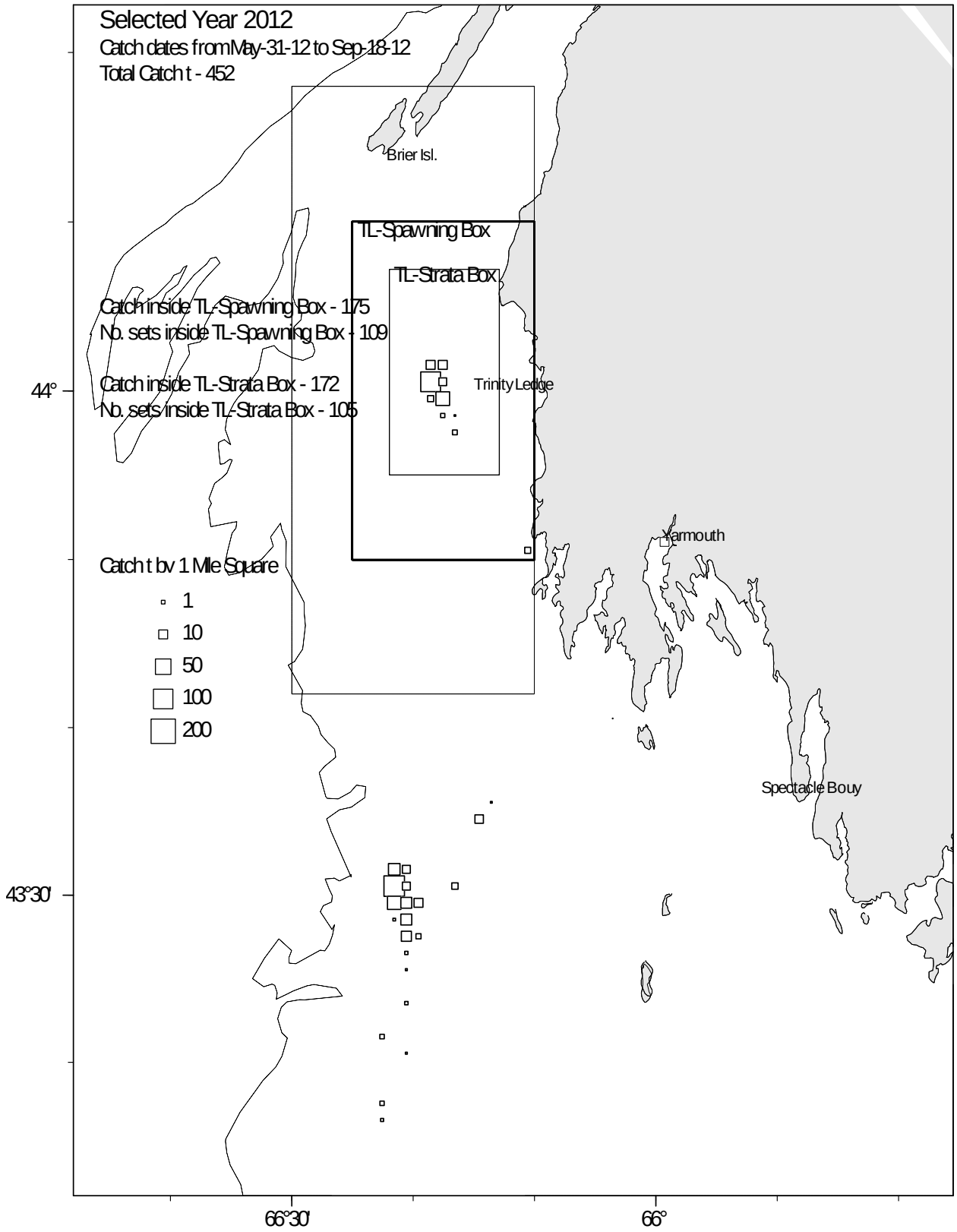


Figure 18B. The 2012 Trinity Ledge herring gillnet catches in the survey strata box and spawning area box areas. Approximately, 277t were caught to the south in the German Bank area.

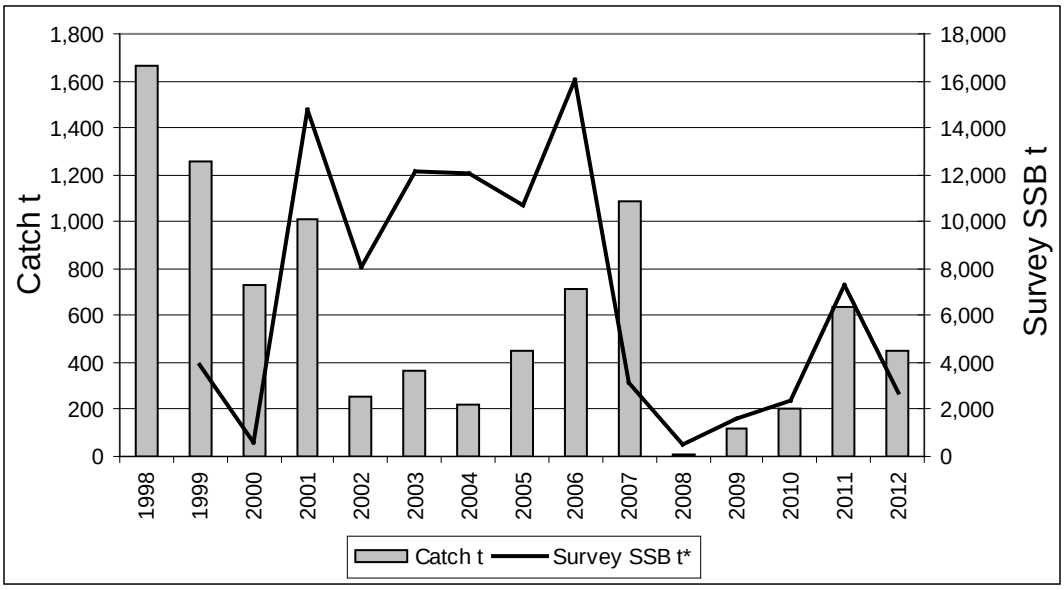


Figure 19. Trinity Ledge herring catches and acoustic survey biomass estimates from 1999-2012. All acoustic estimates prior to 2003 were calculated without the CIF.

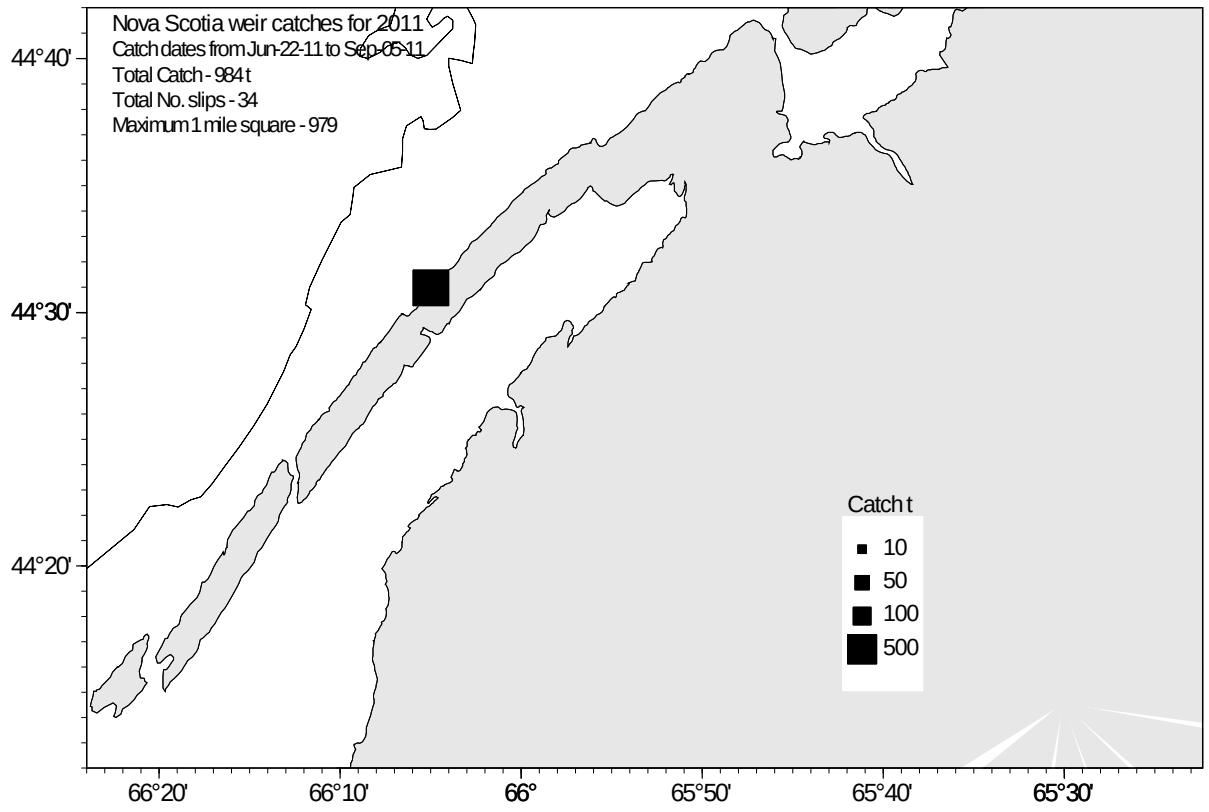


Figure 20A. Nova Scotia herring weir catches by location for the 2011 calendar year.

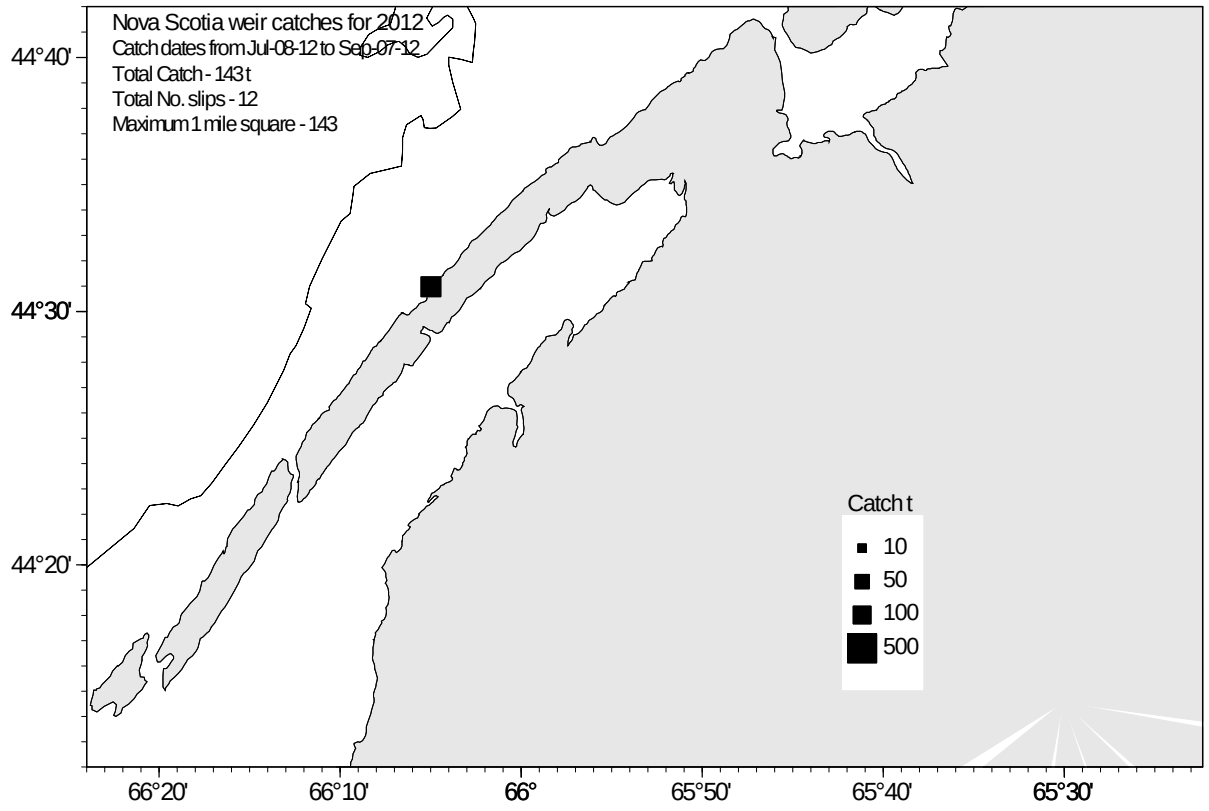


Figure 20B. Nova Scotia herring weir catches by location for the 2012 calendar year.

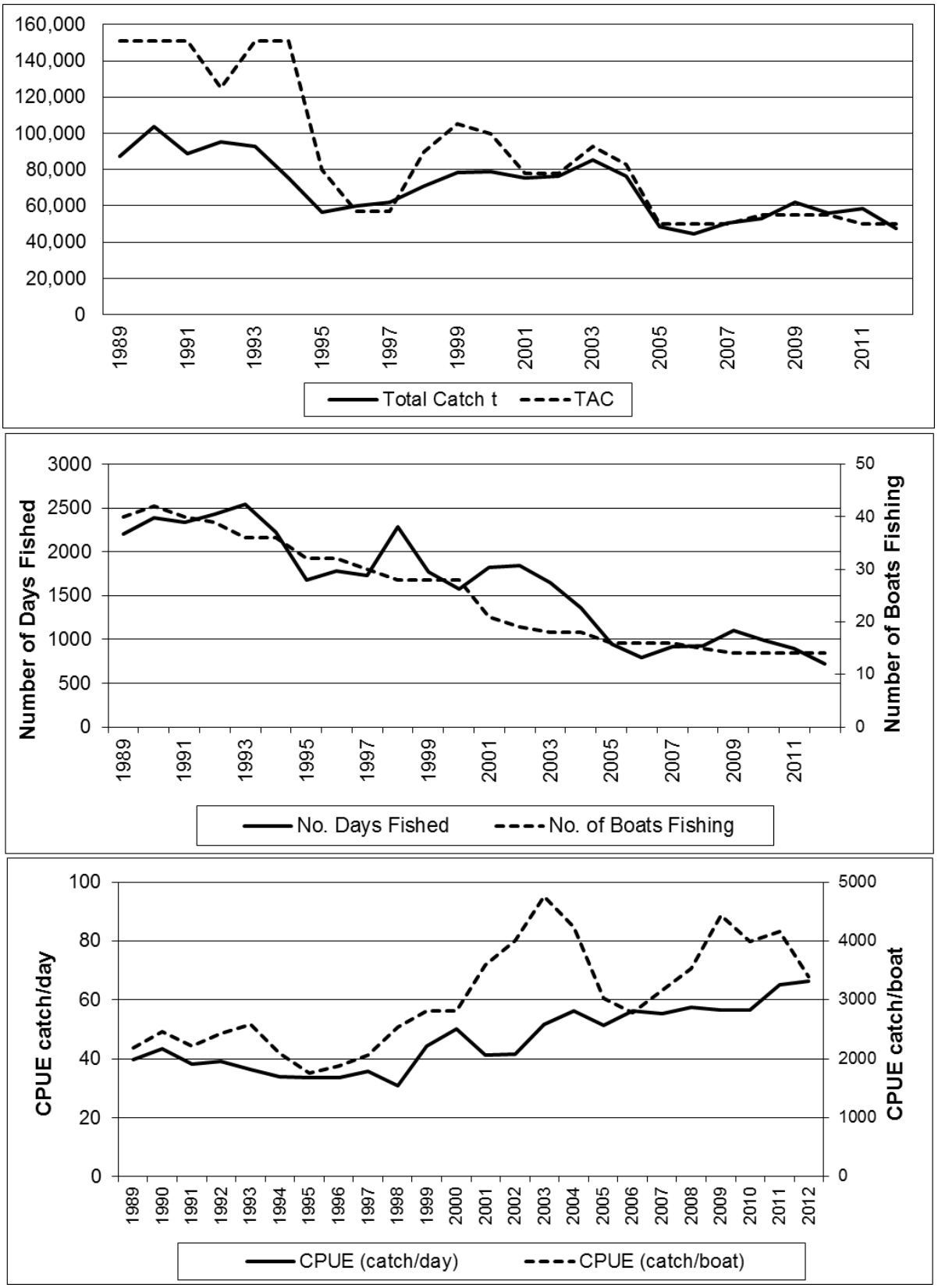


Figure 21. Purse seine catch with TAC (top panel), effort (middle panel), and catch per unit effort (CPUE; bottom) from 1989 to 2012 annual 4WX herring landings data for the SWNS/BoF spawning component.

Figure 22. SSB index from acoustic surveys for the SWNS/BoF spawning component for the German Bank and Scots Bay areas along with the respective averages from 1999-2012 with 95% confidence intervals (equivalent to two times SE).

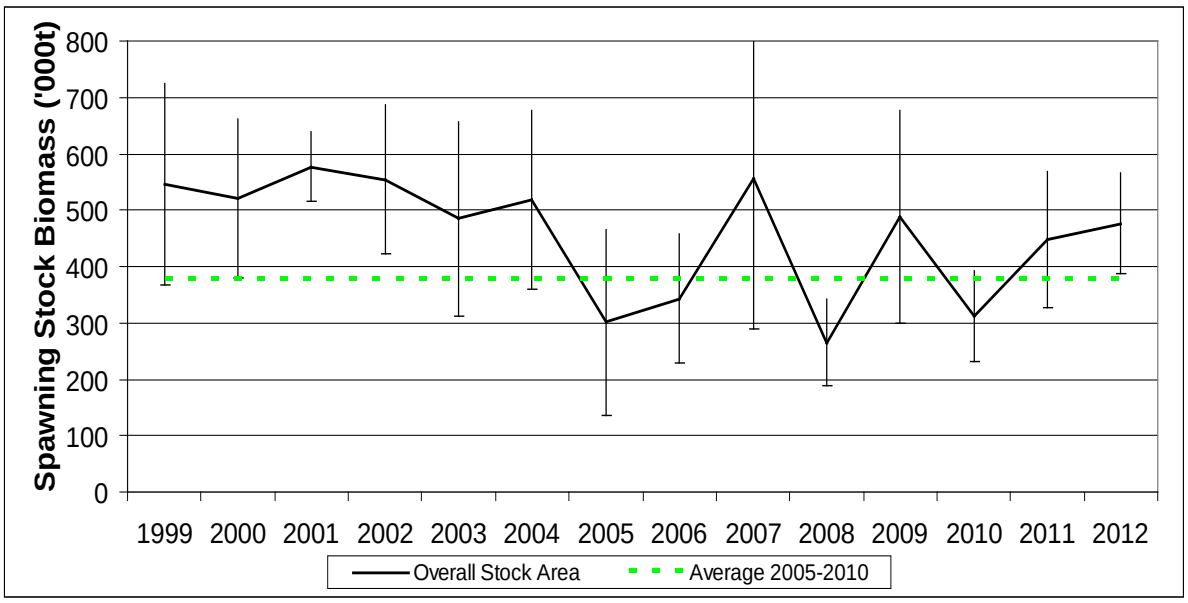


Figure 23. Herring SSB from acoustic surveys for the combined SWNS/BoF spawning component (along with the average from 2005-2010) with 95% confidence intervals (equivalent to two times SE).

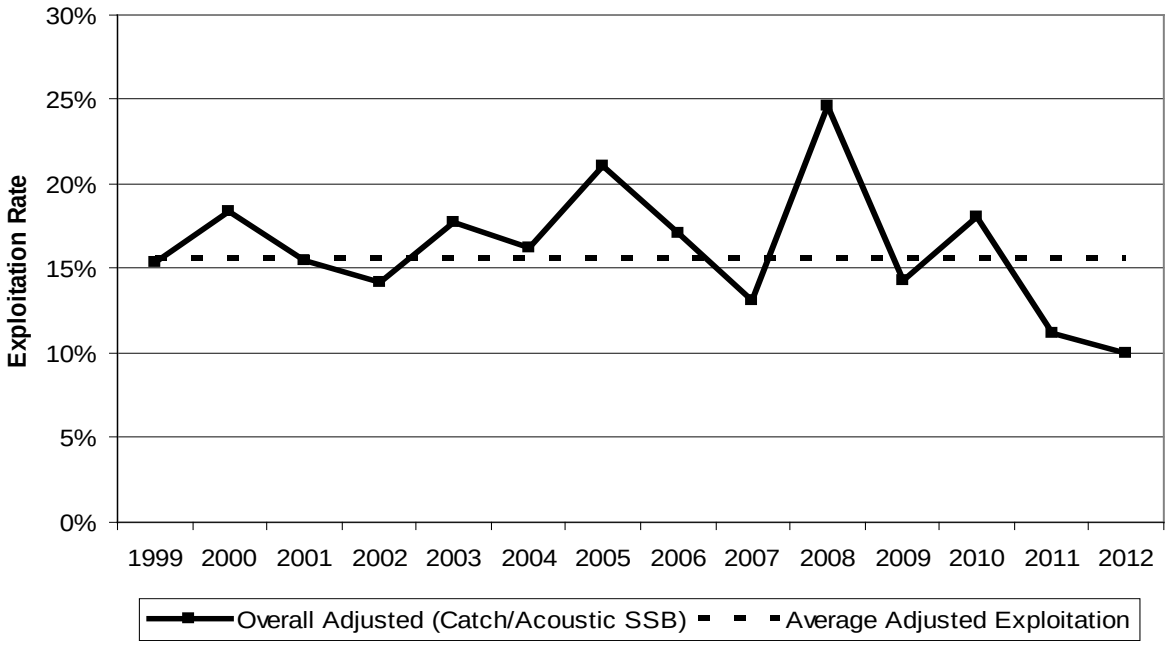


Figure 24. Relative exploitation rate for the SWNS/BoF spawning component using overall catch as a proportion of the overall acoustic SSB.

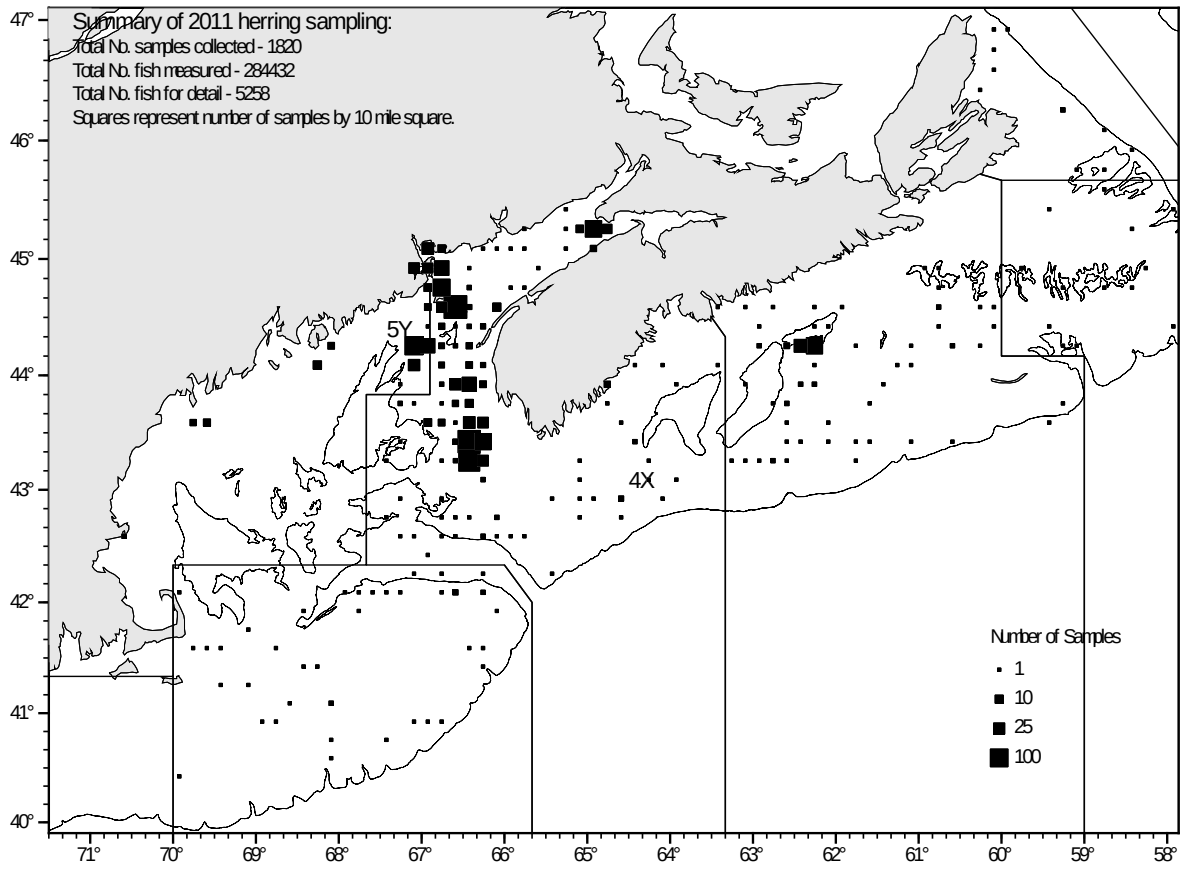


Figure 25A. 2011 herring sampling coverage by location from all sources (numbers of length frequency samples grouped by 10 mile squares).

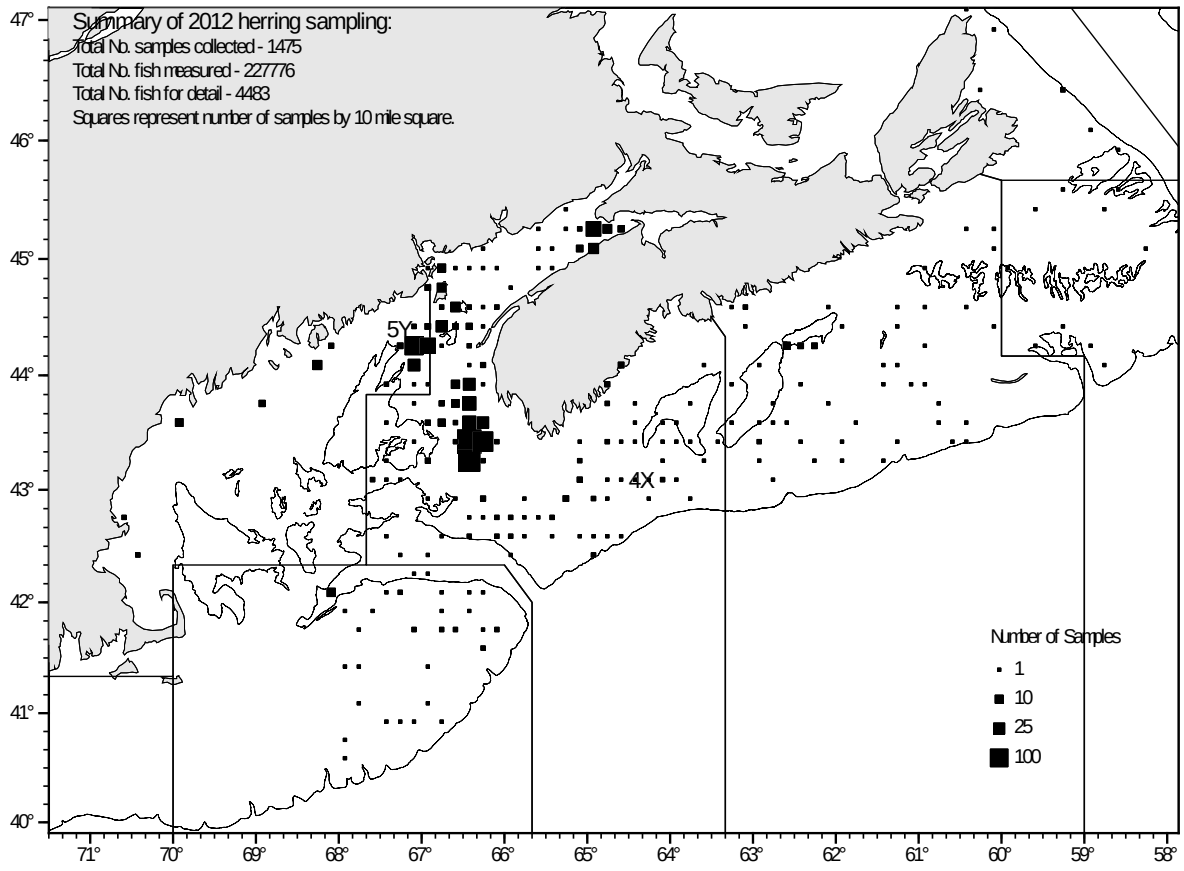


Figure 25B. 2012 herring sampling coverage by location from all sources (numbers of length frequency samples grouped by 10 mile squares).

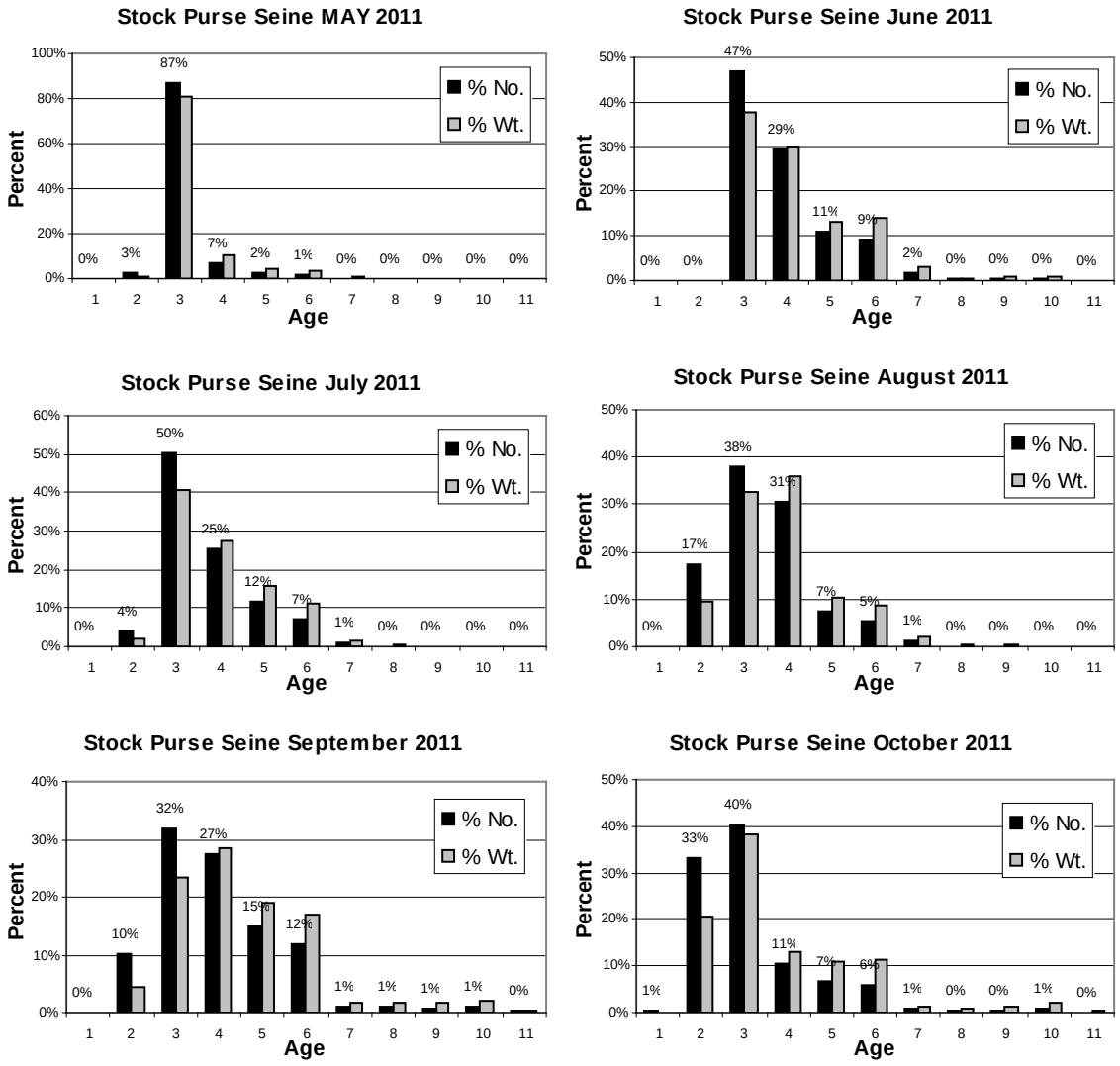


Figure 26A. Fishery catch at age by month (% numbers and % weight) from the 2011 SWNS/BoF summer purse seine fishery.

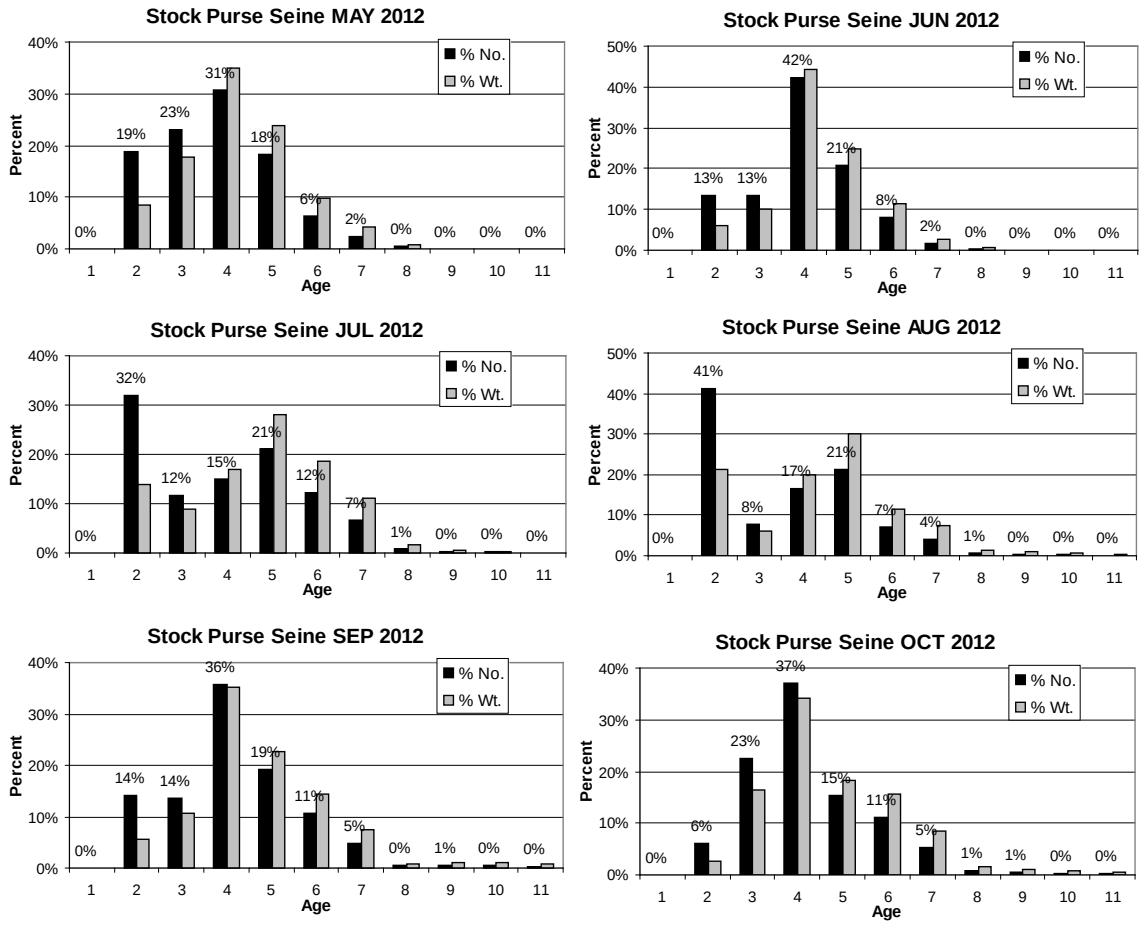


Figure 26B. Fishery catch at age by month (% numbers and % weight) from the 2012 SWNS/BoF summer purse seine fishery.

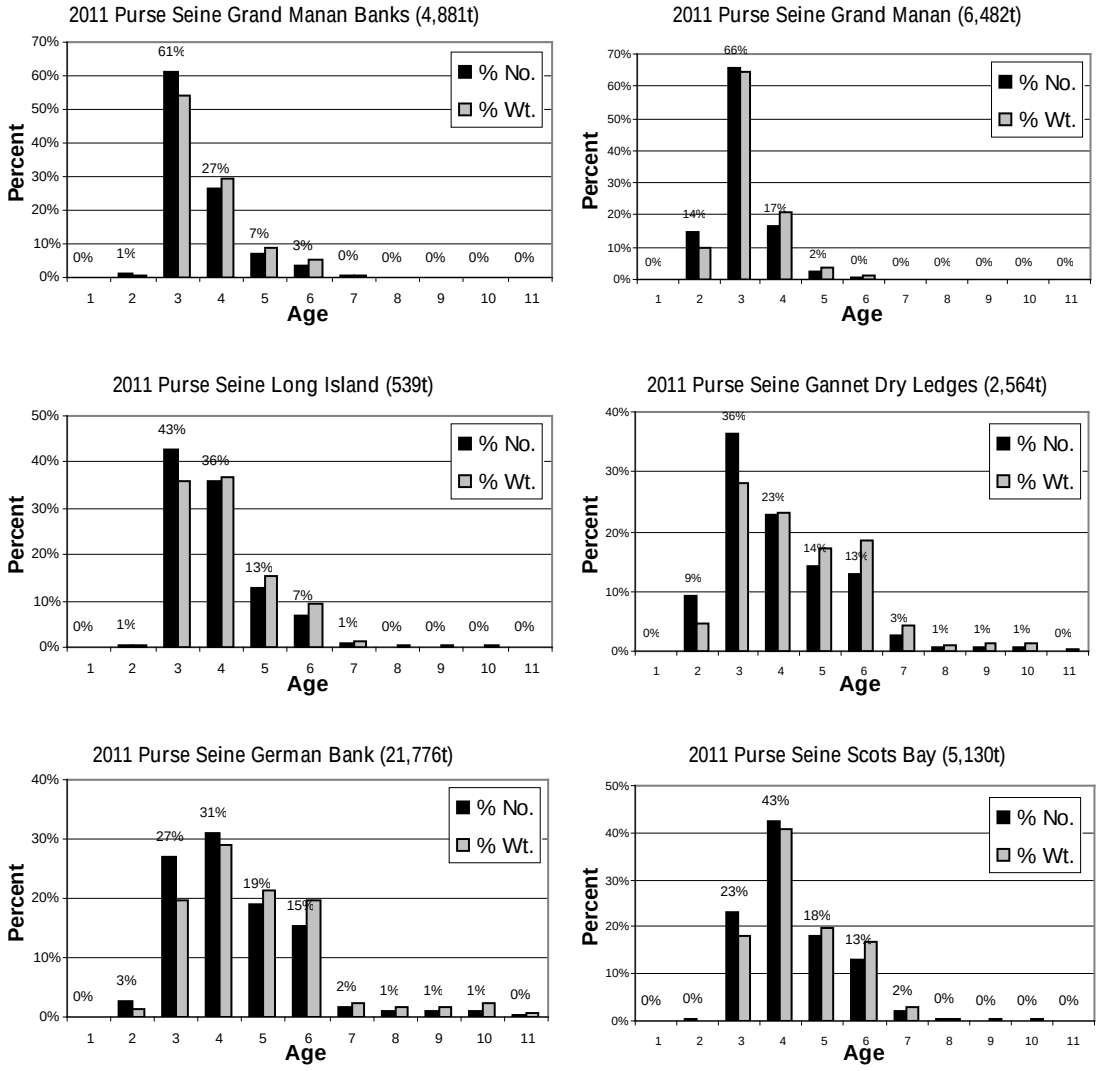


Figure 27A. Fishery catch at age by ground (% numbers and % weight) from the 2011 SWNS/BoF summer purse seine fishery.

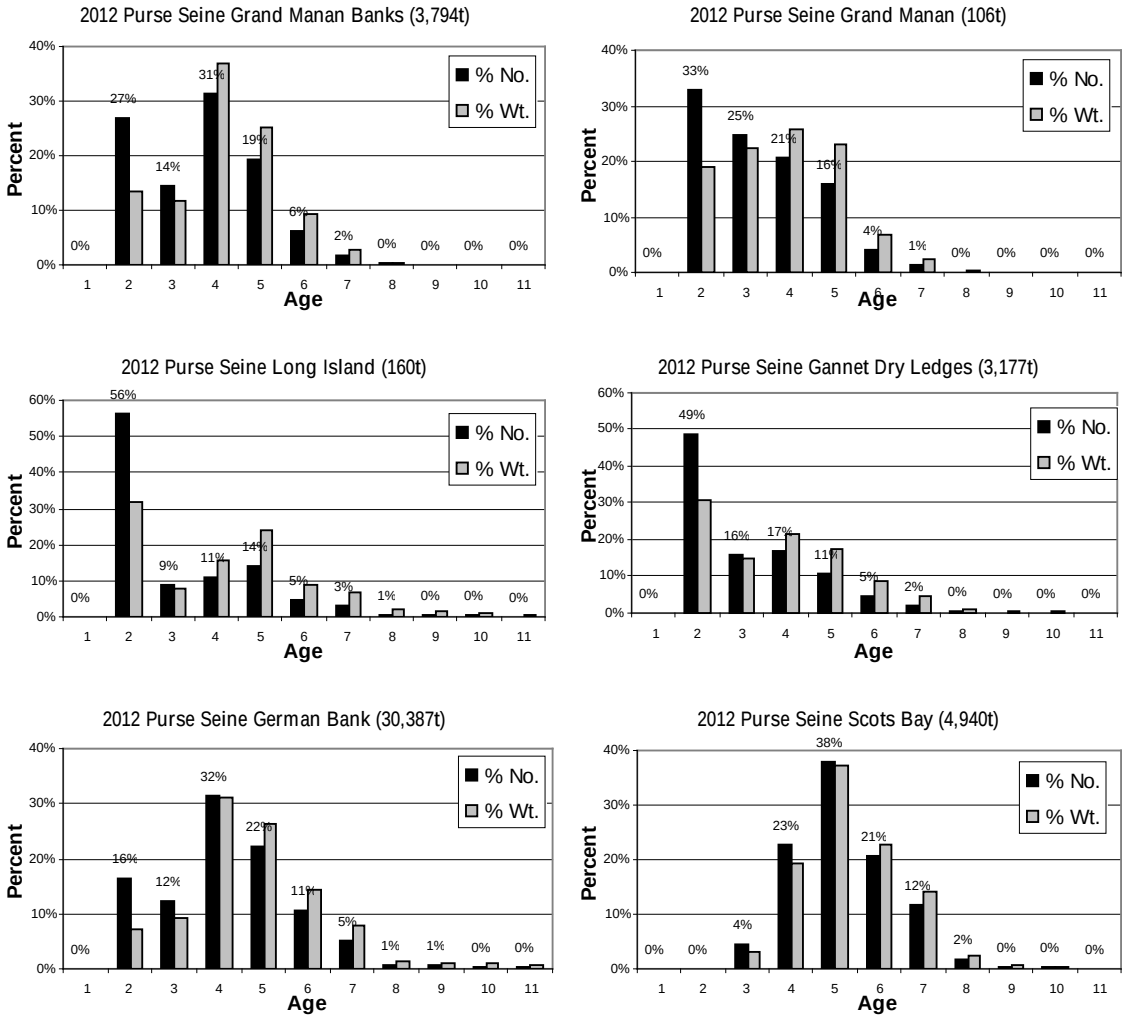


Figure 27B. Fishery catch at age by ground (% numbers and % weight) from the 2012 SWNS/BoF summer purse seine fishery.

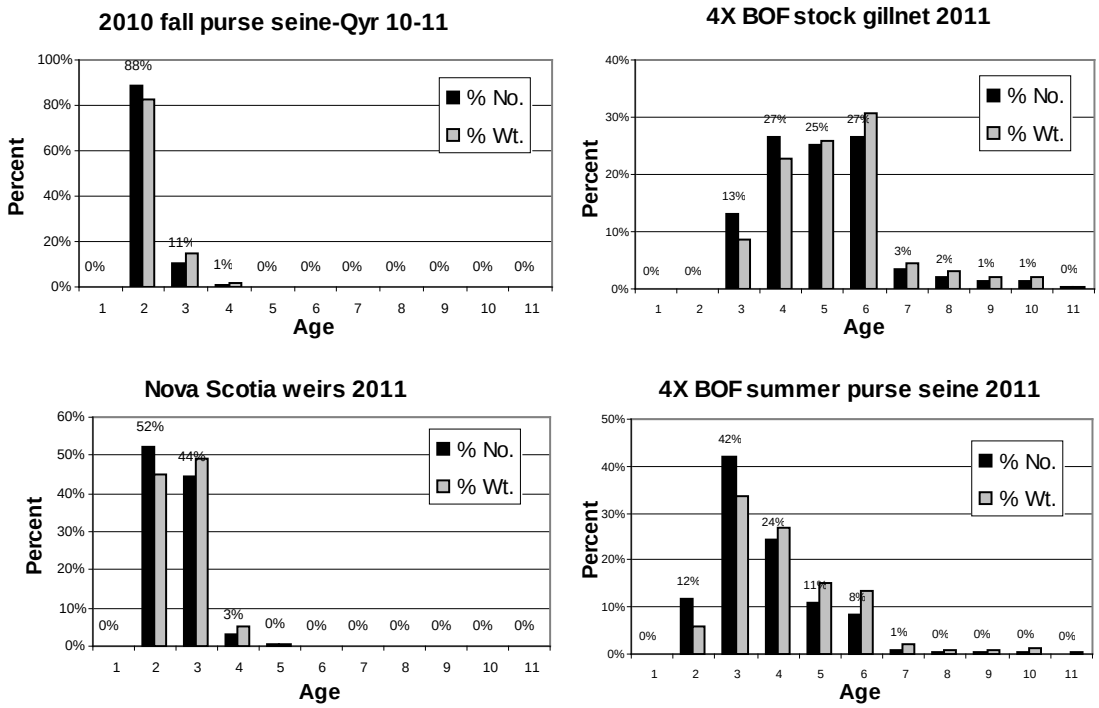


Figure 28A. Fishery catch at age by gear component (% numbers and % weight) from the 2011 SWNS/BoF spawning component

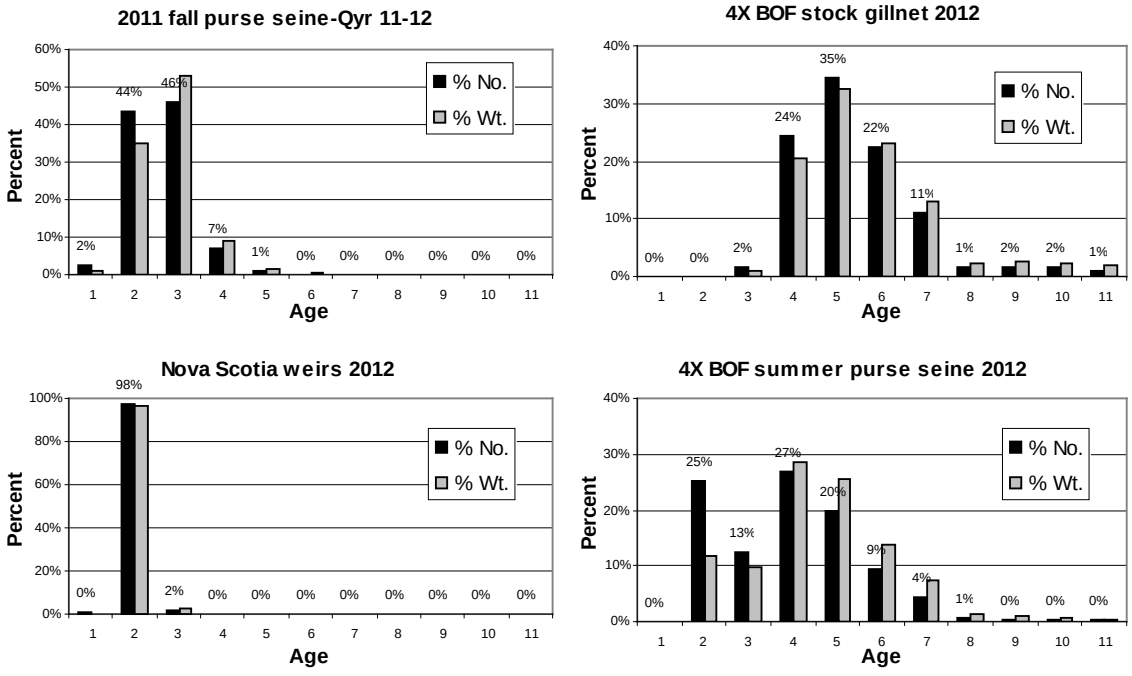


Figure 28B. Fishery catch at age by gear component (% numbers and % weight) from the 2012 SWNS/BoF spawning component

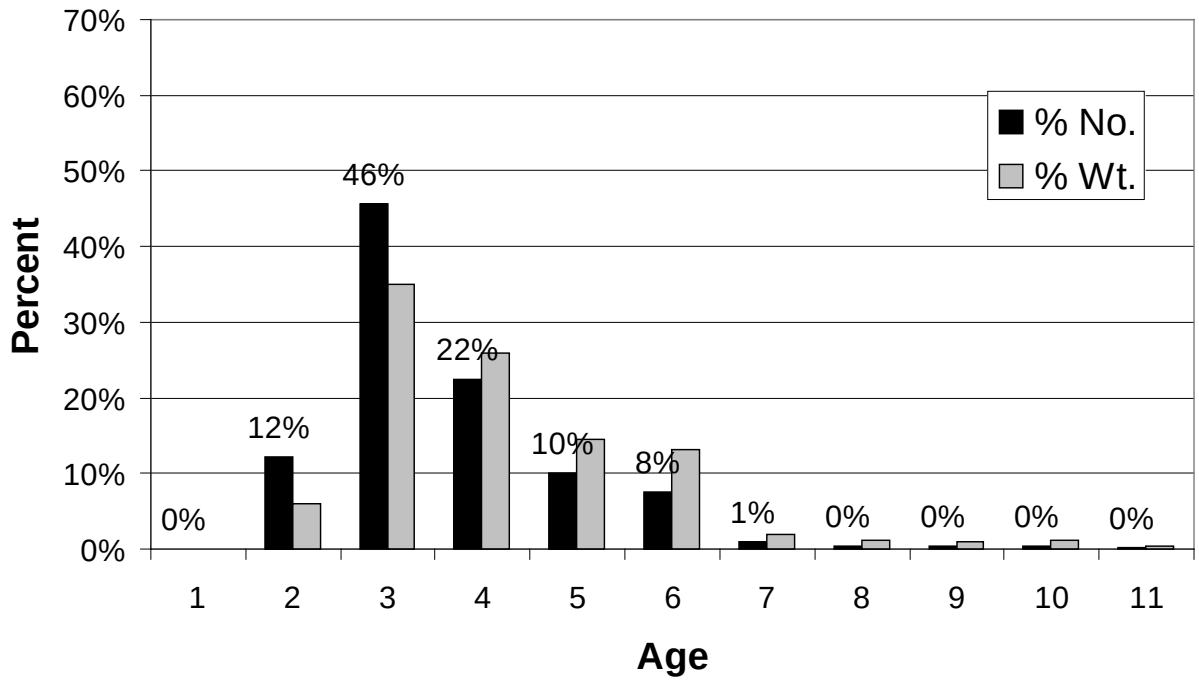


Figure 29A. Overall fishery catch at age (% numbers and % weight) from the 2011 SWNS/BoF spawning component.

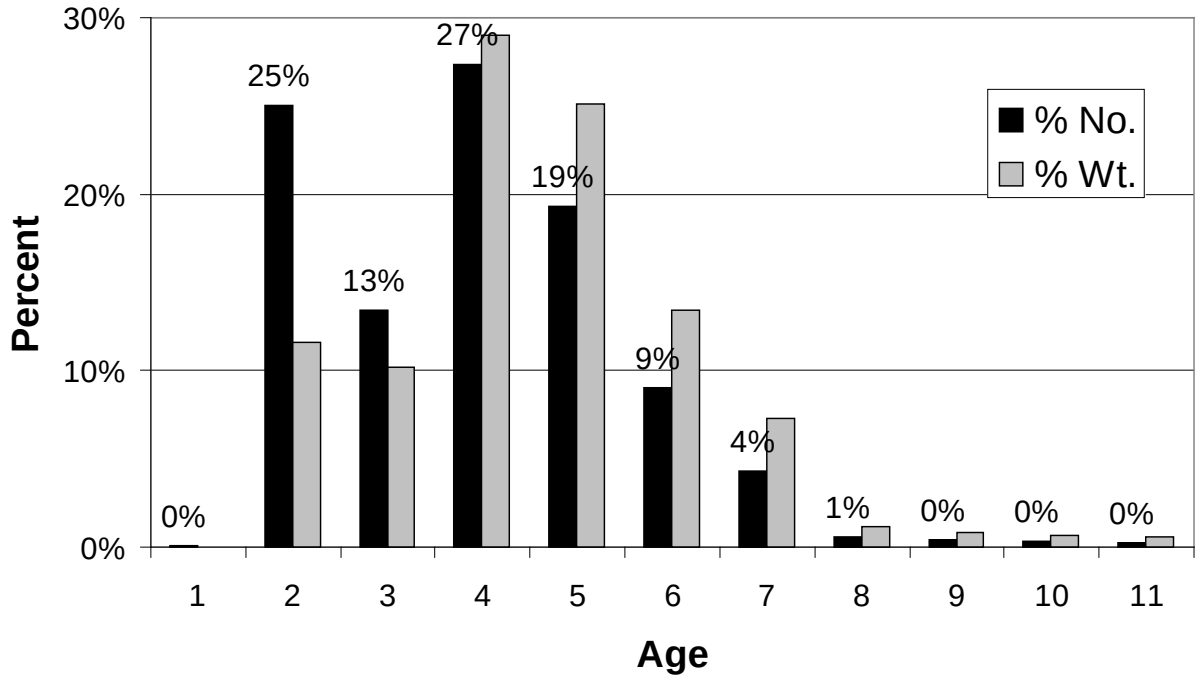


Figure 29B. Overall fishery catch at age (% numbers and % weight) from the 2012 SWNS/BoF spawning component.

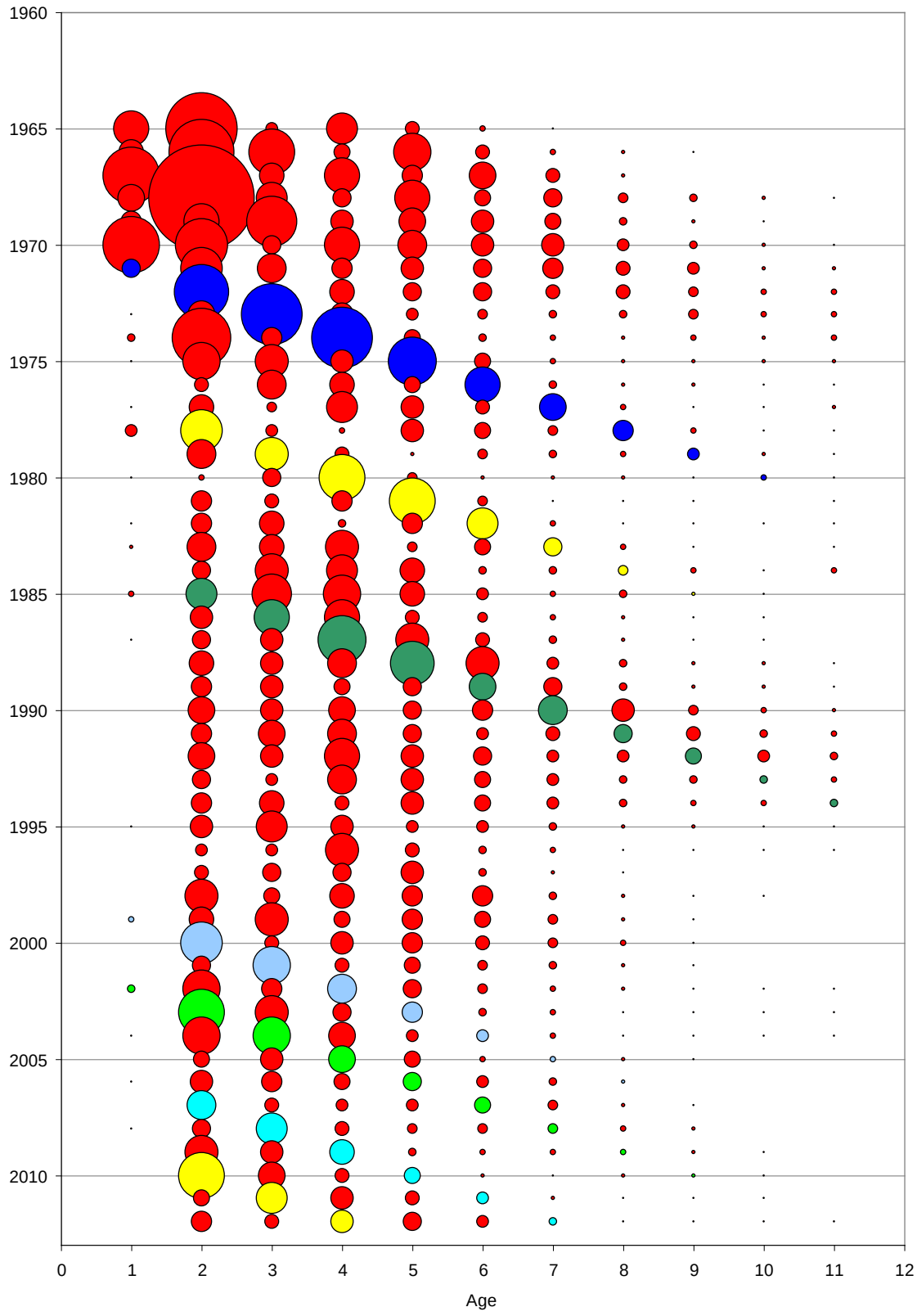


Figure 30. Historical catch at age (bubble size for numbers) for the SWNS/BoF herring spawning component from 1965-2012. Several of the stronger year-classes are highlighted including the 1970, 1978, 1983, 1998, 2001, 2005 and 2008 year-classes.

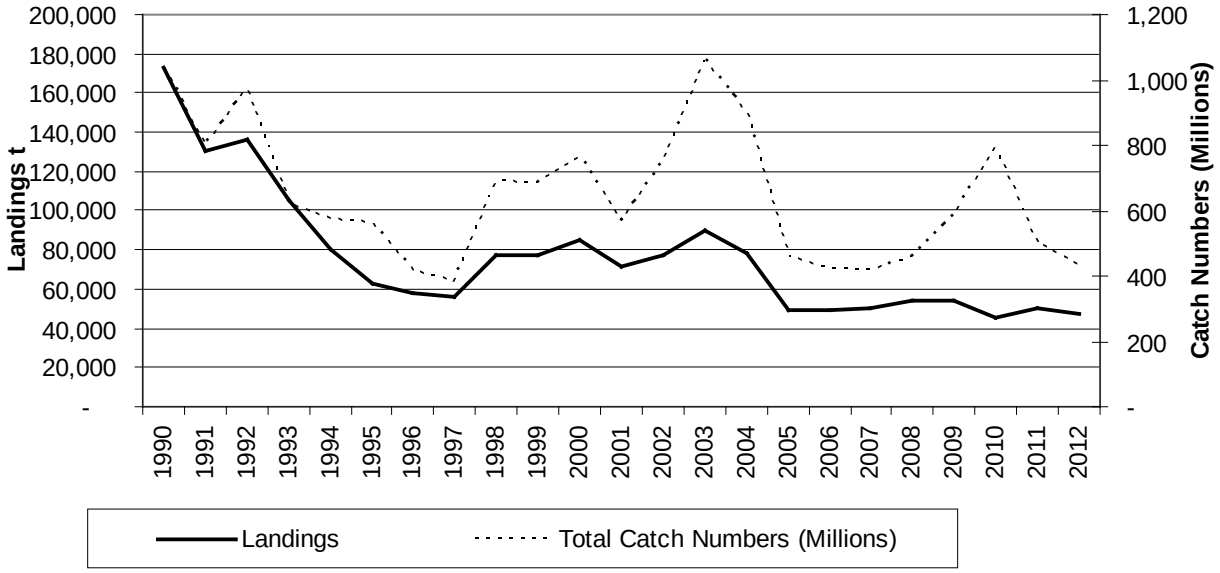


Figure 31. Total landings (t) and total removals (millions) for the combined annual catch from the SWNS spawning component for 1990 to 2012.

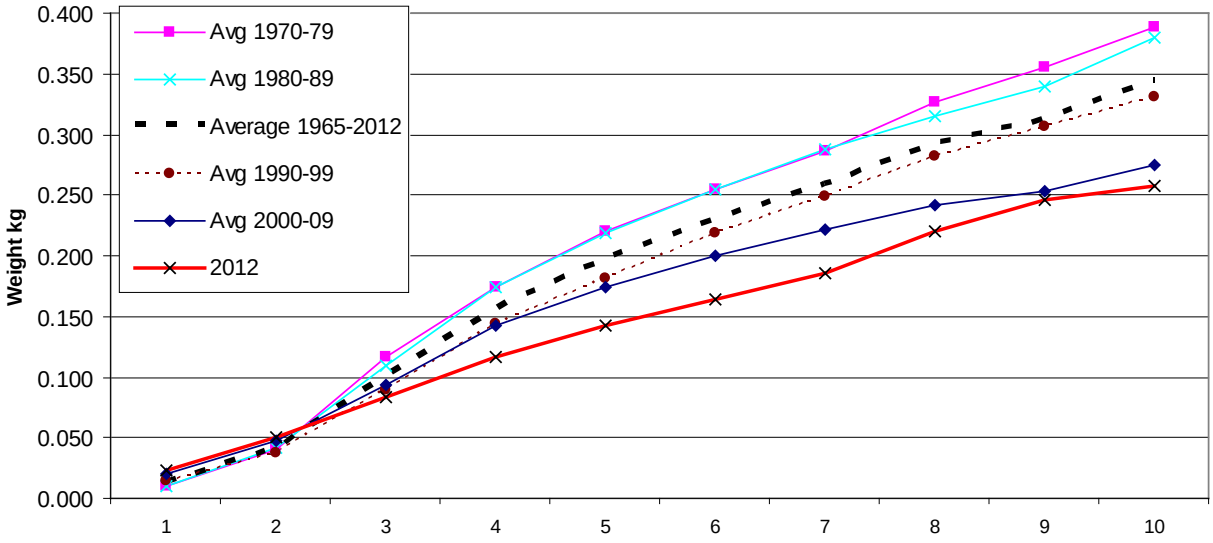


Figure 32. Average weights at age (kg) for the SWNS/BoF component of the 4WX herring fishery (fishery weighted) for the most recent year, by decade and the long term for the historical series.

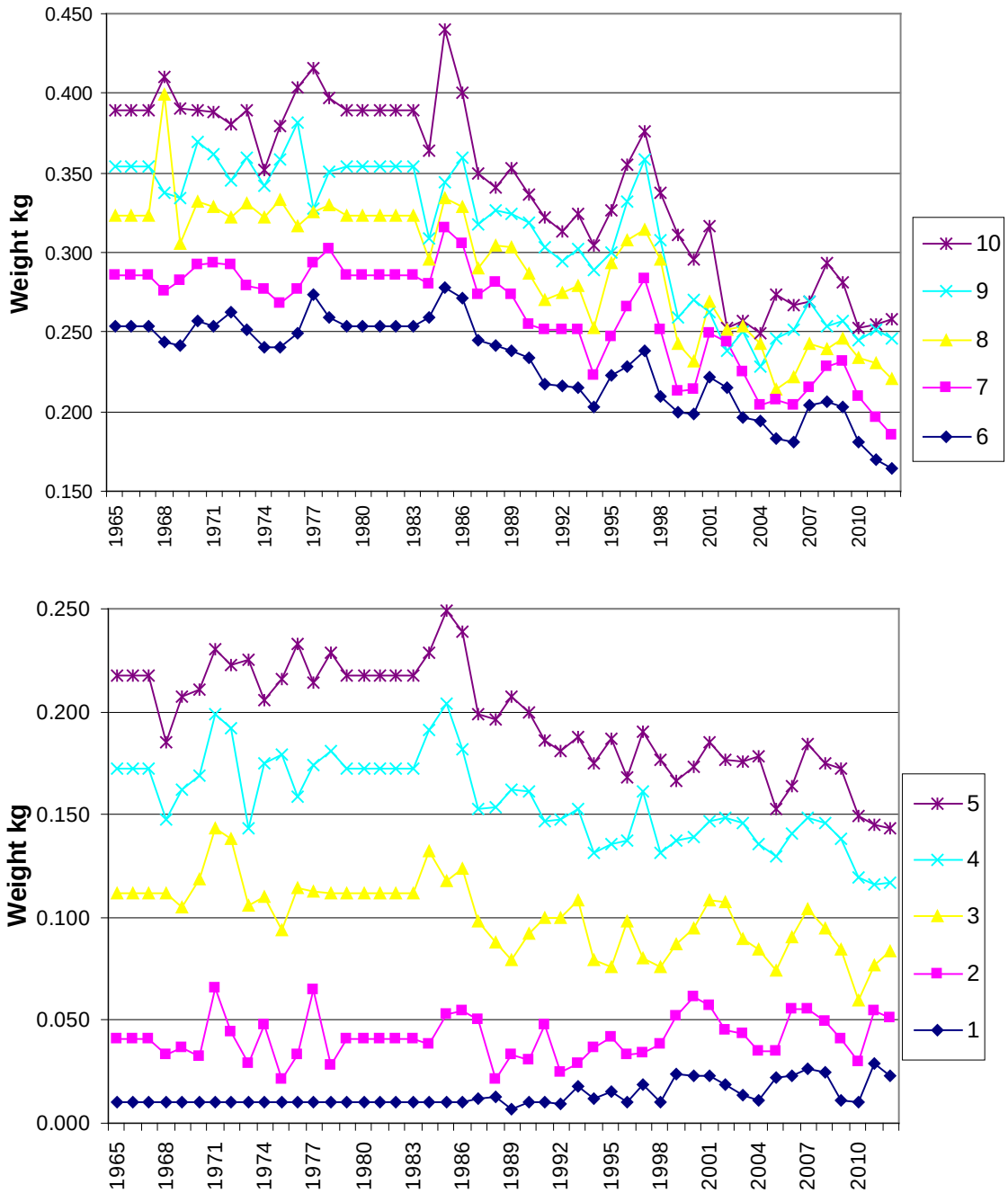


Figure 33. Average weights at age (kg) for the SWNS/BoF component of the 4WX herring fishery (fishery weighted) for 1965-2012.

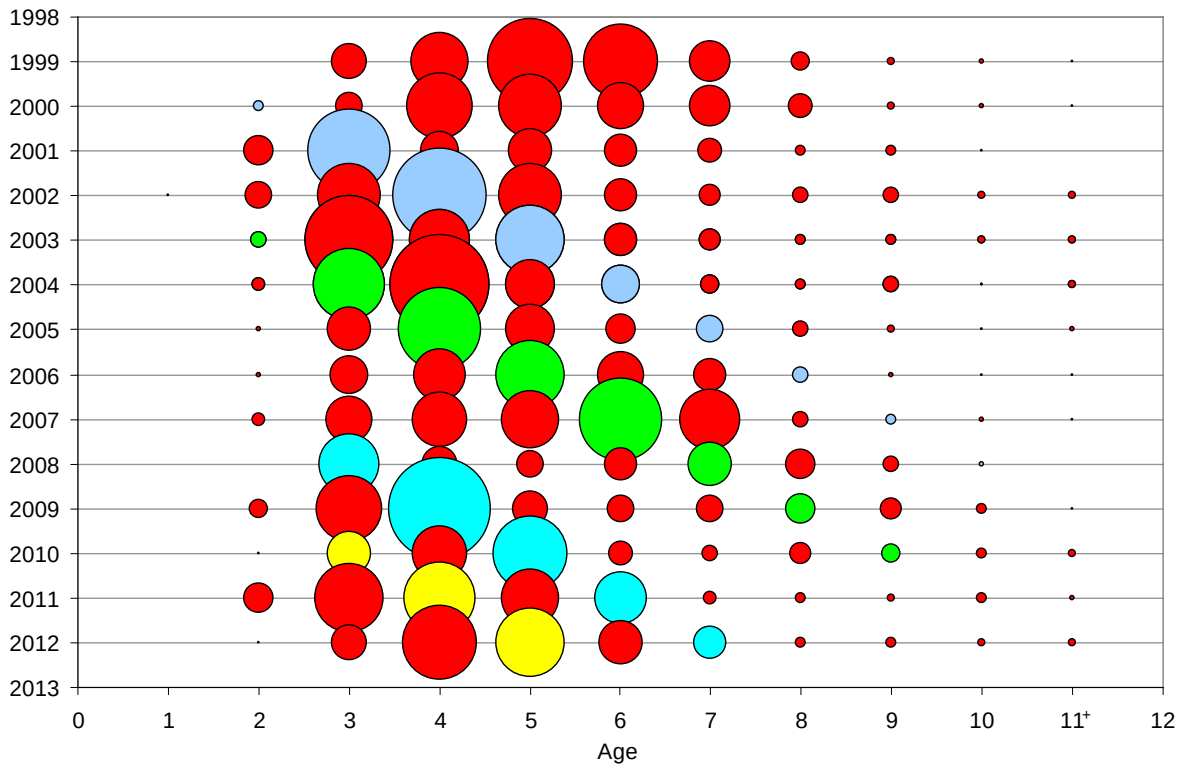


Figure 34. Acoustic survey catch at age (bubble size for numbers) for the German Bank spawning area in the SWNS/BoF component.

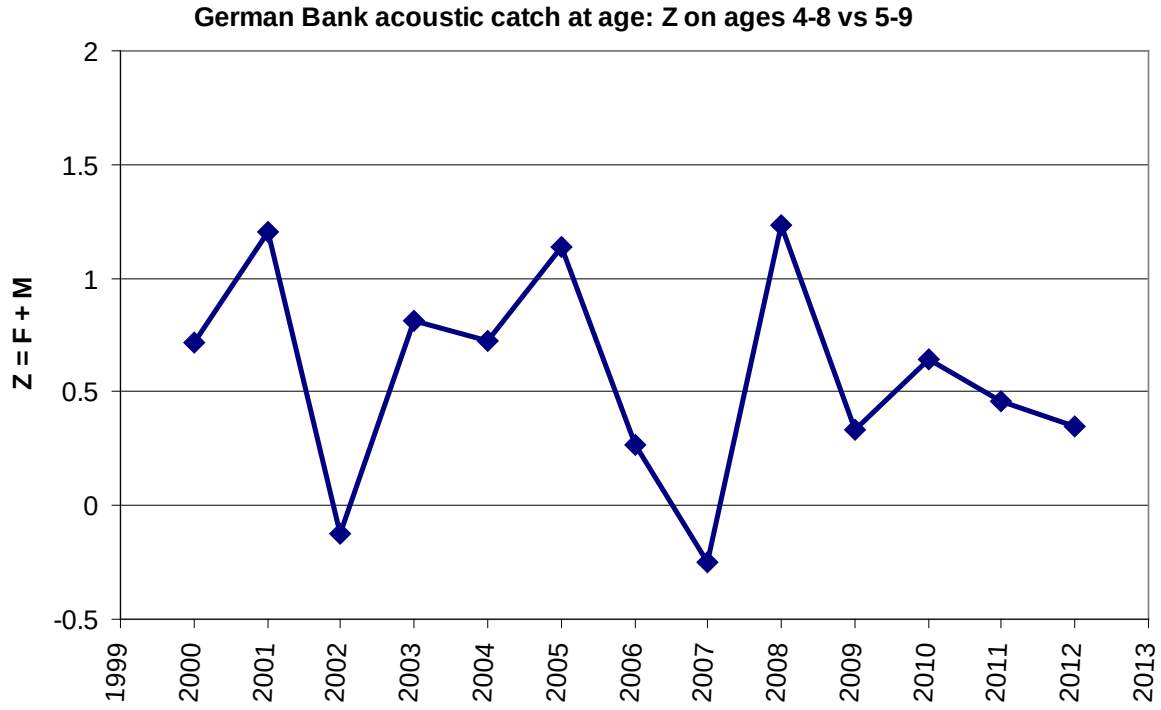


Figure 35. Total mortality estimates (Z=F+M) from the overall acoustic catch at age data for ages 4 to 8 combined, compared with ages 5 to 9 in the following year.

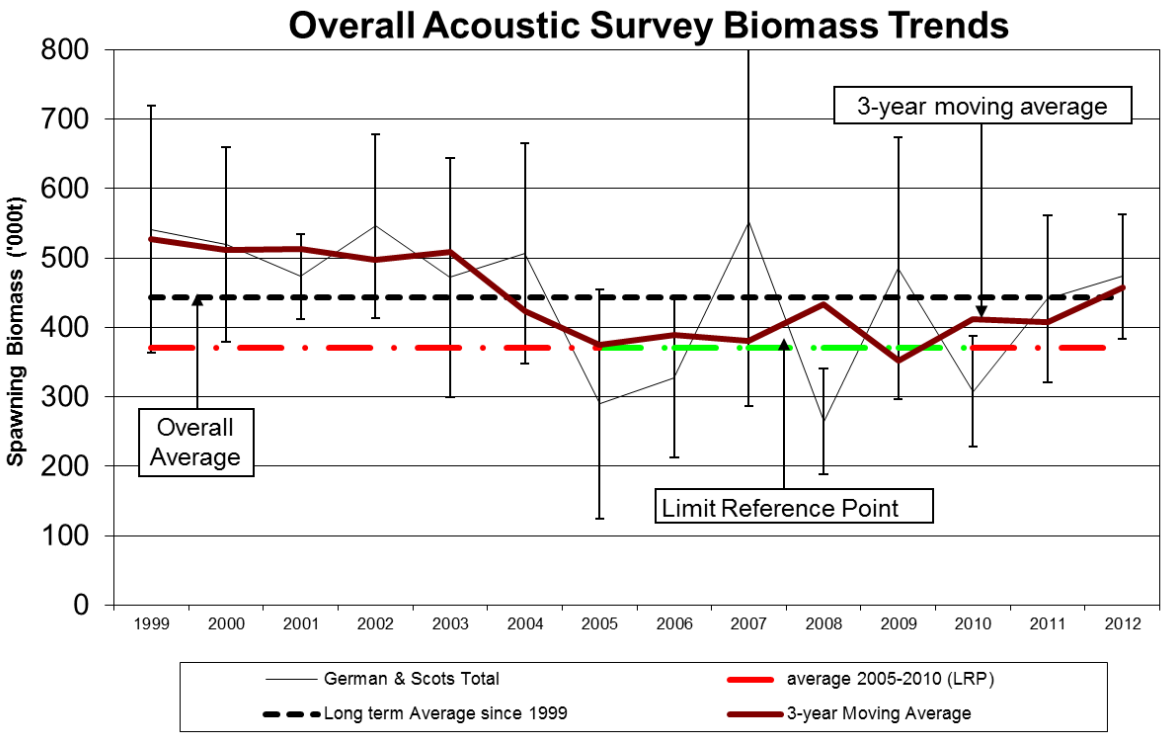


Figure 36A. SSB (thousands t, with 95% standard errors), the three-year moving average, the calculated long term average and the limit reference point (LRP) for the SWNS/BoF spawning component (German Bank and Scots Bay). Biomass estimates calculated with CIF.

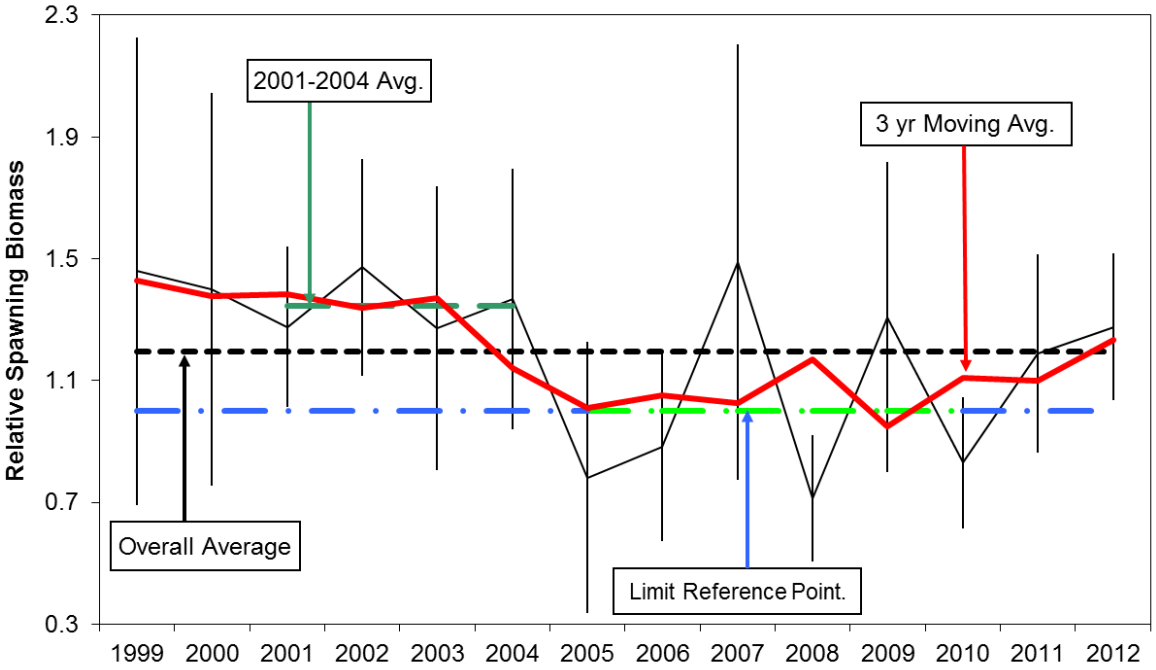


Figure 36B. Relative SSB index (with 95% standard errors), the calculated moving average, the long term average and the limit reference point for the SWNS/BoF spawning component (German Bank and Scots Bay). Biomass estimates calculated with CIF.

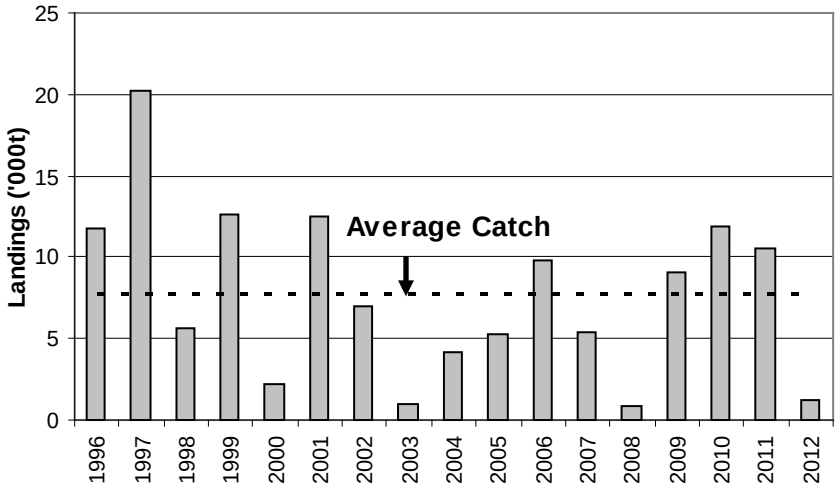


Figure 37. Scotian Shelf banks herring landings from all gears for 1996-2012 with the overall average for the period.

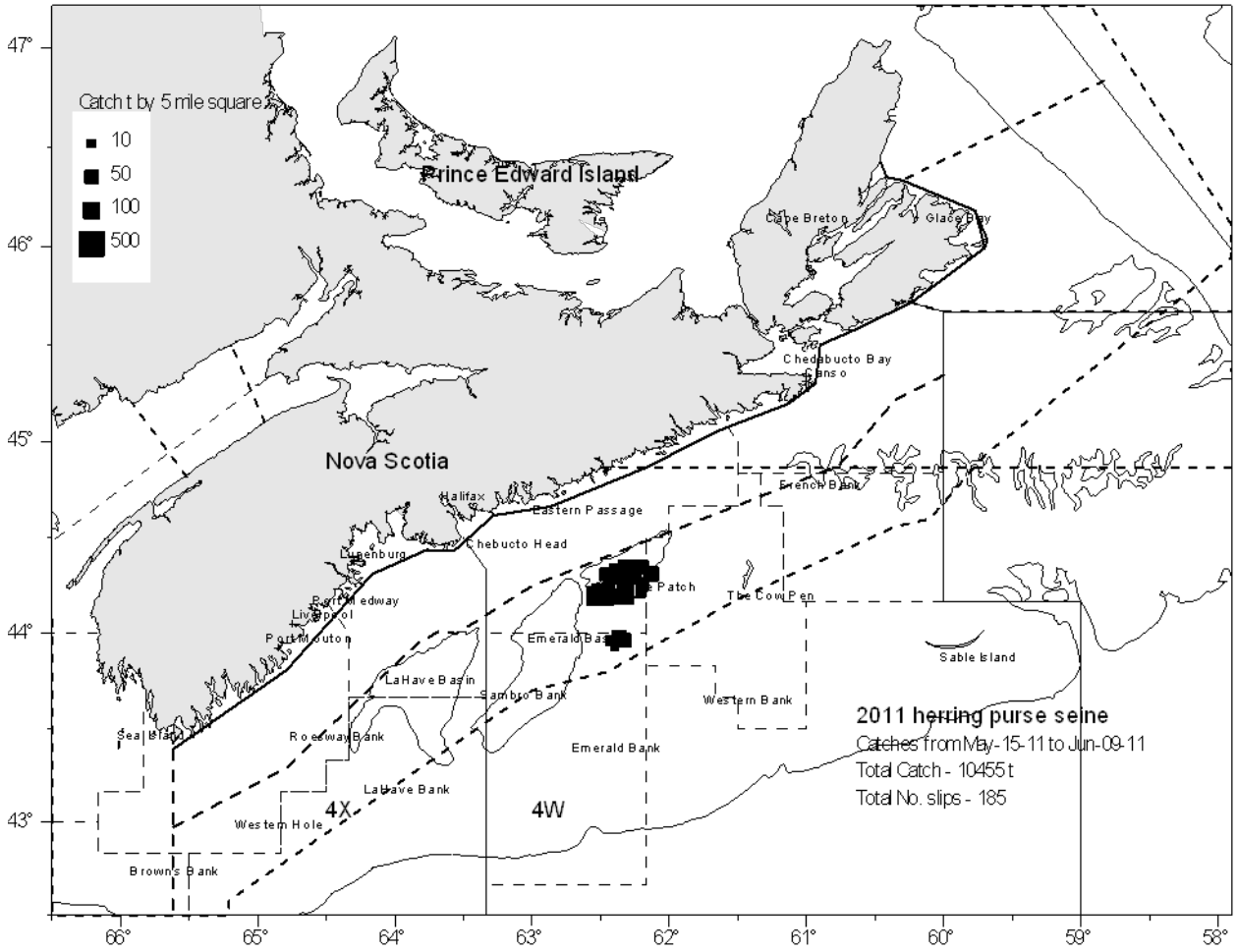


Figure 38A. 2011 herring purse seine on the offshore Scotian Shelf banks with embayment and offshore 25 and 50 mile lines shown.

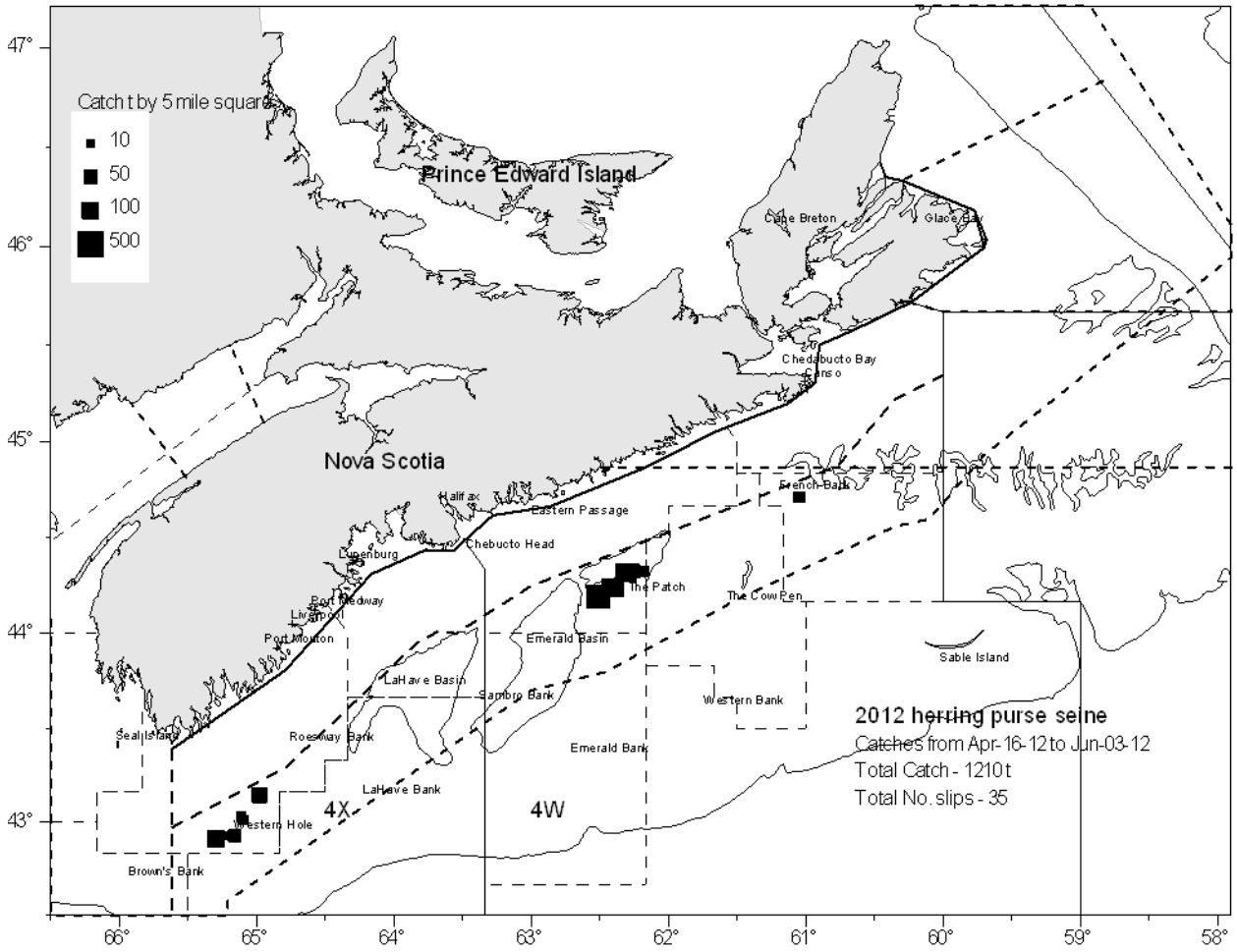


Figure 38B. 2012 herring purse seine on the offshore Scotian Shelf banks with embayment and offshore 25 and 50 mile lines shown.

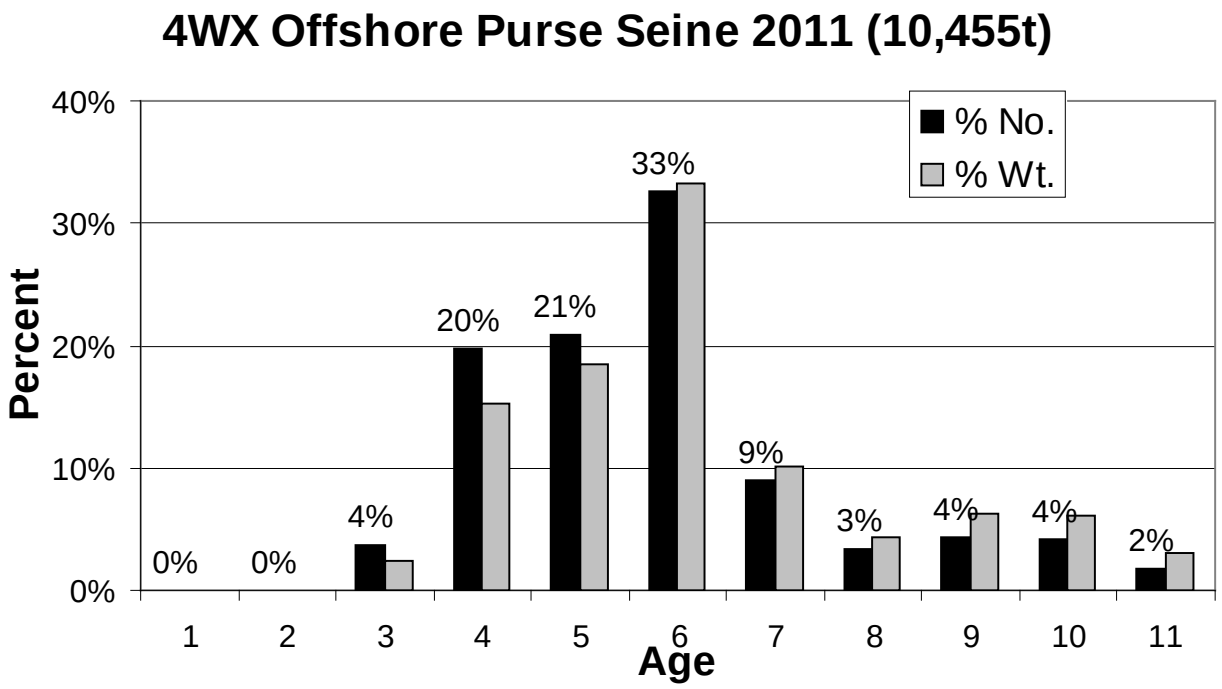


Figure 39A. Fishery catch at age (% numbers and % weight) for the 2011 offshore Scotian Shelf herring component.

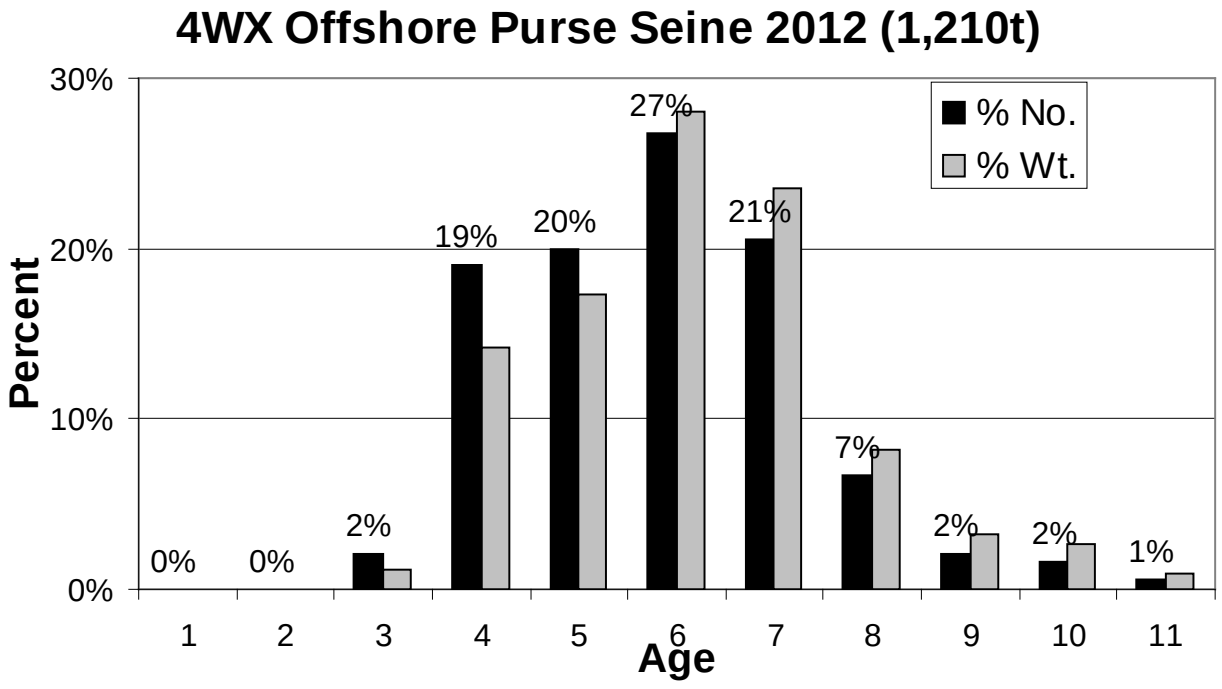


Figure 39B. Fishery catch at age (% numbers and % weight) for the 2012 offshore Scotian Shelf herring component.

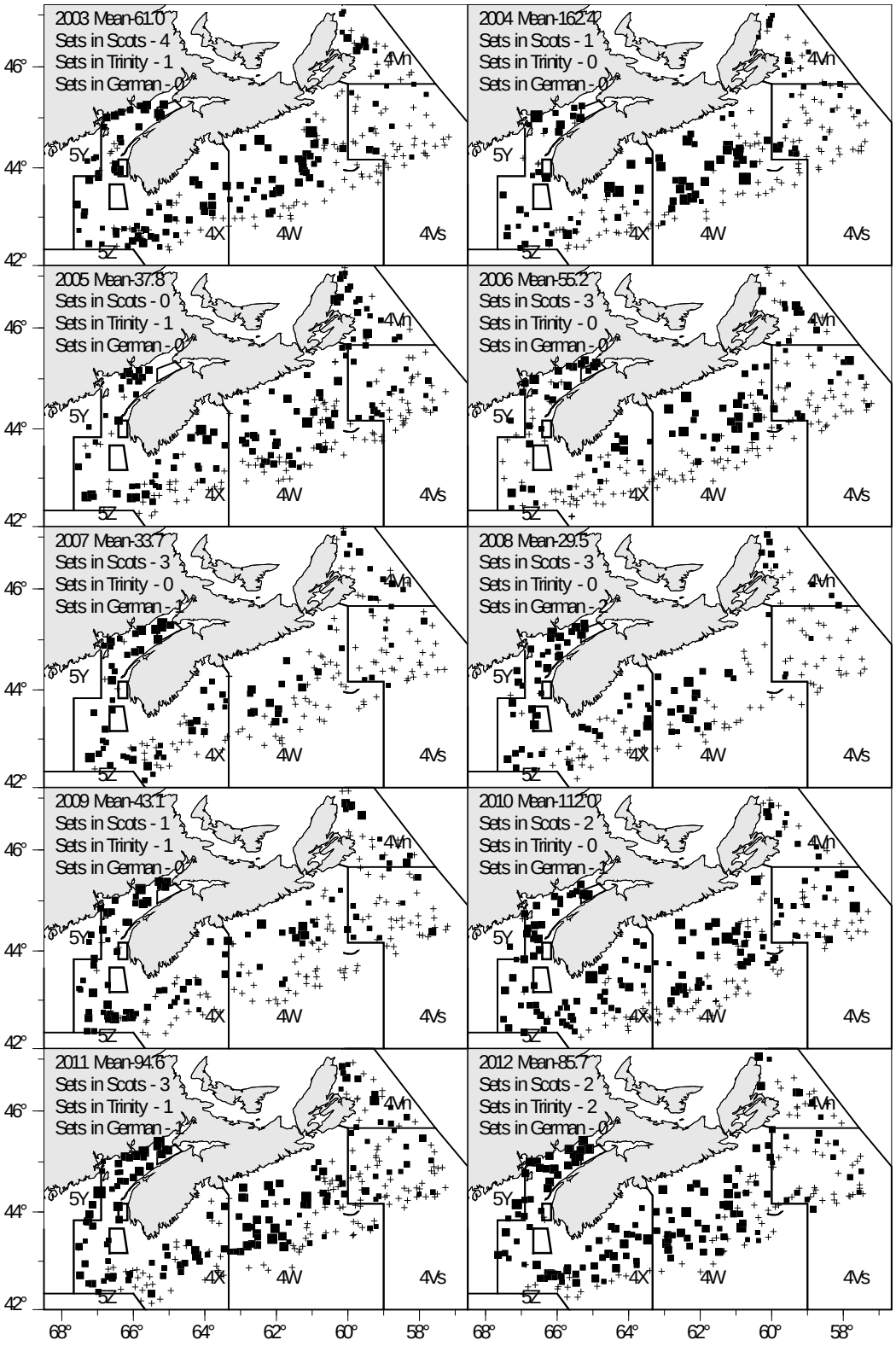


Figure 40. Herring catches from the DFO summer bottom trawl research survey for 2003-2012. Mean numbers per standard tow and count of sets in Scots, Trinity and German spawning areas.

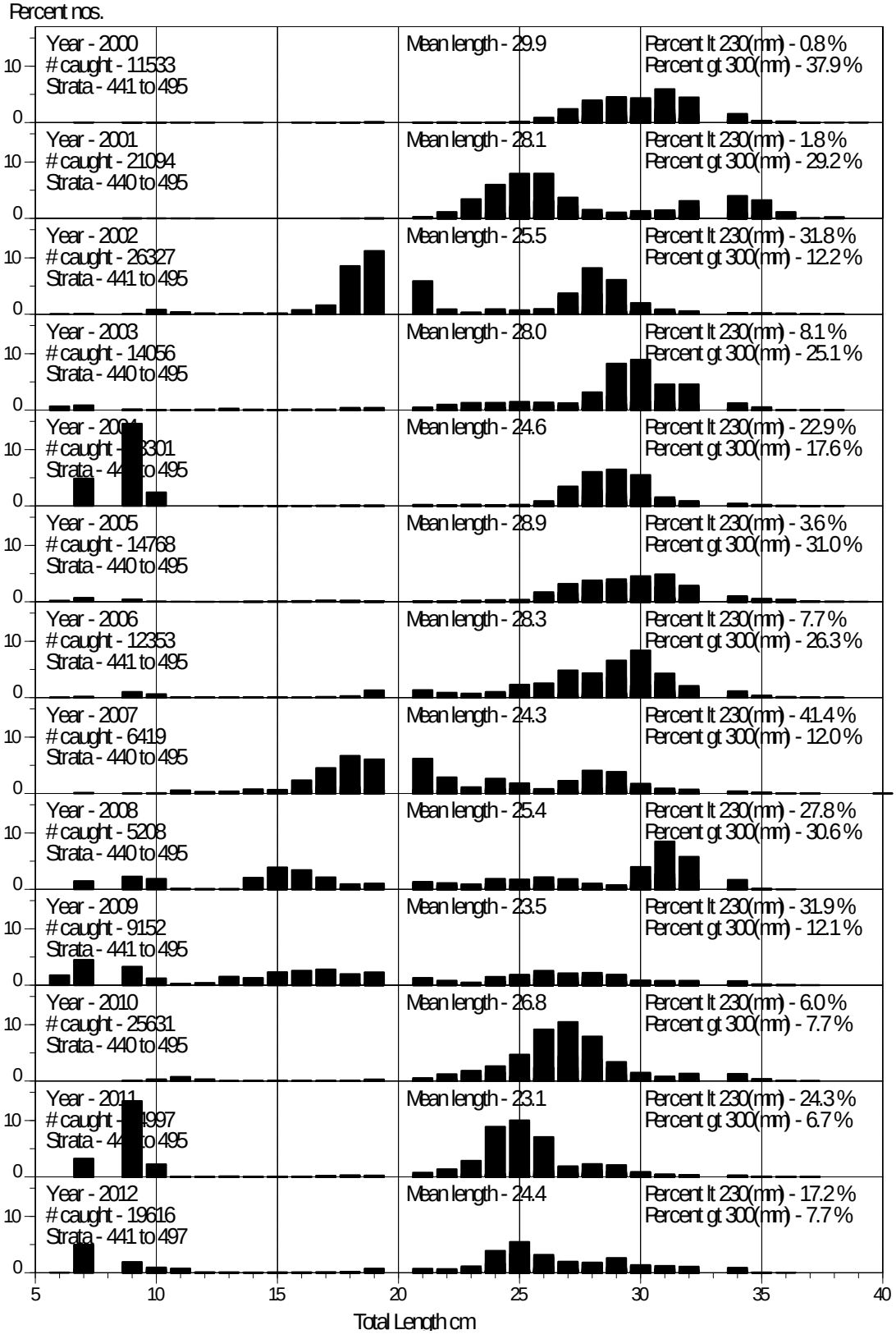


Figure 41. The 2000-2012 herring size distribution (fork length converted to total length cm) from the July bottom trawl research survey for the entire 4VWX area of coverage.

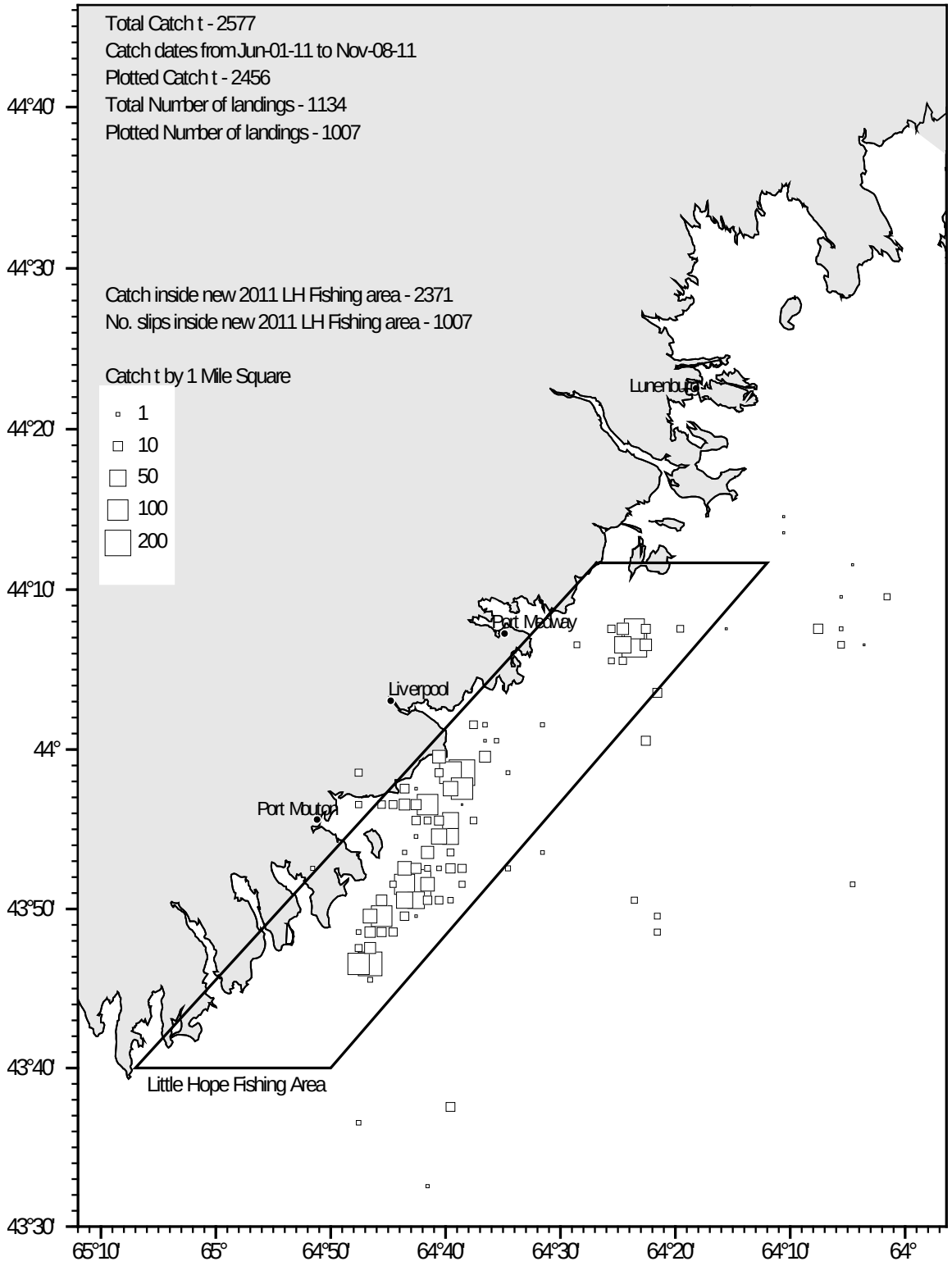


Figure 42A. The 2011 herring gillnet catch locations for landings in statistical districts 23-31 with amount caught within the Little Hope Fishing Area.

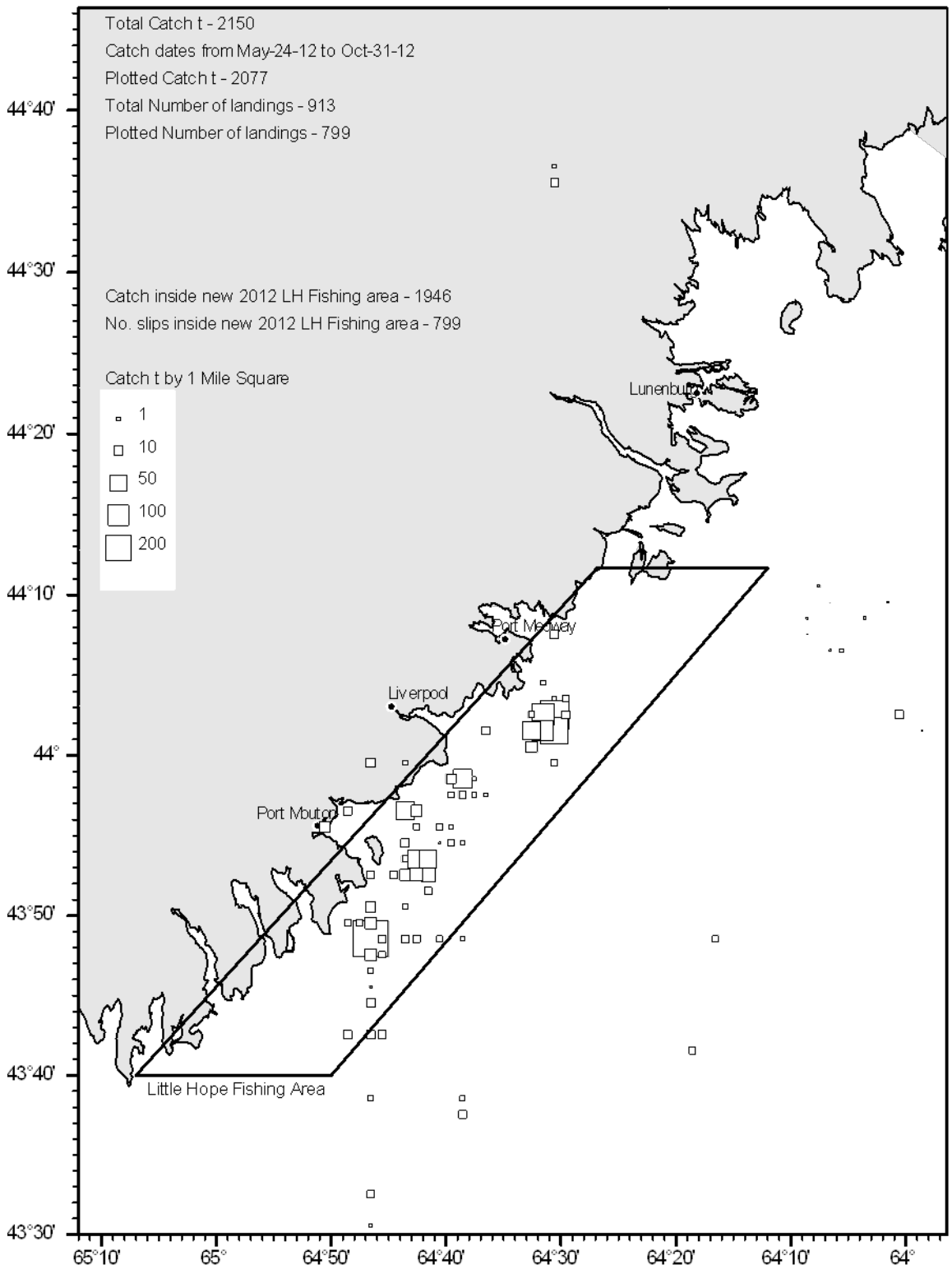


Figure 42B. The 2012 herring gillnet catch locations for landings in statistical districts 23-31 with amount caught within the Little Hope Fishing Area.

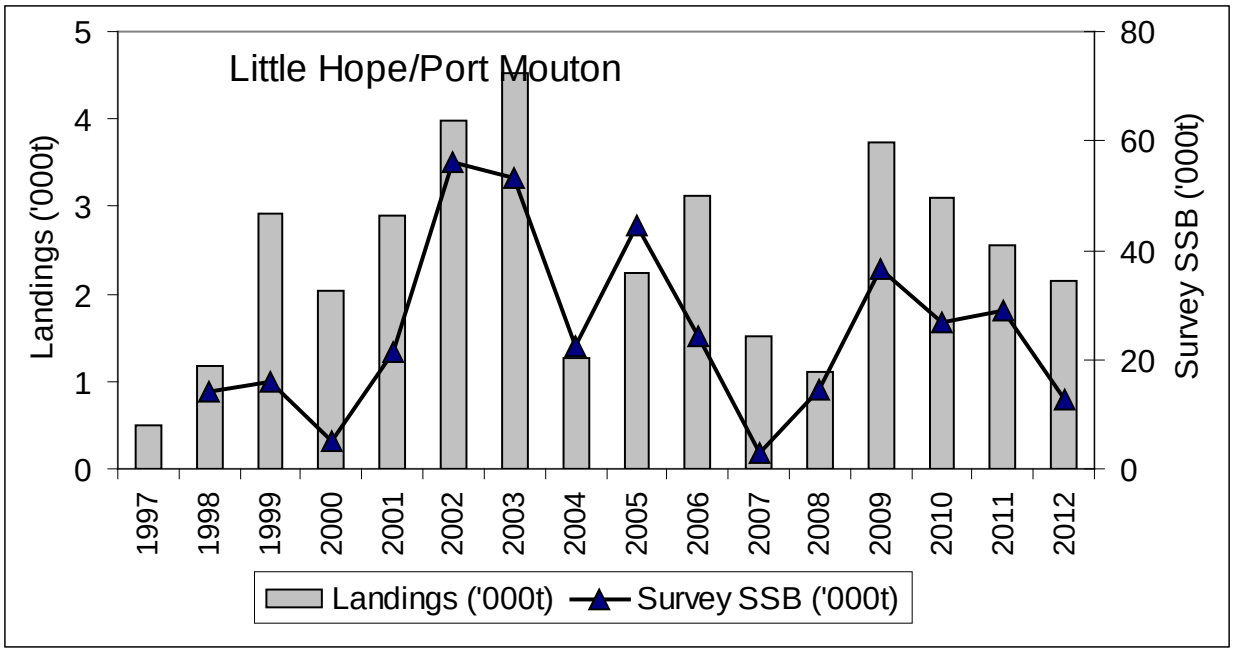


Figure 43. Herring landings and acoustic survey biomass ('000t) for the Little Hope/Port Mouton gillnet fishery from 1997-2012.

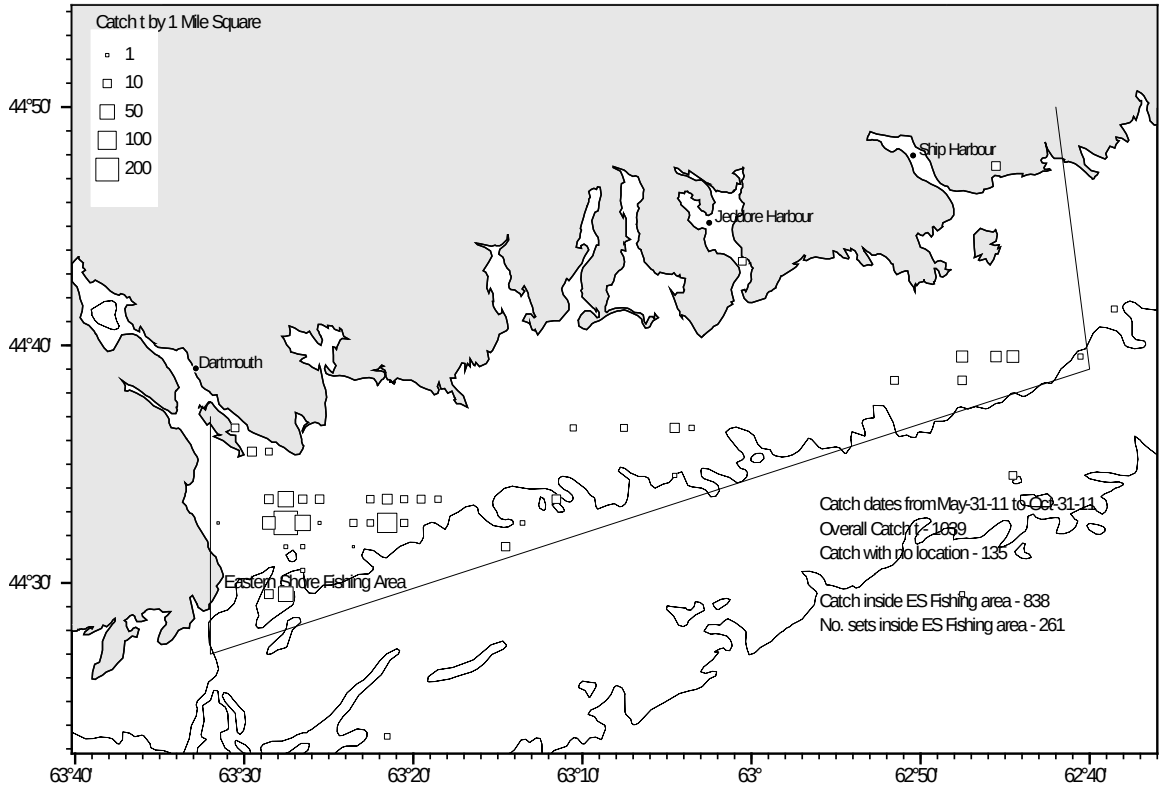


Figure 44A. Gillnet herring catches for the 2011 fall fishery along the Eastern Shore Fishing Area (catches by 1 mile squares).

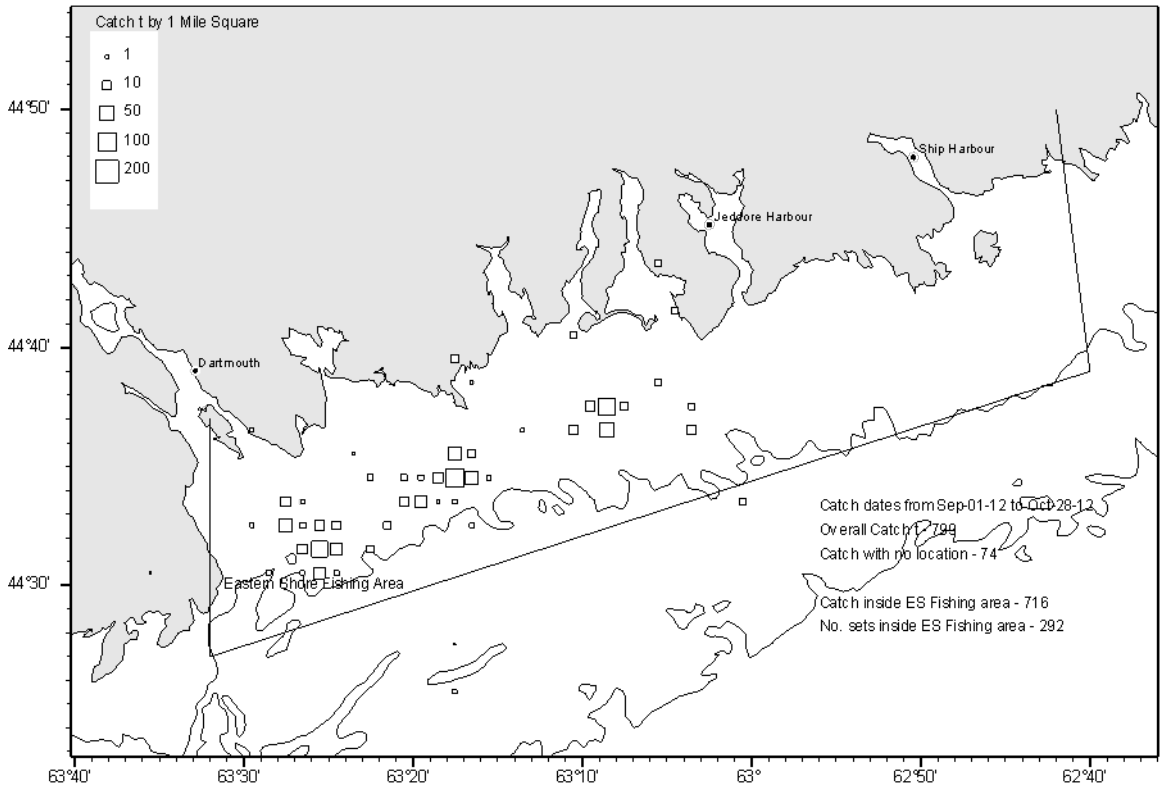


Figure 44B. Gillnet herring catches for the 2012 fall fishery along the Eastern Shore Fishing Area (catches by 1 mile squares).

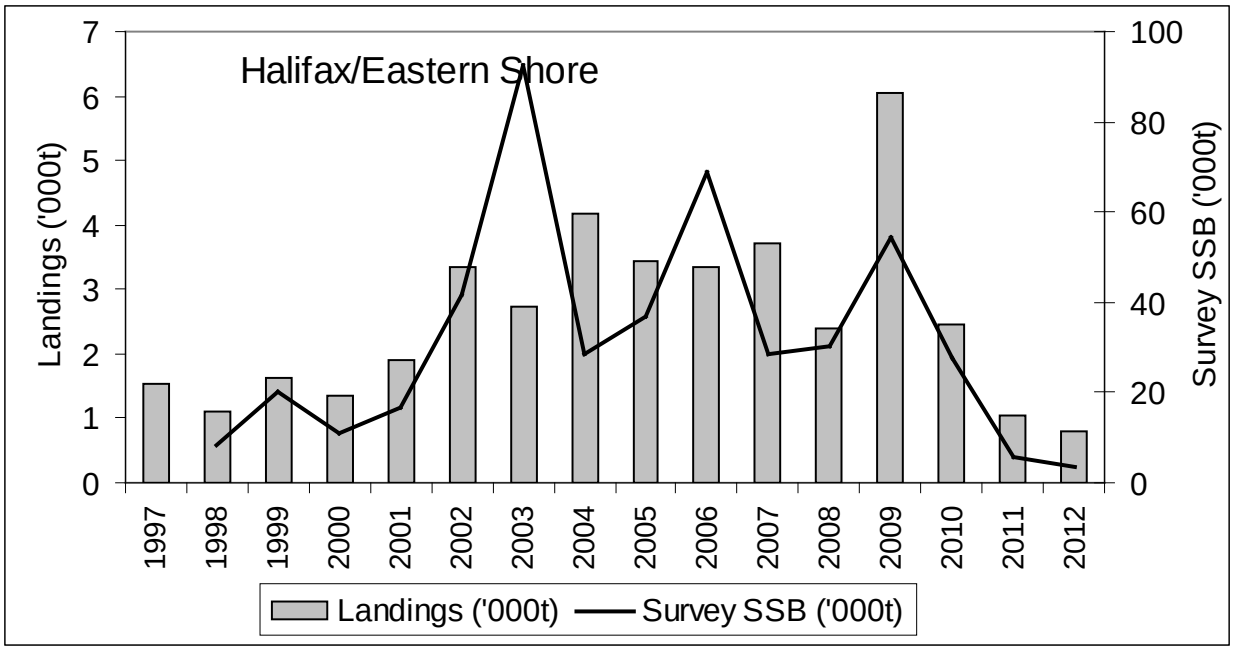


Figure 45. Herring landings and acoustic survey biomass ('000t) for the Halifax/Eastern Shore gillnet fishery from 1997-2012.

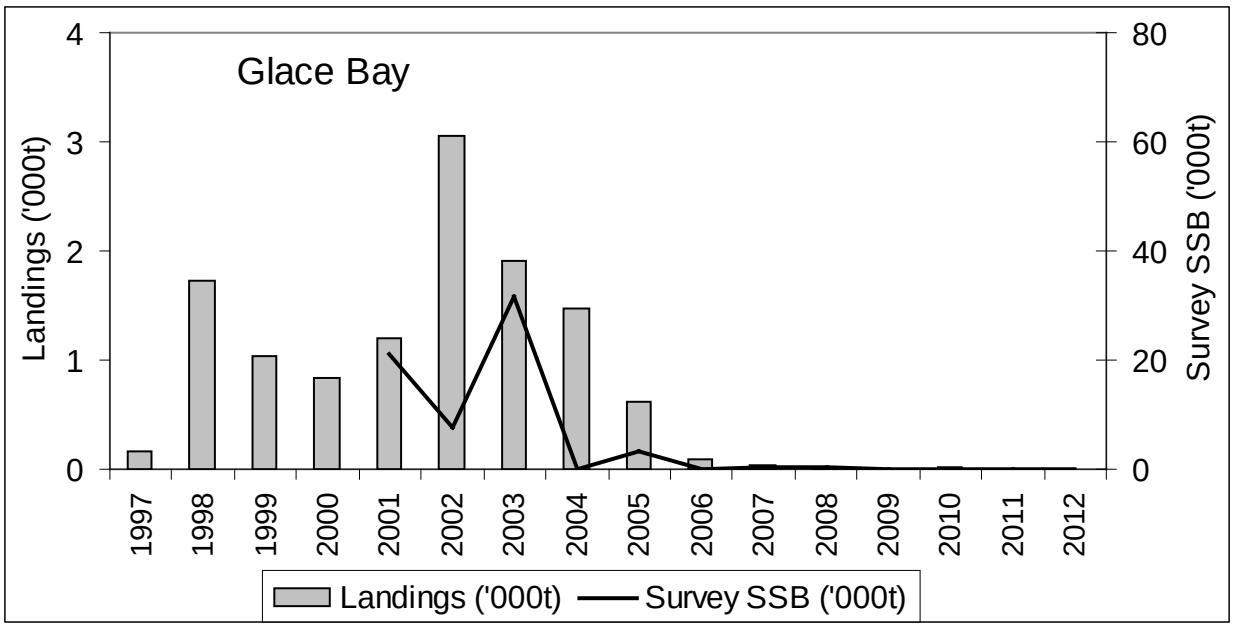


Figure 46. Herring landings and acoustic survey biomass ('000t) for the Glace Bay gillnet fishery from 1997-2012.

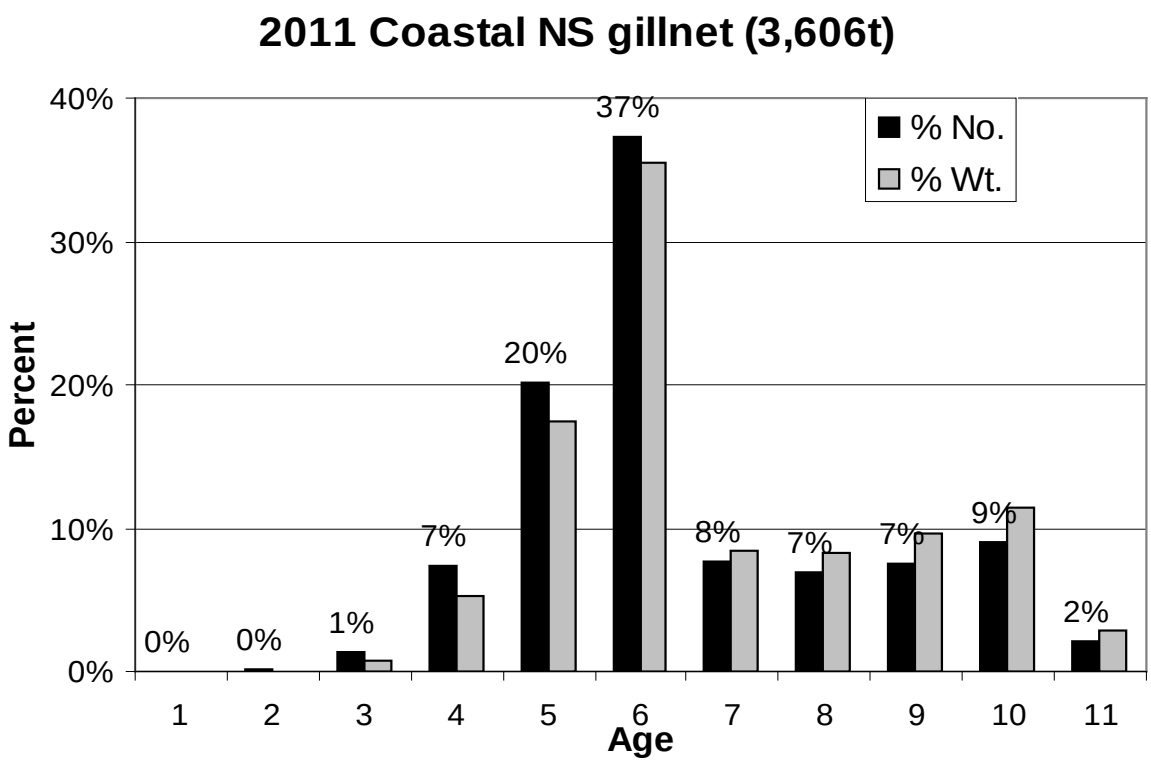


Figure 47A. Fishery catch at age (% numbers and % weight) for the 2011 Coastal Nova Scotia herring component.

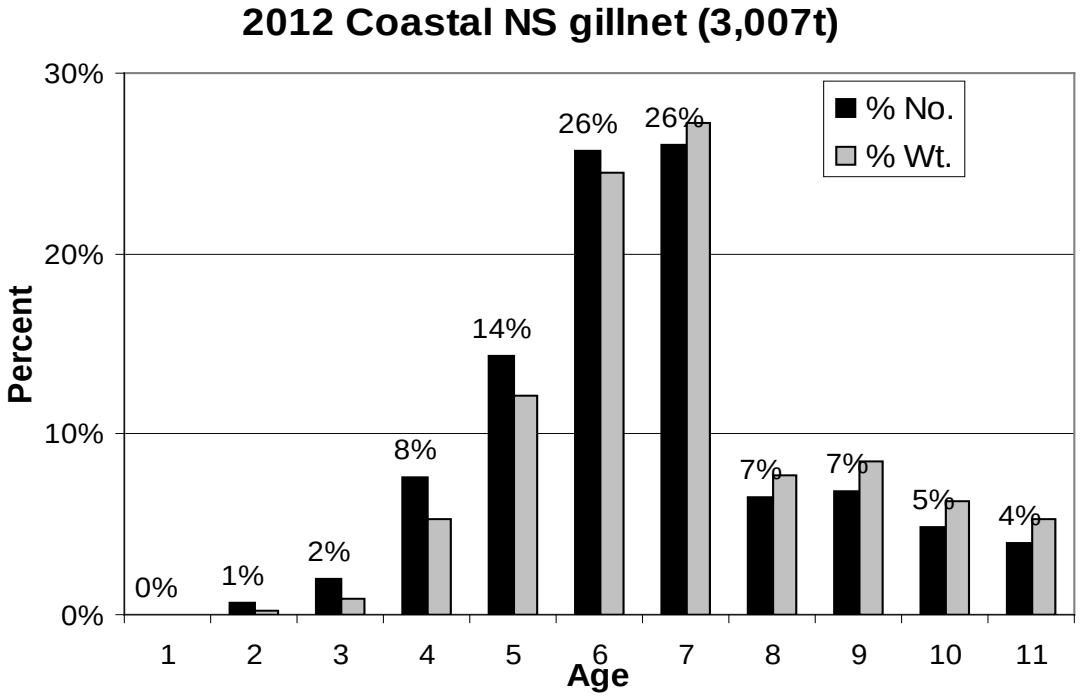


Figure 47B. Fishery catch at age (% numbers and % weight) for the 2012 Coastal Nova Scotia herring component.

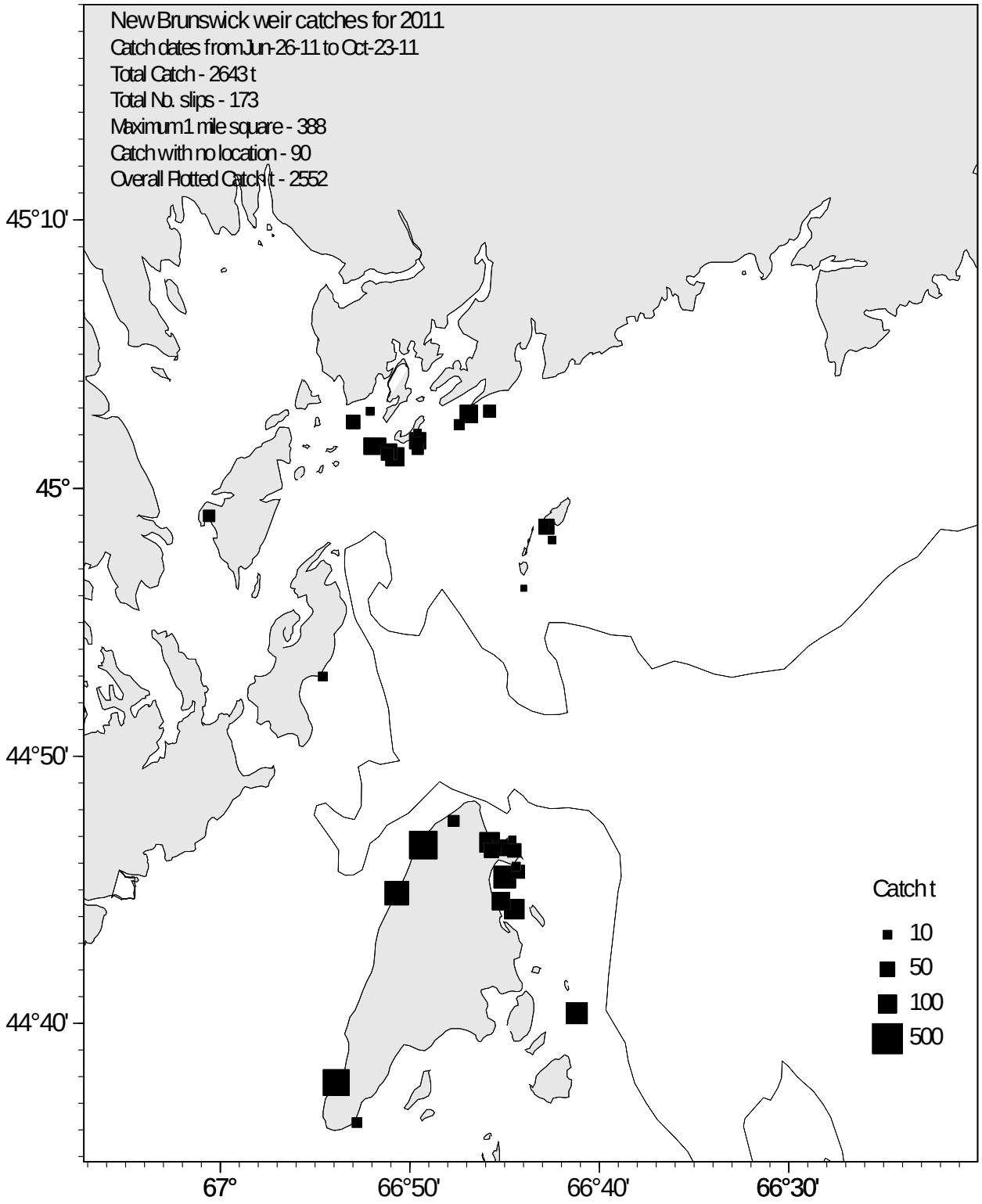


Figure 48A. New Brunswick herring weir catches by location for the 2011 fishing season.

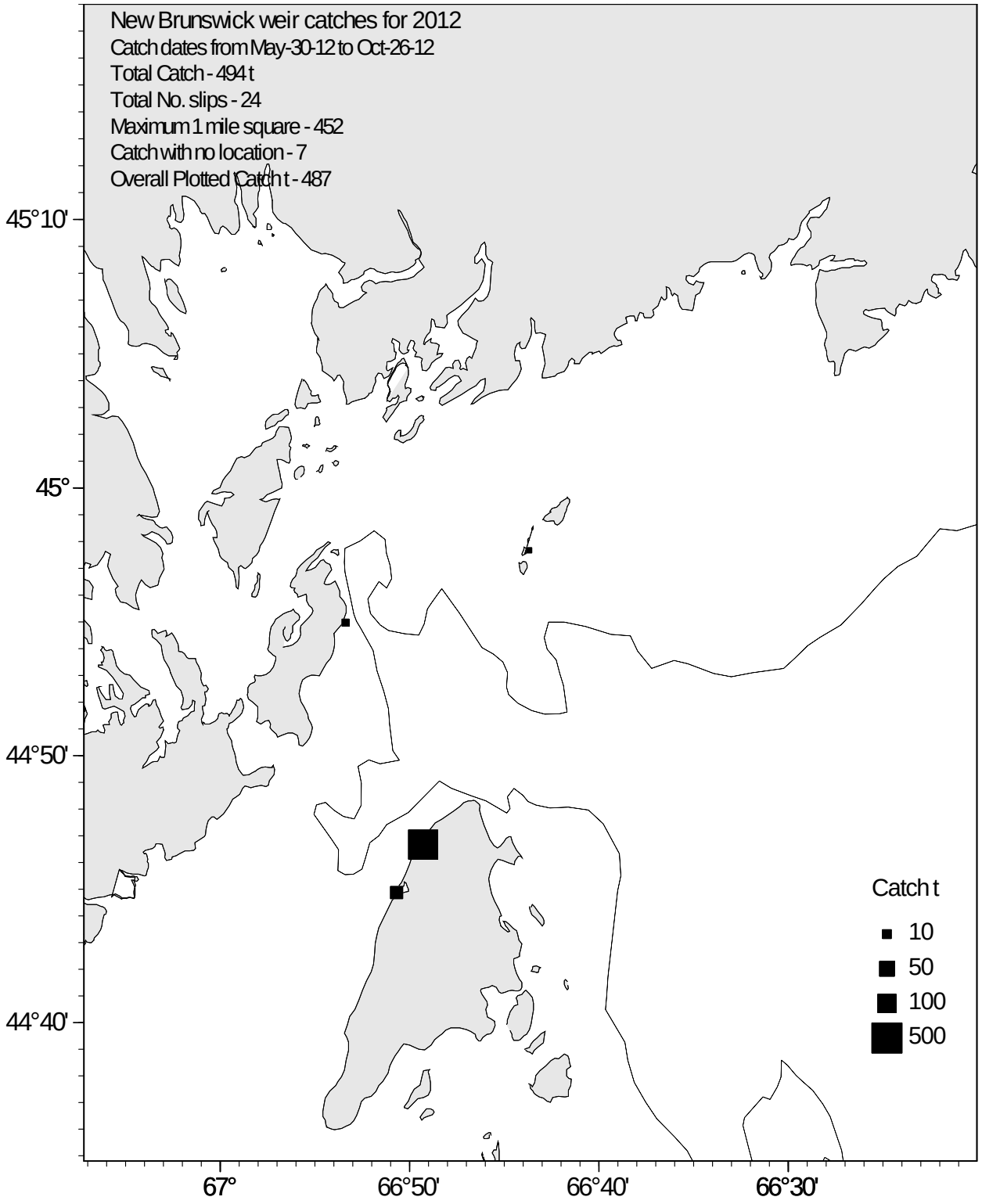


Figure 48B. New Brunswick herring weir catches by location for the 2012 fishing season.

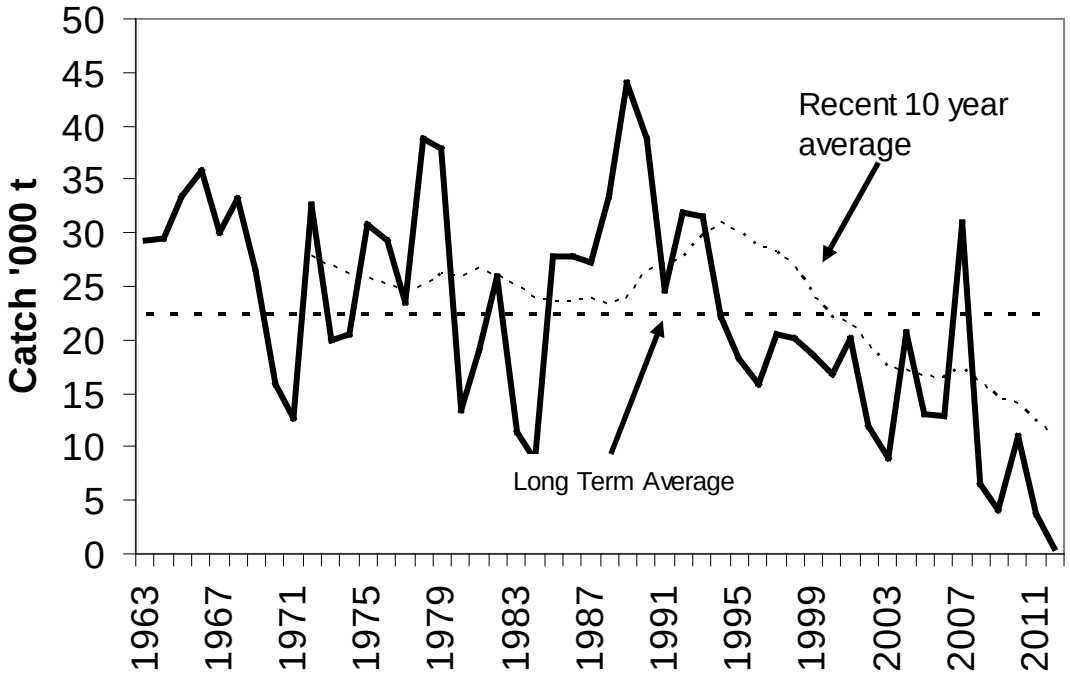


Figure 49. Herring landings from the SWNB weir and shutoff fishery for 1963-2012 with the overall long term average.

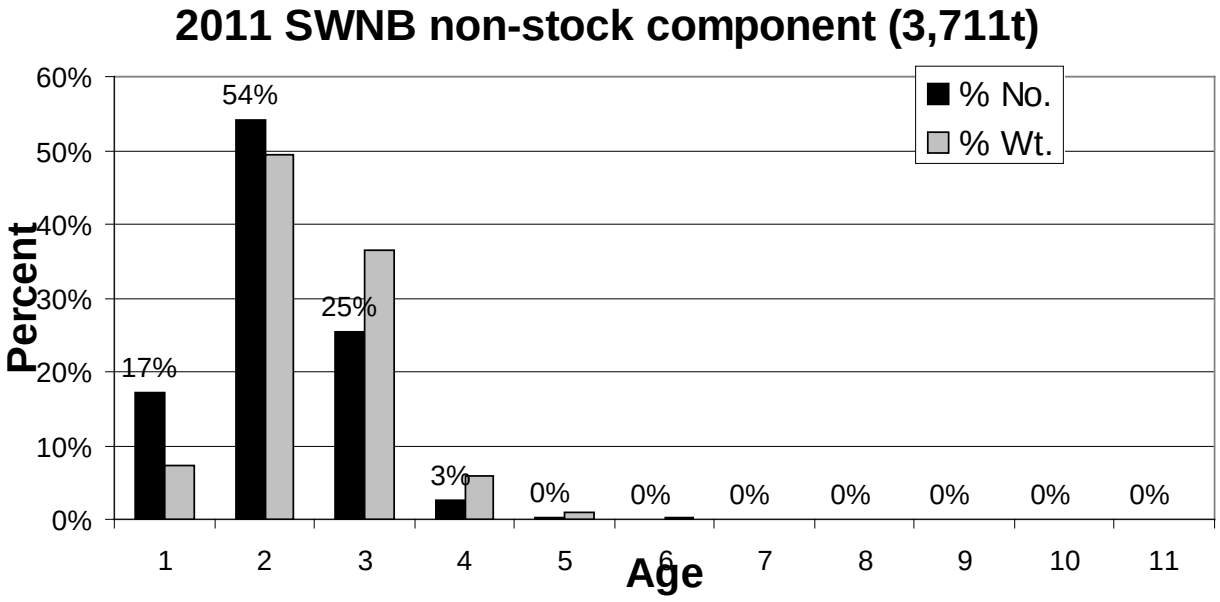


Figure 50A. Fishery catch at age (% numbers and % weight) for the 2011 SWNB migrant juvenile herring component.(check)

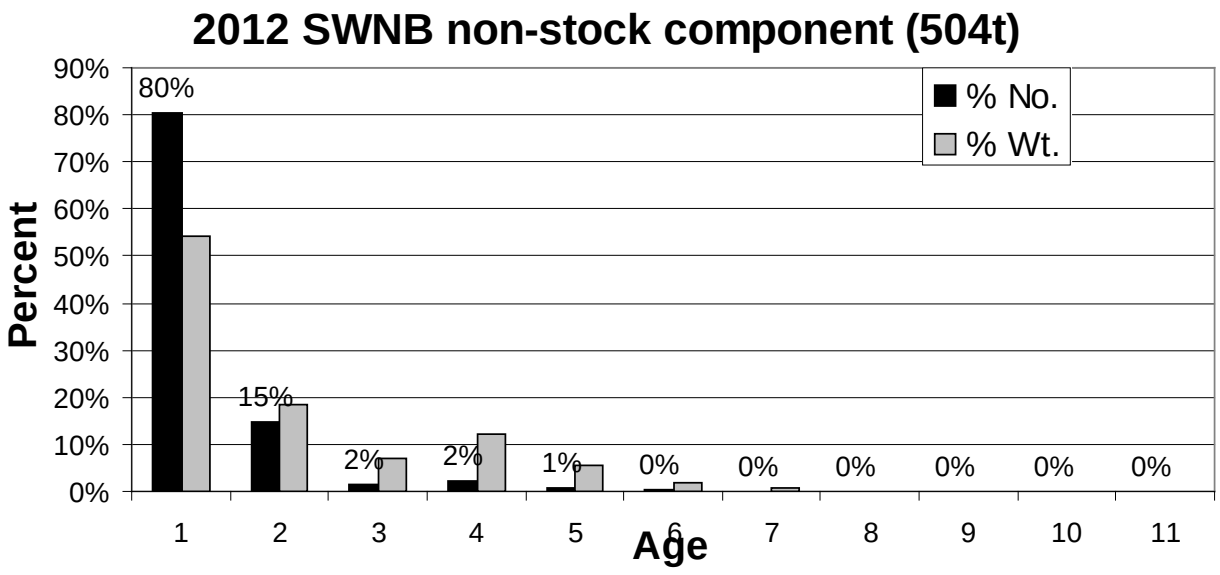


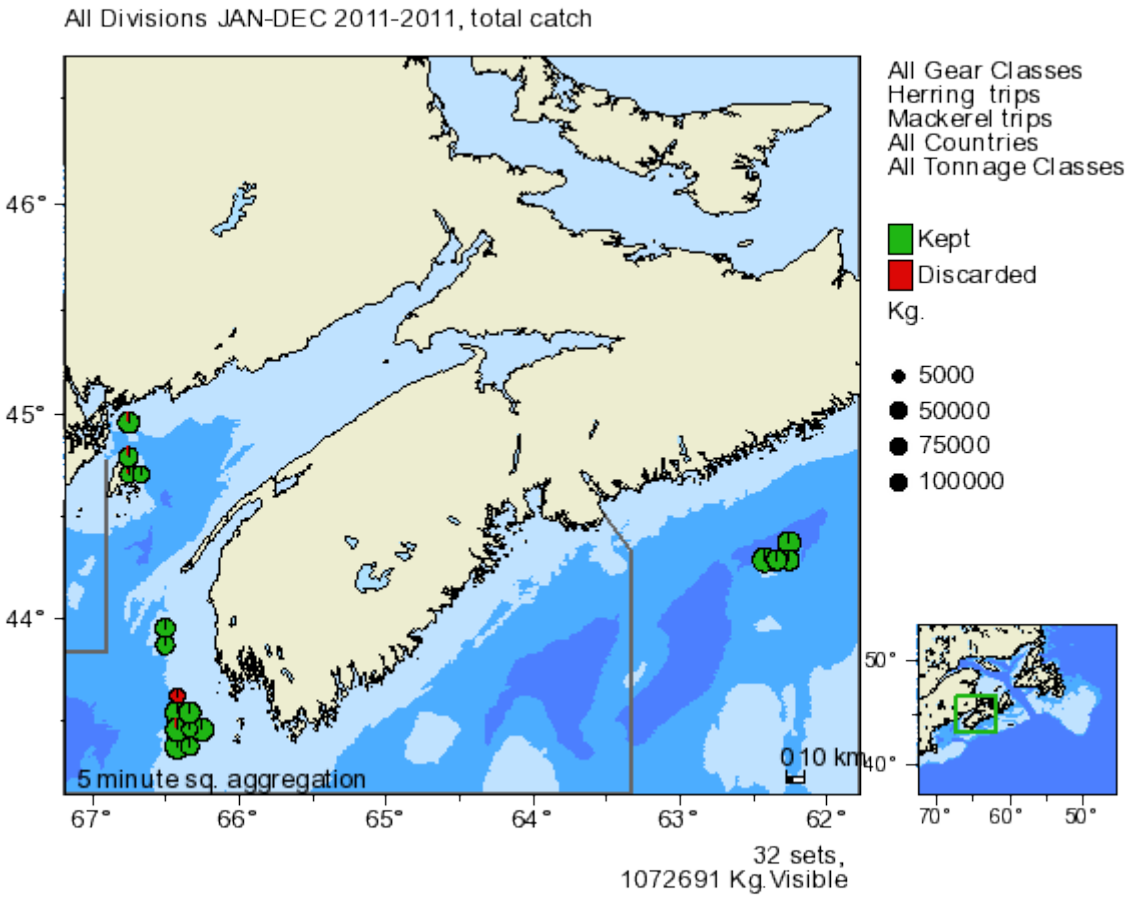
Figure 50B. Fishery catch at age (% numbers and % weight) for the 2012 SWNB migrant juvenile herring component.

APPENDIX

APPENDIX A: OBSERVER REPORTS FOR HERRING DIRECTED TRIPS FROM 2010-2011 AND 2011-2012

2011 Observer data:

- 23 trips, 35 sets monitored, purse seine gear only
- 3 trips in area 4W (Patch area) in May and rest in 4X during July to October
- by-catch of small amounts of short-fin squid, thresher shark, shortfin mako and American lobster.

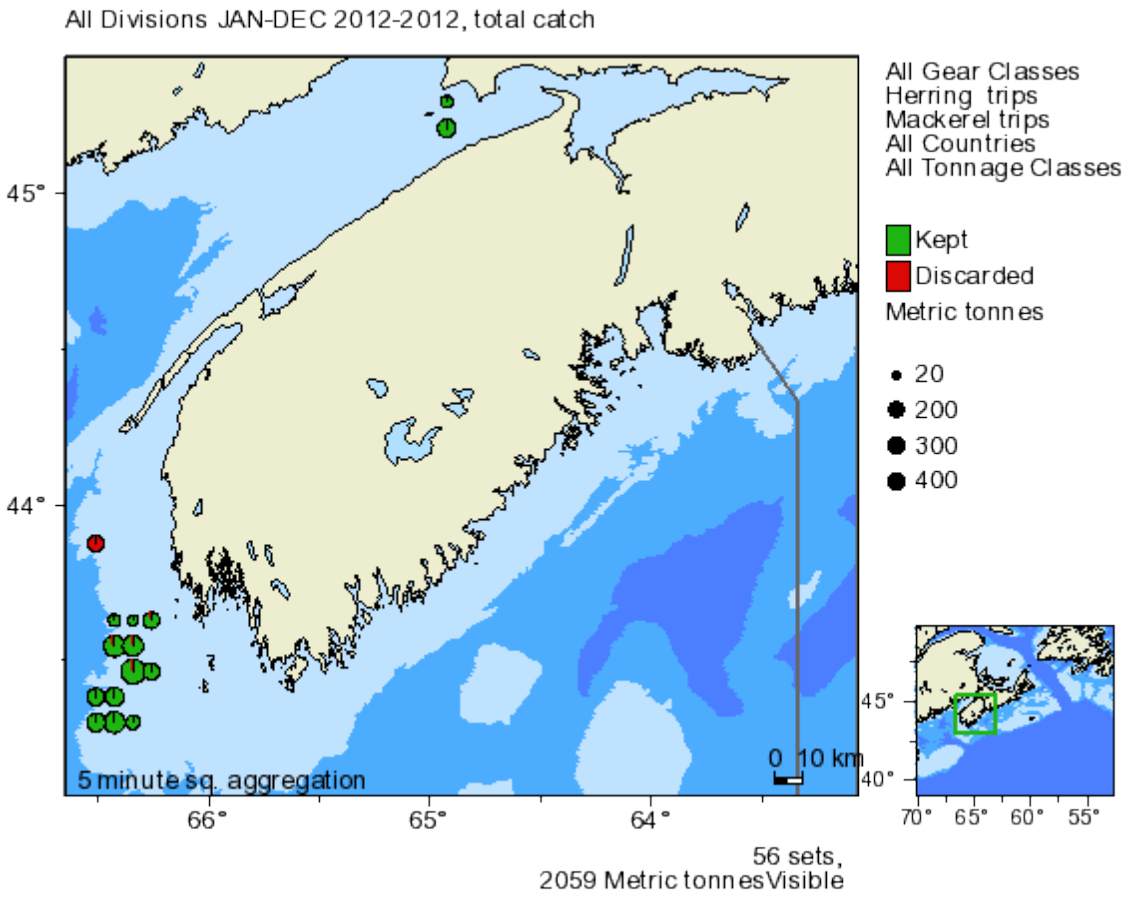


Catch Composition (Metric tonnes)		
Species	Kept 2011	Discarded 2011
HERRING(ATLANTIC)	1067.1	2
MACKEREL(ATLANTIC)	3.282	0
SHORT-FIN SQUID	0.016	0
THRESHER SHARK	0	0.2
SHORTFIN MAKO	0	0.09
AMERICAN LOBSTER	0	0.003

Figure A1. Species report for 2011 herring and mackerel trips combined.

2012 Observer data:

- 28 trips, 61 sets monitored, purse seine gear only
- 1 trip in area 4W (Patch area) in June and rest in 4X during Aug to Oct
- by-catch of small amounts of mackerel, bluefin tuna, American lobster and haddock released.



Catch Composition (Metric tonnes)		
Species	Kept 2012	Discarded 2012
HERRING(ATLANTIC)	2000.38	52.078
MACKEREL(ATLANTIC)	6.045	0.02
BLUEFIN TUNA	0	0.136
AMERICAN LOBSTER	0	0.013
HADDOCK	0	0.001

Figure A2. Species report for 2012 herring and mackerel trips combined.