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2018 Evaluation of Northwest Atlantic Fisheries Organization (NAFO) Divisions 4VWX Herring

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Foreword

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

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ABSTRACT

The 2018 evaluation of the Northwest Atlantic Fisheries Organization (NAFO) Divisions 4VWX Herring considered the data from the 2014–2015, 2015–2016 and 2016–2017 quota years. Quota landings of Atlantic Herring (*Clupea harengus*) in 2014–2015 were 49,204 tonne (t) and in 2015–2016 were 50,012 t against a Total Allowable Catch (TAC) of 50,000 t for each quota year for the Southwest Nova Scotia/Bay of Fundy (SWNS/BoF) component. In the 2016–2017 quota year, landings were 39,430 t against a TAC of 42,500 t. In 2015, the Spawning Stock Biomass (SSB) estimate was 462,241 t, which decreased in 2016 to 328,253 t and increased to 393,396 t in 2017. A survey on 2017 German Bank was initially excluded because it was nine days after the previous one; however, this resulted in a 28-day gap before the next acceptable survey. Subesquently, at the assessment meeting, this survey was included. In 2017, the SWNS/BoF stock component biomass estimate was 11% below the long-term average. It is evident that fluctuations in the biomass estimates are occurring both in Scots Bay and German Bank. In 2015, the fishery catch at age composition by number was comprised of 40% fish at age 2, 15% fish at age 3, 14% at age 4, and 31% at ages 5+. In 2016, the fishery catch at age composition by number was comprised of 27% fish at age 2, 38% at age 3, 10% at age 4, and 25% at ages 5+. In 2017, the fishery catch at age composition by number was comprised of 15% fish at age 2, 33% at age 3, 30% at age 4, and 21% at ages 5+. The proportion of the catch age 5+ has decreased from the 2013 high of 35%.

Landings from the Offshore Scotian Shelf banks improved from the historical low of 58 t in 2014 to 1,803 t (2015), decreased to 1,035 t (2016), and then increased to 3,955 t (2017). There were only limited landings of Herring from the bottom trawl and mid-water trawl gear in the Offshore Scotian Shelf banks areas. No acoustic survey was completed for the offshore area during 2015–2017. Herring abundance in the summer bottom trawl research vessel survey remained relatively constant between 2011 and 2014 and has trended upwards since then. The overall 4VWX area showed an increase in abundance by number in the last three years. 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 increased from 4,760 t (2014) to 5,166 t (2015), 7,780 t (2016) and to 7,816 t (2017). In the Little Hope/Port Mouton area, there was substantial increase in the surveyed acoustic biomass in 2015 to a historic high of 145,396 t from 46,077 t in 2014. The surveyed biomass decreased to 61,408 t in 2016 and increased to 66,815 t in 2017, which is below the five-year average of 78,845 t. There was a substantial increase in the surveyed acoustic biomass in the Halifax/Eastern Shore area from 9,586 t (2014) to 68,562 t (2015), followed by a decrease to 54,312 t. The biomass estimate increased to 58,681 t in 2017, which is above both the five-year average (39,602 t) and the long-term average (33,606 t). No survey was completed near Glace Bay during the reporting period (2015–2017). Minimal landings of 4 t were reported in 2016 with no reports of landings in 2015 and 2017. No Herring surveys took place in the Bras d'Or Lakes.

Landings in the New Brunswick weir and shut-off fishery were decreased to a historic low of 146 t in 2015. Landings increased to 4,060 t in 2016 and then decreased to 2,102 t in 2017. In 2007, landings were 30,944 t, the highest in 20 years. The age distribution of fish caught in the New Brunswick weir and shutoff fishery were primarily juveniles, with 99% (2015), 84% (2016) and 58% (2017) by numbers at either age 1 or age 2. There were more older fish caught in the weirs in 2017 which is a departure from what was being caught in the recent years. The success of this passive trap fishery has been historically unpredictable and landings have declined markedly from the 1980s to present. Landings may not be indicative of abundance because catches are extremely susceptible to many factors in addition to abundance, including effort.

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 (9–11 in or 23–28 cm in length), 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 mid-water 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 2015–2017 from the Canadian portion of Georges Bank, with the last recorded landings observed in 2004. This fishery is included in the Gulf of Maine stock complex and was evaluated in 2009 (DFO 2003a; TRAC 2009), 2012 (Northeast Fisheries Science Center 2012) and 2015 (Deroba 2015).

OBJECTIVES AND MANAGEMENT

The 2003 (Evergreen) Scotia-Fundy Herring Integrated Fisheries Management Plan (IFMP) states the principles, conditions, and management measures for the 4VWX Herring fisheries (DFO 2003b). 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 in Sinclair (1997).

Three conservation objectives appear in the plan:

1. To maintain the reproductive capacity of Herring in each management unit. Targets include:

- persistence of all spawning components in the management unit;
- maintain biomass of each spawning component above a minimum threshold;
- maintain a broad age composition for each spawning component; and
- maintain a long spawning period for each spawning component.

2. To prevent growth overfishing:
   - continue to strive for fishing mortality at or below $F_{0.1}$.
3. To maintain ecosystem integrity/ecological relationships ("ecosystem balance"). Herring is prominent in the diet of many fish, birds and marine mammals and should be managed with these interactions in mind. Specific targets include:
   - maintain spatial and temporal diversity of spawning; and
   - maintain Herring biomass at moderate to high levels.

There is evidence that some of these conservation objectives are not being met; however, there was some improvement from the low level of the spawning stock biomass (SSB[1]) estimates noted in past assessments (Power et al. 2006, 2007, 2008, 2010a, 2013; Singh et al. 2014a). These objectives require better definition in terms of minimum thresholds and should explicitly list the spawning components in terms of spatial and temporal expectations.

An "in-season" management process, first implemented in the SWNS/BoF 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. The Herring industry continues to collect samples and conduct biological sampling, while purse seine and gillnet sectors conducted key acoustic surveys. Field activities during 2015–2017 were supervised by the Herring Science Council (HSC) coordinator with assistance from St. Andrews Biological Station (SABS)/DFO staff, individual survey vessel captains, and plant managers. The HSC coordinator also downloaded and performs preliminary analyses of the acoustic data from the purse seine fleet. The gillnet fleets contracted A. Clay from Femto Electronics Ltd, Lower Sackville, Nova Scotia to provide downloading and data editing services.

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 (80–90%), 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 landings and sampling analysis (Figures 2 to 4).

[1] Throughout this document spawning stock biomass (SSB) refers to the spawning stock biomass observed at the time of the acoustic surveys.

Quota landings for the SWNS/BoF stock component, the only component under a Total Allowable Catch (TAC) control, were 49,024 tonnes (t) for the 2014–2015 quota year and 50,012 t for 2015–2016 quota year against a TAC of 50,000 t. In the 2016–2017 quota year, landings were 39,430 t against a TAC of 42,500 t. The quota year begins on October 15th and ends on October 15th of the following year. Landings in the fall 2015 purse seine fisheries for the 2015–2016 quota year were 1,538 t. The fall 2016 purse seine fisheries for the 2016–2017 quota year were 1,185 t. The fall 2017 purse seine fisheries for the 2017–2018 quota year were 1,609 t. There was no winter fishery for the reporting years. There were additional landings of 7,115 t (2015), 12,901 t (2016), and 13,855 t (2017) from the non-stock components including Coastal Nova Scotia, the Offshore Scotian Shelf Banks, and SWNB Migrant Juveniles. The landings from New Brunswick weirs and shutoffs fisheries decreased from 2,149 t (2014) to a historical low of 146 t (2015), increased to 4,060 t (2016) then decreased to 2,101 t (2017). Landings from the Coastal Nova Scotia gillnet fisheries increased from 4,760 t (2014) to 5,166 t (2015), 7,805 t (2016) to 7,828 t (2017). The landings from the Offshore Scotian Shelf Banks component increased from the historical low of 58 t (2014) to 1,803 t (2015), 1,035 t (2016) and 3,955 t (2017) (Tables 1A, 2A, 1B, 2B, 1C, 2C, and 3).

Landings for SWNS/BoF stock component have recently tracked the TAC, with most of the quota (and on occasion slightly above) being taken each year since 2002 (Figure 5). In the 2014–2015 quota year, landings were 976 t below the TAC. In 2015–2016, landings were 12 t above the TAC while, in 2016-2017, landings were 3,070 t below the reduced TAC of 42,500 t. Since the reduced quota in 2005, total landings from this component have remained low (Table 3). Tables 4A and 4B provide the purse seine landings (in tonnes and in percentages) by fishing grounds from 1985–2017 for the 4WX stock component. Tables 5A and 5B provide the purse seine landings for the same period (in tonnes and in percentages) for the non-stock areas. Throughout the history of this fishery, most landings have been caught by purse seine gear, with the 4X summer purse seine fishery being the largest (Table 3; Figures 6, 7A, 7B, and 7C). Landings by the purse seine sector accounted for 96%, 97%, and 98% of the 4WX component landings in 2015, 2016, and 2017, respectively, with minimal landings by the gillnet sector: 1,806 t (2015), 1,477 t (2016), and 655 t (2017). There is a continuing below average trend in landings from the Nova Scotia weirs (0 t in 2015, 16 t in 2016, and 0 t in 2017; Tables 1A, 1B, and 1C, 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 landings are summarized by fishing grounds using definitions of the various grounds based on groupings of 10-minute boxes of latitude and longitude (Tables 4A, and 4B; Figure 4). The largest proportions of landings came from fishing grounds in the German Bank (40% in 2015, 41% in 2016, 35% in 2017), Gannet Dry Ledge (24% in 2015, 24% in 2016, 19% in 2017) and Scots Bay (16% in 2015, 16% in 2016, 15% in 2017) areas (Table 4B; Figure 8). There was a decrease in percentages of landings from Grand Manan compared to recent previous years. Scots Bay landings increased from 9% (2014) to 16% (2015), 16% (2016), and 15% in 2017. Landings from Scots Bay have increased from 4,498 t (2014) to 8,685 t (2017). Landings from the New Brunswick coastal area decreased from 894 t (2015) to an historical low of 0 t in 2016, then increasing to 1,410 t in 2017. Landings were again below the long-term average from the Long Island and Trinity Ledge areas. Landings from the Long Island area decreased from 2,607 t (2014) to 2,585 t (2015), increased to 4,262 t (2016), then decreased again to 1,156 t (2017). In comparison, landings from the Lurcher area decreased to be below the long-term average of 1,528 t in 2015 (1,282 t), 2016 (584 t), and 2017 (1,105 t).

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 2015, 2016, and 2017,

this fishery occurred in similar areas and months as in previous years with total landings of 45,927 t, 46,983 t and 37,590 t, respectively (Tables 1A, 1B, and 1C; Figures 9A, 9B, and 9C). A large portion of this fishery is directed toward pre-spawning, feeding aggregations in May and June. Landings 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).

Purse seine landings of 1,535 t were reported in the October/November 2015 fall fishery, 1,185 t in the 2016 fall fishery, and 1,609 t were reported in the October/November 2017 fall fishery (Tables 2A, 2B, and 2C; Figures 10A, 10B, and 10C). There was no winter fishery reported in 2015 to 2017 (Tables 1A, 1B, and 1C). Fisheries that occur at the beginning of each quota year are usually concentrated on the New Brunswick side of the Bay of Fundy.

As in recent years, there was no winter fishery in Chedabucto Bay and the majority of the fall Herring landings came from the New Brunswick side of the Bay of Fundy (Table 4A; Figures 9A, 9B, and 9C).

Landings of non-stock component Herring by purse seine, which occurred mainly in the Offshore banks area on the Scotian Shelf in 2015 to 2017, increased from the 25-year low of 23 t in 2014 to 1,763 t (2015), decreased to 507 t (2016), then increased to 3,626 t to be above the long-term average in 2017 (Table 5; see Figures 38A, 38B, and 38C). There have been no purse seine landings from the Georges Bank, Liverpool, Shelburne and Halifax areas since 2006. There were no reported landings in the Western Hole area in 2015, 493 t in 2016 and 313 t in 2017 (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 amounts of fishing occur in the Gannet Dry Ledge, Grand Manan, and Long Island Shore stock areas. Recently, only limited fishing has been occurring by the Nova Scotia weirs in St. Mary's Bay, although some weir landings are sometimes being reported in the upper Bay of Fundy near Parrsboro. In the past, there was also an occasional small gillnet fishery in the spring on spawning Herring near Spectacle Buoy, which is just southeast of Yarmouth, Nova Scotia; however, there has been no reported landings from this area since 2011. Last, there has been a new trend of gillnet landings in Scots Bay (since 2009) and German Bank (since 2005), areas previously not fished by the gillnet fleet (Table 6).

German Bank

German Bank is one of the primary Herring fishing grounds in the Bay of Fundy area. From 2012 to 2015 there was an increasing trend in gillnet landings from German Bank (Table 6). Gillnet landings from German Bank decreased from 1538 t (2015) to 1290 t (2016) to 648 t (2017). Since 1985, purse seine landings from this area have ranged from 9,003–35,977 t during the main fishery period from early-May to late-October (Table 7). Landings during the pre-spawning period (defined as the period from January 1 to August 14) decreased from 15,077 t (2014) to 6,197 t (2015), increased to 10,522 t (2016), and decreased again to 3,007 t (2017). Purse seine and gillnet landings during the spawning period (defined as the period from August 15 to October 15) increased from 10,080 t (2014) to 14,789 t (2015), decreased to 9,633 t (2016), and increased to 11,515 t (2017). The contribution of German Bank landings to the overall TAC continued to decrease from 50% in 2014 to 34% in 2017 (Table 7; Figure 11). This is due mainly to the effort by industry to reduce the percentage of the TAC taken on German Bank.

The distribution of catches (purse seines only) on German Bank in the 2012 to 2017 pre-spawning period (January 1st to August 14th) are 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). During the reporting years, catches of spawning Herring were generally spread within the 'strata box' (which is used as the primary search area in acoustic surveys), with localized groups seen in both the northern and southern portions (Figure 13). In 2016, the majority of the catches were from the northern portion of the box during the spawning period August to the end of September (Figure 14). The total landings for the German Bank area decreased from 25,157 t (2014) to 20,986 t (2015), to 21,154 t (2016), and to 14,523 t (2017) (Table 7). The timing and amount of the landings on German Bank may also be influenced by industry measures to limit catches on the German Bank fishing ground.

Scots Bay

The highest gillnet landings in Scots Bay were recorded in 2014 (418 t). Since then there was a gradual decrease down to 133 t (2016), with only 6t being reported in 2017. Scots Bay Herring purse seine fishery has been an important component of the summer fishery. Since 1987, landings have ranged from 902 t to 24,388 t during the period of late-June to late-August/early-September (Table 8; Figure 15). The catch dates for the Scots Bay Herring purse seine fishery has tended to occur earlier in recent years (2013 to present) (Table 8). The highest recorded landings of 24,388 t, and the most days with catch recorded, occurred in 2004 (Table 8). From 2006, the Scots Bay fishery was restricted by a 5000 t cap self-imposed by the Herring industry due to the poor performance of the spawning component. This 5000 t restriction was adhered to through 2014 when 4,498 t was landed. Landings in 2015 increased to 6,951 t (over a 78-day fishing period), deceased to 6,010 t in 2016 (over a 59-day fishing period), and increased again to 8,652 t (over a 98-day fishing period) in 2017(Table 8; Figure 16). Most of the catches were located within the defined survey box area. Substantial catches also occurred outside the box in Advocate Bay (Figure 16). The catches were spread throughout the season in all the reporting years (Figure 17).

Trinity Ledge

Table 9 presents the landed weight by the gillnet fleet within the Trinity Ledge survey area and the exploitation percentage of the acoustic surveyed biomass. Since 2015, the Trinity Ledge survey area has been closed to fishing and there were no reported landings (Table 9; Figures 18A, 18B, 18C, and 19). In 2015, the total estimated biomass from the acoustic surveys decreased from 4,772 t (2014) to 657 t (2015), to 506 t (2016), and then increased to 13,866 t (2017) (Table 9; Figure 19). The last time the survey biomass was above 10,000 t was in 2006 (16,076 t). The large increase in acoustic biomass is due in part to increased effort to document aggregations in the area. However, there is some evidence that some of the aggregations may be feeding non-mature fish with a mixture of spawning adults. Additional work is required to monitor the status of this spawning area, which once supported a major portion of the overall stock landings (Tables 4A, 4B, and 4C; Figure 8).

Nova Scotia Weirs

The only landings from the Nova Scotia weirs (4Xr) was from the one located in the Bay of Fundy near Parrsboro, Nova Scotia. No landings were reported in 2015, 16 t in 2016 and none in 2017 (Tables 3 and 10; Figure 20). There has also been a decline in the total number of Herring weirs to only one reporting catches in 2016 (Table 11). The landings in 2016 were from April to June (Table 10).

Spectacle Buoy

In the past, the spring gillnet fishery for roe has occurred for a short period in June in the vicinity of Spectacle Buoy located southeast of Yarmouth, Nova Scotia. The fishery is dependent on fish availability and to some extent market conditions, and may or may not occur in any given year. The last reported landings were in 2011 with 1 t being reported. Surveys have previously been conducted on the spring and fall aggregations in the area. The last spring survey that recorded biomass was in 2011 (300 t). Between 2006 and 2016, there was no fall acoustic survey conducted in the area that recorded any biomass. In 2017, acoustic surveys in the fall resulted in an estimate of 8,726 t, the highest recorded in the area since 2001.

RESOURCE STATUS

Commercial Catch Rate Indices

Catch and effort data for gillnet 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 (Power et al. 2004) (Table 3). The 2015 landings from the gillnet fishery in the SWNS/BoF spawning component decreased from 2,102 t (2014) to 1,806 t (2015), 1,477 t (2016), and to 655 t in 2017 (Table 3).

Purse seine landings comprise the majority of the overall landings and are allocated 80% of the TAC for the SWNS/BoF component under the current IFMP. The purse seine landings have fluctuated between 43,144 t and 103,537 t since 1989, primarily reflecting changes in the TAC (Table 12; Figure 21). The number of boats fishing and days fished has dropped since 1990 due to fleet rationalization. This has resulted in increases in landings per boat and catch per day in recent years, but the landings are 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 12).

Acoustic Surveys[2]

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 during the spawning period 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 (264,900 t) was the lowest recorded since acoustic surveys began in 1997. Since 1999, the total SSB has fluctuated between 264,900 t and 576,700 t. In 2015, the SSB estimate was 462,241 t, which decreased in 2016 to 328,253 t and increased to 393,396 t in 2017. At the 2018 assessment meeting, one German Bank survey initially excluded due to the number of days was accepted. The German Bank and Scots Bay biomass estimates tend to display opposite trends. In 2017, the overall biomass estimate was 11% (393,396 t) below the long-term average of 441,289 t. There is need for continued caution in both areas (Table 13; Figures 22 and 23).

[2] Acoustic biomass estimates from Scots Bay and German Bank in this document are not adjusted for turnover. See Melvin et al. (2018) for estimates adjusted for turnover.

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). Melvin et al. (2014) updated the tagging study on German Bank during the spawning period that was completed in 2011. These tagging data were combined with data from previous Scots Bay and German Bank tagging studies for analysis. Overall, 13% of tagged fish in Scots Bay and 19% on German Bank were recaptured after two weeks. Regression analysis indicates a strong relationship between the days at large and the proportion of fish remaining on the spawning ground. An updated working paper with data to 2017 was presented for review at the April 2018 assessment meeting (Melvin et al. 2018).

Exploitation Rates on Spawning Grounds

The acoustic survey estimates and landings 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 landings 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 (Singh et al. 2014b, 2016b), the three main spawning areas of Scots Bay, German Bank, and Trinity Ledge, which have received relatively consistent survey effort since 1999, were used (Table 14-A1). 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 14-C1), while landings from other non-spawning areas were allocated based on the relative spawning ground SSB proportions from annual acoustic surveys (Table 14-A2). The adjusted total landings were thus made equal to the reported stock landings (Table 14-C2). Exploitation rates were then calculated (Landings/SSB) for both the actual landings from the spawning grounds and the overall adjusted landings as proportions (Table 14-E1, E2).

The trends in spawning area proportions estimated from acoustic surveys (Table 14-A2) were stable between 2005 and 2010, with approximately 80–90% of surveyed SSB found in the German Bank area and 7–18% in the Scots Bay area; however, those proportions have changed dramatically since 2011. On German Bank, the proportions are below average and varied between 38% (2015) and 65% (2016), while in Scots Bay the proportions were above average and varied between 62% (2015) and 35% (2016) (Table 14-A2).

Since 1999, calculation of exploitation rates by areas (Table 14-E2) indicated that larger areas (Scots Bay and German Bank) have an average exploitation rate of 17% and 15%, respectively, while the smaller area (Trinity Ledge) had an average exploitation rate of 72%. The combined overall adjusted exploitation rate for these three areas ranged from 10–25% from 1999 to 2017 (Figure 24). These exploitation rates are useful for year-to-year comparisons and indicate that the overall adjusted estimate was 10–15% between 2015 and 2017. 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 to 13% in 2007, followed by an increase to the series high of 25% in 2008. The overall adjusted exploitation rate increased to 15% in 2016 from 11% in 2015 and decreased to 10% in 2017 (Table 14-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 2015, a total of 1,455 samples (246,413 fish) were measured for length, while 4,124 fish were sampled for sex, weight, maturity, and age (Table 15A). In 2016, a total of 1,652 samples (272,116 fish) were measured for length, while 5,227 fish were sampled for sex, weight, maturity, and age (Table 15B). In 2017, a total of 1,272 samples (213,208 fish) were measured for length, while 5,193 fish were sampled for sex, weight, maturity, and age (Table 15C). The sources of the samples are provided in Table 16, 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 with 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, 25B, and 25C).

Catch at Age

Consistent with previous assessments, the catch at length and age were constructed using the 'Catch at Age' application (version 11.5), a program that 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, Maritimes Region, DFO. 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 2015 (Table 17A), 2016 (Table 17B), and 2017 (Table 17C). 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 landings 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.

Tables 18A, 18B and 18C and Figures 26A, 26B, and 26C present monthly and seasonal catch at age data for the 2015, 2016 and 2017 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock). The monthly purse seine catch at age (Tables 18A, 18B and 18C; Figures 26A, 26B, and 26C) during 2015, 2016, and 2017 indicate that catches later in the season tend to consist of larger percentages of younger fish (ages 2 and 3). This continues to be a concern since younger fish would not yet have contributed to spawning. The 2017 data show the presence of more age 4 fish in the landings than in the prior two years. This indicates that there was a strong 2013 year-class, which is now showing up as an age 4 cohort. Tables 19A, 19B and 19C and Figures 27A, 27B, and 27C present catch at age by fishing ground for the 2015, 2016, and 2017 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock). Table 20A presents the catch at age data for the 2013-2014 for the purse seine, gillnet, and weir fisheries conducted on the SWNS/BoF spawning component (4WX stock). Tables 20B, 20C, and 20D and Figures 28A, 28B, and 28C present the catch at age data for the 2014–2015, 2015–2016, and the 2016–2017 quota years for the purse seine, gillnet, and weir fisheries conducted on the SWNS/BoF spawning component (4WX stock). Tables 20E, 20F, and 20G present the comparisons of Herring catch at age for the quota years from 2015–2017.

The 2015 catch was dominated by the 2012 year-class (at age 2), representing approximately 40% by number. The 2011 year-class (at age 3) was the second most important by number at 15%. The 2015 catch by weight of the Herring landed was dominated by age 2 (17%) and

age 4 (18%) (Table 21B, Figure 29A). The proportion of the catch age 5 and older increased in 2015 to 31% (by numbers) from 29% in 2014 (Tables 20A and 20B). The total number of fish of all ages removed by the fishery in 2015 was calculated to be 443 million, a decrease of 5.1 million (or 1%) from 2014.

In the 2016 landings, the 2014 and 2013 year-classes (at age 2 and 3, respectively) represented approximately 27% and 38%, respectively, of the numbers of Herring landed in the SWNS/BoF component (Tables 20C and 21B; Figure 29B). These large percentages of age 2 and 3 Herring in the landings is a concern since they would not have had a chance to contribute to spawning. Industry has implemented measures to monitor catch size distribution and to limit the amount of small fish landed. By weight, the 2013 year-class (at age 3) represented 31% of the Herring landed in the SWNS/BoF component. By weight, the other important age classes were the 2014 year-class (age 2) and the 2012 year-class (age 5). The proportion of the catch aged 5 and older decreased in 2016 to 25% (by numbers) from 31% in 2015 (Tables 20B and 20C). The total number of fish of all ages removed by the fishery in 2016 was calculated to be 476 million, an increase of 32.5 million or 7% from 2015.

In the 2017 landings, the 2013, 2014, and 2015 year-classes (at age 2, 3, and 4, respectively) represented approximately 15%, 33%, and 30%, respectively, of the numbers of Herring landed in the SWNS/BoF component (Tables 20D and 21B; Figure 29C). There was an improvement in the number of age 4 fish landed compared to the two previous years; however, the large percentages of age 2 and 3 Herring in the landings is a concern since they would not have had a chance to contribute to spawning. Industry has continued to implemented measures to monitor catch size distribution and to limit the amount of small fish landed. By weight, the 2013 year-class (at age 4) represented 33% of the Herring landed in the SWNS/BoF component. By weight the other important age classes were the 2014 year-class (age 3) and the 2012 year-class (age 5). The proportion of the catch aged 5 and older decreased in 2017 to 21% (by numbers) from 25% in 2016. The total number of fish of all ages removed by the fishery in 2017 was calculated to be 376 million, a decrease of 100 million or 21% from 2016.

The number of age 2 fish decreased from 40% in 2015 to 15% in 2017 (Figures 29A, 29B, and 29C). Most of this decrease is a result of decreased catches in the Grand Manan and Long Island Shores areas, which are dominated by age 2 fish. The number of age 3 fish increased from 15% in 2015 to 38% in 2016 then decreased to 33% in 2017. Most of that change is a result of changes in catches on Grand Manan Banks and Gannet Dry Ledges areas, where the percentage of age 3 fish changed between years. There was an overall decrease in age 2 fish caught in 2017 compared to the previous two years, and this is reflected in the catch from the stock fishing grounds, which show decreases in the proportion of age 2 fish caught.

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 to 5 (Tables 21A and 21B; 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 1970s through to early-1990s. In recent years, the rapid decline of year-classes in the landings 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. This is usually reflected in the increase in the number of individual fish caught as landings decreased (Figure 31). The recent five years, however, show the number of individual fish mostly tracking the trend in the landings. The proportion of the catch at age 6 and older increased from 22% (2014) to 23% (2015) and decreased to 14% (2016) and 13% (2017) (by numbers). The most recent high proportion of age 6 and older fish was in 2007 (25%).

Weight-at-age

The average (fishery weighted) weight-at-age continues to be below the long-term 1965–2017 average, possibly reflecting changes in fishing patterns and timing (Table 22; 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 in the previous assessment (Singh et al. 2016a), the 2017 weights at age, in particular, are slightly lower than the most recent five-year average and consistently less than the overall time-series average (Figure 32). There appears to be some increases in the weights for ages 1 and 2 over recent averages; however, samples of age 1 fish in the catch is usually small and may not be reflective of the actual weights of age 1 fish in the fishing area.

Total Mortality Estimates from Acoustic Data

Estimates of Total mortality (Z) = Fishing mortality (F) + Natural mortality (M) 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 (overall SWNS/BoF component: Table 23A; Figure 34A, German Bank: Table 23B; Figure 34B and Scots Bay: Table 23C; Figure 34C). The acoustic age composition from 1999 to 2017, and the biological characteristics from sampling from 1999 to 2017, are shown in Table 24 for the overall SWNS/BoF component (A), German Bank (B), and Scots Bay (C). The results for 1999 to 2017 have highly variable Z values, ranging from: -0.3 to 1.3 for the overall SWNS/BoF component (Figure 35A) and German Bank spawning area (Figure 35B), and from -1.3 to 2.2 for the Scots Bay spawning area (Figure 35C). There is no strong trend for the most part; however, there appears to be a slightly decreasing trend in both Scots Bay and German Bank. The overall SWNS/BoF component trend also appears to show decreasing estimates of total mortality.

Stock Trends

The overall acoustic biomass estimates for all survey areas in Scots Bay, Trinity Ledge, and German Bank were the lowest in 2008 (264,900t) since acoustic surveys began in 1997 (Power et al. 2010a). Since that time, the biomass estimate has fluctuated up to a high of 486,000 t (2009) and a low of 301,400 t (2016). The 2015 acoustic SSB estimate for the overall SWNS/BoF component was 462,241 t (95% C.I.: +/-33,406 t), a decrease of less than 1% from 2014. This was followed in 2016 by an estimate of 328,253 t (95% C.I.: +/- 25,627 t), a 29% decrease. In 2017, the SSB estimate was 393,396 t (95% C.I.: +/-28,130 t), a 20% increase over 2016. Overall, the SSB estimate in 2015 was 5% above, while the 2016 and 2017 estimates were 26% and 11% below, the long-term average of 441,289 t (Table 13).

In the past, industry and DFO 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 in 2015 (443.2 million) decreased from the 2014 number (448.3 million) by 1%. The number of removals increased by 7% (475.7 million) in 2016 and decreased by 21% to 376.0 million in 2017. The largest year class in the 2015 catch was the 2-year olds (40%). In 2016, the largest year classes were the 2- and 3-year olds (27%and 38%), while, in 2017, the largest year classes were the 2-, 3-, and 4-year olds (15%, 33%, and 30%, respectively) (Figure 30). The large 2-year olds in 2015 appear to track through to 2017 as 4-year olds. The large number of 2-year old fish in the 2015 catch came mostly from the Grand Manan, Grand Manan Banks, and Trinity fishing areas (Table 19A). In 2016, the large number of 2- and 3-year old fish in the landings came from five areas: Grand Manan, Grand Manan Banks, Long Island Shore, Gannet Dry Ledge, and Trinity Ledge. In 2017, the higher

landings of 2- and 3-year olds came from the same fishing grounds as in 2017, but more 4-year olds came from the spawning grounds of German Bank and Scots Bay.

Conservation Limit Reference Point

In 2012, a conservation limit reference point (LRP) for the SWNS/BoF Herring spawning component (German Bank and Scots Bay) was identified as the 2005–2010 average acoustic survey biomass (371,067t[3]), 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 2017 along with the three-year moving average, the long-term average, and the LRP. Figure 36B presents the same data as a relative biomass index. The 2010 SSB biomass estimate was below the LRP by 17%; this was followed by two years of increases above the LRP (20%, 28%), followed by a decrease of 8% in 2013. The biomass estimate then increased to 25% above the LRP in both 2014 and 2015. In 2016, the estimate was 12% below the LRP, followed in 2017 by an estimate of 6% above the LRP. The three-year moving average is used to determine the status of the stock with respect to the LRP and it has shown a decreasing trend since 2014 when it was 13% above the LRP. The three-year moving average was +12% (2015), +11% (2016), and +6% (2017) with respect to the LRP. This trend continues to be a concern and, as indicated in the 2016 stock update, may require additional management measures to improve the stock.

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 500,000 t. 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). Applying the results of the updated review of the tagging study by Melvin et al. (2014) could help reduce uncertainty about residence time and provide an estimate that takes turnover into consideration (Melvin et al. 2018). Additionally, the mechanisms causing changes in fish weight-at-age are 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. Advice on stock status uses relative trends in SSB and exploitation rate because there is no accepted analytical assessment model. This creates a difficulty in putting current SSB in an historical context as acoustic data only exist for 1999 to 2017.

[3] This LRP biomass was revised subsequenty due to adjustments to the estimates based on turnover. See Melvin et al. (2018) for adjusted numbers.

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, and 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 are documented in Power et al. (2010b) and Singh et al. (2014b, 2016b). In the 2015 fishery evaluation, the assessment of SSB showed that the 2013 SSB estimates decreased by 28% and 2014 estimate increased by 36% over the previous year’s estimates in the main areas for Scots Bay and German Bank (Singh et al. 2016b). In 2015, the SSB estimates increased slightly by 1% over the 2014 estimates, then decreased by 29% in 2016. This was followed by a 13% increase in 2017 for the SSB estimate in the main areas of German Bank and Scots Bay. These numbers include the one 2017 German Bank survey with a 9-day interval that was accepted at the 2018 assessment meeting.

The biomass of spawning fish documented on Trinity Ledge in 2015 decreased from 4,772 t (2014) to 657 t, and decreased again in 2016 to 506 t. This was followed by a substantial increase in 2017 to 13,866 t. During the fall of 2017, a spawning biomass of 8,726 t was also documented in the Spectacle Buoy area. Since 1999, the only other times spawning biomass was documented in this area were in the fall of 2006 (30 t) and 2001 (87,500 t). This assessment indicates that fluctuations are occurring on both of the main spawning grounds in the SWNS/BoF spawning complex. In 2015, there was an increase in Scots Bay and a decrease on German Bank. In 2016, there was a decrease in Scots Bay and an increase in German Bank while, in 2017, there was an increase in Scots Bay and a decrease on German Bank. The combined surveyed biomass for all the spawning grounds, however, decreased slightly in 2015 (462,241 t, 95% C.I.: +/- 33,406 t), decreased again in 2016 (328,253 t, 95% C.I.: +/- 25,627 t), and increased in 2017 to 393,396 t, 95% C.I.: +/- 28,130 t). For the reporting years, the three-year trend shows a continued decrease on German Bank and an increasing trend in Scots Bay. The SSB for the main spawning grounds (Scots Bay and German Bank) was above the long-term average in 2014 and 2015 and below in 2016 and 2017.

Scots Bay showed an increase in the length of spawning period in comparison to recent years (as a result of an earlier start date and later end date), while German Bank showed a similar length of spawning period in the last three years. While there was little spawning on Trinity Ledge in 2015 and 2016, there was a substantial improvement in 2017 with spawning occurring mid-August to early-September. The spatial distribution of spawning aggregations, as well as catches in Scots Bay, appears to be similar during 2015 to 2017. On German Bank, the spawning distribution during 2015–2017 was generally spread within the ‘strata box’, with

localized groups seen in both the northern and southern portions. The catches of spawning Herring appear to be similar in 2015 and 2017, with a wide distribution, while, in 2016, catches were concentrated in the centre of the standard survey area.

The 2015 catch was primarily made up of age 2 (40% of catch by number) and age 3 (15% by number), with age 5+ fish also contributing a large proportion of the catch (31% of catch, by number). Similarly, the majority of the 2016 catch was primarily age 2 and age 3 fish (65% of catch, by number), with age 5+ fish also contributing a little less but still a large portion of the catch (25% of catch, by number). In 2017, age 4 fish made up the largest age group (30% of catch, by number), which is a departure from the two preceding years when age 2 and age 3 fish were dominant. In 2017, ages 2 and 3 made up 48% of the catch (by number), while age 5+ contributed 21% (by number). The large 2-year olds in 2015 appear to track through to 2017 as 4-year olds, which may indicate a larger cohort being present in the population.

The mean age of the acoustic catch at age increased from 5.0 years (2014) to 5.3 (2015), and then decreased to 5.2 (2016) and 5.0 (2017). The acoustic catch at age is higher than the mean age in the catch (3.8 years, 2015; 3.6, 2016; 3.8, 2017), indicating that older fish are collected in acoustic samples than in the catch. In comparison to the relative exploitation rate in 2014 (11%), the relative exploitation rate remained at 11% in 2015, and increased to 15% in 2016 and decreased to 12% in 2017. The relative exploitation rate varied in response to fluctuating survey biomass as well as a decrease in the catch in 2017. There has been a trend of declining mean weight-at-age. Declining trends in mean weight-at-age since the 1970s have reduced productivity of the stock. There appears to be some increases in the weights for the ages 1 and 2 over recent averages; however, this may not be reflective of the actual weights due to small number of age 1 fish in the catch. Historically, German Bank is the main spawning area. German Bank continues to be of concern as the spawning biomass estimate has continued to decrease, except in 2016 when there was an increase.

The overall biomass estimate was above the LRP by 24% in 2014 and 2015 and was 12% and 17% below the LRP in 2016 and 2017, respectively. The three-year moving average, which is the main index used to determine stock status, decreased by one percent each year from 13% above the LRP in 2014 to 11% in 2016. In 2017, the three-year moving average decreased to be at the LRP (Figure 36A). This trend is a cause for concern, and current management measures may not be adequate to meet the rebuilding plan objectives. Overall, there were a few positive signs from the fishery; however, some of the conservation objectives appear to have been met (Table 25).

OTHER CONSIDERATIONS

During November and December 2016, a Herring mortality event occurred on the Nova Scotia side of the Bay of Fundy. Most of the event was concentrated in St. Mary's Bay; however, dead Herring also washed up in Annapolis Basin and southwest Nova Scotia. The cause of the mortality event remains undetermined. From an acoustic survey in St. Mary's Bay, a biomass of over 11,700 t of Herring was estimated to be present in the area during the event. The proportion of biomass actually affected is unknown but is likely small. The majority of the dead Herring were immature fish of ages 2 and 3. If the number of fish involved in the mortality event is small, the impact of this event on future SSB is expected to negligible.

Observer reports of by-catch in purse seine sets have reported low numbers of non-Herring species, most of which are released unharmed. Observers were present on purse seine gear trips in 4X in all three reporting years (2015: 27 trips; 2016: 28 trips; and 2017 18 trips). In 2015, observer reports indicated by-catch of small amounts of Silver Hake, Mackerel (Atlantic), Porbeagle Shark, Spiny Dogfish, American Lobster, and a single Bluefin Tuna. All by-catch was

released with the exception of very small quantities of Silver Hake, Mackerel (Atlantic), Short-fin Squid, and Shrimp (Appendix A1). In 2016, observer reports indicated by-catch of small amounts of Silver Hake, Mackerel (Atlantic), Spiny Dogfish, Mako Shark, Blue Shark, Thresher Shark, American Lobster, Winter Flounder and Sea Raven. All by-catch was released with the exception of very small quantities of Mackerel (Atlantic), Short-fin Squid, and Spiny Dogfish (Appendix A2). In 2017, observer reports indicated by-catch of small amounts of Mackerel (Atlantic), American Lobster, Short-fin Squid, jellyfishes, and Monkfish. All by-catch was released with the exception of very small quantities of Mackerel (Atlantic) (Appendix A3).

During 2017, by-catch was recorded by dockside monitoring companies and indicated on length frequency sheets. Appendix B shows the by-catch data reported on the sheets. The by-catch recorded consisted of squid (0.5% by number), gaspereau (0.5% by number), mackerel (2.3% and 3.9% by number). One landing recorded 53% mackerel by weight out of a 17 t landing.

The reported Herring bait licence catches and the commercial bait landings for the calendar year for 2015, 2016, and 2017 are shown in Appendix B2 and B3.

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 reproductive condition of sampled fish. There was no acoustic survey completed for the offshore area for the reporting years 2015–2017. During the fall of 2014, however, industry conducted searches for Herring aggregations, but failed to find spawning schools.

THE FISHERY

From 1963–1973, foreign fishing boats are estimated to have removed an average of 28,000 t of Herring per year (with a maximum of 121,000 t 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 11,700 t were taken (Table 3). Since 1996, a fishery has occurred on feeding aggregations on the offshore banks, primarily in May and June, with landings ranging from 58t to 20,261 t (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 not present on any of the Offshore Scotian Shelf purse seine gear trips in 2015 and 2016. Observers were present on three trips and five sets to ‘The Patch’ area (4W) in 2017.

In 2015, landings increased from the 2014 historic low of 58 t to 1,803 t but were below average (6,343 t since 1996). In 2015, most of the landings (1,763 t) were caught by purse seine gear in May–June, in the vicinity of ‘The Patch’ (Table 1A; Figure 38A). Additional by-catch (40 t) was reported from otter trawl fisheries for groundfish and Silver Hake on the Scotian Shelf in 2015. The age composition of the catch was primarily adult Herring (age 3+) with larger proportions at age 5 (26%), age 6 (21%) and age 7 (17%; Table 26A; Figure 39A).

In 2016, the landings deceased to 1,035 t. The majority of landings (1,000 t) were caught by purse seine gear in April–June, in the vicinity of ‘The Patch’ and ‘Western Hole’ (Table 1B; Figure 38B). An additional by-catch of 35 t 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 with 33% age 4, 21% age 5 and 19% age 6 (Table 26B; Figure 39B).

In 2017, the landings increased to 3,955 t. The majority of landings (3,945 t) were caught by purse seine gear in May to August, in the vicinity of 'The Patch' and 'Western Hole' (Table 1C; Figure 38C). An additional by-catch of 10 t 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 with ages 3 yo 8 ranging from 11% to 23% (Table 26C; Figure 39C).

RESEARCH AND INDUSTRY SURVEYS

Industry Surveys

No industry survey was conducted in the Offshore Scotian Shelf area during 2015–2017.

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; Singh et al. 2014a, 2016a). 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 1970–2017 summer bottom trawl surveys. While the trawl survey abundance was relatively constant between 2011 and 2014, there has been an increase in 2015 and again in 2017. The mean number per tow was 91 in 2014, 167 in 2015, 119 in 2016, and 233 in 2017. Figure 40A presents Herring catches from the 2008–2017 DFO summer bottom trawl surveys. Figure 40B presents the 2008–2017 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 96 (2014), to 105 (2015), to 111 (2016) and to 189 (2017). The overall 4VWX area showed an increase in abundance by number in the last three years from 67 in 2014 up to 158 in 2017 (Table 27).

OUTLOOK AND MANAGEMENT CONSIDERATIONS

The industry has been encouraged to explore and undertake structured surveys of the offshore area. Industry and DFO continue to work together to improve the biological basis for management. In the absence of recent information on stock status, there is no basis for evaluating the current 12,000 t catch allocation, as described in the management 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, 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, then fish' protocol. In addition to the traditional bait and personal-use fisheries, directed roe fisheries have occurred on several spawning grounds since the 1990s (Clark et al. 1999).

THE FISHERY AND RESOURCE STATUS

The landings in the gillnet roe fisheries along the coast of Nova Scotia increased from 4,760 t in 2014 to 5,166 t in 2015, 7,780 t in 2016 and continued to increase in 2017 to 7,816 t (Table 28-Part A).

Little Hope/Port Mouton

The total landings in the Herring gillnet fishery in Little Hope/Port Mouton area increased to 4,160 t in 2015 from 3,596 t in 2014 and continued to increase to 5,939 t in 2016. There was a decrease in 2017 to 5,557 t (Table 28-Part A) due in part to issues related to the fleet accessing harbours to land catch. In 2015, the catches occurred from September 23 to November 6 in two main areas: east of Port Mouton and east of Liverpool (Figure 42A). In 2016, the catches occurred from May 27 to November 4 in three main areas: east of Port Mouton and east of Liverpool and east of Port Medway (Figure 42B). In 2017, Herring gillnet fishery in Little Hope/Port Mouton area similarly lasted from August 5 to November 14. The catches in 2017 were more widely distributed southeast of Port Mouton and in the area between Liverpool and Port Medway (Figure 42C).

In 2015, four acoustics surveys were conducted in the Little Hope/Port Mouton area between September 24 and November 4. Each survey was supported by multi-panel gillnet deployment to collect representative samples of Herring being surveyed. The total spawning biomass for the Little Hope area for 2015 was taken as the sum of the four surveys, 145,396 t, the historical highest biomass recorded in the area. This biomass estimate was a substantial increase over the estimate of 46,077 t in 2014. In 2016, six surveys were conducted between September 13 and November 14, with a biomass estimate of 61,408 t. Five of the surveys were supported by multi-panel gillnet deployment to collect representative samples of Herring being surveyed. The estimated biomass was a substantial decrease from the high in 2015. There were six acoustics surveys conducted in 2017 in the Little Hope/Port Mouton area between September 15 and November 7. The first four surveys were supported by multi-panel gillnet deployment to collect representative samples of Herring being surveyed. The surveyed biomass in the Little Hope/Port Mouton area increased to 66,815 t, which is below the five-year average of 78,845 t (Table 28-Part B; Figure 43).

The age composition of the gillnet catch for the Little Hope/Port Mouton area was primarily adult Herring, with a substantial proportion (98%, 2015, 100% in 2016 and 99%, 2017) at age 4 and older (Tables 29A, 29B and 29C; Figures 47A, 47B, and 47C).

East of Halifax (4W Eastern Shore)

Landings decreased from 1,163 t in 2014 to 1,001 t in 2015 in the Eastern Shore area. The 2015 Herring gillnet fishery in the Eastern Shore fishing area began on October 15 and ended on November 23. Once again, this was primarily a Herring roe fishery with catches reported from two main cluster areas: one near Halifax Harbour approaches and one southeast of Jeddore Head (Table 28-Part A; Figures 44A and 45). In 2016, the total landings increased to 1,837 t, with the majority of the catch occurring between May 29 and October 20. The catch locations were spread evenly from south of Jeddore Head to Halifax Harbour (Table 28-Part A; Figures 44B and 45). In 2017, the total landings increased to 2,259 t, with the majority of the catch occurring between May 31 and November 17. The catch locations were from three main cluster areas: one near Halifax Harbour approaches, one south of Jeddore Head, and one south of Ship Harbour (Table 28-Part A; Figures 44C and 45).

There were five, ten, and ten acoustic surveys in the Halifax/Eastern Shore area in 2015, 2016, and 2017, respectively. In 2015, the surveys were conducted between September 27 and

October 27 with four of the surveys being supported by multi-panel gillnet deployments to collect representative samples of Herring being surveyed. The total spawning biomass for the Eastern Shore area for 2015 was taken as the sum of the five surveys. The total biomass estimate was 68,562 t, which represents an increase of about seven times the 9,586 t estimate in 2014. In 2016, ten multi-panel gillnet samples were collected in support of the ten acoustic surveys completed between September 13 and November 5. The estimated total spawning biomass decreased by 14% to 54,312 t. In 2017, ten multi-panel gillnet samples were collected in support of the ten acoustic surveys completed between September 15 and November 12. The estimated total spawning biomass increased by about 1% to 58,681 t. This estimate is above both the five-year average of 39,602 t and the long-term average from 1998 to 2017 of 33,606 t (Table 28-Part B; Figure 45).

In all three reporting years, the age composition of the gillnet catch for the Halifax/Eastern Shore area was primarily adult Herring, with a substantial proportion (96%, 2015; 98%, 2016 and 95%, 2017) at age 4 and older (Tables 29A, 29B, and 29C; Figures 47A, 47B, and 47C).

Glace Bay

No landings were reported in 2015 for the Glace Bay area and in 2014, 1 t was reported. In 2016, 4 t were reported and no landings were reported in 2017. There has not been a significant fishery in this area since 2006 when the landings were equal to 85 t (Table 28-Part A; Figure 46). The last survey coverage for the Glace Bay area was in 2013, with a 50 t biomass estimate. The spawning biomass for the Glace Bay area is in close agreement with the trend in landings since 2006 when the SSB was 500 t. There were no surveys completed during the reporting period 2015–2017 (Table 28-Part A; Figure 46).

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. Therefore, it is appropriate to reiterate, from a biological perspective, that no fishing should take place on this spawning component.

Age Composition

The age composition of the catch from the fishery for the overall coastal Nova Scotia spawning component in percentage numbers was primarily adult Herring age 4 and older, 97% in 2015, 99% in 2016, and 98% in 2017 (Tables 29A, 29B, and 29C; Figures 47A, 47B, and 47C). The mean age of the catch was 6.16 in 2015, decreased to 6.11 in 2016, and increased to 6.21 in 2017. Appendix C shows the ageing agreement testing between the primary ager and self on a random selection of all survey and commercial otoliths for years 2015 (C1), 2016 (C2) and 2017 (C3).

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 sporadic surveying in the Glace Bay area mean that no biomass estimates can be identified for the area. The survey method used to estimate abundance in the coastal component differed from that used in SWNS/BoF (Melvin and Power

1999). One difference is the way in which surveys were included, excluded, or combined, which may overestimate abundance.

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 10% of a five-year rolling average of surveyed acoustic biomass to set annual removals. It is recommended that, despite the recent increases in survey biomass from year-to-year, the "survey, assess, then fish" protocol using the five-year average should be adhered to.

SOUTHWEST NEW BRUNSWICK MIGRANT JUVENILES

For over a century, the SWNB weir and shutoff fisheries have relied 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 the landings time series for this fishery may not be indicative of abundance because catches are extremely susceptible to many factors in addition to abundance, including effort. 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 11). Figures 48A, 48B, and 48C present the locations of the New Brunswick weirs and the corresponding landings for the 2015, 2016, and 2017 fishing seasons. Table 30 shows the monthly Herring weir landings from 1978 to 2017.

Landings in the New Brunswick weir and shut-off fishery decreased to a historic low in 2015 of 146 t from 2,149 t in 2014. In 2016, the landings increased to 4,060 t and then deceased to 2,102 t in 2017. It is notable that, in 2007, landings were 30,944 t, the highest in nearly 20 years and higher than the long-term average of 17,656 t (Table 3; 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 99% at either age 1 or age 2 in 2015 (Table 31A, Figure 50A), 84% at either age 1 or age 2 in 2016 (Table 31B; Figure 50B), and 58% at either age 1 or age 2 in 2017 (Table 31C; Figure 50C). There were more older fish caught in the weirs in 2017, which is a departure from what was being caught in the recent years. The number of weirs with catches (number of active weirs) decreased in the 2015 to 11 from 26 in 2014. The number of weirs with catches increased to 26 in 2016 and then decreased to 11 in 2017 (Table 11). The primary sources of information for assessing this component are the landings, which have declined markedly from the 1980s to present.

5Z GEORGES BANK

The activities of mid-water trawlers and Herring purse seiners on the Canadian portion of Georges Bank (area 5Z) are monitored using the Vessel Monitoring System, and there were no trips to the area and no reported landings during 2015–2017.

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TABLES

Table 1A. 4VWX Herring fishery landings (t) by month, gear sector, and management unit for the 2014–2015 quota year (as of Feb. 17, 2016). A dash (-) indicates no data.

2014–2015 quota year	Area	Gear	Month												Total
			1	2	3	4	5	6	7	8	9	10	11	12	
S.W. Nova Scotia	4X	Fall P. Seine (2014)	-	-	-	-	-	-	-	-	-	928	363	-	1,291
	4X	Winter P. Seine (2015)	-	-	-	-	-	-	-	-	-	-	-	-	-
	4X	Summer P. Seine (2015)	-	-	-	-	-	10,304	6,734	12,071	14,222	2,596	-	-	45,927
	4X	Gillnet "Stock" (2015)	-	-	-	-	-	-	172	168	1,467	-	-	-	1,806
	4X	N.S. Weirs (2015)	-	-	-	-	-	-	-	-	-	-	-	-	-
S.W. Nova Scotia total for 2014-2015 quota year			-	-	-	-	-	10,304	6,906	12,239	15,689	3,524	363	-	49,024
Coastal Nova Scotia (South Shore, Eastern Shore, Cape Breton)	4Vn, 4X	Trap	-	-	-	-	0.9	0.5	-	-	3	-	1	-	5
	4Vn	Glace Bay Gillnet	-	-	-	-	-	-	-	-	-	-	-	-	-
	4W	Eastern Shore Gillnet	-	-	-	-	-	-	-	-	-	1,001	-	-	1.001
	4X	Little Hope Gillnet	-	-	-	-	-	-	-	-	1,303	2,642	215		4,160
Coastal Nova Scotia total for 2015 calendar year			-	-	-	-	1	0.5	-	-	1,305	3,643	216	-	5,166
Offshore Scotian Shelf	4WX	Offshore P. Seine	-	-	-	-	1,064	699	-	-	-	-	-	-	1,763
	4WX	Bottom Trawl + Misc.	1	1	5	3	5	2	3	-	6	14	1	1	40
Offshore Scotian Shelf total for 2015 calendar year			1	1	5	3	1,069	701	3	-	6	14	1	1	1,803
S.W. New Brunswick	4X	N.B. Weirs	-	-	-	-	12	32	28	36	5	33	-	-	146
Migrant Juveniles	4X	N.B. Shutoff	-	-	-	-	-	-	-	-	-	-	-	-	-
S.W. New Brunswick Migrant Juveniles for 2015 calendar year			-	-	-	-	12	32	28	36	5	33	-	-	146
														Total 2014–2015	56,139

Table 2A. 4WX Herring fishery landings (t) by month, gear sector and management unit for the 2015–2016 quota year (as of February 17, 2016).

			Month											
2015–2016 quota year	**Area**	**Gear**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
S.W. Nova Scotia	4X	Fall 2015 P. Seine	-	-	-	-	-	-	-	-	-	746	716	73	1,535
		Winter 2016 P. Seine	-	-	-	-	-	-	-	-	-	-	-	-	-
2015 Calendar year	4VWX	Misc. Trawl	1	1	-	-	-	-	-	-	-	-	-	-	2
2015–2016 Total (from Oct. 15, 2015 to Feb. 17, 2016)			1	1	-	-	-	-	-	-	-	746	716	73	1538

Table 1B. 4VWX Herring fishery landings (t) by month, gear sector, and management unit for the 2015–2016 quota year (as of December 31, 2016). A dash (-) indicates no data.

2015–2016 quota year	Area	Gear	Month												Total
			1	2	3	4	5	6	7	8	9	10	11	12	
S.W. Nova Scotia	4X	Fall P. Seine (2015)	-	-	-	-	-	-	-	-	-	746	716	73	1,535
	4X	Winter P. Seine (2016)	-	-	-	-	-	-	-	-	-	-	-	-	-
	4X	Summer P. Seine (2016)	-	-	-	-	-	10,043	11,385	14,741	9,208	1,606	-	-	46,983
	4X	Gillnet "Stock" (2016)	-	-	-	-	-	-	172	168	1,467	-	-	-	1,477
	4X	Otter Trawl Bycatch (2016)	-	-	-	-	-	-	1	-	-	-	-	-	1
	4X	N.S. Weirs (2016)	-	-	0.3	1	13	1	0.5	-	-	-	-	-	16
S.W. Nova Scotia total for 2015-2016 quota year			-	-	0.3	1	13	10,090	11,474	15,098	10,195	2,352	716	73	50,012
Coastal Nova Scotia (South Shore, Eastern Shore, Cape Breton)	4Vn, 4X	Trap	-	-	-	-	-	-	-	2	1	19	0.01	-	21
	4Vn	Glace Bay Gillnet	-	-	-	-	-	4	-	-	-	-	-	-	4
	4W	Eastern Shore Gillnet	-	-	-	-	0.3	-	-	-	299	1,537	-	-	1,837
	4X	Little Hope Gillnet	-	-	-	-	<0.1	-	3	1	2,622	2,643	675	-	5,943
Coastal Nova Scotia total for 2016 calendar year			-	-	-	-	0.4	4	3	2	2,922	4,199	675	-	7,805
Offshore Scotian Shelf	4WX	Offshore P. Seine	-	-	-	25	968	7	-	-	-	-	-	-	1,000
	4WX	Bottom Trawl + Misc.	1	4	6	1	2	4	5	0.5	3	6	1	0.6	35
Offshore Scotian Shelf total for 2016 calendar year			1	4	6	26	970	11	5	0.5	3	6	1	1	1,035
S.W. New Brunswick	4X	N.B. Weirs	-	-	-	-	3	-	102	1,034	1,153	485	-	-	2,777
Migrant Juveniles	4X	N.B. Shutoff	-	-	-	-	-	40	182	613	447	-	-	-	1,282
S.W. New Brunswick Migrant Juveniles for 2016 calendar year			-	-	-	-	3	40	284	1,647	1,600	485	-	-	4,060
														Total 2015–2016	62,913

Table 2B. 4WX Herring fishery landings (t) by month, gear sector and management unit for the 2016–2017 quota year (as of December 31, 2016).

			Month												
2016–2017 quota year	**Area**	**Gear**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
S.W. Nova Scotia	4X	Fall 2016 P. Seine	-	-	-	-	-	-	-	-	-	623	562		1,185
		Winter 2017 P. Seine	-	-	-	-	-	-	-	-	-	-	-	-	-
2016 Calendar year	4VWX	Misc. Trawl	-	-	-	-	-	-	-	-	-	-	-	-	-
2015–2016 Total (from Oct. 15, 2016 to Dec. 31, 2016)			-	-	-	-	-	-	-	-	-	623	562		1,185

Table 1C. 4VWX Herring fishery landings (t) by month, gear sector, and management unit for the 2016–2017 quota year (as of December 31, 2017). A dash (-) indicates no data.

2016–2017 quota year	Area	Gear	Month												Total
			1	2	3	4	5	6	7	8	9	10	11	12	
S.W. Nova Scotia	4X	Fall P. Seine (2016)	-	-	-	-	-	-	-	-	-	623	562	-	1,185
	4X	Winter P. Seine (2017)	-	-	-	-	-	-	-	-	-	-	-	-	-
	4X	Summer P. Seine (2017)	-	-	-	-	-	4,215	9,357	10,725	8,857	4,436	-	-	37,590
	4X	Gillnet "Stock" (2017)	-	-	-	-	-	6	0.0	0.8	648	-	-	-	655
	4X	N.S. Weirs (2017)	-	-	-	-	-	-	-	-	-	-	-	-	-
S.W. Nova Scotia total for 2016-2017 quota year			-	-	-	-	-	4,221	9,357	10,726	9,505	5,059	562	-	39,430
Coastal Nova Scotia (South Shore, Eastern Shore, Cape Breton)	4Vn, 4X	Trap	-	-	-	0.3	5.1	3.0	2.7	0.6	0.27	0.23	-	-	12
	4Vn	Glace Bay Gillnet	-	-	-	-	0.1	-	-	-	-	-	-	-	0
	4W	Eastern Shore Gillnet	-	-	-	-	0.2	-	-	-	506	1,550	202	-	2,259
	4X	Little Hope Gillnet	-	-	-	-	-	-	-	0.1	393	3,898	1,265	-	5,557
Coastal Nova Scotia total for 2017 calendar year			-	-	-	0.3	5.3	3	2.7	1	900	5,449	1,467	-	7,828
Offshore Scotian Shelf	4WX	Offshore P. Seine	-	-	-	-	597	1,586	1,314	448	-	-	-	-	3,945
	4WX	Bottom Trawl + Misc.	0.3	0.7	2.1	1.3	0.8	0.6	0.47	0.0	1.2	1.9	0.1	0.5	10
Offshore Scotian Shelf total for 2017 calendar year			0.3	0.7	2.1	1.3	598	1,587	1,314	448	1.2	1.9	0.1	0.5	3,955
S.W. New Brunswick	4X	N.B. Weirs	-	-	-	-	-	-	35	220	1,478	-	-	-	1,732
Migrant Juveniles	4X	N.B. Shutoff	-	-	-	-	-	-	130	240	-	-	-	-	370
S.W. New Brunswick Migrant Juveniles for 2017 calendar year			-	-	-	-	-	-	165	459	1,478	-	-	-	2,102
														Total 2016–2017	53,315

Table 2C. 4WX Herring fishery landings (t) by month, gear sector and management unit for 2017–2018 quota year (as of December 31, 2017).

			Month											
2017–2018 quota year	**Area**	**Gear**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
S.W. Nova Scotia	4X	Fall 2017 P. Seine	-	-	-	-	-	-	-	-	-	783	826	-	1,609
		Winter 2018 P. Seine	-	-	-	-	-	-	-	-	-	-	-	-	-
2017 Calendar year	4VWX	Misc. Trawl	-	-	-	-	-	-	-	-	-	-	-	-	-
2017–2018 Total (from Oct. 15, 2017 to Dec. 31, 2017)			-	-	-	-	-	-	-	-	-	783	826	-	1,609

Table 3. Historical series of nominal and adjusted annual landings (t) by major gear components and seasons of the 4WX Herring fishery from 1963–2017. The 1963–1973 offshore Scotian Shelf landings are from Stephenson et al. (1987). A dash (-) indicates no data.

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
2013	0	358	44,884	1,270	43	46,554	46,554	50,000	6,431	3,937	1,515	58,437
2014	0	1,460	46,522	2,102	166	50,250	50,250	50,000	2,149	4,760	58	57,216
2015	0	1,291	45,927	1,806	0	49,024	49,024	50,000	146	5,166	1,803	56,139
2016	0	1,535	46,983	1,477	16	50,012	50,012	50,000	4,060	7,805	1,035	62,912
2017	0	1,185	37,590	655	0	39,430	39,430	42,500	2,102	7,828	3,955	53,315

^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 include 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 landings (t) by fishing ground areas (as identified from the 10-mile boxes shown in Figure 4) from 1985–2017 for the 4WX stock component. Note that 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 7.

Stock Areas	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Browns Bank	0	732	0	0	0	0	0	86	0	1,903	1,554	40	14	3,139	2,197	1,137	486	0	0	45	0
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	0	1,583	1,151	10	0	0	0	0	0
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	9,047	6,965	4,456	3,117
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	22,355	21,573	14,175	14,171
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	17,753	17,258	7,542	5,740
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	6,642	12,639	13,115	8,037
Lurcher	476	132	0	2,928	18	65	151	2,141	1,560	530	382	243	599	57	0	715	227	7,683	1,872	7,268	1,692
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	3,113	3,914	2,707	787
Pollock Point	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,563	0	0	0	0
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	791	73	0	1,228
Scots Bay	0	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	8,202	19,196	24,869	6,239
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	238	1096	0	1,358
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	1,609	0	370	1,448
Yankee Bank	0	0	0	194	250	3,647	817	119	10	175	323	9	4	159	82	133	8	78	0	0	528
Unknown	184	500	200	0	0	200	579	494	140	0	73	0	0	62	84	27	0	0	1,103	127	181
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	77,511	85,689	74,674	44,526

Stock Areas	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Recent 5 year	Recent Decade	All Year Avg	2017 vs 2016	2017 vs 5 Year	2017 vs Decade	2017 vs Overall
Browns Bank	88	34	0	0	0	0	21	0	0	0	0	0	0	2	348	0	0	-2	-348
Chedabucto Bay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,164	0	0	0	-2,164
Gannet,Dry Ledge	6,764	11,344	10,006	8,656	771	2,564	3,177	5,903	12,659	10,240	8,718	2,090	7,922	6,478	6,289	-6,628	-5,832	-4,388	-4,198
German Bank	16,522	15,085	22,437	19,354	17,859	21,513	30,253	13,308	14,126	16,933	15,035	13,025	14,485	18,384	16,833	-2,010	-1,461	-5,360	-3,809
Grand Manan	7,716	10,011	10,493	12,368	15,602	12,493	4,106	12,437	9,369	1,602	1,314	2,783	5,501	8,257	7,930	1,468	-2,718	-5,474	-5,147
Long Island	1,884	4,604	3,207	2,983	1,658	590	160	4,942	2,607	2,585	4,262	1,156	3,110	2,415	6,897	-3,106	-1,954	-1,259	-5,741
Lurcher	2,809	2,305	684	3,676	348	1,823	2,050	2,872	2,134	1,282	584	1,105	1,595	1,656	1,528	520	-491	-551	-423
N.B. Coastal	1,889	851	2,205	5,023	2,864	1,821	132	1,760	557	894	0	1,410	924	1,667	1,439	1,410	486	-257	-29
Pollock Point	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	0	0	0	-47
S.W. Grounds	1,206	30	752	178	169	0	0	0	54	0	0	74	26	123	925	74	48	-49	-851
Scots Bay	3,352	4,116	2,373	902	4,165	5,130	4,940	4,786	4,498	6,951	6010	8685	6,186	4,844	6,563	2,675	2,499	3,841	2,122
Seal Island	209	0	15	12	0	0	161	0	0	0	0	616	123	80	4,232	616	493	536	-3,616
Trinity	3,725	112	0	325	616	1,927	1,255	330	1,808	1,971	783	1269	1,232	1,028	3,956	486	37	241	-2,687
Yankee Bank	2	62	178	131	0	0	0	0	0	0	0	0	0	31	209	0	0	-31	-209
Unknown	396	39	0	14	0	0	20	6	0	0	0	0	1	4	134	0	-1	-4	-134
Total Purse Seine	46,561	48,594	52,350	53,621	44,052	47,861	46,276	46,344	47,812	42,458	36,706	32,212	41,107	44,618	59,495	-4,494	-8,894	-12,406	-27,283

Table 4B. Herring purse seine landings (%) by fishing ground areas (as identified from the 10-mile boxes shown in Figure 4) from 1985–2017 for the 4WX stock component.

Stock Areas	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Browns Bank	0%	1%	0%	0%	0%	0%	0%	0%	0%	4%	3%	0%	0%	4%	3%	1%	1%	0%	0%	0%	0%
Chedabucto Bay	5%	13%	9%	7%	11%	13%	15%	5%	5%	3%	4%	4%	0%	2%	2%	0%	0%	0%	0%	0%	0%
Gannet,Dry Ledge	7%	4%	2%	15%	3%	4%	8%	32%	11%	5%	5%	4%	11%	6%	14%	15%	6%	12%	8%	6%	7%
German Bank	19%	23%	23%	18%	10%	12%	28%	6%	15%	19%	40%	33%	34%	29%	34%	31%	37%	29%	25%	19%	32%
Grand Manan	6%	10%	6%	4%	5%	6%	5%	5%	3%	14%	11%	13%	13%	22%	11%	22%	16%	23%	20%	10%	13%
Long Island	1%	6%	10%	11%	28%	20%	12%	6%	10%	15%	16%	9%	9%	17%	25%	13%	20%	9%	15%	18%	18%
Lurcher	1%	0%	0%	3%	0%	0%	0%	4%	6%	1%	1%	1%	1%	0%	0%	1%	0%	10%	2%	10%	4%
N.B. Coastal	0%	1%	1%	1%	4%	2%	1%	2%	2%	0%	3%	1%	3%	1%	3%	0%	2%	4%	5%	4%	2%
Pollock Point	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	0%	5%	0%	0%
S.W. Grounds	1%	2%	0%	0%	0%	0%	1%	0%	11%	7%	13%	6%	2%	2%	4%	2%	0%	1%	0%	0%	3%
	0%	0%	5%	4%	8%	10%	10%	14%	19%	22%	2%	19%	12%	11%	2%	13%	16%	11%	22%	33%	14%
Seal Island	17%	15%	16%	19%	30%	27%	15%	18%	14%	6%	1%	3%	1%	1%	1%	0%	0%	0%	1%	0%	3%
Trinity	43%	23%	26%	18%	0%	1%	4%	8%	5%	5%	1%	7%	13%	4%	2%	0%	0%	2%	0%	0%	3%
Yankee Bank	0%	0%	0%	0%	0%	4%	1%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Unknown	0%	1%	0%	0%	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%
Total Purse Seine	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Stock Areas	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Recent 5 year	Recent Decade	All Year Avg.	2017 vs 2015	2017 vs 5 Year	2017 vs Decade	2017 vs Overall
Browns Bank	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	-1%
Chedabucto Bay	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	-3%
Gannet,Dry Ledge	15%	23%	19%	16%	2%	5%	7%	13%	26%	24%	24%	19%	18%	14%	11%	13%	1%	5%	8%
German Bank	35%	31%	43%	36%	41%	45%	65%	29%	30%	40%	41%	35%	35%	40%	30%	-5%	0%	5%	5%
Grand Manan	17%	21%	20%	23%	35%	26%	9%	27%	20%	4%	4%	13%	14%	19%	14%	5%	1%	5%	-1%
Long Island	4%	9%	6%	6%	4%	1%	0%	11%	5%	6%	12%	8%	7%	5%	11%	4%	1%	3%	-3%
Lurcher	6%	5%	1%	7%	1%	4%	4%	6%	4%	3%	2%	4%	4%	4%	3%	0%	0%	0%	1%
N.B. Coastal	4%	2%	4%	9%	7%	4%	0%	4%	1%	2%	0%	2%	3%	4%	3%	-2%	0%	2%	-0%
Pollock Point	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-0%
S.W. Grounds	3%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	-0%	0%	0%	-2%
Scots Bay	7%	8%	5%	2%	9%	11%	11%	10%	9%	16%	16%	15%	16%	12%	11%	-12%	1%	4%	4%
Seal Island	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	6%	-2%	0%	0%	-6%
Trinity	8%	0%	0%	1%	1%	4%	3%	1%	4%	5%	2%	3%	3%	2%	6%	-1%	0%	1%	-3%
Yankee Bank	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-0%
Unknown	1%	0%	0%	0%	0%	0%	0%	0%	0%	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%	100%	0%	0%	0%	0%

Table 5A. Herring purse seine landings (t) by grounds for non-stock areas from 1985–2017 (with -ve deviations bolded).

Non-stock Areas	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Georges Bank	0	0	0	0	0	91	64	0	0	266	0	2,491	79	0	0	265	0	0	0	0	0
Liverpool	0	0	0	0	0	0	13	0	4,067	4,177	0	0	0	0	0	0	0	0	0	0	0
Shelburne	0	0	59	0	0	0	64	0	526	161	0	56	0	0	0	0	0	0	0	0	29
Halifax	0	0	0	0	0	0	0	0	652	1,945	0	585	455	0	0	1,002	472	367	0	0	0
Offshore Banks	0	0	0	0	0	0	0	0	0	0	0	11,800	18,770	4,284	8,669	1,645	3,977	5,078	722	4,054	4,115
Western Hole	0	41	154	0	0	0	213	3,451	2,255	1,495	108	127	691	1,012	1,057	47	7,712	1,884	156	0	214
Non-stock Total	0	41	213	0	0	91	353	3,451	7,500	8,044	108	15,058	19,995	5,296	9,726	2,958	12,161	7,329	878	4,054	4,358

Non-stock Areas	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Recent 5 year	Recent Decade	All Year Avg.	2017 vs 2016	2017 vs 5 year	2017 vs Decade	2017 vs Overall
Georges Bank	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	0	0	0	**-99**
Liverpool	0	0	0	0	0	0	0	0	0	0	0	0	0	0	250	0	0	0	**-250**
Shelburne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	0	0	0	**-27**
Halifax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	166	0	0	0	**-166**
Offshore Banks	4,846	2,515	829	8,918	7,432	10,455	949	1,466	23	1,763	507	3,632	1,478	3,597	3,226	3,125	2,154	35	406
Western Hole	192	220	52	114	4,405	0	261	0	0	0	493	313	161	564	808	**-180**	152	**-251**	**-495**
Non-stock Total	5,038	2,735	881	9,032	11,837	10,455	1,210	1,466	23	1,763	1,000	3,945	1,639	4,161	4,576	2,945	2,306	**-216**	**-631**

Table 5B. Percentage herring purse seine landings by grounds for non-stock areas from 1985–2017 (with -ve deviations bolded).

Non-stock Areas	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Georges Bank	0%	0%	0%	0%	0%	100%	18%	0%	0%	3%	0%	17%	0%	0%	0%	9%	0%	0%	0%	0%	0%
Liverpool	0%	0%	0%	0%	0%	0%	4%	0%	54%	52%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shelburne	0%	0%	28%	0%	0%	0%	18%	0%	7%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Halifax	0%	0%	0%	0%	0%	0%	0%	0%	9%	24%	0%	4%	2%	0%	0%	34%	4%	5%	0%	0%	0%
Offshore Banks	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	78%	94%	81%	89%	56%	33%	69%	82%	100%	94%
Western Hole	0%	100%	72%	0%	0%	0%	60%	100%	30%	19%	100%	1%	3%	19%	11%	2%	63%	26%	18%	0%	5%
Non-stock Total	0%	100%	100%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Non-stock Areas	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Recent 5 year	Recent Decade	All Year Avg.	2017 vs 2016	2017 vs 5 year	2017 vs Decade	2017 vs Overall
Georges Bank	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	**-2%**
Liverpool	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	0%	0%	0%	**-5%**
Shelburne	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	**-1%**
Halifax	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	0%	**-4%**
Offshore Banks	96%	92%	94%	99%	63%	100%	78%	100%	100%	100%	92%	90%	90%	86%	70%	**-2%**	0%	4%	20%
Western Hole	4%	8%	6%	1%	37%	0%	22%	0%	0%	0%	8%	10%	10%	14%	18%	2%	0%	**-4%**	**-8%**
Non-stock Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%	0%	0%	0%

Table 6. Herring gillnet landings (t) for Scots Bay and German Bank from 2004–2017.

Year	Scots Bay Gillnet			German Bank Gillnet		
	Start Day	End Day	Landings (t)	Start Day	End Day	Landings (t)
2004	-	-	-	-	-	-
2005	-	-	-	09-Jun-05	11-Jul-05	80
2006	-	-	-	-	-	-
2007	-	-	-	11-Jun-07	20-Sep-07	22
2008	-	-	-	25-Sep-08	25-Sep-08	6
2009	15-Apr-09	11-May-09	1	10-Sep-09	11-Sep-09	1
2010	16-Apr-10	14-Jun-10	1	19-Aug-10	24-Sep-10	33
2011	-	-	-	20-Sep-11	20-Sep-11	1
2012	14-Apr-12	09-May-12	1	15-Aug-12	03-Oct-12	296
2013	23-Jul-13	21-Aug-13	305	19-Aug-13	09-Sep-13	854
2014	30-Apr-14	13-Aug-14	418	12-Aug-14	09-Sep-14	1523
2015	14-Jul-15	26-Jul-15	172	17-Aug-15	18-Sep-15	1538
2016	27-Jun-16	18-Jul-16	133	22-Aug-16	13-Sep-16	1290
2017	25-Jun-17	28-Jun-17	6	28-Aug-17	16-Sep-17	648
Scots Bay Landings Average			145	German Bank Landings Average		313

Table 7. German Bank acoustic catch area (dotted line large box), as shown in Figures 12 and 13. Herring landings (t) (includes purse seines and gillnets) for 1985–2017 with start date, end date, landings (t) before August 15 (pre-spawning period), landings (t) after August 14 (spawning period), and proportion of Total Allowable Catch (TAC).

Year	Start Date	End Date	Duration No. Days	Total No. Slips	Landings before Aug. 15 (pre-spawn)	Landings on/ after Aug. 15 (spawning)	Total Landing t	% Landings 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%
2013	06-May-13	11-Oct-13	159	686	6,324	12,700	19,025	67%	50,000	38%
2014	14-May-14	29-Sep-14	139	922	15,077	10,080	25,157	40%	50,000	50%
2015	04-Jun-15	06-Oct-15	125	873	6,197	14,789	20,986	70%	50,000	42%
2016	02-Jun-16	27-Sep-16	118	830	10,522	9,633	20,154	48%	50,000	40%
2017	01-Jun-17	07-Oct-17	129	386	3,007	11,515	14,523	79%	42,500	34%

Table 8. Scots Bay Herring purse seine landings (t) for 1987–2017.

Year	Min. Date	Max. Date	Duration in Days	Days with Landings	Landings 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
2013	24-Jun-13	02-Sep-13	71	9	4,702	58	522.44	81.07
2014	23-Jun-14	01-Sep-14	71	17	4,498	68	264.60	66.15
2015	28-Jun-15	13-Sep-15	78	19	6,951	85	365.84	81.78
2016	20-Jun-16	17-Aug-16	59	17	6,010	88	353.51	68.29
2017	22-Jun-17	27-Sep-17	98	21	8,652	86	412.01	100.61

Table 9. Summary of 1998–2017 Spectacle Buoy and Trinity Ledge Herring gillnet landings (t) with start and end dates, acoustic survey biomass estimates (t), and overall gillnet landings (t) reported from the area. Shaded cells refer to Spawning Stock Biomass (SSB) estimates calculated without the Calibration Integration Factor. In 2000, the exploitation rate exceeded 100%.

	Spec. Buoy landings and surveys				Trinity Ledge Strata Box landings and surveys					Overall Stock Gillnet Landings (t)
Year	Start Day	End Day	Landings t	Survey SSB t*	Start Day	End Day	Landings t	Survey SSB t*	Exploitation Landings/ SSB	
1998	10-May-98	30-Jun-98	484	n/s	24-Aug-98	21-Sep-98	1,668	n/s	n/s	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	682	621	110%	814
2001	11-Jun-01	10-Jul-01	699	1,110	21-Aug-01	26-Sep-01	781	14,797	5%	1,576
2002	15-May-02	01-Jul-02	137	n/s	02-Sep-02	30-Sep-02	204	8,096	3%	378
2003	04-Jun-03	06-Jun-03	69	1,420	21-Aug-03	18-Sep-03	361	12,117	3%	439
2004	17-Jun-04	15-Jul-04	5	n/s	02-Sep-04	15-Sep-04	229	12,022	2%	229
2005	09-Jun-05	11-Jul-05	124	290	05-Sep-05	20-Sep-05	427	10,701	4%	570
2006	03-Jun-06	22-Jun-06	2	n/s	23-Aug-06	21-Sep-06	647	16,076	4%	719
2007	07-May-07	22-Jun-07	243	310	27-Aug-07	20-Sep-07	1,042	3,113	33%	1,334
2008	29-May-08	19-Jun-08	6	0	21-Aug-08	25-Sep-08	7	516	1%	15
2009	11-Jun-09	25-Jun-09	0.2	n/s	01-Sep-09	11-Sep-09	102	1,575	6%	117
2010	02-Jun-10	19-Jun-10	-	1,859	09-Aug-11	24-Sep-10	145	2,405	6%	204
2011	22-Jun-11	29-Jun-11	1	282	09-Aug-11	20-Sep-11	598	7,316	8%	638
2012	31-May-12	31-May-12	-	n/s	31-May-12	18-Sep-12	177	2,754	6%	471
2013	31-May-13	31-May-13	-	n/s	13-Aug-13	18-Sep-13	99	950	10%	1270
2014	31-May-14	31-May-14	-	n/s	12-Aug-14	30-Sep-14	123	4,772	3%	2,102
2015	31-May-15	31-May-15	-	n/s	17-Aug-15	18-Sep-15	-	657	0%	1,806
2016	31-May-16	31-May-16	-	n/s	31-Jul-16	03-Oct-16	-	506	0%	1,477
2017	31-May-16	31-May-16	-	8,726	04-Jun-17	16-Sep-17	-	13,866	0%	655
Spec. Buoy Average			110	1,750	Gillnet Average		427	6,144	-	929

*SSB estimates calculated with Calibration Integration Factor after 2003 inclusive. No survey in 1998.

Table 10. Monthly Nova Scotia Herring weir landings (t) for 1978–2017.

YEAR	MONTH												Year Total
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
1978	0	0	0	1	490	3,704	2,990	239	46	111	198	79	7,858
1979	0	0	0	0	811	3,458	1,418	420	39	136	57	0	6,339
1980	0	0	0	0	69	647	1,271	395	0	0	0	0	2,383
1981	0	0	0	0	50	437	983	276	37	0	41	0	1,824
1982	0	0	0	0	16	267	468	195	172	12	0	0	1,130
1983	0	0	0	2	286	141	188	208	53	0	18	0	896
1984	0	0	0	0	113	1,032	736	602	220	0	0	0	2,702
1985	0	0	0	0	378	1,799	1,378	489	0	0	11	0	4,055
1986	0	0	0	0	385	403	71	704	390	5	0	0	1,957
1987	0	0	0	0	1,503	2,526	1,215	1,166	367	0	0	0	6,776
1988	0	0	0	0	1,217	2,976	1,696	1,204	386	0	0	0	7,480
1989	0	0	0	0	340	1,018	870	843	226	0	0	0	3,296
1990	0	0	0	0	208	973	1,482	879	538	52	0	0	4,132
1991	0	0	0	3	23	149	719	342	262	0	0	0	1,498
1992	0	0	0	0	35	659	405	754	371	0	0	0	2,224
1993	0	0	0	0	226	908	608	867	53	0	0	0	2,662
1994	0	0	0	0	111	736	499	519	180	0	0	0	2,045
1995	0	0	0	0	236	1,255	1,059	470	29	0	0	0	3,049
1996	0	0	0	0	430	1,267	1,232	358	188	0	0	0	3,476
1997	0	0	0	0	70	1,874	1,739	271	65	0	0	0	4,019
1998	0	0	0	0	1,304	1,677	390	359	317	0	0	0	4,048
1999	0	0	0	0	1,958	1,513	547	488	31	0	0	0	4,537
2000	0	0	0	0	0	16	151	326	191	0	0	0	683
2001	0	0	0	0	105	1,439	1,565	391	207	0	0	0	3,708
2002	0	0	0	0	23	95	240	558	228	0	0	0	1,143
2003	0	0	0	0	98	126	68	344	284	0	0	0	921
2004	0	0	0	0	0	667	873	1,370	219	0	0	0	3,130
2005	0	0	0	11	84	731	472	828	118	0	0	0	2,245
2006	0	0	0	0	195	138	414	1,447	182	115	0	0	2,491
2007	0	0	0	0	26	11	290	579	224	0	0	0	1,130
2008	0	0	0	0	0	1,136	381	836	171	0	0	0	2,524
2009	0	0	0	0	0	110	233	44	0	0	0	0	387
2010	0	0	0	0	89	391	320	398	0	0	0	0	1,198
2011	0	0	0	0	0	4	499	395	106	0	0	0	1,004
2012	0	0	0	0	6	0	100	9	35	0	0	0	149
2013	0	0	0	18	20	5	1	0	0	0	0	0	43
2014	0	0	0	1	115	50	0	0	0	0	0	0	166
2015	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	1	13	1	0	0	0	0	0	0	16
2017	0	0	0	0	0	0	0	0	0	0	0	0	0

YEAR	MONTH												Year Total
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
NS Average Landings (t)	0	0	0	1	276	858	689	489	148	11	8	2	2,483
NS Minimum Landings (t)	0	0	0	0	0	0	0	0	0	0	0	0	0
NS Maximum Landings (t)	0	0	0	18	1,958	3,704	2,990	1,447	538	136	198	79	7,858

Table 11. Annual landings (t), number of active weirs (defined here as weirs with catch), and the catch of Herring per weir (t) for New Brunswick and Nova Scotia weirs from 1978 to 2017.

	Annual Landings (t)			No. Active Weirs			Catch per weir (t)		
Year	NB	NS	Total Landings	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
2013	5,902	43	5,945	49	3	52	120	14	114
2014	1,571	166	1,737	26	3	29	60	55	60
2015	146	0	146	11	0	11	13	0	13
2016	2,777	16	2,794	26	1	27	107	16	103
2017	1,732	0	1,732	11	0	11	157	0	157
Average	17,656	2,483	20,139	103	13	116	158	191	161

Table 12. Annual effort with number of days fished, number of active boats, total landings (t), average catch of Herring per day (t), and average catch per boat (t) for 1989 to 2017 Herring purse seine boats from all areas in 4WX-5Y.

Year	No. Days Fished	No. of Boats Fishing	Total Landings (t)	CPUE (catch/day)	CPUE (catch/boat)	TAC
1989	2,198	40	87,383	40	2,185	151,200
1990	2,390	42	103,537	43	2,465	151,200
1991	2,333	40	88,830	38	2,221	151,200
1992	2,431	39	95,072	39	2,438	125,000
1993	2,542	36	92,828	37	2,579	151,200
1994	2,227	36	75,652	34	2,101	151,200
1995	1,682	32	56,441	34	1,764	80,000
1996	1,781	32	60,038	34	1,876	57,000
1997	1,731	30	61,769	36	2,059	57,000
1998	2,290	28	70,931	31	2,533	90,000
1999	1,775	28	78,574	44	2,806	105,000
2000	1,572	28	78,727	50	2,812	100,000
2001	1,826	21	75,343	41	3,588	78,000
2002	1,838	19	76,210	41	4,011	78,000
2003	1,652	18	85,499	52	4,750	93,000
2004	1,358	18	76,361	56	4,242	83,000
2005	945	16	48,517	51	3,032	50,000
2006	789	16	44,476	56	2,780	50,000
2007	914	16	50,667	55	3,167	50,000
2008	923	15	53,019	57	3,535	55,000
2009	1,099	14	62,162	57	4,440	55,000
2010	989	14	55,890	57	3,992	55,000
2011	896	14	58,316	65	4,165	50,000
2012	717	14	47,486	66	3,392	50,000
2013	790	12	47,810	61	3,984	50,000
2014	718	11	47,835	67	4,349	50,000
2015	644	11	49,225	76	4,475	50,000
2016	679	11	49,168	72	4,470	50,000
2017	597	11	43,144	72	3,922	42,500

CPUE - Catch Per Unit Effort.

Table 13. Summary of the minimum observed Spawning Stock Biomass (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 (except 2015–2017) (n/d = no data). A dash (-) indicates no data. Note: Scots Bay 2014 data updated. Overall Standard Error (SE) (t and %) recalculated and updated for all years. Does not reflect biomass turnover estimates (see Melvin et al. 2018).

Location/Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Average 2005–2010	Average 1999–2017
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	66,900	221,300	260,215	110,002	160,330	41,750	112,267
Scots Bay (outbox)	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/d	2,200	100	6,100	11,700	35,100	41,300	9,300	4,800	24,979	5,667	12,525	5,025	13,981
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	76,200	226,100	285,194	115,669	172,855	45,100	120,361
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	253,900	230,300	176,389	212,078	197,949	320,617	305,802
German Bank (outbox)	n/d	n/d	n/d	n/d	n/d	n/d	n/d	4,900	4,000	2,400	1,700	19,100	11,500	10,100	10,600	2,800	0	0	0	6,420	5,591
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	264,500	233,000	176,389	212,078	197,949	325,967	309,332
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	900	4,800	657	506	13,866	5,733	6,234
Spec Buoy (spring)	n/d	n/d	1,100	n/d	1,200	n/d	600	n/d	300	0	n/d	1,900	300	n/d	0	n/d	n/d	n/d	n/s	700	771
Spec Buoy (fall)	n/d	n/d	87,500	n/d	n/d	n/d	n/d	30	n/d	n/d	n/d	n/d	n/d	n/d	n/d	0	0	n/d	8,726	-	32,085
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	341,700	464,000	462,241	328,253	393,396	377,272	441,289
Seal Island	n/d	n/d	3,900	1,200	11,900	n/d	n/d	10,000	n/d	n/d	n/d	n/d	1,500	n/d	n/d	n/d	n/d	n/d	n/d	-	-
Browns Bank	n/d	n/d	45,100	n/d	n/d	n/d	n/d	7,700	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/d	-	-
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	341,700	464,000	462,241	328,253	393,396	380,214	445,564
Overall SE (t)	24,488	22,715	5,961	25,406	24,646	25,199	35,843	16,876	38,290	24,758	29,039	11,609	25,339	11,664	17,214	22,640	17,044	13,075	14,352	-	-
Overall SE (%)	5%	4%	1%	5%	5%	5%	12%	5%	7%	9%	6%	4%	6%	2%	5%	5%	4%	4%	4%	-	-

Location/Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Long term Average since 1999	441,289	441,289	441,289	441,289	441,289	441,289	441,289	441,289	441,289	441,289	441,289	441,289	441,289	441,289	441,289	441,289	441,289	441,289	441,289
Difference from Long Term	104,011	79,484	135,445	112,993	43,789	77,730	-140,134	-98,177	114,190	-176,382	45,633	-129,234	12,849	34,737	-99,595	22,639	20,951	-113,036	-47,894
% difference from Long Term	24%	18%	31%	26%	10%	18%	-32%	-22%	26%	-40%	10%	-29%	3%	8%	-23%	5%	5%	-26%	-11%

Table 14. Relative exploitation rates (%) by major spawning grounds and for the overall SWNS/BoF Herring component with (A1) acoustic survey Spawning Stock Biomass (SSB), (A2) acoustic survey proportion of total SSB, (C1) catch by spawning component areas, (C2) adjusted catch including non-spawning area landings, (E1) exploitation rate as percentage of acoustic SSB for spawning area landings, and (E2) adjusted landings.

A1) Acoustic Survey SSB (t)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg 99–17
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	76,218	226,124	285,194	115,669	172,855	111,516
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	949	4,772	657	506	13,865	5,066
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	264,527	233,034	176,389	212,078	206,675	284,946
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	341,694	463,930	462,241	328,252	393,395	401,543

A2) Acoustic Survey Proportions	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg 99–17
Scots Bay	28%	14%	8%	23%	36%	26%	26%	22%	7%	10%	12%	9%	18%	18%	31%	39%	22%	49%	62%	35%	44%	26%
Trinity	4%	1%	1%	0%	3%	1%	3%	1%	2%	3%	0%	0%	0%	0%	2%	1%	0%	1%	0%	0%	4%	1%
German Bank	68%	85%	91%	77%	61%	73%	71%	76%	91%	87%	88%	91%	82%	82%	67%	61%	77%	50%	38%	65%	53%	73%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

C1) Landings by Spawn Area	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg 99–17
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	4,786	4,498	6,951	6,010	8,685	7,256
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	426	1,932	1,971	783	1,269	1,410
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	13,308	14,126	16,933	15,035	13,025	19,061
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	18,520	20,556	25,855	21,827	22,979	27,727
Overall SW Nova Landings	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	46,601	50,250	49,024	50,012	39,430	58,672
Non-spawning area landings 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	28,081	29,694	23,169	28,185	27,033	30,945

C2) Adjusted Landings by Area	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg 99–17
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	11,049	18,971	21,246	15,941	15,914	14,841
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	506	2,237	2,004	826	1,849	1,789
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	35,046	29,041	25,774	33,244	21,668	42,041
Adjusted Landings 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	46,601	50,250	49,024	50,012	39,430	58,671

E1) Exploitation rate (C1/SSB)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg 99–17
Scots Bay	3%	11%	4%	10%	7%	6%	14%	23%	37%	12%	9%	12%	1%	9%	4%	3%	6%	2%	2%	5%	5%	9%
Trinity	38%	67%	65%	136%	9%	23%	3%	9%	39%	52%	86%	5%	63%	80%	35%	52%	45%	40%	300%	155%	9%	63%
German Bank	4%	5%	5%	7%	9%	6%	6%	4%	7%	7%	4%	11%	6%	9%	7%	10%	5%	6%	10%	7%	6%	7%
Overall (C1/SSB)	5%	6%	6%	8%	8%	6%	8%	8%	10%	8%	5%	11%	5%	9%	7%	8%	5%	4%	6%	7%	6%	7%

E2) Exploitation rate adjusted (C2/SSB)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg 99–17
Scots Bay	8%	20%	14%	21%	14%	14%	24%	31%	49%	20%	17%	26%	10%	18%	8%	5%	14%	8%	7%	14%	9%	17%
Trinity	43%	75%	75%	146%	16%	31%	12%	17%	51%	61%	94%	18%	72%	89%	40%	54%	53%	47%	305%	163%	13%	71%
German Bank	9%	13%	15%	18%	16%	14%	16%	12%	18%	15%	12%	25%	15%	18%	12%	13%	13%	12%	15%	16%	10%	15%
Overall Adjusted (Landings/Acoustic SSB)	10%	15%	15%	18%	16%	14%	18%	16%	21%	17%	13%	25%	14%	18%	11%	10%	14%	11%	11%	15%	10%	15%

Table 15A. Summary of biological samples by gear and month as collected during the 2015 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.

Gear Name	Data	Month											Total
		1	2	3	5	6	7	8	9	10	11	12	
4W Purse Seine	# LF Samples	0	0	0	13	15	0	0	0	0	0	0	28
	# Measured	0	0	0	1,955	2,313	0	0	0	0	0	0	4,268
	# Aged	0	0	0	98	59	0	0	0	0	0	0	157
	# Processed	0	0	0	98	59	0	0	0	0	0	0	157
5Y CAN P.Seine	# LF Samples	0	0	0	0	30	25	65	22	0	22	2	166
	# Measured	0	0	0	0	5,922	5,237	12,689	4,139	0	4,174	395	32,556
	# Aged	0	0	0	0	88	137	111	17	0	135	29	517
	# Processed	0	0	0	0	88	137	111	17	0	135	29	517
5Y USA P.Seine/MWT	# LF Samples	0	0	0	0	4	10	0	0	1	0	0	15
	# Measured	0	0	0	0	633	1,665	0	0	163	0	0	2,461
	# Aged	0	0	0	0	18	95	0	0	0	0	0	113
	# Processed	0	0	0	0	18	95	0	0	0	0	0	113
5Z USA P.Seine/MWT	# LF Samples	43	13	12	3	2	1	0	0	0	4	31	109
	# Measured	6,783	2,042	1,946	433	317	165	0	0	0	591	4,860	17,137
	# Aged	0	0	0	0	0	0	0	0	0	0	52	52
	# Processed	0	0	0	0	0	0	0	0	0	0	52	52
Gillnet	# LF Samples	0	0	0	1	0	0	3	8	18	1	0	31
	# Measured	0	0	0	20	0	0	457	1,160	2,369	62	0	4,068
	# Aged	0	0	0	0	0	0	44	82	278	30	0	434
	# Processed	0	0	0	21	0	0	44	146	932	62	0	1,205
N.B. Purse Seine	# LF Samples	0	0	0	0	0	2	4	39	78	8	0	131
	# Measured	0	0	0	0	0	365	777	7,622	15,015	1,572	0	25,351
	# Aged	0	0	0	0	0	30	14	51	107	17	0	219
	# Processed	0	0	0	0	0	104	14	51	107	17	0	293
N.B. Shut-off	# LF Samples	0	0	0	0	0	0	0	1	0	0	0	1
	# Measured	0	0	0	0	0	0	0	166	0	0	0	166
	# Aged	0	0	0	0	0	0	0	11	0	0	0	11
	# Processed	0	0	0	0	0	0	0	11	0	0	0	11
N.B. Weirs	# LF Samples	0	0	0	0	2	4	1	0	3	0	0	10
	# Measured	0	0	0	0	326	665	175	0	493	0	0	1,659
	# Aged	0	0	0	0	0	27	0	0	0	0	0	27
	# Processed	0	0	0	0	0	27	0	0	0	0	0	27
N.S. Purse Seine	# LF Samples	0	0	0	0	205	166	199	230	35	0	0	835
	# Measured	0	0	0	0	38,435	32,589	37,133	43,864	6,726	0	0	158,747
	# Aged	0	0	0	0	384	492	334	258	120	0	0	1,588
	# Processed	0	0	0	0	544	525	691	353	189	0	0	2,302
Resrch. Otter Trawl	# LF Samples	0	0	26	0	7	48	47	0	1	0	0	129
	# Measured	0	0	0	0	0	0	0	0	0	0	0	0
	# Aged	0	0	178	0	57	392	379	0	0	0	0	1,006
	# Processed	0	0	178	0	57	392	379	0	0	0	0	1,006
Total # LF Samples		43	13	38	17	265	256	319	300	136	35	33	1,455
Total # Measured		6,783	2,042	1,946	2,408	47,946	40,686	51,231	56,951	24,766	6,399	5,255	246,413
Total # Aged		0	0	178	98	606	1,173	882	419	505	182	81	4,124
Total # Processed		0	0	178	119	766	1,280	1,239	578	1,228	214	81	5,683

Table 15B. Summary of biological samples by gear and month as collected during the 2016 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.

Gear Name	Data	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
4W Purse Seine	# LF Samples	0	0	0	0	7	0	0	0	0	0	0	0	7
	# Measured	0	0	0	0	1,031	0	0	0	0	0	0	0	1,031
	# Aged	0	0	0	0	72	0	0	0	0	0	0	0	72
	# Processed	0	0	0	0	72	0	0	0	0	0	0	0	72
5Y CAN P.Seine	# LF Samples	0	0	0	0	0	6	131	116	61	2	0	0	316
	# Measured	0	0	0	0	0	1,140	25,406	22,570	12,333	378	0	0	61,827
	# Aged	0	0	0	0	0	17	180	209	75	17	0	0	498
	# Processed	0	0	0	0	0	17	180	209	75	17	0	0	498
5Y USA P.Seine/MWT	# LF Samples	0	0	0	0	0	0	0	0	0	1	0	0	1
	# Measured	0	0	0	0	0	0	0	0	0	150	0	0	150
	# Aged	0	0	0	0	0	0	0	0	0	12	0	0	12
	# Processed	0	0	0	0	0	0	0	0	0	12	0	0	12
5Z USA P.Seine/MWT	# LF Samples	15	9	6	0	3	1	0	0	0	0	7	19	60
	# Measured	2,381	1,451	985	0	453	126	0	0	0	0	1,119	3,057	9,572
	# Aged	0	16	0	0	0	0	0	0	0	0	0	0	16
	# Processed	0	16	0	0	0	0	0	0	0	0	0	0	16
Gillnet	# LF Samples	0	0	0	1	0	0	0	2	21	21	4	0	49
	# Measured	0	0	0	93	0	0	0	298	2,802	2,925	489	0	6,607
	# Aged	0	0	0	94	0	0	0	24	228	375	13	0	734
	# Processed	0	0	0	94	0	0	0	24	450	888	38	0	1,494
N.B. Purse Seine	# LF Samples	0	0	0	0	0	0	0	0	30	26	18	0	74
	# Measured	0	0	0	0	0	0	0	0	5,895	4,807	3,377	0	14,079
	# Aged	0	0	0	0	0	0	0	0	83	70	24	0	177
	# Processed	0	0	0	0	0	0	0	0	83	70	24	0	177
N.B. Shut-off	# LF Samples	0	0	0	0	0	3	7	23	13	0	0	0	46
	# Measured	0	0	0	0	0	493	1,134	3,844	2,242	0	0	0	7,713
	# Aged	0	0	0	0	0	0	27	21	35	0	0	0	83
	# Processed	0	0	0	0	0	0	27	21	35	0	0	0	83
N.B. Weirs	# LF Samples	0	0	0	0	1	0	4	37	41	19	0	0	102
	# Measured	0	0	0	0	159	0	654	5,966	6,799	3,074	0	0	16,652
	# Aged	0	0	0	0	0	0	10	71	207	105	0	0	393
	# Processed	0	0	0	0	0	0	10	71	207	105	0	0	393
N.S. Purse Seine	# LF Samples	0	0	0	1	6	243	176	213	131	40	0	0	810
	# Measured	0	0	0	89	869	46,176	33,624	40,224	25,171	8,044	0	0	154,197
	# Aged	0	0	0	0	83	633	506	491	260	50	0	0	2,023
	# Processed	0	0	0	0	83	700	703	833	376	50	0	0	2,745
Resrch. Otter Trawl	# LF Samples	0	22	71	0	0	7	68	17	0	0	0	0	185
	# Measured	0	0	0	0	0	0	0	0	0	0	0	0	0
	# Aged	0	231	590	0	0	56	305	34	0	0	0	0	1,216
	# Processed	0	231	609	0	0	57	326	36	0	0	0	0	1,259
Shore pick-up	# LF Samples	0	0	0	0	0	0	0	0	0	0	0	2	2
	# Measured	0	0	0	0	0	0	0	0	0	0	0	288	288
	# Aged	0	0	0	0	0	0	0	0	0	0	0	53	53
	# Processed	0	0	0	0	0	0	0	0	0	0	0	64	64
Total # LF Samples		15	31	77	2	17	260	386	408	297	109	29	21	1,652
Total # Measured		2,381	1,451	985	182	2,512	47,935	60,818	72,902	55,242	19,378	4,985	3,345	272,116
Total # Aged		0	247	590	94	155	706	1,028	850	888	629	37	53	5,277
Total # Processed		0	247	609	94	155	774	1,246	1,194	1,226	1,142	62	64	6,813

Table 15C. Summary of biological samples by gear and month as collected during the 2017 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.

Gear Name	Data	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
4W Purse Seine	# LF Samples	0	0	0	0	3	18	18	5	0	0	0	0	44
	# Measured	0	0	0	0	453	2,716	2,703	755	0	0	0	0	6,627
	# Aged	0	0	0	0	62	115	111	49	0	0	0	0	337
	# Processed	0	0	0	0	62	115	111	49	0	0	0	0	337
5Y CAN P.Seine	# LF Samples	0	0	0	0	0	0	46	8	63	55	27	0	199
	# Measured	0	0	0	0	0	0	8,777	1,596	12,050	10,809	5,382	0	38,614
	# Aged	0	0	0	0	0	0	133	35	78	121	16	0	383
	# Processed	0	0	0	0	0	0	133	35	78	121	16	0	383
5Y USA P.Seine/MWT	# LF Samples	2	0	0	0	0	0	0	0	1	3	0	0	6
	# Measured	325	0	0	0	0	0	0	0	160	502	0	0	987
	# Aged	0	0	0	0	0	0	0	0	0	54	0	0	54
	# Processed	0	0	0	0	0	0	0	0	0	54	0	0	54
5Z USA P.Seine/MWT	# LF Samples	25	2	0	0	0	0	0	0	0	1	0	0	28
	# Measured	3,873	261	0	0	0	0	0	0	0	171	0	0	4,305
	# Aged	90	12	0	0	0	0	0	0	0	0	0	0	102
	# Processed	90	12	0	0	0	0	0	0	0	0	0	0	102
Gillnet	# LF Samples	0	0	0	0	0	0	0	3	10	23	8	0	44
	# Measured	0	0	0	0	0	0	0	378	1,427	3,190	1,139	0	6,134
	# Aged	0	0	0	0	0	0	0	71	204	252	50	0	577
	# Processed	0	0	0	0	0	0	0	378	983	736	153	0	2,250
N.B. Purse Seine	# LF Samples	0	0	0	0	0	0	48	45	10	76	6	0	185
	# Measured	0	0	0	0	0	0	9,138	8,798	2,049	14,805	1,197	0	35,987
	# Aged	0	0	0	0	0	0	71	35	37	205	0	0	348
	# Processed	0	0	0	0	0	0	71	35	37	205	0	0	348
N.B. Shut-off	# LF Samples	0	0	0	0	0	0	6	18	0	0	0	0	24
	# Measured	0	0	0	0	0	0	1,187	3,085	0	0	0	0	4,272
	# Aged	0	0	0	0	0	0	63	107	0	0	0	0	170
	# Processed	0	0	0	0	0	0	63	107	0	0	0	0	170
N.B. Weirs	# LF Samples	0	0	0	0	0	0	2	12	34	2	0	0	50
	# Measured	0	0	0	0	0	0	329	2,151	6,037	441	0	0	8,958
	# Aged	0	0	0	0	0	0	0	163	272	0	0	0	435
	# Processed	0	0	0	0	0	0	0	163	272	0	0	0	435
N.S. Purse Seine	# LF Samples	0	0	0	0	4	112	140	183	120	9	0	0	568
	# Measured	0	0	0	0	582	21,290	26,538	34,594	22,549	1,733	0	0	107,286
	# Aged	0	0	0	0	37	405	504	642	323	33	0	0	1,944
	# Processed	0	0	0	0	37	439	504	642	323	181	0	0	2,126
Resrch. Otter Trawl	# LF Samples	0	0	21	0	0	6	85	12	0	0	0	0	124
	# Measured	0	0	0	0	0	0	38	0	0	0	0	0	38
	# Aged	0	0	136	0	0	38	607	62	0	0	0	0	843
	# Processed	0	0	137	0	0	38	607	63	0	0	0	0	845
Total # LF Samples		27	2	21	0	7	136	345	286	238	169	41	0	1,272
Total # Measured		4,198	261	0	0	1,035	24,006	48,710	51,357	44,272	31,651	7,718	0	213,208
Total # Aged		90	12	136	0	99	558	1,489	1,164	914	665	66	0	5,193
Total # Processed		90	12	137	0	99	592	1,489	1,472	1,693	1,297	169	0	7,050

Table 16. 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	0	0	185	0	607
1991	448	0	0	167	1	616
1992	330	0	0	205	1	536
1993	183	0	0	421	0	604
1994	223	0	0	228	14	465
1995	138	0	0	244	108	490
1996	127	868	49	0	69	1,113
1997	78	1,443	0	0	114	1,635
1998	225	1,376	0	0	98	1,699
1999	49	1,388	89	0	198	1,724
2000	34	1,387	108	0	177	1,706
2001	47	1,455	96	0	190	1,788
2002	17	1,339	84	0	181	1,621
2003	58	1,292	56	0	199	1,605
2004	50	1,270	60	0	105	1,485
2005	48	1,017	23	0	152	1,240
2006	33	1,049	70	0	99	1,251
2007	10	1,139	29	0	137	1,315
2008	16	781	17	0	130	944
2009	26	980	21	0	135	1,162
2010	29	947	38	146	209	1,369
2011	21	862	15	743	191	1,832
2012	6	594	49	668	204	1,521
2013	2	893	11	778	168	1,852
2014	3	835	10	707	203	1,758
2015	-	684	42	629	142	1,497
2016	-	786	38	667	199	1,690
2017	-	606	28	525	141	1,300
Average	101	821	33	451	127	1,300

*2009–2017 Observer samples in observer database only.
^DMP with 100% coverage for purse seine in the Bay of Fundy began August 2010.

Table 17A. Herring catch at age by gear component and overall for the quota year (QY) for the 2014–2015 fisheries conducted on the SWNS/BoF spawning component (4WX stock).

2014 Fall Purse Seine - QY 14–15 (1,291 t)	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)	199	20,285	1,684	288	86	18	6	1	-	-	-	22,568
% numbers	1%	90%	7%	1%	0%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	5	1,080	150	39	13	3	1	0	0	-	-	1,291
% catch wt.	0%	84%	12%	3%	1%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	15.5	19.7	22.7	25.7	26.5	27.6	28.5	29.1	-	-	-	20.0
Avg. wt. (g)	23.9	53.2	89.1	134.9	149.4	172.9	192.7	205.0	-	-	-	57.2
4X BOF Summer Purse Seine (45,927 t)	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)	201	174,867	48,104	58,403	35,750	31,239	35,902	20,863	4,944	700	234	411,206
% numbers	0%	43%	12%	14%	9%	8%	9%	5%	1%	0%	0%	100%
Catch wt. (t)	5	8,404	4,395	8,540	6,021	5,866	7,105	4,279	1,062	181	69	45,927
% catch wt.	0%	18%	10%	19%	13%	13%	15%	9%	2%	0%	0%	100%
Avg. len (cm)	15.5	19.1	23.0	26.4	27.5	28.4	28.9	29.1	29.5	31.2	32.4	23.6
Avg. wt. (g)	23.2	48.1	91.4	146.2	168.4	187.8	197.9	205.1	214.8	258.1	297.0	111.7
4X BOF Stock Gillnet (1,1806 t)	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)	-	-	101	1,381	1,784	2,090	2,034	1,451	460	78	14	9,394
% numbers	0%	0%	1%	15%	19%	22%	22%	15%	5%	1%	0%	100%
Catch wt. (t)	-	-	13	225	319	407	414	304	102	19	4	1,806
% catch wt.	0%	0%	1%	12%	18%	23%	23%	17%	6%	1%	0%	100%
Avg. len (cm)	-	-	25.6	27.2	28.0	28.7	29.0	29.3	29.7	30.6	31.2	28.5
Avg. wt. (g)	-	-	130.4	162.6	178.9	194.6	203.6	209.6	220.9	243.9	261.6	192.2
Nova Scotia weirs (0 t)	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)	-	-	-	-	-	-	-	-	-	-	-	-
% numbers	-	-	-	-	-	-	-	-	-	-	-	-
Catch wt. (t)	-	-	-	-	-	-	-	-	-	-	-	-
% catch wt.	-	-	-	-	-	-	-	-	-	-	-	-
Avg. len (cm)	-	-	-	-	-	-	-	-	-	-	-	-
Avg. wt. (g)	-	-	-	-	-	-	-	-	-	-	-	-
2015 SWNS/BOF Stock Component (49,024)	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)	201	75,066	8,490	1,469	7,822	33,415	7,954	2,320	5,405	777	248	443,168
% numbers	0%	40%	15%	14%	9%	8%	9%	5%	1%	0%	0%	100%
Catch wt. (t)	5	8,409	5,488	8,915	6,379	6,285	7,523	4,584	1,164	200	73	49,024
% catch wt.	0%	17%	11%	18%	13%	13%	15%	9%	2%	0%	0%	100%
Avg. len (cm)	15.5	19.1	22.0	26.3	27.6	28.4	28.9	29.1	29.5	215.3	32.3	23.5
Avg. wt. (g)	23.2	48.0	80.1	145.0	168.7	188.1	198.2	205.4	215.3	256.6	294.9	110.6

Table 17B. Herring catch at age by gear component and overall for the quota year (QY) for the 2015–2016 fisheries conducted on the SWNS/BoF spawning component (4WX stock).

15–16 QY Fall BoF Purse Seine (1,535 t)	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)	223	22,442	2,451	1,072	460	187	157	86	6	-	-	27,084
% numbers	1%	83%	9%	4%	2%	1%	1%	0%	0%	0%	0%	100%
Catch wt. (t)	5	1,024	223	143	68	30	27	14	1	-	-	1,535
% catch wt.	0%	67%	14%	9%	4%	2%	2%	1%	0%	0%	0%	100%
Avg. len (cm)	15.3	19.1	23.6	26.5	27.3	28.0	28.7	28.1	0.5	-	-	20.0
Avg. wt. (g)	21.7	45.6	90.8	133.0	147.9	161.8	175.0	163.6	216.3	-	-	56.7
4X BOF Summer Purse Seine (46,984 t)	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	126,837	160,453	45,052	45,443	19,404	19,587	17,936	4,612	1,111	160	440,597
% numbers	0%	29%	36%	10%	10%	4%	4%	4%	1%	0%	0%	100%
Catch wt. (t)	0	7,288	14,514	5,706	7,272	3,527	3,802	3,612	988	239	36	46,984
% catch wt.	0%	16%	31%	12%	15%	8%	8%	8%	2%	1%	0%	100%
Avg. len (cm)	16.0	19.9	22.8	25.3	27.3	28.3	28.9	29.3	29.8	30.0	30.3	23.6
Avg. wt. (g)	28.6	57.5	90.5	126.7	160.0	181.8	194.1	201.4	214.1	215.0	227.5	106.6
4X BOF Stock Gillnet (1,477 t)	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	75	1,014	1,757	1,621	1,536	1,484	306	76	-	7,870
% numbers	0%	0%	1%	13%	22%	21%	20%	19%	4%	1%	0%	100%
Catch wt. (t)	-	0	9	153	307	309	312	305	65	17	-	1,477
% catch wt.	0%	0%	1%	10%	21%	21%	21%	21%	4%	1%	0%	100%
Avg. len (cm)	-	24.0	25.2	26.9	28.1	28.8	29.4	29.5	29.8	30.2	-	28.7
Avg. wt. (g)	-	103.0	122.5	151.3	174.6	190.7	203.3	205.2	212.0	220.0	-	187.7
Minas Basin weirs (16 t)	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	16	42	11	9	9	2	1	0	105
% numbers	0%	0%	13%	15%	40%	10%	9%	9%	2%	1%	0%	100%
Catch wt. (t)	-	-	1	2	7	2	2	2	1	0	0	16
% catch wt.	0%	0%	9%	12%	41%	12%	11%	11%	3%	1%	0%	100%
Avg. len (cm)	-	-	23.6	24.8	27.3	28.0	28.7	29.2	30.4	30.2	33.5	26.9
Avg. wt. (g)	-	-	99.1	117.0	157.6	171.1	183.9	193.3	220.5	217.7	297.2	152.4
2016 SWNS/BOF Stock Component (50,102)	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	127,061	182,986	48,534	48,316	21,497	21,319	19,587	5,007	1,194	160	475,660
% numbers	0%	27%	38%	10%	10%	5%	4%	4%	1%	0%	0%	100%
Catch wt. (t)	0	7,293	15,549	6,084	7,728	3,906	4,146	3,945	1,067	257	36	50,013
% catch wt.	0%	15%	31%	12%	15%	8%	8%	8%	2%	1%	0%	100%
Avg. len (cm)	16.0	19.9	22.4	25.3	27.3	28.4	28.9	29.3	29.8	30.0	30.3	23.5
Avg. wt. (g)	28.6	57.4	85.0	125.4	160.0	181.7	194.5	201.4	213.2	215.3	227.5	105.1

Table 17C. Herring catch at age by gear component and overall for the quota year (QY) for the 2016–2017 fisheries conducted on the SWNS/BoF spawning component (4WX stock).

16–17 QY Fall BoF Purse Seine (1,185 t)	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)	-	11,544	5,037	471	111	32	7	11	-	-	-	17,213
% numbers	0%	67%	29%	3%	1%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	-	685	422	54	16	5	1	2	-	-	-	1,185
% catch wt.	0%	58%	36%	5%	1%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	-	20.5	22.7	25.1	26.7	27.8	28.0	28.3	-	-	-	21.4
Avg. wt. (g)	-	59.3	83.8	115.7	142.8	162.6	165.9	172.1	-	-	-	68.8
4X BOF Summer Purse Seine (37,590 t)	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)	123	56,336	114,244	108,935	29,635	22,584	11,926	7,503	2,927	976	158	355,346
% numbers	0%	16%	32%	31%	8%	6%	3%	2%	1%	0%	0%	100%
Catch wt. (t)	4	2,924	9,480	12,726	4,224	3,764	2,221	1,435	567	209	37	37,590
% catch wt.	0%	8%	25%	34%	11%	10%	6%	4%	2%	1%	0%	100%
Avg. len (cm)	17.0	19.7	22.7	25.2	26.8	28.2	29.2	29.4	29.5	30.5	31.4	24.1
Avg. wt. (g)	31.3	51.9	83.0	116.8	142.5	166.7	186.2	191.3	193.8	213.9	233.0	105.8
4X BOF Stock Gillnet (655 t)	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	353	651	1,090	837	482	152	58	-	3,626
% numbers	0%	0%	0%	10%	18%	30%	23%	13%	4%	2%	0%	100%
Catch wt. (t)	-	-	0	50	106	198	162	96	30	12	-	655
% catch wt.	0%	0%	0%	8%	16%	30%	25%	15%	5%	2%	0%	100%
Avg. len (cm)	-	-	25.5	26.7	27.9	28.8	29.4	29.7	29.7	30.1	-	28.7
Avg. wt. (g)	-	-	121.0	140.8	163.2	181.2	193.9	200.0	199.4	209.6	-	180.6
NS weirs (0 t)	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)	-	-	-	-	-	-	-	-	-	-	-	-
% numbers	-	-	-	-	-	-	-	-	-	-	-	-
Catch wt. (t)	-	-	-	-	-	-	-	-	-	-	-	-
% catch wt.	-	-	-	-	-	-	-	-	-	-	-	-
Avg. len (cm)	-	-	-	-	-	-	-	-	-	-	-	-
Avg. wt. (g)	-	-	-	-	-	-	-	-	-	-	-	-
2016 SWNS/BOF Stock Component (39,430 t)	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)	123	56,336	125,791	114,326	30,757	23,785	12,795	7,991	3,089	1,034	158	376,185
% numbers	0%	15%	33%	30%	8%	6%	3%	2%	1%	0%	0%	100%
Catch wt. (t)	4	2,924	10,165	13,198	4,384	3,977	2,388	1,533	599	221	37	39,430
% catch wt.	0%	7%	26%	33%	11%	10%	6%	4%	2%	1%	0%	100%
Avg. len (cm)	17.0	19.7	22.5	25.1	26.8	28.2	29.2	29.4	29.5	30.4	31.4	24.0
Avg. wt. (g)	31.3	51.9	80.8	115.4	142.6	167.2	186.7	191.8	194.0	213.7	233.0	104.8

Table 18A. Herring catch at age by month and overall for the season for the 2015 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock).

BOF Purse Seine June (10,304t)	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)	-	1,610	7,496	22,601	8,326	9,202	11,139	6,286	455	164	29	67,308
% numbers	0%	2%	11%	34%	12%	14%	17%	9%	1%	0%	0%	100%
Catch wt. (t)	-	69	617	3,288	1,300	1,613	2,071	1,207	89	41	8	10,304
% catch wt.	0%	1%	6%	32%	13%	16%	20%	12%	1%	0%	0%	100%
Avg. len (cm)	-	18.1	22.1	26.3	26.9	27.9	28.4	28.7	28.8	31.2	32.0	26.5
Avg. wt. (g)	-	42.8	82.4	145.5	156.2	175.3	185.9	192.0	196.4	250.9	273.2	153.1
BOF Purse Seine July (6,734 t)	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)	-	24,350	10,519	11,384	3,719	3,243	5,707	2,927	655	124	-	62,629
% numbers	0%	39%	17%	18%	6%	5%	9%	5%	1%	0%	0%	100%
Catch wt. (t)	-	1,175	901	1,620	593	588	1,094	585	144	33	-	6,734
% catch wt.	0%	17%	13%	24%	9%	9%	16%	9%	2%	0%	0%	100%
Avg. len (cm)	-	19.2	22.6	26.2	27.1	28.1	28.6	28.9	29.7	31.4	-	23.4
Avg. wt. (g)	-	48.3	85.7	142.3	159.5	181.3	191.7	199.9	219.6	265.2	-	107.5
BOF Purse Seine Aug. (12,701 t)	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)	-	28,168	7,992	8,291	8,886	10,937	11,910	9,120	2,425	410	166	88,303
% numbers	0%	32%	9%	9%	10%	12%	13%	10%	3%	0%	0%	100%
Catch wt. (t)	-	1,307	753	1,264	1,575	2,135	2,457	1,897	528	106	48	12,071
% catch wt.	0%	11%	6%	10%	13%	18%	20%	16%	4%	1%	0%	100%
Avg. len (cm)	-	19.0	23.2	26.7	27.9	28.7	29.1	29.2	29.6	31.1	32.2	25.0
Avg. wt. (g)	-	46.4	94.3	152.5	177.3	195.2	206.3	208.0	217.8	258.8	292.3	136.7
BOF Purse Seine Sept. (14,222 t)	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)	-	84,468	14,908	15,332	14,470	7,705	7,069	2,507	1,395	-	39	147,893
% numbers	0%	57%	10%	10%	10%	5%	5%	2%	1%	0%	0%	100%
Catch wt. (t)	-	4,136	1,464	2,258	2,497	1,501	1,469	585	298	-	13	14,222
% catch wt.	0%	29%	10%	16%	18%	11%	10%	4%	2%	0%	0%	100%
Avg. len (cm)	-	19.2	23.5	26.5	27.8	28.8	29.3	30.4	29.6	-	33.8	22.5
Avg. wt. (g)	-	49.0	98.2	147.3	172.6	194.9	207.8	233.5	213.4	-	335.4	96.2
BOF Purse Seine Oct. (2,596 t)	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)	201	36,270	7,189	795	350	153	76	23	14	1	-	45,073
% numbers	0%	80%	16%	2%	1%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	5	1,717	659	110	55	28	15	5	3	0	-	2,596
% catch wt.	0%	66%	25%	4%	2%	1%	1%	0%	0%	0%	0%	100%
Avg. len (cm)	15.5	19.1	23.3	26.4	27.5	28.6	29.3	30.3	30.5	32.0	-	20.0
Avg. wt. (g)	23.2	47.3	91.6	138.6	157.2	181.2	194.1	217.7	222.9	262.1	-	57.6
4X BOF Summer Purse Seine (45,927 t)	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)	201	174,867	48,104	58,403	35,750	31,239	35,902	20,863	4,944	700	234	411,206
% numbers	0%	43%	12%	14%	9%	8%	9%	5%	1%	0%	0%	100%
Catch wt. (t)	5	8,404	4,395	8,540	6,021	5,866	7,105	4,279	1,062	181	69	45,927
% catch wt.	0%	18%	10%	19%	13%	13%	15%	9%	2%	0%	0%	100%
Avg. len (cm)	15.5	19.1	23.0	26.4	27.5	28.4	28.9	29.1	29.5	31.2	32.4	23.6
Avg. wt. (g)	23.2	48.1	91.4	146.2	168.4	187.8	197.9	205.1	214.8	258.1	297.0	111.7

Table 18B. Herring catch at age by month and overall for the season for the 2016 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock).

BOF Purse Seine June (10,043 t)	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)	-	2,168	24,790	8,840	22,617	5,964	5,157	5,406	1,176	507	4	76,628
% numbers	0%	3%	32%	12%	30%	8%	7%	7%	2%	1%	0%	100%
Catch wt. (t)	-	94	1,989	1,034	3,561	1,024	950	1,035	250	103	2	10,043
% catch wt.	0%	1%	20%	10%	35%	10%	9%	10%	2%	1%	0%	100%
Avg. len (cm)	-	18.1	22.0	24.8	27.3	28.1	28.7	29.1	30.1	29.6	37.4	25.4
Avg. wt. (g)	-	43.5	80.2	116.9	157.5	171.7	184.2	191.5	213.0	203.3	428.5	131.1
BOF Purse Seine July (11,385 t)	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)	-	21,428	54,763	10,140	9,860	3,308	4,420	3,556	1,405	269	142	109,290
% numbers	0%	20%	50%	9%	9%	3%	4%	3%	1%	0%	0%	100%
Catch wt. (t)	-	1,158	4,924	1,265	1,513	594	854	693	299	56	30	11,385
% catch wt.	0%	10%	43%	11%	13%	5%	8%	6%	3%	0%	0%	100%
Avg. len (cm)	-	19.4	22.8	25.2	27.0	28.3	29.0	29.1	29.9	29.7	29.8	23.5
Avg. wt. (g)	-	54.0	89.9	124.7	153.4	179.5	193.2	195.0	212.6	207.7	210.9	104.2
BOF Purse Seine Aug. (14,741 t)	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	22,422	41,179	18,180	9,965	8,266	8,481	7,409	1,766	222	14	117,905
% numbers	0%	19%	35%	15%	8%	7%	7%	6%	1%	0%	0%	100%
Catch wt. (t)	-	1,296	4,056	2,420	1,709	1,562	1,689	1,567	382	55	5	14,741
% catch wt.	0%	9%	28%	16%	12%	11%	11%	11%	3%	0%	0%	100%
Avg. len (cm)	16.0	19.8	23.3	25.6	27.6	28.5	28.9	29.4	29.6	30.9	34.1	24.6
Avg. wt. (g)	28.6	57.8	98.5	133.1	171.5	189.0	199.2	211.5	216.4	248.5	339.9	125.0
BOF Purse Seine Sept. (9,209 t)	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)	-	68,879	30,893	7,016	2,867	1,843	1,518	1,554	265	114	-	114,950
% numbers	0%	60%	27%	6%	2%	2%	1%	1%	0%	0%	0%	100%
Catch wt. (t)	-	4,033	2,769	890	471	343	307	314	57	25	-	9,209
% catch wt.	0%	44%	30%	10%	5%	4%	3%	3%	1%	0%	0%	100%
Avg. len (cm)	-	20.1	22.9	25.5	27.7	28.8	29.5	29.5	30.0	30.2	-	21.8
Avg. wt. (g)	-	58.6	89.6	126.9	164.3	186.3	202.0	202.1	213.0	219.0	-	80.1
BOF Purse Seine Oct. (1,606 t)	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)	-	11,940	8,829	877	135	23	10	11	-	-	-	21,824
% numbers	0%	55%	40%	4%	1%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	-	706	776	98	18	3	2	2	-	-	-	1,606
% catch wt.	0%	44%	48%	6%	1%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	-	20.5	23.1	24.9	26.3	27.3	28.6	28.6	-	-	-	21.8
Avg. wt. (g)	-	59.1	87.9	112.2	135.6	152.7	178.6	178.5	-	-	-	73.6
4X BOF Summer Purse Seine (46,984 t)	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	126,837	160,453	45,052	45,443	19,404	19,587	17,936	4,612	1,111	160	440,597
% numbers	0%	29%	36%	10%	10%	4%	4%	4%	1%	0%	0%	100%
Catch wt. (t)	0	7,288	14,514	5,706	7,272	3,527	3,802	3,612	988	239	36	46,984
% catch wt.	0%	16%	31%	12%	15%	8%	8%	8%	2%	1%	0%	100%
Avg. len (cm)	16.0	19.9	22.8	25.3	27.3	28.3	28.9	29.3	29.8	30.0	30.3	23.6
Avg. wt. (g)	28.6	57.5	90.5	126.7	160.0	181.8	194.1	201.4	214.1	215.0	227.5	106.6

Table 18C. Herring catch at age by month and overall for the season for the 2017 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock).

BOF Purse Seine June (4,215 t)	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)	-	903	9,295	10,087	2,636	6,629	1,811	1,342	222	330	58	33,315
% numbers	0%	3%	28%	30%	8%	20%	5%	4%	1%	1%	0%	100%
Catch wt. (t)	-	42	786	1,177	360	1,124	338	260	44	69	15	4,215
% catch wt.	0%	1%	19%	28%	9%	27%	8%	6%	1%	2%	0%	100%
Avg. len (cm)	-	18.9	22.7	25.2	26.4	28.3	29.1	29.5	29.6	30.2	32.4	25.5
Avg. wt. (g)	-	46.6	84.6	116.7	136.4	169.5	186.5	193.6	197.5	209.5	262.2	126.5
BOF Purse Seine July (9,357 t)	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)	-	12,999	34,768	28,680	6,121	4,387	3,119	2,116	1,081	234	96	93,600
% numbers	0%	14%	37%	31%	7%	5%	3%	2%	1%	0%	0%	100%
Catch wt. (t)	-	607	2,759	3,193	849	720	558	397	203	50	20	9,357
% catch wt.	0%	6%	29%	34%	9%	8%	6%	4%	2%	1%	0%	100%
Avg. len (cm)	-	19.1	22.5	25.0	26.8	28.3	29.0	29.5	29.5	30.8	30.7	23.9
Avg. wt. (g)	-	46.7	79.3	111.3	138.8	164.1	178.9	187.4	188.2	214.8	212.0	100.0
BOF Purse Seine Aug. (10,725 t)	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)	-	13,991	28,349	30,301	9,762	6,290	4,007	2,487	1,251	274	-	96,712
% numbers	0%	14%	29%	31%	10%	7%	4%	3%	1%	0%	0%	100%
Catch wt. (t)	-	772	2,360	3,600	1,425	1,032	754	477	246	60	-	10,725
% catch wt.	0%	7%	22%	34%	13%	10%	7%	4%	2%	1%	0%	100%
Avg. len (cm)	-	19.9	22.6	25.2	26.9	27.9	29.1	29.3	29.5	30.5	-	24.4
Avg. wt. (g)	-	55.2	83.3	118.8	145.9	164.0	188.1	192.0	196.6	219.0	-	110.9
BOF Purse Seine Sept. (8,857 t)	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)	-	5,543	21,878	32,198	9,086	4,756	2,069	1,019	308	97	4	76,957
% numbers	0%	7%	28%	42%	12%	6%	3%	1%	0%	0%	0%	100%
Catch wt. (t)	-	288	1,941	3,858	1,305	799	386	197	61	21	1	8,857
% catch wt.	0%	3%	22%	44%	15%	9%	4%	2%	1%	0%	0%	100%
Avg. len (cm)	-	19.7	23.1	25.4	26.8	28.1	29.1	29.4	29.6	30.6	34.0	24.8
Avg. wt. (g)	-	51.9	88.7	119.8	143.6	168.0	186.7	193.8	198.0	221.6	311.9	115.1
BOF Purse Seine Oct. (4,436 t)	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)	123	22,899	19,955	7,669	2,030	522	920	539	64	40	-	54,762
% numbers	0%	42%	36%	14%	4%	1%	2%	1%	0%	0%	0%	100%
Catch wt. (t)	4	1,216	1,634	898	285	89	185	104	13	8	-	4,436
% catch wt.	0%	27%	37%	20%	6%	2%	4%	2%	0%	0%	0%	100%
Avg. len (cm)	17.0	19.9	22.8	25.4	26.9	28.6	30.1	29.6	30.0	29.5	-	22.4
Avg. wt. (g)	31.3	53.1	81.9	117.1	140.5	171.2	201.1	192.5	200.3	191.9	-	81.0
4X BOF Summer Purse Seine (37,590 t)	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)	123	56,336	114,244	108,935	29,635	22,584	11,926	7,503	2,927	976	158	355,346
% numbers	0%	16%	32%	31%	8%	6%	3%	2%	1%	0%	0%	100%
Catch wt. (t)	4	2,924	9,480	12,726	4,224	3,764	2,221	1,435	567	209	37	37,590
% catch wt.	0%	8%	25%	34%	11%	10%	6%	4%	2%	1%	0%	100%
Avg. len (cm)	17.0	19.7	22.7	25.2	26.8	28.2	29.2	29.4	29.5	30.5	31.4	24.1
Avg. wt. (g)	31.3	51.9	83.0	116.8	142.5	166.7	186.2	191.3	193.8	213.9	233.0	105.8

Table 19A. Herring catch at age by fishing ground for the 2015 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock).

Purse - German Bank (16,933 t)	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)	-	3,559	10,012	20,286	19,775	15,629	16,125	9,547	3,090	329	172	98,525
% numbers	0%	4%	10%	21%	20%	16%	16%	10%	3%	0%	0%	100%
Catch wt. (t)	-	185	1,049	3,040	3,441	3,043	3,326	2,045	668	85	52	16,933
% catch wt.	0%	1%	6%	18%	20%	18%	20%	12%	4%	1%	0%	100%
Avg. len (cm)	-	19.6	23.9	26.6	27.8	28.7	29.2	29.5	29.6	31.1	32.5	27.5
Avg. wt. (g)	-	51.9	104.8	149.8	174.0	194.7	206.3	214.2	216.2	258.6	301.5	171.9
Purse - GM Banks (4,269 t)	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)	-	42,427	10,939	4,554	1,351	953	1,097	553	68	3	0	61,947
% numbers	0%	68%	18%	7%	2%	2%	2%	1%	0%	0%	0%	100%
Catch wt. (t)	-	2,035	920	626	210	163	199	102	13	1	0	4,269
% catch wt.	0%	48%	22%	15%	5%	4%	5%	2%	0%	0%	0%	100%
Avg. len (cm)	-	19.1	22.4	25.9	26.9	27.7	28.2	28.3	28.6	30.6	31.0	20.8
Avg. wt. (g)	-	48.0	84.1	137.5	155.2	171.3	181.2	185.0	191.1	243.4	255.3	68.9
Purse - Grand Manan (1,371 t)	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)	128	26,998	908	204	140	30	18	1	2	-	-	28,429
% numbers	0%	95%	3%	1%	0%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	3	1,232	75	30	23	5	3	0	0	-	-	1,371
% catch wt.	0%	90%	5%	2%	2%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	15.6	18.9	22.5	26.5	27.4	28.0	28.3	29.7	28.5	-	-	19.1
Avg. wt. (g)	23.4	45.6	82.2	146.5	162.7	176.0	183.0	214.6	188.2	-	-	48.2
Purse - Scots Bay (6,951 t)	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)	-	80	3,351	11,683	6,297	5,775	7,383	4,578	1,144	239	46	40,577
% numbers	0%	0%	8%	29%	16%	14%	18%	11%	3%	1%	0%	100%
Catch wt. (t)	-	6	365	1,709	1,047	1,083	1,469	943	253	63	13	6,951
% catch wt.	0%	0%	5%	25%	15%	16%	21%	14%	4%	1%	0%	100%
Avg. len (cm)	-	21.5	24.3	26.4	27.4	28.4	28.9	29.1	29.8	31.3	32.2	27.6
Avg. wt. (g)	-	71.3	109.0	146.3	166.3	187.5	199.0	205.9	221.4	262.9	289.3	171.3
BOF Purse Long Island (2,585 t)	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)	7	29,933	9,335	1,029	293	143	111	45	10	1	-	40,906
% numbers	0%	73%	23%	3%	1%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	0	1,524	825	135	45	25	20	9	2	0	-	2,585
% catch wt.	0%	59%	32%	5%	2%	1%	1%	0%	0%	0%	0%	100%
Avg. len (cm)	15.7	19.5	23.0	25.8	27.2	28.0	28.4	28.8	30.1	31.0	-	20.5
Avg. wt. (g)	23.8	50.9	88.4	131.1	154.4	172.8	183.0	193.3	221.8	252.4	-	63.2
BOF Purse Gannet/Dry Ledge (10,240 t)	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)	-	13,742	8,312	19,344	7,551	8,440	10,830	5,966	610	124	15	74,933
% numbers	0%	18%	11%	26%	10%	11%	14%	8%	1%	0%	0%	100%
Catch wt. (t)	-	662	721	2,824	1,202	1,500	2,026	1,148	121	31	4	10,240
% catch wt.	0%	6%	7%	28%	12%	15%	20%	11%	1%	0%	0%	100%
Avg. len (cm)	-	19.1	22.6	26.4	27.1	28.0	28.4	28.7	28.9	31.0	31.8	25.4
Avg. wt. (g)	-	48.2	86.7	146.0	159.3	177.7	187.1	192.5	198.9	248.1	270.3	136.7
BOF Purse Trinity (1,971 t)	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)	-	36,847	2,432	119	8	-	-	-	-	-	-	39,406
% numbers	0%	94%	6%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	-	1,751	206	13	1	-	-	-	-	-	-	1,971
% catch wt.	0%	89%	10%	1%	0%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	-	19.0	22.6	24.4	26.7	-	-	-	-	-	-	19.3
Avg. wt. (g)	-	47.5	84.6	110.7	149.2	-	-	-	-	-	-	50.0
BOF Purse Lurcher (1,282 t)	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)	-	14,782	2,523	1,158	326	265	338	172	20	2	-	19,586
% numbers	0%	75%	13%	6%	2%	1%	2%	1%	0%	0%	0%	100%
Catch wt. (t)	-	718	209	160	50	46	62	32	4	0	-	1,282
% catch wt.	0%	56%	16%	12%	4%	4%	5%	3%	0%	0%	0%	100%
Avg. len (cm)	-	19.3	22.4	26.0	26.9	27.8	28.2	28.5	28.8	30.9	-	20.5
Avg. wt. (g)	-	48.6	82.8	138.2	154.7	172.5	183.2	188.0	195.7	246.0	-	65.5
BOF Purse N.B. Coastal (325 t)	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)	66	6,499	294	26	9	3	0	-	-	-	-	6,897
% numbers	1%	94%	4%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	1	292	26	4	1	1	0	-	-	-	-	325
% catch wt.	0%	90%	8%	1%	0%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	15.4	18.9	23.1	26.3	27.4	28.3	29.0	-	-	-	-	19.0
Avg. wt. (g)	22.8	44.9	87.9	136.4	155.6	172.4	188.2	-	-	-	-	47.1

4X BOF Stock Purse Seine (45,927 t)	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)	201	174,867	48,104	58,403	35,750	31,239	35,902	20,863	4,944	700	234	411,206
% numbers	0%	43%	12%	14%	9%	8%	9%	5%	1%	0%	0%	100%
Catch wt. (t)	5	8,404	4,395	8,540	6,021	5,866	7,105	4,279	1,062	181	69	45,927
% catch wt.	0%	18%	10%	19%	13%	13%	15%	9%	2%	0%	0%	100%
Avg. len (cm)	15.5	19.1	23.0	26.4	27.5	28.4	28.9	29.1	29.5	31.2	32.4	23.6
Avg. wt. (g)	23.2	48.1	91.4	146.2	168.4	187.8	197.9	205.1	214.8	258.1	297.0	111.7

Table 19B. Herring catch at age by fishing ground for the 2016 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock).

Purse - German Bank (15,035 t)	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)	-	3,018	35,084	20,709	16,374	9,664	9,536	8,620	2,028	402	38	105,473
% numbers	0%	3%	33%	20%	16%	9%	9%	8%	2%	0%	0%	100%
Catch wt. (t)	-	177	3,436	2,732	2,689	1,795	1,885	1,782	437	92	10	15,035
% catch wt.	0%	1%	23%	18%	18%	12%	13%	12%	3%	1%	0%	100%
Avg. len (cm)	-	19.9	23.3	25.6	27.5	28.5	29.0	29.4	29.8	30.4	31.3	25.9
Avg. wt. (g)	-	58.8	97.9	131.9	164.2	185.8	197.7	206.7	215.6	228.1	254.9	142.5
Purse - GM Banks (11,239)	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	72,906	64,244	7,083	2,278	683	598	437	111	18	6	148,364
% numbers	0%	49%	43%	5%	2%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	0	4,103	5,615	844	339	118	110	83	22	4	1	11,239
% catch wt.	0%	37%	50%	8%	3%	1%	1%	1%	0%	0%	0%	100%
Avg. len (cm)	16.0	19.7	22.6	24.8	26.6	27.9	28.4	28.6	29.1	29.5	29.0	21.4
Avg. wt. (g)	28.6	56.3	87.4	119.2	148.8	173.1	183.6	188.9	197.6	204.9	192.4	75.8
Purse - Grand Manan (353 t)	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)	-	2,871	1,489	218	62	25	16	16	2	1	-	4,700
% numbers	0%	61%	32%	5%	1%	1%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	-	179	126	27	10	4	3	3	0	0	-	353
% catch wt.	0%	51%	36%	8%	3%	1%	1%	1%	0%	0%	0%	100%
Avg. len (cm)	-	20.6	22.6	25.4	27.2	28.3	28.9	28.9	30.0	30.1	-	21.6
Avg. wt. (g)	-	62.5	84.5	123.8	155.5	176.6	189.9	189.3	212.4	216.4	-	75.1
Purse - Scots Bay (6,010 t)	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)	-	71	8,906	6,149	8,442	4,034	4,807	4,185	1,383	276	91	38,343
% numbers	0%	0%	23%	16%	22%	11%	13%	11%	4%	1%	0%	100%
Catch wt. (t)	-	5	914	811	1,363	745	944	849	299	60	20	6,010
% catch wt.	0%	0%	15%	13%	23%	12%	16%	14%	5%	1%	0%	100%
Avg. len (cm)	-	21.4	23.8	25.6	27.4	28.5	29.0	29.3	29.9	30.0	30.0	26.9
Avg. wt. (g)	-	73.3	102.6	131.9	161.5	184.7	196.4	202.8	216.2	216.5	216.9	156.7
BOF Purse Long Island (4,262 t)	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)	-	38,810	19,550	2,039	163	17	7	7	-	-	-	60,594
% numbers	0%	64%	32%	3%	0%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	-	2,291	1,714	230	22	3	1	1	-	-	-	4,262
% catch wt.	0%	54%	40%	5%	1%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	-	20.2	22.9	24.7	26.2	27.2	27.4	27.8	-	-	-	21.3
Avg. wt. (g)	-	59.0	87.7	112.9	135.0	152.8	158.3	164.5	-	-	-	70.3
BOF Purse Gannet/Dry Ledge (8,718 t)	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)	-	2,233	26,914	7,999	16,515	4,551	4,250	4,320	1,019	387	22	68,211
% numbers	0%	3%	39%	12%	24%	7%	6%	6%	1%	1%	0%	100%
Catch wt. (t)	-	123	2,334	959	2,597	788	790	828	215	78	5	8,718
% catch wt.	0%	1%	27%	11%	30%	9%	9%	10%	2%	1%	0%	100%
Avg. len (cm)	-	19.5	22.5	25.0	27.3	28.1	28.8	29.1	30.0	29.6	30.5	25.2
Avg. wt. (g)	-	55.2	86.7	119.9	157.3	173.1	185.9	191.8	210.9	202.3	234.8	127.8
BOF Purse Trinity (783 t)	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)	-	6,793	3,728	398	50	10	6	5	0	0	-	10,990
% numbers	0%	62%	34%	4%	0%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	-	401	326	45	7	2	1	1	0	0	-	783
% catch wt.	0%	51%	42%	6%	1%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	-	20.1	22.7	24.7	26.5	28.0	28.3	28.4	29.2	29.5	-	21.2
Avg. wt. (g)	-	59.0	87.4	114.2	143.6	170.0	176.3	177.7	195.3	201.2	-	71.2
BOF Purse Lurcher (584 t)	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)	-	135	538	457	1,559	421	367	346	68	28	2	3,922
% numbers	0%	3%	14%	12%	40%	11%	9%	9%	2%	1%	0%	100%
Catch wt. (t)	-	7	49	58	246	72	67	65	14	5	0	584
% catch wt.	0%	1%	8%	10%	42%	12%	12%	11%	2%	1%	0%	100%
Avg. len (cm)	-	19.4	22.9	25.4	27.3	28.0	28.6	28.9	29.6	29.2	29.7	26.6
Avg. wt. (g)	-	53.6	91.2	126.1	157.5	171.2	183.0	189.1	204.2	193.9	208.5	148.9
4X BOF Stock Purse Seine (46,984 t)	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	126,837	160,453	45,052	45,443	19,404	19,587	17,936	4,612	1,111	160	440,597
% numbers	0%	29%	36%	10%	10%	4%	4%	4%	1%	0%	0%	100%
Catch wt. (t)	0	7,288	14,514	5,706	7,272	3,527	3,802	3,612	988	239	36	46,984
% catch wt.	0%	16%	31%	12%	15%	8%	8%	8%	2%	1%	0%	100%
Avg. len (cm)	16.0	19.9	22.8	25.3	27.3	28.3	28.9	29.3	29.8	30.0	30.3	23.6
Avg. wt. (g)	28.6	57.5	90.5	126.7	160.0	181.8	194.1	201.4	214.1	215.0	227.5	106.6

Table 19C. Herring catch at age by fishing ground for the 2017 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock).

Purse - German Bank (13,025 t)	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)	-	344	19,595	49,186	15,059	8,354	4,830	2,693	1,084	257	5	101,406
% numbers	0%	0%	19%	49%	15%	8%	5%	3%	1%	0%	0%	100%
Catch wt. (t)	-	21	1,862	5,908	2,162	1,381	905	517	211	57	1	13,025
% catch wt.	0%	0%	14%	45%	17%	11%	7%	4%	2%	0%	0%	100%
Avg. len (cm)	-	20.6	23.7	25.4	26.8	28.0	29.1	29.3	29.4	30.6	30.8	25.8
Avg. wt. (g)	-	61.6	95.0	120.1	143.6	165.4	187.3	192.1	194.3	220.2	215.5	128.4
Purse - GM Banks (5,658 t)	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	15,633	35,090	14,169	2,372	768	399	273	72	20	5	68,813
% numbers	0%	23%	51%	21%	3%	1%	1%	0%	0%	0%	0%	100%
Catch wt. (t)	0	767	2,751	1,554	325	124	71	47	13	4	1	5,658
% catch wt.	0%	14%	49%	27%	6%	2%	1%	1%	0%	0%	0%	100%
Avg. len (cm)	15.2	19.4	22.4	24.8	26.6	28.0	28.9	28.6	29.0	29.5	32.9	22.5
Avg. wt. (g)	21.9	49.1	78.4	109.7	137.1	161.1	178.9	171.9	179.9	189.3	278.5	82.2
Purse - Grand Manan (2,693 t)	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)	36	14,272	18,578	3,375	451	145	77	52	11	5	0	37,001
% numbers	0%	39%	50%	9%	1%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	1	785	1,445	351	62	23	14	9	2	1	0	2,693
% catch wt.	0%	29%	54%	13%	2%	1%	1%	0%	0%	0%	0%	100%
Avg. len (cm)	17.1	20.1	22.3	24.3	26.5	27.8	29.2	28.5	29.2	29.1	30.6	21.7
Avg. wt. (g)	31.8	55.0	77.8	104.1	136.8	159.1	185.2	170.9	185.6	182.5	210.1	72.8
Purse - Scots Bay (8,685 t)	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	10,236	25,774	8,334	8,427	4,989	3,363	1,539	465	121	63,316
% numbers	0%	0%	16%	41%	13%	13%	8%	5%	2%	1%	0%	100%
Catch wt. (t)	-	5	990	3,064	1,210	1,413	928	648	300	100	28	8,685
% catch wt.	0%	0%	11%	35%	14%	16%	11%	7%	3%	1%	0%	100%
Avg. len (cm)	-	21.5	23.8	25.4	27.0	28.3	29.2	29.5	29.7	30.6	31.2	26.4
Avg. wt. (g)	-	71.0	96.7	118.9	145.2	167.7	186.0	192.6	194.8	215.6	227.7	137.2
BOF Purse Long Island (1,156 t)	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)	5	1,921	4,903	2,006	572	1,244	491	299	58	67	13	11,578
% numbers	0%	17%	42%	17%	5%	11%	4%	3%	1%	1%	0%	100%
Catch wt. (t)	0	93	360	229	81	211	94	59	12	14	3	1,156
% catch wt.	0%	8%	31%	20%	7%	18%	8%	5%	1%	1%	0%	100%
Avg. len (cm)	17.1	19.2	21.8	25.0	26.7	28.3	29.5	29.7	29.9	30.3	32.5	23.5
Avg. wt. (g)	31.9	48.2	73.4	114.3	141.0	169.5	192.1	197.2	201.6	210.3	265.0	99.8
BOF Purse Gannet/Dry Ledge (2,090t)	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)	-	142	4,847	6,374	1,470	2,565	752	553	103	115	10	16,930
% numbers	0%	1%	29%	38%	9%	15%	4%	3%	1%	1%	0%	100%
Catch wt. (t)	-	8	431	732	198	433	137	105	19	24	2	2,090
% catch wt.	0%	0%	21%	35%	9%	21%	7%	5%	1%	1%	0%	100%
Avg. len (cm)	-	20.0	23.2	25.1	26.4	28.3	29.0	29.4	29.2	30.1	31.7	25.5
Avg. wt. (g)	-	54.5	88.9	114.8	134.9	169.0	182.7	190.2	186.1	205.0	241.0	123.4
BOF Purse Trinity (1,269 t)	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)	-	7,316	9,054	1,597	129	42	9	4	1	-	-	18,153
% numbers	0%	40%	50%	9%	1%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	-	399	682	161	18	6	1	1	0	-	-	1,269
% catch wt.	0%	31%	54%	13%	1%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	-	19.9	21.9	24.0	26.5	27.1	27.8	28.0	27.9	-	-	21.3
Avg. wt. (g)	-	54.6	75.3	100.9	137.7	149.2	162.0	164.4	162.8	-	-	69.9
BOF Purse Lurcher (1,105 t)	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)	-	5,027	4,169	2,144	430	781	227	167	27	41	3	13,015
% numbers	0%	39%	32%	16%	3%	6%	2%	1%	0%	0%	0%	100%
Catch wt. (t)	-	260	328	239	57	132	42	32	5	8	1	1,105
% catch wt.	0%	24%	30%	22%	5%	12%	4%	3%	0%	1%	0%	100%
Avg. len (cm)	-	19.5	22.2	24.8	26.3	28.3	29.0	29.5	29.4	30.0	31.5	22.3
Avg. wt. (g)	-	51.8	78.6	111.6	133.6	169.1	184.6	192.9	192.6	205.2	238.2	84.9
BOF Purse N.B. Coastal (1,219 t)	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)	71	11,592	5,817	1,001	242	69	62	45	4	3	-	18,906
% numbers	0%	61%	31%	5%	1%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	2	584	455	111	33	12	12	8	1	1	-	1,219
% catch wt.	0%	48%	37%	9%	3%	1%	1%	1%	0%	0%	0%	100%
Avg. len (cm)	17.2	19.6	22.5	25.0	26.6	28.3	29.9	28.8	29.5	28.6	-	21.0
Avg. wt. (g)	32.4	50.4	78.2	111.1	136.6	166.0	197.2	176.6	188.3	169.8	-	64.5

BOF Purse SW Grounds (74 t)	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	197	375	59	21	9	5	2	-	-	667
% numbers	0%	0%	30%	56%	9%	3%	1%	1%	0%	0%	0%	100%
Catch wt. (t)	-	0	18	42	8	3	1	1	0	-	-	74
% catch wt.	0%	0%	25%	57%	10%	4%	2%	1%	0%	0%	0%	100%
Avg. len (cm)	-	22.0	23.7	25.2	26.5	27.7	27.8	28.0	28.0	-	-	25.0
Avg. wt. (g)	-	72.8	93.2	112.6	132.3	153.7	155.2	158.2	158.0	-	-	110.9
BOF Purse Seal Island (616 t)	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)	-	21	1,757	2,935	519	169	82	50	24	4	1	5,561
% numbers	0%	0%	32%	53%	9%	3%	1%	1%	0%	0%	0%	100%
Catch wt. (t)	-	1	159	333	70	26	14	9	4	1	0	616
% catch wt.	0%	0%	26%	54%	11%	4%	2%	1%	1%	0%	0%	100%
Avg. len (cm)	-	21.0	23.4	25.2	26.5	27.5	28.3	28.7	28.7	30.5	30.4	24.9
Avg. wt. (g)	-	63.8	90.3	113.6	134.1	151.4	165.8	174.9	173.3	210.4	206.8	110.8
4X BOF Stock Purse Seine (37,590 t)	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)	123	56,336	114,244	108,935	29,635	22,584	11,926	7,503	2,927	976	158	355,346
% numbers	0%	16%	32%	31%	8%	6%	3%	2%	1%	0%	0%	100%
Catch wt. (t)	4	2,924	9,480	12,726	4,224	3,764	2,221	1,435	567	209	37	37,590
% catch wt.	0%	8%	25%	34%	11%	10%	6%	4%	2%	1%	0%	100%
Avg. len (cm)	17.0	19.7	22.7	25.2	26.8	28.2	29.2	29.4	29.5	30.5	31.4	24.1
Avg. wt. (g)	31.3	51.9	83.0	116.8	142.5	166.7	186.2	191.3	193.8	213.9	233.0	105.8

Table 20. Herring catch at age for the 2013–2014 (A), 2014–2015 (B), 2015–2016 (C), and 2016–2017 (D) quota years for the purse seine, gillnet, and weir fisheries conducted on the SWNS/BoF spawning component (4WX stock). Comparisons of Herring catch at age for 2013-2014 versus 2014–2015 quota years, 2014–2015 versus 2015–2016, and 2015–2016 versus 2016–2017. (QY = quota year).

A)

2013–2014 QY	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)	69	136,145	130,504	51,668	29,279	52,784	33,406	10,656	3,209	469	93	448,282
% numbers	0%	30%	29%	12%	7%	12%	7%	2%	1%	0%	0%	100%
Catch wt. (t)	2	7,608	12,366	7,037	4,670	9,178	6,305	2,231	710	117	27	50,250
% catch wt.	0%	15%	25%	14%	9%	18%	13%	4%	1%	0%	0%	100%
Avg. len (cm)	-	19.6	23.0	25.7	26.9	27.7	28.3	29.2	29.7	30.6	32.1	23.7
Avg. wt. (g)	22.5	55.9	94.8	136.2	159.5	173.9	188.7	209.4	221.1	248.5	291.7	112.1

B)

2014–2015 QY	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)	201	175,066	68,490	61,469	37,822	33,415	37,954	22,320	5,405	777	248	443,168
% numbers	0%	40%	15%	14%	9%	8%	9%	5%	1%	0%	0%	100%
Catch wt. (t)	5	8,409	5,488	8,915	6,379	6,285	7,523	4,584	1,164	200	73	49,024
% catch wt.	0%	17%	11%	18%	13%	13%	15%	9%	2%	0%	0%	100%
Avg. len (cm)	15.5	19.1	22.0	26.3	27.6	28.4	28.9	29.1	29.5	215.3	32.3	23.5
Avg. wt. (g)	23.2	48.0	80.1	145.0	168.7	188.1	198.2	205.4	215.3	256.6	294.9	110.6

C)

2015–2016 QY	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	127,061	182,986	48,534	48,316	21,497	21,319	19,587	5,007	1,194	160	475,660
% numbers	0%	27%	38%	10%	10%	5%	4%	4%	1%	0%	0%	100%
Catch wt. (t)	0	7,293	15,549	6,084	7,728	3,906	4,146	3,945	1,067	257	36	50,013
% catch wt.	0%	15%	31%	12%	15%	8%	8%	8%	2%	1%	0%	100%
Avg. len (cm)	16.0	19.9	22.4	25.3	27.3	28.4	28.9	29.3	29.8	30.0	30.3	23.5
Avg. wt. (g)	28.6	57.4	85.0	125.4	160.0	181.7	194.5	201.4	213.2	215.3	227.5	105.1

D)

2016–2017 QY	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)	123	56,336	125,791	114,326	30,757	23,785	12,795	7,991	3,089	1,034	158	376,185
% numbers	0%	15%	33%	30%	8%	6%	3%	2%	1%	0%	0%	100%
Catch wt. (t)	4	2,924	10,165	13,198	4,384	3,977	2,388	1,533	599	221	37	39,430
% catch wt.	0%	7%	26%	33%	11%	10%	6%	4%	2%	1%	0%	100%
Avg. len (cm)	17.0	19.7	22.5	25.1	26.8	28.2	29.2	29.4	29.5	30.4	31.4	24.0
Avg. wt. (g)	31.3	51.9	80.8	115.4	142.6	167.2	186.7	191.8	194.0	213.7	233.0	104.8

E)

Differences 2014–15 minus 2013–14	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)	131	38,921	**-62,014**	9,801	8,543	**-19,368**	4,549	11,664	2,196	308	155	**-5,114**
% numbers	0%	9%	**-14%**	2%	2%	**-4%**	1%	3%	1%	0%	0%	0%
Catch wt. (t)	3	800	**-6,878**	1,878	1,708	**-2,893**	1,218	2,353	454	83	46	**-1,226**
% catch wt.	0%	2%	**-13%**	4%	4%	**-5%**	3%	5%	1%	0%	0%	0%
Avg. len (cm)	0.0	**-0.5**	**-1.0**	0.7	0.6	0.8	0.5	**-0.1**	**-0.1**	184.7	0.3	**-0.2**
Avg. wt. (g)	0.7	**-7.9**	**-14.6**	8.8	9.1	14.2	9.5	**-4.0**	**-5.8**	8.1	3.2	**-1.5**

F)

Differences 2015–16 minus 2014–15	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)	**-200**	**-48,005**	114,496	**-12,935**	10,493	**-11,918**	**-16,636**	**-2,734**	**-399**	416	**-88**	32,492
% numbers	0%	**-13%**	23%	**-4%**	2%	**-3%**	**-4%**	**-1%**	**-0%**	0%	0%	0%
Catch wt. (t)	**-5**	**-1,116**	10,061	**-2,831**	1,350	**-2,379**	**-3,376**	**-639**	**-97**	58	**-37**	989
% catch wt.	0%	**-3%**	20%	**-6%**	2%	**-5%**	**-7%**	**-1%**	**-0%**	0%	0%	0%
Avg. len (cm)	0.0	0.8	0.4	**-1.1**	**-0.2**	**-0.1**	0.1	0.1	0.3	**-1.1**	**-2.0**	**-0.0**
Avg. wt. (g)	5.4	9.4	4.8	**-19.7**	**-8.7**	**-6.4**	**-3.7**	**-4.0**	**-2.2**	**-41.3**	**-67.4**	**-5.5**

G)

Differences 2016–17 minus 2015–16	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)	122	**-70,725**	**-56,891**	65,772	**-17,754**	2,288	**-8,343**	**-11,334**	**-2,448**	122	**-283**	**-99,475**
% numbers	0%	**-12%**	**-5%**	20%	**-2%**	2%	**-1%**	**-2%**	0%	0%	0%	0%
Catch wt. (t)	4	**-4,368**	**-5,397**	7,151	**-3,357**	71	**-1,728**	**-2,363**	**-560**	20	**-56**	**-10,583**
% catch wt.	0%	**-7%**	**-5%**	21%	**-4%**	2%	**-2%**	**-4%**	**-1%**	0%	0%	0%
Avg. len (cm)	1.0	**-0.2**	0.1	**-0.1**	**-0.5**	**-0.2**	0.2	0.2	**-0.1**	0.2	1.8	0.6
Avg. wt. (g)	2.7	**-5.5**	**-4.4**	**-9.1**	**-17.0**	**-14.5**	**-8.1**	**-9.8**	**-15.4**	**-6.2**	22.8	**-0.3**

Table 21A. Catch at age (millions) for the SWNS/BoF Herring spawning component from 1965–2017. Some relatively strong year-classes that persisted in the fishery catch have been highlighted.

	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
2013	0	148	92	39	57	55	25	10	2	0	0	429
2014	0	136	131	52	29	53	33	11	3	0	0	448
2015	0	175	8	61	38	33	38	22	5	1	0	443
2016	0	127	183	49	48	21	21	20	5	1	0	476
2017	0	56	126	114	31	24	13	8	3	1	0	376

Table 21B. Catch at age (percent by numbers) for the SWNS/BoF Herring spawning component, 1965–2017. Proportions for some relatively strong year-classes that persisted in the fishery catch have been highlighted. Note: green bolded highlight is greater or equal to 50% by number for age group.

	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
2013	0	34	21	9	13	13	6	2	0	0	0	100
2014	0	30	29	12	7	12	7	2	1	0	0	100
2015	0	40	15	14	9	8	9	5	1	0	0	100
2016	0	27	38	10	10	5	4	4	1	0	0	100
2017	0	15	33	30	8	6	3	2	1	0	0	100

Table 22. Average (fishery weighted) weights at age (g) for the SWNS/BoF component of the 4WX Herring fishery for 1965–2017. Data for 1965–1967 and 1979–1983 are averages for the period 1968–1978. Note: years 1965–1967 (except age 11 for 1967) and 1979–1983 have average weights for 1967–2000 applied.

Year	Average weight (kg)										
	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
2013	0.021	0.065	0.087	0.122	0.143	0.162	0.182	0.197	0.216	0.290	0.277
2014	0.023	0.056	0.095	0.136	0.160	0.174	0.189	0.209	0.221	0.249	0.292
2015	0.023	0.048	0.080	0.145	0.169	0.188	0.198	0.205	0.215	0.257	0.295
2016	0.029	0.057	0.085	0.125	0.160	0.182	0.194	0.201	0.213	0.215	0.228
2017	0.031	0.052	0.081	0.115	0.143	0.167	0.187	0.192	0.194	0.214	0.233
Average 1965–2017	0.015	0.043	0.100	0.154	0.193	0.225	0.253	0.283	0.303	0.334	0.343
Minimum	0.007	0.021	0.060	0.115	0.143	0.162	0.182	0.192	0.194	0.214	0.210
Maximum	0.031	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: 2008–2017	0.022	0.050	0.083	0.128	0.156	0.180	0.200	0.218	0.231	0.257	0.273
Prev 5yr: 2012–2016	0.024	0.056	0.086	0.129	0.155	0.174	0.190	0.207	0.221	0.255	0.268

Table 23A. Acoustic age composition fro Herring for the overall SWNS/BoF component from 1999 to 2017.

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 Acoustics Overall (with CIF)	% catch wt.	0%	2%	39%	14%	20%	13%	8%	2%	2%	0%	0%	100%
2002 Acoustics 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 Acoustics Overall (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%
2013 Acoustics Overall (with CIF)	% catch wt.	0%	3%	15%	14%	23%	24%	12%	6%	1%	0%	0%	100%
2014 Acoustics Overall (with CIF)	% catch wt.	0%	0%	20%	18%	11%	21%	18%	8%	3%	1%	0%	100%
2015 Acoustics Overall (with CIF)	% catch wt.	0%	0%	6%	28%	19%	15%	18%	10%	3%	1%	0%	100%
2016 Acoustics Overall (with CIF)	% catch wt.	0%	0%	15%	15%	19%	14%	15%	15%	4%	1%	0%	100%
2017 Acoustics Overall (with CIF)	% catch wt.	0%	0%	10%	30%	15%	22%	13%	7%	2%	1%	0%	100%
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 Acoustic Overall (with CIF)	% numbers	0%	4%	50%	14%	17%	9%	5%	1%	1%	0%	0%	100%
2002 Acoustics 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 Acoustics Overall (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%
2013 Acoustics Overall (with CIF)	% numbers	0%	6%	20%	15%	23%	20%	9%	4%	1%	0%	0%	100%
2014 Acoustics Overall (with CIF)	% numbers	0%	0%	28%	20%	11%	18%	14%	6%	2%	0%	0%	100%
2015 Acoustics Overall (with CIF)	% numbers	0%	0%	8%	32%	19%	14%	16%	8%	2%	0%	0%	100%
2016 Acoustics Overall (with CIF)	% numbers	0%	1%	23%	18%	19%	12%	12%	12%	3%	1%	0%	100%
2017 Acoustics Overall (with CIF)	% numbers	0%	0%	15%	35%	14%	18%	10%	5%	2%	0%	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 Acoustics Overall (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 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 Acoustics Overall (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

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
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
2013 Acoustics Overall (with CIF)	Catch wt. (t)	0	12,011	49,864	47,325	80,586	82,660	42,377	20,896	3,460	991	1,525	341,695
2014 Acoustics Overall (with CIF)	Catch wt. (t)	-	705	93,800	81,948	51,581	97,380	83,326	36,375	13,617	3,206	510	462,447
2015 Acoustics Overall (with CIF)	Catch wt. (t)	-	257	25,989	127,874	87,111	69,615	85,304	48,134	14,438	2,683	836	462,241
2016 Acoustics Overall (with CIF)	Catch wt. (t)	-	1,224	48,820	50,631	63,811	46,827	49,727	48,665	14,078	3,728	741	328,252
2017 Acoustics Overall (with CIF)	Catch wt. (t)	-	245	33,512	98,026	48,062	71,782	43,707	23,905	7,625	2,573	1,027	330,462
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 Acoustic Overall (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 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 Acoustics Overall (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 Acoustics Overall (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 Acoustics Overall (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 Acoustics Overall (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
2013 Acoustics Overall (with CIF)	Numbers (x1,000)	18	154,304	514,279	382,897	577,748	513,497	235,337	107,002	15,930	3,557	5,426	2,509,994
2014 Acoustics Overall (with CIF)	Numbers (x1,000)	-	8,860	797,713	570,309	315,593	524,273	413,167	162,800	58,365	12,134	1,790	2,865,003
2015 Acoustics Overall (with CIF)	Numbers (x1,000)	-	3,531	231,550	875,133	522,490	372,454	430,084	230,537	65,519	10,264	2,722	2,744,285
2016 Acoustics Overall (with CIF)	Numbers (x1,000)	-	13,651	457,259	365,916	376,658	245,318	242,616	234,091	64,209	16,423	3,185	2,019,326
2017 Acoustics Overall (with CIF)	Numbers (x1,000)	-	4,345	344,202	803,832	322,740	423,675	227,826	117,497	37,041	11,143	4,469	2,296,772

Table 23B. Acoustic age composition for Herring for the German Bank component from 1999 to 2017 (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 (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 (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%
2013 Acoustics German Bank (with CIF)	% catch wt.	0%	4%	17%	14%	24%	22%	11%	6%	1%	0%	0%	100%
2014 Acoustics German Bank (with CIF)	% catch wt.	0%	0%	16%	22%	14%	21%	16%	7%	3%	0%	0%	100%
2015 Acoustics German Bank (with CIF)	% catch wt.	0%	0%	9%	24%	26%	16%	15%	7%	3%	0%	0%	100%
2016 Acoustics German Bank (with CIF)	% catch wt.	0%	1%	14%	17%	17%	15%	15%	16%	4%	1%	0%	100%
2017 Acoustics German Bank (with CIF)	% catch wt.	0%	0%	9%	33%	20%	14%	16%	7%	1%	0%	0%	100%
1999 German Bank Acoustic (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 (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%
2013 Acoustics German Bank (with CIF)	% numbers	0%	8%	23%	15%	23%	18%	8%	4%	1%	0%	0%	100%
2014 Acoustics German Bank (with CIF)	% numbers	0%	0%	22%	25%	14%	18%	13%	5%	2%	0%	0%	100%
2015 Acoustics German Bank (with CIF)	% numbers	0%	0%	13%	28%	25%	14%	12%	5%	2%	0%	0%	100%
2016 Acoustics German Bank (with CIF)	% numbers	0%	1%	21%	20%	16%	13%	12%	13%	3%	1%	0%	100%
2017 Acoustics German Bank (with CIF)	% numbers	0%	0%	14%	38%	18%	12%	12%	4%	1%	0%	0%	100%
1999 German Bank Acoustic (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 (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

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
2013 Acoustics German Bank (with CIF)	Catch wt. (t)	-	11,688	45,041	37,523	63,130	57,987	28,921	15,801	2,379	855	1,204	264,528
2014 Acoustics German Bank (with CIF)	Catch wt. (t)	-	489	36,873	52,144	31,877	47,689	37,741	17,089	6,181	1,095	373	231,552
2015 Acoustics German Bank (with CIF)	Catch wt. (t)	-	103	15,412	42,893	45,756	27,909	26,455	11,815	5,369	202	476	176,389
2016 Acoustics German Bank (with CIF)	Catch wt. (t)	-	1,099	29,194	36,317	36,260	32,754	32,429	33,696	7,514	2,632	184	212,078
2017 Acoustics German Bank (with CIF)	Catch wt. (t)	-	223	12,592	44,461	26,470	18,894	22,053	8,790	992	539	-	135,014
1999 German Bank Acoustic (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 (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
2013 Acoustics German Bank (with CIF)	Numbers (x1,000)	-	150,296	466,144	302,837	455,609	358,555	161,390	81,112	10,799	3,040	4,257	1,994,037
2014 Acoustics German Bank (with CIF)	Numbers (x1,000)	-	5,678	305,885	350,889	189,632	247,476	183,560	73,417	25,776	4,374	1,334	1,388,020
2015 Acoustics German Bank (with CIF)	Numbers (x1,000)	-	1,334	135,807	290,328	266,660	144,320	128,599	51,818	25,213	779	1,477	1,046,334
2016 Acoustics German Bank (with CIF)	Numbers (x1,000)	-	12,087	269,929	260,999	212,780	172,504	158,931	163,684	34,794	11,753	753	1,298,213
2017 Acoustics German Bank (with CIF)	Numbers (x1,000)	-	4,007	133,178	366,157	177,047	114,131	115,785	42,065	4,834	2,127	-	959,332

Table 23C. Acoustic age composition for Herring for the Scots Bay component from 1999 to 2017 (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 Scots Bay Acoustics (with CIF)	% catch wt.	0%	0%	4%	14%	34%	30%	11%	3%	1%	0%	0%	100%
2000 Scots Bay Overall (with CIF)	% catch wt.	0%	1%	3%	26%	30%	17%	15%	7%	1%	1%	0%	100%
2001 Scots Bay Acoustic (with CIF)	% catch wt.	0%	3%	41%	12%	19%	13%	8%	2%	2%	0%	0%	100%
2002 Scots Bay Overall (with CIF)	% catch wt.	0%	1%	16%	42%	21%	7%	4%	3%	2%	1%	1%	99%
2003 Scots Bay Acoustics (with CIF)	% catch wt.	0%	1%	32%	20%	30%	8%	4%	1%	1%	1%	1%	99%
2004 Acoustics Scots Bay (with CIF)	% catch wt.	0%	0%	19%	46%	16%	10%	3%	1%	3%	0%	1%	99%
2005 Scots Bay Acoustics (with CIF)	% catch wt.	0%	0%	10%	47%	20%	8%	8%	4%	1%	0%	1%	99%
2006 Scots Bay Acoustics (with CIF)	% catch wt.	0%	0%	8%	20%	37%	19%	12%	3%	0%	0%	0%	100%
2007 Scots Bay Acoustics (with CIF)	% catch wt.	0%	1%	8%	12%	17%	38%	20%	2%	1%	0%	0%	100%
2008 Scots Bay Acoustics (with CIF)	% catch wt.	0%	0%	24%	12%	9%	13%	24%	12%	5%	1%	0%	100%
2009 Scots Bay Acoustics (with CIF)	% catch wt.	0%	1%	16%	49%	8%	5%	7%	8%	4%	1%	0%	100%
2010 Scots Bay Acoustics (with CIF)	% catch wt.	0%	0%	10%	20%	44%	6%	3%	6%	5%	2%	1%	99%
2011 Scots Bay Acoustics (with CIF)	% catch wt.	0%	3%	19%	29%	22%	21%	2%	1%	1%	1%	0%	100%
2012 Acoustics Scots Bay (with CIF)	% catch wt.	0%	0%	6%	31%	32%	16%	9%	2%	2%	1%	1%	99%
2013 Acoustics Scots Bay (with CIF)	% catch wt.	0%	4%	17%	14%	24%	22%	11%	6%	1%	0%	0%	100%
2014 Acoustics Scots Bay (with CIF)	% catch wt.	0%	0%	16%	22%	14%	21%	16%	7%	3%	0%	0%	100%
2015 Acoustics Scots Bay (with CIF)	% catch wt.	0%	0%	4%	30%	14%	15%	21%	13%	3%	1%	0%	100%
2016 Acoustics Scots Bay (with CIF)	% catch wt.	0%	0%	17%	12%	24%	12%	15%	13%	6%	1%	0%	100%
2017 Acoustics Scots Bay (with CIF)	% catch wt.	0%	0%	10%	25%	10%	29%	11%	8%	4%	1%	1%	100%
1999 Scots Bay Acoustics (with CIF)	% numbers	0%	0%	6%	17%	37%	27%	9%	2%	1%	0%	0%	100%
2000 Scots Bay Acoustics (with CIF)	% numbers	0%	1%	5%	31%	29%	15%	12%	5%	1%	0%	0%	100%
2001 Scots Bay Acoustic (with CIF)	% numbers	0%	8%	50%	12%	15%	9%	5%	1%	1%	0%	0%	100%
2002 Scots Bay Acoustics (with CIF)	% numbers	0%	4%	20%	44%	19%	5%	3%	2%	1%	0%	0%	100%
2003 Scots Bay Acoustics (with CIF)	% numbers	0%	2%	41%	20%	25%	6%	3%	1%	1%	0%	0%	100%
2004 Acoustics Scots Bay (with CIF)	% numbers	0%	1%	25%	48%	12%	7%	2%	1%	2%	0%	1%	99%
2005 Scots Bay Acoustics (with CIF)	% numbers	0%	0%	14%	50%	19%	7%	6%	3%	1%	0%	0%	100%
2006 Scots Bay Acoustics (with CIF)	% numbers	0%	0%	12%	22%	36%	17%	9%	2%	0%	0%	0%	100%
2007 Scots Bay Acoustics (with CIF)	% numbers	0%	1%	12%	15%	17%	34%	18%	2%	1%	0%	0%	100%
2008 Scots Bay Acoustics (with CIF)	% numbers	0%	0%	36%	14%	8%	11%	18%	9%	3%	0%	0%	100%
2009 Scots Bay Acoustics (with CIF)	% numbers	0%	2%	22%	52%	7%	4%	4%	5%	2%	1%	0%	100%
2010 Scots Bay Acoustics (with CIF)	% numbers	0%	0%	16%	24%	43%	5%	2%	4%	3%	1%	1%	99%
2011 Scots Bay Acoustics (with CIF)	% numbers	0%	6%	27%	29%	19%	15%	1%	1%	1%	1%	0%	100%
2012 Acoustics Scots Bay (with CIF)	% numbers	0%	0%	9%	36%	31%	14%	7%	1%	1%	1%	1%	99%
2013 Acoustics Scots Bay (with CIF)	% numbers	0%	8%	23%	15%	23%	18%	8%	4%	1%	0%	0%	100%
2014 Acoustics Scots Bay (with CIF)	% numbers	0%	0%	22%	25%	14%	18%	13%	5%	2%	0%	0%	100%
2015 Acoustics Scots Bay (with CIF)	% numbers	0%	0%	6%	34%	15%	13%	18%	11%	2%	1%	0%	100%
2016 Acoustics Scots Bay (with CIF)	% numbers	0%	0%	26%	15%	23%	10%	12%	10%	4%	1%	0%	100%
2017 Acoustics Scots Bay (with CIF)	% numbers	0%	0%	15%	31%	10%	26%	9%	6%	3%	1%	0%	100%
1999 Scots Bay Acoustics (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 Scots Bay Acoustics (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 Scots Bay 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 Scots Bay Acoustics (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 Scots Bay 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 Scots Bay (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 Scots Bay 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 Scots Bay 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 Scots Bay 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 Scots Bay 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 Scots Bay 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 Scots Bay Acoustics (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 Scots Bay Acoustics (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

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
2012 Acoustics Scots Bay (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
2013 Acoustics Scots Bay (with CIF)	Catch wt. (t)	-	11,688	45,041	37,523	63,130	57,987	28,921	15,801	2,379	855	1,204	264,528
2014 Acoustics Scots Bay (with CIF)	Catch wt. (t)	-	489	36,873	52,144	31,877	47,689	37,741	17,089	6,181	1,095	373	231,552
2015 Acoustics Scots Bay (with CIF)	Catch wt. (t)	-	154	10,537	84,846	41,185	41,591	58,733	36,268	9,039	2,481	360	285,195
2016 Acoustics Scots Bay (with CIF)	Catch wt. (t)	-	124	19,509	14,203	27,471	14,009	17,236	14,915	6,550	1,094	556	115,668
2017 Acoustics Scots Bay (with CIF)	Catch wt. (t)	-	17	17,284	43,642	17,140	50,911	19,654	14,646	6,501	2,033	1,027	172,855
1999 Scots Bay Acoustics (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 Scots Bay Acoustics (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 Scots Bay Acoustics (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 Scots Bay Acoustics (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 Scots Bay 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 Scots Bay (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 Scots Bay 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 Scots Bay 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 Scots Bay 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 Scots Bay 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 Scots Bay 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 Scots Bay Acoustics (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 Scots Bay Acoustics (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 Scots Bay (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
2013 Acoustics Scots Bay (with CIF)	Numbers (x1,000)	-	150,296	466,144	302,837	455,609	358,555	161,390	81,112	10,799	3,040	4,257	1,994,037
2014 Acoustics Scots Bay (with CIF)	Numbers (x1,000)	-	5,678	305,885	350,889	189,632	247,476	183,560	73,417	25,776	4,374	1,334	1,388,020
2015 Acoustics Scots Bay (with CIF)	Numbers (x1,000)	-	2,192	95,390	583,918	254,862	227,555	300,934	178,503	40,169	9,485	1,245	1,694,254
2016 Acoustics Scots Bay (with CIF)	Numbers (x1,000)	-	1,554	186,244	104,106	163,402	72,468	83,359	70,140	29,347	4,662	2,429	717,711
2017 Acoustics Scots Bay (with CIF)	Numbers (x1,000)	-	256	172,318	356,254	115,767	298,603	101,411	72,992	31,619	9,016	4,469	1,162,704

Table 24A. Biological characteristics of Herring from sampling for the overall SWNS/BoF component acoustic surveys from 1999 to 2017 with average length (cm) and average weight (g) by age. A dash (-) indicates no data.

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 Acoustics Overall (with CIF)	Avg. len (cm)	-	23.2	25.3	26.9	27.9	29.4	30.4	31.9	33.0	33.5	-	28.3
2000 Acoustics Overall (with CIF)	Avg. len (cm)	-	23.9	24.9	26.8	28.6	29.8	30.5	31.2	33.2	33.5	-	28.4
2001 Overall Acoustics (with CIF)	Avg. len (cm)	-	20.9	25.2	26.8	28.5	30.1	31.3	32.2	31.7	33.5	-	26.7
2002 Acoustics Overall (with CIF)	Avg. len (cm)	15.9	20.2	25.7	27.2	28.3	30.1	31.3	31.8	31.3	31.9	-	27.3
2003 Overall Acoustics (with CIF)	Avg. len (cm)	-	22.5	24.6	26.7	28.2	29.1	30.3	31.4	31.4	31.6	-	26.6
2004 Acoustics Overall (with CIF)	Avg. len (cm)	-	20.8	24.6	26.6	29.0	29.3	29.7	31.2	30.6	32.5	-	26.7
2005 Acoustics Overall (with CIF)	Avg. len (cm)	-	19.2	24.7	26.7	27.6	28.9	30.1	30.2	31.4	32.4	-	27.1
2006 Acoustics Overall (with CIF)	Avg. len (cm)	-	21.2	24.7	26.9	27.8	28.6	29.5	30.1	31.1	31.7	-	27.6
2007 Overall Acoustics (with CIF)	Avg. len (cm)	-	23.7	25.1	26.9	28.4	29.2	29.4	31.3	31.5	32.1	-	28.3
2008 Overall Acoustics (with CIF)	Avg. len (cm)	-	22.0	24.8	26.7	28.4	29.3	30.3	30.7	31.3	32.3	-	27.6
2009 Acoustics Overall (with CIF)	Avg. len (cm)	-	20.9	24.2	26.3	27.8	29.2	30.3	30.9	31.3	32.0	32.7	26.4
2010 Acoustics Overall (with CIF)	Avg. len (cm)	-	21.4	24.0	25.8	27.2	28.6	30.2	31.0	31.3	31.6	31.9	26.8
2011 Acoustics Overall (with CIF)	Avg. len (cm)	12.5	19.9	23.0	25.3	26.8	27.9	28.9	30.6	31.7	31.9	32.3	25.4
2012 Acoustics Overall (with CIF)	Avg. len (cm)	13.7	21.1	23.9	25.4	26.7	27.7	28.6	30.1	31.4	31.7	32.1	26.6
2013 Acoustics Overall (with CIF)	Avg. len (cm)	11.5	22.5	24.0	25.7	26.6	27.7	28.6	29.4	30.3	32.7	32.7	26.3
2014 Acoustics Overall (with CIF)	Avg. len (cm)	-	21.8	24.6	26.0	27.0	28.1	28.8	29.8	30.2	31.4	31.9	26.8
2015 Acoustics Overall (with CIF)	Avg. len (cm)	-	21.6	24.5	26.4	27.5	28.4	28.9	29.3	29.8	31.3	32.8	27.5
2016 Acoustics Overall (with CIF)	Avg. len (cm)	-	22.7	23.9	25.9	27.6	28.7	29.3	29.5	29.9	30.4	30.1	27.1
2017 Acoustics Overall (with CIF)	Avg. len (cm)	-	20.3	23.9	25.6	27.2	28.2	29.6	29.9	29.8	30.8	30.7	26.8
1999 Acoustics Overall (with CIF)	Avg. wt. (g)	2	98	132	159	178	211	237	272	301	321	-	190
2000 Acoustics Overall (with CIF)	Avg. wt. (g)	2	98	113	145	180	206	219	239	289	307	-	179
2001 Overall Acoustics (with CIF)	Avg. wt. (g)	2	65	121	151	187	224	254	280	265	318	-	153
2002 Acoustics Overall (with CIF)	Avg. wt. (g)	2	57	125	151	175	215	246	258	238	271	-	157
2003 Overall Acoustics (with CIF)	Avg. wt. (g)	2	84	111	145	173	191	221	248	247	253	-	146
2004 Acoustics Overall (with CIF)	Avg. wt. (g)	2	63	111	142	191	199	209	245	228	283	-	148
2005 Acoustics Overall (with CIF)	Avg. wt. (g)	2	49	113	145	162	188	215	217	247	273	-	154
2006 Acoustics Overall (with CIF)	Avg. wt. (g)	2	70	116	156	173	190	211	226	252	267	-	170
2007 Overall Acoustics (with CIF)	Avg. wt. (g)	2	99	122	154	186	205	210	260	264	284	-	185
2008 Overall Acoustics (with CIF)	Avg. wt. (g)	2	80	119	153	189	210	234	245	261	290	-	177
2009 Acoustics Overall (with CIF)	Avg. wt. (g)	2	66	109	144	175	207	235	250	262	279	299	151
2010 Acoustics Overall (with CIF)	Avg. wt. (g)	2	66	98	126	152	180	215	236	245	251	257	146
2011 Acoustics Overall (with CIF)	Avg. wt. (g)	2	57	93	126	150	171	194	228	256	259	270	130
2012 Acoustics Overall (with CIF)	Avg. wt. (g)	2	67	101	125	146	165	182	215	246	255	265	146
2013 Acoustics Overall (with CIF)	Avg. wt. (g)	2	78	97	124	139	161	180	195	217	279	281	136
2014 Acoustics Overall (with CIF)	Avg. wt. (g)	2	80	118	144	163	186	202	223	233	264	285	161
2015 Acoustics Overall (with CIF)	Avg. wt. (g)	-	73	112	146	167	187	198	209	220	261	307	168
2016 Acoustics Overall (with CIF)	Avg. wt. (g)	-	90	107	138	169	191	205	208	219	227	233	163
2017 Acoustics Overall (with CIF)	Avg. wt. (g)	0	56	97	122	149	169	192	203	206	231	230	144

Table 24B. Biological characteristics of Herring from sampling for German Bank acoustic surveys from 1999 to 2017 with average length (cm) and average weight (g) by age. A dash (-) indicates no data.

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 Acoustics (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 (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
2013 Acoustics German Bank (with CIF)	Avg. len (cm)	-	22.5	24.0	25.8	26.6	27.8	28.7	29.4	30.4	32.8	32.8	26.1
2014 Acoustics German Bank (with CIF)	Avg. len (cm)	-	22.4	24.7	26.2	27.1	28.2	28.8	29.8	30.1	30.5	31.6	27.0
2015 Acoustics German Bank (with CIF)	Avg. len (cm)	-	22.0	24.6	26.6	27.8	28.7	29.2	30.1	29.5	31.2	33.3	27.5
2016 Acoustics German Bank (with CIF)	Avg. len (cm)	-	22.8	24.1	26.1	27.9	28.8	29.5	29.6	30.1	30.5	30.8	27.3
2017 Acoustics German Bank (with CIF)	Avg. len (cm)	-	20.3	23.8	25.7	27.5	28.2	29.9	30.7	29.9	31.8	-	26.8
1999 German Bank Acoustics (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 Acoustics (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 (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
2013 Acoustics German Bank (with CIF)	Avg. wt. (g)	2.0	77.8	96.6	123.9	138.6	161.7	179.2	194.8	220.3	281.2	282.9	132.7
2014 Acoustics German Bank (with CIF)	Avg. wt. (g)	2.0	86.0	120.5	148.6	168.1	192.7	205.6	232.8	239.8	250.4	279.9	166.8
2015 Acoustics German Bank (with CIF)	Avg. wt. (g)	-	76.9	113.5	147.7	171.6	193.4	205.7	228.0	212.9	259.2	322.1	168.6
2016 Acoustics German Bank (with CIF)	Avg. wt. (g)	-	90.9	108.2	139.1	170.4	189.9	204.0	205.9	215.9	223.9	243.9	163.4
2017 Acoustics German Bank (with CIF)	Avg. wt. (g)	-	55.7	94.6	121.4	149.5	165.5	190.5	209.0	205.2	253.6	-	140.7

Table 24C. Biological characteristics of Herring from sampling for Scots Bay acoustic surveys from 1999 to 2017 with average length (cm) and average weight (g) by age. A dash (-) indicates no data.

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 Scots Bay Acoustics (with CIF)	Avg. len (cm)	-	21.5	25.1	26.6	27.9	29.1	29.6	30.7	-	32.5	-	28.1
2000 Scots Bay Overall (with CIF)	Avg. len (cm)	-	24.0	24.8	26.6	28.4	30.0	30.6	31.4	32.9	33.4	-	28.4
2001 Scots Bay Acoustic (with CIF)	Avg. len (cm)	-	22.0	25.2	26.8	28.5	30.1	31.2	32.0	32.4	33.4	-	27.0
2002 Scots Bay Overall (with CIF)	Avg. len (cm)	-	22.5	25.9	27.0	28.3	30.1	31.3	31.6	31.3	31.7	-	27.5
2003 Scots Bay Acoustics (with CIF)	Avg. len (cm)	-	22.8	24.4	27.0	28.2	29.2	30.2	31.4	31.2	31.5	-	27.0
2004 Acoustics Scots Bay (with CIF)	Avg. len (cm)	-	20.8	24.7	26.5	28.3	29.2	29.6	31.0	30.4	31.1	-	26.6
2005 Scots Bay Acoustics (with CIF)	Avg. len (cm)	-	21.0	24.3	25.9	27.0	28.9	29.6	29.9	31.4	32.5	-	26.6
2006 Scots Bay Acoustics (with CIF)	Avg. len (cm)	-	21.6	24.3	26.5	27.5	28.1	29.1	30.0	31.5	32.7	-	27.3
2007 Scots Bay Acoustics (with CIF)	Avg. len (cm)	-	22.8	24.7	26.5	28.2	28.9	29.4	30.5	32.2	31.5	-	27.4
2008 Scots Bay Acoustics (with CIF)	Avg. len (cm)	-	22.0	24.7	26.6	27.7	29.4	30.2	31.2	30.6	32.0	-	27.8
2009 Scots Bay Acoustics (with CIF)	Avg. len (cm)	-	20.1	23.9	26.1	27.6	29.1	30.0	30.6	30.9	31.7	33.0	25.9
2010 Scots Bay Acoustics (with CIF)	Avg. len (cm)	-	21.0	23.8	25.6	27.0	28.1	30.0	30.7	30.8	31.0	31.1	26.1
2011 Scots Bay Acoustics (with CIF)	Avg. len (cm)	-	19.5	23.3	25.0	26.2	27.5	28.2	30.2	30.8	31.3	31.9	25.4
2012 Scots Bay Acoustics (with CIF)	Avg. len (cm)	13.7	20.6	23.6	25.4	26.6	27.6	28.3	29.6	31.0	31.0	31.7	26.8
2013 Scots Bay Acoustics (with CIF)	Avg. len (cm)	11.5	22.5	24.0	25.4	26.6	27.5	28.6	29.3	29.9	32.1	32.4	26.9
2014 Scots Bay Acoustics (with CIF)	Avg. len (cm)	-	20.8	24.5	25.7	26.8	28.0	28.9	29.7	30.2	31.9	32.7	26.7
2015 Acoustics Scots Bay (with CIF)	Avg. len (cm)	-	21.4	24.4	26.4	27.2	28.2	28.7	29.0	29.9	31.3	32.2	27.4
2016 Acoustics Scots Bay (with CIF)	Avg. len (cm)	-	21.8	23.7	25.6	27.3	28.4	29.0	29.2	29.6	30.1	29.8	26.8
2017 Acoustics Scots Bay (with CIF)	Avg. len (cm)	-	21.1	24.0	25.5	27.0	28.3	29.3	29.5	29.7	30.6	30.7	26.9
1999 Scots Bay Acoustic (with CIF)	Avg. wt. (g)	2.0	78.5	131.0	158.0	181.5	209.0	219.0	244.7	-	293.7	-	187.7
2000 Scots Bay Overall (with CIF)	Avg. wt. (g)	2.0	104.7	115.2	145.6	180.0	215.7	229.1	249.2	288.3	302.8	-	183.1
2001 Scots Bay Acoustics (with CIF)	Avg. wt. (g)	2.0	80.9	125.2	155.0	189.8	227.3	256.8	279.7	291.1	322.0	-	162.7
2002 Scots Bay Overall (with CIF)	Avg. wt. (g)	2.0	79.8	130.2	151.1	178.6	219.8	250.0	260.6	250.8	264.8	-	162.9
2003 Scots Bay Acoustics (with CIF)	Avg. wt. (g)	2.0	87.2	108.1	153.0	174.1	196.3	220.4	249.8	245.6	251.6	-	154.2
2004 Acoustics Scots Bay (with CIF)	Avg. wt. (g)	2.0	63.2	113.6	143.8	180.5	199.7	210.4	245.4	230.1	248.4	-	147.9
2005 Scots Bay Acoustics (with CIF)	Avg. wt. (g)	2.0	65.5	107.3	134.2	153.9	190.9	207.0	212.9	253.6	285.7	-	147.3
2006 Scots Bay Acoustics (with CIF)	Avg. wt. (g)	2.0	73.3	108.4	145.4	164.1	176.5	196.4	217.7	255.2	287.0	-	160.3
2007 Scots Bay Acoustics (with CIF)	Avg. wt. (g)	2.0	90.0	118.1	150.2	184.7	200.5	212.0	239.9	285.8	268.2	-	170.2
2008 Scots Bay Acoustics (with CIF)	Avg. wt. (g)	2.0	79.9	119.8	155.1	176.8	216.9	237.0	263.8	247.1	285.8	-	184.0
2009 Scots Bay Acoustics (with CIF)	Avg. wt. (g)	2.0	60.7	105.1	140.3	168.9	201.5	222.8	238.0	244.5	266.4	310.7	140.5
2010 Scots Bay Acoustics (with CIF)	Avg. wt. (g)	2.0	62.3	97.4	125.4	148.7	171.7	210.6	229.1	231.4	236.1	238.5	136.3
2011 Scots Bay Acoustics (with CIF)	Avg. wt. (g)	2.0	54.2	97.1	122.5	141.3	166.2	181.0	226.5	239.3	252.2	268.8	129.7
2012 Scots Bay Acoustics (with CIF)	Avg. wt. (g)	2.0	63.4	97.3	124.2	142.9	161.4	175.0	201.5	233.9	232.7	249.8	148.0
2013 Scots Bay Acoustics (with CIF)	Avg. wt. (g)	2.0	80.5	100.2	122.4	142.8	159.1	181.9	196.8	210.9	264.1	274.4	149.3
2014 Scots Bay Acoustics (with CIF)	Avg. wt. (g)	2.0	67.9	115.6	135.3	156.0	179.2	198.3	215.3	227.9	272.0	301.9	156.1
2015 Acoustics Scots Bay (with CIF)	Avg. wt. (g)	-	70.5	110.5	145.3	161.6	182.8	195.2	203.2	225.0	261.6	289.0	168.3
2016 Acoustics Scots Bay (with CIF)	Avg. wt. (g)	-	79.8	104.7	136.4	168.1	193.3	206.8	212.6	223.2	234.7	229.1	161.2
2017 Acoustics Scots Bay (with CIF)	Avg. wt. (g)	-	65.9	100.3	122.5	148.1	170.5	193.8	200.7	205.6	225.5	229.7	148.7

Table 25. Observations and conclusions on conservation objective elements from the Herring management plan for SWNS/BoF spawning component during 2015–2017.

Objective from Management Plan	2015, 2016 and 2017: Observations and Conclusions
Persistence of all spawning components	Spawning continues to be 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. In 2017, there was in improvement in the amount of documented spawning biomass on Trinity Ledge and in the Spectacle Buoy area in the fall.
Maintain biomass of each component	After the 36% increase in 2014 over the 2013 estimates in the main areas for Scots Bay and German Bank, there was a slight decrease by 1% in 2015, followed by a decreased of 29% in 2016 and a 20% increase in 2017. The biomass on German Bank for the last three years is the lowest in the time series. In 2017, there was a substantial improvement in the SSB on Trinity Ledge and in the Spectacle Buoy area in the fall.
Maintain broad age composition	Currently broad ranges of ages are in the commercial landings (2–10), as well as in the acoustic surveys catch-at-age (2–11). During the three years, there was a reduction in the number of 2-year olds caught in the fishery and there are indications of a stronger 2013 year class.
Maintain long spawning period	Scots Bay showed an increase in the length of spawning period in comparison to recent years (as a result of an earlier start date and later end date, also seen in the maturity samples collected during surveys), while German Bank showed a similar length of spawning period in the last three years. While there was little spawning on Trinity Ledge in 2015 and 2016, there was a substantial improvement in 2017 with spawning occurring mid-August to early September.
Fishing mortality at or below $F_{0.1}$	Fishing mortality could not be determined. In comparison to the relative exploitation rate in 2014 (11%), the relative exploitation rate remained at 11% in 2015, increased to 15% in 2016 and decreased to 12% in 2017. The relative exploitation rate varied in response to fluctuating survey biomass as well as a decrease in the catch in 2017.
Maintain spatial and temporal diversity of spawning	This objective seems to be met with the spatial distribution of spawning aggregations as well as catches in Scots Bay appearing to be similar during 2015 to 2017. On German Bank, the spawning distribution during 2015–2017 was generally spread within the ‘strata box’, with localized groups seen in both the northern and southern portions. Therefore, spawning periods are being maintained both temporally and spatially on the two major spawning grounds. There was an improvement in 2017 in the Trinity Ledge and Spectacle Buoy spawning areas.
Maintain biomass at moderate to high levels	In 2015, the SSB estimates in the main areas of German Bank and Scots Bay increased slightly by 1% (over 2014), decreased 29% in 2016 and increased in 2017 by 13%.
Maintain three-year moving average above the lower reference point	The three-year moving has decreased relative to the limit reference point and in 2017 is 1% below the LRP. There has been a downward trend in the average since 2014.

Table 26A. Herring catch at age for the 2015 Offshore Banks fisheries with numbers caught (thousands), weight (t) and percent, average length, and average weight by age.

4WX Offshore Banks	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)	-	22	1,039	1,470	2,831	2,356	1,876	1,049	328	30	5	11,006
% numbers	0%	0%	9%	13%	26%	21%	17%	10%	3%	0%	0%	100%
Catch wt. (t)	-	1	108	192	444	412	360	209	73	7	1	1,807
% catch wt.	0%	0%	6%	11%	25%	23%	20%	12%	4%	0%	0%	100%
Avg. len (cm)	-	20.3	23.9	25.8	27.4	28.3	29.2	29.6	30.7	31.8	32.5	27.7
Avg. wt. (g)	-	62.6	103.6	130.5	156.8	174.7	192.1	198.9	222.2	248.6	258.0	164.2

Table 26B. Herring catch at age for the 2016 Offshore Banks fisheries with numbers caught (thousands), weight (t) and percent, average length and average weight by age.

4WX Offshore Banks	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)	-	-	721	2,363	1,521	1,339	509	497	155	90	17	7,213
% numbers	0%	0%	10%	33%	21%	19%	7%	7%	2%	1%	0%	100%
Catch wt. (t)	-	-	61	293	219	224	93	92	30	19	4	1,035
% catch wt.	0%	0%	6%	28%	21%	22%	9%	9%	3%	2%	0%	100%
Avg. len (cm)	-	-	22.6	25.6	27.0	28.4	29.3	29.4	29.7	30.9	31.5	26.8
Avg. wt. (g)	-	-	84.8	124.0	143.8	167.3	183.1	184.8	192.0	214.0	226.8	143.5

Table 26C. Herring catch at age for the 2017 Offshore Banks fisheries with numbers caught (thousands), weight (t) and percent, average length and average weight by age.

4WX Offshore Banks	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)	-	450	3,206	3,106	5,830	4,759	3,768	2,671	754	228	39	24,811
% numbers	0%	2%	13%	13%	23%	19%	15%	11%	3%	1%	0%	100%
Catch wt. (t)	-	27	244	404	913	850	739	554	162	56	8	3,956
% catch wt.	0%	1%	6%	10%	23%	21%	19%	14%	4%	1%	0%	100%
Avg. len (cm)	-	20.4	22.0	26.2	27.7	28.9	29.7	30.2	30.5	31.8	30.0	27.5
Avg. wt. (g)	-	59.1	76.1	130.0	156.6	178.6	196.1	207.3	214.4	245.5	209.5	159.4

Table 27. Herring abundance indices from the July bottom trawl survey (stratified numbers per tow): 1970–2017. Note 2005 had duplicate coverage of the entire area with comparative surveys by the CCGS Alfred Needler *and CCGS* Templeman *research vessels (shaded rows). SE = Standard Error.*

		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	0.4	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	1.9	1.1	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	3.6	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	23.4	15.0	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	8.0	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	5.3	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	10.9	5.9	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	29.1	8.7	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	18.8	4.6	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	75.9	30.4	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	63.9	24.5	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	39.4	14.3	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	43.2	20.8	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

Year	Cruise	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	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
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
2013	NED2013-022	91.8	54.9	91.2	19.9	115.6	30.4	103.8	18.5	121.6	41.7	98.1	18.9	97.9	19.9
2014	NED2014-018	11.4	4.9	101.1	54.2	81.7	27.7	91.1	29.8	96.1	39.7	90.9	41.3	66.7	21.0
2015	NED2015-017	37.2	16.2	205.2	80.2	85.2	37.4	143.1	43.2	104.5	57.9	167.4	59.8	110.8	30.7
2016	NED2016-016	121.9	57.8	139.2	40.2	92.3	47.2	114.0	31.0	111.4	73.4	119.1	29.9	113.3	26.9
2017	NED2017-020	26.2	14.7	253.2	124.9	177.2	59.0	213.8	67.2	189.4	80.2	233.3	94.5	157.5	47.3
Overall Mean		14.4	9.5	66.6	28.9	55.5	24.9	61.0	20.7	53.7	28.2	66.7	25.9	46.8	15.5
Minimum		0.0	0.0	0.0	0.0	0.1	0.0	0.4	0.2	0.1	0.0	0.0	0.0	0.3	0.2
Maximum		121.9	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 1996–2017, B) spawning biomass (t) from acoustic surveys in the Coastal Nova Scotia spawning component from 1996–2017, and C) estimated exploitation as calculated as landings/SSB (%).No acoustic surveys were done in 1996 and 1997.

A) Landings (t)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg. last 5 years	Avg. 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	2,499	3,596	4,160	5,943	5,557	4,351	2,886
Little Hope/Port Mouton 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	2,387	3,577	3,772	6,151	6,803	-	-
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	1,390	1,163	1,001	1,837	2,259	1,530	2,245
Halifax/Eastern Shore 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	2,427	1,959	1,066	1,884	2,856	-	-
Glace Bay	-	170	1,730	1,040	834	1,204	3,058	1,905	1,481	626	85	45	12	4	11	0	7	2	1	0	4	0	1	582
Bras d'Or Lakes	170	160	120	31	56	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
Total	1,450	2,340	4,120	5,621	4,280	6,004	10,369	9,109	6,981	6,316	6,575	5,275	3,468	9,620	5,419	3,484	2,928	3,891	4,760	5,161	7,784	7,816	5,882	5,738

B) Survey SSB (t)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg. last 5 years	Avg. 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	74,532	46,077	145,395	61,408	66,815	78,845	38,659
Halifax/East-ern 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	6,870	9,586	68,562	54,312	58,681	39,602	33,606
Glace Bay	-	2,000	-	21,200	7,700	31,500	n/s	3,180	n/s	240	500	100	8	51	n/s	50	n/s	n/s	n/s	n/s	50	6,048
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	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 made with data without CIF.

C) Exploitation	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg. last 5 years	Avg. all years
Little Hope/Port Mouton	8%	18%	39%	14%	7%	9%	6%	5%	13%	54%	8%	10%	12%	9%	17%	3%	8%	3%	10%	8%	8%	13%
Halifax/Eastern Shore	13%	8%	12%	11%	8%	3%	15%	9%	5%	13%	8%	11%	9%	19%	22%	20%	12%	1%	3%	4%	10%	10%
Glace Bay	-	52%	-	6%	40%	6%	-	20%	-	19%	2%	4%	-	-	-	-	-	-	-	-	-	18%
Bras d'Or Lakes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 29A. Herring catch at age for the 2015 Coastal Nova Scotia gillnet fisheries (does not include trap = 5 t) with numbers caught (thousands), weight (t) and percent, average length and average weight by age.

Coastal NS Gillnet (5,161 t)	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)	-	-	669	1,610	8,128	5,631	5,191	3,461	1,277	406	48	26,421
% numbers	0%	0%	3%	6%	31%	21%	20%	13%	5%	2%	0%	100%
Catch wt. (t)	-	-	78	248	1,455	1,124	1,118	749	281	93	16	5,161
% catch wt.	0%	0%	2%	5%	28%	22%	22%	15%	5%	2%	0%	100%
Avg. len (cm)	-	-	25.1	27.2	28.5	29.3	30.0	30.1	30.3	30.7	33.8	29.1
Avg. wt. (g)	-	-	116.3	154.1	179.0	199.6	215.4	216.4	220.2	228.5	321.6	195.3
Halifax/Eastern Shore Gillnet (1,001 t)	**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)	-	-	228	471	2,208	1,128	744	549	172	70	2	5,571
% numbers	0%	0%	4%	8%	40%	20%	13%	10%	3%	1%	0%	100%
Catch wt. (t)	-	-	26	71	379	211	149	112	37	15	0	1,001
% catch wt.	0%	0%	3%	7%	38%	21%	15%	11%	4%	2%	0%	100%
Avg. len (cm)	-	-	24.8	27.2	28.2	28.9	29.5	29.7	30.1	30.4	32.5	28.5
Avg. wt. (g)	-	-	112.7	151.4	171.8	187.1	200.9	203.7	213.4	221.2	275.9	179.7
Little Hope Gillnet (4,160 t)	**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)	-	-	461	1,172	5,990	4,506	4,422	2,886	1,091	331	46	20,905
% numbers	0%	0%	2%	6%	29%	22%	21%	14%	5%	2%	0%	100%
Catch wt. (t)	-	-	54	182	1,086	912	962	631	241	76	15	4,160
% catch wt.	0%	0%	1%	4%	26%	22%	23%	15%	6%	2%	0%	100%
Avg. len (cm)	-	-	25.3	27.2	28.5	29.4	30.0	30.2	30.3	30.7	33.8	29.3
Avg. wt. (g)	-	-	117.8	154.9	181.4	202.4	217.6	218.7	221.2	229.8	322.8	199.0

Table 29B. Herring catch at age for the 2016 Coastal Nova Scotia gillnet fisheries (includes trap = 21 t) with numbers caught (thousands), weight (t) and percent, average length and average weight by age.

Coastal NS Gillnet (7,788 t)	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)	-	-	354	4,136	3,588	15,504	7,821	4,438	2,555	765	348	39,510
% numbers	0%	0%	1%	10%	9%	39%	20%	11%	6%	2%	1%	100%
Catch wt. (t)	-	-	36	595	668	3,009	1,637	989	585	179	90	7,788
% catch wt.	0%	0%	0%	8%	9%	39%	21%	13%	8%	2%	1%	100%
Avg. len (cm)	-	-	24.1	26.7	28.9	29.2	29.9	30.5	30.7	31.0	31.9	29.3
Avg. wt. (g)	-	-	102.7	143.9	186.1	194.1	209.3	222.9	228.8	234.2	259.1	197.1
Halifax/Eastern Shore Gillnet (1,838 t)	**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)	-	-	214	1,605	1,044	3,778	1,586	838	531	174	77	9,847
% numbers	0%	0%	2%	16%	11%	38%	16%	9%	5%	2%	1%	100%
Catch wt. (t)	-	-	21	227	186	710	326	185	123	40	19	1,838
% catch wt.	0%	0%	1%	12%	10%	39%	18%	10%	7%	2%	1%	100%
Avg. len (cm)	-	-	24.0	26.6	28.5	29.0	29.8	30.5	30.9	30.9	31.7	28.9
Avg. wt. (g)	-	-	100.0	141.3	177.9	187.9	205.9	221.2	231.2	232.1	251.4	186.7
Little Hope Gillnet (5,943 t)	**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	2,525	2,541	11,710	6,229	3,598	2,022	591	271	29,627
% numbers	0%	0%	0%	9%	9%	40%	21%	12%	7%	2%	1%	100%
Catch wt. (t)	-	-	15	367	481	2,296	1,309	803	461	139	71	5,943
% catch wt.	0%	0%	0%	6%	8%	39%	22%	14%	8%	2%	1%	100%
Avg. len (cm)	-	-	24.3	26.8	29.0	29.3	29.9	30.5	30.7	31.0	32.0	29.5
Avg. wt. (g)	-	-	106.8	145.5	189.4	196.1	210.2	223.3	228.2	234.8	261.3	200.6

Table 29C. Herring catch at age for the 2017 Coastal Nova Scotia gillnet fisheries (includes trap and handline = 12 t) with numbers caught (thousands), weight (t) and percent, average length, and average weight by age.

Coastal NS Gillnet (7,828 t)	**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)	-	48	920	4,007	9,328	10,531	10,445	5,139	1,855	684	81	43,038
% numbers	0%	0%	2%	9%	22%	24%	24%	12%	4%	2%	0%	100%
Catch wt. (t)	-	4	96	517	1,479	2,007	2,032	1,099	407	165	23	7,828
% catch wt.	0%	0%	1%	7%	19%	26%	26%	14%	5%	2%	0%	100%
Avg. len (cm)	-	23.0	24.6	26.2	27.9	29.5	29.7	30.5	30.7	31.7	33.1	29.0
Avg. wt. (g)	-	83.6	104.7	129.0	158.6	190.5	194.5	213.9	219.1	241.1	279.8	181.9
Halifax/Eastern Shore Gillnet (2,258 t)	**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)	-	38	581	1,562	2,823	2,889	2,757	1,466	562	166	24	12,868
% numbers	0%	0%	5%	12%	22%	22%	21%	11%	4%	1%	0%	100%
Catch wt. (t)	-	3	59	191	446	545	533	314	123	39	6	2,258
% catch wt.	0%	0%	3%	8%	20%	24%	24%	14%	5%	2%	0%	100%
Avg. len (cm)	-	23.0	24.3	25.7	27.8	29.4	29.6	30.5	30.6	31.5	32.0	28.6
Avg. wt. (g)	-	83.6	100.9	122.3	157.9	188.8	193.2	213.9	218.4	236.2	255.1	175.5
Little Hope Gillnet (5,558 t)	**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	337	2,431	6,485	7,623	7,680	3,668	1,292	517	56	30,098
% numbers	0%	0%	1%	8%	22%	25%	26%	12%	4%	2%	0%	100%
Catch wt. (t)	-	1	37	324	1,030	1,458	1,498	785	283	126	16	5,558
% catch wt.	0%	0%	1%	6%	19%	26%	27%	14%	5%	2%	0%	100%
Avg. len (cm)	-	23.0	25.0	26.5	27.9	29.5	29.7	30.6	30.8	31.8	33.5	29.2
Avg. wt. (g)	-	83.6	111.1	133.4	158.8	191.3	195.0	213.9	219.5	242.7	290.6	184.7

Table 30. Monthly landings (t) of Herring from weirs located in New Brunswick from 1978 to 2017.

YEAR	MONTH												Year Total
	Jan	Feb	Mar	Apr	May	June	July	Aug.	Sept	Oct	Nov	Dec	
1978	3	0	0	0	512	802	5,499	10,275	10,877	4,972	528	132	33,599
1979	535	96	0	0	25	1,120	7,321	9,846	4,939	5,985	2,638	74	32,579
1980	0	0	0	0	36	119	1,755	5,572	2,352	1,016	216	0	11,066
1981	0	0	0	0	70	199	4,431	3,911	2,044	2,435	1,686	192	14,968
1982	0	17	0	0	132	30	2,871	7,311	7,681	3,204	849	87	22,181
1983	0	0	0	0	65	29	299	2,474	5,382	3,945	375	0	12,568
1984	0	0	0	0	6	3	230	2,344	2,581	3,045	145	0	8,353
1985	0	0	0	0	22	89	4,217	8,450	6,910	4,814	2,078	138	26,718
1986	43	0	0	0	17	0	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	0	12	1	90	657	287	5,993	11,975	8,375	8,457	2,343	43	38,235
1989	0	24	0	95	37	385	8,315	15,093	10,156	7,258	2,158	0	43,520
1990	0	0	0	0	93	20	4,915	14,664	12,207	7,741	168	0	39,808
1991	0	0	0	0	57	180	4,649	10,319	6,392	2,028	93	0	23,717
1992	0	0	0	15	50	774	5,477	10,989	9,597	4,395	684	0	31,981
1993	0	0	0	0	14	168	5,561	14,085	8,614	2,406	470	10	31,328
1994	0	0	0	18	0	55	4,529	10,592	3,805	1,589	30	0	20,618
1995	0	0	0	0	15	244	4,517	8,590	3,956	896	10	0	18,228
1996	0	0	0	0	19	676	4,819	7,767	1,917	518	65	0	15,781
1997	0	0	0	8	153	1,017	6,506	7,396	5,316	0	0	0	20,396
1998	0	0	0	0	560	713	3,832	8,295	5,604	525	0	0	19,529
1999	0	0	0	0	690	805	5,155	9,895	2,469	48	0	0	19,063
2000	0	0	0	0	10	7	2,105	7,533	4,940	1,713	69	0	16,376
2001	0	0	0	0	35	478	3,931	8,627	5,514	1,479	0	0	20,064
2002	0	0	0	0	84	20	1,099	6,446	2,878	1,260	20	0	11,807
2003	0	0	0	0	257	250	1,423	3,554	3,166	344	10	0	9,003
2004	0	0	0	0	21	336	2,694	8,354	8,298	913	3	0	20,620
2005	0	0	0	0	0	213	802	7,145	3,729	740	11	0	12,639
2006	0	0	0	0	8	43	1,112	3,731	3,832	2,328	125	462	11,641
2007	182	0	20	30	84	633	3,241	11,363	7,637	6,567	314	73	30,145
2008	0	0	0	0	0	81	1,502	2,479	1,507	389	49	32	6,041
2009	0	0	0	0	5	239	699	1,111	1,219	330	0	0	3,603
2010	0	0	0	6	64	1,912	2,560	3,903	1,933	247	46	0	10,671
2011	0	0	0	0	0	250	656	1,097	500	140	0	0	2,643
2012	0	0	0	0	29	140	5	5	98	217	0	0	494
2013	0	0	0	0	7	612	1,517	1,797	1,051	919	0	0	5,902
2014	0	0	0	0	0	70	130	147	449	774	0	0	1,571
2015	0	0	0	0	12	32	28	36	5	33	0	0	146
2016	0	0	0	0	3	0	102	1,034	1,153	485	0	0	2,777
2017	0	0	0	0	0	0	35	220	1,478	0	0	0	1,732
NB Average Landings (t)	20	4	1	7	97	330	2,990	6,736	4,582	2,394	461	36	17,656
NB Minimum Landings (t)	0	0	0	0	0	0	5	5	5	0	0	0	146
NB Maximum Landings (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 2015 New Brunswick juvenile fisheries (weir and shutoff combined) with numbers caught (thousands), weight (t) and percent, average length, and average weight by age.

2015 NB 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)	429	5,945	50	7	4	2	1	-	1	-	-	6,438
% numbers	7%	92%	1%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	4	138	2	1	1	0	0	-	0	-	-	146
% catch wt.	3%	94%	2%	1%	0%	0%	0%	0%	0%	0%	0%	100%
Avg. len (cm)	11.6	15.0	18.7	26.8	27.7	28.2	29.0	-	30.5	-	-	14.9
Avg. wt. (g)	8.9	23.1	47.8	144.8	161.2	172.1	188.2	-	222.9	-	-	22.7

Table 31B. Herring catch at age for the 2016 New Brunswick juvenile fisheries (weir and shutoff combined) with numbers caught (thousands), weight (t) and percent, average length, and average weight by age.

2016 NB 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)	832	61,494	9,109	1,707	657	253	145	181	15	5	-	74,399
% numbers	1%	83%	12%	2%	1%	0%	0%	0%	0%	0%	0%	100%
Catch wt. (t)	21	2,823	794	211	102	44	26	33	3	1	-	4,059
% catch wt.	1%	70%	20%	5%	3%	1%	1%	1%	0%	0%	0%	100%
Avg. len (cm)	15.5	18.4	22.7	25.4	27.3	28.1	28.6	28.7	29.7	29.7	-	19.2
Avg. wt. (g)	25.4	45.9	87.2	123.9	154.5	171.7	181.7	183.8	205.8	205.6	-	54.6

Table 31C. Herring catch at age for the 2017 New Brunswick juvenile fisheries (weir and shutoff combined) with numbers caught (thousands), weight (t) and percent, average length, and average weight by age.

2017 NB 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)	2,428	13,588	2,361	5,096	1,861	1,234	584	285	82	22	-	27,540
% numbers	9%	49%	9%	19%	7%	4%	2%	1%	0%	0%	0%	100%
Catch wt. (t)	33	574	207	623	273	209	108	55	16	5	-	2,103
% catch wt.	2%	27%	10%	30%	13%	10%	5%	3%	1%	0%	0%	100%
Avg. len (cm)	13.1	18.3	23.0	25.5	27.0	28.2	29.0	29.3	29.4	30.2	-	21.0
Avg. wt. (g)	13.7	42.2	87.8	122.3	146.6	169.6	185.7	192.1	193.6	210.1	-	76.4

FIGURES

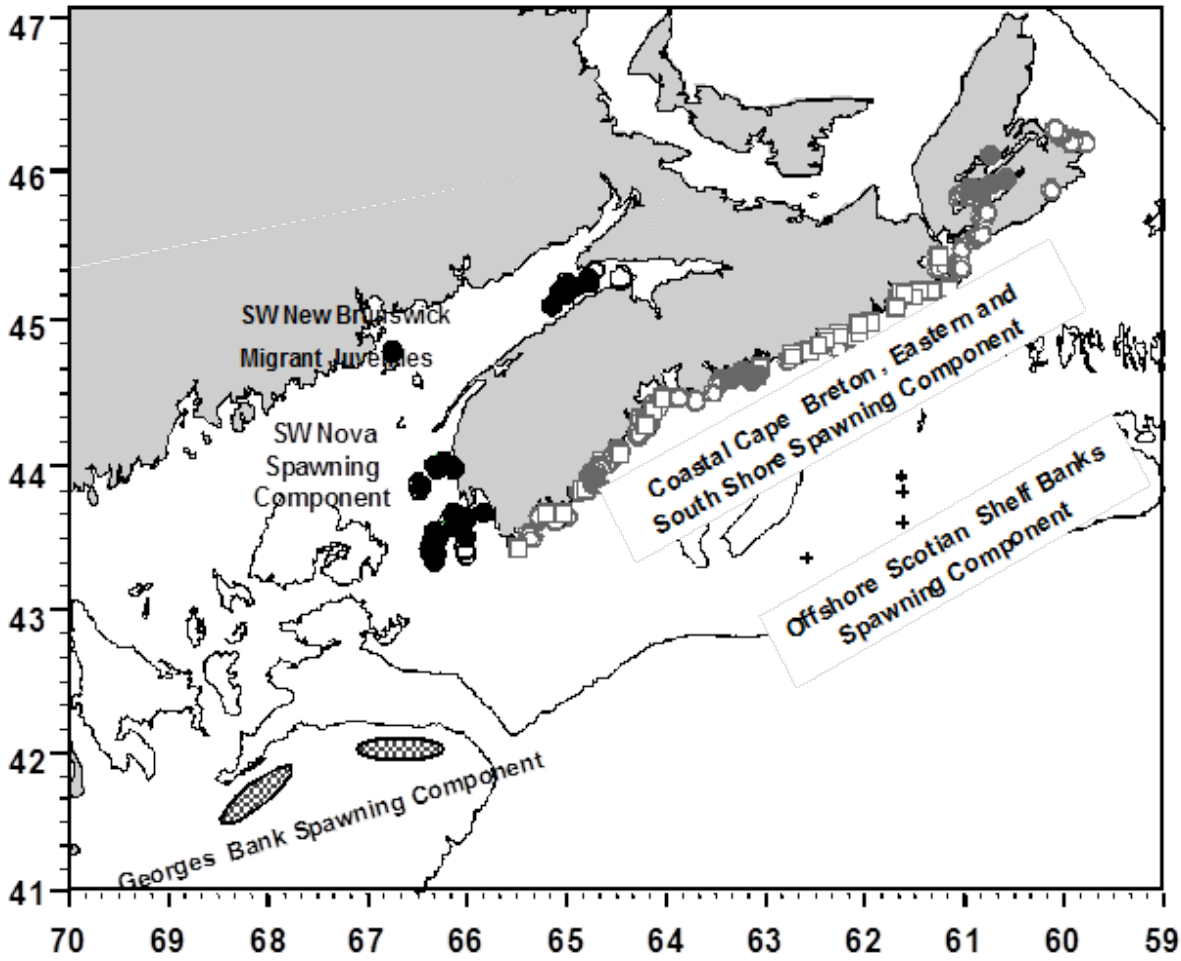


Figure 1. Management units for Herring in NAFO Divisions 4VWX and 5YZ showing locations of known current (solid) and historical (open) spawning locations.

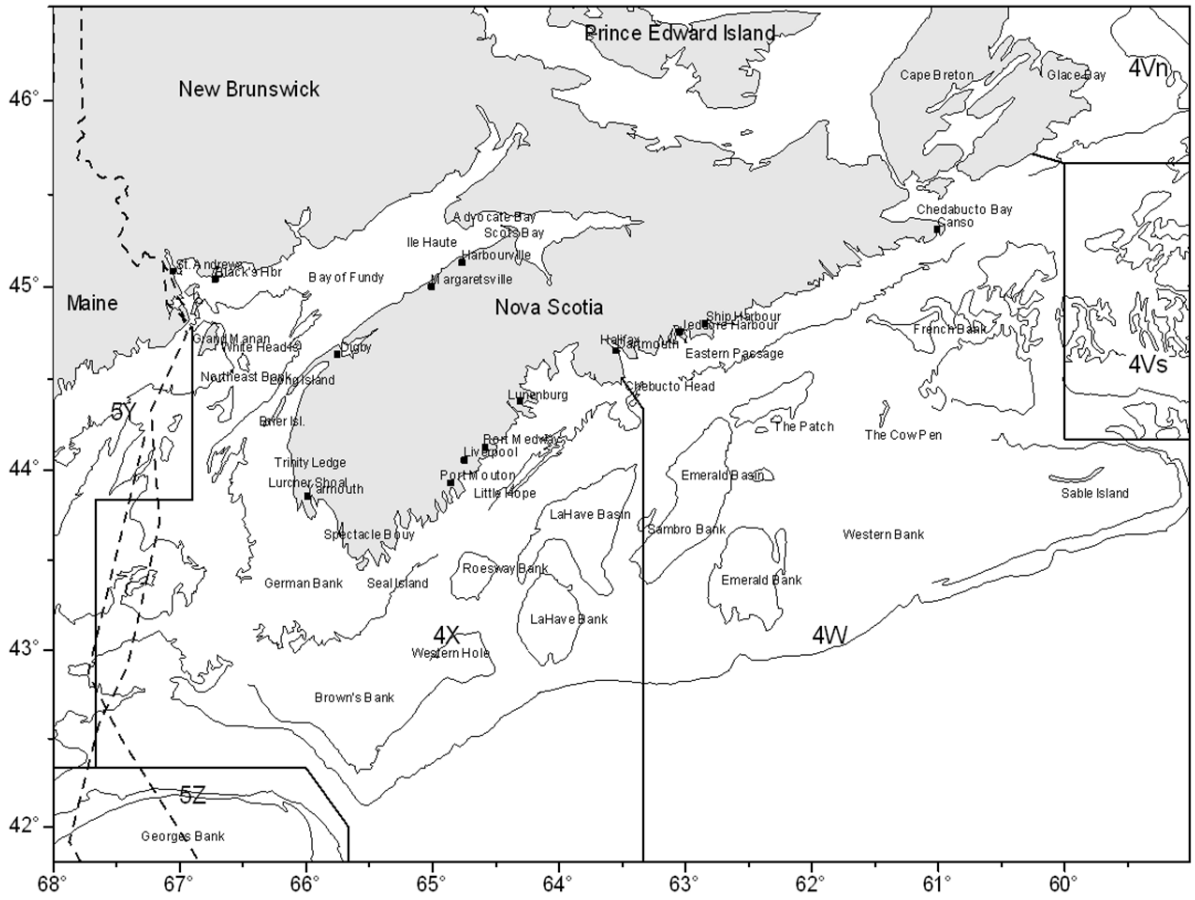


Figure 2. Place names and fishing locations for South West New Brunswick (SWNB), Coastal Nova Scotia, and Scotian Shelf/Bay of Fundy.

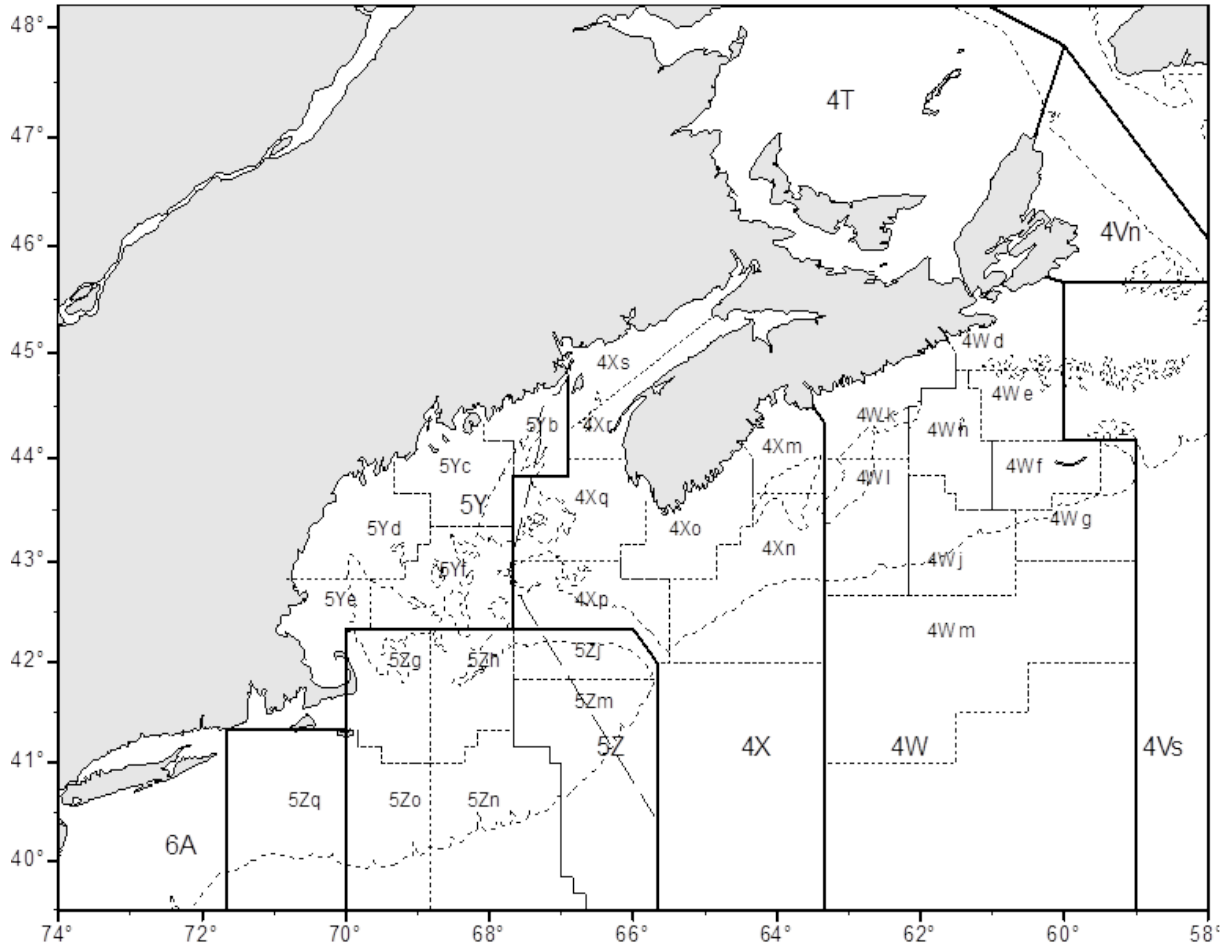


Figure 3. NAFO divisions, subareas, and DFO unit areas used for sample and landings data aggregation.

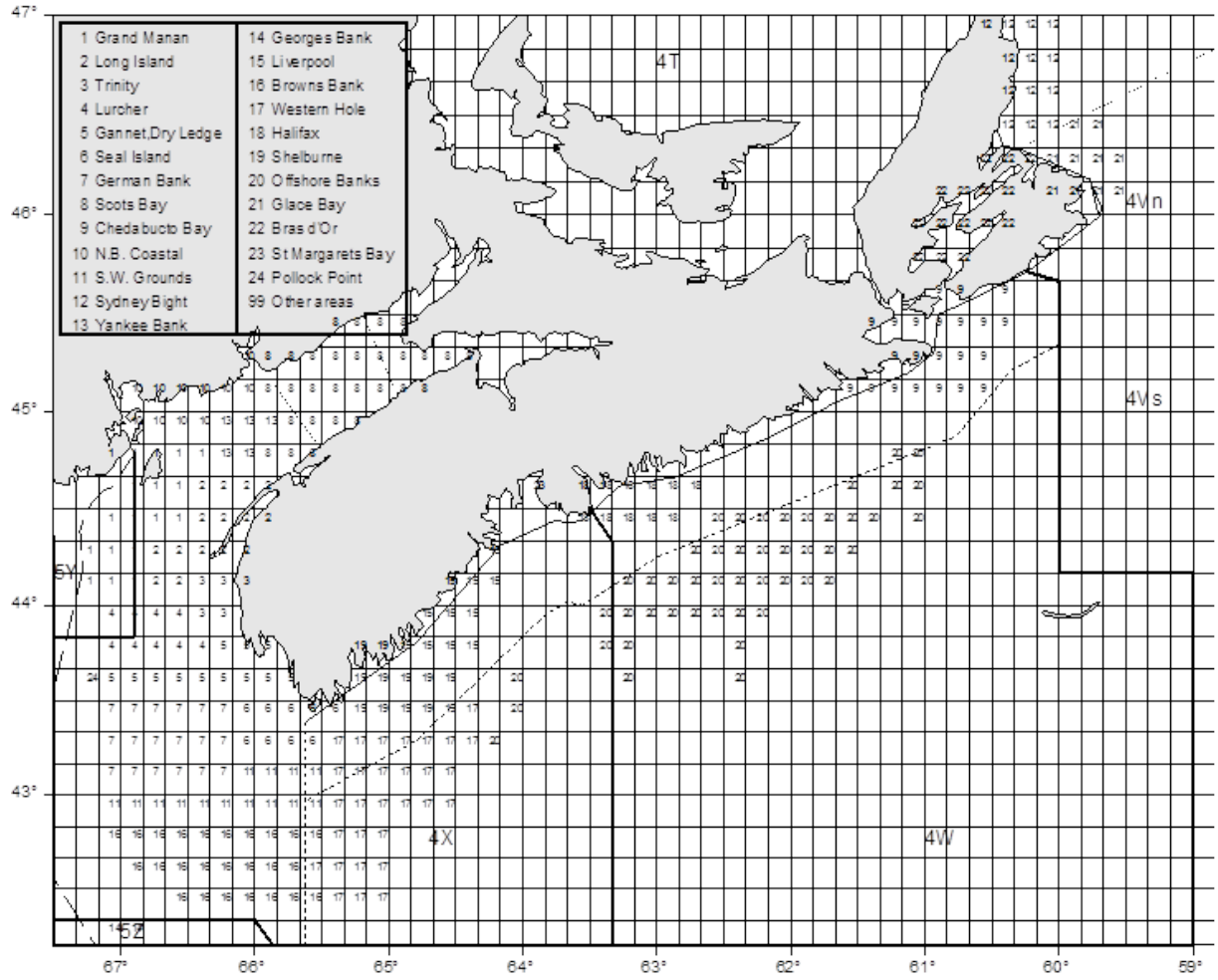


Figure 4. Herring fishing ground areas by 10-mile boxes and management lines for NAFO divisions, 25-mile offshore line, coastal embayment line, and Herring area lines.

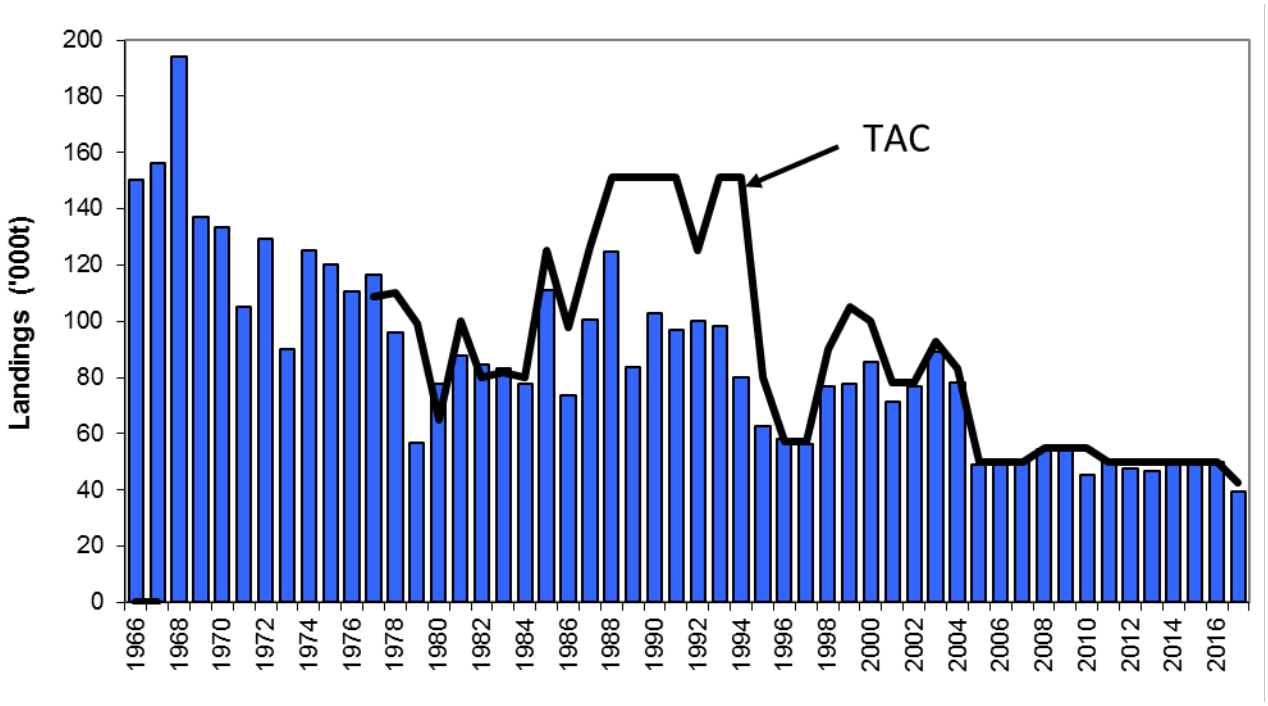


Figure 5. Annual adjusted Herring landings [bars] and Total Allowable Catch (TAC) [solid line] for the SWNS/BoF spawning component (4WX stock).

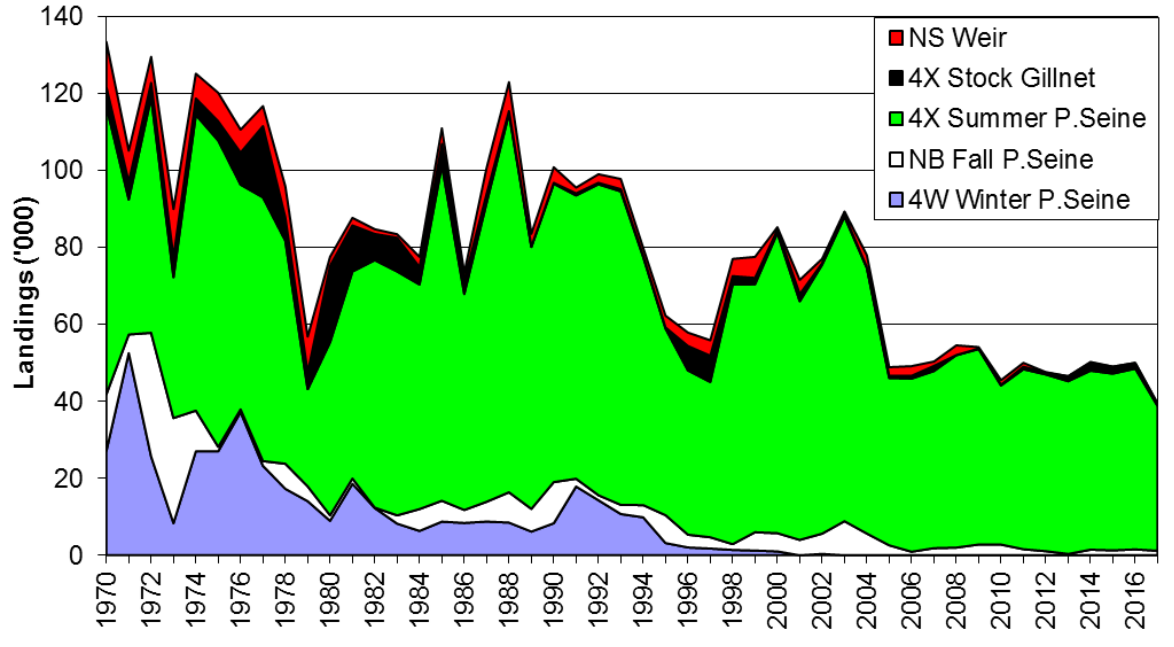


Figure 6. Annual Herring landings by gear component for the SWNS/BoF spawning component (4WX stock) from 1970–2017.

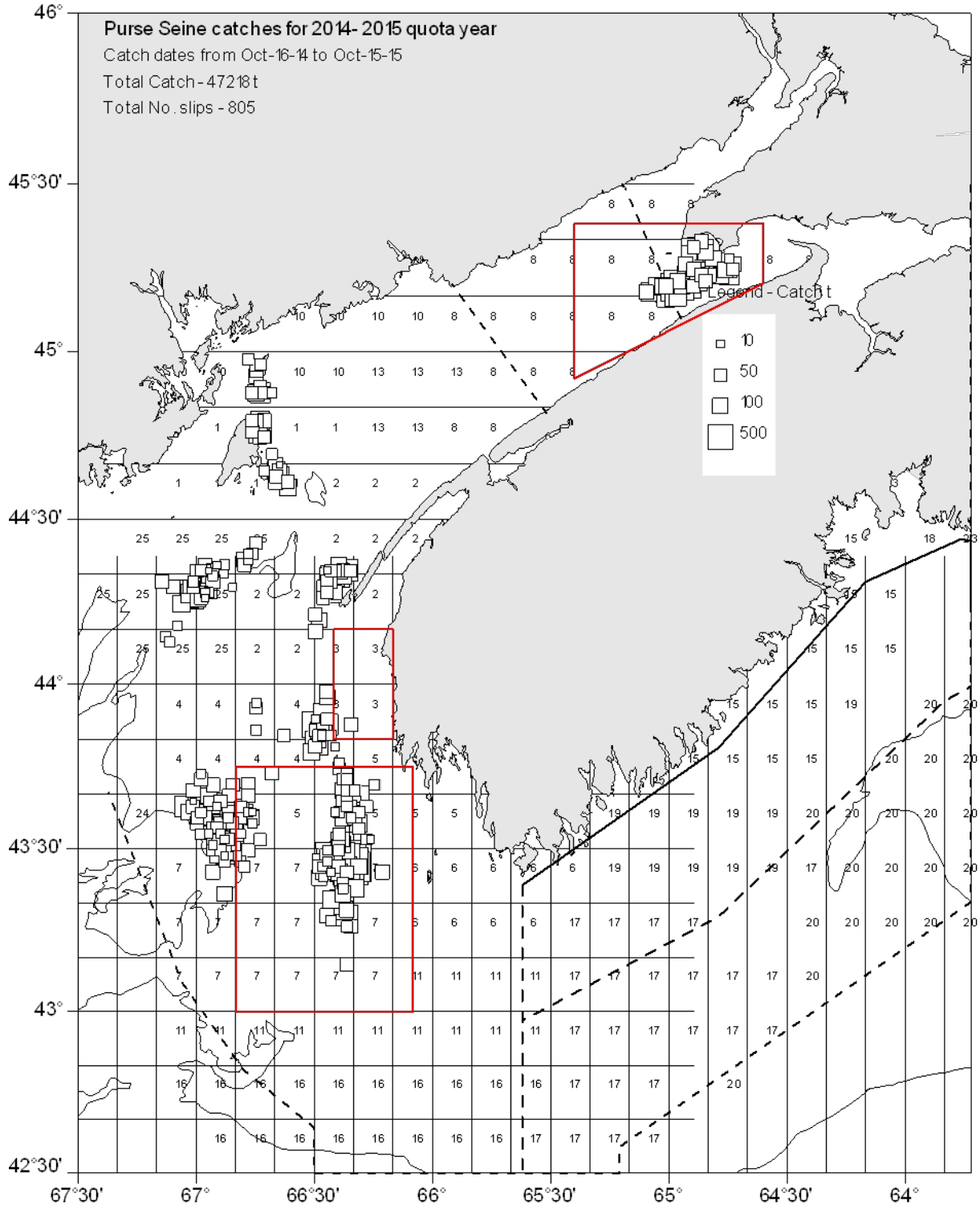


Figure 7A. The 2014–2015 quota year Herring purse seine landings (t) for NAFO Division 4X (from Statistics Division Maritime Fishery Information System (MARFIS) database).

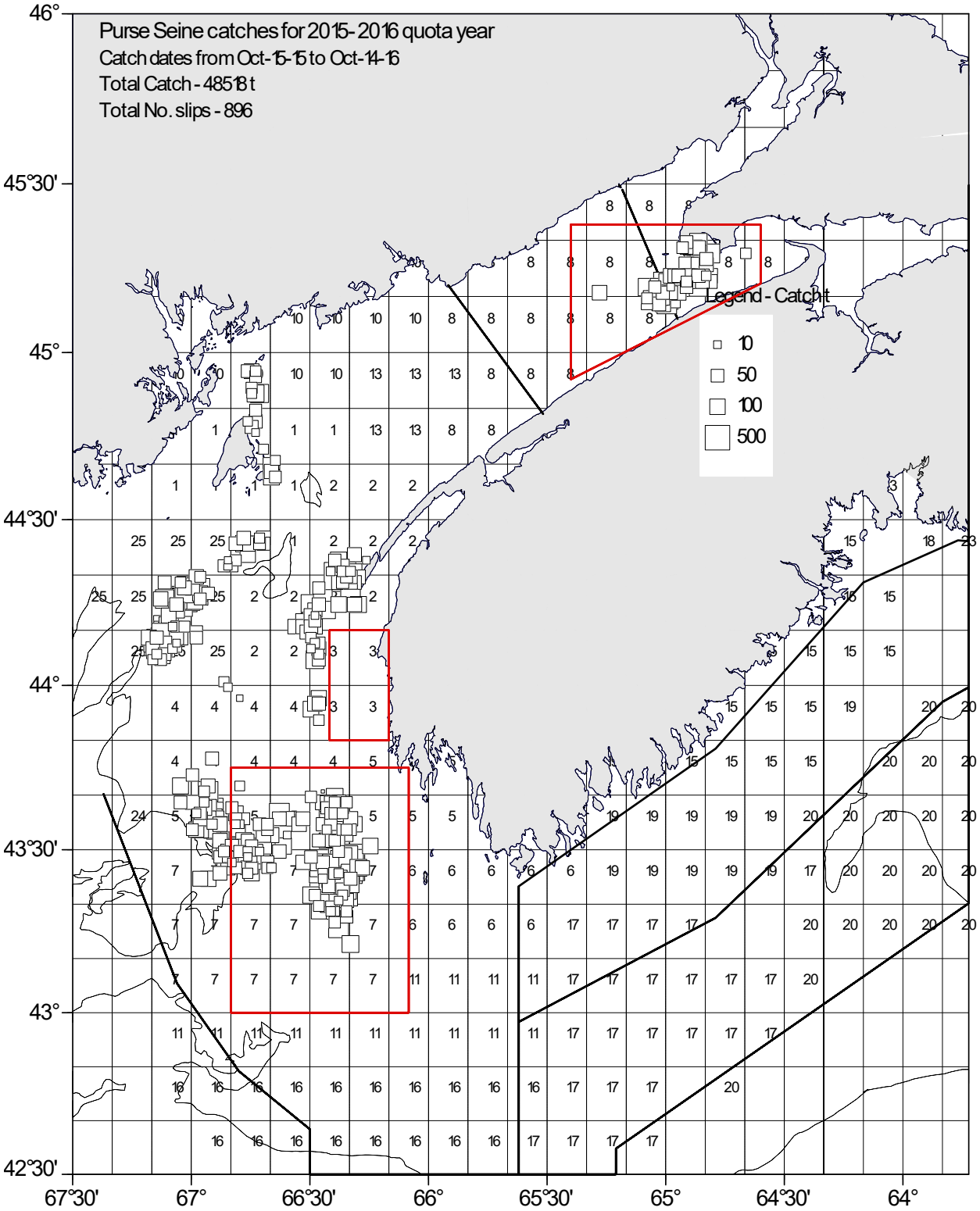


Figure 7B. The 2015–2016 quota year Herring purse seine landings (t) for NAFO Division 4X (from Statistics Division MARFIS database).

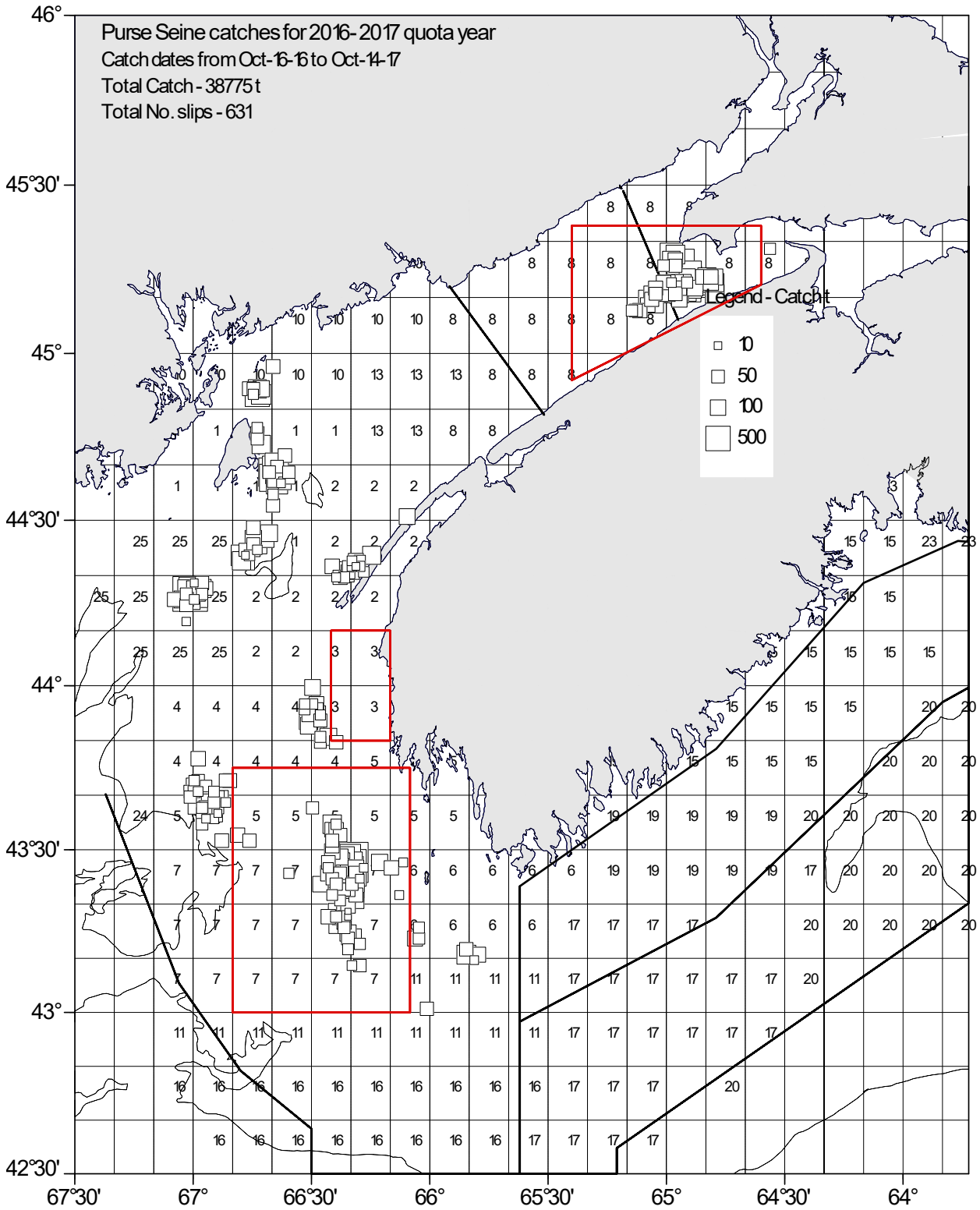


Figure 7C. The 2016–2017 quota year Herring purse seine landings (t) for NAFO Division 4X (from Statistics Division MARFIS database).

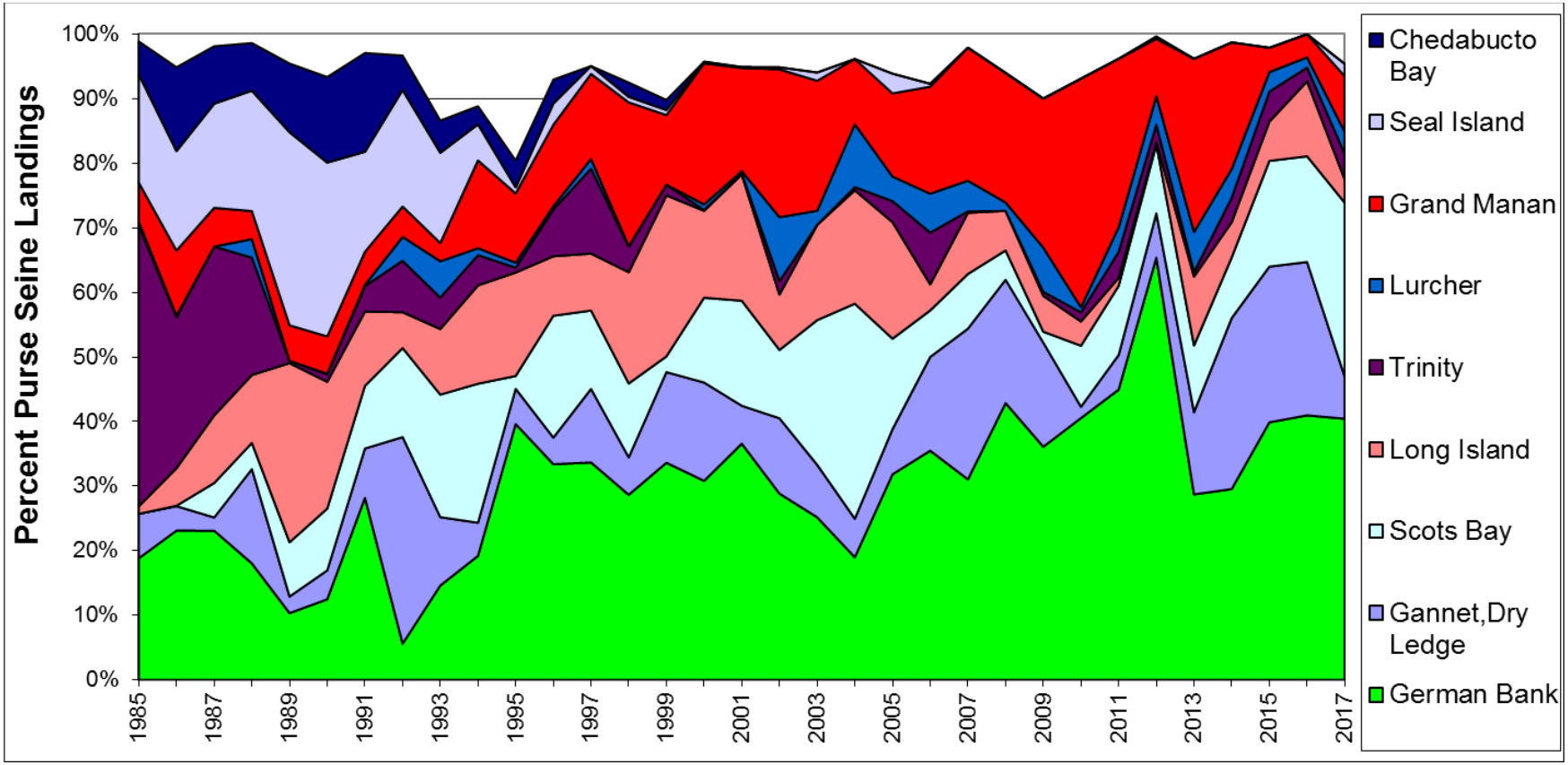


Figure 8. Herring purse seine catches as a proportion of overall landings (%) for selected fishing grounds in the SWNS/BoF spawning component from 1985–2017.

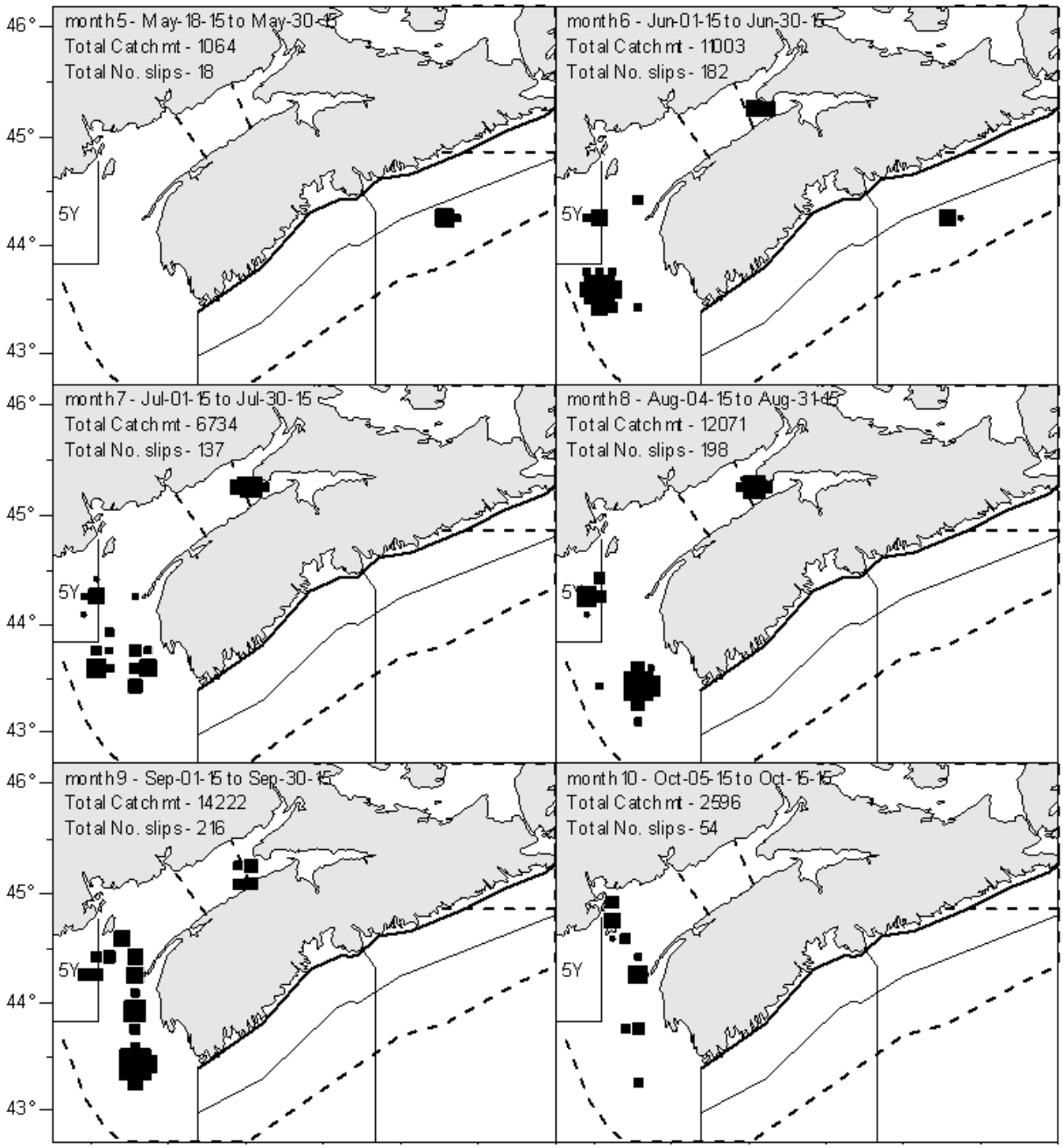


Figure 9A. 2014–2015 Herring purse seine landings (t) by month in NAFO Divisions 4WX (from Statistics Division MARFIS database).

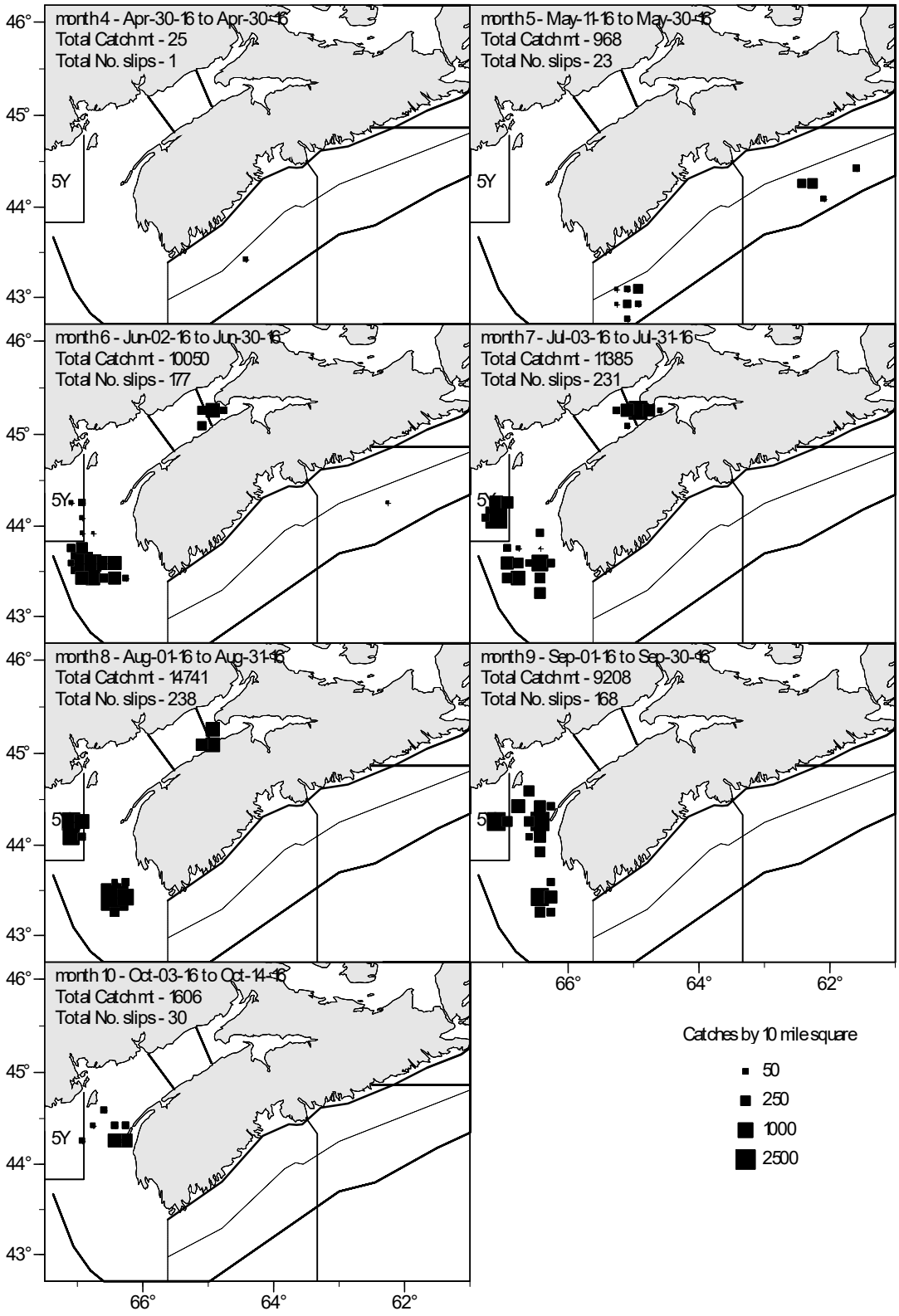


Figure 9B. 2015–2016 Herring purse seine landings (t) by month in NAFO Divisions 4WX (from Statistics Division MARFIS database).

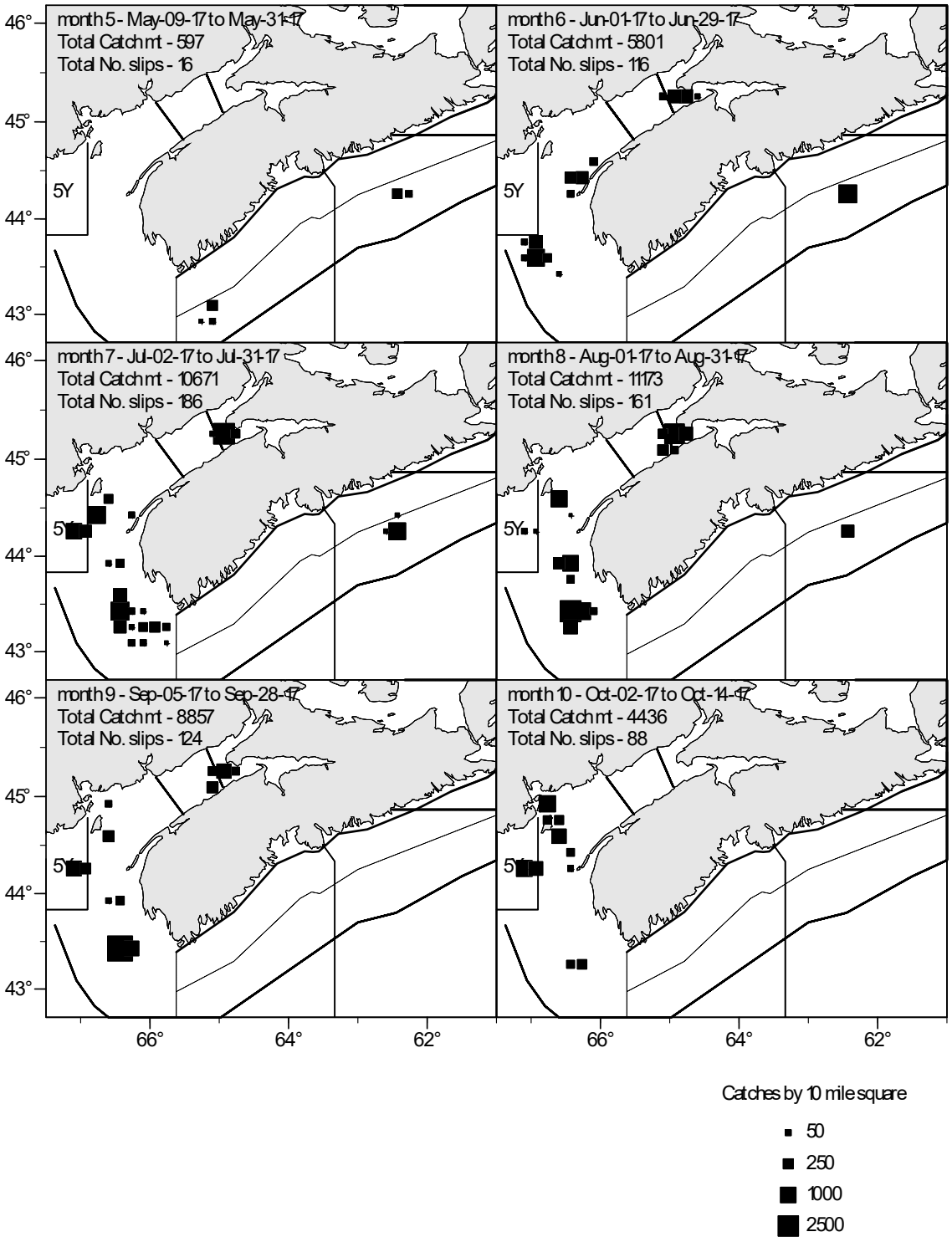


Figure 9C. 2016–2017 Herring purse seine landings (t) by month in NAFO Divisions 4WX (from Statistics Division MARFIS database).

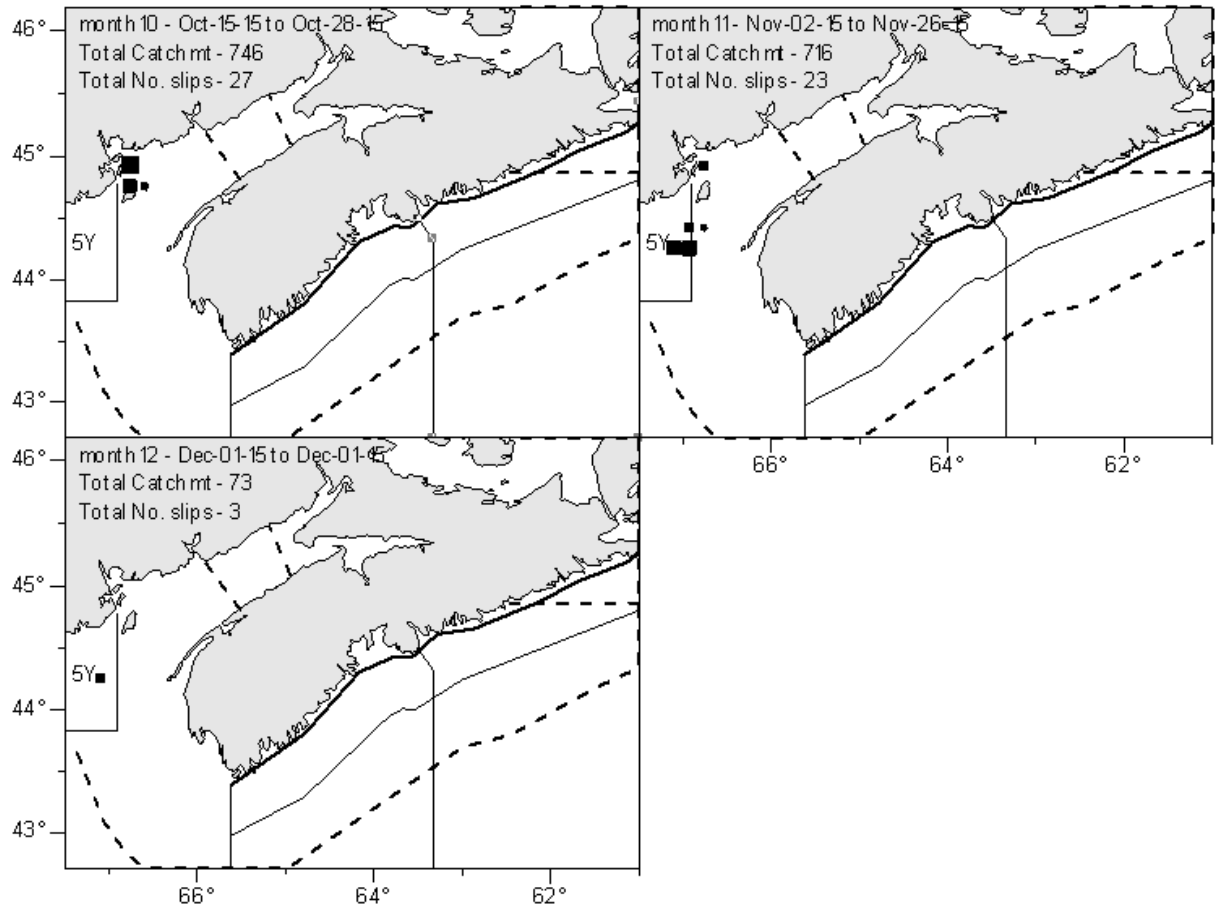


Figure 10A. Fall 2015 Herring purse seine landings (t) by month in NAFO Division 4X (part of 2015–2016 quota year).

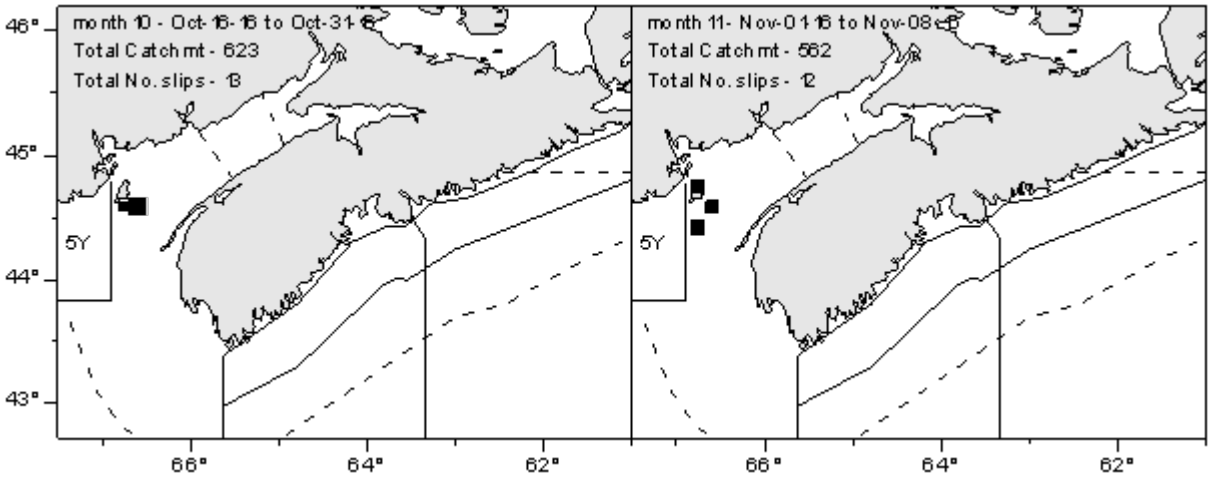


Figure 10B. Fall 2016 Herring purse seine landings (t) by month in NAFO Division 4X (part of 2016–2017 quota year).

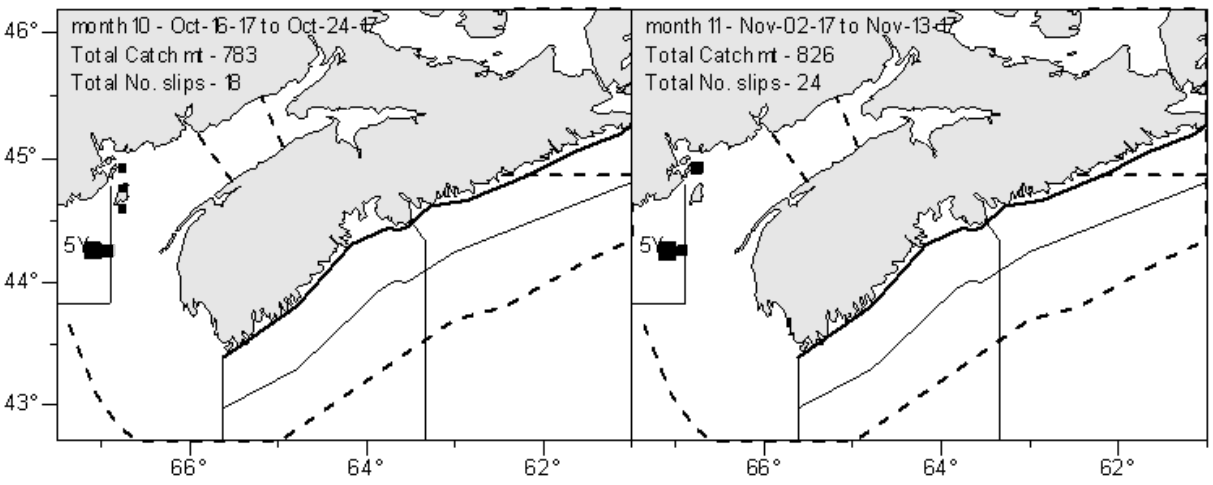


Figure10C. Fall 2017 Herring purse seine landings (t) by month in NAFO Division 4X (part of 2017–2018 quota year).

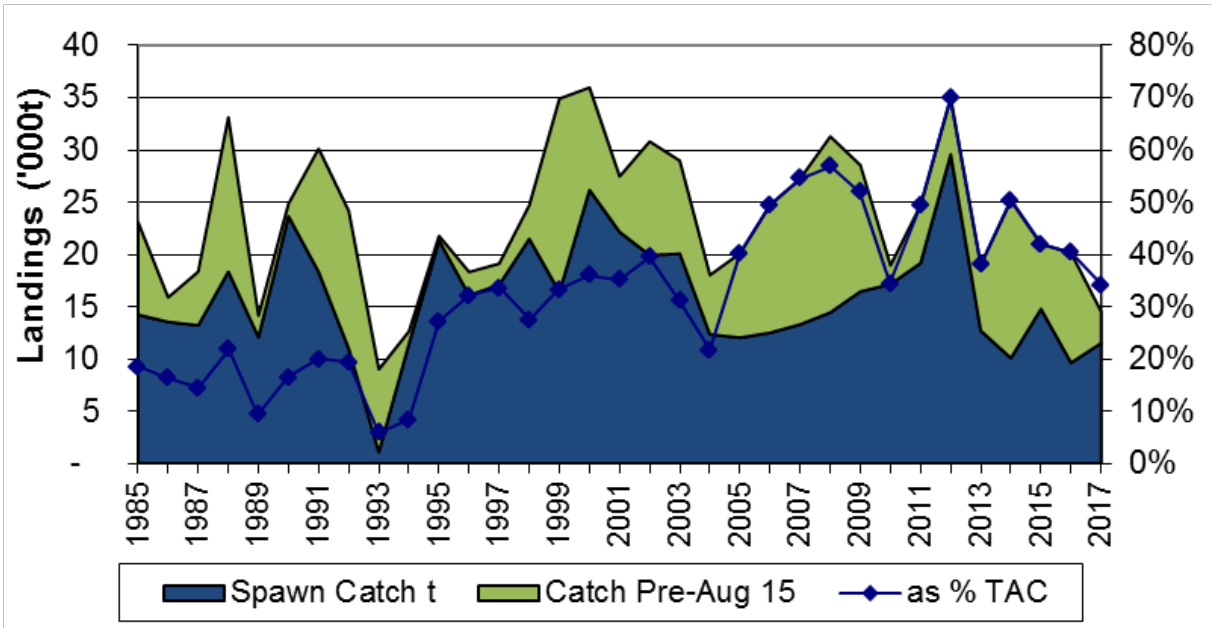


Figure 11. Annual Herring purse seine landings (t) for the German Bank area from 1985–2017 with pre-spawning and spawning period landings based on an August 15 start date for the defined spawning period and overall German Bank landings as a proportion of the Total Allowable Catch (TAC).

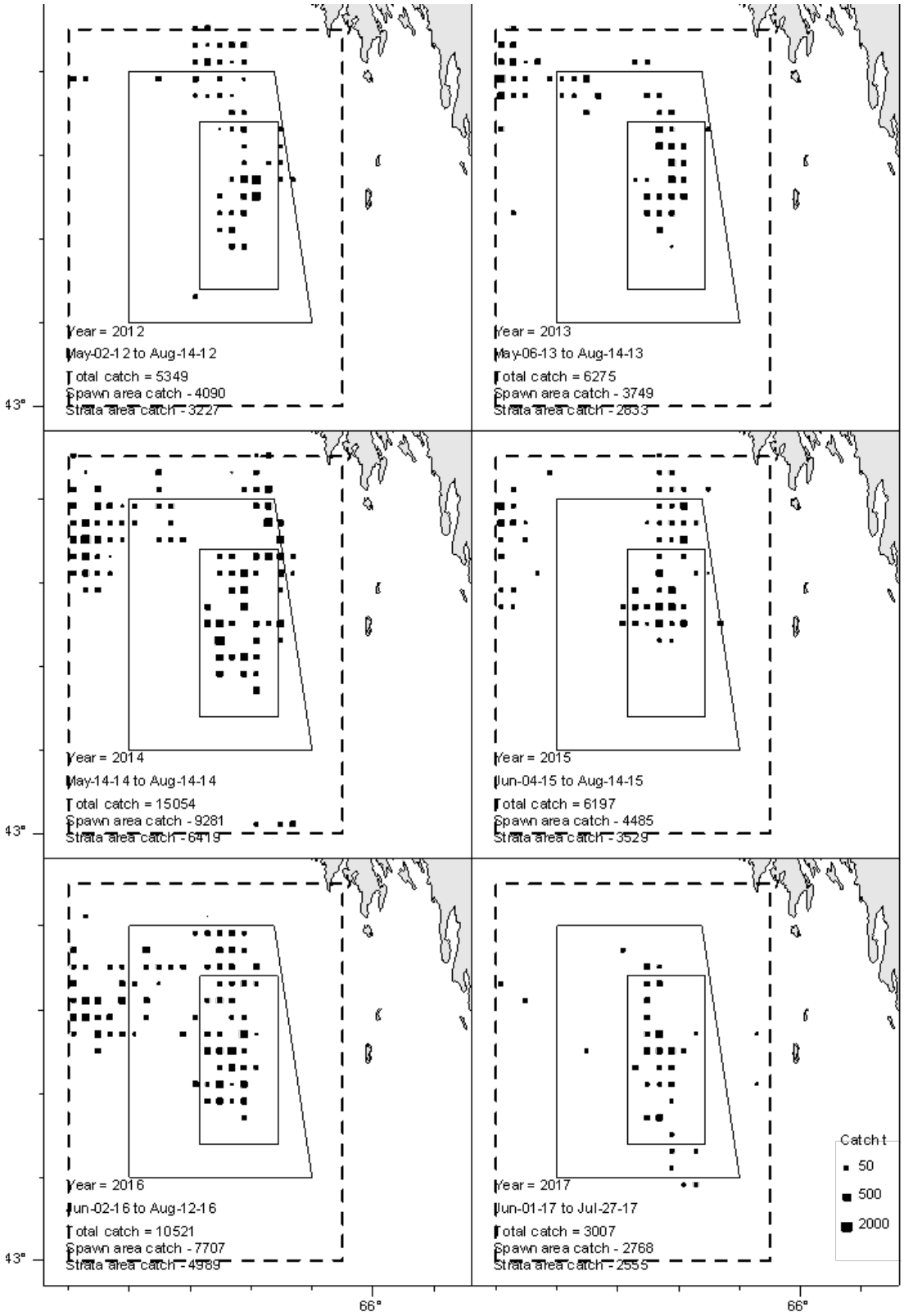


Figure 12. Herring purse seine pre-spawning period landings (t) (January 1 to August 14) for German Bank from 2012–2017 with landed totals for the overall catch area, the middle 'Spawn Box,' and the inner 'Strata Box', which was used as the primary search area in acoustic surveys.

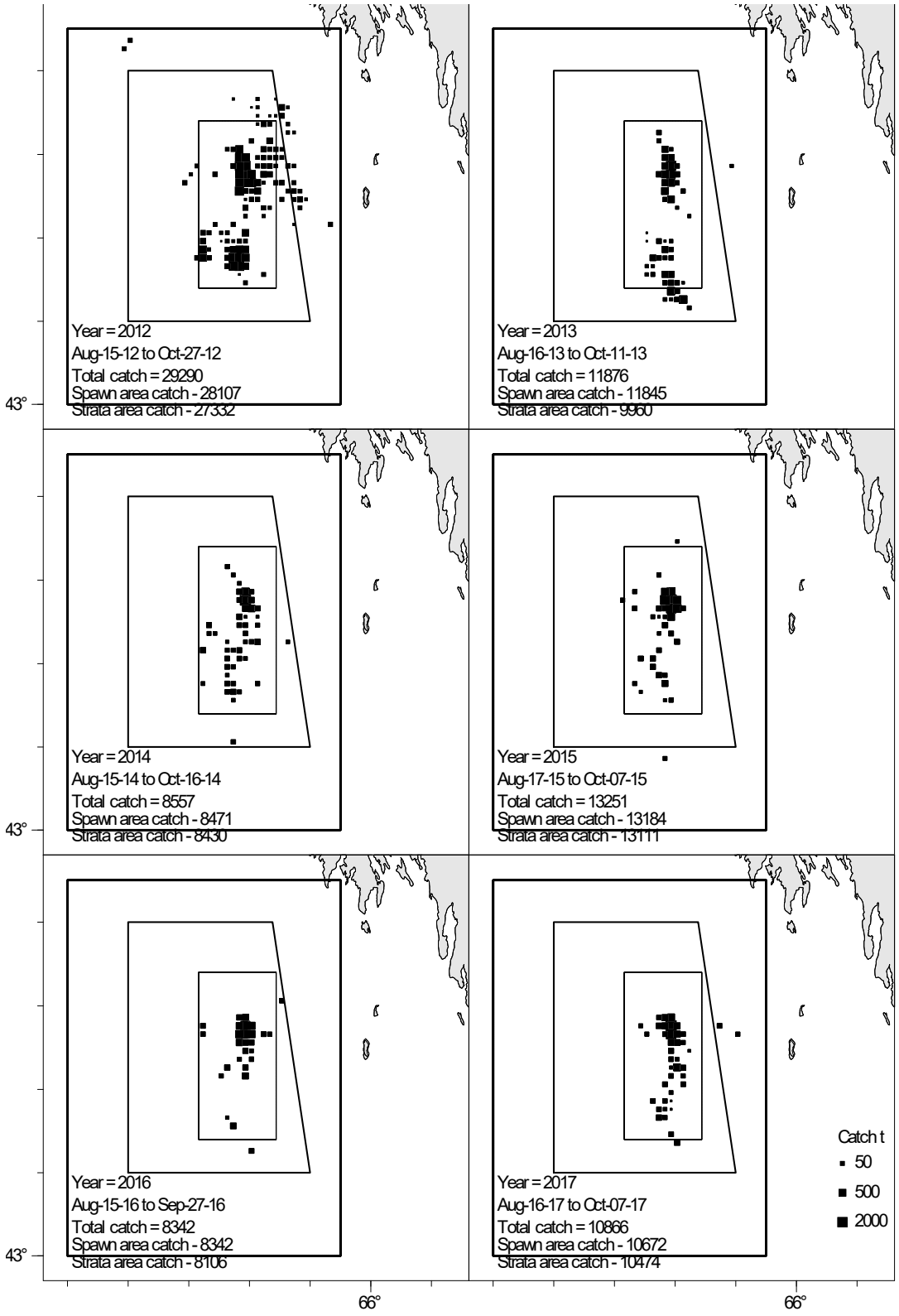


Figure 13. Herring purse seine spawning period landings (t) (August 15 to October 31) for German Bank from 2012–2017 with landed totals for the overall catch area, the middle 'Spawn Box,' and the inner 'Strata Box', which was used as the primary search area in acoustic surveys.

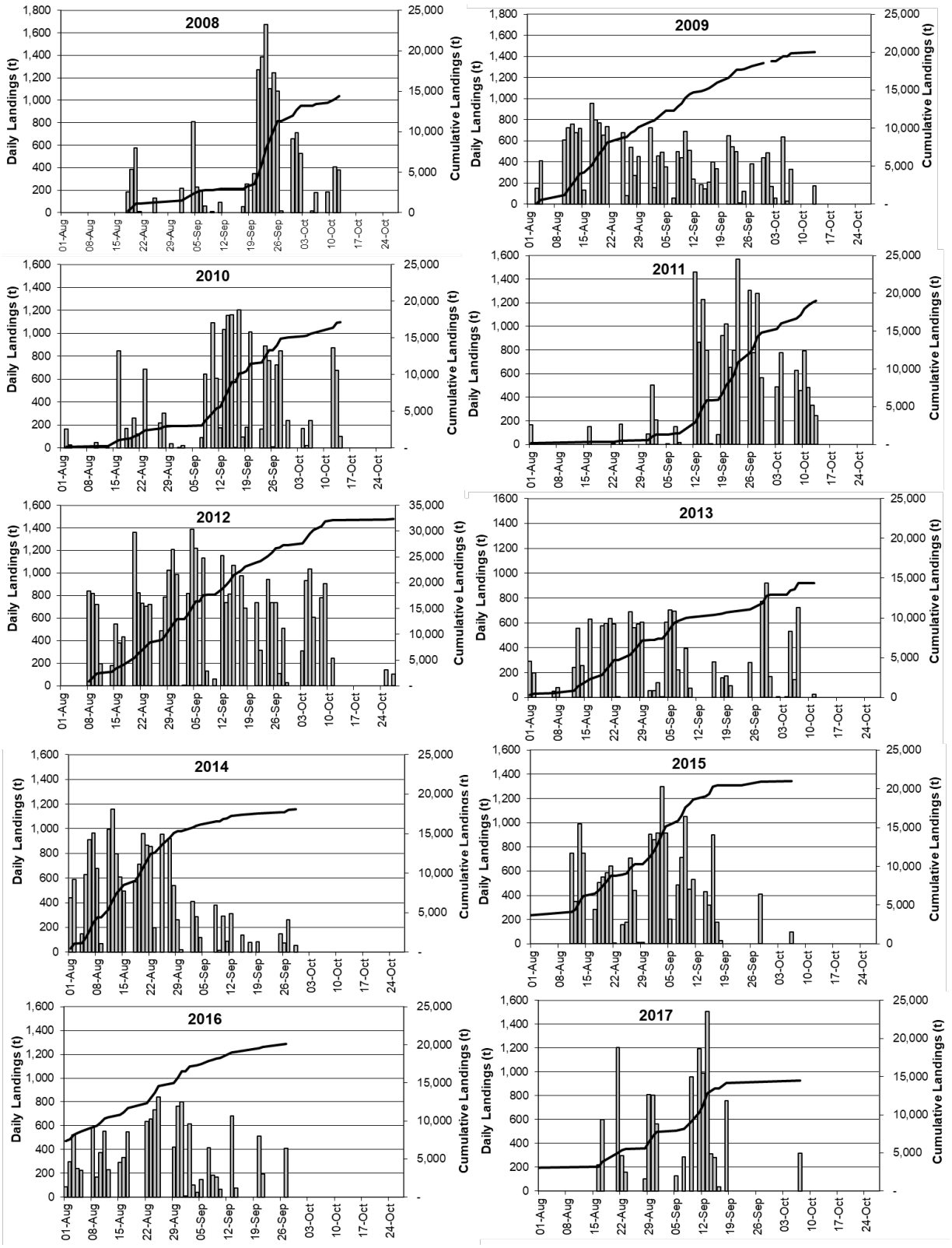


Figure 14. The 2008 to 2017 daily purse seine Herring landings (t) [bars] for German Bank with the cumulative total landed [solid line] over the defined spawning season from August 15 to October 30 (note years after 2014 include landings prior to August 15).

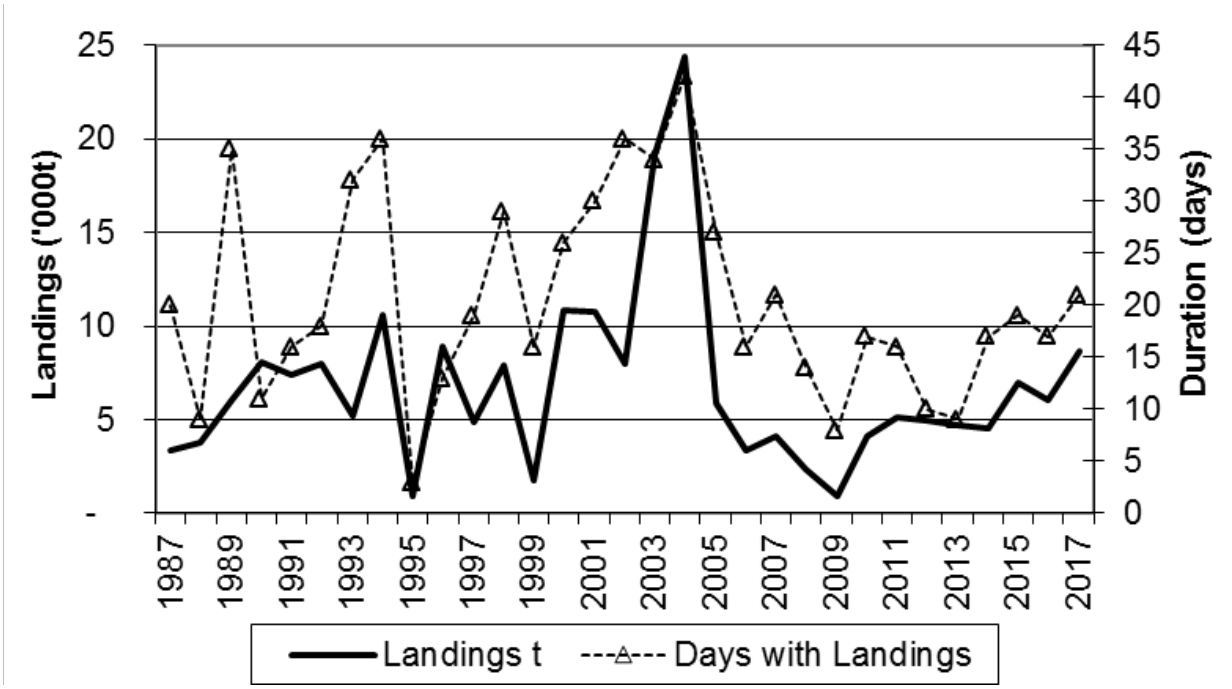


Figure 15. Annual Herring purse seine landings (t) for the Scots Bay area from 1987–2017 with duration of fishery in days (start date to end date).

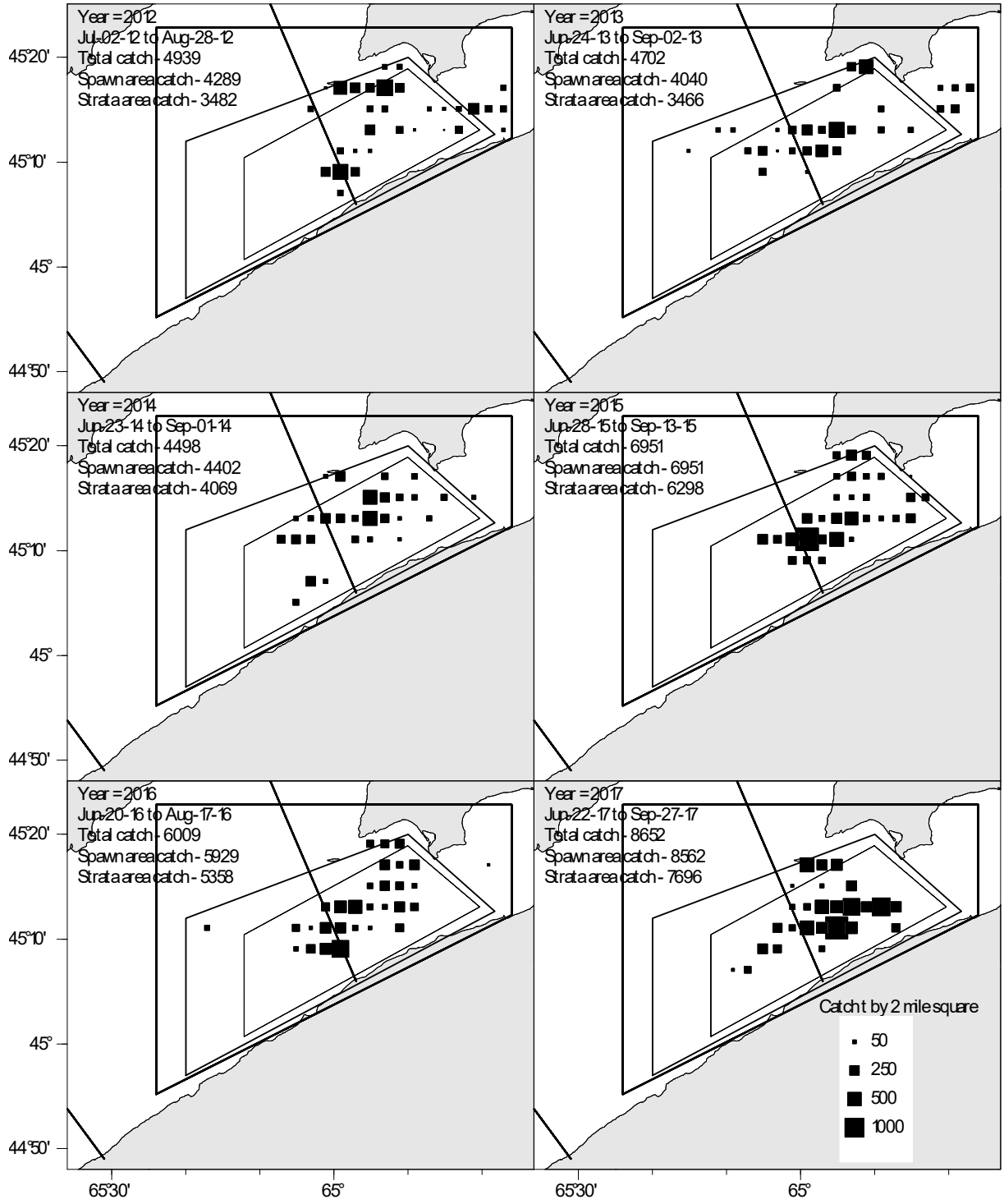


Figure 16. Herring purse seine landings (t) for the Scots Bay area from 2012–2017 with landed totals (t) for the overall area, the middle 'Spawning' area, and the inner 'Strata' area, which is used as the primary search area in acoustic surveys.

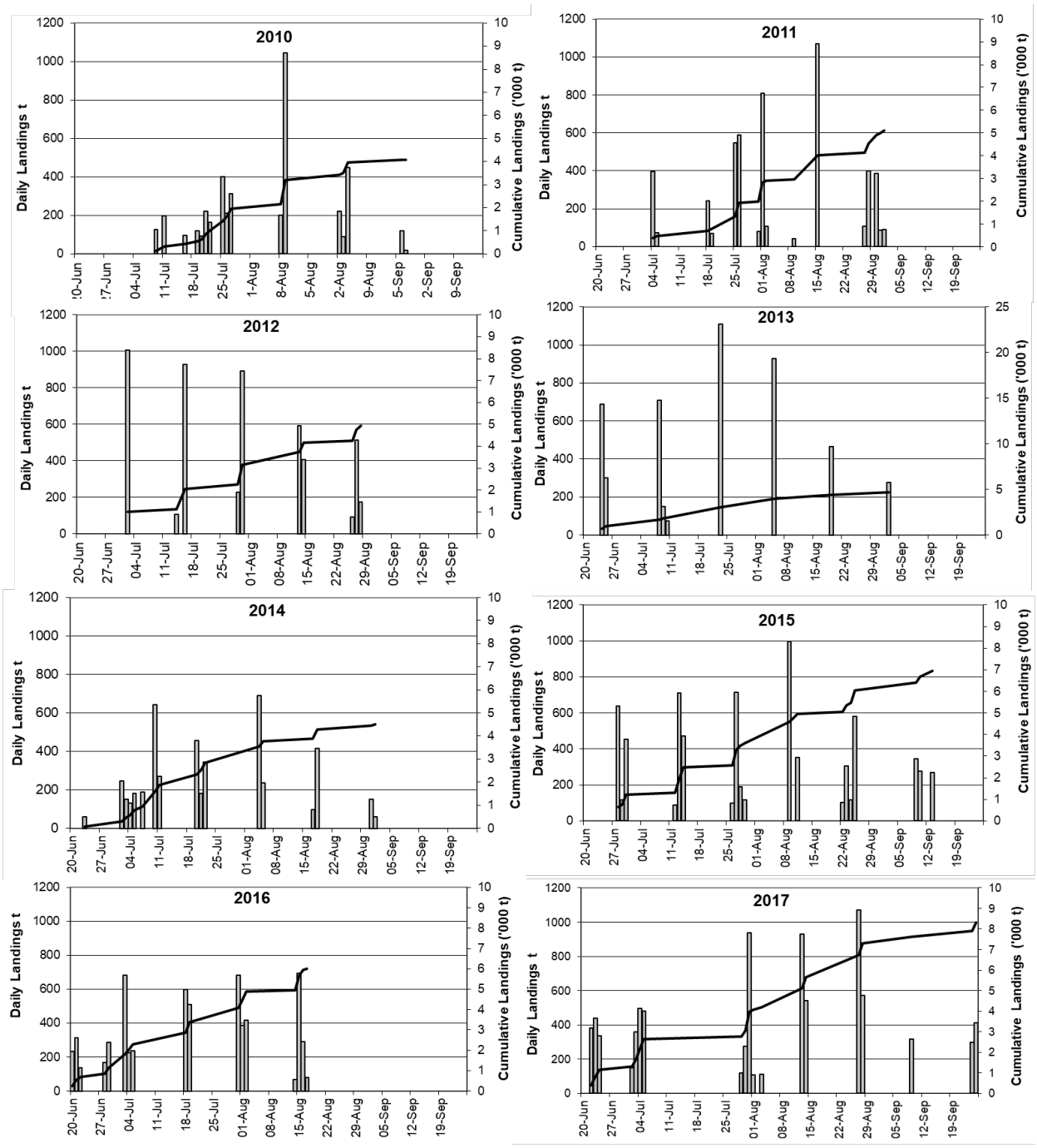


Figure 17. The 2010–2017 Scots Bay daily purse seine Herring landings (t) [bars] for Scots Bay with the cumulative total landed (t) [solid line] over the entire fishing season.

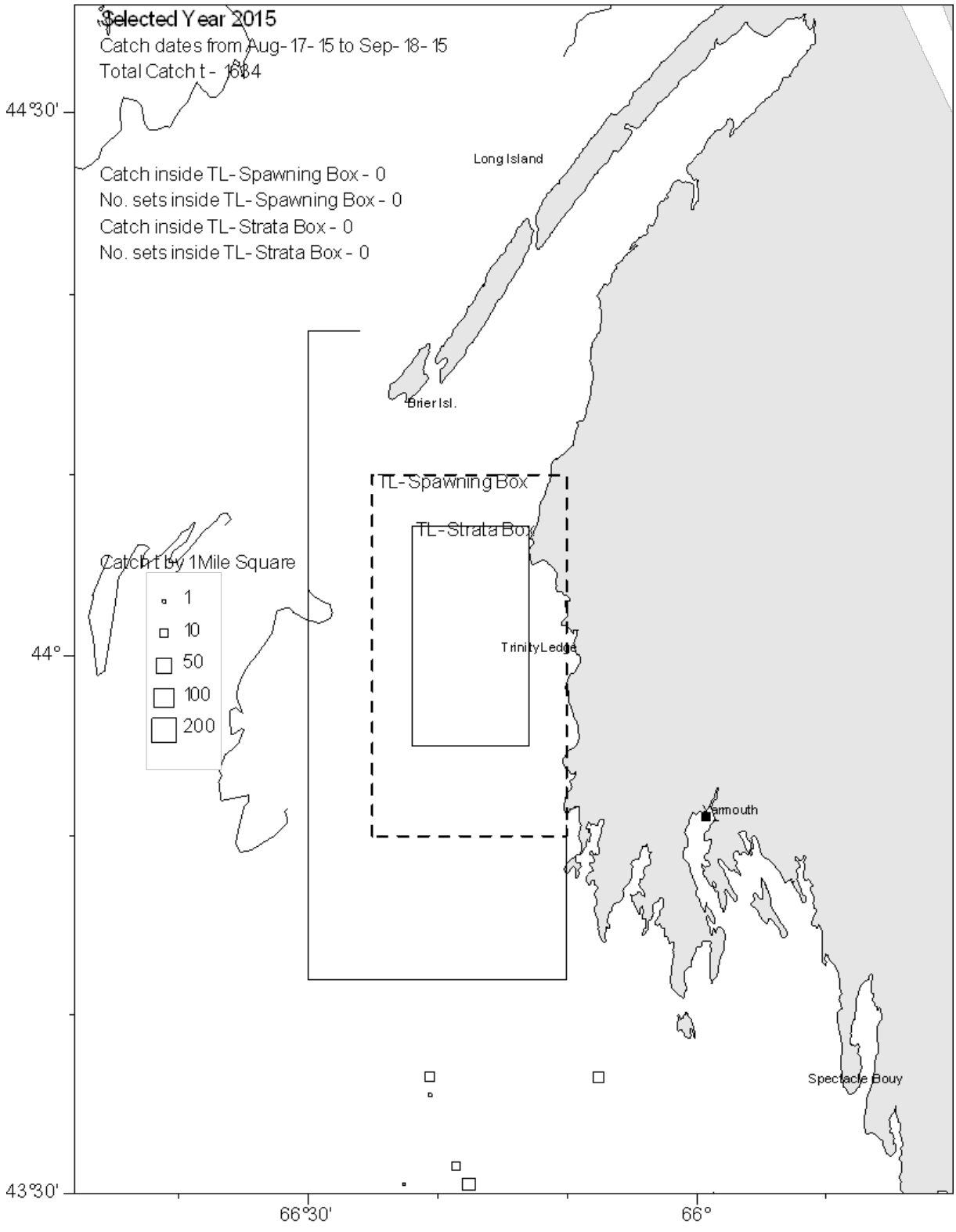


Figure 18A. The 2015 Trinity Ledge Herring gillnet landings (t) in the survey strata box and spawning area box areas.

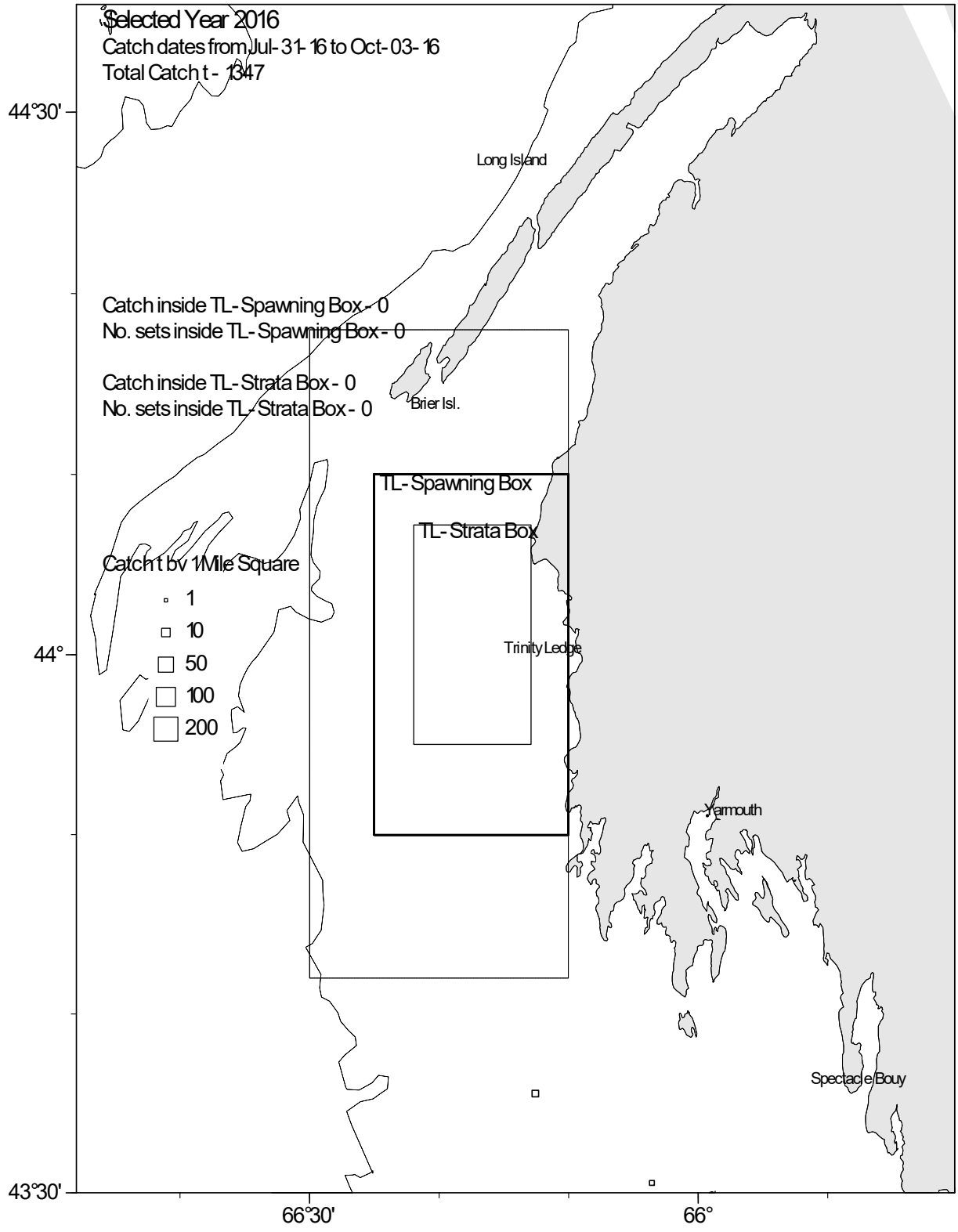


Figure 18B. The 2016 Trinity Ledge Herring gillnet landings (t) in the survey strata box and spawning area box areas.

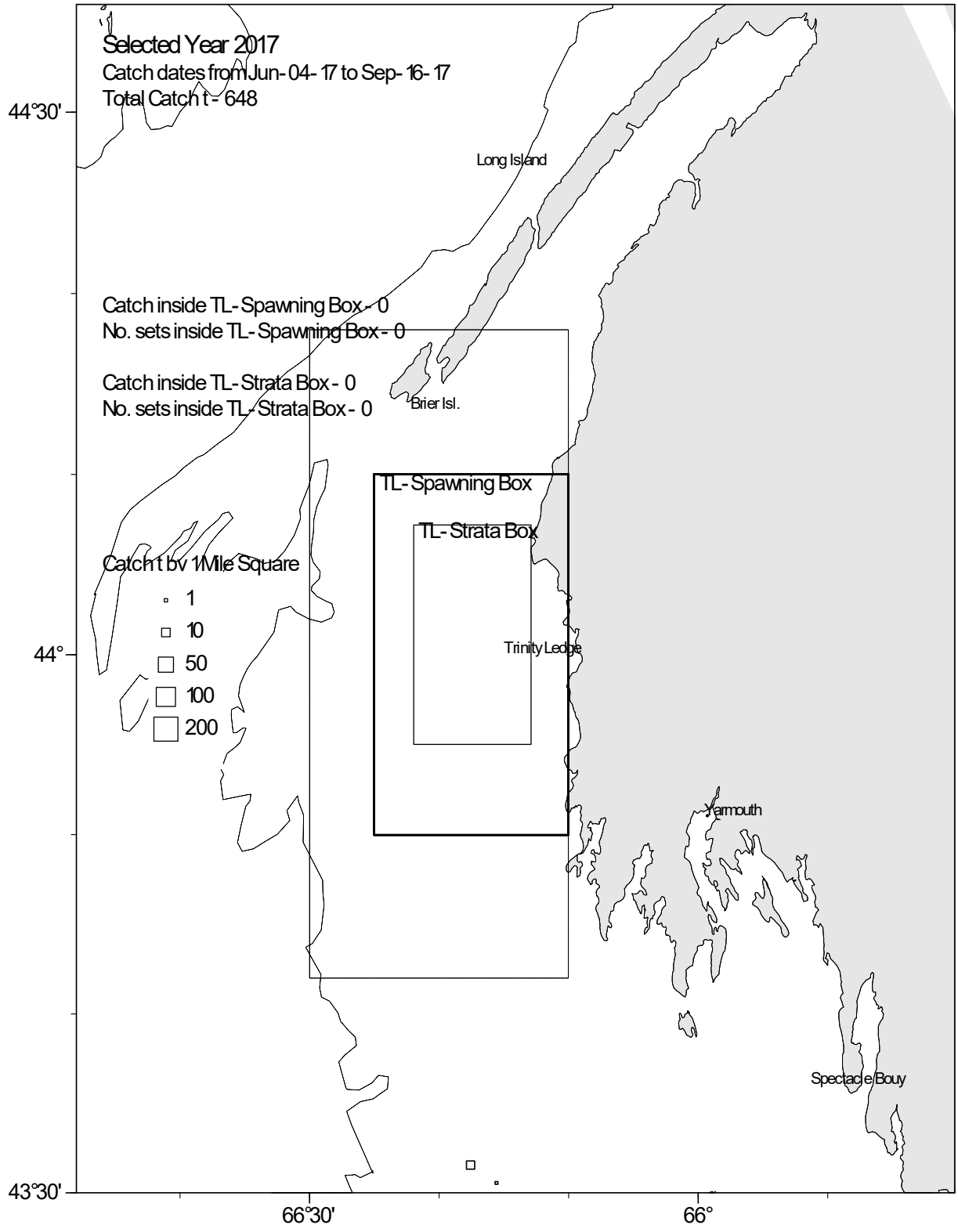


Figure 18C. The 2017 Trinity Ledge Herring gillnet landings (t) in the survey strata box and spawning area box areas.

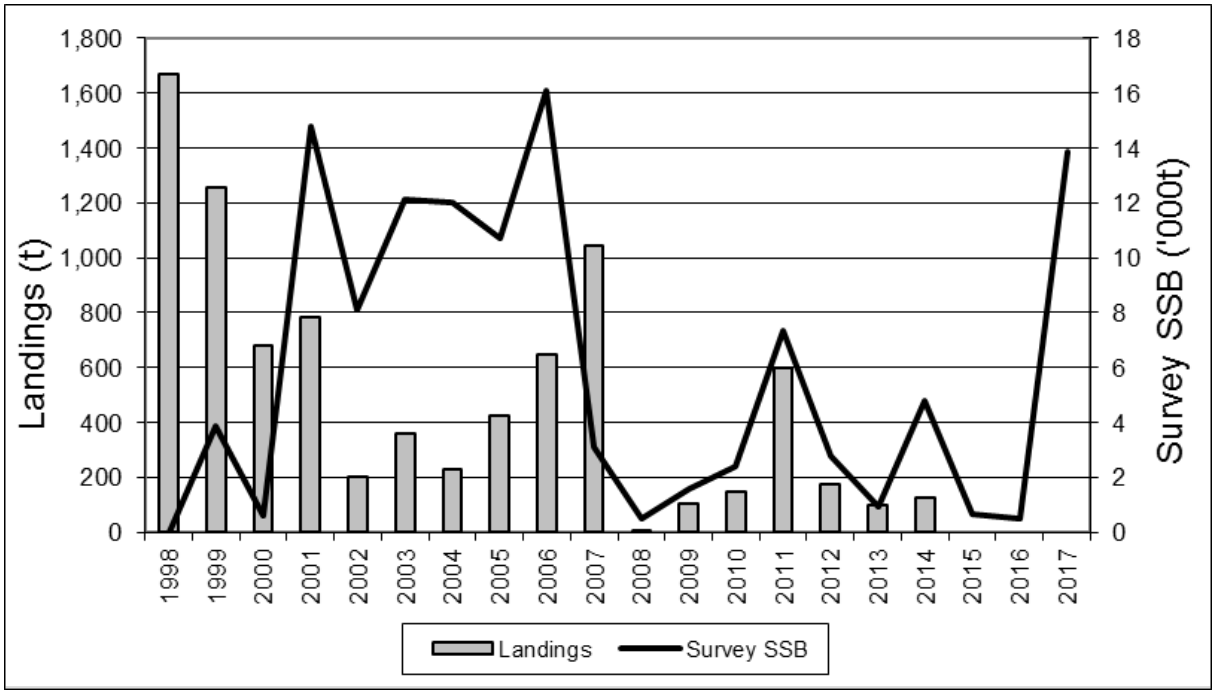


Figure 19. Trinity Ledge Herring landings (t) and acoustic survey biomass (t) estimates from 1998–2017. All acoustic estimates prior to 2003 were calculated without the Calibration Integration Factor (CIF). Note: Landings scale is 10% of that of survey biomass.

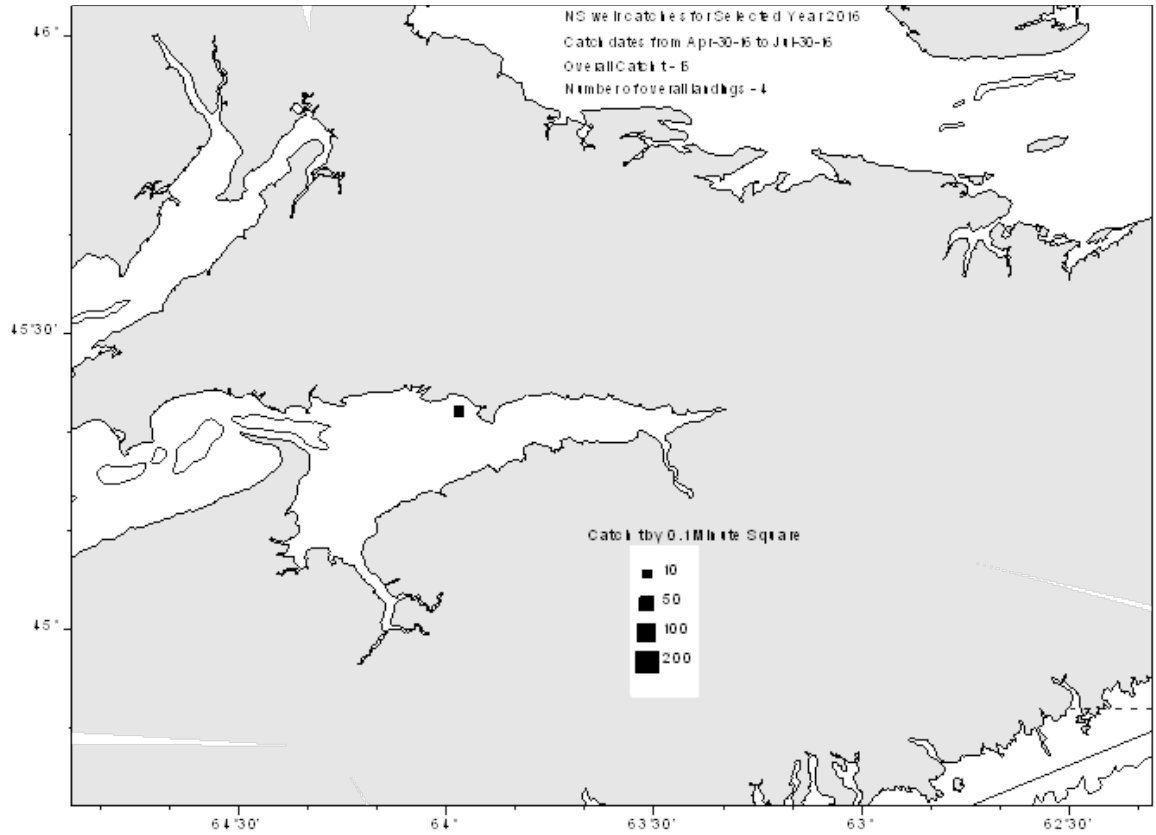


Figure 20. Nova Scotia Herring weir landings (t) by location for the 2016 calendar year. Note : No landings reported in 2015 and 2017 for NS weirs.

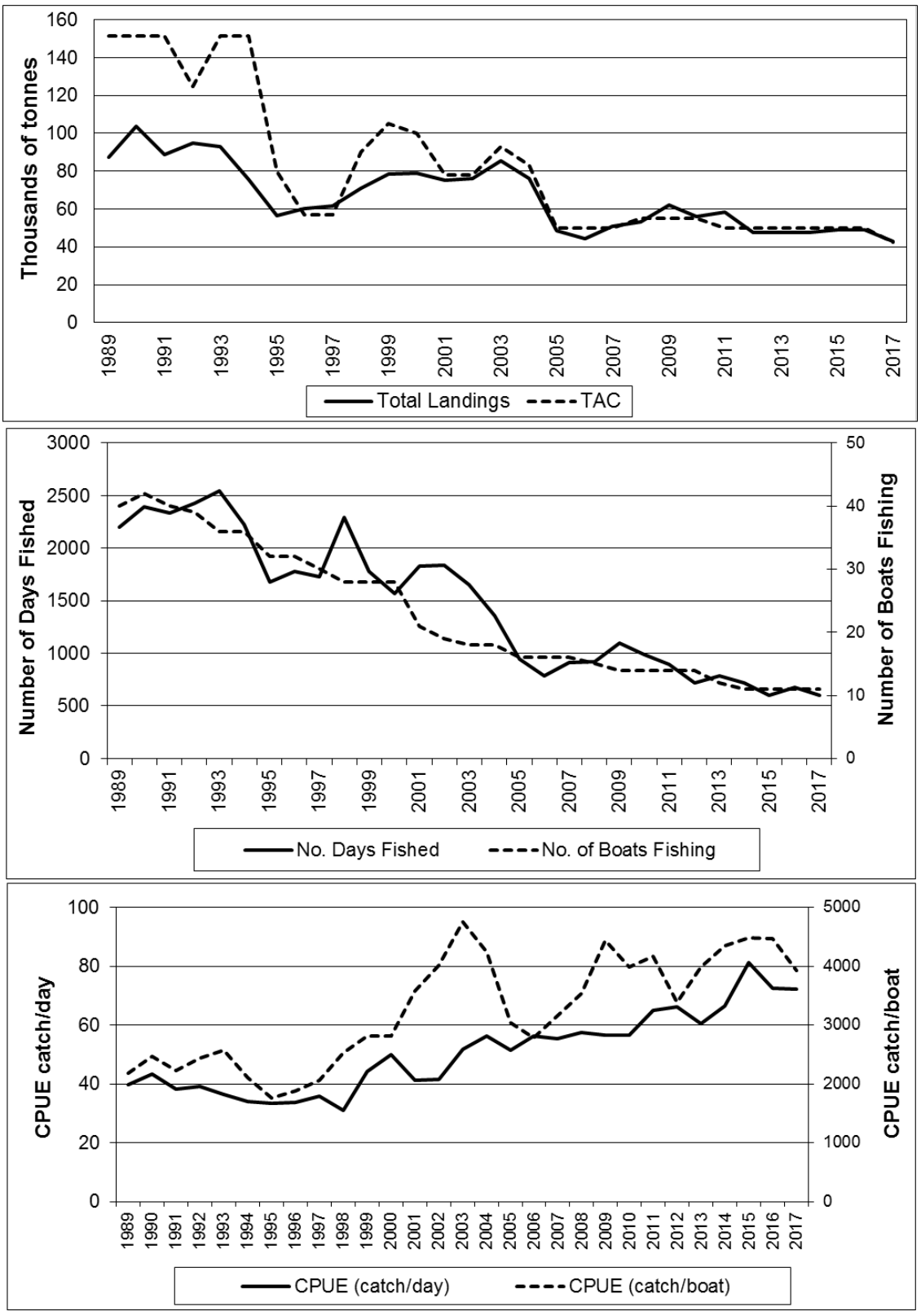


Figure 21. Purse seine landings (t) with Total Allowable Catch (TAC) (top panel), effort (middle panel), and Catch Per Unit Effort (CPUE; bottom) from 1989 to 2017 annual 4WX Herring landings data for the SWNS/BoF spawning component.

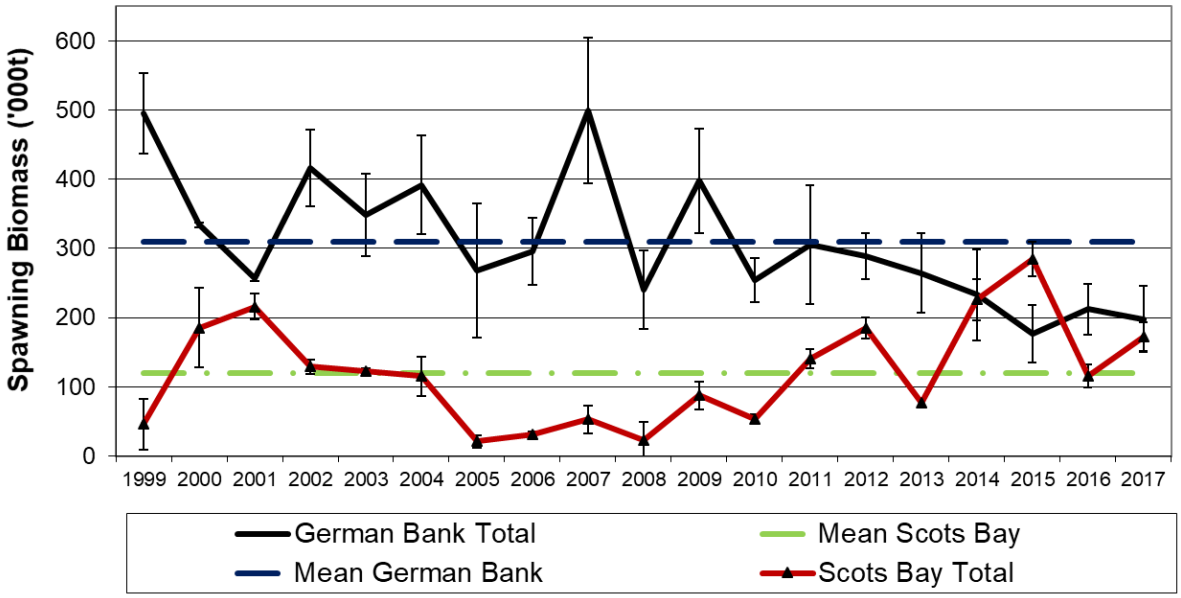


Figure 22. Spawning Stock Biomass (SSB) index ('000t) from acoustic surveys for the SWNS/BoF spawning component for the German Bank and Scots Bay areas along with the respective averages from 1999–2017 with 95% confidence intervals (equivalent to two times SE).Note: Standard Error (SE) recalculated for all years.

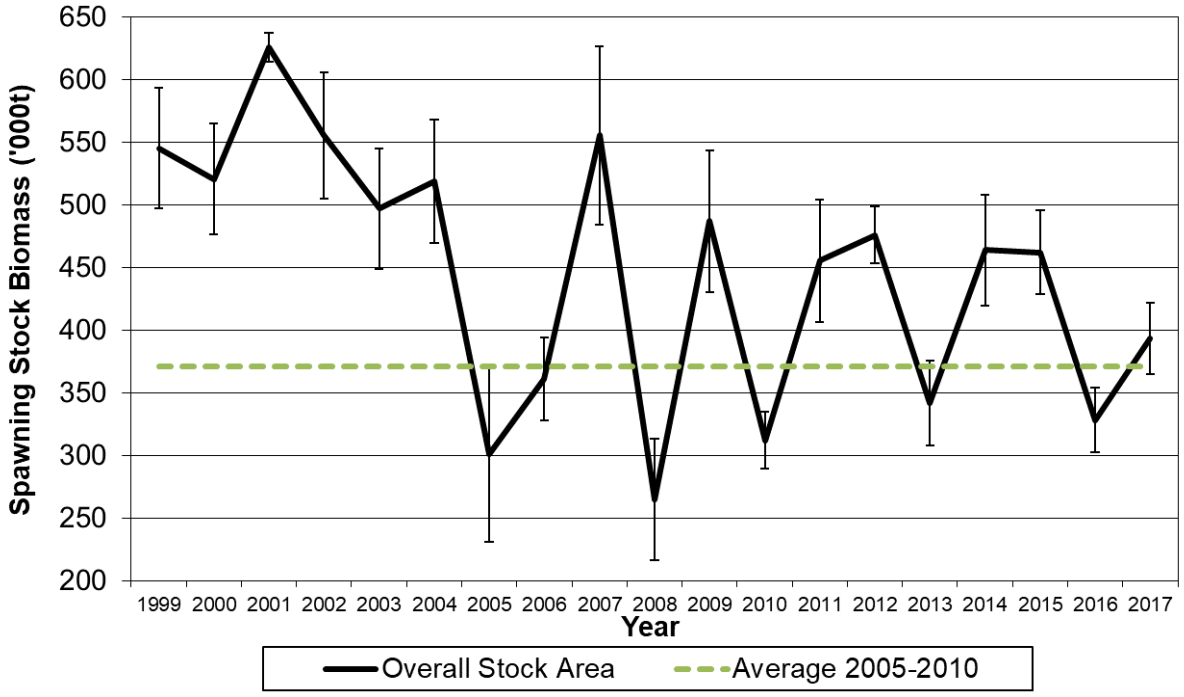


Figure 23. Herring SSB ('000t) from acoustic surveys for the combined SWNS/BoF spawning component (along with the average from 2005–2010) with 95% confidence intervals (equivalent to two times SE). Note: SE Recalculated for all years.

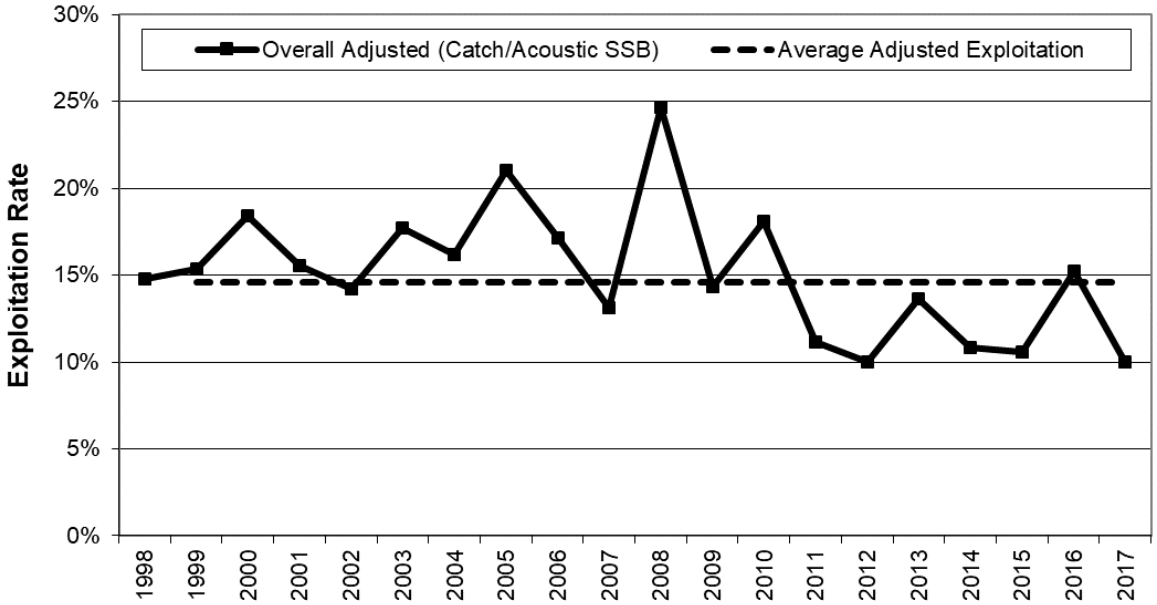


Figure 24. Relative exploitation rate (%) for the SWNS/BoF spawning component using overall landings as a proportion of the overall acoustic Spawning Stock Biomass (SSB).

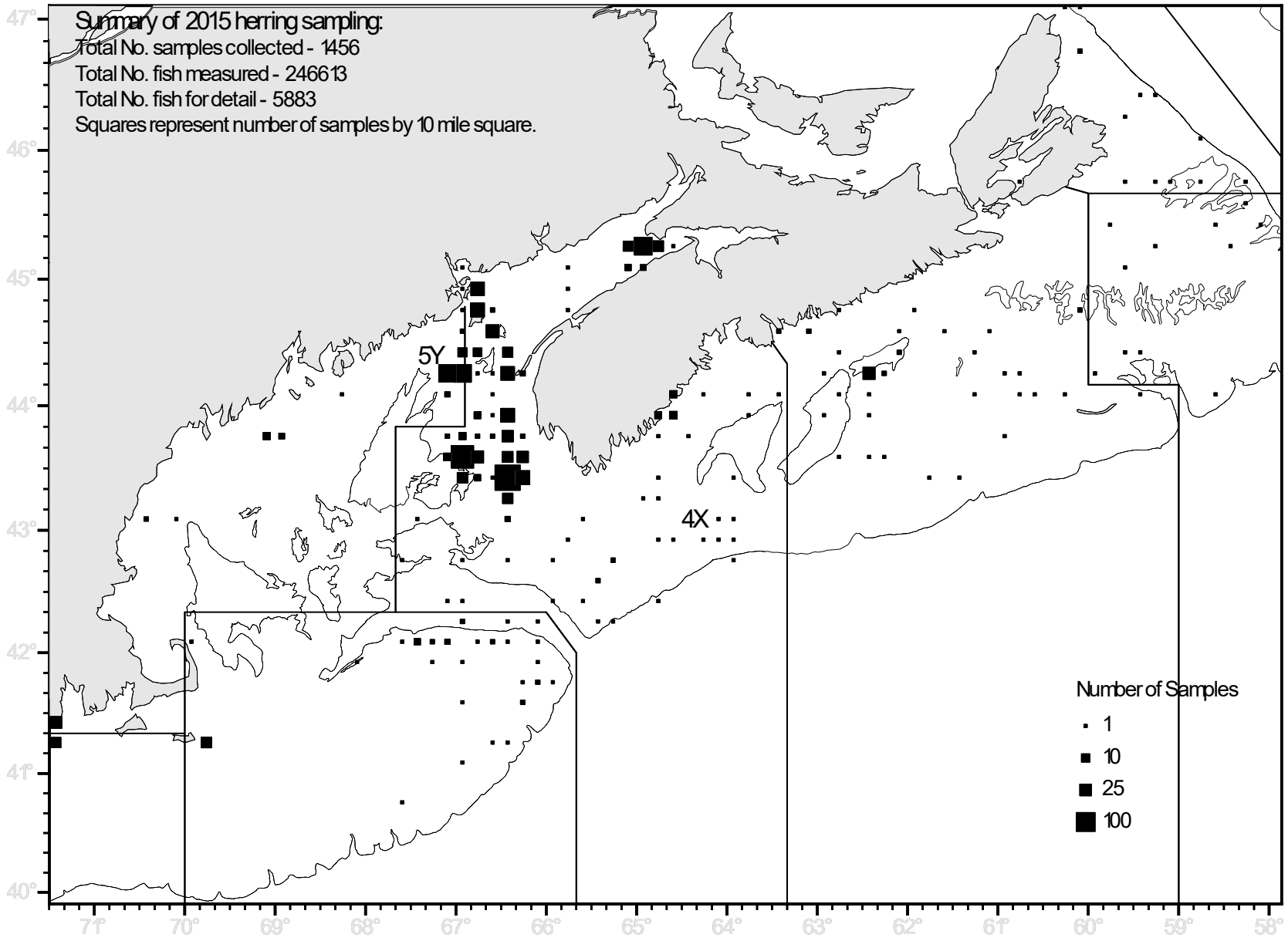


Figure 25A. 2015 Herring sampling coverage by location from all sources (numbers of length frequency samples grouped by 10-mile squares).

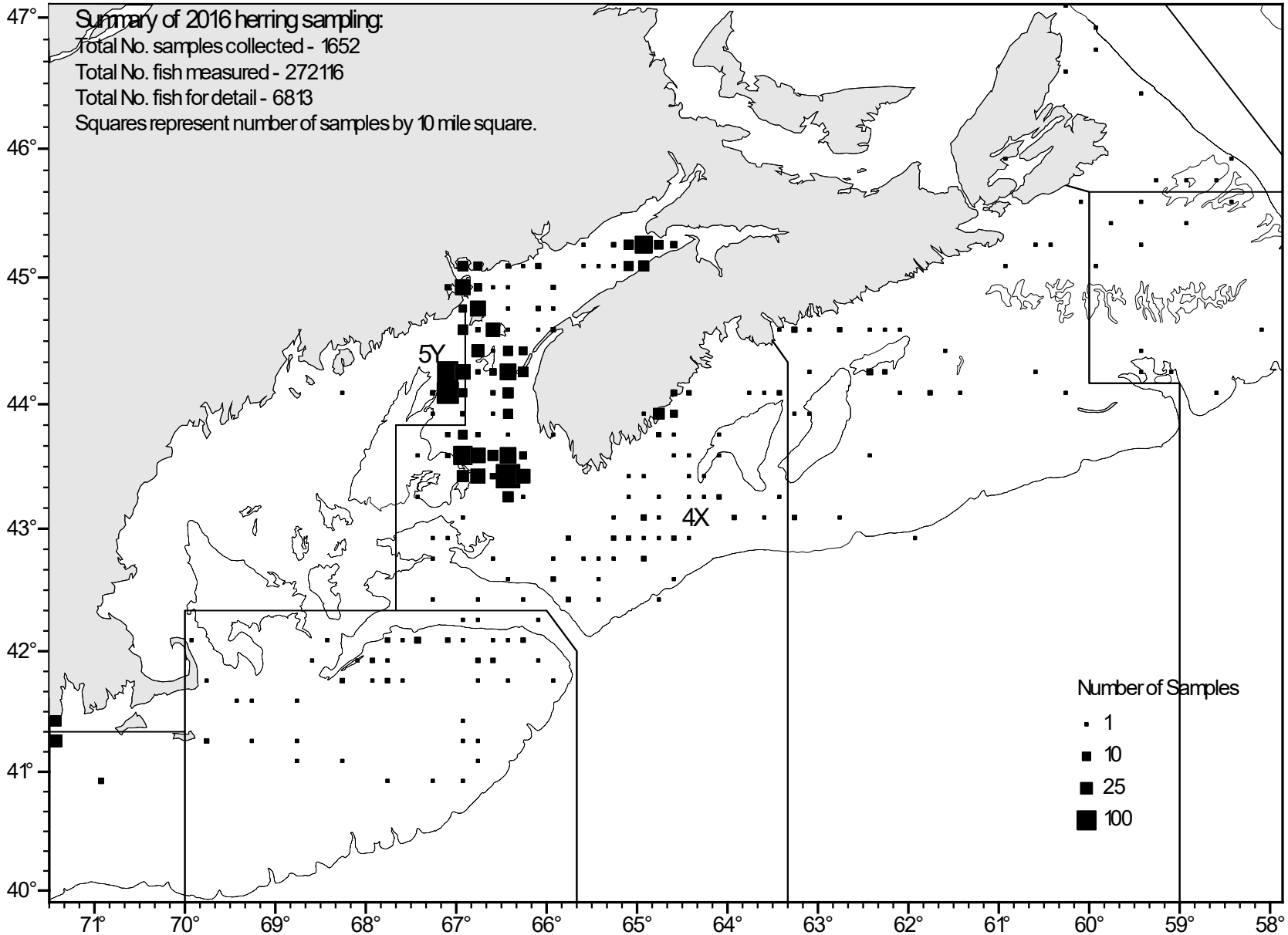


Figure 25B. 2016 Herring sampling coverage by location from all sources (numbers of length frequency samples grouped by 10-mile squares).

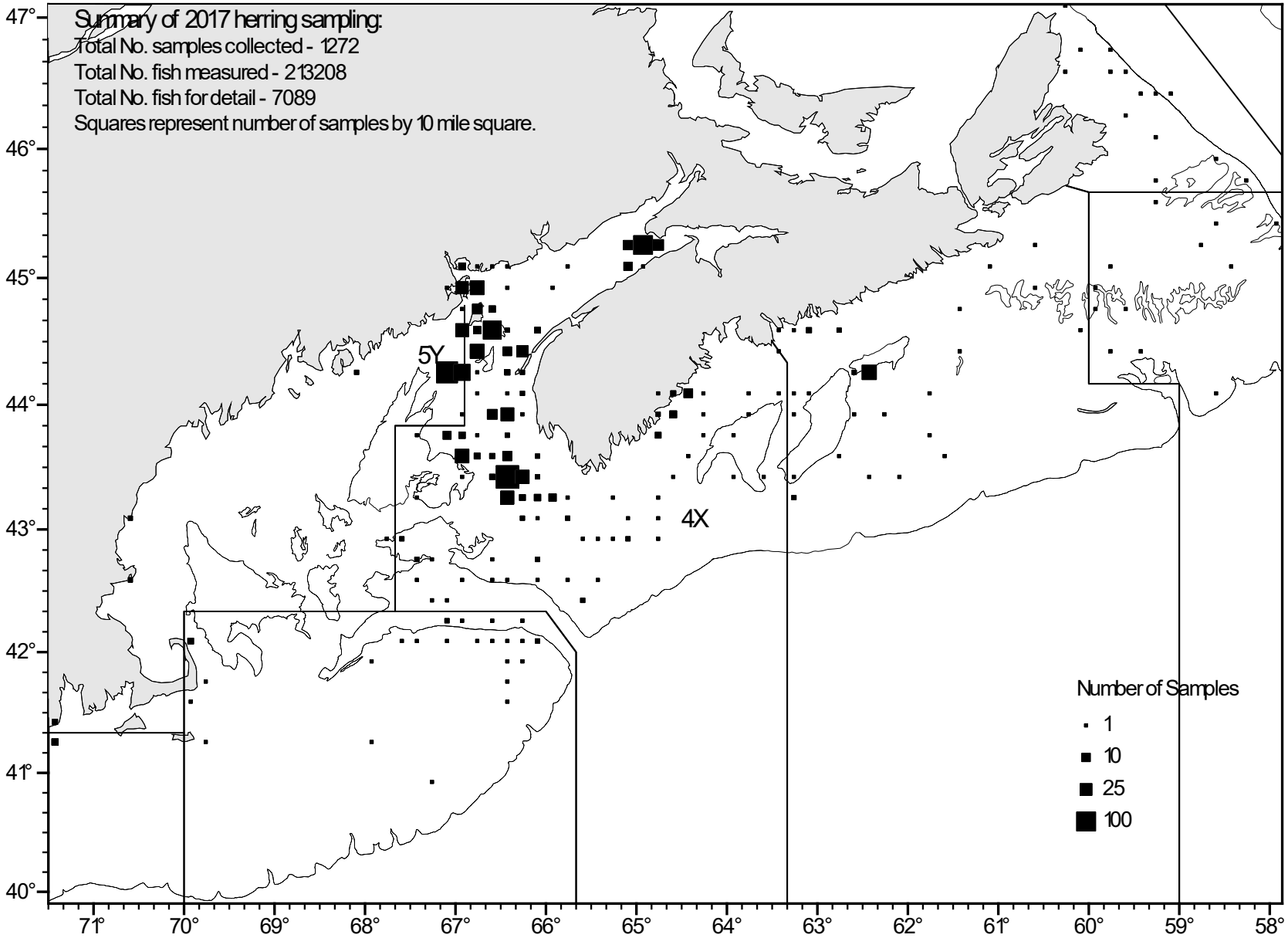


Figure 25C. 2017 Herring sampling coverage by location from all sources (numbers of length frequency samples grouped by 10-mile squares)

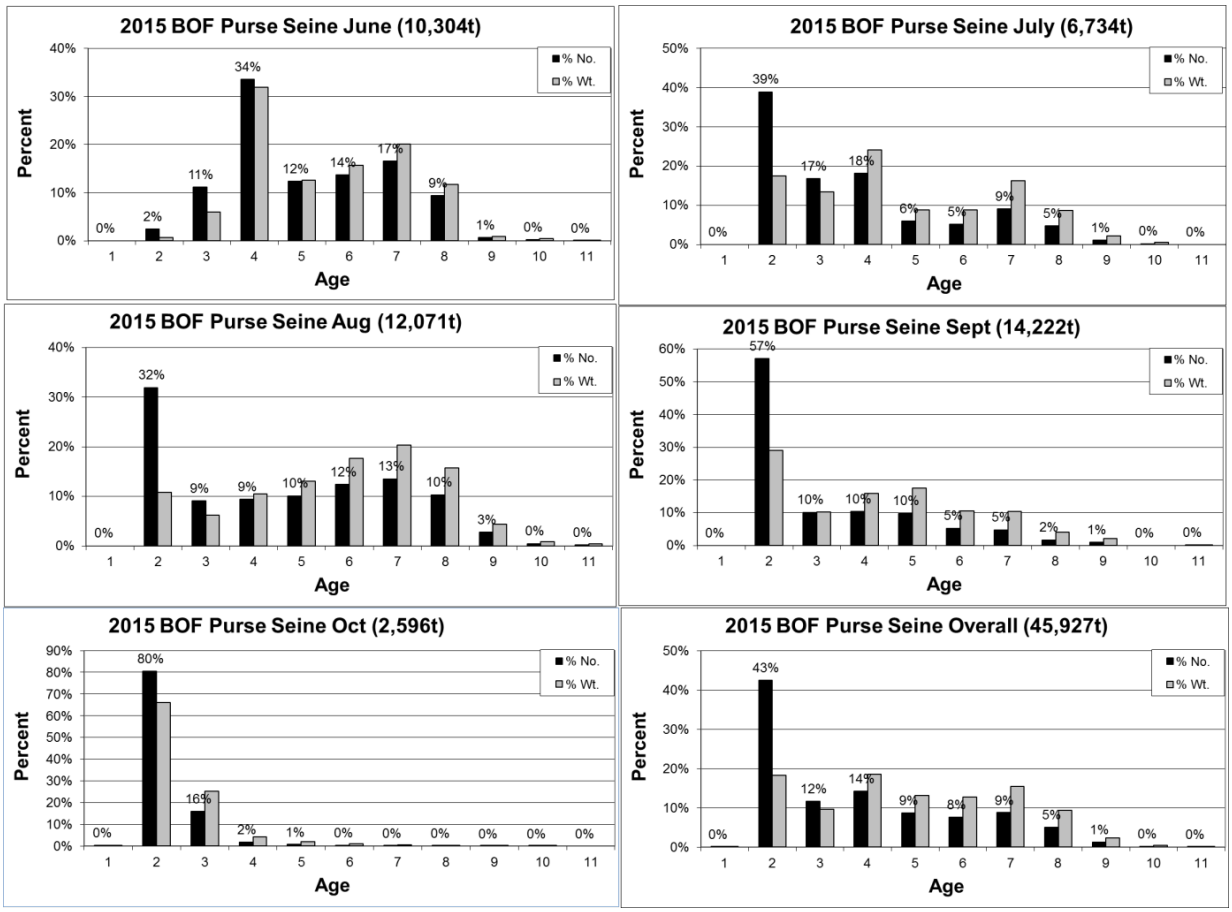


Figure 26A. Fishery catch at age by month and overall (% numbers and % weight) from the 2015 SWNS/BoF summer purse seine fishery.

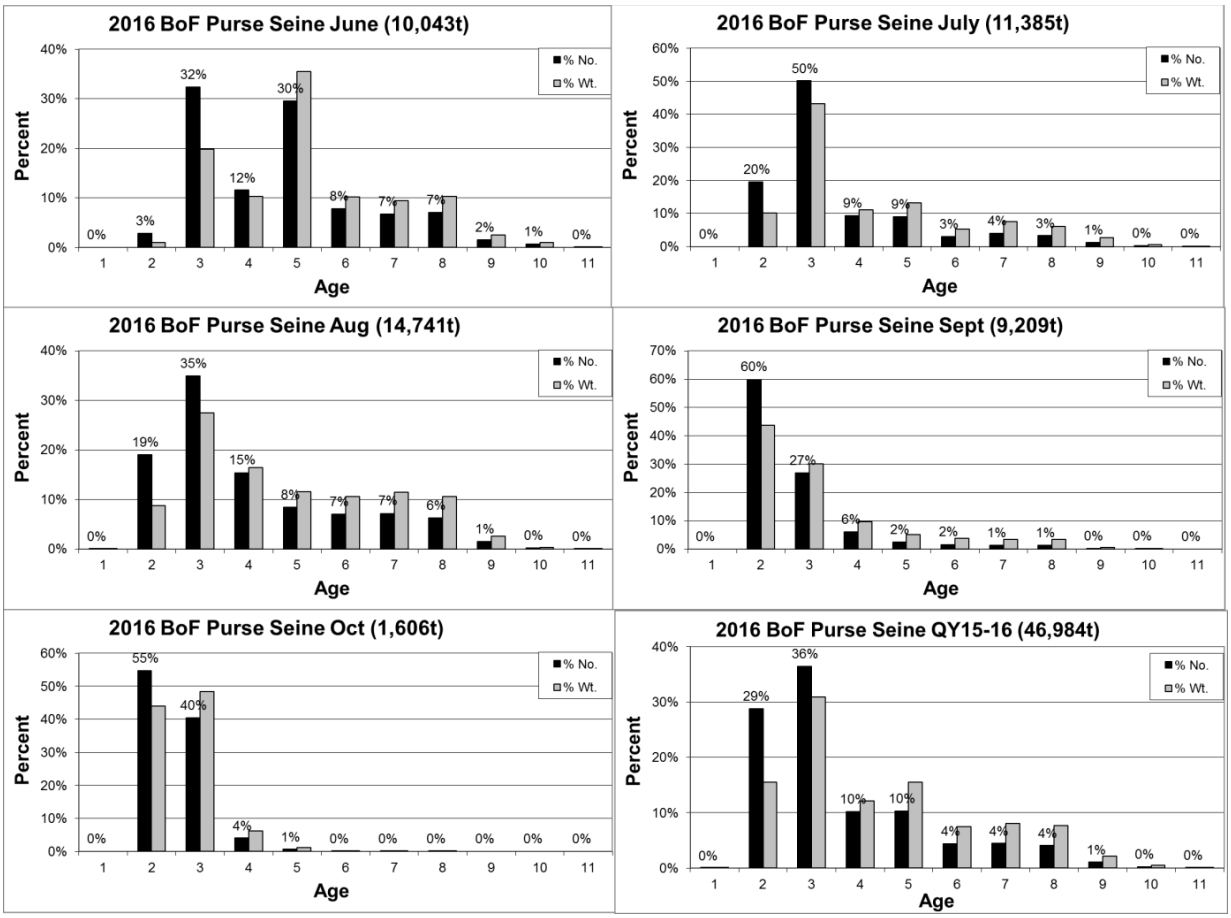


Figure 26B. Fishery catch at age by month and overall (% numbers and % weight) from the 2016 SWNS/BoF summer purse seine fishery.

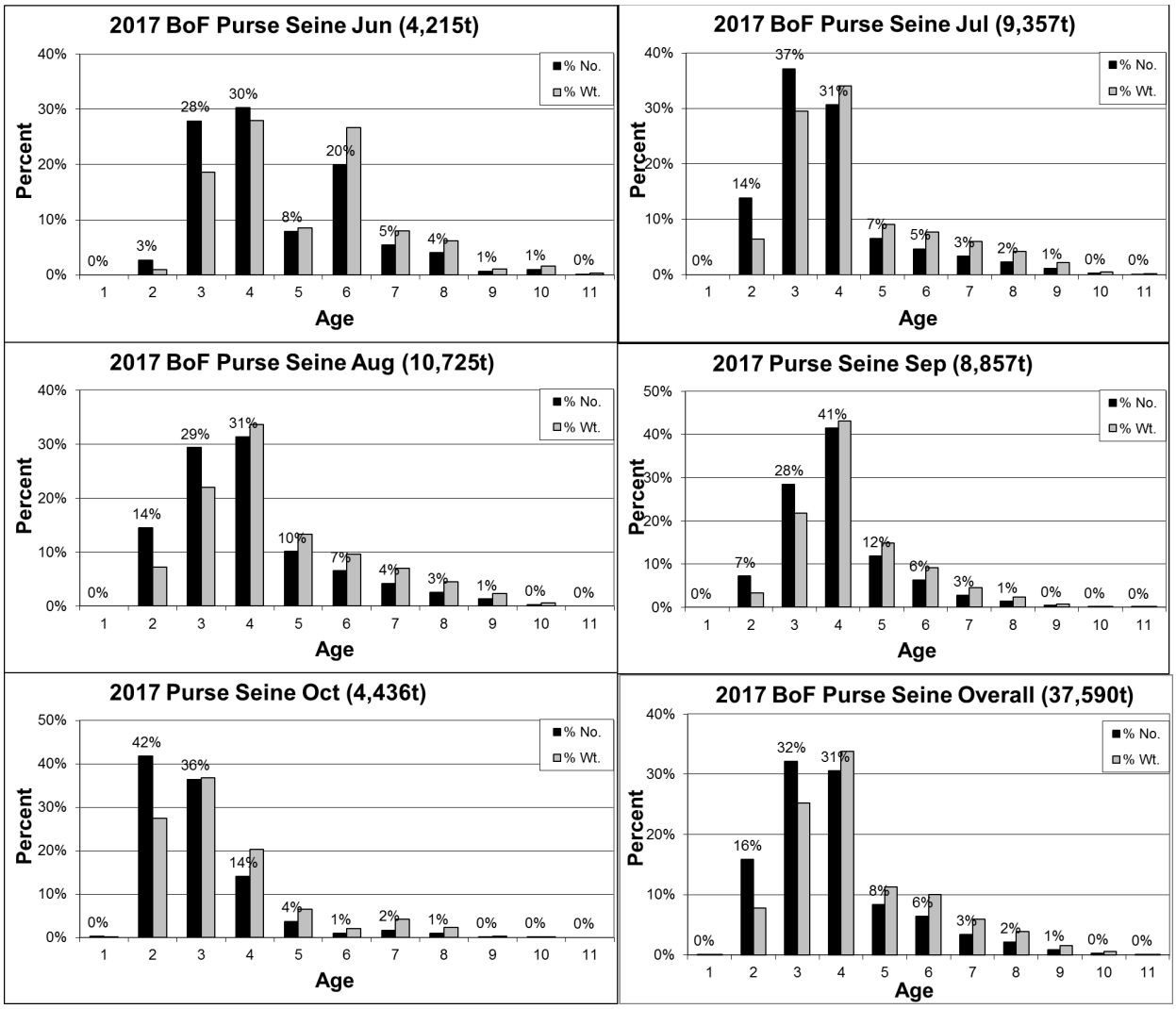


Figure 26C. Fishery catch at age by month and overall (% numbers and % weight) from the 2017 SWNS/BoF summer purse seine fishery.

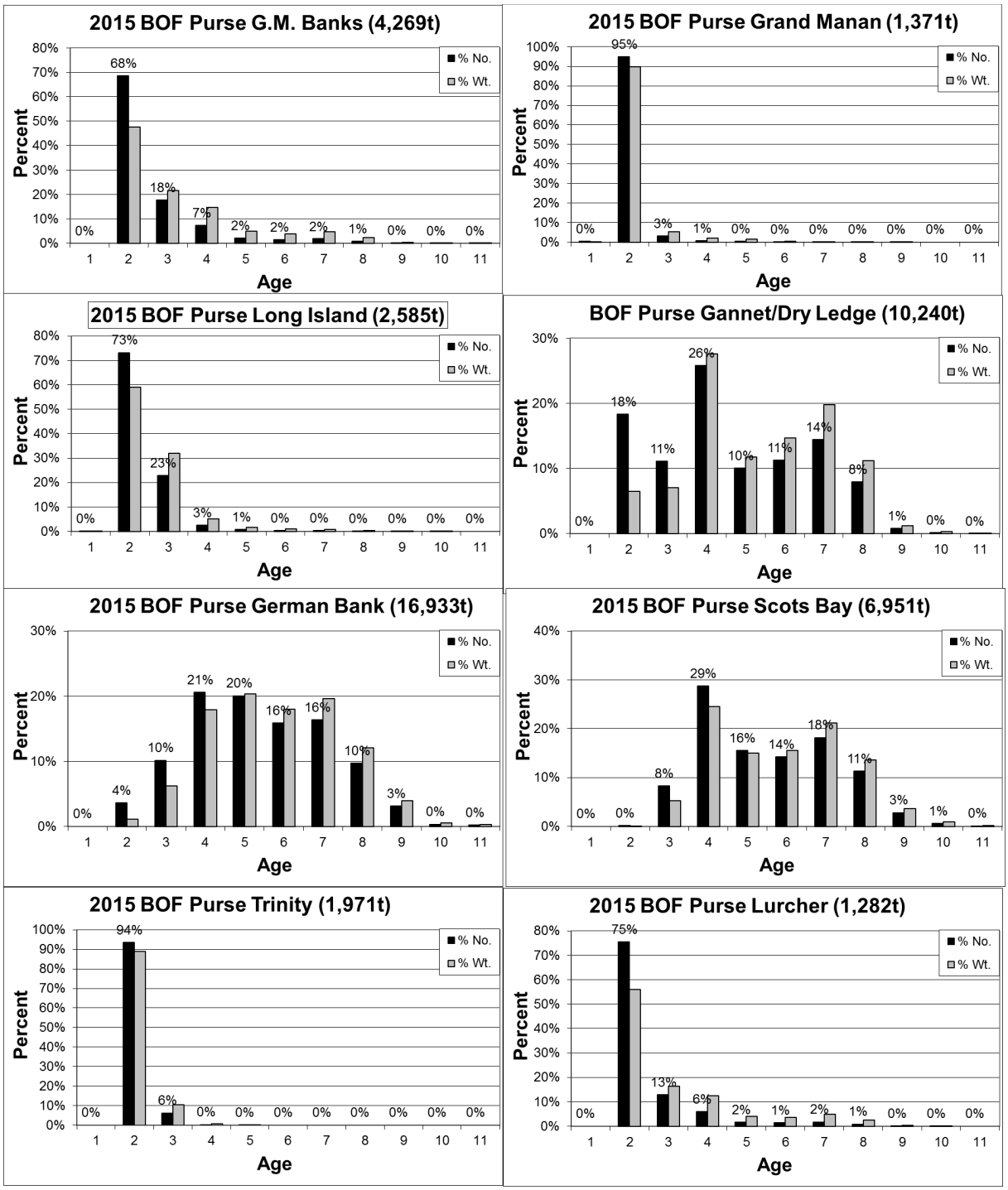


Figure 27A. Fishery catch at age by ground (% numbers and % weight) from the 2015 SWNS/BoF summer purse seine fishery.

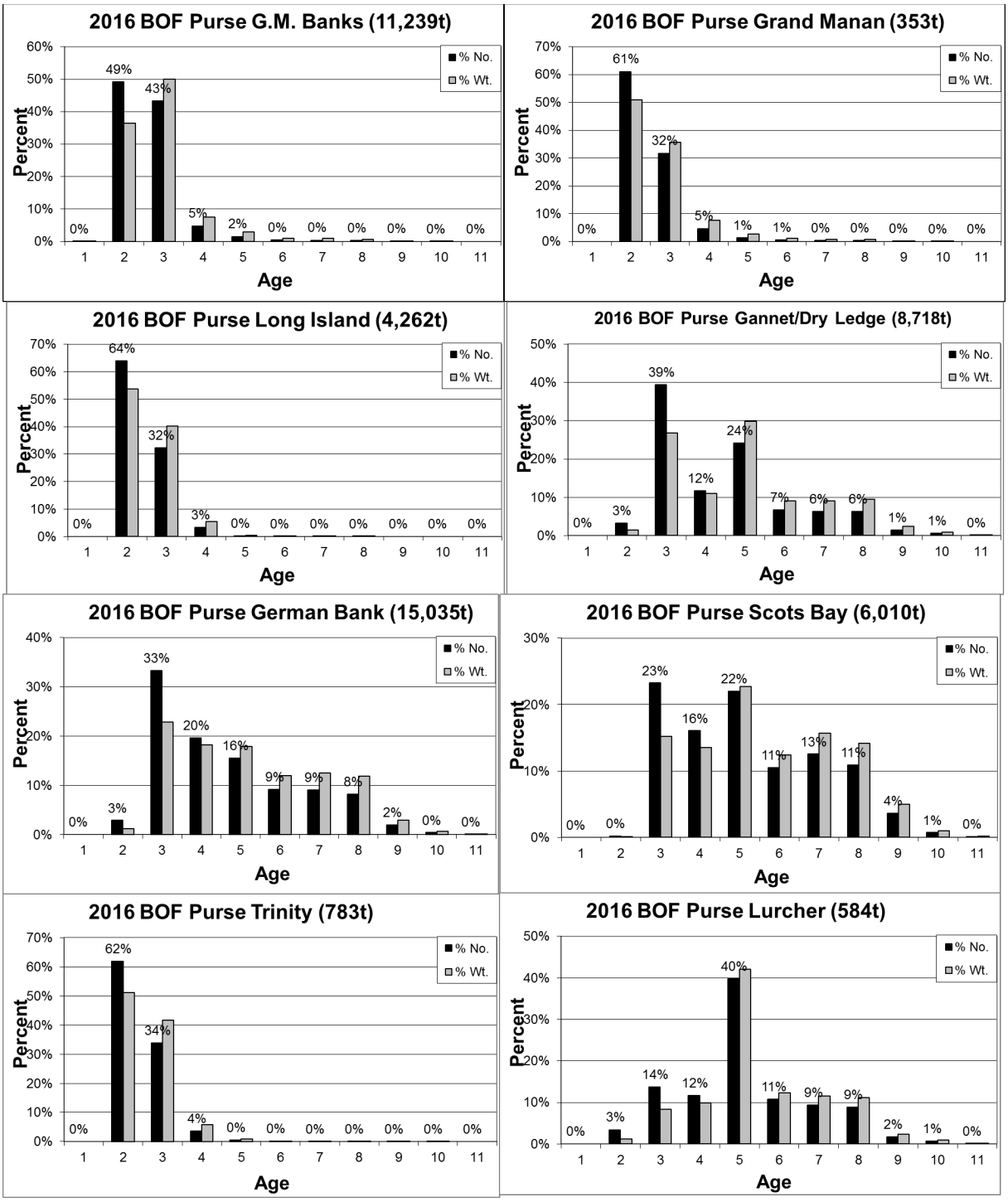


Figure 27B. Fishery catch at age by ground (% numbers and % weight) from the 2016 SWNS/BoF summer purse seine fishery.

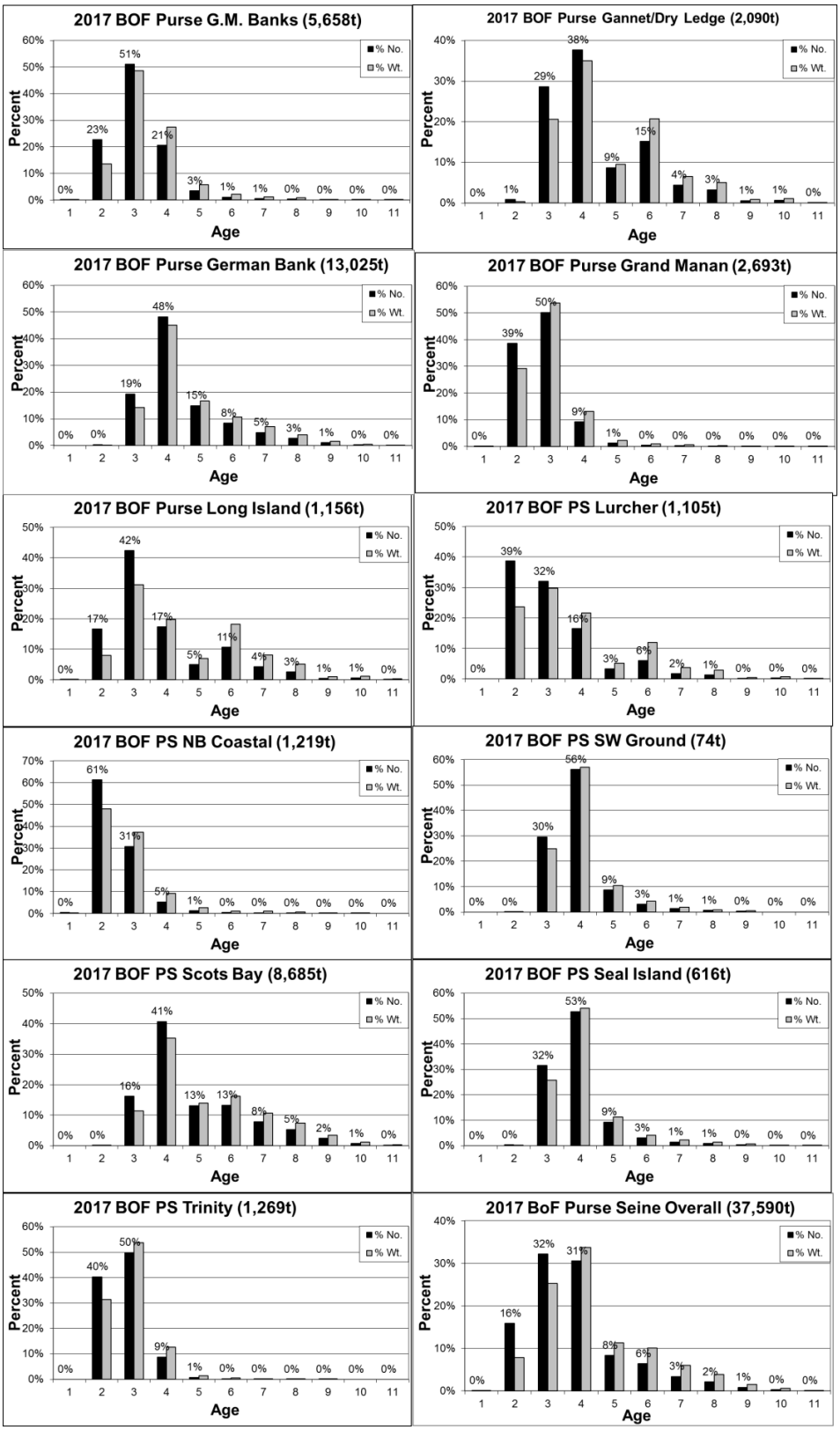


Figure 27C. Fishery catch at age by ground (% numbers and % weight) from the 2017 SWNS/BoF summer purse seine fishery.

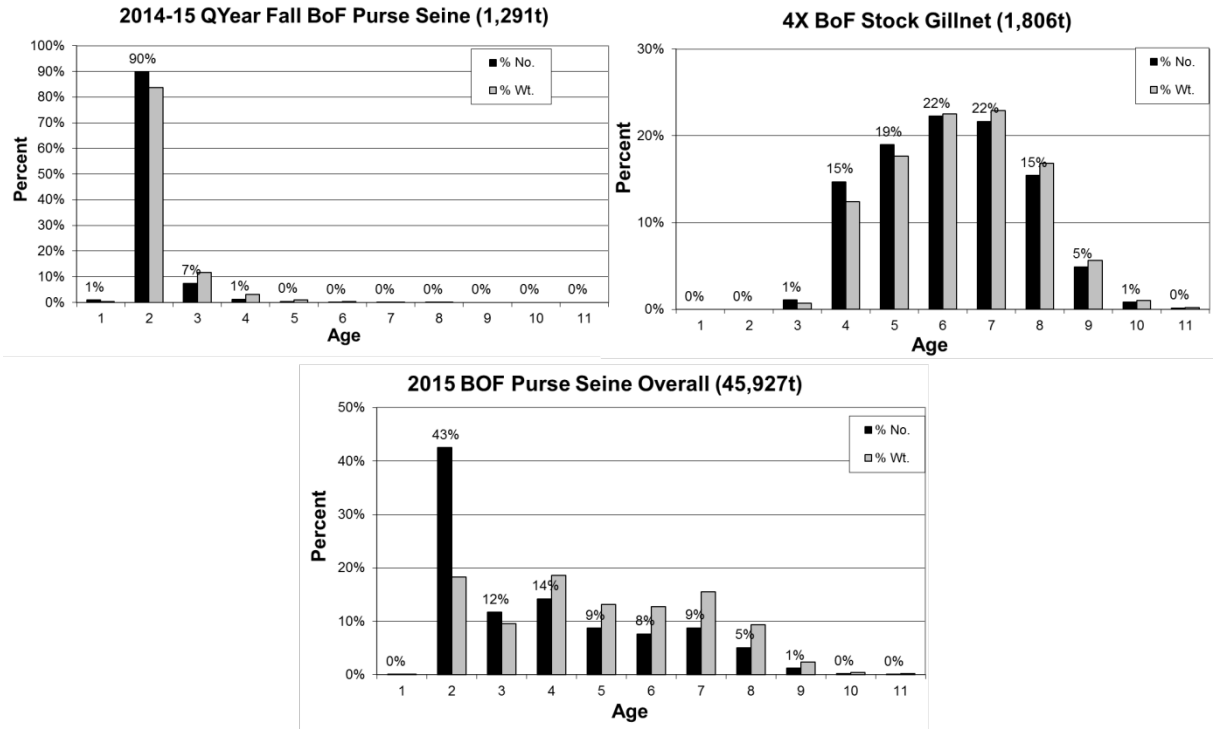


Figure 28A. Fishery catch at age by gear component (% numbers and % weight) from the 2015 SWNS/BoF spawning component. Note: No Nova Scotia weir landings reported.

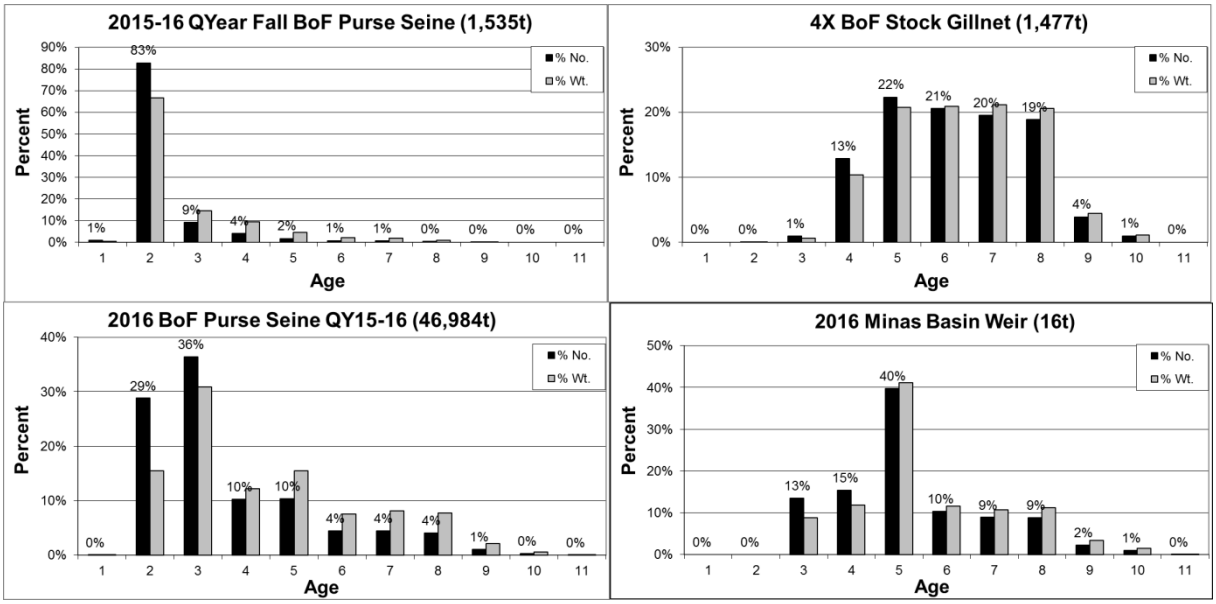


Figure 28B. Fishery catch at age by gear component (% numbers and % weight) from the 2016 SWNS/BoF spawning component.

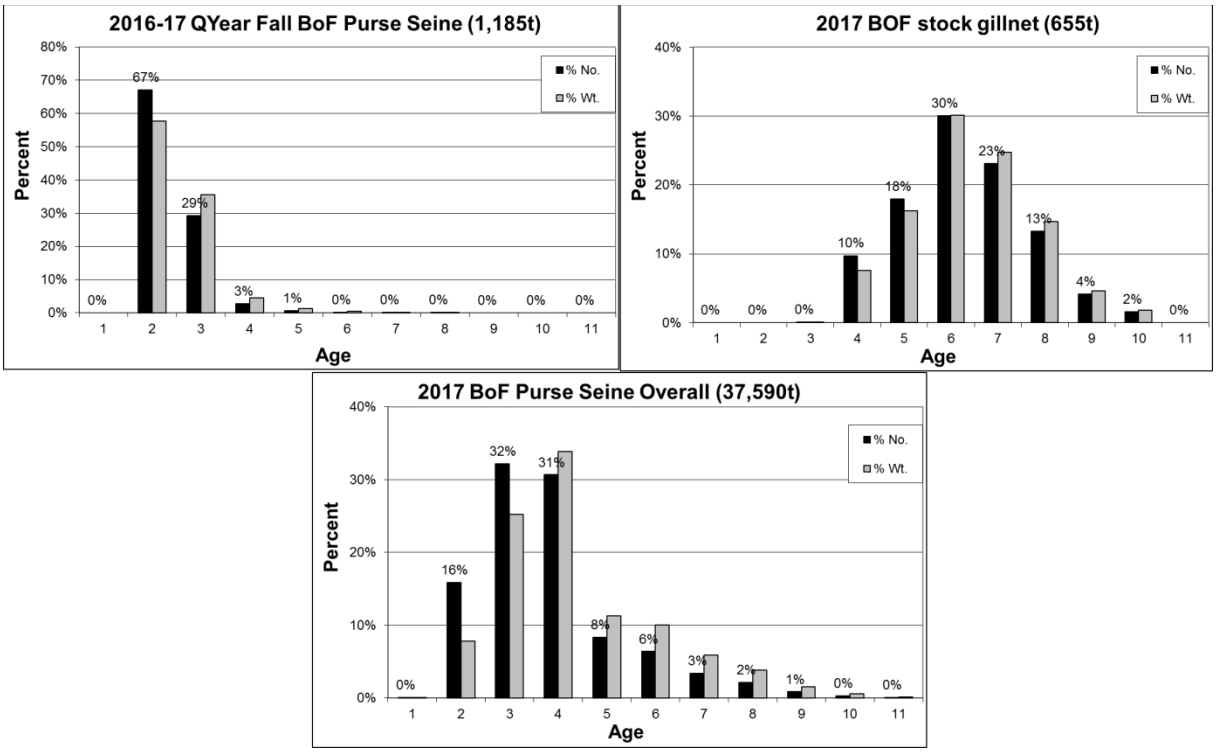


Figure 28C. Fishery catch at age by gear component (% numbers and % weight) from the 2017 SWNS/BoF spawning component.

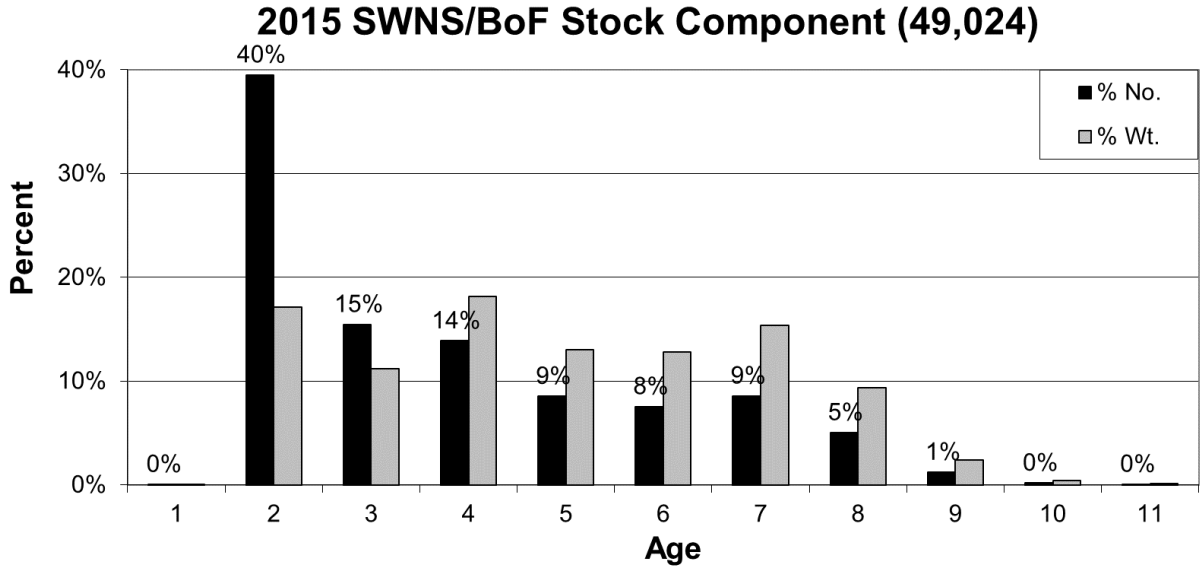


Figure 29A. Overall fishery catch at age (% numbers and % weight) from the 2015 SWNS/BoF spawning component.

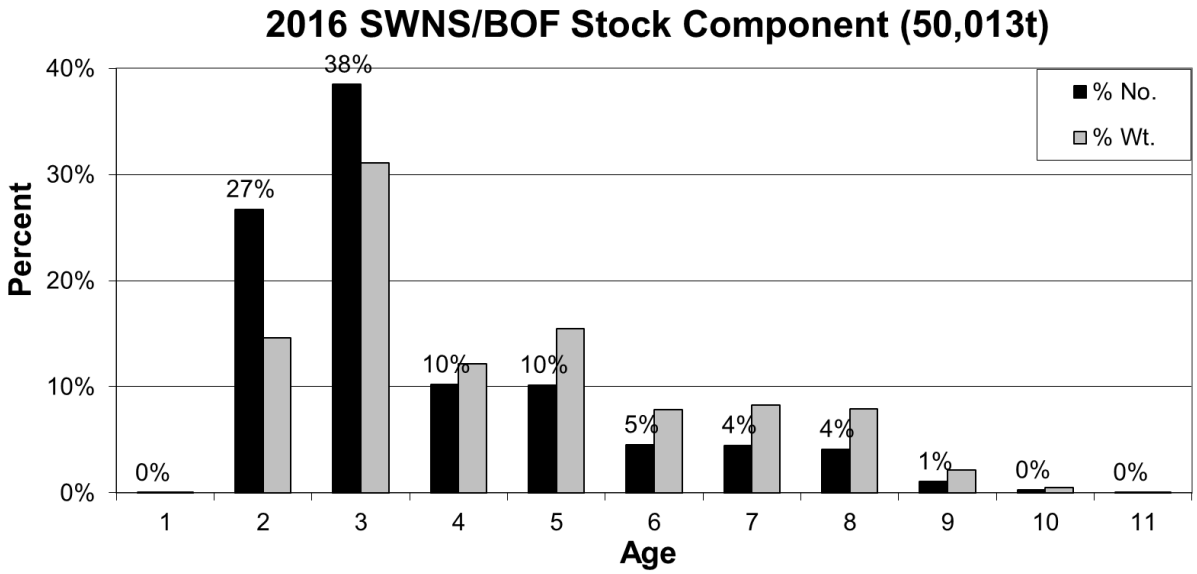


Figure 29B. Overall fishery catch at age (% numbers and % weight) from the 2016 SWNS/BoF spawning component.

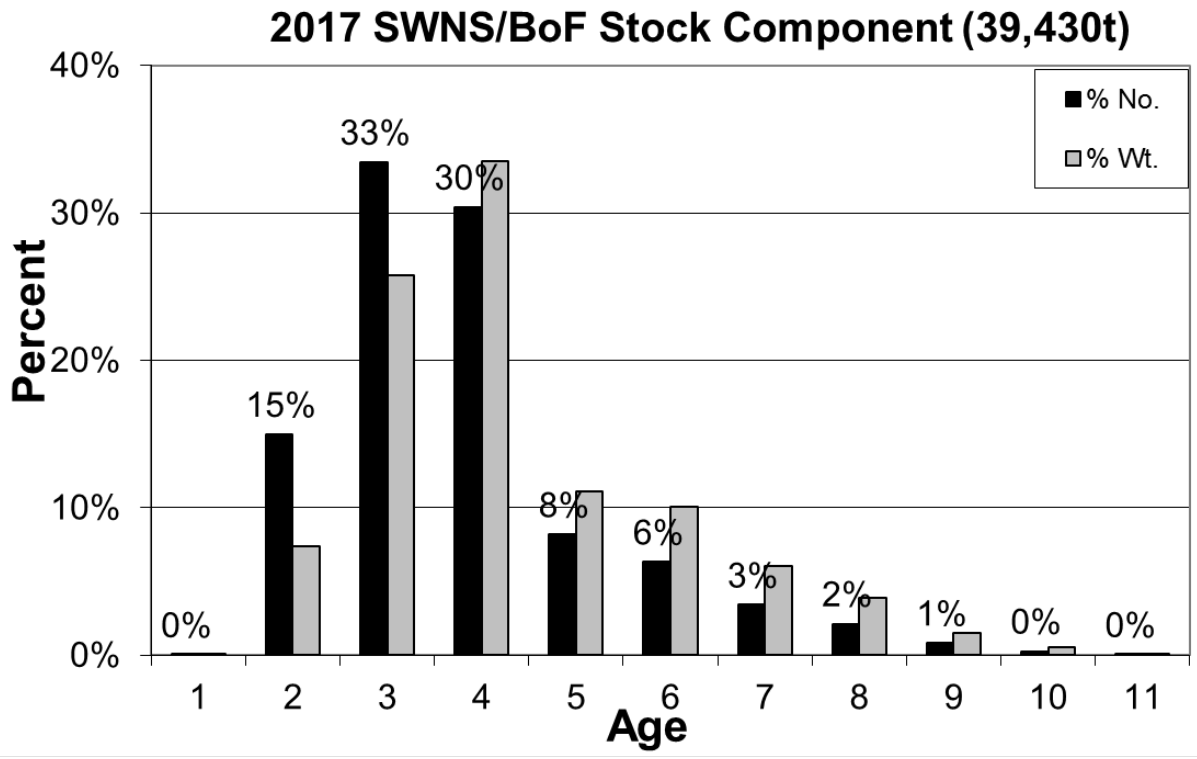


Figure 29C. Overall fishery catch at age (% numbers and % weight) from the 2017 SWNS/BoF spawning component.

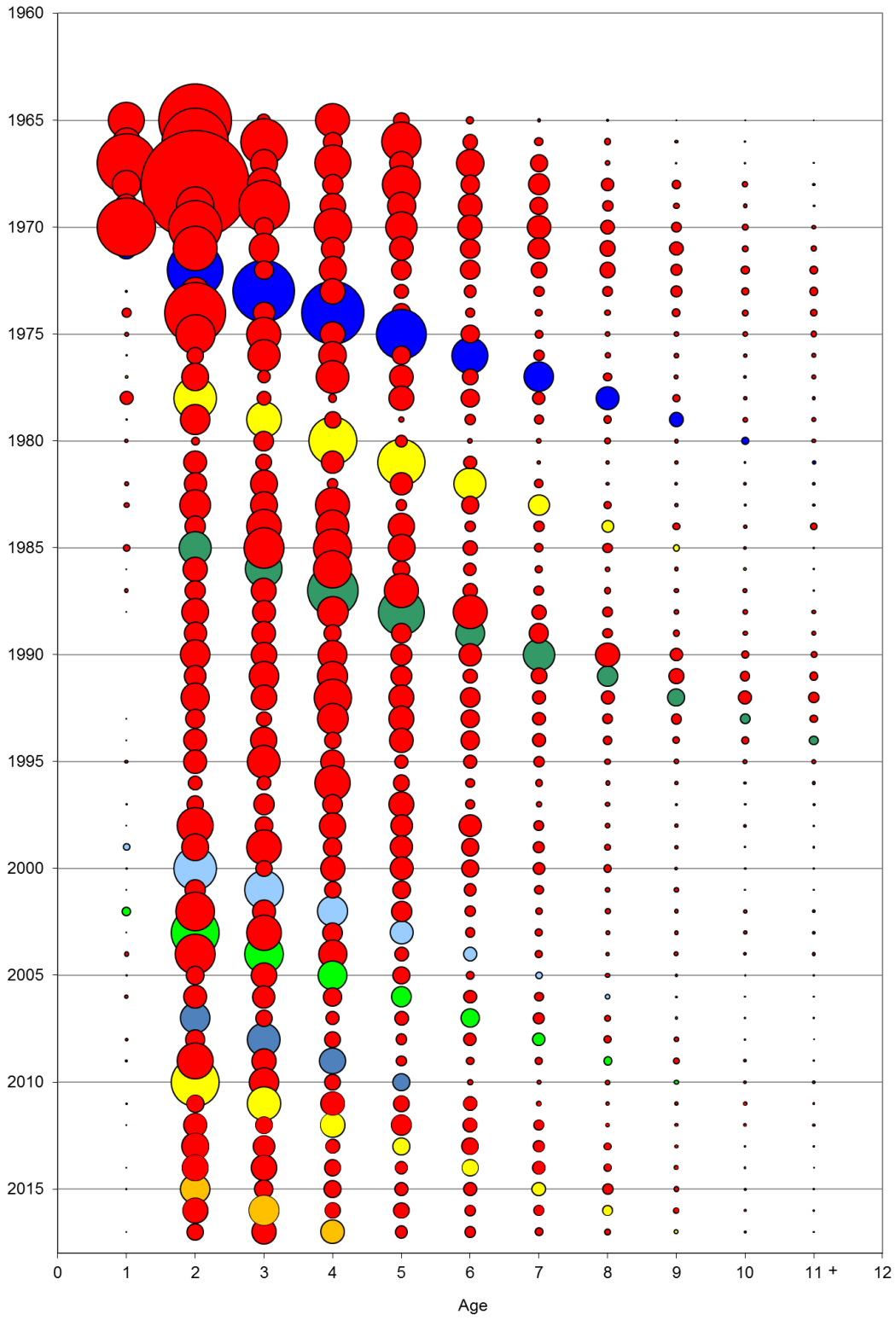


Figure 30. Historical relative numbers at age (denoted by circle size) for the SWNS/BoF Herring spawning component from 1965–2017. Several of the stronger year-classes are indicated by colours including the 1970, 1978, 1983, 1998, 2001, 2005, 2008, and 2013 year-classes.

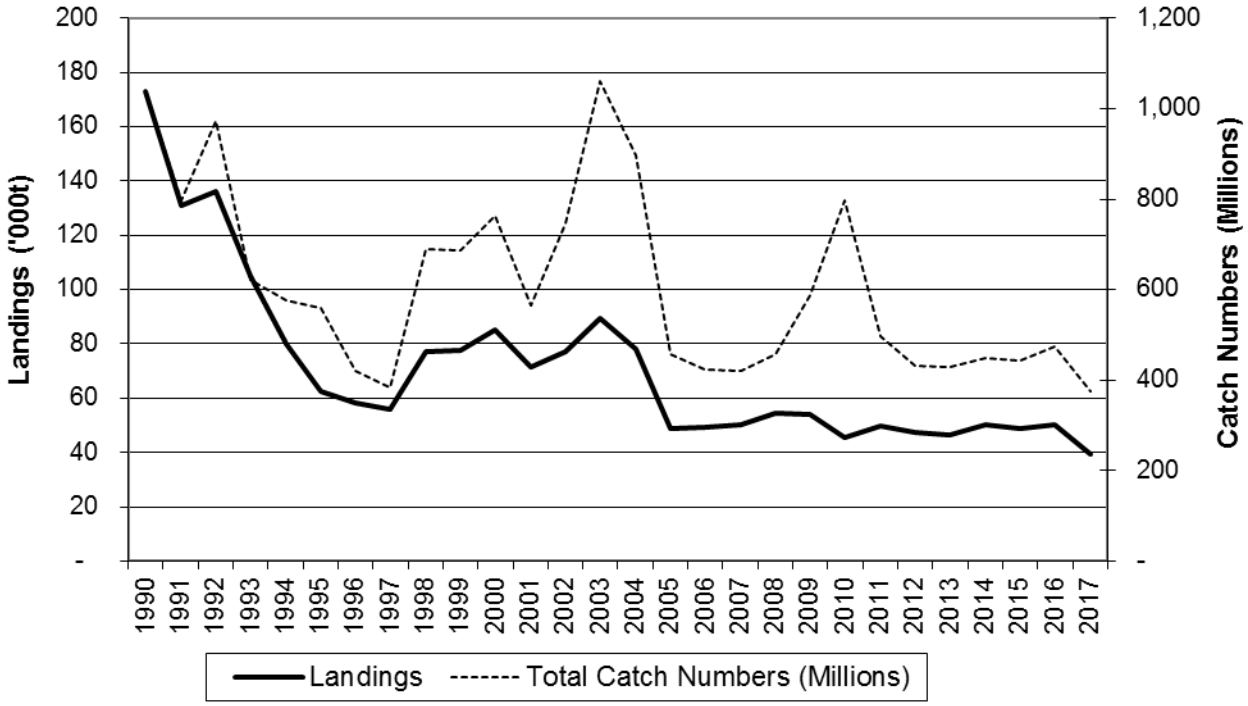


Figure 31. Total landings (t) and total removals (millions) for the combined annual landings from the SWNS spawning component for 1990 to 2017.

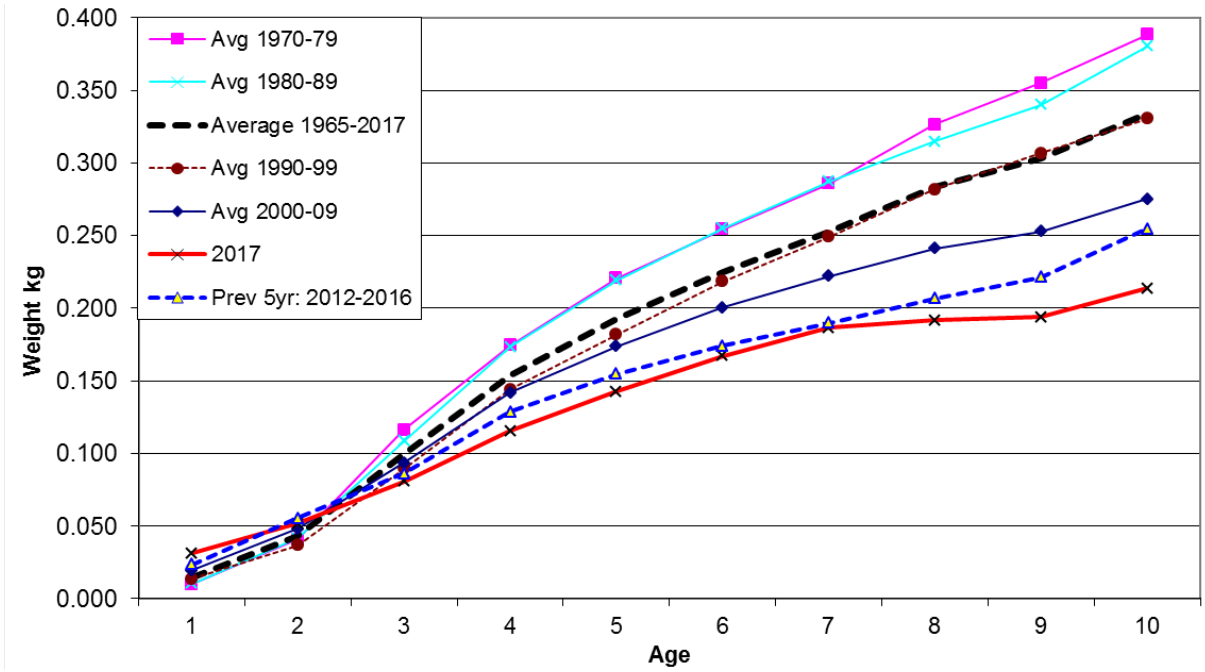


Figure 32. Average weights at age (kg) for the SWNS/BoF component of the 4WX Herring fishery (fishery weighted) for the most recent year, by decade and the long term for the historical series.

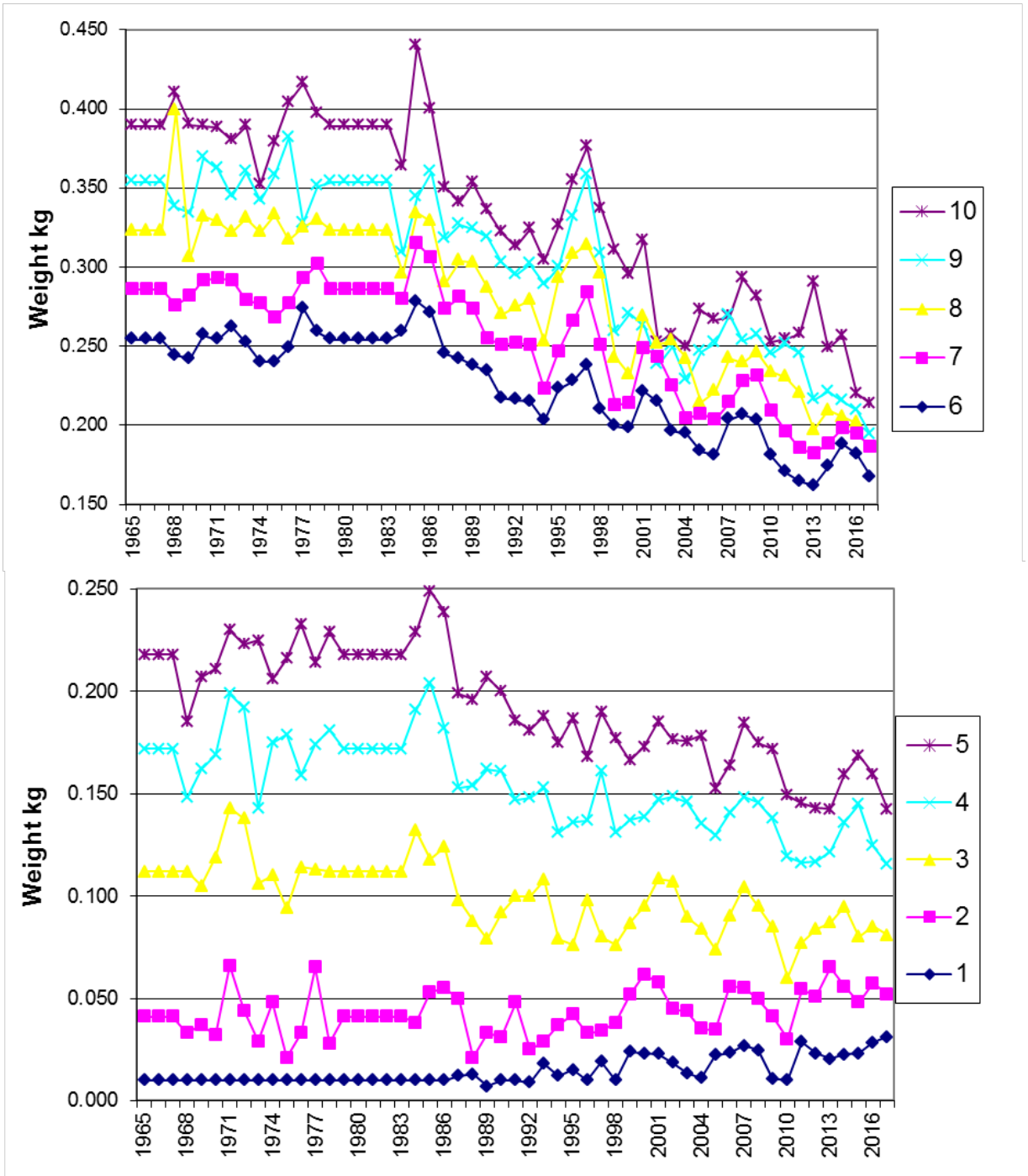


Figure 33. Average weights at age (kg) for the SWNS/BoF component of the 4WX Herring fishery (fishery weighted) for 1965–2017.

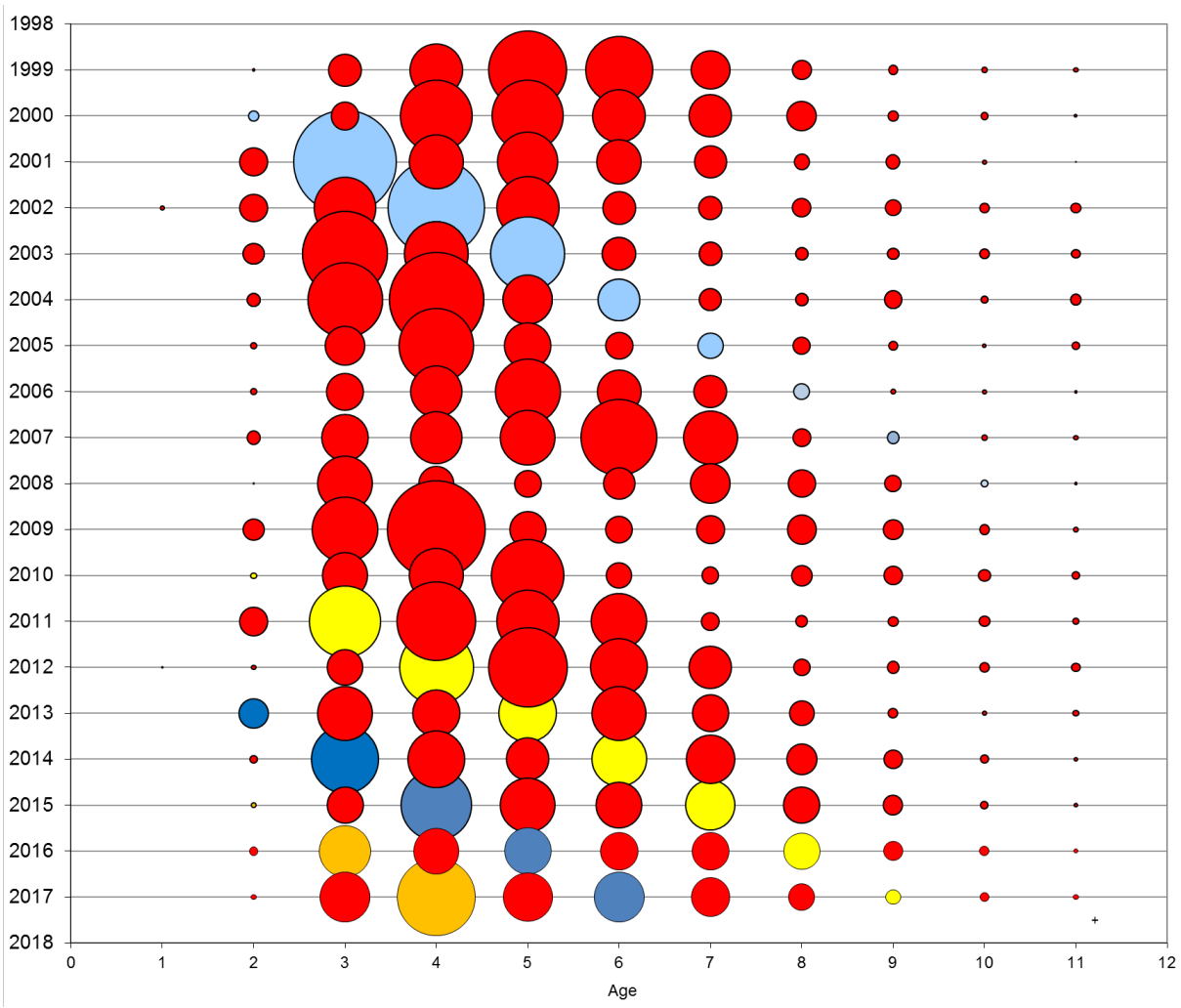


Figure 34A. Acoustic survey relative numbers at age (denoted by circle size) for the overall SWNS/BoF component. Selected year-classes are indicated by colours.

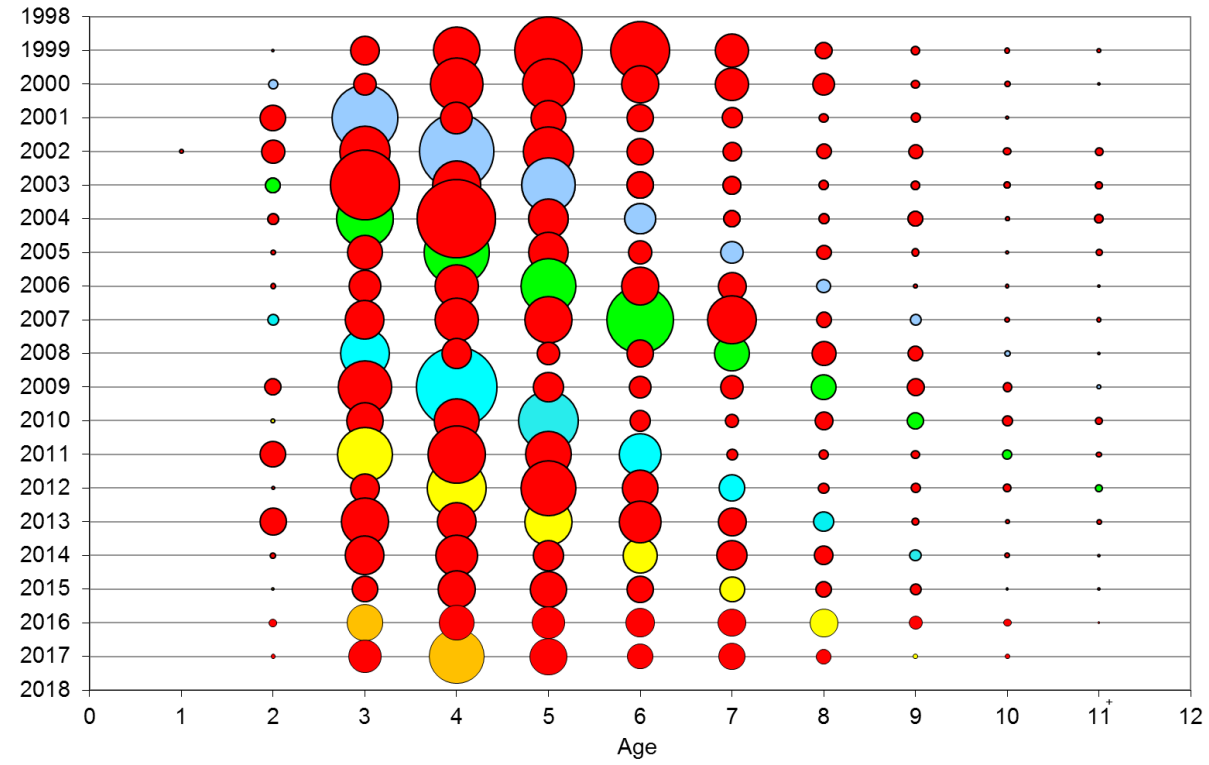


Figure 34B. Acoustic survey relative numbers at age (denoted by circle size) for the German Bank spawning area in the SWNS/BoF component. Selected year-classes are indicated by colours.

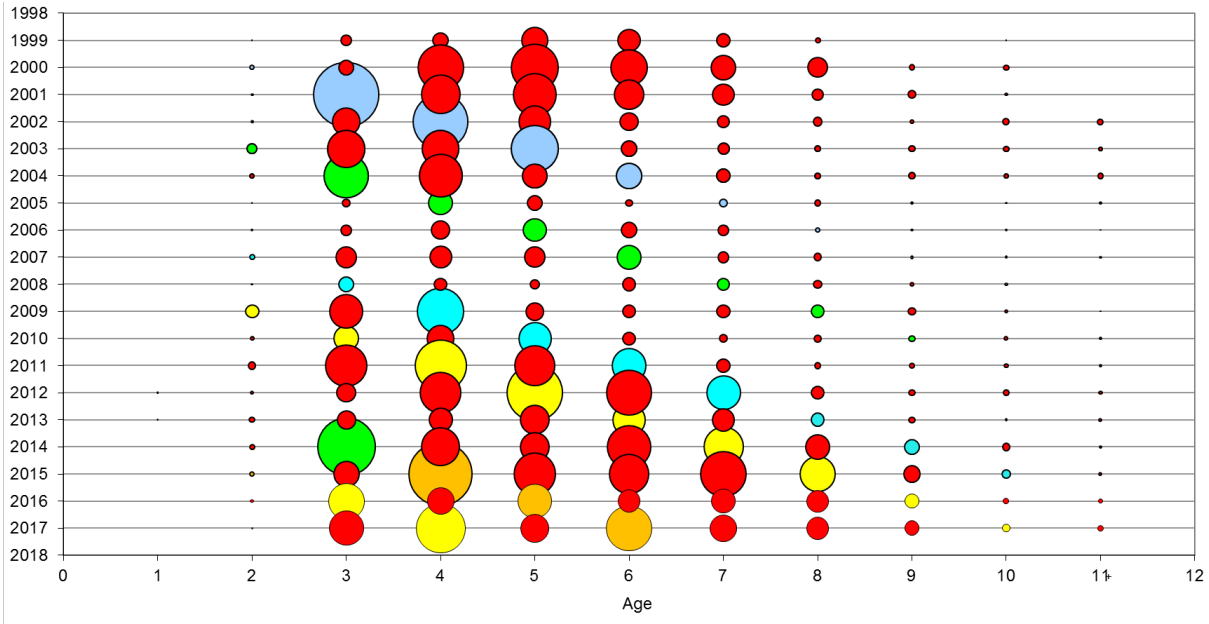


Figure 34C. Acoustic survey relative numbers at age (denoted by circle size) for the Scots Bay spawning area in the SWNS/BoF component. Selected year-classes are indicated by colours.

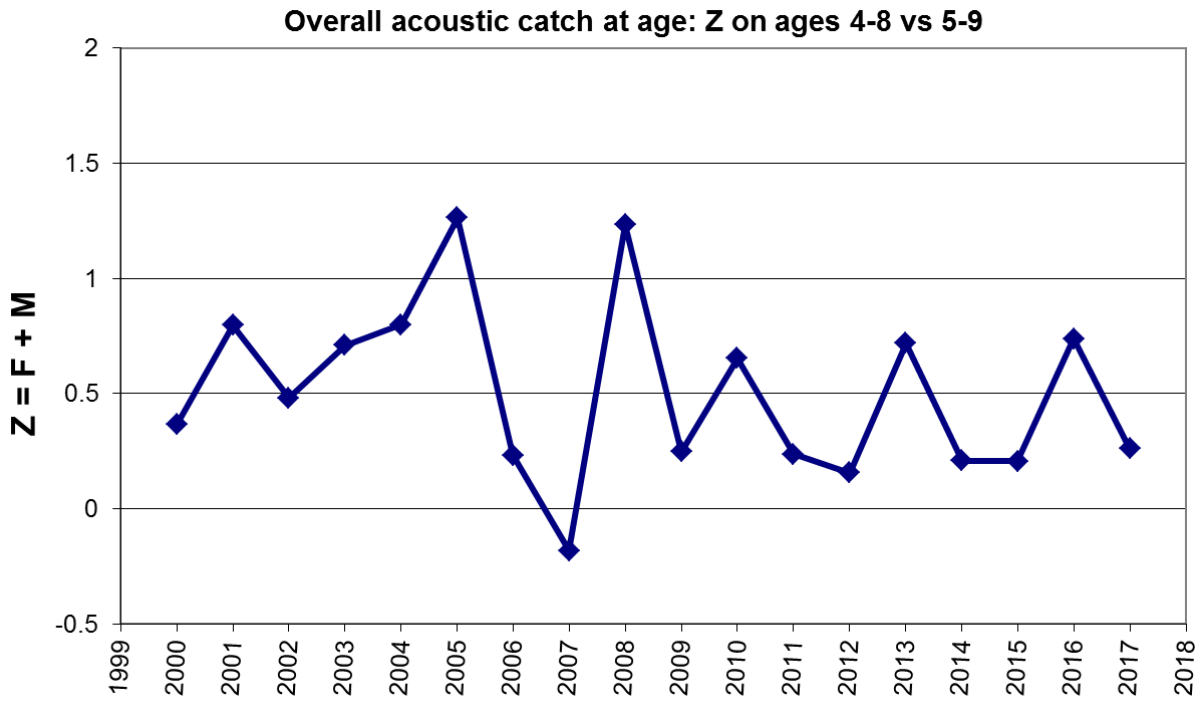


Figure 35A. Total mortality estimates (Z=F+M) from the overall SWNS/BoF component acoustic catch at age data for ages 4 to 8 combined, compared with ages 5 to 9 in the following year.

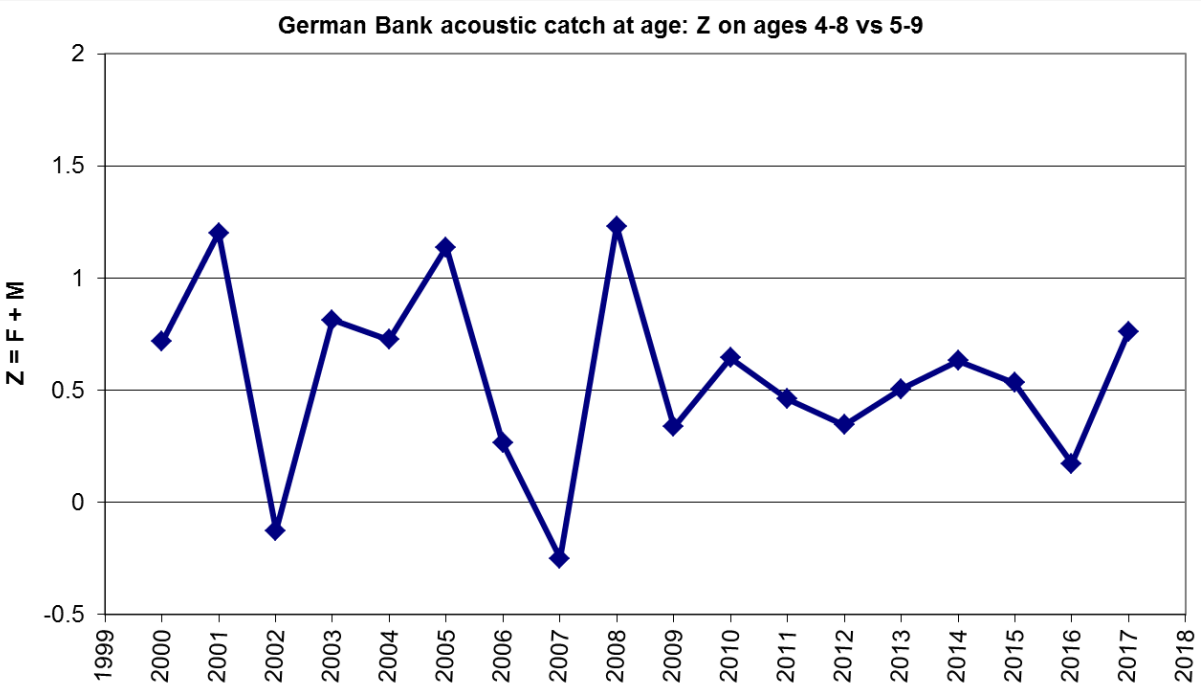


Figure 35B. Total mortality estimates (Z=F+M) for the German Bank spawning area acoustic catch at age data for ages 4 to 8 combined, compared with ages 5 to 9 in the following year.

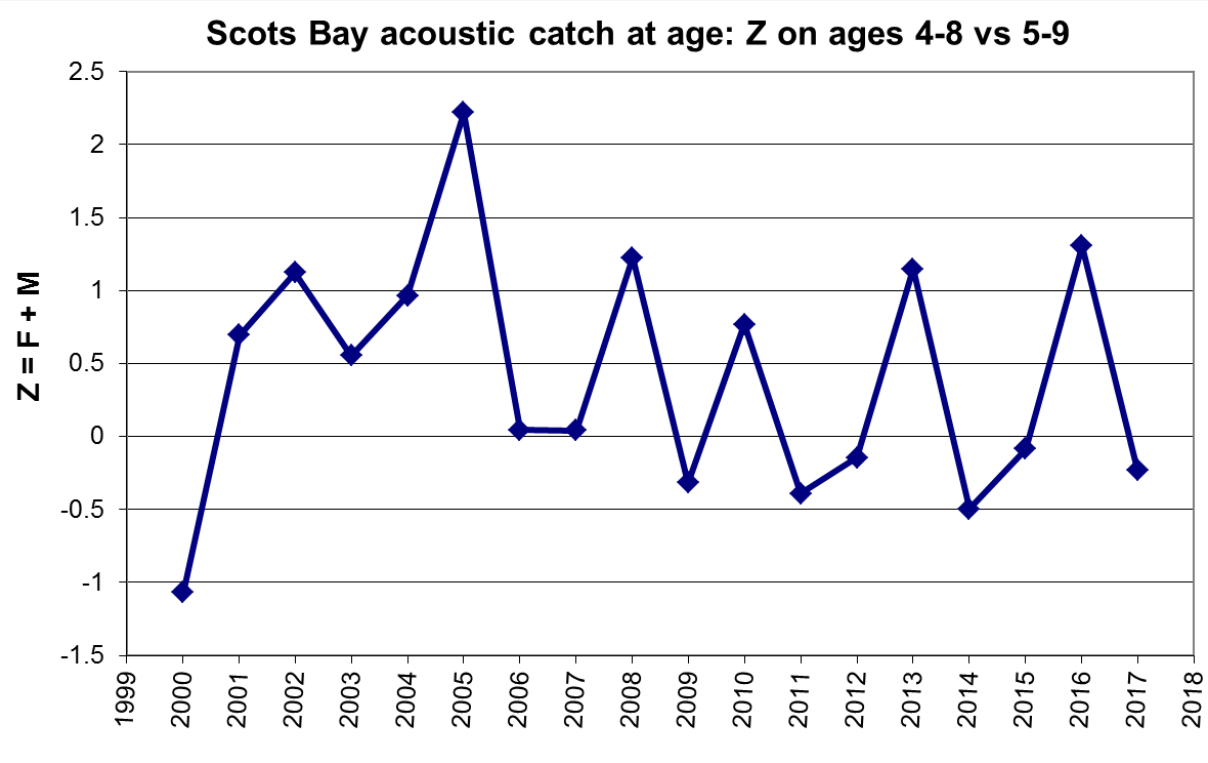


Figure 35C. Total mortality estimates (Z=F+M) for the Scots Bay spawning area acoustic catch at age data for ages 4 to 8 combined, compared with ages 5 to 9 in the following year.

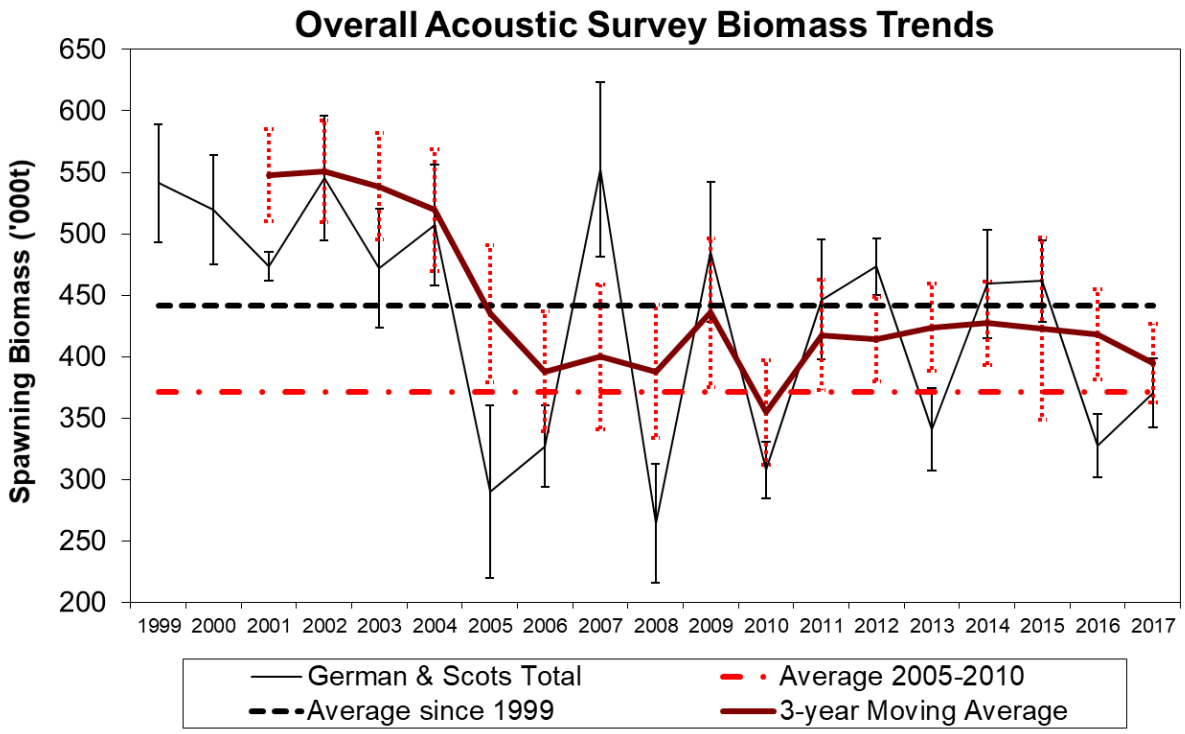


Figure 36A. Spawning Stock Biomass (SSB) (thousands t, with 95% standard errors), the three-year moving average, the calculated long term average and the limit reference point (LRP) for the SWNS/BoF spawning component (German Bank and Scots Bay). Biomass estimates calculated with Calibration Integration Factor (CIF). See Melvin et al. (2018) for updated figure.

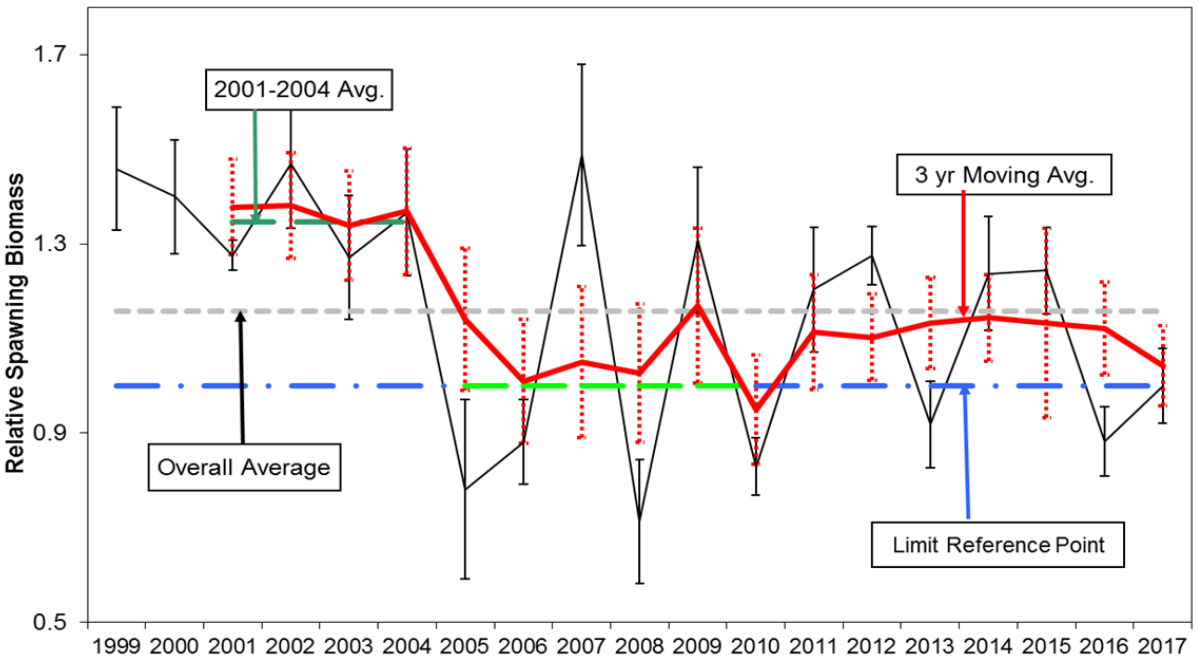


Figure 36B. Relative Spawning Stock Biomass (SSB) index (with 95% confidence interval), the calculated three-year moving average, the long term average and the limit reference point for the SWNS/BoF spawning component (German Bank and Scots Bay). See Melvin et al. (2018) for updated figure.

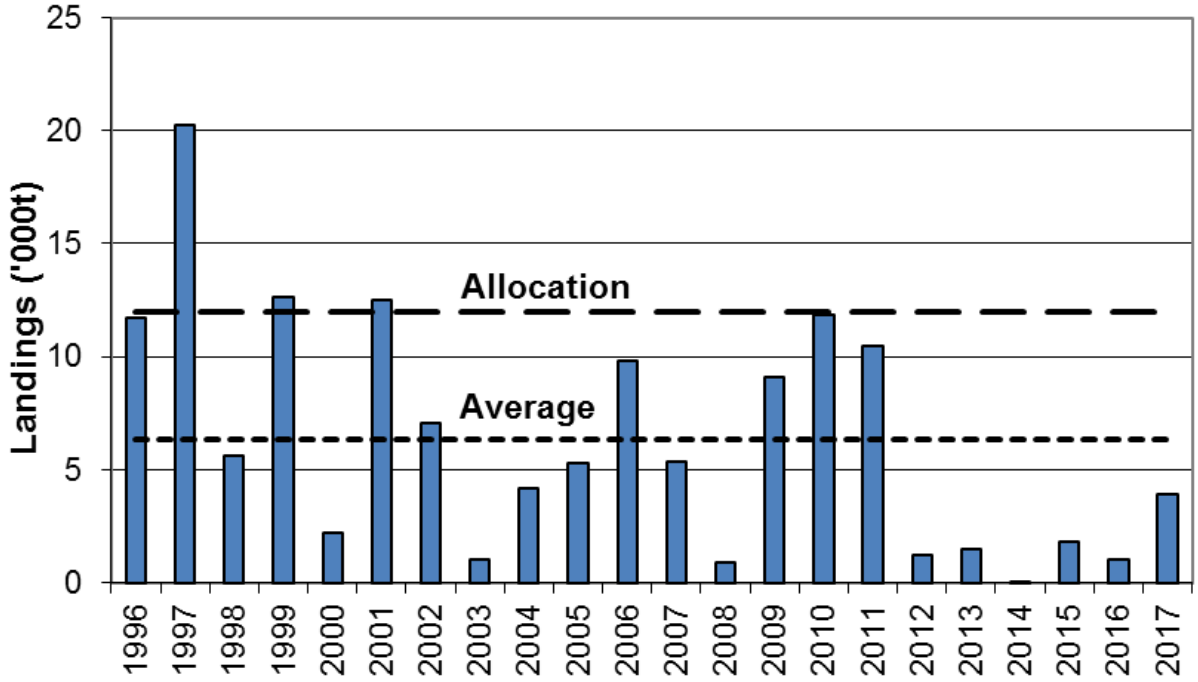


Figure 37. Offshore Scotian Shelf Herring landings ('000 t) (includes by-catch in other fisheries) since 1996 with the overall average for the period and 12,000 t allocation.

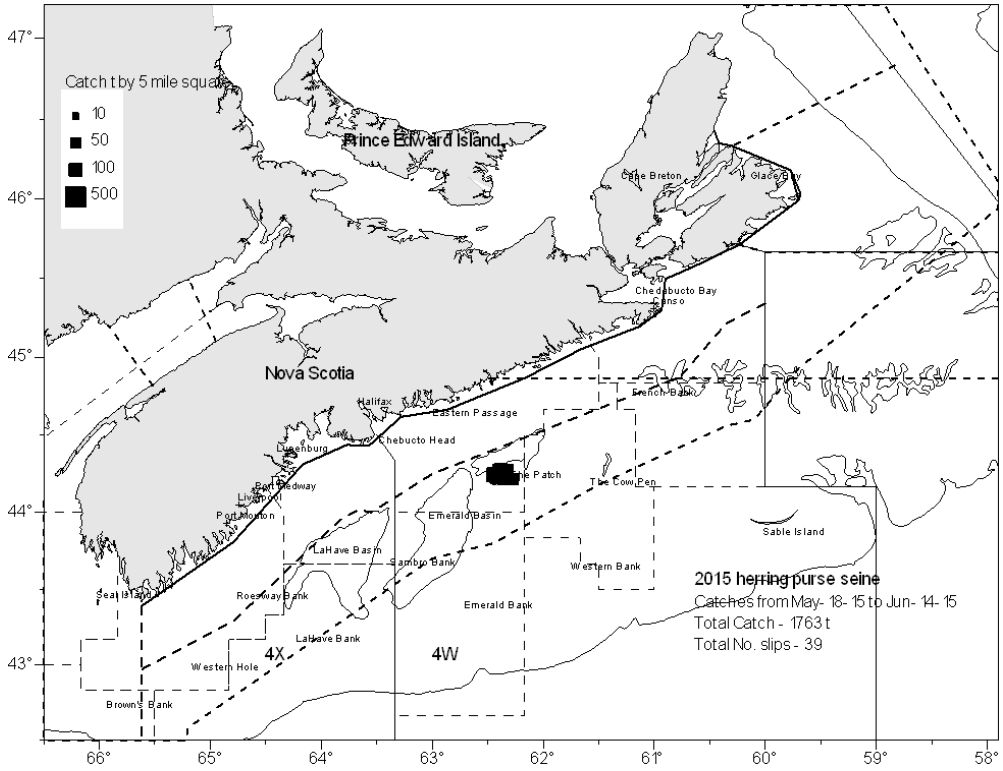


Figure 38A. 2015 Herring purse seine landings (t) on the offshore Scotian Shelf banks with embayment and offshore 25- and 50-mile lines shown.

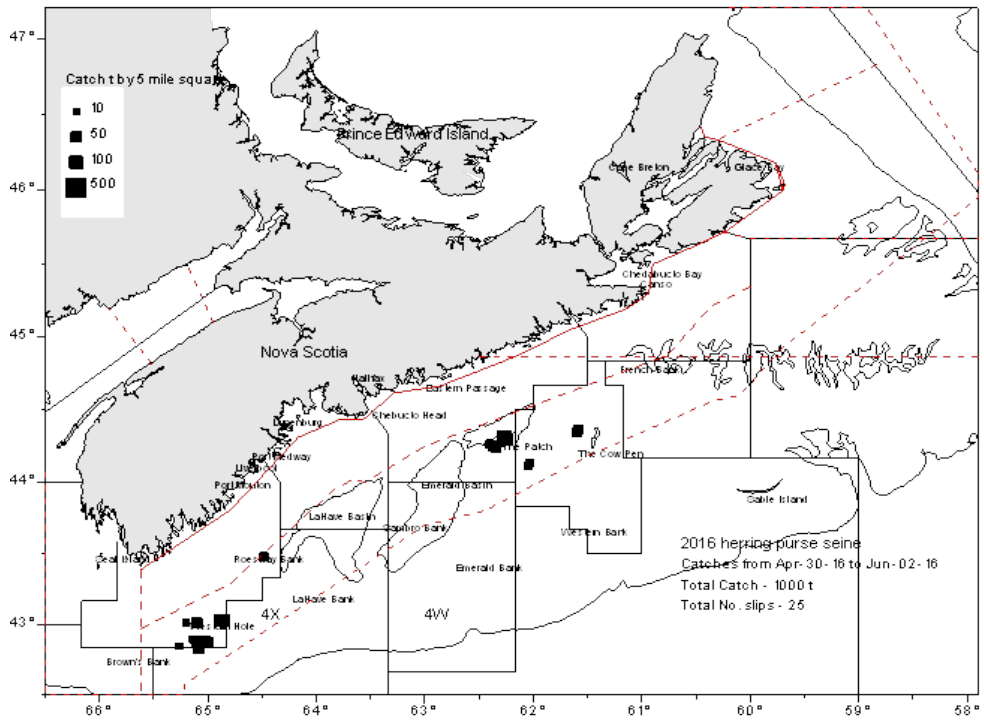


Figure 38B. 2016 Herring purse seine landings (t) on the offshore Scotian Shelf banks with embayment and offshore 25- and 50-mile lines shown.

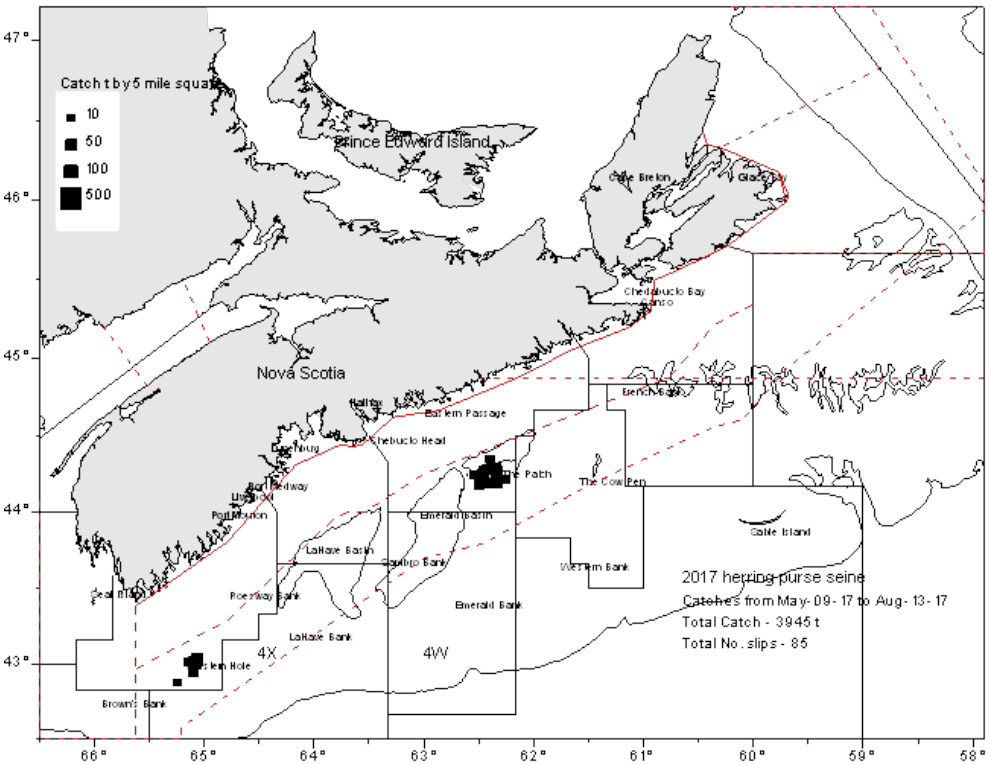


Figure 38C. 2017 Herring purse seine landings (t) on the offshore Scotian Shelf banks with embayment and offshore 25- and 50-mile lines shown.

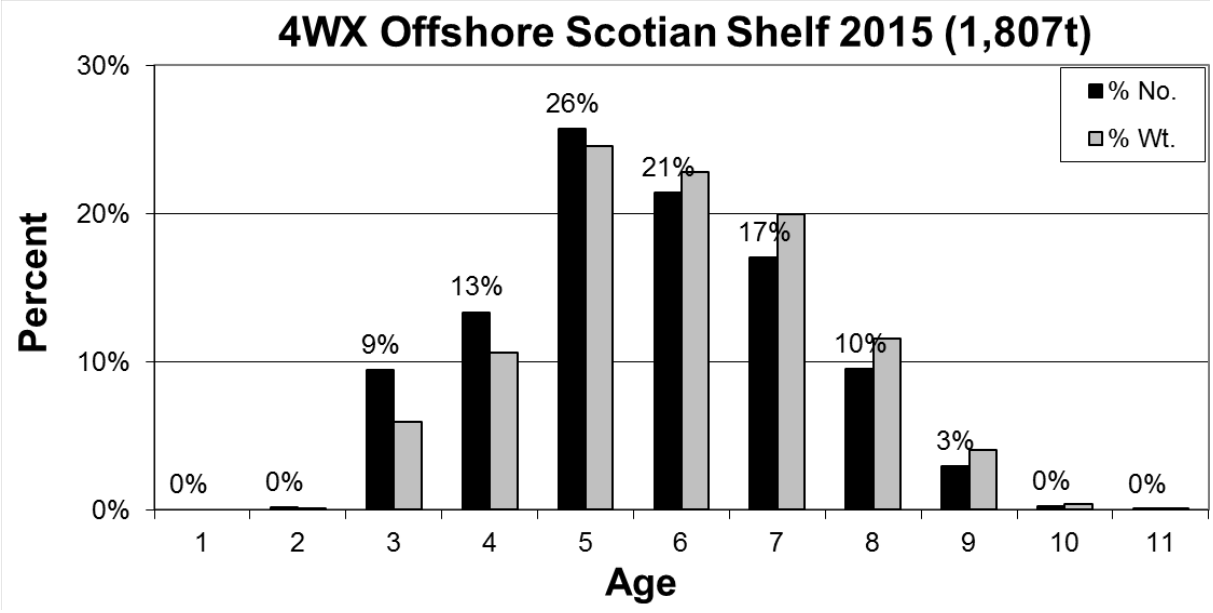


Figure 39A. Fishery catch at age (% numbers and % weight) for the 2015 offshore Scotian Shelf Herring component.

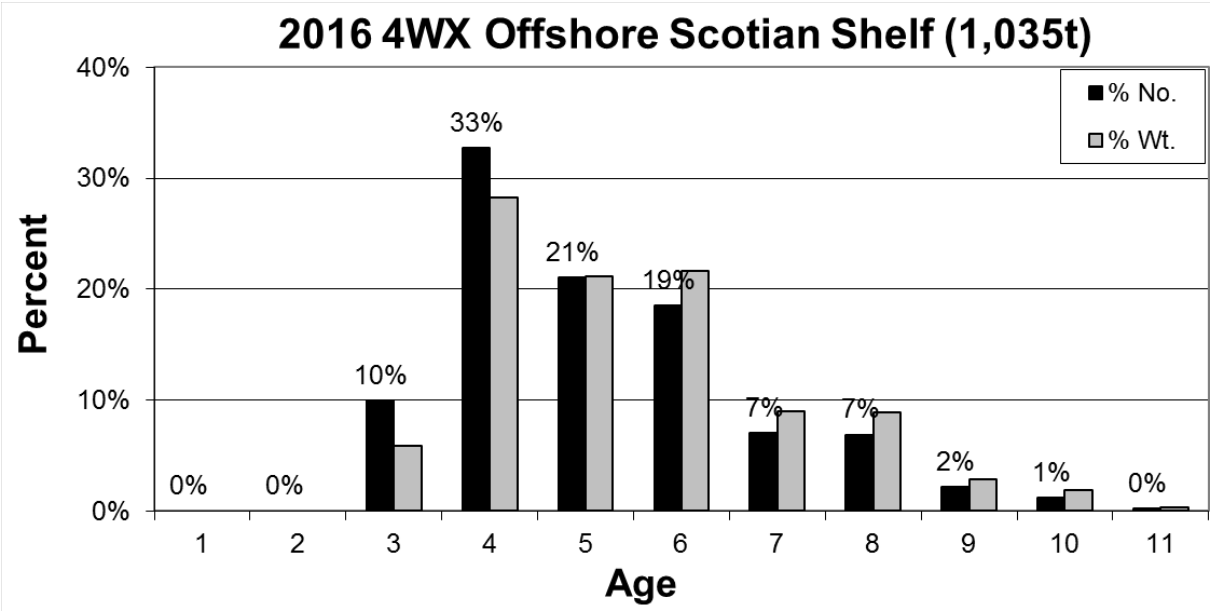


Figure 39B. Fishery catch at age (% numbers and % weight) for the 2016 offshore Scotian Shelf Herring component.

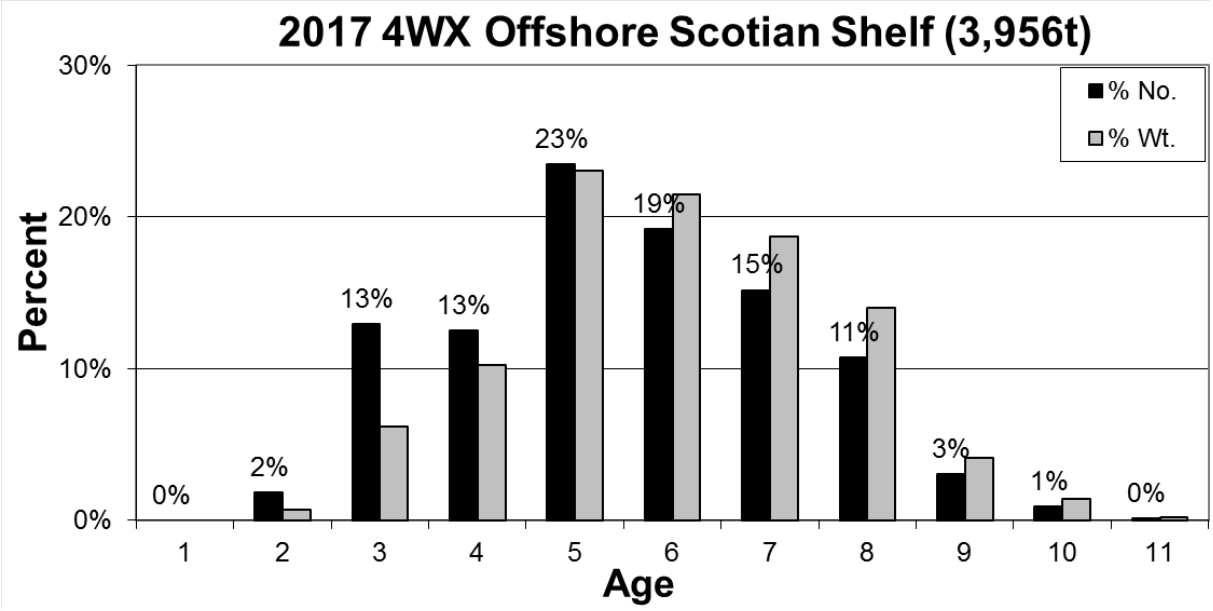


Figure 39C. Fishery catch at age (% numbers and % weight) for the 2017 offshore Scotian Shelf Herring component.

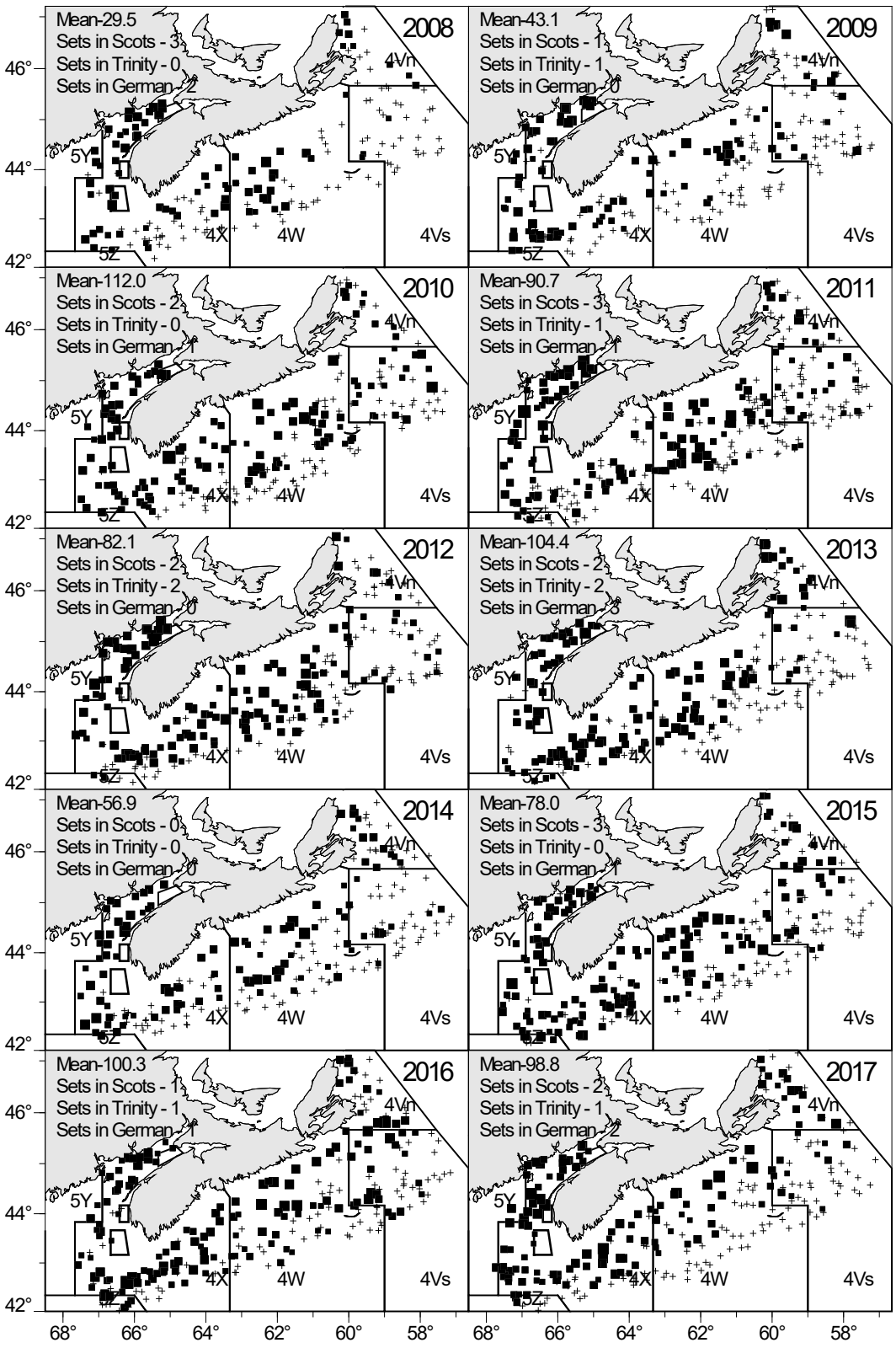


Figure 40A. Herring catches (by number) from the DFO summer bottom trawl research survey for 2008–2017. Mean numbers per standard tow and count of sets in Scots, Trinity and German spawning areas.

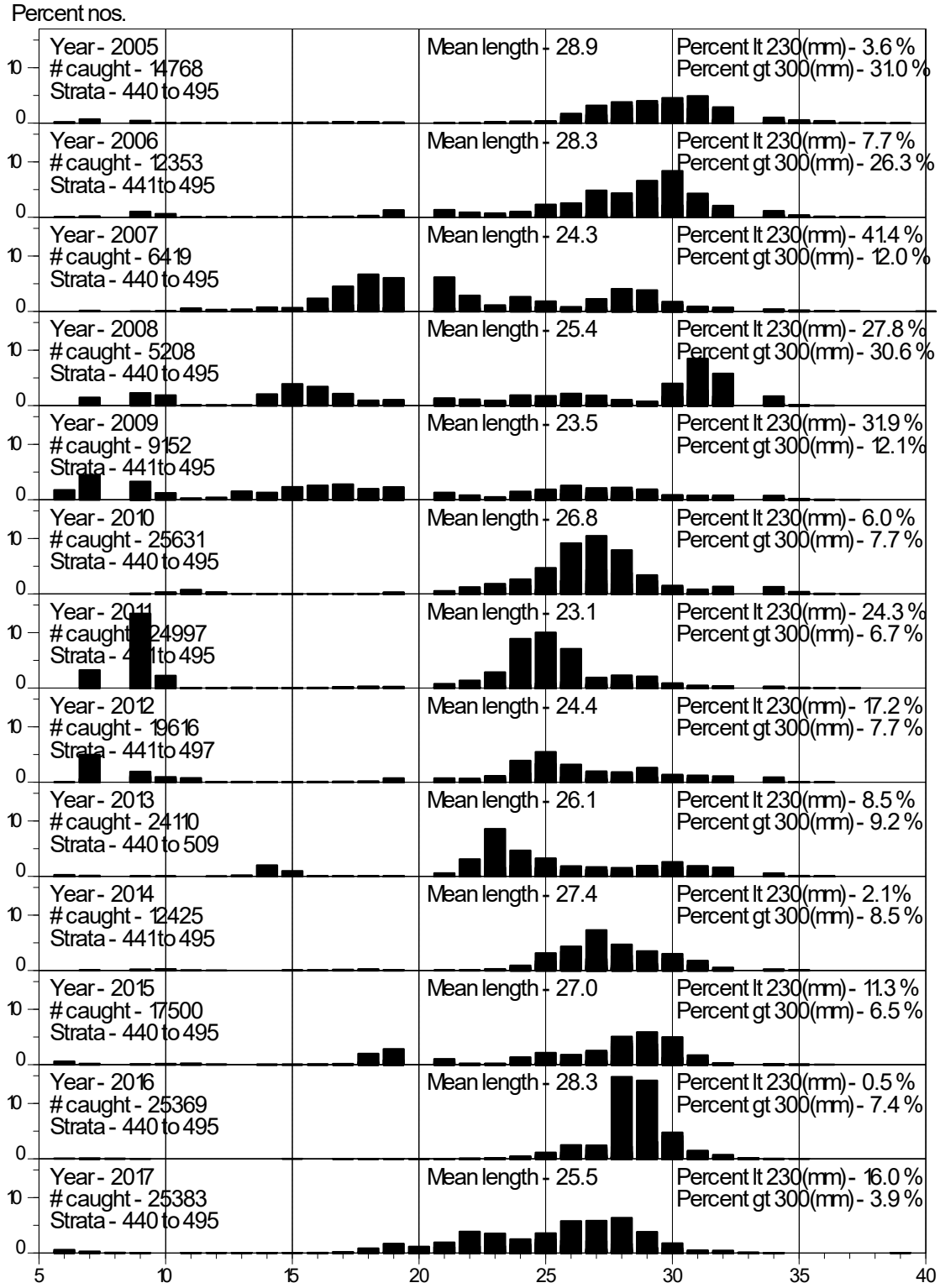


Figure 40B. The 2005–2017 Herring size distribution (fork length converted to total length cm) from the July bottom trawl research survey for the entire 4VWX area of coverage.

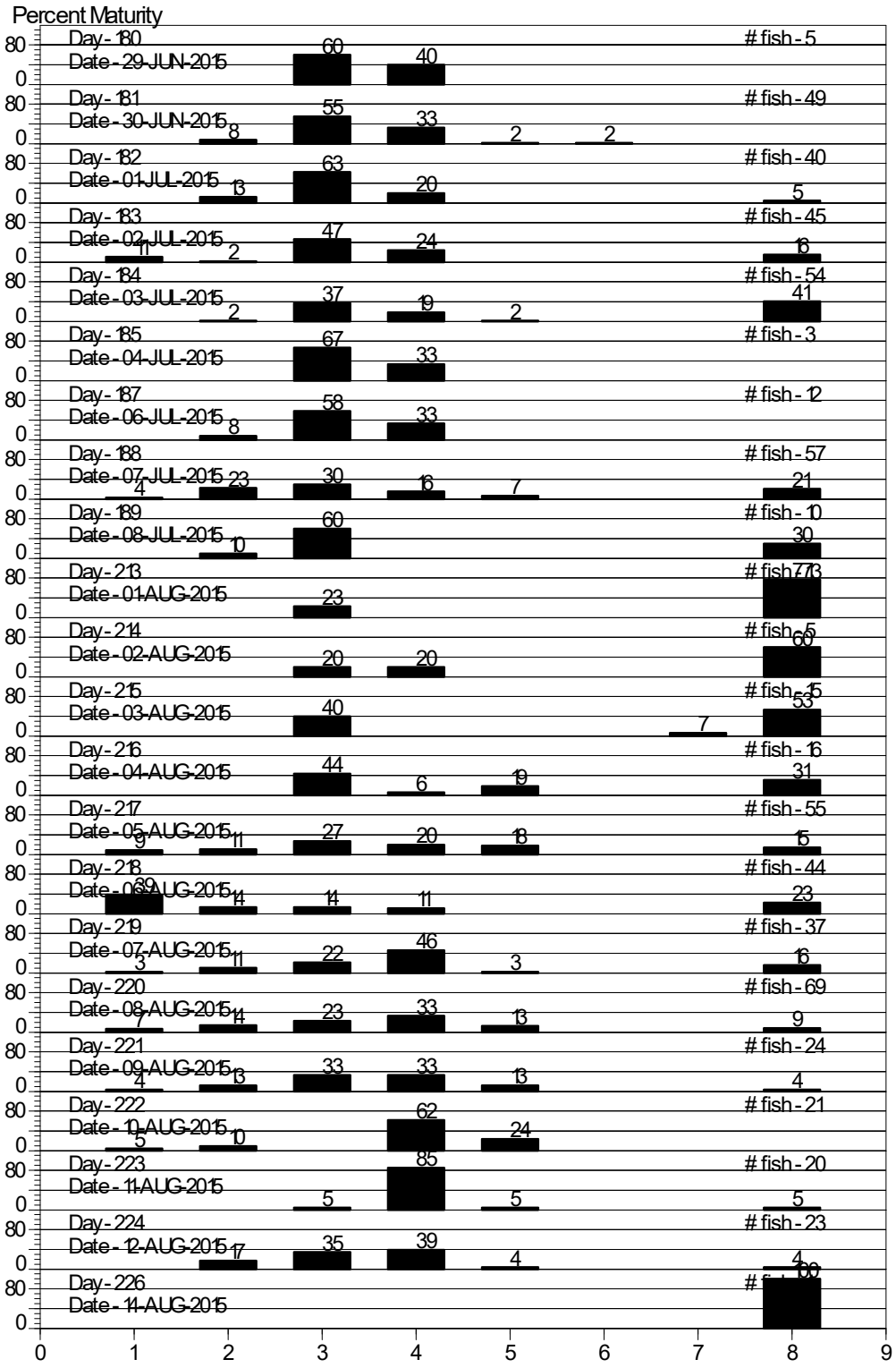


Figure 41A. Herring maturity samples collected from the Ecosystem Survey Offshore Banks area including area 470 in 2015. Staging codes are: 1–2=immature; 3–4–5=maturing/hard; 6=ripe and running; 7=spent; and 8=recovering.

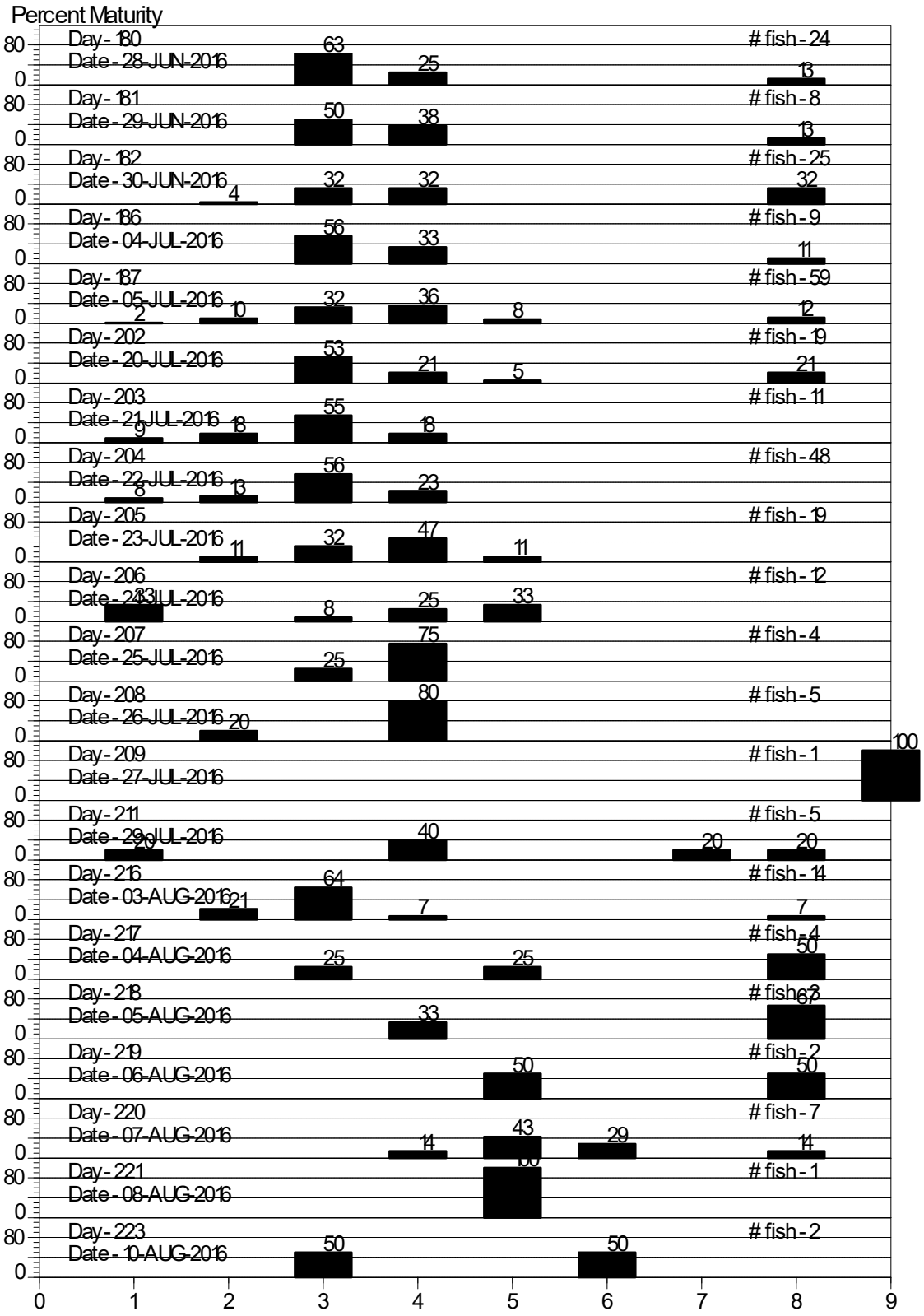


Figure 41B. Herring maturity samples collected from the Ecosystem Survey Offshore Banks area including area 470 in 2016. Staging codes are: 1–2=immature; 3–4–5=maturing/hard; 6=ripe and running; 7=spent; and 8=recovering.

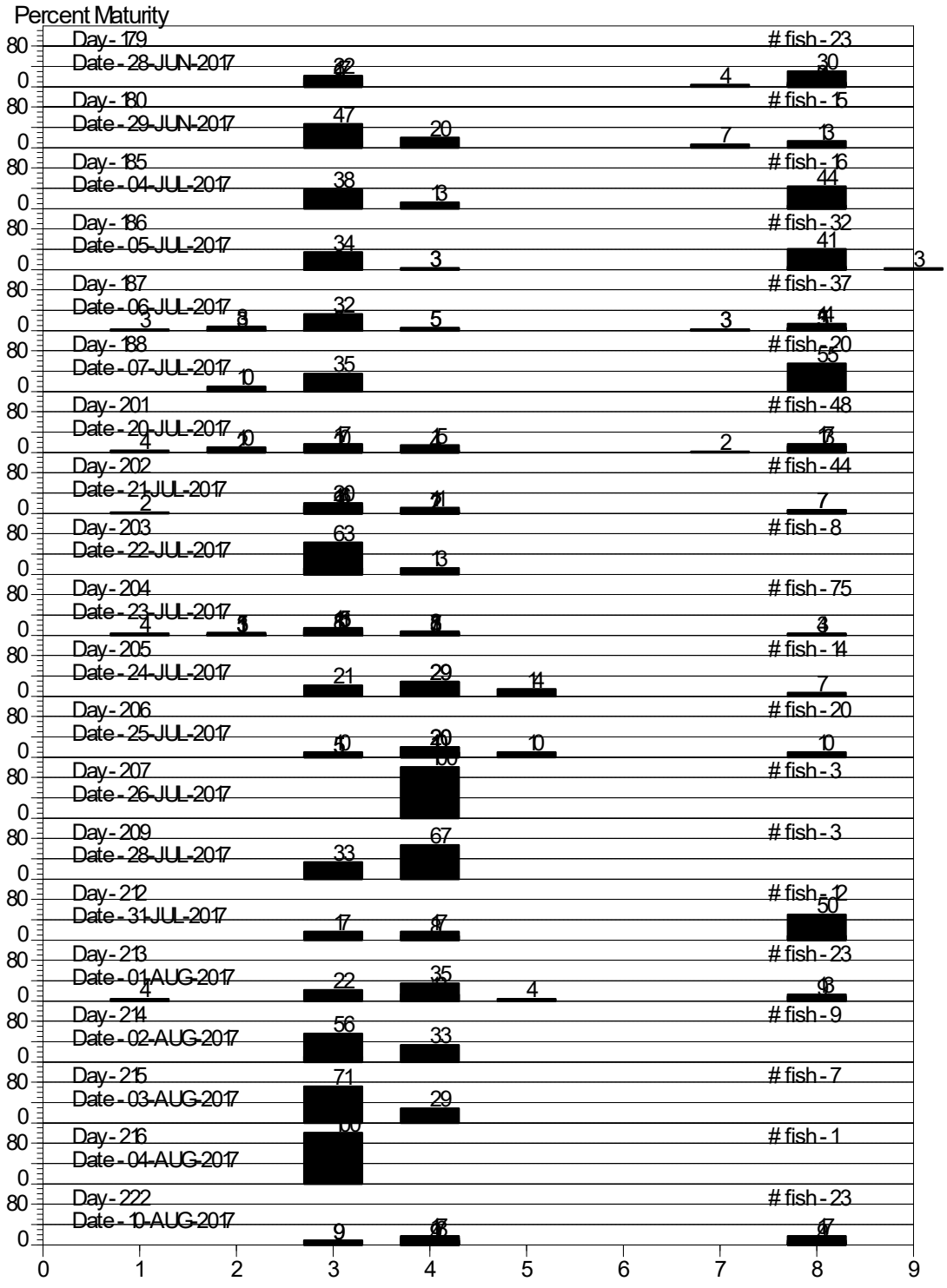


Figure 41C. Herring maturity samples collected from the Ecosystem Survey Offshore Banks area including area 470 in 2017. Staging codes are: 1–2=immature; 3–4–5=maturing/hard; 6=ripe and running; 7=spent; and 8=recovering.

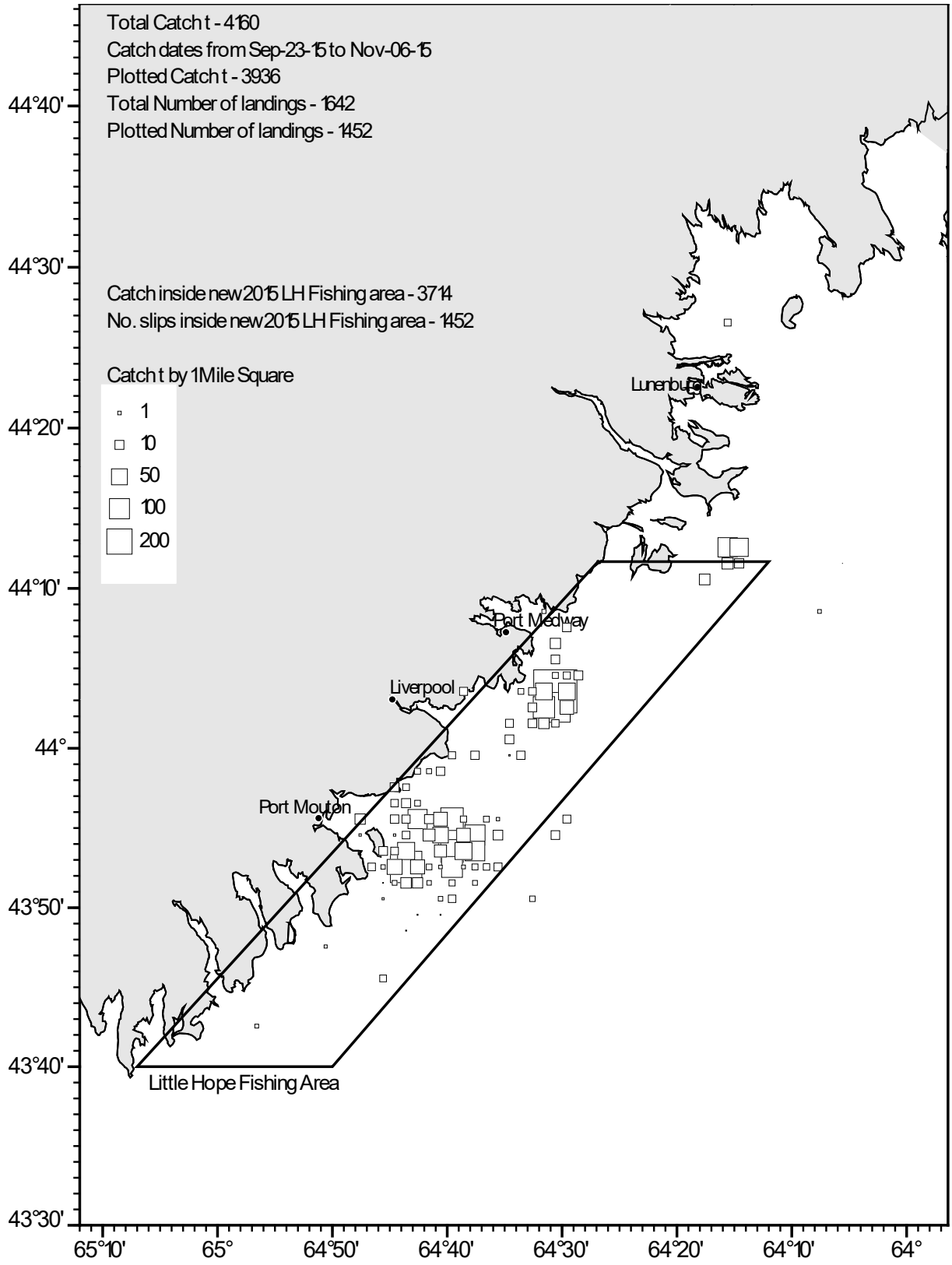


Figure 42A. The 2015 Herring gillnet catch locations for landings (t) in statistical districts 23–31 with amount caught within the Little Hope Fishing Area.

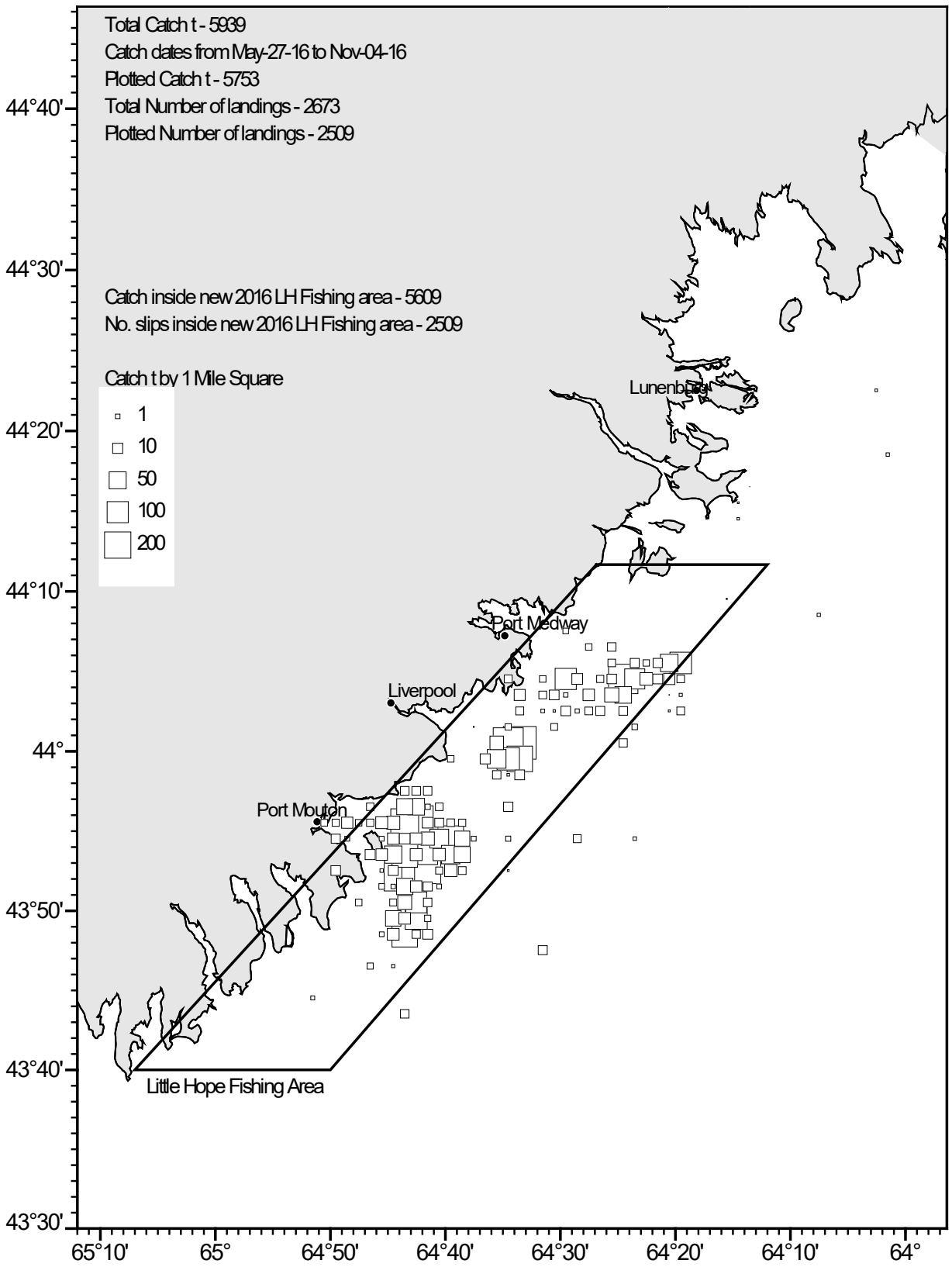


Figure 42B. The 2016 Herring gillnet catch locations for landings (t) in statistical districts 23–31 with amount caught within the Little Hope Fishing Area.

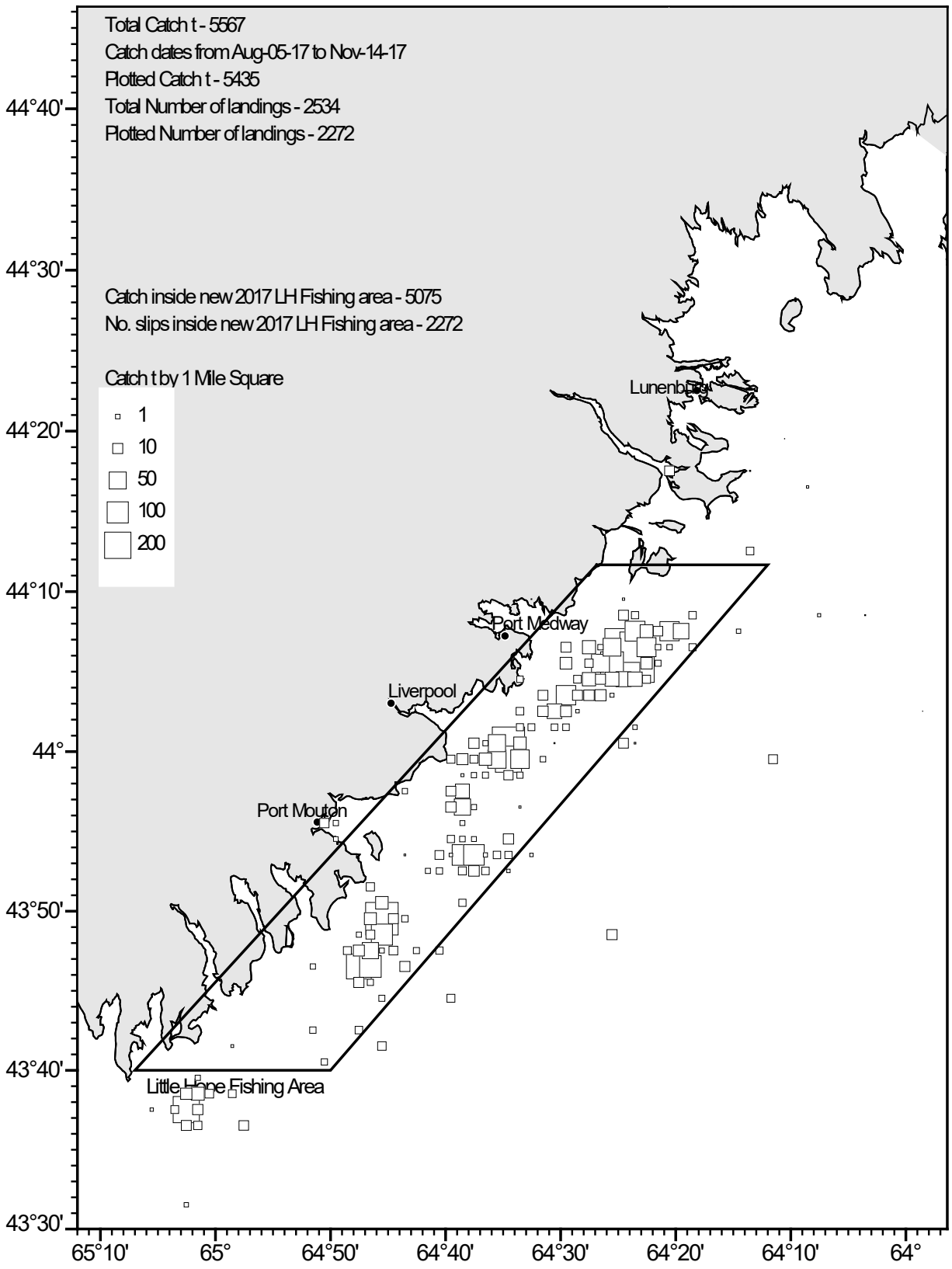


Figure 42C. The 2017 Herring gillnet catch locations for landings (t) in statistical districts 23–31 with amount caught within the Little Hope Fishing Area.

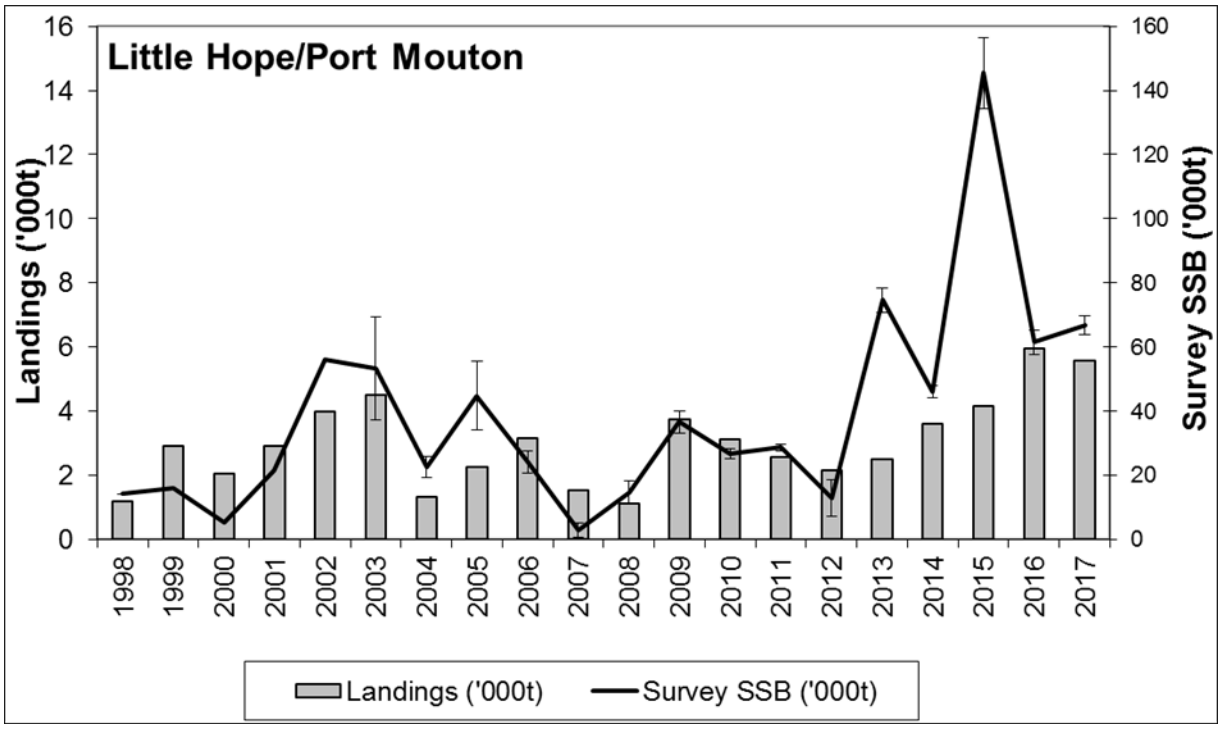


Figure 43. Herring landings (‘000t) and acoustic SSB (‘000t) with 95% Confidence Intervals (C.I.) for the Little Hope/Port Mouton gillnet fishery from 1997–2017. No C.I. could be calculated for years prior to 2003.

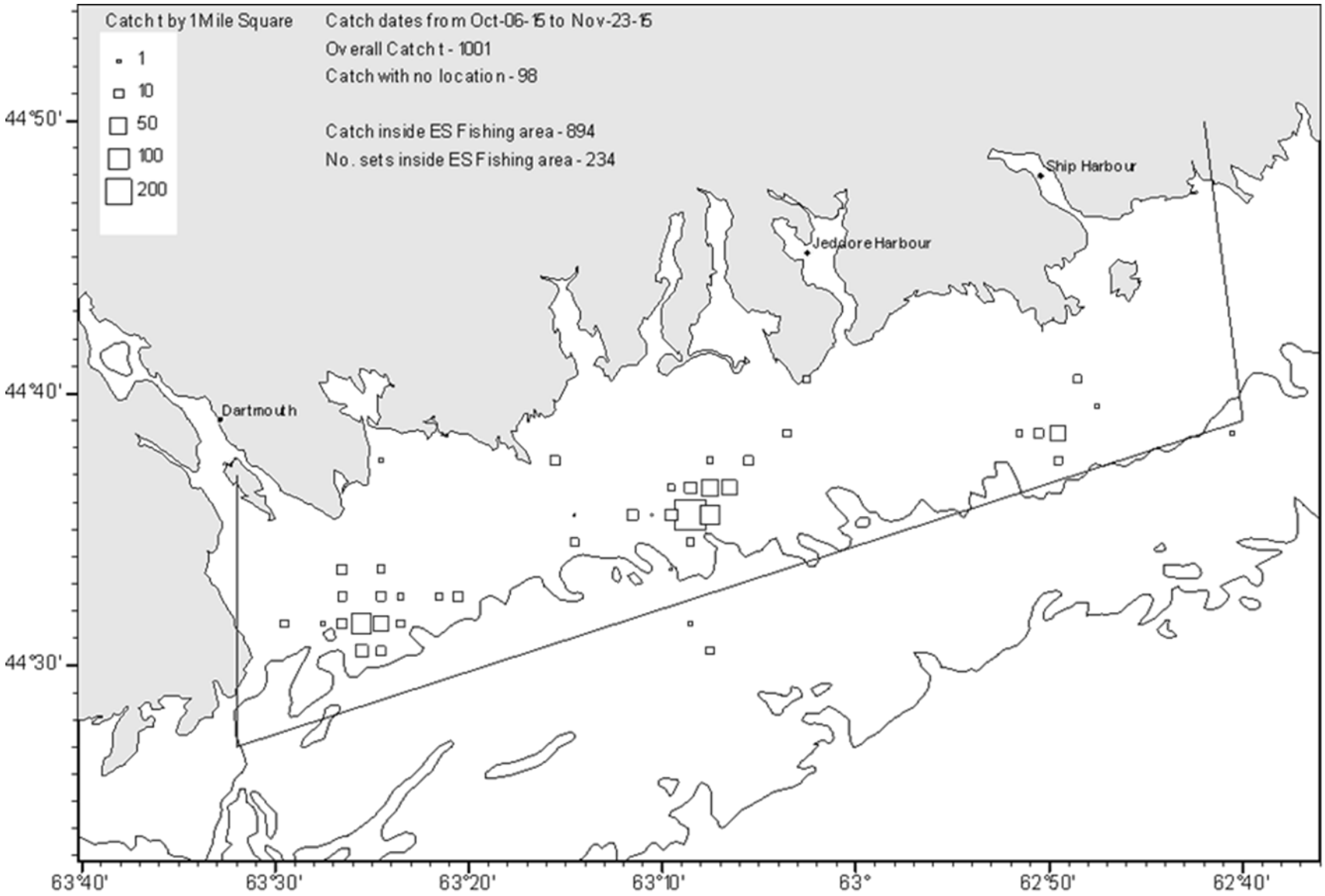


Figure 44A. Gillnet Herring landings (t) for the 2015 fall fishery along the Eastern Shore Fishing Area (landings by 1-mile squares).

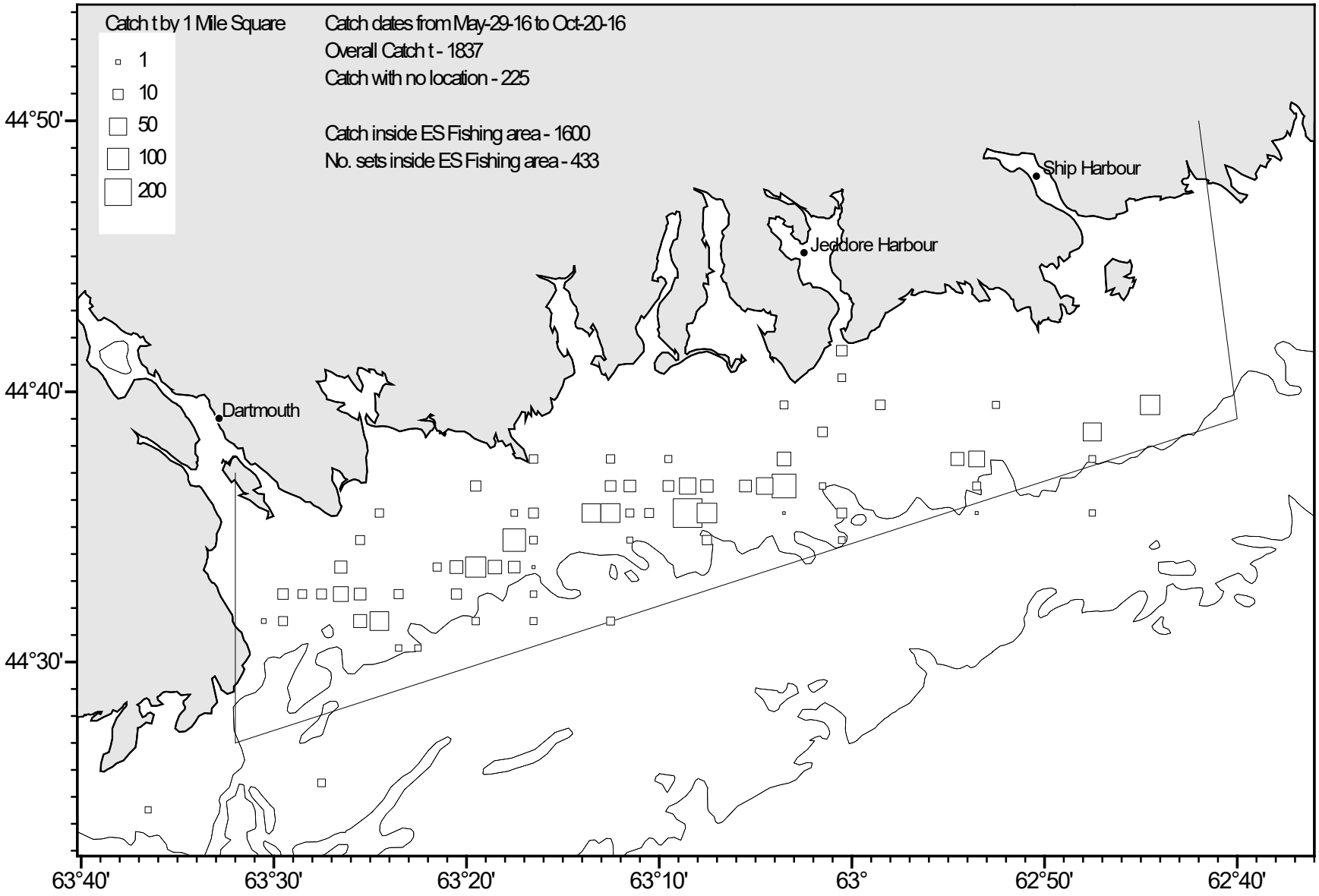


Figure 44B. Gillnet Herring landings (t) for the 2016 fall fishery along the Eastern Shore Fishing Area (landings by 1-mile squares).

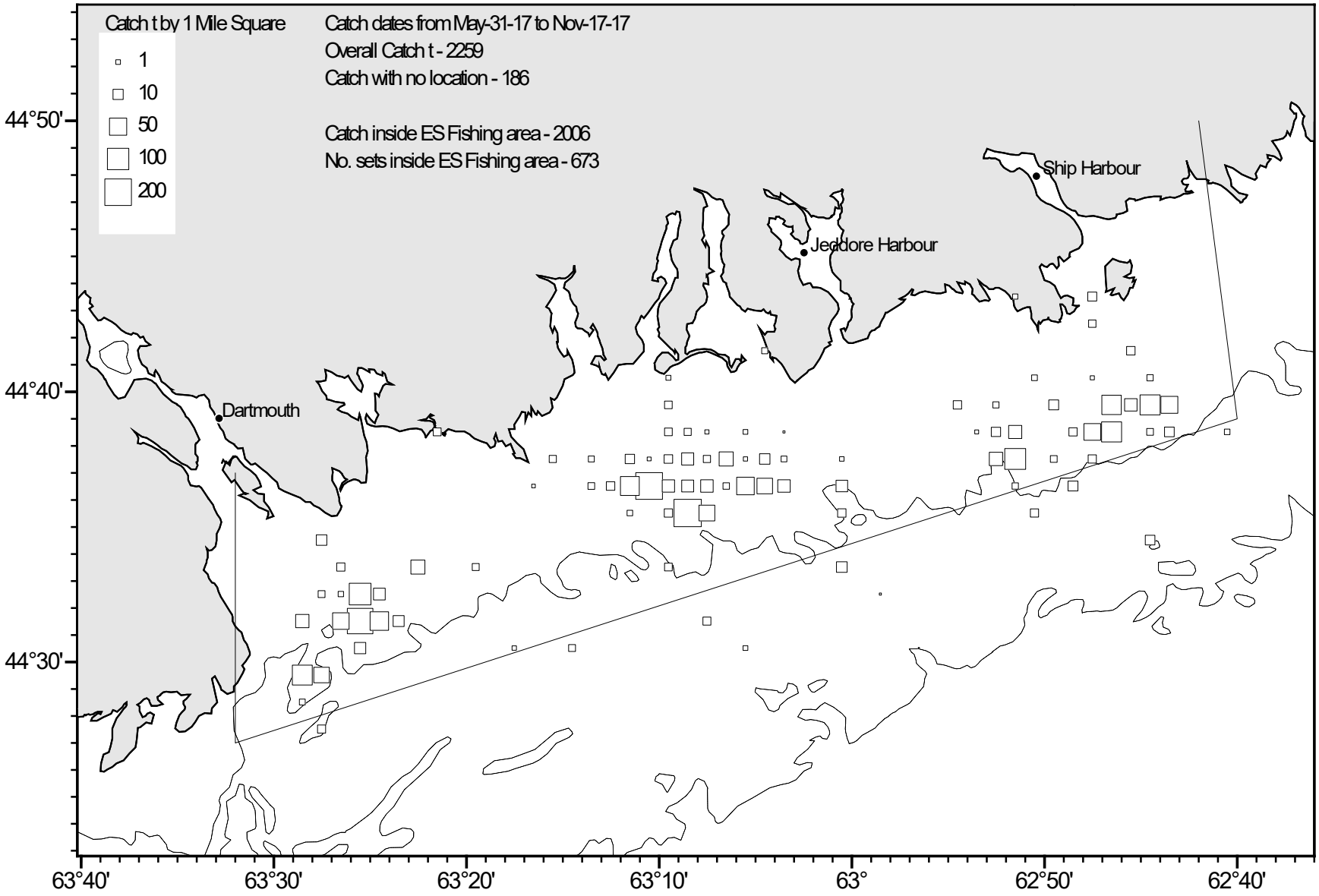


Figure 44C. Gillnet Herring landings (t) for the 2017 fall fishery along the Eastern Shore Fishing Area (landings by 1-mile squares).

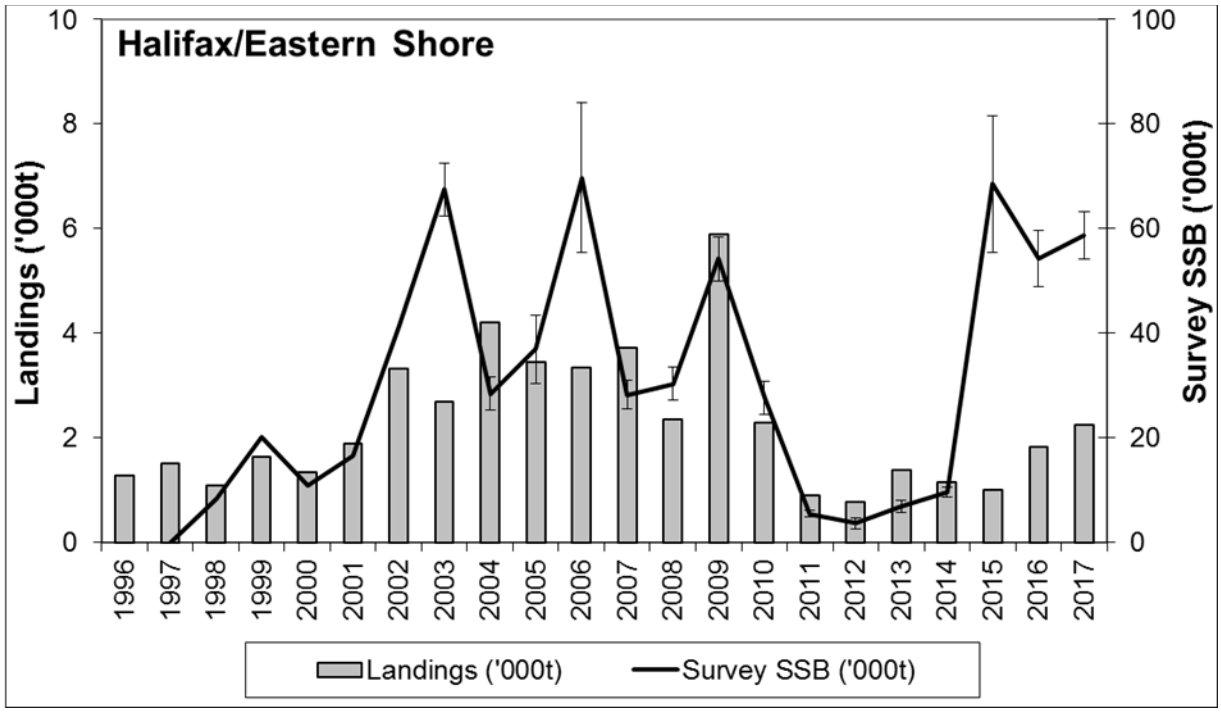


Figure 45. Herring landings (‘000 t) and acoustic Spawning Stock Biomass (SSB) (‘000 t) with 95% Confidence Intervals (C.I.) for the Halifax/Eastern Shore gillnet fishery from 1997–2017. No C.I. could be calculated for years prior to 2004.

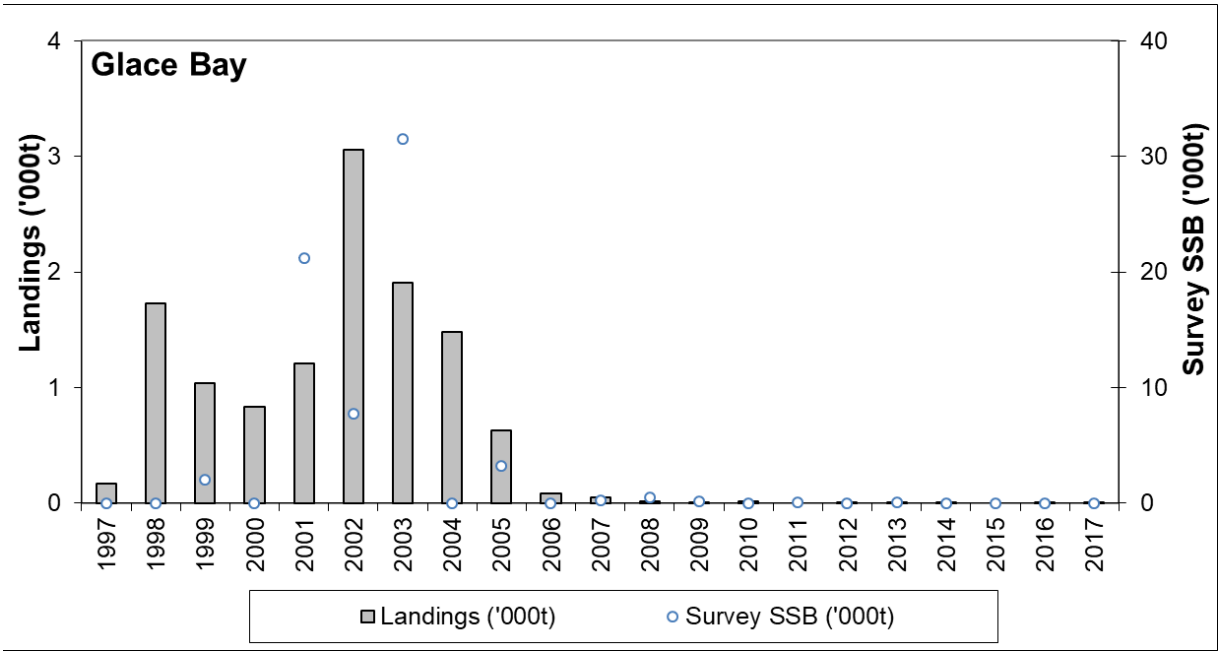


Figure 46. Herring landings (‘000 t) and acoustic Spawning Stock Biomass (SSB) (‘000 t) for the Glace Bay gillnet fishery from 1997–2017. No Confidence Intervals (C.I.) could be calculated due to limited number of surveys.

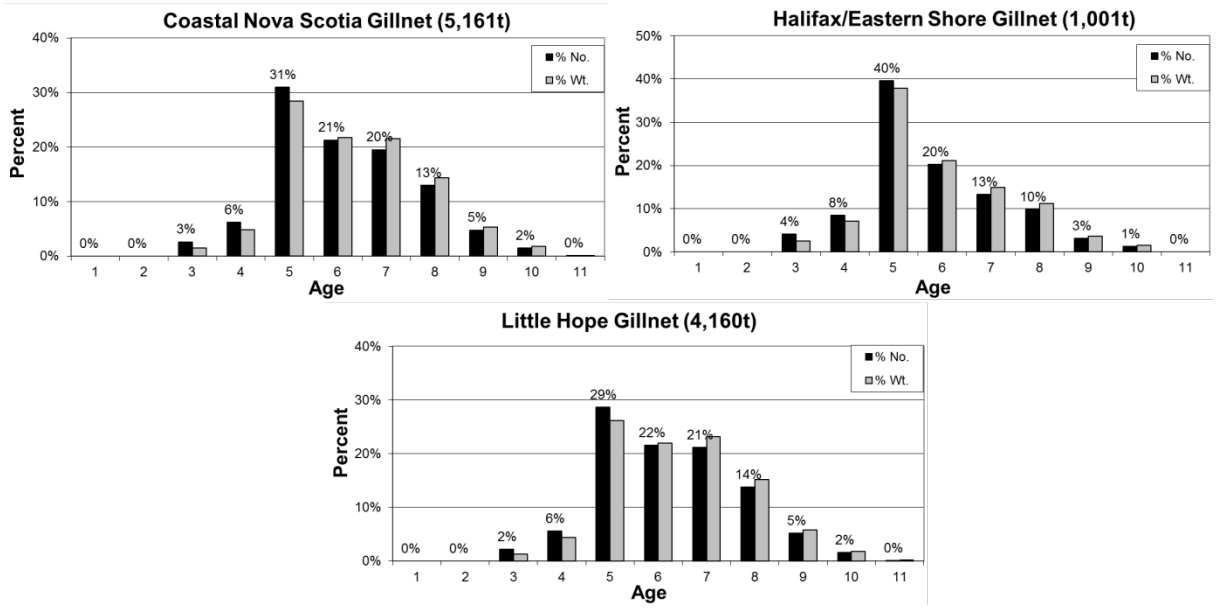


Figure 47A. Fishery catch at age (% numbers and % weight) for the 2015 Coastal Nova Scotia Herring gillnet fishery and within the Coastal Nova Scotia component for the Halifax/Eastern Shore area and the Little Hope area. Five tonnes landings were reported for the trap fishery in 2015.

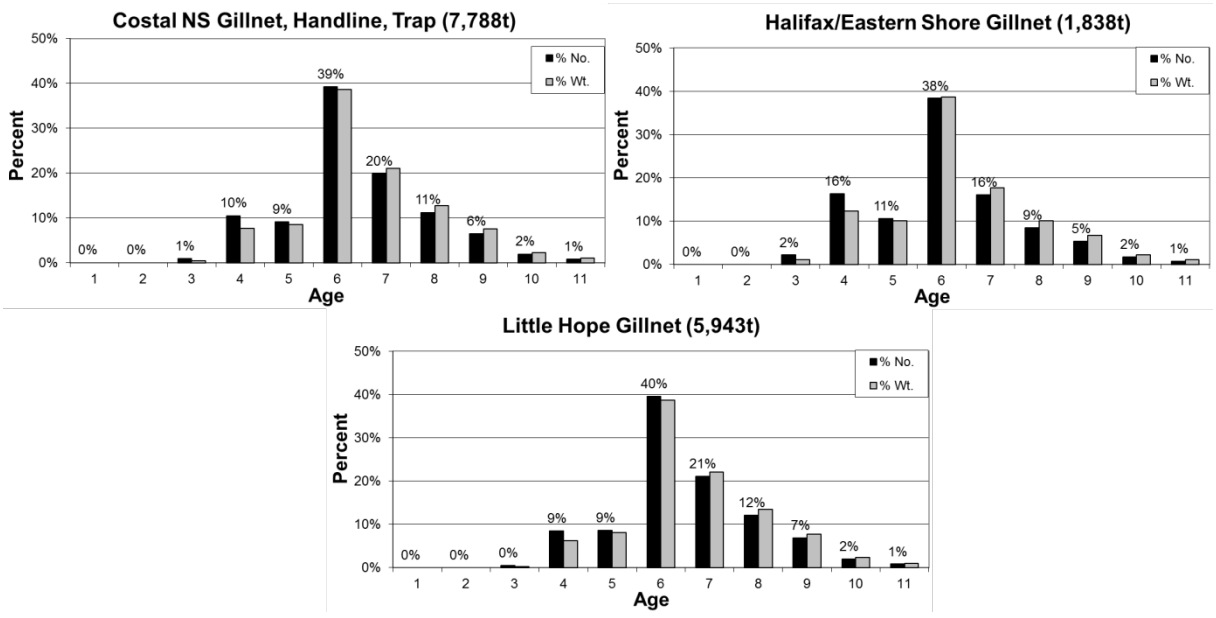


Figure 47B. Fishery catch at age (% numbers and % weight) for the 2016 Coastal Nova Scotia Herring gillnet fishery and within the Coastal Nova Scotia component for the Halifax/Eastern Shore area and the Little Hope area. 21 tonnes landings were reported for the trap fishery in 2016.

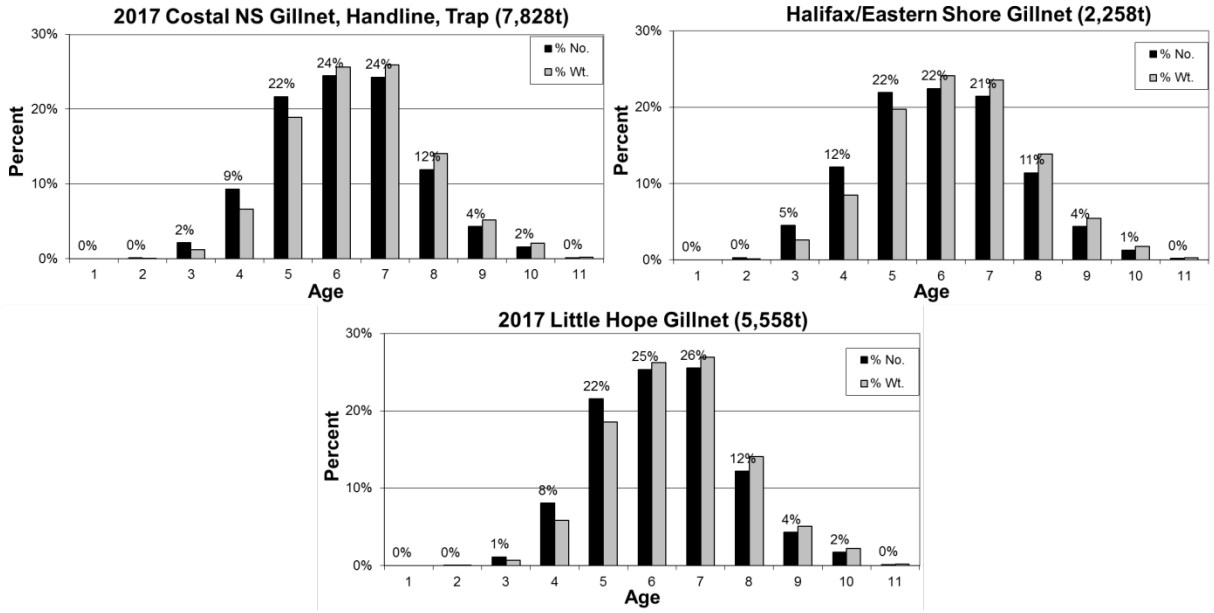


Figure 47C. Fishery catch at age (% numbers and % weight) for the 2017 Coastal Nova Scotia Herring gillnet fishery and within the Coastal Nova Scotia component for the Halifax/Eastern Shore area and the Little Hope area. 12 tonnes landings were reported for the trap and handline fishery in 2017.

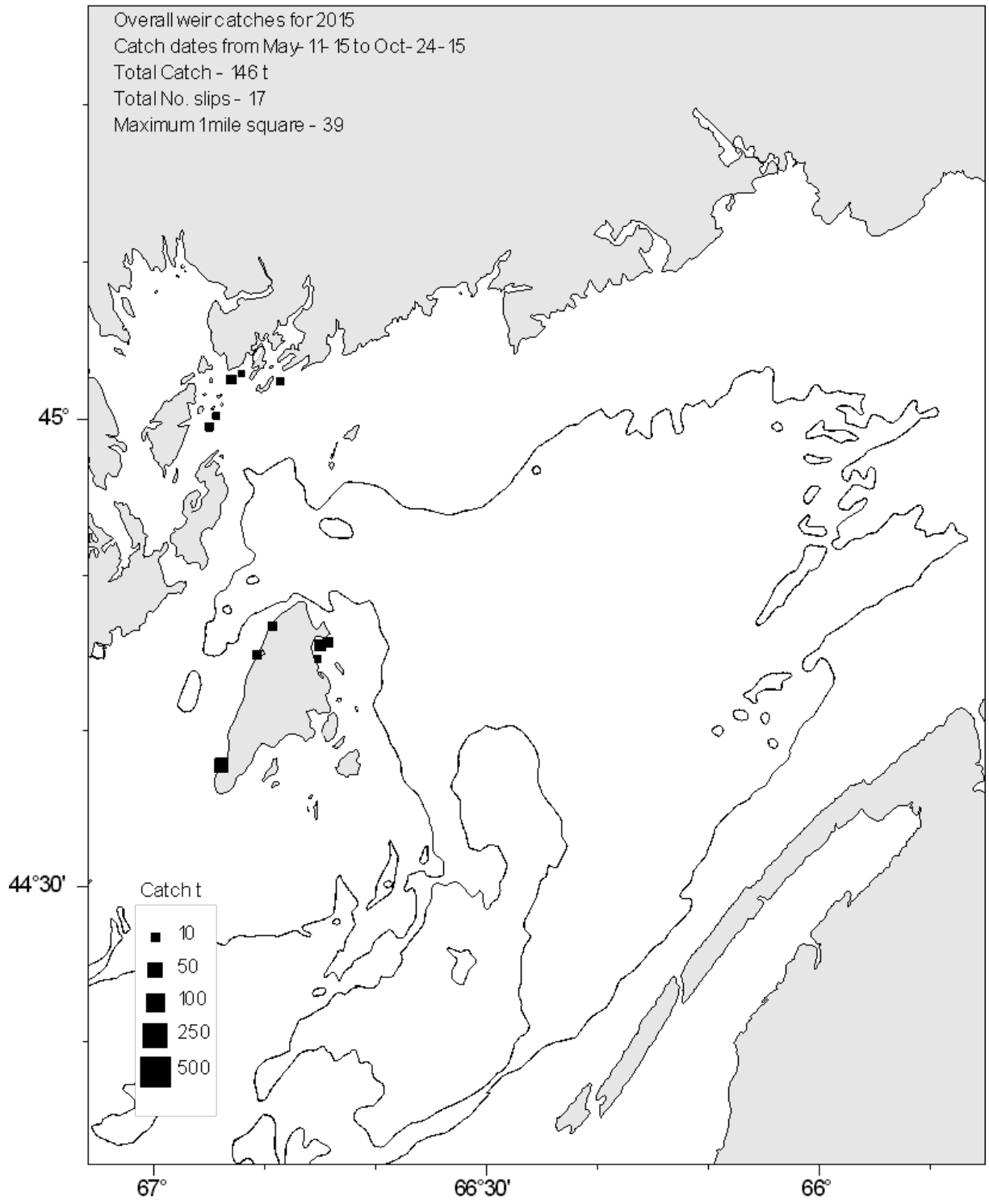


Figure 48A. New Brunswick Herring weir landings (t) by location for the 2015 fishing season.

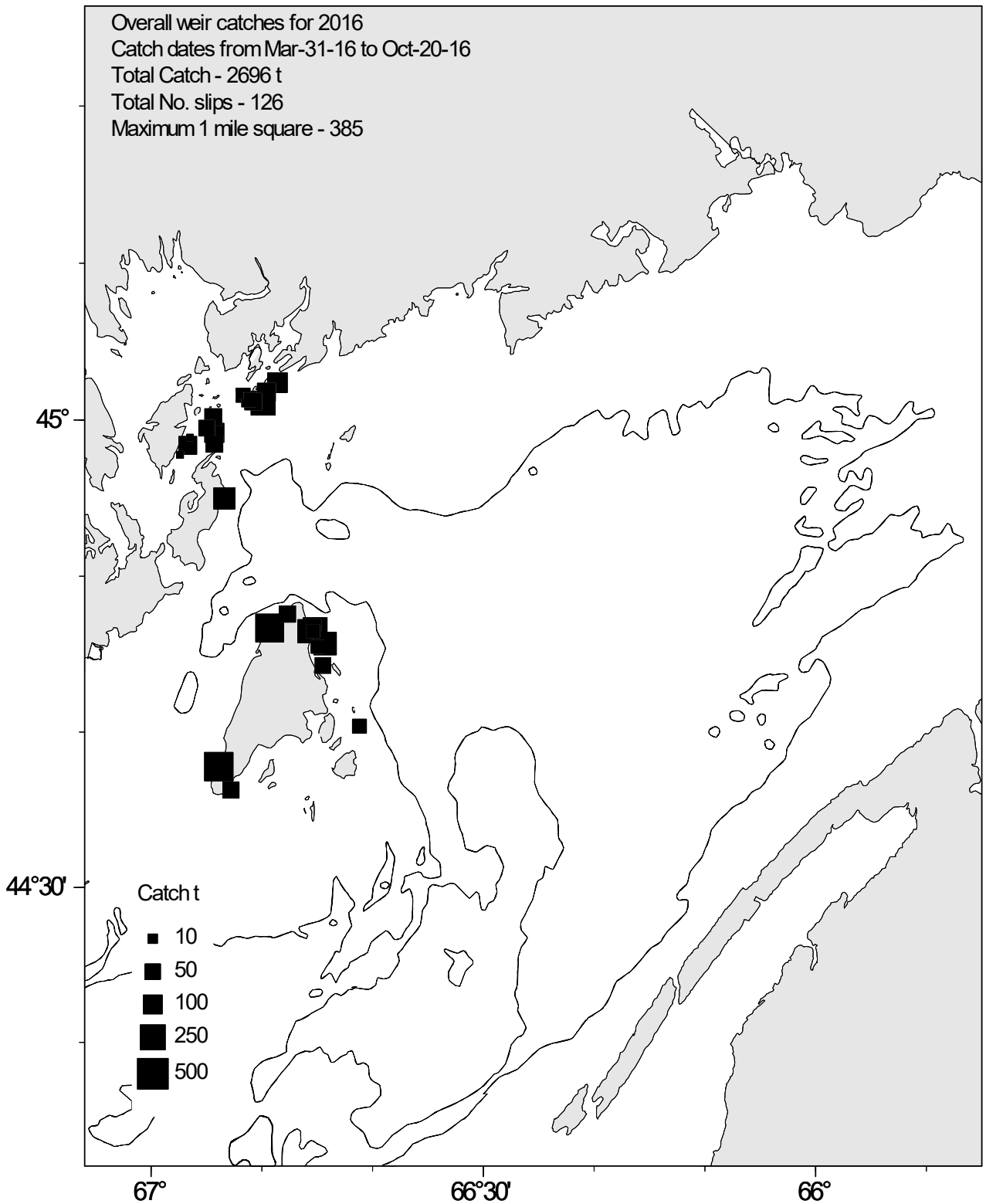


Figure 48B. New Brunswick Herring weir landings (t) by location for the 2016 fishing season.

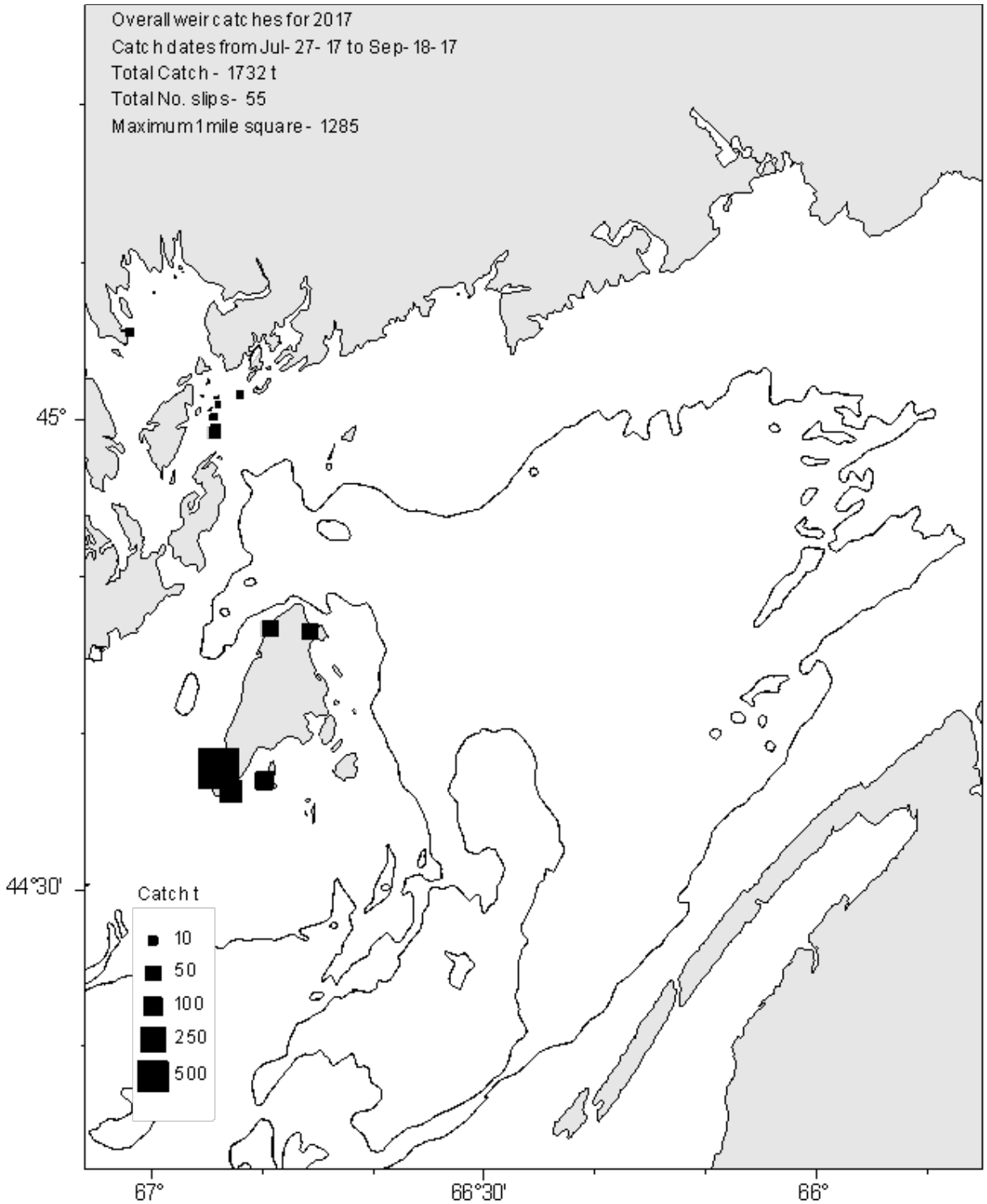


Figure 48C. New Brunswick Herring weir landings (t) by location for the 2017 fishing season.

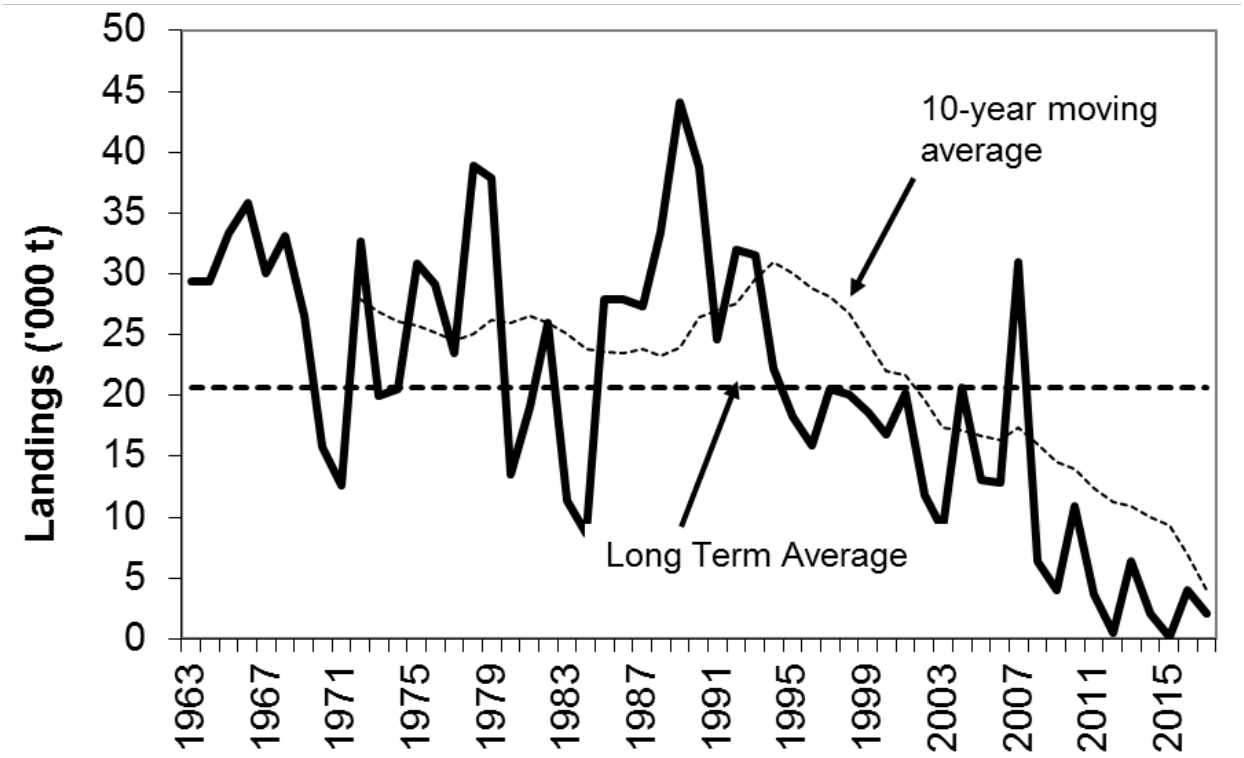


Figure 49. Herring landings ('000 t) from the SWNB weir and shutoff fishery for 1963–2017 with long term average and 10-year moving average.

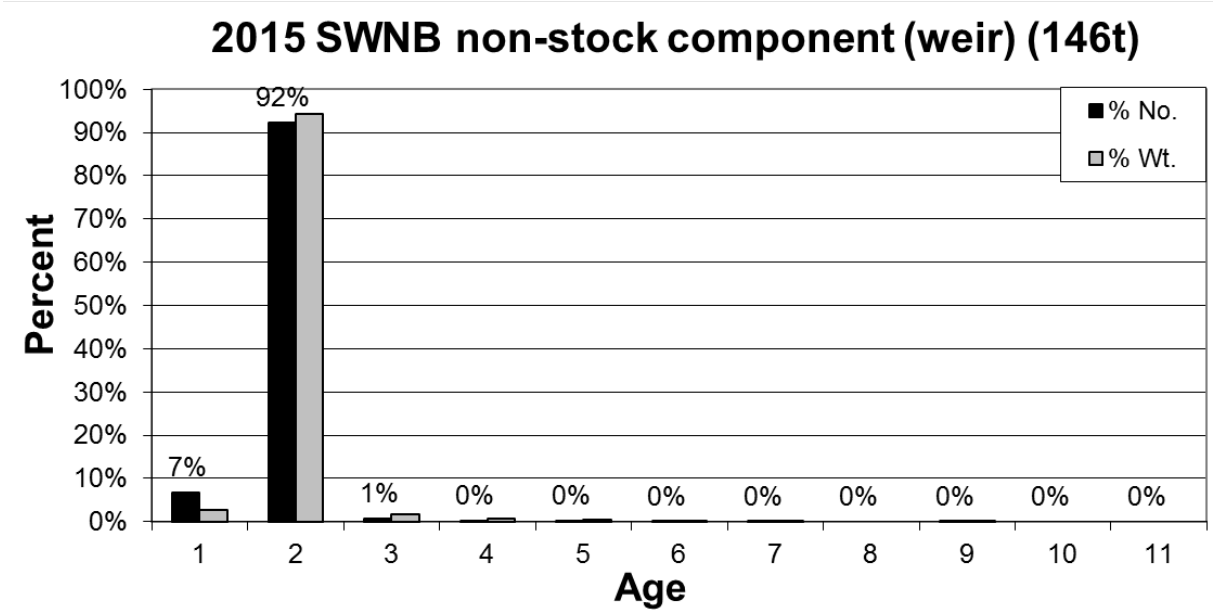


Figure 50A. Fishery catch at age (% numbers and % weight) for the 2015 South West New Brunswick (SWNB) migrant juvenile Herring component.

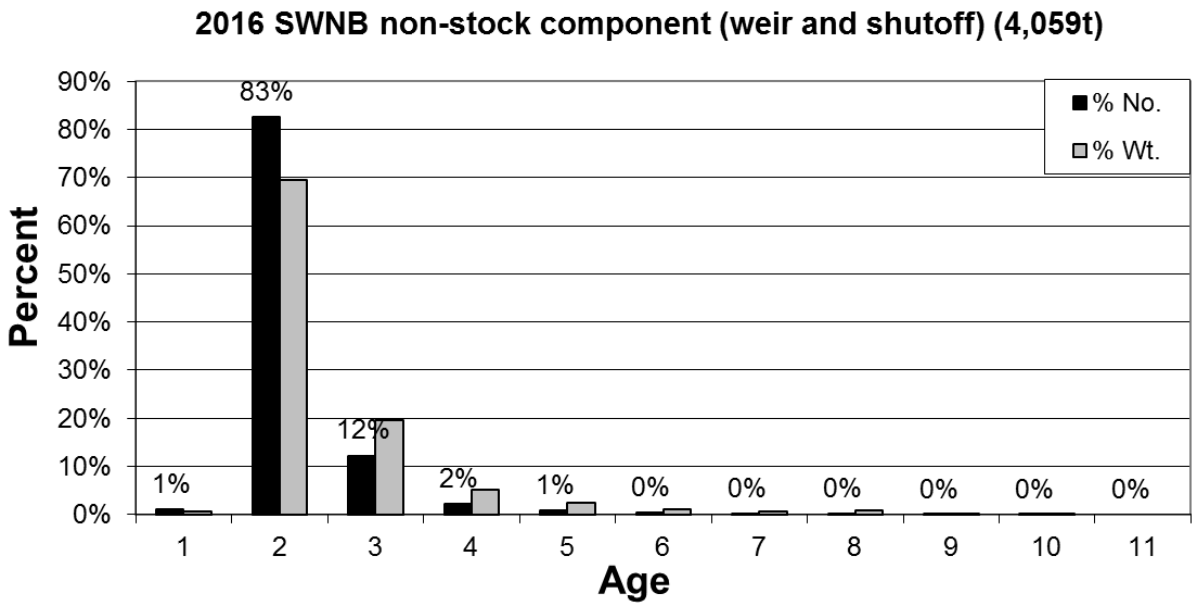


Figure 50B. Fishery catch at age (% numbers and % weight) for the 2016 South West New Brunswick (SWNB) migrant juvenile Herring component.

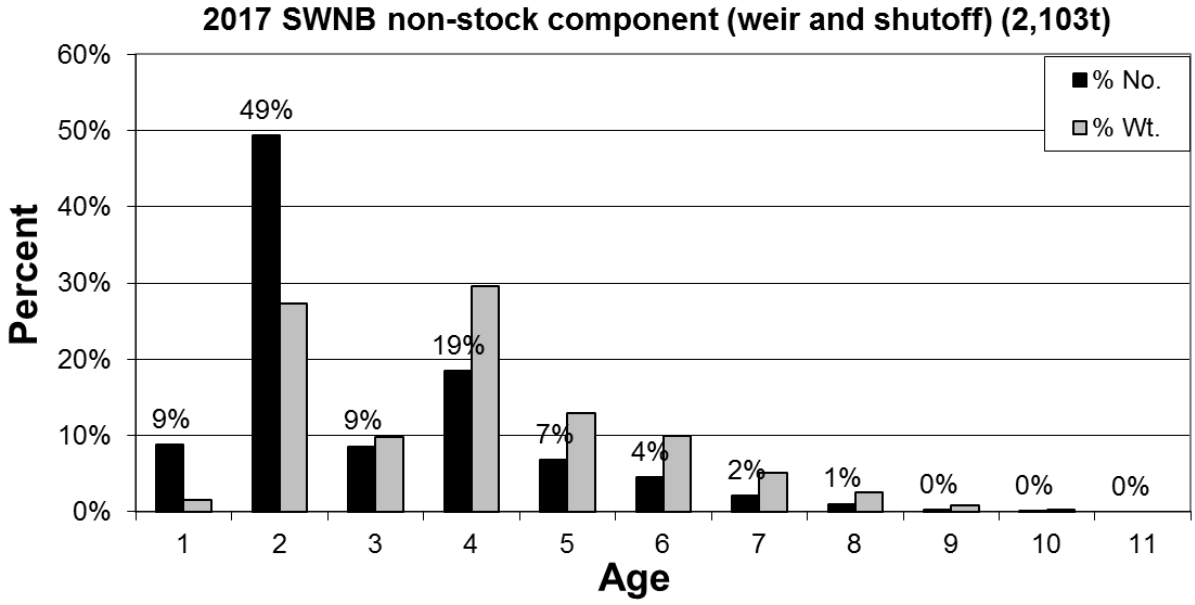


Figure 50C. Fishery catch at age (% numbers and % weight) for the 2017 South West New Brunswick (SWNB) migrant juvenile Herring component.

APPENDICES

APPENDIX A: OBSERVER REPORTS FOR HERRING DIRECTED TRIPS FROM 2015, 2016 AND 2017

2015 Observer data:

- 27 trips (54 sets) monitored; purse seine gear.
- 2.2 tonnes of seals discarded.

2016 Observer data:

- 28 trips (44 sets) monitored; purse seine gear.
- 3.95 tonnes of seals discarded.

2017 Observer data:

- 18 trips (38 sets) monitored; purse sein gear.

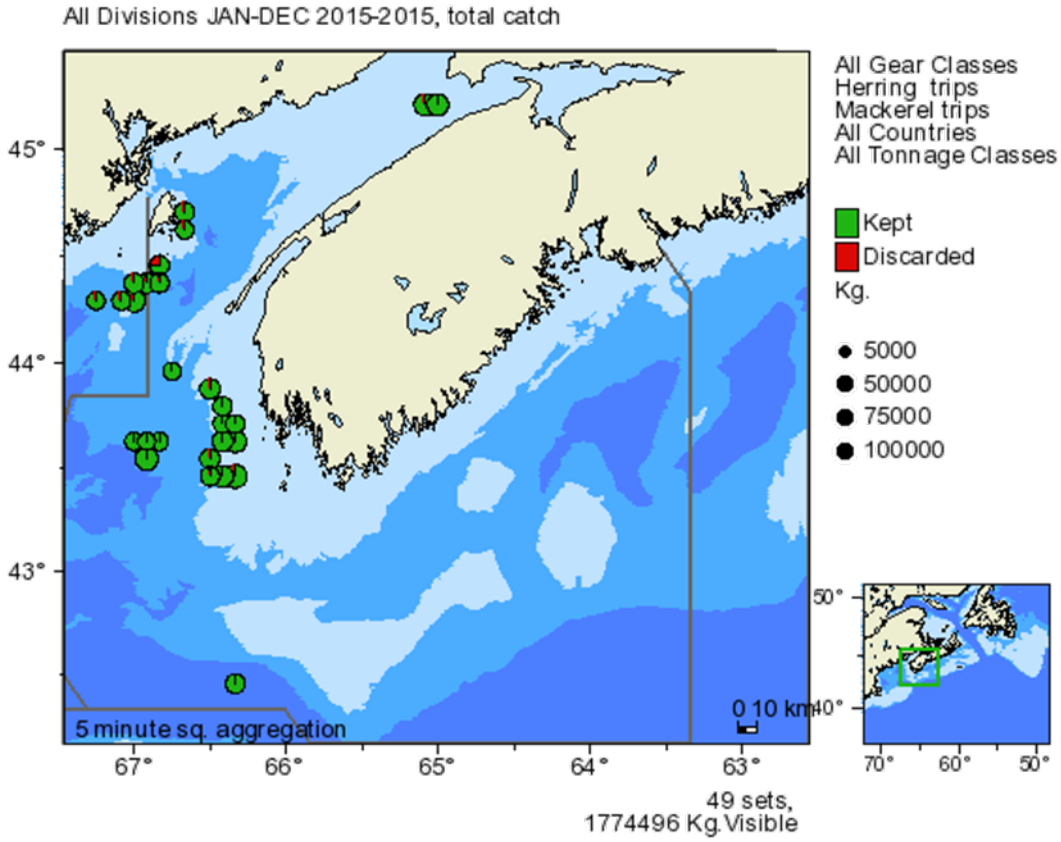


Figure A1. Species report for 2015 Herring and Mackerel trips combined.

Table A1. Catch composition for 2015 Herring and Mackerel trips combined.

Catch Composition (Metric tonnes)		
Species	**Kept 2015**	**Discarded 2015**
HERRING(ATLANTIC)	1760.2	10.5
MACKEREL(ATLANTIC)	1.145	0.005
SILVER HAKE	0.006	0
SHORT-FIN SQUID	0.001	0.061
SHRIMPS	0.001	0
SEALS (NS)	0	2.243
BLUEFIN TUNA	0	0.182
THRESHER SHARK	0	0.075
JELLYFISHES	0	0.051
SPINY DOGFISH	0	0.008
PORBEAGLE,MACKEREL SHARK	0	0.008
BUTTERFISH	0	0.007
LONGHORN SCULPIN	0	0.001
HADDOCK	0	0.001
AMERICAN LOBSTER	0	0.001

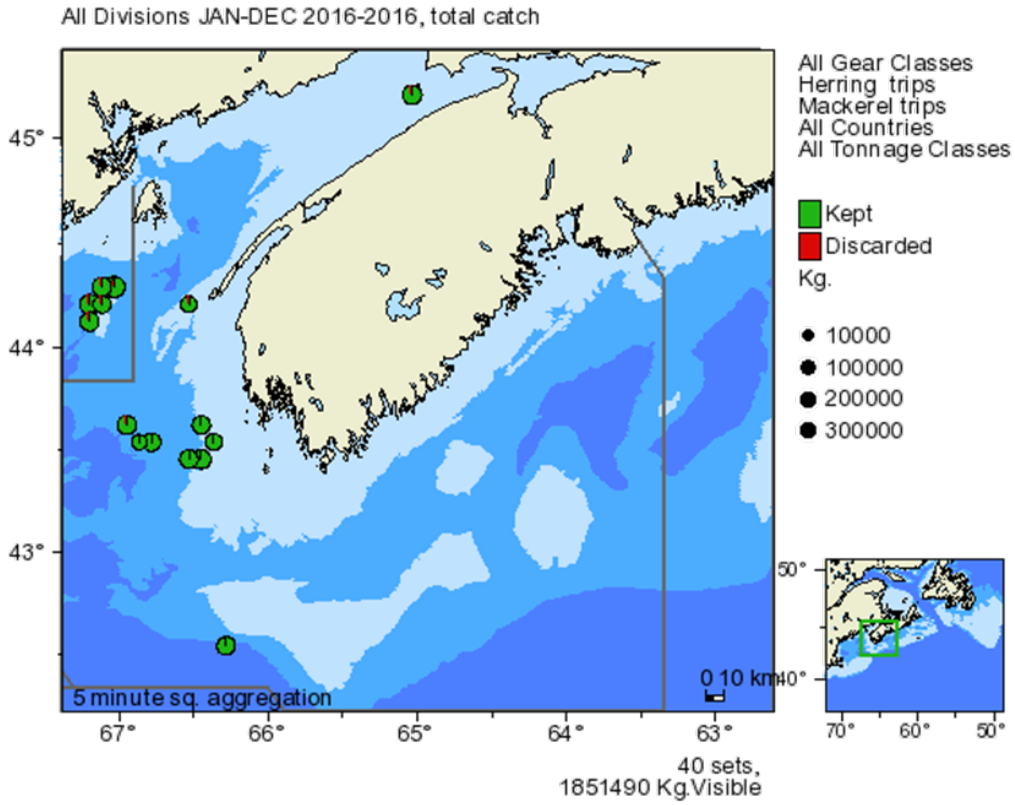


Figure A2. Species report for 2016 Herring and Mackerel trips combined.

Table A2. Catch composition of 2016 Herring and Mackerel trips combined.

Catch Composition (Metric tonnes)		
Species	**Kept 2016**	**Discarded 2016**
HERRING(ATLANTIC)	1836	10
MACKEREL(ATLANTIC)	0.33	0
SPINY DOGFISH	0.01	0.06
SHORT-FIN SQUID	0.007	0.49
SEALS (NS)	0	3.95
THRESHER SHARK	0	0.225
SHORTFIN MAKO	0	0.2
BLUE SHARK	0	0.1
HADDOCK	0	0.06
JELLYFISHES	0	0.032
SILVER HAKE	0	0.017
SEA RAVEN	0	0.005
WINTER FLOUNDER	0	0.003
AMERICAN LOBSTER	0	0.001

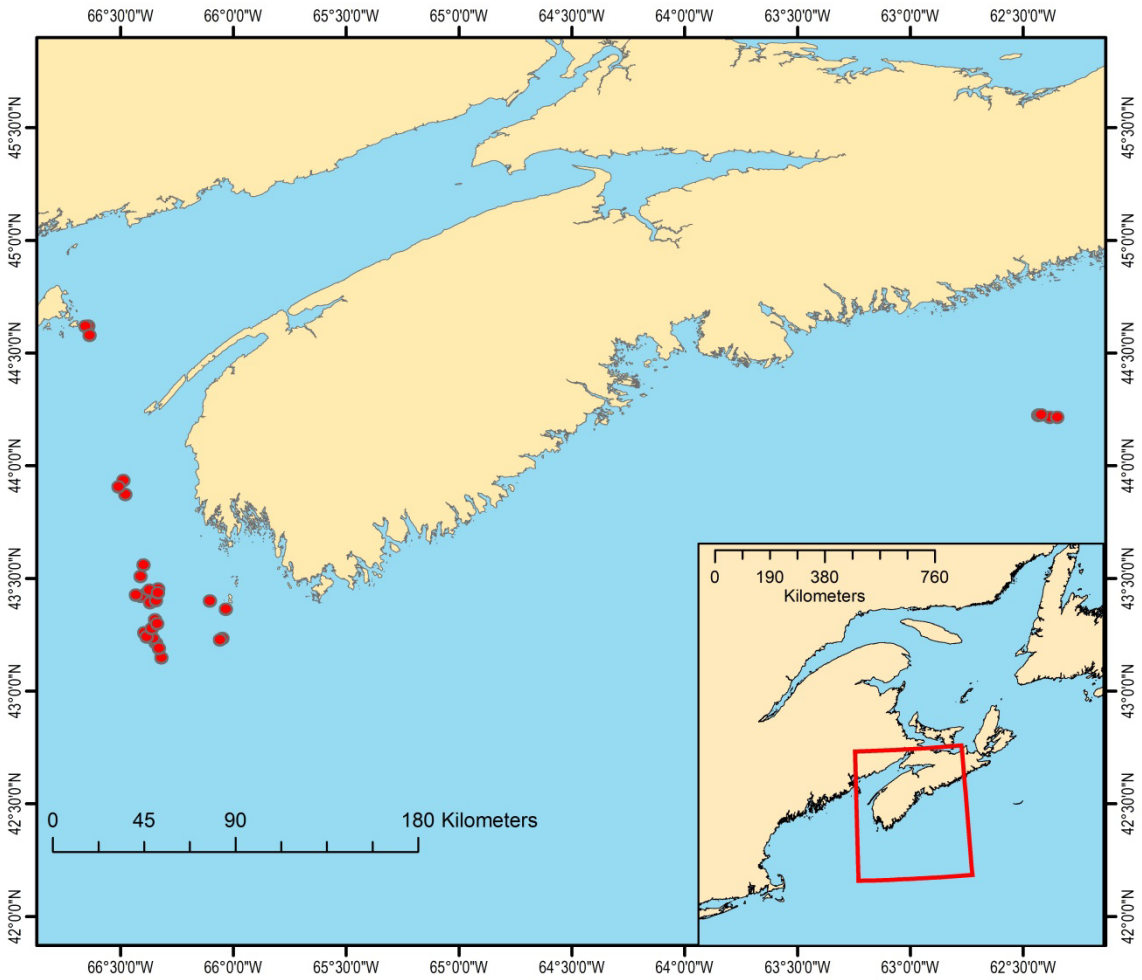


Figure A3. Species report for 2017 Herring and Mackerel trips combined.

Table A3. Catch composition for 2017 Herring and Mackerel trips combined.

Catch Composition (Metric tonnes)

Species	Kept 2017	Discarded 2017
HERRING(ATLANTIC)	1471.0	.091
MACKEREL(ATLANTIC)	0.36	0.0
MONKFISH, GOOSEFISH	0.0	0.005
SHORT-FIN SQUID	0.0	0.014
JELLYFISHES	0.0	0.007
AMERICAN LOBSTER	0.0	0.001

APPENDIX B1: BY-CATCH RECORDED BY DOCKSIDE MONITORING OF PURSE SEINE FISHERY IN 2017

Sample ID	Date	Recorded bycatch	Number of Herring in sample	Catch weight (t)	Estimated % bycatch (# or weight)
20170977	Sep-24-2017	1 squid	207	141	0.5% squid (#)
20171142	Oct-11-2017	5 mackerel 1 gaspereau	216	80	2.3% mackerel (#) 0.5% gaspereau (#)
20171178	Oct-14-2017	8 mackerel	204	2	3.9% mackerel (#)
20171244	Oct-8-2017	9t mackerel	239	17	53% mackerel (wt)

APPENDIX B2: REPORTED HERRING BAIT LICENCE CATCHES FOR THE CALENDAR YEAR IN MT

NAFO Area	2015	2016	2017
4VN	2.27	2.83	0.60
4WD	0	0.28	1.41
4WK	1.81	2.50	0
4XM	2.27	2.84	3.14
4XO	2.81	13.62	0
4XU	5.44	0	0
Total non-quota	14.61	22.07	5.15
4XQ	0	0	0
4XR	0.18	0.01	0
Total quota area	0.18	0.01	0
Overall total	**14.79**	**22.08**	**5.15**

APPENDIX B3: REPORTED COMMERCIAL BAIT CATCH BY GEAR TYPE FOR CALENDAR YEAR IN MT

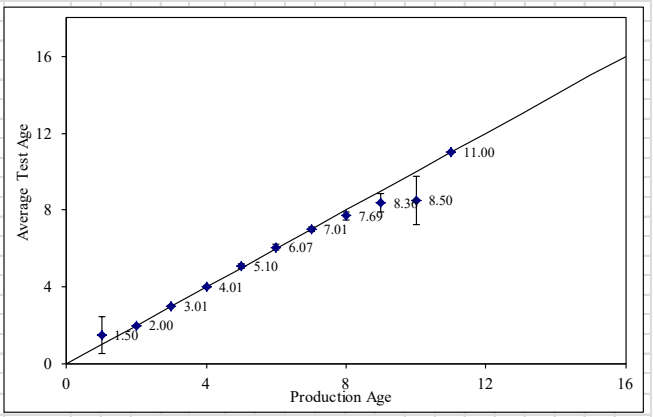
Gear Type	2015	2016	2017
Purse seine	121.0	2089.0	1323.0
Gillnet fixed	4.3	31.1	12.0
Gillnet drift	14.0	0.5	30.1
Handline	0	0.2	0
Trapnet	0	0	0.7
Total	**139.4**	**2120.8**	**1365.7**
Quota area	121.0	2024.2	1038.4
Non-quota area	18.4	96.6	327.4
Overall area	**139.4**	**2120.8**	**1365.7**

APPENDIX C: AGEING AGREEMENT TESTING

all ages 2015 DK1 v DK2			Species	Herring				
			Date	all ages 2015				
			Age Reader	DK1 v DK2				
N Aged	n/a					Bowker's test		
N Tested	534		Total CV	2.19%		Chi-sq	11.67	
N Agreed	449					d.f.	16	
Disagreed	85		%Agreement	84.1%		P-value	0.77	
							n/s	

Prod Age	N	N Agreed	%Agrmnt	Ave Age	s.d.	C.I.	95% C I	
0			#DIV/0!	0.00		#NUM!	#NUM!	#NUM!
1	2	1	50%	1.50	0.71	0.98	0.52	2.48
2	81	79	98%	2.00	0.16	0.03	1.97	2.03
3	76	75	99%	3.01	0.11	0.03	2.99	3.04
4	110	106	96%	4.01	0.25	0.05	3.96	4.06
5	60	52	87%	5.10	0.48	0.12	4.98	5.22
6	69	52	75%	6.07	0.58	0.14	5.94	6.21
7	71	49	69%	7.01	0.60	0.14	6.88	7.15
8	49	27	55%	7.69	0.85	0.24	7.46	7.93
9	11	6	55%	8.36	0.81	0.48	7.89	8.84
10	4	1	25%	8.50	1.29	1.27	7.23	9.77
11	1	1	100%	11.00				
12								
13								
14								
15								
16								
Total	534	449						

Omitted Samples	
Prod Age	Test Age
NONE	



Error bars indicate 95% confidence intervals

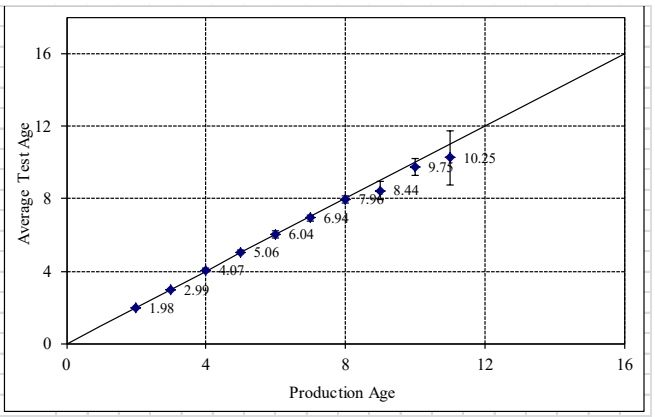
Test Age	Production Age 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
0																		
1		1	1															2
2		1	79															80
3			1	75	2													78
4				1	106	2												109
5					1	52	7		1									61
6					1	4	52	11	3									71
7						2	8	49	12	2	1							74
8							2	10	27	3	1							43
9								1	6	6	1							14
10											1							1
11												1						1
12																		
13																		
14																		
15																		
16																		
Total		2	81	76	110	60	69	71	49	11	4	1						534

Figure C1. Primary ager against self on a random selection of all survey and commercial otoliths collected in 2015.

DK1 vs dk2 2016			Species		Herring			
dk1 vs dk2 all fish			Date		**DK1 vs dk2 2016**			
(D = Prod Age)			Age Reader		dk1 vs dk2 all fish			
						Bowker's test		
N Aged		634	Total CV	2.25%		Chi-sq	22.74	
N Agreed		534				d.f.	18	
Disagreed		100	%Agreement	84.2%		P-value	0.20	
							n/s	

Prod Age	N	N Agreed	%Agrmnt	Ave Age	s.d.	C.I.	95% C I	
0				0.00				
1				0.00				
2	111	109	98%	1.98	0.13	0.02	1.96	2.01
3	146	144	99%	2.99	0.12	0.02	2.97	3.01
4	92	81	88%	4.07	0.39	0.08	3.99	4.14
5	85	71	84%	5.06	0.45	0.09	4.96	5.15
6	74	55	74%	6.04	0.83	0.19	5.85	6.23
7	48	32	67%	6.94	0.63	0.18	6.76	7.12
8	52	32	62%	7.96	0.79	0.22	7.75	8.18
9	18	4	22%	8.44	1.10	0.51	7.94	8.95
10	4	3	75%	9.75	0.50	0.49	9.26	10.24
11	4	3	75%	10.25	1.50	1.47	8.78	11.72
12								
13								
14								
15								
16								
Total	634	534						

Omitted Samples	
Prod Age	Test Age
NONE	



Error bars indicate 95% confidence intervals

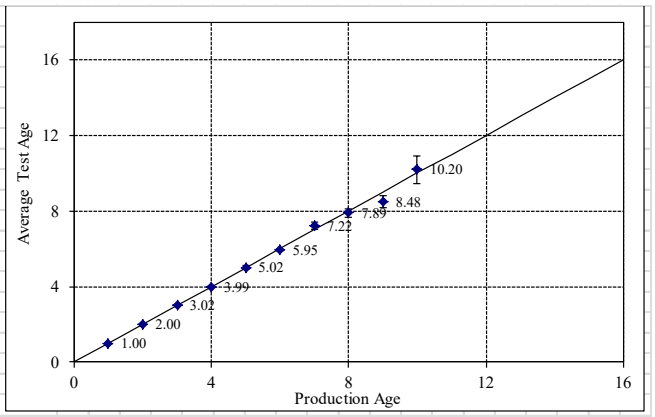
Prod Age \ Test Age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
0																		
1																		
2		2	109															111
3			2	144														146
4				3	81	7	1											92
5					5	71	8	1										85
6					1	10	55	4	2	1	1							74
7							10	32	5	1								48
8							1	11	32	5	3							52
9								3	8	4	2	1						18
10										1	3							4
11									1			3						4
12																		
13																		
14																		
15																		
16																		
Total		2	111	147	87	88	75	51	48	12	9	4						634

Figure C2. Primary ager against self on a random selection of all survey and commercial otoliths collected in 2016.

DK1 vs DK2			Species		Herring			
dk1 vs dk2 all 2017			Date		**DK1 vs DK2**			
(D = Prod Age)			Age Reader		dk1 vs dk2 all 2017			
						Bowker's test		
N Aged		615	Total CV	1.43%		Chi-sq	4.21	
N Agreed		540				d.f.	9	
Disagreed		75	%Agreement	87.8%		P-value	0.90	
							n/s	

Prod Age	N	N Agreed	%Agrmnt	Ave Age	s.d.	C.I.	95% C I	
0				0.00				
1	4	4	100%	1.00				
2	65	65	100%	2.00				
3	102	100	98%	3.02	0.14	0.03	2.99	3.05
4	161	156	97%	3.99	0.18	0.03	3.97	4.02
5	88	78	89%	5.02	0.34	0.07	4.95	5.09
6	84	72	86%	5.95	0.38	0.08	5.87	6.03
7	49	31	63%	7.22	0.71	0.20	7.02	7.42
8	36	22	61%	7.89	0.62	0.20	7.69	8.09
9	21	10	48%	8.48	0.75	0.32	8.16	8.80
10	5	2	40%	10.20	0.84	0.73	9.47	10.93
11								
12								
13								
14								
15								
16								
Total	615	540						

Omitted Samples	
Prod Age	Test Age
NONE	



Error bars indicate 95% confidence intervals

Prod Age \ Test Age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
0																		
1		4																4
2			65															65
3				100	2													102
4				3	156	2												161
5					4	78	6											88
6						8	72	4										84
7							5	31	10	3								49
8								9	22	5								36
9								2	8	10	1							21
10										1	2	2						5
11																		
12																		
13																		
14																		
15																		
16																		
Total		4	65	103	162	88	83	46	40	19	3	2						615

Figure C3. Primary ager against self on a random selection of all survey and commercial otoliths collected in 2017.