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#### Abstract

Quota landings of Atlantic herring (Clupea harengus) in 2009-2010 were 45,534t against a Total Allowable Catch of 55,000t for the Southwest (SW) Nova Scotia/Bay of Fundy (SWNS/BoF) component. Acoustic biomass estimates decreased by $36 \%$ for the major spawning ground survey areas in Scots Bay and on German Bank. In 2010, the fishery catch at age composition by number was comprised of $60 \%$ fish at 2 years of age, $22 \%$ at age 3 , and only $7 \%$ at ages older than age 5 . There was a large reduction in fish condition and weights at age across all ages in the fishery, which is attributed to poor feeding conditions. This assessment indicates a decline in the resource with reduced spawning abundance, poor fish condition and a lack of older fish in the population. The high catches and targeting of juvenile fish, which was a major feature of the 2009 and 2010 fisheries, may impede future rebuilding of the stock.

There was an increase in landings from 9,088t to 11,862t from the offshore Scotian Shelf banks, mainly due to good fishing conditions and the availability of herring to the purse seine gear. There was no midwater trawl activity in the offshore area and only limited by-catch of herring from bottom trawl gear. Herring abundance in the summer bottom trawl research survey was again at a high level with large increases in all areas except the Bay of Fundy. This survey has not been considered indicative of overall abundance due to changes in catchability for herring and a lack of year-class tracking. There was a single acoustic survey completed for the offshore area in 2010, which documented 3,500 t of biomass.

The recorded landings in the 2010 gillnet and trap net fisheries along the coast of Nova Scotia decreased from $9,873 \mathrm{t}$ to 5,575 t. There were decreases in surveyed acoustic biomass in the Halifax/Eastern Shore and Little Hope areas from the previous year. Surveys were also completed near Glace Bay, but there were few spawning herring documented and very little catch reported. No herring surveys took place in the Bras d'Or Lakes.

Landings in the 2010 New Brunswick weir and shut-off fishery were 10,958 t, up from the low of $4,031 \mathrm{t}$ in the previous year. It is notable that, as recently as 2007, landings were 30,944t, the highest in nearly 20 years. The age distribution of fish caught in the 2010 New Brunswick weir and shutoff fishery were primarily juveniles, with $95 \%$ by number at age 2 . The success of this passive trap fishery has been historically unpredictable, and catches are inherently susceptible to many natural variables in addition to abundance.


## RÉSUMÉ

Les quotas de débarquements du hareng de l'Atlantique (Clupea harengus) en 2009-2010 se chiffraient à 45534 t par rapport à un total autorisé des captures de 55000 t pour la composante du sud-ouest de la Nouvelle-Écosse et de la baie de Fundy. Les estimations de la biomasse dans les relevés acoustiques ont diminué de $36 \%$ pour les principales zones de relevé des frayères dans la baie Scots et du banc German. En 2010, la composition des captures (numériques) selon l'âge reflétaient 60 \% de poissons d'âge 2, 22 \% d'âge 3, et seulement $7 \%$ de poissons d'âge supérieur à 5 . On a observé une dégradation importante de la condition des poissons et une diminution importante de leur poids selon l'âge pour tous les âges dans la pêche, ce qui est attribuable à de mauvaises conditions alimentaires. Cette évaluation dénote un déclin des ressources avec une réduction de l'abondance des géniteurs, la piètre condition du poisson et un manque de poissons plus vieux dans la population. Le taux élevé de prises et le ciblage des juvéniles, qui étaient les principales caractéristiques des pêches de 2009 et de 2010, pourraient entraver le rétablissement futur du stock.

Il y a eu une augmentation des débarquements de 9088 t à 11862 t à partir des bancs du large du plateau néo-écossais, principalement en raison des bonnes conditions de pêche et de la disponibilité du hareng pour les engins utilisant une senne coulissante. Il n'y avait pas d'activité de pêche au chalut pélagique dans la zone extracôtière et seulement quelques prises accessoires de hareng provenant de la pêche au chalut de fond. L'abondance du hareng dans le relevé d'été au chalut de fond concernant le chalut de fond était encore une fois élevée avec d'importantes augmentations dans toutes les zones sauf dans la baie de Fundy. Ce relevé n'a pas été considéré indicateur de l'abondance globale en raison des variations de la capturabilité du hareng et du manque de suivi de la classe d'âge. Un seul relevé acoustique a été effectué pour la zone extracôtière en 2010 qui a indiqué une biomasse de 3500 t .

Les débarquements enregistrés en 2010 pour la pêche au filet-trappe et filet maillant le long de la côte de la Nouvelle-Écosse ont diminué pour passer de 9873 tà 5575 t. Le relevé acoustique a fait état d'une diminution de la biomasse dans les régions de Halifax/côte est et de Little Hope depuis l'année précédente. Des relevés ont aussi été effectués près de Glace Bay, mais peu de harengs en frai y ont été observés et peu de captures signalées. Il n'y a pas eu de relevé sur le hareng dans les lacs Bras d'Or.

Les débarquements des parcs à hareng et des sennes de plage au Nouveau-Brunswick se sont chiffrés à 10958 t en 2010, une augmentation par rapport aux débarquements de l'année précédente qui se chiffraient à 4031 t . Il faut également noter qu'en 2007, les débarquements se chiffraient à 30944 t , soit le niveau le plus élevé depuis presque 20 ans. Il ressort de la répartition des âges dans les captures de hareng provenant des parcs à hareng et des sennes de plage au Nouveau-Brunswick que ces captures étaient constituées essentiellement de juvéniles, dont $95 \%$ d'âge 2 . Le succès de cette pêche passive au casier est historiquement imprévisible et les prises ont une tendance inhérente à fluctuer en fonction de nombreuses variables naturelles, en plus de l'abondance.

## INTRODUCTION

Atlantic herring (Clupea harengus) is a pelagic species found on both sides of the North Atlantic. Herring spawn in discrete locations, to which they are presumed to home. Herring first mature and spawn at three or four years of age ( 23 to 28 cm or 9 to 11 in ), 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. Most fishing takes place on dense summer feeding, over wintering, and spawning aggregations and has been dominated by purse seine, weir and gillnet gear types, with relatively minor landings by shutoff, trap and midwater trawl.

The 4VWX Atlantic herring 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. These undoubtedly have much closer affinity than spawning areas that are widely separated in space or time, and do not share a common larval distribution. Some spawning areas are large and offshore, whereas others are small and more localized, sometimes very 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 management have explored means of managing the complexity within each component (such as distributing fishing effort among spawning areas according to their relative size) and of taking appropriate account of interaction among components (such as 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 2010 from the Canadian portion of Georges Bank, with the last recorded landings in 2004. This fishery is included in the Gulf of Maine stock complex and was last evaluated in 2006 (DFO 2003a; TRAC 2006).

## OBJECTIVES AND MANAGEMENT

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

Three conservation objectives appear in the plan:

1. To maintain the reproductive capacity of herring in each management unit through:

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

2. To prevent growth over fishing:

- continue to strive for fishing mortality at or below $\mathrm{F}_{0.1}$.

3. To maintain ecosystem integrity/ecological relationships ("ecosystem balance":

- maintain spatial and temporal diversity of spawning; and
- maintain herring biomass at moderate to high levels.

There is evidence that several of these objectives are not being met, and little improvement has been seen from the low level of the resource noted in recent assessments despite efforts that have been made recently including five years of a reduced Total Allowable Catch (TAC; Power et al. 2006, 2007, 2008, 2010a). There is also a need to better define these objectives in terms of minimum thresholds and to explicitly list the spawning components in terms of spatial and temporal expectations.

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

Collaborative research efforts with the fishing industry have been important in recent years. A major portion of the herring industry, including the purse seine sector and major processors which form the Herring Science Council (HSC), and some members of the fixed gear sector have undertaken a separate Joint Project Agreement with Department of Fisheries and Oceans (DFO) to undertake collaborative scientific projects. The herring industry has continued to undertake biological sampling and to collect samples, while the purse seine and gillnet sectors undertook key acoustic surveys. In 2010, field activities were covered by the HSC manager with assistance from St. Andrews Biological Station (SABS) / DFO staff, individual survey vessel captains and plant managers. In addition, downloading and data editing services were contracted by the HSC through A. Clay from FEMTO Electronics.

## SOUTHWEST NOVA SCOTIA/BAY OF FUNDY SPAWNING COMPONENT

## THE FISHERY

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

Quota landings for the SWNS/BoF stock component, the only component under TAC control were 45,534 t against a TAC of 55,000 t for 2009-2010 quota year (Table 1). The quota year begins on October 15 and ends on October 15 of the following year. Landings in the fall 2010 and winter 2011 purse seine fisheries for the 2010/2011 quota year were 1,584t as of March 2, 2011 (Table 2). There were additional landings of 28,395 from the non-stock components including Coastal Nova Scotia, the Offshore Banks and SWNB. There was an increase in the proportion of landings from the New Brunswick weirs and shutoffs in 2010 over the 2009 landings, a decrease in landings from the Coastal Nova Scotia and an increase from the Scotian Shelf Banks components (tables 1, 3).

In 2009-2010, landings for the SWNS/BoF stock component were below the TAC. As a result of an industry decision late in the season 9,466 t of quota was left in the water. This was in order to avoid catching and adding more fish of a size of less than 23 cm to the 2010 landings. Landings for this component have recently tracked the TAC, with most of the quota being taken each year since 2002 (Figure 5). As a result of the reduced quota since 2005, total landings from this component remain near the lowest on record since 1963 (Table 3). Table 4 (a, b) show the purse seine catches (in t and in percentages) by fishing grounds from 1985-2010 for the 4WX stock component. Most of the catch over the history of this fishery has been caught by purse seine gear with the 4 X summer purse seine fishery being the most important (Table 3; figures 6 , 7). In 2010, landings by the purse seine sector accounted for $97 \%$ of the component catch, with minimal landings by the gillnet sector (204t) and below average landings from the Nova Scotia weirs ( 1,198 t; Table 1). According to the management plan, $80 \%$ of the TAC is initially allocated to the mobile gear sector and $20 \%$ to the fixed gear sector and, as in past years, a transfer of unused quota to the mobile fleet occurred near the end of the fishing season.

Purse seine catches are summarized by fishing grounds using definitions of the various grounds based on groupings of 10 minute boxes of latitude and longitude (Table 4a, b; Figure 4).
Catches by fishing grounds in 2010 showed that the largest proportions came from the German Bank ( $40 \%$ ) and Grand Manan ( $35 \%$ ) areas (Table 4b; Figure 8). There was a decrease in catches from the Gannet/Dry Ledge area (down from 8,656t to 723t). The New Brunswick coastal area also deceased from 5,023t to 2,762t. Catches were again below the long term average from Scots Bay and the Long Island shore areas, however, the 2010 Scots Bay landings showed a 4.5 -fold increase ( $4,086 t$ ) over the 2009 landings (902t).

Purse seine landings of 1,664t were reported in the October/November 2009 fall fishery and 1,123 t in the January 2010 winter fishery (Table 1, Figure 9). These fisheries, which take place at the beginning of each quota year, are usually concentrated on the New Brunswick side of the Bay of Fundy.

The largest single fishery of the SWNS/BoF stock component is the summer purse seine fishery, which occurs from May to October in the Bay of Fundy area. In 2010, this fishery took place in similar areas and months as in previous years with total landings of 41,345 ( Table 1; Figure 10). A large part of this fishery is directed toward pre-spawning, feeding aggregations in

May and June. Catches on the major spawning grounds during the spawning period in Scots Bay and on German Bank are found primarily within the pre-defined acoustic survey areas (Melvin and Power 1999).

During the 1970's and 1980's, a large purse seine fishery took place on over-wintering aggregations in Chedabucto Bay, with total landings as high as 17,878t as recently as 1991 (Table 3, 4a, b; Figure 8). The last recorded landing occurring in 2000 (1,012t) and 2002 (367t). Since 1999, there has been a small fishery on over-wintering herring in January near Halifax Harbour (Chebucto Head), but the majority of the fall and winter herring landings for the past several years have come from the New Brunswick side of the Bay of Fundy.

Catches of non-stock component herring by purse seine came mainly from the Offshore Banks and Western Hole areas on the Scotian Shelf with 11,837t landed in 2010, up from the 9,032t landed in 2009 (Table 5). There have been no catches from the Georges Bank area since 2000 when 265 t were landed (Table 5).

## Main Fishing Areas for the SWNS/BoF Component

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

## German Bank

German Bank is one of the primary herring fishing grounds in the Bay of Fundy area. Since 1985, catches from this area have ranged from 9,003t to 35,977 t during the main fishery period from early May to late October (Table 6). Catches in the 2010 pre-spawning period (defined as the period from January 1 to August 14) decreased to 1,756 trom 12.092t in 2009 during the same period. In 2008, catches during the pre-spawning period reached 16,845t, the highest since 1999 (Table 6). Catches during the 2010 spawning period (defined as the period from August 15 to October 15) were slightly higher (16,953t) than in 2009 (16,454t). The contribution of German Bank catch to the overall TAC was $52 \%$ in 2009 and decreased to $34 \%$ in 2010 (Table 6; Figure 11).

The distribution of catches on German Bank in the 2010 pre-spawning period (January 1 to August 14) is shown in Figure 12. Catches on German Bank during the spawning period within the spawning box area are primarily of spawning "roe" fish (Figure 13). However, not all catches are spawners, with juvenile sized non-spawning groups often located to the north of the spawning box. In 2010, catches of spawning herring were widespread with localized groups seen in both the northern and southern portions of the standard survey area on German Bank (Figure 13). The highest fishery catches during the spawning period in 2010 occurred in September (Figure 14) with less catches occurring in the latter half of August. The total catch for German Bank area declined to 18,708 (from 28,546 t in 2009) making up $34 \%$ of the overall TAC (Table 6).

Scots Bay
The Scots Bay herring purse seine fishery has been an important component of the summer fishery with catches since 1987 ranging from 902t (2009) to 24,388t (2004) during the period of early July to late August-early September (Table 7; Figure 15). The 2006 fishery had catches
scattered mainly within the defined spawning area, but there was a reduction in overall fishing activity with 3,350 t landed and less than half of the number of daily landings (purchase slips) than in 2005 (Table 7; Figure 16). The peak year of 2004 was unusual in several aspects, with the highest recorded catch of 24,400 t, the longest season extending to September 16 and the most days with catch recorded (Table 7; Figure 17). Landings in 2008 were substantially reduced from 2007, with 2,373t caught from July 14 to August 27 (Table 7; Figure 17). There was a gap in landings similar to that seen in 2006 from July 22 to August 8. The 2010 Scots Bay fishery continued to be restricted by a 5,000t cap imposed due to the poor performance of the spawning component since 2005. Landings in 2010 increased from the 902t (over the 31-day fishing period) to 4,086t (over a 61-day fishing period; Table 7; Figure 17).

## Trinity Ledge

Catches were limited for Trinity Ledge in 2010 with 202t recorded between August 11 to September 24 (Table 8; figures 18 and 19). This is an increase over the catches in 2009 of 116t recorded between September 1 and September 11. In 2010, the total estimated biomass (with the Calibration Integration Factor (CIF)) from the acoustic surveys was 2,405t, up from the 1,575 t in 2009 (Table 8; Figure 19). More work is needed to monitor the status of this spawning area, which once supported a major portion of the overall stock catch (Table 4a, b; Figure 8).

## Nova Scotia Weirs

The 2010 Nova Scotia weir catch (4Xr) from weirs located in St. Marys Bay and along the Long Island shore was 1,198t, up from the low of 387t in 2009 (tables 3, 9; Figure 20). The seasonal timing of the Nova Scotia weir landings has shifted to the later months of the season in recent years, with most of the catch in June, July and August in 2010 (Table 9). Catches for the Nova Scotia weirs have been highly variable in recent years and are not as consistent in their amount or timing, having occurred early in the season in the 1990's and later in the season in the last decade. There has also been a decline in the total number of herring weirs with six to 14 active weirs in the last decade, down from 20 or more in the 1980's, with only eight reporting catch in 2010 (Table 10).

## Spectacle Buoy

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

## RESOURCE STATUS

## Commercial Catch Rate Indices

Catch and effort for gillnet data in the SWNS/BoF spawning component have been examined in previous assessments. They showed little trend and were considered unrepresentative due to the small amounts and variable timing and location of catch and effort (Table 3; Power et al. 2004). The 2010 catch from the gillnet fishery in the SWNS/BoF spawning component increased from 117t in 2009 to 204t in 2010.

Purse seine landings make up most of the overall catch and are allocated $80 \%$ of the TAC for the SWNS/BoF component under the current management plan. The purse seine catch has fluctuated between 44,476 t and $103,537 \mathrm{t}$ since 1989 , primarily reflecting changes in the TAC (Table 11; Figure 21). The number of boats fishing and days fished has dropped since 1990 due to fleet rationalization. This has resulted in increases in catch per boat and catch per day in recent years but these 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 11).

## Acoustic Surveys

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

In 2008, biomass estimates in the traditional survey areas of Scots Bay, Trinity Ledge and German Bank decreased by approximately 160,000t from the 2007 estimate. The 2008 estimate was a 42\% decrease from 2007 and the lowest recorded since acoustic surveys began in 1997. In 2009, the biomass estimate for Scots Bay, Trinity Ledge and German Bank (in and out of the box) increased to 383,700t (Table 12, figures 22-23). The 2010 estimate showed a decrease in biomass to $252,600 \mathrm{t}$.

## Spawning Ground Turnover Rates from Tagging Studies

The current acoustic survey methodology on spawning grounds is dependent on periodic turnover of spawning fish on the grounds. Acoustic surveys are required to be separated by at least 10 to 14 days to allow for turnover and to prevent double counting (Power et al. 2002). A tagging study to examine herring turnover rate on the German Bank spawning grounds was conducted during the summer/fall of 2009 (Maxner et al. 2010). The ongoing project to analyse and interpret the data will continue in 2012-13 in an attempt to gain a better understanding of residency time of herring throughout the spawning season for this area.

## Exploitation Rates on Spawning Grounds

The acoustic survey estimates and catches from individual spawning areas were examined to estimate relative exploitation rates on the different spawning groups and for the overall complex. In this analysis, exploitation was calculated as the ratio of catch divided by acoustic survey biomass. These estimates can be used to assess the impact of fishing and also to estimate the relative size of individual spawning units within the complex. 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, the three main spawning components for Scots Bay, German Bank and Trinity Ledge, which have received relatively consistent survey effort since 1999, were used. The acoustic SSB for nearby Seal Island and Spectacle Buoy areas were allocated to the German Bank spawning area. All catches throughout the year captured on each spawning ground were
assumed to be site specific (Table 13-C1), while catches from other non-spawning areas were allocated based on the relative spawning ground SSB proportions from annual acoustic surveys (Table 13-A2). The adjusted total catch was thus made equal to the reported stock catch (Table 13-C2). Exploitation rates were then calculated (Catch / SSB) for both the actual catch on the spawning grounds and the overall adjusted catch as proportions (Table 13-E1, E2).

The trends in spawning area proportions as estimated from acoustic surveys (Table 13-A2) have been stable since 2005, with about 80-90\% of survey SSB found in the German Bank area and $10-20 \%$ in the Scots Bay area. The increase in 2005 for German Bank corresponded with a dramatic decline seen in Scots Bay in 2005, which made up as much as $36 \%$ of the overall SSB before this decline.

Calculation of exploitation rates since 1999 by component (Table 13-E2) showed that the larger grounds (Scots Bay and German Bank) have an average exploitation of $21 \%$ and $16 \%$, respectively. The smaller Trinity Ledge area had a very high average exploitation of $57 \%$. The overall adjusted exploitation rate for the three areas combined showed a range from 14-25\% from 1999 to 2010 (Figure 24). These exploitation values are useful in a relative sense for year to year comparisons and show that the overall adjusted estimate was stable between 14-18\% between 1999 and 2004. There was an increase to $21 \%$ in 2005 coinciding with a large decrease in total survey biomass. The rate declined in 2006 to 2007 to a low of $13 \%$ followed by an increase to the series high of $25 \%$ in 2008. In 2009 the rate declined to $14 \%$ and increased to $18 \%$ in 2010 (Table 13-E2; Figure 24).

## Biological Sampling

Comprehensive biological sampling continued for this fishery with substantial involvement of the fishing industry, which supplied data in the form of length frequencies and maturity reports and saved frozen fish samples for analysis by DFO personnel. In 2010, a total of 1,331 samples (146,348 fish) were measured for length, while 4,582 fish were sampled for sex, weight, maturity and age (Table 14). The sources of the samples are shown in Table 15, with the bulk coming from the processing industry since 1996. Additional samples were collected by DFO personnel, observers deployed on fishing vessels and from DFO research surveys. Sampling from the commercial fishery was well matched to the spatial and temporal distribution of the fishery and additional sampling from research vessel surveys during the spring and summer resulted in widespread geographic coverage as in the past (Figure 25).

## Catch at Age

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

The size and age composition was characterized by month, unit area and gear type using all available length and age samples (Table 16). The length-weight relationships, needed for the calculations, were calculated on a monthly basis. The catch at age statistics were then calculated from length frequency and age-length key samples expanded to total catch using appropriate monthly length-weight relationships. The data were grouped or combined and then age-length keys were applied to length frequencies to produce catch at age statistics by NAFO unit area, gear-type and month.

Table 17 and Figure 26 show the catch at age by month and overall for the season for the 2010 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock). Table 18 and Figure 27 show the catch at age by fishing ground for the 2010 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock). Table 19 and Figure 28 show the catch at age for the overall 2008-09 and 2009-10 quota years for the purse seine, gillnet and weir fisheries conducted on the SWNS/BoF spawning component (4WX stock).

The 2010 catch was dominated by the 2008 year-class (at age 2), representing about $60 \%$ of the numbers and $32 \%$ of the weight of herring landed in the SWNS/BoF component (Table 20a,b, Figure 29). The 2007 year-class (at age 3) was the second most important by number at $22 \%$ and contributed $35 \%$ by weight of the landings. The proportion of the catch older than age five decreased in 2010 to $8 \%$ from $24 \%$ in 2009. The total number of fish removed by the fishery in 2010 was calculated to be 796 million, an increase of 209 million or $36 \%$ from 2009, which has the same overall TAC as 2010.

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

## Weight at Age

The fishery weighted average weight at age continued to be below the long term 1965-2010 average in recent years possibly reflecting changes in fishing patterns and timing (Table 21; Figure 32). There was a general decline in weight at age that occurred for all ages around 1987 (Figure 33). A further decline is also apparent for older ages (6 to 10) after 1997 with ages 8+ fish now consistently below 300 g . The 2010 weights at age in particular are similar to the most recent 5 -year and 10-year averages, which are consistently lighter than the overall series average (Figure 32).

## Total Mortality Estimates from Acoustic Data

Estimates of total mortality ( $Z=$ Fishing mortality + Natural mortality) were calculated using the acoustic catch at age data. $Z$ calculations are typically quite variable when done in this manner, but can often be used to detect broad patterns. Total mortality was calculated using ages 4 to 8 combined compared with ages 5 to 9 in the following year (Table 22; Figure 34). The acoustic age composition for the German Bank component from 1999 to 2010 and the biological characteristics from sampling for German Bank acoustic surveys from 1999 to 2010 are shown in tables 23 and 24. The acoustic age composition is assumed to be representative of the overall spawning biomass at these ages. The results for 2000 to 2010 have highly variable values of $Z$ between 0 and 1.8 (Figure 35). There is no apparent trend as the series is very short.

## Stock Trends

In 2008, the acoustic biomass estimates decreased for all survey areas in Scots Bay, Trinity Ledge and German Bank to an overall amount of 223,100t (Power et al. 2010a). This was a $42 \%$ decrease from the previous year, and was the lowest recorded since acoustic surveys began in 1997. The 2008 acoustic SSB estimate for the overall area remained well below the long term average, as it has since 2005. The proportion of the catch greater than 30 cm increased slightly in 2008, which may indicate improved survival but it is important to note that these catch data may not reflect the overall population composition and so must be used with caution when considering population trends.

In the past, industry and DFO Management have explored ways to manage the complexity within each component (such as distributing fishing effort among spawning areas according to their relative size) and taking appropriate account of the interaction among components (such as fishing restrictions on some areas of mixing). The total removals of fish by number were reduced by close to $50 \%$ from 2005 to 2008 relative to 2004, but increased in 2009 when the catch consisted of $45 \%$ by number of 2 year olds. This increase in the catch of 2 year olds was attributed to a potentially large year-class.

In 2012, the acoustic biomass estimates decreased for all survey areas in Scots Bay, Trinity Ledge and German Bank to an overall amount of 252,600t (Table 12) down from the 383,700t estimated for 2009. This was a 34\% decrease from the estimate for 2009. The 2008 year-class made up 60\% (by number) of the catch at age 2 in 2010.

## SOURCES OF UNCERTAINTY

There are several sources of uncertainty in this assessment that need to be considered. The use of the acoustic survey results as a measure of absolute abundance has a number of unknowns including 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 $500,000 \mathrm{t}$. 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 the surveys are additive continues to be a source of uncertainty (DFO 2007). Other significant issues relate to the completeness of coverage of the survey area on Trinity Ledge, inter-annual turn-over processes on each area, and factors that influence the target strength and acoustic backscatter (DFO 2007). Additionally, the mechanisms causing changes in fish condition is not understood.

The acoustic survey index provides fisheries independent information on the SSB but does not provide data on younger age classes. The size of recruiting herring year-classes is known to be highly variable and with no index of recruitment there is a large fraction of the catch dependent on recruiting year-classes of uncertain abundances. The size of the recruiting 2008 year-class is unknown but made up $60 \%$ (by number) of the catch at age 2 in 2010. This assessment uses relative trends in SSB and exploitation rate because there is no accepted population assessment model. This creates a difficulty in putting current SSB levels in a historical context when using trend data only for the period from 1999-2010.

## 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 into consideration these interactions.

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

Evaluations of the progress in 2006 to 2009 against biological objectives in the management plan are documented in Power et al. (2010b). In the 2010 fishery evaluation, the assessment of SSB showed a 36\% decrease from the level in 2009 in the main areas for Scots Bay and German Bank. The amount of spawning fish documented on Trinity Ledge in 2010 was again extremely low. This assessment indicated stability at the lower level from 2005-2010 and showed little or no signs of improvement. Scots Bay showed an increase in the length of spawning period recently. German Bank had a spawning period in 2010 similar to previous years. The duration of spawning in the Trinity area was very short. There was a change in spatial distribution in Scots Bay with more catches and biomass outside the survey area box. German Bank in 2010 showed good spawning distribution in comparison to recent historical distribution. A very restricted spawning area was evident in the Trinity area.

The 2010 fishery catch at age composition consisted of $60 \%$ fish by number at age 2 and only $3 \%$ older than age 5 in the catch. The mean age of the acoustic catch at age increased from 4.3 to 4.8 years in 2010 and was higher than the mean age in the catch. The relative exploitation rate has been constant in response to changes in survey biomass. There has been a trend of declining mean-weight at age and about $10-15 \%$ of the observed decline in stock spawning biomass (SSB) from 2009 to 2010 can be attributed to this reduced mean weight at age. This unexpected reduction was consistent with the unusual environmental conditions in 2010. Declining trends in mean-weight at age since the 1970's have reduced productivity of the stock. The lack of SSB rebuilding despite reduced catch levels in recent years is cause for concern. There were few positive signs from this fishery in 2010 and only a few of the conservation objectives appear to have been met (Table 25).

## Other Considerations

Observer reports of by-catch in purse seine sets have reported very small amounts of nonherring species, most of which are released unharmed.

## OFFSHORE SCOTIAN SHELF BANKS SPAWNING COMPONENT

There continues to be little information on stock size, distribution and spawning behavior for this offshore component which currently supports a limited spring fishery on feeding herring. Recent information comes primarily from sampling of this fishery and from catches and samples from the summer research bottom trawl survey. Spawing is presumed to take place in the fall but there is no information on spawning timing or location for the offshore. There was a single acoustic survey completed for the offshore area in 2010, which documented 3,500t of biomass.

## THE FISHERY

A foreign fishery during 1963-1973 is estimated to have removed an average of 28,000t per year and as much as 121,000t in 1969 from the offshore Scotian Shelf banks (Stephenson et al. 1987). Few herring were caught after the extension of jurisdiction in 1977 until 1996, when a fishery was initiated by the Scotia-Fundy purse seine fleet and 11,700t were taken (Table 3). Since 1996, a fishery has taken place on feeding aggregations on the offshore banks, primarily in May and June, with catches ranging from 1,000t to 20,000t (Figure 36). The variability in catch levels is often due to problems of fish being too deep, weather and market conditions rather than in the abundance of herring in these areas.

In both 2009 and 2010, at-sea fishery observers were present on five trips on 'The Patch' area. The by-catch in 2009 was only small amounts of mackerel and dogfish, while in 2010 there was an increase in the number of species recorded as by-catch (Appendix A). This increase in additional species was based on one observer's records in particular.

In 2010, the landings were above average at $11,862 \mathrm{t}$, up from the $9,088 \mathrm{t}$ in 2009. Most landings were caught by purse seine gear in May-June, in the vicinity of 'The Patch', Emerald Bank and the Western Hole (Figure 37). The increased landings were mainly due to good fishing conditions and the availability of the fish to the purse seine gear. Additional by-catch (25t) was reported from otter trawl fisheries for groundfish and silver hake on the Scotian Shelf. The age composition of the catch was primarily adult herring (age 3+) with substantial proportions at age 3 ( $23 \%$ ) and age 5 (32\%; Table 31; Figure 38).

## RESEARCH AND INDUSTRY SURVEYS

## Industry Surveys

An industry survey of the offshore Scotian Shelf area was conducted on 'The Patch' in June 2010, with 3.5 kt of biomass estimated.

## July Bottom Trawl Survey

Summer research bottom trawl surveys showed few herring on the Scotian Shelf during the 1970's, increasing amounts during the 1980's and a relatively widespread distribution in recent years (Harris and Stephenson 1999; Power et al. 2004; Stephenson et al. 2001). There are several shortcomings to this data series, which preclude its use as an indicator of overall abundance for a schooling pelagic species like herring. These include variable behavior and availability to the gear from year to year and the lack of year-class tracking when this was explored previously (Power et al. 2005). The bottom trawl data, while useful for documenting size, maturity and distribution, are not considered indicative of overall herring abundance. Table 27 shows herring abundance indices from the summer bottom trawl surveys from 1970-2010. The trawl survey index increased substantially from a below average level in 2009 (39 to 300
per tow). Figure 39 shows the herring catches from DFO summer bottom trawl survey from 2001-2010. Figure 40 shows the 2000-2010 herring size distribution from the summer bottom trawl research survey for the entire 4VWX area. Herring abundance in the summer bottom trawl research survey was again at a high level with large increases in all areas except the Bay of Fundy.

## OUTLOOK AND MANAGEMENT CONSIDERATIONS

The industry has been encouraged to explore and undertake structured surveys of the offshore area. Industry, and DFO Science and Management branches continue to work together to improve the biological basis for management. There is little new information to add and no reason to change the previous recommendation that the initial catch allocation for 2011 should not exceed the 12,000t as described in the Scotia-Fundy Fisheries Integrated Herring 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, as the inshore gillnet roe fisheries off Glace Bay, East of Halifax and Little Hope have developed, participants have contributed to sampling and surveying, and the fisheries have attempted to follow the 'survey, assess, fish' protocol. In addition to the traditional bait and personal-use fisheries, directed roe fisheries have occurred on several spawning grounds since the 1990's (Clark et al. 1999).

## THE FISHERY AND RESOURCE STATUS

The landings in the gillnet roe fisheries along the coast of Nova Scotia decreased from 9,780t in 2009 to 5,573t in 2010 (Table 28a).

## Little Hope/Port Mouton

The 2010 herring gillnet fishery in Little Hope/Port Mouton area extended to October 13, 2010. The total catch was down slightly to 3,106 from 3,730t in 2009. The catches occurred in three main areas off Port Mouton, near Liverpool and Port Medway (Figure 41). Overall, five acoustics surveys were conducted in the Little Hope/ Port Mouton area between September 21 and October 25, but only four were used to determine the biomass estimate. There was a decrease in the surveyed biomass in 2010 for the Little Hope/Port Mouton area from 36,600t in 2009 to $26,700 \mathrm{t}$, but the 2010 SSB is still above the recent 5 -year average of 20,940t (Table 28b; Figure 42).

## East of Halifax (4W Eastern Shore)

Landings decreased from 6,045t in 2009 to 2,456t in 2010 in the Eastern Shore area (Table 28a; figures 43,45 ). This was primarily a herring roe fishery with catches reported from three main areas; near Halifax Harbour approaches, southwest of Jeddore Head and south of Ship Harbour (Figure 43). Four surveys were completed in the area between September 21 and October 20, but only three surveys were used to estimate the biomass. The surveyed biomass in the Halifax/Eastern shore area saw a decrease in 2010 to 27,700t down from the high in 2009
from of 54,200t. The 2010 SSB is below the recent 5 -year average of 41,880 t observed for this area (Table 28b; Figure 44).

## Glace Bay

Landings were minimal for Glace Bay with only 11t reported in May and June (Table 28a; Figure 45). Survey coverage for the Glace Bay area was poor in 2010 with two surveys attempted on September 15 and October 20, respectively. There were very little spawning herring documented. The estimated biomass for the area was 8t (Figure 45).

## Bras d'Or Lakes

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

## Age Composition

In 2010, the age composition of the catch for the overall Coastal Nova Scotia spawning component was primarily adult herring from this size selective gillnet fishery with a substantial proportion (99\%) at age 4 and older (Table 29; Figure 46).

## 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. Individual spawning groups within this 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, but since there has been no research or surveys in recent years, it is appropriate to reiterate that no fishing should take place on this spawning component.

The main areas for Little Hope/Port Mouton and Halifax/Eastern Shore use a 5-year average of recent catches and/or $10 \%$ of surveyed acoustic biomass calculated with the CIF to set annual removals. The provision to document sufficient quantities of fish each year before the fishery begins was waived in some recent years due to substantial abundances. It is recommended that given the recent variability in survey biomass from year to year, the "survey, assess, then fish" protocol should be adhered to.

## SOUTHWEST NEW BRUNSWICK MIGRANT JUVENILES

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

The success of this passive fishery is historically unpredictable, and catches are inherently susceptible to many natural variables in addition to abundance. The number and distribution of active weirs have decreased over the past decade, due in part to the conversion of sites to aquaculture, as well as reduced landings in the past 30 years in the Passamaquoddy Bay area (Table 10). Figure 47 shows the locations of the New Brunswick weirs and the corresponding catches for the 2010 fishing season.

Landings in the 2010 New Brunswick weir and shut-off fishery were 10,958t, up from the low of $4,031 \mathrm{t}$ in the previous year. It is notable that as recently as 2007 landings were 30,944t, the highest in nearly 20 years and higher than the long term average of 23,560t (Table 30; Figure 48). The age distribution of fish caught in the 2010 New Brunswick weir and shutoff fishery were mostly juveniles, which are well suited to the sardine market, with $95 \%$ at age 2 (Table 31; Figure 49). The number of weirs with catches increased in the 2010 season, but effort (number of active weirs) remained similar.

## $5 Z$ GEORGES BANK

The activities of midwater trawlers and herring purse seiners on the Canadian portion of Georges Bank (area 5Z) are monitored using the Vessel Monitoring System (VMS) and there were no trips to the area and no reported landings in 2010.

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Table 1. 4VWX herring fishery landings (t) by month, gear sector and management unit for 2009-2010 quota year.

|  |  |  | Month |  |  |  |  |  |  |  |  |  |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 2009-2010 quota year | Area | Gear | 1 | 2 |  | 4 |  | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |  |
| S.W. Nova Scotia | 4X | Fall P. Seine (2009) |  |  |  |  |  |  |  |  |  |  | 1,091 | 573 |  | 1,664 |
|  | 4X | Winter P. Seine (2010) | 1,123 |  |  |  |  |  |  |  |  |  |  |  |  | 1,123 |
|  | 4X | Summer P. Seine (2010) |  |  |  |  |  | 1,377 | 2,509 | 7,176 | 11,377 | 15,590 | 3,316 |  |  | 41,345 |
|  | 4X | Gillnet "Stock" (2010) |  |  |  |  |  |  |  |  | 161 | 41 | 1 |  |  | 204 |
|  | 4X | N.S. Weirs (2010) |  |  |  |  |  | 89 | 391 | 320 | 398 |  |  |  |  | 1,198 |
| S.W. Nova Scotia total for 2009-2010 quota year |  |  | 1,123 |  | - |  |  | 1,466 | 2,900 | 7,496 | 11,937 | 15,631 | 4,408 | 573 | - | 45,534 |



Table 2. 4WX herring fishery landings (t) by month and gear sector for 2010-2011 quota year (as of March 2, 2011).

|  |  |  | Month |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Area | Gear | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
| 2010-2011 quota year | 4X | Fall 2010 P. Seine Winter 2011 P. Seine |  |  |  |  |  |  |  |  |  | 878 | 706 |  | $1,584$ |
| 2011 Calendar year |  |  |  |  |  |  |  |  |  |  |  |  |  |  | - |
| 2010-2011 Total (from Oct. 15, 2010 to Jan. 11, 2011) |  |  | - | - | - |  |  |  |  |  |  | 878 | 706 |  | 1,584 |

Table 3. Historical series of nominal and adjusted annual landings (t) by major gear components and seasons of the 4WX herring fishery, 1963-2010 (the 1963-1973 Offshore Scotian Shelf landings are from Stephenson et al. (1987)).

| Year^ | $\begin{array}{r} 4 \mathrm{~W} \\ \text { Winter } \\ \text { Purse Seine } \\ \hline \end{array}$ | 4 Xs Fall\&Winter Purse Seine | $\begin{array}{r} 4 \mathrm{Xqr} \\ \text { Summer } \\ \text { Purse Seine } \\ \hline \end{array}$ |  | $\begin{array}{r} \hline \text { 4Xr } \\ \text { Nova } \\ \text { Scotia } \\ \text { Weir } \\ \hline \end{array}$ | 4WX Stock Nominal Landings | $\begin{array}{r} \text { 4WX } \\ \text { Stock } \\ \text { Adjusted } \\ \text { Landings* } \\ \hline \end{array}$ | $\begin{array}{r} \hline 4 \mathrm{WX} \\ \text { Stock } \\ \mathrm{TAC} \end{array}$ | Non-Stock 4Xs <br> N.B. Weir <br> \& Shutoff | $\begin{array}{r} \hline \text { 4VWX } \\ \text { Coastal } \\ \text { Nova } \\ \text { Scotia } \\ \hline \end{array}$ | $\begin{array}{r} \hline \text { Offshore } \\ \text { Scotian } \\ \text { Shelf } \\ \text { Banks } \\ \hline \end{array}$ | $\begin{array}{r} \hline \text { Total } \\ \text { 4VWX } \\ \text { Adjusted } \\ \text { Landings } \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 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 |
| landing d totals <br> dings by | by purse seine cludes misrep her gear type | are defined fo rting adjustme are for the cale | he period fro for 1978-84 dar year. | October 15 <br> Mace 1985) | 5 of the p ) and for | ceding year 985-93 (Ste | to October 14 henson 1993 | of the cur <br> Stephenso | t year. <br> et al 1994) |  |  |  |

Table 4a. Herring purse seine catches (t) by fishing ground areas (as identified from the 10-mile boxes shown in Figure 4) from 1985-2010 for the 4WX stock component.

## a) Catches (t) by grounds for the 4WX stock area from 1985-2010.

| Stock Areas | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Browns Bank |  | 732 |  |  |  |  |  | 86 |  | 1,903 | 1,554 | 40 | 14 |
| 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 |  |
| 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 |
| 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 |
| 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 |
| 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 |
| Lurcher | 476 | 132 |  | 2,928 | 18 | 65 | 151 | 2,141 | 1,560 | 530 | 382 | 243 | 599 |
| N.B. Coastal | 188 | 621 | 960 | 1,031 | 3,033 | 2,347 | 488 | 992 | 598 | 99 | 1,502 | 271 | 1,176 |
| Pollock Point |  |  |  |  |  |  |  |  |  |  |  |  |  |
| S.W. Grounds | 558 | 1,108 | 184 | 181 | 276 | 56 | 521 | 225 | 2,961 | 3,444 | 6,205 | 3,035 | 797 |
| Scots Bay |  | 36 | 3,822 | 4,145 | 6,583 | 9,003 | 7,982 | 7,987 | 5,258 | 10,840 | 980 | 8,984 | 4,894 |
| 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 |
| 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 |
| Yankee Bank |  |  |  | 194 | 250 | 3,647 | 817 | 119 | 10 | 175 | 323 | 9 | 4 |
| Unknown | 184 | 500 | 200 |  |  | 200 | 579 | 494 | 140 |  | 73 |  |  |
| UWX Stock Total | 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 |


|  |  |  |  |  |  |  |  |  |  |  |  |  |  | Recent Decade <br> Average 01-10 | All Series <br> Avg 85-10 | $\begin{array}{\|l\|} \hline 2010 \text { vs } \\ \text { Avg 01-10 } \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Stock Areas | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |  |  |  |
| Browns Bank | 3,139 | 2,197 | 1,137 | 486 |  |  | 45 |  | 88 | 34 |  |  |  | 163 | 818 |  |
| Chedabucto Bay | 1,583 | 1,151 | 10 |  |  |  |  |  |  |  |  |  |  |  | 4,762 |  |
| Gannet,Dry Ledge | 4,156 | 10,296 | 12,674 | 3,877 | 9,047 | 6,965 | 4,456 | 3,117 | 6,764 | 11,344 | 10,006 | 8,656 | 723 | 6,495 | 6,236 | -5,773 |
| German Bank | 20,556 | 24,660 | 25,631 | 24,139 | 22,355 | 21,573 | 14,175 | 14,171 | 16,522 | 15,085 | 22,437 | 19,354 | 17654 | 18,747 | 16,581 | -1,093 |
| Grand Manan | 15,983 | 7,912 | 18,185 | 10,545 | 17,753 | 17,258 | 7,542 | 5,740 | 7,716 | 10,011 | 10,493 | 12,368 | 15395 | 11,482 | 8,361 | 3,913 |
| Long Island | 12,360 | 18,286 | 11,199 | 12,904 | 6,642 | 12,639 | 13,115 | 8,037 | 1,884 | 4,604 | 3,207 | 2,983 | 1658 | 6,767 | 8,127 | -5,109 |
| Lurcher | 57 |  | 715 | 227 | 7,683 | 1,872 | 7,268 | 1,692 | 2,809 | 2,305 | 684 | 3,676 | 348 | 2,856 | 1,607 | -2,508 |
| N.B. Coastal | 782 | 1,867 | 361 | 1,250 | 3,113 | 3,914 | 2,707 | 787 | 1,889 | 851 | 2,205 | 5,023 | 2762 | 2,450 | 1,570 | 312 |
| Pollock Point |  |  |  | 1,563 |  |  |  |  |  |  |  |  |  | 1,563 | 1,563 | -1,563 |
| S.W. Grounds | 1,239 | 3,241 | 1,879 | 53 | 791 | 73 |  | 1,228 | 1,206 | 30 | 752 | 178 | 169 | 498 | 1,216 | -329 |
| Scots Bay | 8,210 | 1,789 | 10,926 | 10,739 | 8,202 | 19,196 | 24,869 | 6,239 | 3,352 | 4,116 | 2,373 | 902 | 4086 | 8,407 | 7,020 | -4,321 |
| Seal Island | 617 | 567 | 206 | 101 | 238 | 1,096 |  | 1,358 | 209 |  | 15 | 12 |  | 433 | 6,039 | -433 |
| Trinity | 2,825 | 1,220 | 103 | 113 | 1,609 |  | 370 | 1,448 | 3,725 | 112 |  | 325 | 616 | 1,040 | 5,050 | -423 |
| Yankee Bank | 159 | 82 | 133 | 8 | 78 |  |  | 528 | 2 | 62 | 178 | 131 |  | 141 | 345 | -141 |
| Unknown | 62 | 84 | 27 |  |  | 1,103 | 127 | 181 | 396 | 39 |  | 14 | 641 | 357 | 280 | 284 |
| 4WX Stock Total | 71,727 | 73,350 | 83,186 | 66,005 | 77,511 | 85,689 | 74,674 | 44,526 | 46,561 | 48,594 | 52,350 | 53,621 | 44052 | 59,358 | 63,987 | -15,306 |

Table 4b. Herring purse seine catches (\%) by fishing ground areas (as identified from the 10-mile boxes shown in Figure 4) from 1985-2010 for the $4 W X$ stock component.

## b) Percentage by grounds for the 4WX stock area from 1985-2010.

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


|  |  |  |  |  |  |  |  |  |  |  |  |  |  | Recent Decade <br> Average 01-10 | All Series Avg 85-10 | $\begin{array}{\|l\|} \hline 2010 \text { vs } \\ \text { Avg 01-10 } \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Stock Areas | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |  |  |  |
| Browns Bank | 4\% | 3\% | 1\% | 1\% |  |  | 0\% |  | 0\% | 0\% |  |  |  | 0\% | 1\% |  |
| Chedabucto Bay | 2\% | 2\% | 0\% |  |  |  |  |  |  |  |  |  |  | 0\% | 4\% |  |
| Gannet,Dry Ledge | 6\% | 14\% | 15\% | 6\% | 12\% | 8\% | 6\% | 7\% | 15\% | 23\% | 19\% | 16\% | 2\% | 13\% | 10\% | -11\% |
| German Bank | 29\% | 34\% | 31\% | 37\% | 29\% | 25\% | 19\% | 32\% | 35\% | 31\% | 43\% | 36\% | 40\% | 32\% | 26\% | 8\% |
| Grand Manan | 22\% | 11\% | 22\% | 16\% | 23\% | 20\% | 10\% | 13\% | 17\% | 21\% | 20\% | 23\% | 35\% | 18\% | 13\% | 17\% |
| Long Island | 17\% | 25\% | 13\% | 20\% | 9\% | 15\% | 18\% | 18\% | 4\% | 9\% | 6\% | 6\% | 4\% | 13\% | 12\% | -9\% |
| Lurcher | 0\% |  | 1\% | 0\% | 10\% | 2\% | 10\% | 4\% | 6\% | 5\% | 1\% | 7\% | 1\% | 4\% | 3\% | -3\% |
| N.B. Coastal | 1\% | 3\% | 0\% | 2\% | 4\% | 5\% | 4\% | 2\% | 4\% | 2\% | 4\% | 9\% | 6\% | 3\% | 2\% | 3\% |
| Pollock Point |  |  |  | 2\% |  |  |  |  |  |  |  |  |  | 0\% | 0\% |  |
| S.W. Grounds | 2\% | 4\% | 2\% | 0\% | 1\% | 0\% |  | 3\% | 3\% | 0\% | 1\% | 0\% | 0\% | 1\% | 2\% | -1\% |
| Scots Bay | 11\% | 2\% | 13\% | 16\% | 11\% | 22\% | 33\% | 14\% | 7\% | 8\% | 5\% | 2\% | 9\% | 12\% | 11\% | -3\% |
| Seal Island | 1\% | 1\% | 0\% | 0\% | 0\% | 1\% |  | 3\% | 0\% |  | 0\% | 0\% |  | 1\% | 8\% | -1\% |
| Trinity | 4\% | 2\% | 0\% | 0\% | 2\% |  | 0\% | 3\% | 8\% | 0\% |  | 1\% | 1\% | 2\% | 7\% | 0\% |
| Yankee Bank | 0\% | 0\% | 0\% | 0\% | 0\% |  |  | 1\% | 0\% | 0\% | 0\% | 0\% |  | 0\% | 0\% | 0\% |
| Unknown | 0\% | 0\% | 0\% |  |  | 1\% | 0\% | 0\% | 1\% | 0\% |  | 0\% | 1\% | 0\% | 0\% | 1\% |
| Total | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% |  |

Table 5. Herring purse seine catches (t) and percentage by fishing ground for 1985-2010 from non-stock areas.
a) Catches (t) by grounds for non-stock areas from 1985-2010.

| Non-stock Areas | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Georges Bank |  |  |  |  |  | 91 | 64 |  |  | 266 |  | 2,491 |
| Liverpool |  |  |  |  |  |  | 13 |  | 4,067 | 4,177 |  |  |
| Shelburne |  |  | 59 |  |  |  | 64 |  | 526 | 161 |  | 56 |
| Halifax |  |  |  |  |  |  |  |  | 652 | 1,945 |  | 585 |
| Offshore Banks |  |  |  |  |  |  |  |  |  |  |  | 11,800 |
| Western Hole |  | 41 | 154 |  |  |  | 213 | 3,451 | 2,255 | 1,495 | 108 | 127 |
| Nonstock Total |  | 41 | 213 |  |  | 91 | 353 | 3,451 | 7,500 | 8,044 | 108 | 15,058 |


| Non-stock Areas | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Average 01-10 | Avg 85-10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Georges Bank | 79 |  |  | 265 |  |  |  |  |  |  |  |  |  |  |  | 542 |
| Liverpool |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2,752 |
| Shelburne |  |  |  |  |  |  |  |  | 29 |  |  |  |  |  | 29 | 128 |
| Halifax | 455 |  |  | 1,002 | 472 | 367 |  |  |  |  |  |  |  |  | 280 | 685 |
| Offshore Banks | 18,770 | 4,284 | 8,669 | 1,645 | 3,977 | 5,078 | 722 | 4,054 | 4,115 | 4,846 | 2,515 | 829 | 8,918 | 7,432 | 4,249 | 5,478 |
| Western Hole | 691 | 1,012 | 1,057 | 47 | 7,712 | 1,884 | 156 |  | 214 | 192 | 220 | 52 | 114 | 4,405 | 1,661 | 1,219 |
| Nonstock Total | 19,995 | 5,296 | 9,726 | 2,958 | 12,161 | 7,329 | 878 | 4,054 | 4,358 | 5,038 | 2,735 | 881 | 9,032 | 11,837 | 5,830 | 10,805 |

b) Percentage by grounds for non-stock areas from 1985-2010.

| Non-stock Areas | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Georges Bank |  |  |  |  |  | 100\% | 18\% |  |  | 3\% |  | 17\% |
| Liverpool |  |  |  |  |  |  | 4\% |  | 54\% | 52\% |  |  |
| Shelburne |  |  | 28\% |  |  |  | 18\% |  | 7\% | 2\% |  | 0\% |
| Halifax |  |  |  |  |  |  |  |  | 9\% | 24\% |  | 4\% |
| Offshore Banks |  |  |  |  |  |  |  |  |  |  |  | 78\% |
| Western Hole |  | 100\% | 72\% |  |  |  | 60\% | 100\% | 30\% | 19\% | 100\% | 1\% |
| Non-stock Total |  | 100\% | 100\% |  |  | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% |


| Non-stock Areas | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Average 01-10 | Avg 85-10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Georges Bank | 0\% |  |  | 9\% |  |  |  |  |  |  |  |  |  |  |  | 6\% |
| Liverpool |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5\% |
| Shelburne |  |  |  |  |  |  |  |  | 1\% |  |  |  |  |  | 0\% | 2\% |
| Halifax | 2\% |  |  | 34\% | 4\% | 5\% |  |  |  |  |  |  |  |  | 1\% | 3\% |
| Offshore Banks | 94\% | 81\% | 89\% | 56\% | 33\% | 69\% | 82\% | 100\% | 94\% | 96\% | 92\% | 94\% | 99\% | 63\% | 82\% | 54\% |
| Western Hole | 3\% | 19\% | 11\% | 2\% | 63\% | 26\% | 18\% |  | 5\% | 4\% | 8\% | 6\% | 1\% | 37\% | 17\% | 29\% |
| Non-stock Total | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% |

Table 6. German Bank (defined here as the acoustic survey box as shown in Figure 15 )herring purse seine catches for 1985-2010 with start date, end date, catch before August 15 (pre-spawning period), catch after August 14 (defined as spawning period) and proportion of TAC.

| Year | Start Date | End Date | Duration <br> No. Days | Total No. Slips | Catch before Aug. 15 (prespawn) | $\begin{gathered} \hline \text { Catch on/after } \\ \text { Aug. } 15 \\ \text { (spawning) } \\ \hline \end{gathered}$ | Total Catch t | \% Catch on/after Aug-14 | TAC | $\begin{array}{r} \text { German } \\ \text { as \% TAC } \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 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 | 1,756 | 16,953 | 18,708 | 91\% | 55,000 | 34\% |

Table 7. Scots Bay herring purse seine catches for 1987-2010.

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

Table 8. Summary of 1998-2010 Spectacle Buoy and Trinity Ledge herring gillnet catches with start and end dates, catches and overall amounts.

| Year | Spec. Buoy catches and surveys |  |  |  | Trinity Ledge catches and surveys |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Start Day | End Day | Catch t | $\begin{array}{\|l\|} \hline \text { Survey } \\ \text { SSB } \mathrm{t}^{*} \end{array}$ | Start Day | End Day | Catch t | $\begin{array}{l\|} \hline \text { Survey } \\ \text { SSB } t^{*} \end{array}$ | Exploitation |
| 1998 | 10-May-98 | 30-Jun-98 | 484 | $\mathrm{n} / \mathrm{s}$ | 24-Aug-98 | 21-Sep-98 | 1,668 | $\mathrm{n} / \mathrm{s}$ |  |
| 1999 | 10-May-99 | 16-Jul-99 | 355 | $\mathrm{n} / \mathrm{s}$ | 12-Aug-99 | 15-Sep-99 | 1,257 | 3,885 | 32\% |
| 2000 | 11-Jun-00 | 14-Jun-00 | 80 | $\mathrm{n} / \mathrm{s}$ | 30-Aug-00 | 12-Sep-00 | 734 | 621 | 118\% |
| 2001 | 11-Jun-01 | 10-Jul-01 | 699 | 1,110 | 21-Aug-01 | 26-Sep-01 | 1,012 | 14,797 | 7\% |
| 2002 | 15-May-02 | 01-Jul-02 | 137 | $\mathrm{n} / \mathrm{s}$ | 02-Sep-02 | 30-Sep-02 | 256 | 8,096 | 3\% |
| 2003 | 04-Jun-03 | 06-Jun-03 | 69 | 1,420 | 21-Aug-03 | 18-Sep-03 | 369 | 12,117 | 3\% |
| 2004 | 17-Jun-04 | 15-Jul-04 | 5 | $\mathrm{n} / \mathrm{s}$ | 02-Sep-04 | 15-Sep-04 | 225 | 12,022 | 2\% |
| 2005 | 09-Jun-05 | 11-Jul-05 | 124 | 290 | 05-Sep-05 | 20-Sep-05 | 447 | 10,701 | \% |
| 2006 | 03-Jun-06 | 22-Jun-06 | 2 | $\mathrm{n} / \mathrm{s}$ | 23-Aug-06 | 21-Sep-06 | 717 | 16,076 | 4\% |
| 2007 | 07-May-07 | 22-Jun-07 | 243 | 310 | 27-Aug-07 | 20-Sep-07 | 1,091 | 3,113 | 35\% |
| 2008 | 29-May-08 | 19-Jun-08 | 6 |  | 21-Aug-08 | 25-Sep-08 | 7 | 516 | 1\% |
| 2009 | 11-Jun-09 | 25-Jun-09 | 0.2 | $\mathrm{n} / \mathrm{s}$ | 01-Sep-09 | 11-Sep-09 | 116 | 1,575 | 7\% |
| 2010 | 02-Jun-10 | 19-Jun-10 |  | 1,859 | 11-Aug-10 | 24-Sep-10 | 202 | 2,405 | 8\% |
| Average |  |  | 170 | 832 |  |  |  | 7,160 |  |

[^0]Table 9. Monthly Nova Scotia weir landings (t) for 1978-2010.

| YEAR | Jan. Feb. Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Year Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1978 |  | 1 | 490 | 3,704 | 2,990 | 239 | 46 | 111 | 198 | 79 | 7,858 |
| 1979 |  |  | 811 | 3,458 | 1,418 | 420 | 39 | 136 | 57 |  | 6,339 |
| 1980 |  |  | 69 | 647 | 1,271 | 395 |  |  |  |  | 2,383 |
| 1981 |  |  | 50 | 437 | 983 | 276 | 37 |  | 41 |  | 1,824 |
| 1982 |  |  | 16 | 267 | 468 | 195 | 172 | 12 |  |  | 1,130 |
| 1983 |  | 2 | 286 | 141 | 188 | 208 | 53 |  | 18 |  | 896 |
| 1984 |  |  | 113 | 1,032 | 736 | 602 | 220 |  |  |  | 2,702 |
| 1985 |  |  | 378 | 1,799 | 1,378 | 489 |  |  | 11 |  | 4,055 |
| 1986 |  |  | 385 | 403 | 71 | 704 | 390 | 5 |  |  | 1,957 |
| 1987 |  |  | 1,503 | 2,526 | 1,215 | 1,166 | 367 |  |  |  | 6,776 |
| 1988 |  |  | 1,217 | 2,976 | 1,696 | 1,204 | 386 |  |  |  | 7,480 |
| 1989 |  |  | 340 | 1,018 | 870 | 843 | 226 |  |  |  | 3,296 |
| 1990 |  |  | 208 | 973 | 1,482 | 879 | 538 | 52 |  |  | 4,132 |
| 1991 |  | 3 | 23 | 149 | 719 | 342 | 262 |  |  |  | 1,498 |
| 1992 |  |  | 35 | 659 | 405 | 754 | 371 |  |  |  | 2,224 |
| 1993 |  |  | 226 | 908 | 608 | 867 | 53 |  |  |  | 2,662 |
| 1994 |  |  | 111 | 736 | 499 | 519 | 180 |  |  |  | 2,045 |
| 1995 |  |  | 236 | 1,255 | 1,059 | 470 | 29 |  |  |  | 3,049 |
| 1996 |  |  | 430 | 1,267 | 1,232 | 358 | 188 |  |  |  | 3,476 |
| 1997 |  |  | 70 | 1,874 | 1,739 | 271 | 65 |  |  |  | 4,019 |
| 1998 |  |  | 1,304 | 1,677 | 390 | 359 | 317 |  |  |  | 4,048 |
| 1999 |  |  | 1,958 | 1,513 | 547 | 488 | 31 |  |  |  | 4,537 |
| 2000 |  |  |  | 16 | 151 | 326 | 191 |  |  |  | 683 |
| 2001 |  |  | 105 | 1,439 | 1,565 | 391 | 207 |  |  |  | 3,708 |
| 2002 |  |  | 23 | 95 | 240 | 558 | 228 |  |  |  | 1,143 |
| 2003 |  |  | 98 | 126 | 68 | 344 | 284 |  |  |  | 921 |
| 2004 |  |  |  | 667 | 873 | 1,370 | 219 |  |  |  | 3,130 |
| 2005 |  | 11 | 84 | 731 | 472 | 828 | 118 |  |  |  | 2,245 |
| 2006 |  |  | 195 | 138 | 414 | 1,447 | 182 | 115 |  |  | 2,491 |
| 2007 |  |  | 26 | 11 | 290 | 579 | 224 |  |  |  | 1,130 |
| 2008 |  |  |  | 1,136 | 381 | 836 | 171 |  |  |  | 2,524 |
| 2009 |  |  |  | 110 | 233 | 44 | 0 |  |  |  | 387 |
| 2010 |  |  | 89 | 391 | 320 | 398 |  |  |  |  | 1,198 |
| NS Average Catch (t) |  | 5 | 385 | 1,090 | 852 | 604 | 200 | 72 | 65 | 79 | 3,108 |
| NS Minimum Catch (t) |  | 1 | 16 | 11 | 68 | 44 | 0 | 5 | 11 | 79 | 387 |
| NS Maximum Catch (t) |  | 11 | 1,958 | 3,704 | 2,990 | 1,447 | 538 | 136 | 198 | 79 | 7,858 |

Table 10. Annual catch (t), number of active weirs and the catch per weir (t) for New Brunswick and Nova Scotia weirs from 1978-2010.

| Year | Annual Catch (t) | NS | Total Catch | No. Active Weirs |  |  | Catch per weir (t) |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | 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 |
| Average | 20,939 | 2,968 | 23,907 | 120 | 15 | 135 | 172 | 211 | 175 |

Table 11. Annual effort with number of days fished, number of active boats, total catch (t), average catch per day and average catch per boat for 1989-2010 herring purse seine boats from all areas in 4WX-5Y.

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

Note: CPUE = catch per unit effort.

Table 12. Summary of the minimum observed SSB for each of the surveyed spawning grounds in the SWNS/BoF component of the $4 W X$ stock complex. Total SSB is rounded to nearest $100 t$ and all data was calculated without the use of the CIF (Power et al. 2010b).

| Location/Year | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | $\begin{gathered} \hline \text { Average } \\ 1999- \\ 2010 \\ \hline \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Scots Bay (inbox) | 41,000 | 106,300 | 163,900 | 141,000 | 133,900 | 107,600 | 16,800 | 28,600 | 45,700 | 19,400 | 67,600 | 35,500 | 75,608 |
| Scots Bay (outbox) |  |  |  |  |  |  |  |  | 2,000 | 100 | 5,300 | 9,900 | 4,325 |
| Trinity Ledge | 3,900 | 600 | 14,800 | 8,100 | 14,500 | 6,500 | 5,100 | 8,500 | 1,400 | 300 | 700 | 1,000 | 5,450 |
| German Bank (inbox) | 460,800 | 356,400 | 190,500 | 393,100 | 343,500 | 367,600 | 211,000 | 245,500 | 337,200 | 201,700 | 308,700 | 190,000 | 300,500 |
| German Bank (outbox) |  |  |  |  |  |  |  | 4,100 | 2,820 | 1,700 | 1,400 | 15,400 | 5,084 |
| Spec Buoy (spring) | 0 | 0 | 1,100 |  | 1,400 | n/s | 300 | $\mathrm{n} / \mathrm{s}$ | 100 | 0 | 0 | 800 | 411 |
| Spec Buoy (fall) |  |  | 87,500 |  |  |  |  | 16 |  |  |  |  | 43,758 |
| Sub-Total | 505,700 | 463,300 | 457,800 | 542,200 | 493,300 | 481,700 | 233,200 | 286,716 | 389,220 | 223,200 | 383,700 | 252,600 | 392,720 |
| Seal Island |  |  | 3,300 | 1,200 | 12,200 |  |  | 8,100 |  |  |  |  | 6,200 |
| Browns Bank |  |  | 45,800 |  |  |  |  | 6,100 |  |  |  |  | 25,950 |
| Total | 505,700 | 463,300 | 506,900 | 543,400 | 505,400 | 481,700 | 233,200 | 300,916 | 389,220 | 223,200 | 383,700 | 252,600 | 399,103 |
| Overall SE t | 94,600 | 64,900 | 50,800 | 49,500 | 86,100 | 74,200 | 64,900 | 47,251 | 94,257 | 61,075 | 61,425 | 32,132 | 65,095 |
| Overall SE \% | 19 | 14 | 10 | 9 | 17 | 15 | 28 | 16 | 25 | 27 | 27 | 13 | 18 |

Table 12b. Summary of observed spawning stock biomass calculated WITH the calibration integration factor since 2001.

| Location/Year | 1999* | 2000* | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | $\begin{array}{\|c\|} \hline \text { Average } \\ 2001- \\ 2010 \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Scots Bay (inbox) Scots Bay (outbox) | 41,000 | 106,300 | 216,000 | 129,700 | 123,000 | 115,000 | 21,200 | 31,600 | $\begin{array}{r} 50,500 \\ 2,200 \end{array}$ | $\begin{array}{r} 23,300 \\ 100 \end{array}$ | $\begin{array}{r} 81,600 \\ 6,100 \end{array}$ | $\begin{aligned} & 42,300 \\ & 11,700 \end{aligned}$ | $\begin{array}{r} 83,420 \\ 5,025 \end{array}$ |
| Scots Bay total | 41,000 | 106,300 | 216,000 | 129,700 | 123,000 | 115,000 | 21,200 | 31,600 | 52,700 | 23,400 | 87,700 | 54,000 | 85,430 |
| German Bank (inbox) German Bank (outbox) | 460,800 | 356,400 | 257,300 | 416,200 | 348,800 | 392,000 | 268,600 | $\begin{array}{r} \hline 290,500 \\ 4,900 \\ \hline \end{array}$ | $\begin{array}{r} \hline 495,400 \\ 4,000 \end{array}$ | $\begin{array}{\|r\|} \hline 238,600 \\ 2,400 \\ \hline \end{array}$ | $\begin{array}{r} \hline 395,900 \\ 1,700 \\ \hline \end{array}$ | $\begin{array}{\|r\|} \hline 234,700 \\ 19,100 \\ \hline \end{array}$ | $\begin{array}{r} \hline 333,800 \\ 6,420 \\ \hline \end{array}$ |
| German Bank total | 460,800 | 356,400 | 257,300 | 416,200 | 348,800 | 392,000 | 268,600 | 295,400 | 499,400 | 241,000 | 397,600 | 253,800 | 337,010 |
| Trinity Ledge Spec Buoy (spring) Spec Buoy (fall) | $\begin{array}{r} \hline 3,900 \\ 0 \end{array}$ | 600 | $\begin{array}{r} 14,800 \\ 1,100 \\ 87,500 \\ \hline \end{array}$ | 8,900 | $\begin{array}{r} 12,100 \\ 1,200 \end{array}$ | 12,000 $\mathrm{n} / \mathrm{s}$ | $\begin{array}{r} \hline 10,700 \\ 600 \end{array}$ | $\begin{array}{r} 16,100 \\ \mathrm{n} / \mathrm{s} \\ 30 \\ \hline \end{array}$ | 3,100 300 | 500 | 1,600 | $\begin{aligned} & 2,400 \\ & 1,900 \end{aligned}$ | $\begin{array}{r} 8,220 \\ 850 \\ 43,765 \\ \hline \end{array}$ |
| Stock Area Sub-Total | 505,700 | 463,300 | 576,700 | 554,800 | 485,100 | 519,000 | 301,100 | 343,130 | 555,500 | 264,900 | 486,900 | 312,100 | 439,923 |
| Seal Island Browns Bank |  |  | $\begin{array}{r} 3,900 \\ 50,400 \end{array}$ | 1,200 | 11,900 |  |  | $\begin{array}{r} 10,000 \\ 7,700 \end{array}$ |  |  |  |  | $\begin{array}{r} 6,750 \\ 29,050 \end{array}$ |
| Total All Areas | 505,700 | 463,300 | 631,000 | 556,000 | 497,000 | 519,000 | 301,100 | 360,830 | 555,500 | 264,900 | 486,900 | 312,100 | 448,433 |
| Long term Average since 2001 |  |  | 439,923 | 439,923 | 439,923 | 439,923 | 439,923 | 439,923 | 439,923 | 439,923 | 439,923 | 439,923 |  |
| Difference from Long Term Average |  |  | 136,777 | 114,877 | 45,177 | 79,077 | -138,823 | -96,793 | 115,577 | -175,023 | 46,977 | -127,823 |  |
| \% difference from Long Term Average |  |  | $31 \%$ | 26\% | 10\% | 18\% | -32\% | -22\% | 26\% | -40\% | 11\% | -29\% |  |

*Biomass estimates for 1999 to 2000 were calculated 'without' the CIF.

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

| A1) Acoustic Survey SSB (t) | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Avg $99-10$ |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Scots Bay | 40,972 | 106,316 | 163,900 | 141,000 | 133,900 | 107,600 | 16,800 | 28,600 | 45,700 | 19,400 | 67,600 | 45,419 | 76,434 |
| Trinity | 3,885 | 621 | 14,800 | 8,100 | 14,500 | 6,500 | 5,100 | 8,500 | 1,400 | 300 | 700 | 1,026 | 5,453 |
| German Bank | 460,823 | 356,372 | 282,400 | 394,357 | 357,100 | 367,600 | 211,000 | 249,600 | 337,300 | 201,700 | 308,700 | 205,423 | 311,031 |
| Total SSB | 505,680 | 463,309 | 461,100 | 543,457 | 505,500 | 481,700 | 232,900 | 286,700 | 384,400 | 221,400 | 377,000 | 251,868 | 392,918 |


| A2) Acoustic Survey Proportions | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Avg 99-10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Scots Bay | 8\% | 23\% | 36\% | 26\% | 26\% | 22\% | 7\% | 10\% | 12\% | 9\% | 18\% | 18\% | 18\% |
| Trinity | 1\% | 0\% | 3\% | 1\% | 3\% | 1\% | 2\% | 3\% | 0\% | 0\% | 0\% | 0\% | 1\% |
| German Bank | 91\% | 77\% | 61\% | 73\% | 71\% | 76\% | 91\% | 87\% | 88\% | 91\% | 82\% | 82\% | 81\% |
| Total | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% | 100\% |
| C1) Catch by Spawn Area | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Avg 99-10 |
| Scots Bay | 1,789 | 10,926 | 10,739 | 8,202 | 19,196 | 24,869 | 6,239 | 3,352 | 4,116 | 2,373 | 902 | 4,086 | 8,066 |
| Trinity (purse seine+gillnet) | 2,526 | 843 | 1,271 | 1,865 | 369 | 595 | 2,014 | 4,444 | 1,203 | 15 | 442 | 820 | 1,367 |
| German Bank | 24,660 | 25,631 | 24,139 | 22,355 | 21,573 | 14,175 | 14,171 | 16,522 | 15,085 | 22,437 | 19,354 | 17,654 | 19,813 |
| Spawn Area Total | 28,974 | 37,400 | 36,149 | 32,422 | 41,138 | 39,639 | 22,424 | 24,318 | 20,404 | 24,825 | 20,698 | 22,560 | 29,246 |
| Overall SW Nova Catch | 77,552 | 85,284 | 71,570 | 77,054 | 89,461 | 78,029 | 48,981 | 49,159 | 50,529 | 54,561 | 54,113 | 45,534 | 65,152 |
| Non-spawning area catch remaining | 48,578 | 47,884 | 35,421 | 44,632 | 48,323 | 38,390 | 26,557 | 24,841 | 30,125 | 29,736 | 33,415 | 22,974 | 35,906 |


| C2) Adjusted Catch by Area | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Avg 99-10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Scots Bay | 5,725 | 21,914 | 23,330 | 19,782 | 31,996 | 33,444 | 8,155 | 5,830 | 7,697 | 4,979 | 6,894 | 8,229 | 14,831 |
| Trinity | 2,899 | 907 | 2,408 | 2,530 | 1,755 | 1,113 | 2,596 | 5,181 | 1,313 | 55 | 504 | 914 | 1,848 |
| German Bank | 68,929 | 62,462 | 45,832 | 54,742 | 55,710 | 43,472 | 38,231 | 38,148 | 41,519 | 49,527 | 46,715 | 36,391 | 48,473 |
| Adjusted Catch Total | 77,552 | 85,284 | 71,570 | 77,054 | 89,461 | 78,029 | 48,981 | 49,159 | 50,529 | 54,561 | 54,113 | 45,534 | 65,152 |


| E1) Exploitation rate (C1/SSB) | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Avg $99-10$ |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Scots Bay | $4 \%$ | $10 \%$ | $7 \%$ | $6 \%$ | $14 \%$ | $23 \%$ | $37 \%$ | $12 \%$ | $9 \%$ | $12 \%$ | $1 \%$ | $9 \%$ |  |
| Trinity | $65 \%$ | $136 \%$ | $9 \%$ | $23 \%$ | $3 \%$ | $9 \%$ | $39 \%$ | $52 \%$ | $86 \%$ | $5 \%$ | $63 \%$ | $80 \%$ | $47 \%$ |
| German Bank | $5 \%$ | $7 \%$ | $9 \%$ | $6 \%$ | $6 \%$ | $4 \%$ | $7 \%$ | $7 \%$ | $4 \%$ | $11 \%$ | $6 \%$ | $9 \%$ | $7 \%$ |
| Overall (C1/SSB) | $6 \%$ | $8 \%$ | $8 \%$ | $6 \%$ | $8 \%$ | $8 \%$ | $10 \%$ | $8 \%$ | $5 \%$ | $11 \%$ | $5 \%$ | $9 \%$ | $7 \%$ |


| E2) Exploitation rate adjusted (C2/SSE | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Avg $99-10$ |  |  |  |  |  |  |  |  |  |  |  |  |
| Scots Bay | $14 \%$ | $21 \%$ | $14 \%$ | $14 \%$ | $24 \%$ | $31 \%$ | $49 \%$ | $20 \%$ | $17 \%$ | $26 \%$ | $10 \%$ | $18 \%$ |
| Trinity | $75 \%$ | $146 \%$ | $16 \%$ | $31 \%$ | $12 \%$ | $17 \%$ | $51 \%$ | $61 \%$ | $94 \%$ | $18 \%$ | $72 \%$ | $89 \%$ |
| German Bank | $15 \%$ | $18 \%$ | $16 \%$ | $14 \%$ | $16 \%$ | $12 \%$ | $18 \%$ | $15 \%$ | $12 \%$ | $25 \%$ | $15 \%$ | $18 \%$ |
| Overall Adjusted (Catch/Acoustic SSB) | $15 \%$ | $18 \%$ | $16 \%$ | $14 \%$ | $18 \%$ | $16 \%$ | $21 \%$ | $17 \%$ | $13 \%$ | $25 \%$ | $14 \%$ | $18 \%$ |

Table 14. Summary of biological samples by gear and month as collected during the 2010 4VWX herring fisheries. '\# LF Samples' is the number of length frequency samples collected, '\# Measured' is the number of lengths taken and '\# Processed' is the number of detail fish with sex and maturity determined.

|  |  | Month |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Gearname | Data | 12 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
| 4W Purse Seine | \# LF Samples |  |  |  | 20 | 26 |  |  |  |  |  |  | 46 |
|  | \# Measured |  |  |  | 2,533 | 3,032 |  |  |  |  |  |  | 5,565 |
|  | \# Aged |  |  |  | 98 | 165 |  |  |  |  |  |  | 263 |
|  | \# Processed |  |  |  | 98 | 167 |  |  |  |  |  |  | 265 |
| 5Y CAN P.Seine | \# LF Samples |  |  |  |  | 11 | 33 | 65 | 51 |  |  |  | 160 |
|  | \# Measured |  |  |  |  | 1,345 | 3,898 | 8,299 | 6,540 |  |  |  | 20,082 |
|  | \# Aged |  |  |  |  | 20 | 128 | 115 | 67 |  |  |  | 330 |
|  | \# Processed |  |  |  |  | 20 | 129 | 115 | 67 |  |  |  | 331 |
| 5Y USA P.Seine/MWT | \# LF Samples |  |  |  |  |  |  |  |  |  | 2 |  | 4 |
|  | \# Measured |  |  |  |  |  |  |  |  |  | 230 | 237 | 467 |
|  | \# Aged |  |  |  |  |  |  |  |  |  | 0 |  | 0 |
|  | \# Processed |  |  |  |  |  |  |  |  |  |  | 0 | 0 |
| $5 Z ~ U S A ~ P . S e i n e / M W T ~$ | \# LF Samples | 2611 |  |  |  |  |  |  |  |  |  | 10 | 47 |
|  | \# Measured | 3,188 1,255 |  |  |  |  |  |  |  |  |  | 1,174 | 5,617 |
|  | \# Aged | 00 |  |  |  |  |  |  |  |  |  | 0 | 0 |
|  | \# Processed | 00 |  |  |  |  |  |  |  |  |  | 0 | 0 |
| Gillnet | \# LF Samples |  |  |  |  |  |  | 1 | 9 | 7 |  |  | 17 |
|  | \# Measured |  |  |  |  |  |  | 90 | 1,197 | 985 |  |  | 2,272 |
|  | \# Aged |  |  |  |  |  |  | 28 | 84 | 117 |  |  | 229 |
|  | \# Processed |  |  |  |  |  |  | 28 | 84 | 119 |  |  | 231 |
| N.B. Purse Seine | \# LF Samples | 39 |  |  |  | 13 | 17 | 9 | 11 | 88 | 37 |  | 214 |
|  | \# Measured | 4,942 |  |  |  | 1,522 | 2,173 | 1,053 | 1,488 | 13,175 | 5,656 |  | 30,009 |
|  | \# Aged | 100 |  |  |  | 65 | 35 | 11 | 8 | 83 | 14 |  | 316 |
|  | \# Processed | 101 |  |  |  | 65 | 35 | 11 | 8 | 83 | 14 |  | 317 |
| N.B. Shut-off | \# LF Samples |  |  |  |  |  | 1 | 2 |  |  |  |  | 3 |
|  | \# Measured |  |  |  |  |  | 119 | 248 |  |  |  |  | 367 |
|  | \# Aged |  |  |  |  |  | 10 | 0 |  |  |  |  | 10 |
|  | \# Processed |  |  |  |  |  | 10 | 0 |  |  |  |  | 10 |
| N.B. Weirs | \# LF Samples |  |  | 1 | 7 | 44 | 72 | 85 | 50 | 16 | 2 |  | 277 |
|  | \# Measured |  |  | 15 | 877 | 5,230 | 8,685 | 9,803 | 5,838 | 1,888 | 228 |  | 32,564 |
|  | \# Aged |  |  | 15 | 16 | 29 | 71 | 87 | 44 | 36 | 28 |  | 326 |
|  | \# Processed |  |  | 15 | 19 | 29 | 71 | 88 | 44 | 36 | 28 |  | 330 |
| N.S. Purse Seine | \# LF Samples |  |  |  | 31 | 40 | 38 | 53 | 124 | 45 |  |  | 331 |
|  | \# Measured |  |  |  | 4,473 | 4,784 | 4,681 | 7,402 | 17,890 | 6,656 |  |  | 45,886 |
|  | \# Aged |  |  |  | 45 | 52 | 279 | 430 | 412 | 97 |  |  | 1,315 |
|  | \# Processed |  |  |  | 45 | 53 | 279 | 435 | 413 | 97 |  |  | 1,322 |
| N.S. Weirs | \# LF Samples |  |  |  | 2 | 12 | 6 | 3 |  |  |  |  | 23 |
|  | \# Measured |  |  |  | 295 | 1,425 | 732 | 340 |  |  |  |  | 2,792 |
|  | \# Aged |  |  |  | 0 | 34 | 0 | 0 |  |  |  |  | 34 |
|  | \# Processed |  |  |  | 0 | 34 | 0 | 0 |  |  |  |  | 34 |
| Resrch. Otter Trawl | \# LF Samples | 8 | 60 |  |  |  | 122 | 7 |  | 6 |  |  | 203 |
|  | \# Measured |  |  |  |  |  |  |  |  | 102 |  |  | 102 |
|  | \# Aged | 78 | 409 |  |  |  | 1,117 | 54 |  | 37 |  |  | 1,695 |
|  | \# Processed |  |  |  |  |  | 1,130 | 54 |  | 37 |  |  | 1,709 |
| Resrch. MW Trawl | \# LF Samples |  |  |  |  |  |  | 4 | 2 |  |  |  | 6 |
|  | \# Measured |  |  |  |  |  |  | 383 | 242 |  |  |  | 625 |
|  | \# Aged |  |  |  |  |  |  | 43 | 21 |  |  |  | 64 |
|  | \# Processed |  |  |  |  |  |  | 43 | 21 |  |  |  | 64 |
| Total \# LF Samples |  | $65 \quad 19$ | 60 | 1 | 60 | 146 | 289 | 229 | 247 | 162 | 41 | 12 | 1,331 |
| Total \# Measured |  | 8,130 1,255 |  | 15 | 8,178 | 17,338 | 20,288 | 27,618 | 33,195 | 22,806 | 6,114 | 1,411 | 146,348 |
| Total \# Aged |  | 10078 | 409 | 15 | 159 | 365 | 1,640 | 768 | 636 | 370 | 42 | 0 | 4,582 |
| Total \# Processed |  | 10179 | 409 | 15 | 162 | 368 | 1,654 | 774 | 637 | 372 | 42 | 0 | 4,613 |

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

|  | Sample Source |  |  |  |  |  |
| ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Year | Commercial | Industry | Observer | OSS/DMP^ | Research | Total |
| 1990 | 422 |  |  | 185 |  | 607 |
| 1991 | 448 |  |  | 167 | 1 | 616 |
| 1992 | 330 |  |  | 205 | 1 | 536 |
| 1993 | 183 |  |  | 421 |  | 604 |
| 1994 | 223 |  |  | 228 | 14 | 465 |
| 1995 | 138 |  |  | 244 | 108 | 490 |
| 1996 | 127 | 868 | 49 |  | 69 | 1,113 |
| 1997 | 78 | 1,443 |  |  | 114 | 1,635 |
| 1998 | 225 | 1,376 |  |  | 98 | 1,699 |
| 1999 | 49 | 1,388 | 89 |  | 198 | 1,724 |
| 2000 | 34 | 1,387 | 108 |  | 177 | 1,706 |
| 2001 | 47 | 1,455 | 96 |  | 190 | 1,788 |
| 2002 | 17 | 1,339 | 84 |  | 181 | 1,621 |
| 2003 | 58 | 1,292 | 56 |  | 199 | 1,605 |
| 2004 | 50 | 1,270 | 60 |  | 105 | 1,485 |
| 2005 | 48 | 1,017 | 23 |  | 152 | 1,240 |
| 2006 | 33 | 1,049 | 70 |  | 99 | 1,251 |
| 2007 | 10 | 1,139 | 29 |  | 137 | 1,315 |
| 2008 | 16 | 781 | 17 |  | 130 | 944 |
| 2009 | 26 | 980 | $21^{*}$ |  | 135 | 1,162 |
| 2010 | 29 | 947 | $38^{\star}$ |  | $146^{\wedge}$ | 209 |
| 1,223 |  |  |  |  |  |  |
| Average | $\mathbf{1 2 3}$ | $\mathbf{1 , 1 8 2}$ | $\mathbf{6 2}$ | $\mathbf{2 4 2}$ | $\mathbf{1 2 2}$ | $\mathbf{1 , 1 8 3}$ |

[^1]Table 16. Herring catch at age by gear component and overall for the quota year for the 2009-2010 fisheries conducted on the SWNS/BoF spawning component (4WX stock).

| 2009 fall purse seine-Q09-10 | 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 | 34,967 | 1,665 | 221 | 15 | 4 | 2 | 2 | 1 | 1 | 0 | 37,102 |
| \% numbers | 1\% | 94\% | 4\% | 1\% | 0\% | 0\% | 0\% | 0\% | 0\% | 0\% | 0\% | 100\% |
| Catch wt. (t) | 3 | 1,501 | 129 | 27 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 1,664 |
| \% catch wt. | 0\% | 90\% | 8\% | 2\% | 0\% | 0\% | 0\% | 0\% | 0\% | 0\% | 0\% | 100\% |
| Avg. len (cm) | 12.5 | 18.7 | 22.4 | 25.6 | 27.3 | 29.0 | 30.1 | 30.9 | 31.2 | 32.4 | 33.0 | 18.8 |
| Avg. wt. (g) | 11.5 | 42.9 | 77.6 | 122.9 | 154.5 | 186.2 | 211.6 | 232.6 | 240.7 | 271.0 | 288.8 | 44.8 |


| 4X BOF winter purse seine | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Numbers $(\times 1,000)$ | - | 2,534 | 30,125 | 267 | - | - | - | - | - | - | - |
| $\%$ Total |  |  |  |  |  |  |  |  |  |  |  |
| $\%$ numbers | $0 \%$ | $8 \%$ | $91 \%$ | $1 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ |
| Catch wt. $(\mathrm{t})$ | - | 34 | 1,069 | 20 | - | - | - | - | - | - | - |
| $\%$ catch wt. | $0 \%$ | $3 \%$ | $95 \%$ | $2 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ |
| Avg. len $(\mathrm{cm})$ | - | 13.2 | 18.2 | 22.8 | - | - | - | - | - | - | \#DIV/0! |
| Avg. wt. $(\mathrm{g})$ | 13.6 | 35.5 | 73.6 | - | - | - | - | - | - | $100 \%$ |  |


| 4X BOF summer purse seine | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Numbers $(x 1,000)$ | - | 442,849 | 108,975 | 50,716 | 62,404 | 6,640 | 3,469 | 4,372 | 3,838 | 1,725 | 902 | 685,890 |
| $\%$ numbers | $0 \%$ | $65 \%$ | $16 \%$ | $7 \%$ | $9 \%$ | $1 \%$ | $1 \%$ | $1 \%$ | $1 \%$ | $0 \%$ | $0 \%$ | $100 \%$ |
| Catch wt. (t) | - | 13,435 | 7,928 | 6,121 | 9,302 | 1,198 | 727 | 1,022 | 941 | 436 | 235 | 41,345 |
| $\%$ catch wt. | $0 \%$ | $32 \%$ | $19 \%$ | $15 \%$ | $22 \%$ | $3 \%$ | $2 \%$ | $2 \%$ | $2 \%$ | $1 \%$ | $1 \%$ | $100 \%$ |
| Avg. len $(\mathrm{cm})$ | - | 16.2 | 21.7 | 25.5 | 27.2 | 28.6 | 30.0 | 31.0 | 31.5 | 31.8 | 32.1 | 19.2 |
| Avg. wt. $(\mathrm{g})$ | - | 30.3 | 72.7 | 120.7 | 149.1 | 180.5 | 209.5 | 233.9 | 245.1 | 252.5 | 260.2 | 60.3 |


| 4X BOF stock gillnet | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Numbers (x1,000) | - | - | 32 | 235 | 713 | 72 | 57 | 41 | 27 | 11 | 7 | 1,194 |
| \% numbers | 0\% | 0\% | 3\% | 20\% | 60\% | 6\% | 5\% | 3\% | 2\% | 1\% | 1\% | 100\% |
| Catch wt. (t) | - | - | 4 | 34 | 119 | 14 | 12 | 9 | 6 | 3 | 1 | 203 |
| \% catch wt. | 0\% | 0\% | 2\% | 17\% | 59\% | 7\% | 6\% | 5\% | 3\% | 1\% | 1\% | 100\% |
| Avg. len (cm) | - | - | 25.3 | 26.8 | 27.9 | 29.3 | 29.7 | 30.6 | 31.0 | 31.5 | 31.8 | 28.0 |
| Avg. wt. (g) | - | - | 119.0 | 144.5 | 167.3 | 197.1 | 206.0 | 227.1 | 237.8 | 251.6 | 259.1 | 170.1 |


| Nova Scotia weirs | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Numbers $(x 1,000)$ | - | 36,171 | 3,070 | 57 | 61 | 3 | 0 | - | - | - | - | 39,362 |
| $\%$ numbers | $0 \%$ | $92 \%$ | $8 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $100 \%$ |
| Catch wt. $(\mathrm{t})$ | - | 1,067 | 116 | 7 | 8 | 0 | 0 | - | - | - | - | 1,198 |
| $\%$ catch wt. | $0 \%$ | $89 \%$ | $10 \%$ | $1 \%$ | $1 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $100 \%$ |
| Avg. len $(\mathrm{cm})$ | - | 16.6 | 17.7 | 25.2 | 25.7 | 26.6 | 27.4 | - | - | - | \#DIV/0! | 16.7 |
| Avg. wt. $(\mathrm{g})$ | - | 29.5 | 37.7 | 119.0 | 126.6 | 142.1 | 155.8 | - | - | - | \#DIV/0! | 30.4 |


| SW NS Component Q09-10 | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| :--- | :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Numbers $(x 1,000)$ | - | 481,777 | 177,168 | 52,940 | 63,400 | 6,730 | 3,530 | 4,414 | 3,868 | 1,737 | 910 | 796,474 |
| $\%$ numbers | $0 \%$ | $60 \%$ | $22 \%$ | $7 \%$ | $8 \%$ | $1 \%$ | $0 \%$ | $1 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $100 \%$ |
| Catch wt. $(\mathrm{t})$ | - | 14,539 | 10,617 | 6,311 | 9,456 | 1,215 | 739 | 1,032 | 948 | 439 | 237 | 45,533 |
| $\%$ catch wt. | $0 \%$ | $32 \%$ | $23 \%$ | $14 \%$ | $21 \%$ | $3 \%$ | $2 \%$ | $2 \%$ | $2 \%$ | $1 \%$ | $1 \%$ | $100 \%$ |
| Avg. len $(\mathrm{cm})$ |  | 16.2 | 20.5 | 25.4 | 27.2 | 28.6 | 30.0 | 31.0 | 31.5 | 31.8 | 32.1 | 19.0 |
| Avg. wt. $(\mathrm{g})$ |  | 30.2 | 59.9 | 119.2 | 149.2 | 180.6 | 209.5 | 233.8 | 245.1 | 252.5 | 260.2 | 57.2 |

Table 17. Herring catch at age by month and overall for the season for the 2010 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock).

| BOF Purse Seine May | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Numbers (x1,000) |  | 150,312 | 4,083 | 618 | 361 | 44 | - | 6 | 12 | 8 | 1 | 155,454 |
| \% numbers | 0\% | 97\% | 3\% | 0\% | 0\% | 0\% | 0\% | 0\% | 0\% | 0\% | 0\% | 100\% |
| Catch wt. (t) | - | 999 | 260 | 59 | 43 | 7 | 2 | 1 | 3 | 2 | 0 | 1,377 |
| \% catch wt. | 0\% | 73\% | 19\% | 4\% | 3\% | 0\% | 0\% | 0\% | 0\% | 0\% | 0\% | 100\% |
| Avg. len (cm) | - | 11.4 | 21.3 | 23.9 | 25.5 | 27.2 | 29.4 | 30.4 | 31.4 | 31.6 | 32.0 | 11.7 |
| Avg. wt. (g) | - | 6.6 | 63.8 | 95.6 | 119.1 | 152.9 | 205.7 | 225.6 | 255.1 | 260.7 | 272.2 | 8.9 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| BOF Purse Seine June | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| Numbers (x1,000) | - | 21,348 | 13,284 | 1,705 | 2,313 | 698 | 147 | 123 | 65 | 59 | 7 | 39,749 |
| \% numbers | 0\% | 54\% | 33\% | 4\% | 6\% | 2\% | 0\% | 0\% | 0\% | 0\% | 0\% | 100\% |
| Catch wt. (t) | - | 888 | 897 | 185 | 341 | 115 | 27 | 27 | 15 | 14 | 2 | 2,509 |
| \% catch wt. | 0\% | 35\% | 36\% | 7\% | 14\% | 5\% | 1\% | 1\% | 1\% | 1\% | 0\% | 100\% |
| Avg. len (cm) | - | 18.2 | 21.0 | 24.4 | 26.8 | 27.8 | 28.6 | 30.3 | 30.8 | 31.0 | 31.9 | 20.2 |
| Avg. wt. (g) | - | 41.6 | 67.5 | 108.7 | 147.2 | 164.1 | 181.0 | 218.7 | 228.7 | 234.3 | 258.1 | 63.1 |


| BOF Purse Seine July | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ |
| :--- | :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | Total $\mid$


| BOF Purse Seine Aug | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ |
| :--- | :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Numbers $(x 1,000)$ | - | 114,304 | 25,912 | 7,746 | 15,508 | 2,237 | 817 | 1,547 | 1,222 | 496 | 137 |
| $\%$ Total |  |  |  |  |  |  |  |  |  |  |  |
| \% numbers | $0 \%$ | $67 \%$ | $15 \%$ | $5 \%$ | $9 \%$ | $1 \%$ | $0 \%$ | $1 \%$ | $1 \%$ | $0 \%$ | $0 \%$ |
| Catch wt. $(\mathrm{t})$ | - | 4,782 | 1,887 | 954 | 2,340 | 397 | 184 | 370 | 302 | 126 | 35 |
| $\%$ catch wt. | $0 \%$ | $42 \%$ | $17 \%$ | $8 \%$ | $21 \%$ | $3 \%$ | $2 \%$ | $3 \%$ | $3 \%$ | 11,377 |  |
| Avg. len $(\mathrm{cm})$ | - | 18.6 | 21.7 | 25.5 | 27.0 | 28.3 | 30.5 | 31.0 | 31.2 | 31.5 | 31.7 |
| Avg. wt. $(\mathrm{g})$ | 41.8 | 72.8 | 123.1 | 150.9 | 177.7 | 225.7 | 239.0 | 246.9 | 253.5 | 258.9 | $20 \%$ |


| BOF Purse Seine Sept | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Numbers (x1,000) |  | 58,717 | 35,842 | 29,179 | 31,053 | 1,810 | 1,639 | 1,882 | 1,850 | 830 | 612 | 163,413 |
| \% numbers | 0\% | 36\% | 22\% | 18\% | 19\% | 1\% | 1\% | 1\% | 1\% | 1\% | 0\% | 100\% |
| Catch wt. (t) | - | 2,630 | 2,788 | 3,558 | 4,638 | 354 | 340 | 441 | 463 | 216 | 162 | 15,590 |
| \% catch wt. | 0\% | 17\% | 18\% | 23\% | 30\% | 2\% | 2\% | 3\% | 3\% | 1\% | 1\% | 100\% |
| Avg. len (cm) | - | 19.2 | 22.4 | 25.7 | 27.2 | 29.5 | 30.0 | 31.1 | 31.7 | 32.1 | 32.2 | 23.2 |
| Avg. wt. (g) | - | 44.8 | 77.8 | 121.9 | 149.4 | 195.7 | 207.5 | 234.4 | 250.4 | 260.2 | 264.9 | 95.4 |


| BOF Purse Seine Oct | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Numbers (x1,000) | - | 23,336 | 6,758 | 5,108 | 6,149 | 488 | 231 | 351 | 365 | 219 | 114 | 43,120 |
| \% numbers | 0\% | 54\% | 16\% | 12\% | 14\% | 1\% | 1\% | 1\% | 1\% | 1\% | 0\% | 100\% |
| Catch wt. (t) | - | 976 | 484 | 607 | 880 | 86 | 44 | 76 | 83 | 52 | 28 | 3,316 |
| \% catch wt. | 0\% | 29\% | 15\% | 18\% | 27\% | 3\% | 1\% | 2\% | 3\% | 2\% | 1\% | 100\% |
| Avg. len (cm) | - | 18.6 | 21.9 | 25.8 | 27.3 | 29.2 | 29.9 | 31.2 | 31.6 | 32.0 | 32.2 | 21.7 |
| Avg. wt. (g) | - | 41.8 | 71.6 | 118.9 | 143.1 | 177.0 | 190.4 | 218.0 | 227.5 | 235.2 | 241.6 | 76.9 |


| 4X BOF summer purse seine | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Numbers ( $\times 1,000$ ) |  | 442,849 | 108,975 | 50,716 | 62,404 | 6,640 | 3,469 | 4,372 | 3,838 | 1,725 | 902 | 685,890 |
| \% numbers | 0\% | 65\% | 16\% | 7\% | 9\% | 1\% | 1\% | 1\% | 1\% | 0\% | 0\% | 100\% |
| Catch wt. (t) | - | 13,435 | 7,928 | 6,121 | 9,302 | 1,198 | 727 | 1,022 | 941 | 436 | 235 | 41,345 |
| \% catch wt. | 0\% | 32\% | 19\% | 15\% | 22\% | 3\% | 2\% | 2\% | 2\% | 1\% | 1\% | 100\% |
| Avg. len (cm) |  | 16.2 | 21.7 | 25.5 | 27.2 | 28.6 | 30.0 | 31.0 | 31.5 | 31.8 | 32.1 | 19.2 |
| Avg. wt. (g) | - | 30.3 | 72.7 | 120.7 | 149.1 | 180.5 | 209.5 | 233.9 | 245.1 | 252.5 | 260.2 | 60.3 |

Table 18. Herring catch at age by fishing ground for the 2010 summer purse seine fishery conducted on the SWNS/BoF spawning component (4WX stock).

| Purse German Bank (17,794t) | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Numbers (x1,000) |  | 10,870 | 31,789 | 36,933 | 45,135 | 3,664 | 2,328 | 3,065 | 2,865 | 1,301 | 803 | 138,754 |
| \% numbers | 0\% | 8\% | 23\% | 27\% | 33\% | 3\% | 2\% | 2\% | 2\% | 1\% | 1\% | 100\% |
| Catch wt. (t) | - | 554 | 2,851 | 4,510 | 6,742 | 685 | 487 | 716 | 707 | 331 | 210 | 17,794 |
| \% catch wt. | 0\% | 3\% | 16\% | 25\% | 38\% | 4\% | 3\% | 4\% | 4\% | 2\% | 1\% | 100\% |
| Avg. len (cm) | - | 19.6 | 23.4 | 25.7 | 27.2 | 29.0 | 30.1 | 31.1 | 31.6 | 31.9 | 32.2 | 25.7 |
| Avg. wt. (g) | - | 51.0 | 89.7 | 122.1 | 149.4 | 186.9 | 209.3 | 233.7 | 246.7 | 254.7 | 261.4 | 128.2 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Purse GM Banks (9,726t) | 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) | - | 271,182 | 38,400 | 2,826 | 1,669 | 300 | 74 | 33 | 16 | 4 | 2 | 314,505 |
| \% numbers | 0\% | 86\% | 12\% | 1\% | 1\% | 0\% | 0\% | 0\% | 0\% | 0\% | 0\% | 100\% |
| Catch wt. (t) | - | 6,659 | 2,463 | 294 | 235 | 49 | 14 | 7 | 4 | 1 | 0 | 9,726 |
| \% catch wt. | 0\% | 68\% | 25\% | 3\% | 2\% | 1\% | 0\% | 0\% | 0\% | 0\% | 0\% | 100\% |
| Avg. len (cm) | - | 15.0 | 21.0 | 24.2 | 26.5 | 27.7 | 29.1 | 29.9 | 30.3 | 30.5 | 30.7 | 15.9 |
| Avg. wt. (g) |  | 24.6 | 64.1 | 104.2 | 140.8 | 163.0 | 192.2 | 209.7 | 218.8 | 224.2 | 228.1 | 30.9 |


| Purse Grand Manan (6,307t) | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ |
| :--- | :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Numbers $(x 1,000)$ | - | 128,857 | 19,050 | 496 | 81 | 0 | 0 | 1 | 1 | 1 | 1 |
| Total |  |  |  |  |  |  |  |  |  |  |  |
| $\%$ numbers | $0 \%$ | $87 \%$ | $13 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ |
| Catch wt. $(\mathrm{t})$ | - | 5,191 | 1,059 | 46 | 9 | 0 | 0 | $100 \%$ |  |  |  |
| $\%$ catch wt. | $0 \%$ | $82 \%$ | $17 \%$ | $1 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | 0 | 0 | 0 |
| Avg. len $(\mathrm{cm})$ | - | 18.3 | 20.1 | 23.7 | 25.6 | 29.1 | 29.2 | 32.9 | 32.9 | 33.0 | $0 \%$ |
| Avg. wt. $(\mathrm{g})$ | 40.3 | 55.6 | 92.9 | 115.7 | 172.8 | 175.9 | 257.2 | 258.2 | 259.5 | 259.5 | $100 \%$ |


| Purse Scots Bay (4,086t) | 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) |  | 191 | 7,054 | 7,516 | 11,724 | 1,720 | 632 | 585 | 415 | 143 | 45 | 30,024 |
| \% numbers | 0\% | 1\% | 23\% | 25\% | 39\% | 6\% | 2\% | 2\% | 1\% | 0\% | 0\% | 100\% |
| Catch wt. (t) | - | 12 | 684 | 940 | 1,745 | 295 | 133 | 135 | 97 | 34 | 11 | 4,086 |
| \% catch wt. | 0\% | 0\% | 17\% | 23\% | 43\% | 7\% | 3\% | 3\% | 2\% | 1\% | 0\% | 100\% |
| Avg. len (cm) | - | 20.9 | 23.8 | 25.6 | 27.0 | 28.1 | 29.9 | 30.8 | 30.9 | 31.0 | 31.4 | 26.1 |
| Avg. wt. (g) | - | 61.8 | 96.9 | 125.0 | 148.9 | 171.7 | 210.6 | 231.6 | 233.2 | 237.3 | 246.5 | 136.1 |


| Purse Long Island (1,585t) | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ |
| :--- | :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Numbers (x1,000) | - | 18,121 | 9,396 | 966 | 741 | 140 | 23 | 15 | 9 | 7 | 0 |
| $\%$ Total |  |  |  |  |  |  |  |  |  |  |  |
| \% numbers | $0 \%$ | $62 \%$ | $32 \%$ | $3 \%$ | $3 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ |
| Catch wt. (t) | - | 739 | 613 | 99 | 102 | 22 | 4 | 3 | 2 | 2 | 0 |
| $\%$ catch wt. | $0 \%$ | $47 \%$ | $39 \%$ | $6 \%$ | $6 \%$ | $1 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ |
| Avg. len (cm) | - | 18.1 | 21.0 | 24.1 | 26.3 | 27.3 | 28.4 | 30.4 | 30.5 | 30.7 | 31.4 |
| Avg. wt. (g) | - | 40.8 | 65.2 | 102.4 | 137.5 | 155.7 | 177.7 | 220.3 | 223.0 | 228.1 | 243.4 |


| Purse Gannet/Dry Ledge (723t) | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ |
| :--- | :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Numbers (x1,000) | - | 30 | 1,211 | 1,185 | 1,705 | 424 | 167 | 178 | 123 | 78 | 17 |
| $\%$ numbers | $0 \%$ | $1 \%$ | $24 \%$ | $23 \%$ | $33 \%$ | $8 \%$ | $3 \%$ | $3 \%$ | $2 \%$ | $2 \%$ | $0 \%$ |
| Catch wt. (t) | - | 2 | 111 | 142 | 264 | 76 | 34 | 41 | 29 | 19 | 4 |
| \% catch wt. | $0 \%$ | $0 \%$ | $15 \%$ | $20 \%$ | $37 \%$ | $10 \%$ | $5 \%$ | $6 \%$ | $4 \%$ | $3 \%$ | $1 \%$ |
| Avg. len (cm) | - | 20.8 | 23.7 | 25.5 | 27.4 | 28.5 | 29.7 | 30.8 | 31.1 | 31.2 | 31.7 |
| Avg. wt. (g) | - | 59.6 | 92.0 | 120.3 | 154.9 | 178.5 | 204.7 | 230.2 | 237.8 | 239.5 | 253.6 |


| BOF Purse Trinity (689t) | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ |
| :--- | :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Numbers ( $(x 1,000)$ | - | 4,283 | 393 | 188 | 526 | 180 | 192 | 466 | 387 | 179 | 34 |
| $\%$ Total |  |  |  |  |  |  |  |  |  |  |  |
| \% numbers | $0 \%$ | $63 \%$ | $6 \%$ | $3 \%$ | $8 \%$ | $3 \%$ | $3 \%$ | $7 \%$ | $6 \%$ | $3 \%$ | $0 \%$ |
| Catch wt. (t) | - | 203 | 29 | 23 | 87 | 38 | 44 | 113 | 97 | 46 | 9 |
| \% catch wt. | $0 \%$ | $29 \%$ | $4 \%$ | $3 \%$ | $13 \%$ | $5 \%$ | $6 \%$ | $16 \%$ | $14 \%$ | $7 \%$ | $1 \%$ |
| Avg. len (cm) | - | 19.3 | 21.8 | 25.6 | 27.8 | 29.7 | 30.7 | 31.1 | 31.4 | 31.6 | 31.6 |
| Avg. wt. $(\mathrm{g})$ | - | 47.3 | 74.0 | 124.7 | 166.3 | 209.0 | 231.7 | 242.8 | 250.3 | 256.4 | 256.6 |


| Purse Lurcher (218t) | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ |
| :--- | :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Numbers $(x 1,000)$ | - | 648 | 370 | 263 | 551 | 172 | 43 | 22 | 11 | 4 | 0 |
| $\%$ Total |  |  |  |  |  |  |  |  |  |  |  |
| \%umbers | $0 \%$ | $31 \%$ | $18 \%$ | $13 \%$ | $26 \%$ | $8 \%$ | $2 \%$ | $1 \%$ | $1 \%$ | $0 \%$ | $0 \%$ |
| Catch wt. (t) | - | 29 | 31 | 31 | 83 | 28 | 8 | 5 | 2 | $100 \%$ |  |
| $\%$ catch wt. | $0 \%$ | $13 \%$ | $14 \%$ | $14 \%$ | $38 \%$ | $13 \%$ | $3 \%$ | $2 \%$ | $1 \%$ | $0 \%$ | 0 |
| Avg. len $(\mathrm{cm})$ | - | 19.0 | 22.6 | 25.1 | 27.0 | 27.8 | 28.4 | 30.2 | 30.5 | 30.8 | 31.2 |
| Avg. wt. $(\mathrm{g})$ | - | 44.7 | 84.8 | 118.9 | 149.9 | 164.8 | 175.9 | 215.5 | 223.3 | 229.6 | 239.7 |

Table 19. Herring catch at age for the overall 2009 quota year purse seine, gillnet and weir fisheries conducted on the SWNS/BoF spawning component (4WX stock).

| SWNS Quota Year 2008-2009 | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ |
| :--- | :---: | :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Total |  |  |  |  |  |  |  |  |  |  |  |
| Numbers $(\times 1,000)$ | 702 | 263,298 | 117,708 | 138,589 | 22,198 | 11,954 | 11,487 | 13,084 | 6,008 | 1,418 | 314 |
| numbers | $0 \%$ | $45 \%$ | $20 \%$ | $24 \%$ | $4 \%$ | $2 \%$ | $2 \%$ | $2 \%$ | $1 \%$ | $0 \%$ | $0 \%$ |
| Catch wt. (t) | 8 | 10,846 | 9,990 | 19,106 | 3,817 | 2,429 | 2,660 | 3,221 | 1,545 | 399 | 93 |
| \% catch wt. | $0 \%$ | $20 \%$ | $18 \%$ | $35 \%$ | $7 \%$ | $4 \%$ | $5 \%$ | $6 \%$ | $3 \%$ | $1 \%$ | $0 \%$ |
| Avg. len (cm) | 12.2 | 18.1 | 22.3 | 25.9 | 27.7 | 29.1 | 30.2 | 30.8 | 31.2 | 32.0 | 32.6 |
| Avg. wt. $(\mathrm{g})$ | 10.8 | 41.2 | 84.9 | 137.9 | 171.9 | 203.2 | 231.5 | 246.2 | 257.2 | 281.2 | 297.4 |


| SWNS Quota Year 2009-2010 | 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) |  | 481,777 | 177,168 | 52,940 | 63,400 | 6,730 | 3,530 | 4,414 | 3,868 | 1,737 | 910 | 796,474 |
| \% numbers | 0\% | 60\% | 22\% | 7\% | 8\% | 1\% | 0\% | 1\% | 0\% | 0\% | 0\% | 100\% |
| Catch wt. (t) | - | 14,539 | 10,617 | 6,311 | 9,456 | 1,215 | 739 | 1,032 | 948 | 439 | 237 | 45,533 |
| \% catch wt. | 0\% | 32\% | 23\% | 14\% | 21\% | 3\% | 2\% | 2\% | 2\% | 1\% | 1\% | 100\% |
| Avg. len (cm) |  | 16.2 | 20.5 | 25.4 | 27.2 | 28.6 | 30.0 | 31.0 | 31.5 | 31.8 | 32.1 | 19.0 |
| Avg. wt. (g) |  | 30.2 | 59.9 | 119.2 | 149.2 | 180.6 | 209.5 | 233.8 | 245.1 | 252.5 | 260.2 | 57.2 |


| Differences 2010 minus 2009 | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Numbers $(x 1,000)$ | -702 | 218,479 | 59,460 | $-85,649$ | 41,202 | $-5,224$ | $-7,957$ | $-8,670$ | $-2,140$ | 319 | 596 |
| \% | 209,713 |  |  |  |  |  |  |  |  |  |  |
| \% numbers | -0.00 | 0.16 | 0.02 | -0.17 | 0.04 | -0.01 | -0.02 | -0.02 | -0.01 | -0.00 | 0.00 |
| Catch wt. (t) | -8 | 3,693 | 627 | $-12,796$ | 5,639 | $-1,213$ | $-1,920$ | $-2,189$ | -597 | 40 | 143 |
| \% catch wt. | -0.00 | 0.12 | 0.05 | -0.21 | 0.14 | -0.02 | -0.03 | -0.04 | -0.01 | 0.00 | 0.00 |
| Avg. len (cm) | -12.2 | -1.9 | -1.9 | -0.5 | -0.6 | -0.5 | -0.2 | 0.2 | 0.2 | -0.3 | -0.5 |
| Avg. wt. (g) | -10.8 | -11.0 | -24.9 | -18.7 | -22.8 | -22.6 | -22.1 | -12.4 | -12.1 | -28.6 | -37.2 |

Table 20a. Catch at age (thousands) for the SWNS/BoF herring spawning component for 1965-2010 with revisions from 1999-2005 and new data for 2006-2010.

Historical Catch at age in millions

|  | Year |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11+ | Total |
| 1965 | 270 | 1,085 | 35 | 234 | 50 | 11 | 2 | 1 | 0 | 0 | 0 | 1,687 |
| 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 |

Table 20b. Catch at age (percent numbers) for the SWNS/BoF herring spawning component, 1965-2010 with revisions from 1999-2010. Proportions for some relatively strong year-classes that persisted in the fishery catch have been highlighted.

Historical catch at age in percentages

|  | Age |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11+ | Total |
| 1965 | 16 | 64 | 2 | 14 | 3 | 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 |

Note - green highlight for age $2>=50 \%$

Table 21. Average (fishery weighted) weights at age (g) for the SWNS/BoF component of the 4WX herring fishery for 1965-2010. Data for 1965-1967 and 1979-1983 are averages for the period 1968-1978.

| 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 |
| Average 1965-2010 | 0.013 | 0.041 | 0.102 | 0.158 | 0.199 | 0.233 | 0.262 | 0.295 | 0.316 | 0.347 | 0.355 |
| Minimum | 0.007 | 0.021 | 0.060 | 0.119 | 0.149 | 0.181 | 0.204 | 0.214 | 0.228 | 0.249 | 0.253 |
| Maximum | 0.027 | 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 |
| Avg19 80-89 | 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 |
| Last 10yr: 2001-2010 | 0.018 | 0.046 | 0.090 | 0.140 | 0.171 | 0.199 | 0.221 | 0.241 | 0.252 | 0.273 | 0.286 |
| Last 5yr: 2006-2010 | 0.019 | 0.044 | 0.085 | 0.137 | 0.166 | 0.193 | 0.216 | 0.233 | 0.254 | 0.272 | 0.289 |

Note: highlighted cells have average weights for 1967-2000 applied

Table 22. Acoustic age composition for the overall SWNS/BoF component from 1999-2010.

| 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 (newages) | \% catch wt. | 0\% | 0\% | 4\% | 14\% | 34\% | 31\% | 12\% | 3\% | 1\% | 0\% | 0\% | 100\% |
| 2000 Acoustics Overall (newages) | \% catch wt. | 0\% | 2\% | 3\% | 24\% | 29\% | 18\% | 14\% | 7\% | 1\% | 0\% | 0\% | 100\% |
| 2001 Sub-total Stock Acoustic (newages) | \% catch wt. | 0\% | 2\% | 38\% | 14\% | 21\% | 14\% | 8\% | 2\% | 2\% | 0\% | 0\% | 100\% |
| 2002 Acoustics Stock Overall (newages) | \% catch wt. | 0\% | 1\% | 15\% | 45\% | 21\% | 7\% | 4\% | 3\% | 2\% | 1\% | 1\% | 99\% |
| 2003 Overall Acoustics (newages) | \% catch wt. | 0\% | 2\% | 28\% | 21\% | 33\% | 7\% | 4\% | 1\% | 1\% | 1\% | 1\% | 99\% |
| 2004 Acoustics Overall (newages) | \% catch wt. | 0\% | 0\% | 21\% | 43\% | 16\% | 11\% | 3\% | 1\% | 2\% | 0\% | 1\% | 99\% |
| 2005 Acoustics Overall (newages) | \% catch wt. | 0\% | 0\% | 10\% | 47\% | 20\% | 8\% | 8\% | 4\% | 1\% | 0\% | 1\% | 99\% |
| 2006 Acoustics Overall (newages) | \% catch wt. | 0\% | 0\% | 8\% | 21\% | 37\% | 19\% | 11\% | 3\% | 0\% | 0\% | 0\% | 100\% |
| 2007 Overall Acoustics (newages) | \% catch wt. | 0\% | 1\% | 8\% | 13\% | 18\% | 37\% | 19\% | 3\% | 1\% | 0\% | 0\% | 100\% |
| 2008 Overall Acoustics (newages) | \% catch w | 0\% | 0\% | 24\% | 12\% | 9\% | 14\% | 24\% | 12\% | 5\% | 1\% | 0\% | 100\% |
| 2009 Acoustics Overall | \% catch wt. | 0\% | 1\% | 17\% | 49\% | 8\% | 5\% | 6\% | 8\% | 4\% | 1\% | 0\% | 100\% |
| 2010 BOF Stock Acoustics overall (w/o CIF) | \% catch wt. | 0\% | 0\% | 12\% | 21\% | 44\% | 6\% | 3\% | 6\% | 5\% | 2\% | 1\% | 100\% |
| 1999 Acoustics Overall (newages) | \% numbers | 0\% | 0\% | 6\% | 16\% | 37\% | 28\% | 10\% | 2\% | 1\% | 0\% | 0\% | 100\% |
| 2000 Acoustics Overall (newages) | \% numbers | 0\% | 7\% | 5\% | 29\% | 28\% | 15\% | 11\% | 5\% | 1\% | 0\% | 0\% | 100\% |
| 2001 Sub-total Stock Acoustic (newages) | \% numbers | 0\% | 4\% | 49\% | 14\% | 17\% | 9\% | 5\% | 1\% | 1\% | 0\% | 0\% | 100\% |
| 2002 Acoustics Stock Overall (newages) | \% numbers | 0\% | 3\% | 19\% | 47\% | 19\% | 5\% | 3\% | 2\% | 1\% | 1\% | 1\% | 99\% |
| 2003 Overall Acoustics (newages) | \% numbers | 0\% | 5\% | 37\% | 20\% | 27\% | 5\% | 3\% | 1\% | 1\% | 0\% | 0\% | 100\% |
| 2004 Acoustics Overall (newages) | \% numbers | 0\% | 1\% | 28\% | 45\% | 12\% | 9\% | 2\% | 1\% | 2\% | 0\% | 1\% | 99\% |
| 2005 Acoustics Overall (newages) | \% numbers | 0\% | 0\% | 14\% | 50\% | 19\% | 7\% | 6\% | 3\% | 1\% | 0\% | 0\% | 100\% |
| 2006 Acoustics Overall (newages) | \% numbers | 0\% | 0\% | 12\% | 23\% | 37\% | 17\% | 9\% | 2\% | 0\% | 0\% | 0\% | 100\% |
| 2007 Overall Acoustics (newages) | \% numbers | 0\% | 1\% | 13\% | 16\% | 17\% | 33\% | 17\% | 2\% | 1\% | 0\% | 0\% | 100\% |
| 2008 Overall Acoustics (newages) | \% numbers | 0\% | 0\% | 35\% | 14\% | 8\% | 12\% | 18\% | 9\% | 3\% | 0\% | 0\% | 100\% |
| 2009 Acoustics Overall | \% numbers | 0\% | 3\% | 23\% | 52\% | 7\% | 4\% | 4\% | 5\% | 2\% | 1\% | 0\% | 100\% |
| 2010 BOF Stock Acoustics overall (w/o CIF) | \% numbers | 0\% | 0\% | 17\% | 24\% | 43\% | 5\% | 2\% | 3\% | 3\% | 1\% | 0\% | 100\% |
| 1999 Acoustics Overall (newages) | Catch wt. (t) |  | 84 | 22,216 | 69,469 | 173,595 | 155,515 | 61,022 | 16,493 | 4,242 | 1,754 | 1,291 | 505,680 |
| 2000 Acoustics Overall (newages) | Catch wt. (t) | - | 11,400 | 14,380 | 112,184 | 134,684 | 84,156 | 66,464 | 32,791 | 4,742 | 2,039 | 469 | 463,309 |
| 2001 Sub-total Stock Acoustic (newages) | Catch wt. (t) |  | 7,001 | 176,018 | 62,399 | 94,533 | 62,077 | 38,372 | 9,330 | 7,312 | 769 | 8 | 457,820 |
| 2002 Acoustics Stock Overall (newages) | Catch wt. (t) | 52 | 5,304 | 80,806 | 244,021 | 116,212 | 40,702 | 22,607 | 14,424 | 9,574 | 4,792 | 4,906 | 543,401 |
| 2003 Overall Acoustics (newages) | Catch wt. (t) | - | 11,921 | 144,848 | 104,594 | 167,789 | 36,704 | 19,940 | 6,841 | 5,765 | 3,767 | 3,263 | 505,432 |
| 2004 Acoustics Overall (newages) | Catch wt. (t) | - | 1,706 | 101,072 | 207,633 | 75,581 | 55,374 | 16,618 | 5,998 | 11,296 | 1,917 | 4,568 | 481,764 |
| 2005 Acoustics Overall (newages) | Catch wt. (t) | - | 219 | 23,804 | 111,443 | 47,155 | 18,710 | 18,720 | 8,591 | 2,414 | 456 | 1,656 | 233,168 |
| 2006 Acoustics Overall (newages) | Catch wt. (t) | - | 349 | 22,840 | 59,161 | 105,088 | 52,822 | 32,210 | 8,241 | 934 | 636 | 265 | 282,548 |
| 2007 Overall Acoustics (newages) | Catch wt. (t) | - | 2,115 | 32,457 | 50,989 | 67,778 | 142,394 | 72,708 | 9,699 | 4,516 | 982 | 741 | 384,379 |
| 2008 Overall Acoustics (newages) | Catch wt. (t) |  | 13 | 53,013 | 26,693 | 19,720 | 30,353 | 54,061 | 26,910 | 10,370 | 1,716 | 221 | 223,071 |
| 2009 Acoustics Overall | Catch wt. (t) | - | 4,314 | 63,651 | 186,373 | 30,773 | 20,455 | 24,377 | 28,454 | 14,128 | 3,727 | 780 | 377,031 |
| 2010 BOF Stock Acoustics overall (w/o CIF) | Catch wt. (t) | - | 290 | 29,336 | 53,148 | 112,153 | 16,377 | 8,445 | 14,083 | 11,685 | 5,012 | 2,133 | 252,661 |
| 1999 Acoustics Overall (newages) | Numbers (x1,000) |  | 854 | 167,854 | 437,601 | 970,567 | 733,451 | 257,034 | 60,631 | 13,956 | 5,445 | 3,389 | 2,650,782 |
| 2000 Acoustics Overall (newages) | Numbers ( $\mathrm{x} 1,000$ ) | - | 176,913 | 128,754 | 770,463 | 744,375 | 412,096 | 303,870 | 139,098 | 16,532 | 6,648 | 1,175 | 2,699,924 |
| 2001 Sub-total Stock Acoustic (newages) | Numbers ( $\mathrm{x} 1,000$ ) | - | 108,158 | 1,446,910 | 413,181 | 504,205 | 276,744 | 151,010 | 33,231 | 27,607 | 2,419 | 25 | 2,963,491 |
| 2002 Acoustics Stock Overall (newages) | Numbers ( $\mathrm{x} 1,000$ ) | 2,037 | 92,602 | 643,349 | 1,611,858 | 664,014 | 188,737 | 91,655 | 55,810 | 40,093 | 17,737 | 17,489 | 3,425,381 |
| 2003 Overall Acoustics (newages) | Numbers ( $\times 1,000$ ) |  | 187,496 | 1,317,612 | 719,568 | 968,611 | 191,900 | 90,384 | 27,540 | 23,373 | 14,877 | 12,977 | 3,554,338 |
| 2004 Acoustics Overall (newages) | Numbers ( $\mathrm{x} 1,000$ ) | - | 27,081 | 912,633 | 1,458,078 | 396,624 | 278,517 | 79,659 | 24,488 | 49,614 | 6,788 | 18,011 | 3,251,491 |
| 2005 Acoustics Overall (newages) | Numbers ( $\times 1,000$ ) |  | 4,483 | 209,985 | 765,947 | 290,870 | 99,540 | 87,118 | 39,532 | 9,769 | 1,670 | 6,702 | 1,515,617 |
| 2006 Acoustics Overall (newages) | Numbers ( $\mathrm{x} 1,000$ ) | - | 4,970 | 197,497 | 380,770 | 609,173 | 278,179 | 153,090 | 36,457 | 3,710 | 2,381 | 930 | 1,667,157 |
| 2007 Overall Acoustics (newages) | Numbers ( $\times 1,000$ ) | - | 21,462 | 266,920 | 331,681 | 364,304 | 696,015 | 346,312 | 37,429 | 17,093 | 3,456 | 2,516 | 2,087,187 |
| 2008 Overall Acoustics (newages) | Numbers ( $\mathrm{x} 1,000$ ) | - | 162 | 446,066 | 174,742 | 104,483 | 144,766 | 230,953 | 110,028 | 39,693 | 5,922 | 731 | 1,257,545 |
| 2009 Acoustics Overall | Numbers ( $x 1,000$ ) | - | 65,642 | 586,617 | 1,297,340 | 176,290 | 98,834 | 103,880 | 113,808 | 53,951 | 13,370 | 2,616 | 2,512,347 |
| 2010 BOF Stock Acoustics overall (w/o CIF) | Numbers ( $\mathrm{x} 1,000$ ) | - | 4,435 | 298,756 | 422,868 | 737,319 | 90,715 | 39,180 | 59,589 | 47,658 | 19,999 | 8,294 | 1,728,812 |

Table 23. Acoustic age composition for the German Bank component from 1999-2010 with percent by weight, percent by number, catch/survey biomass(t) and numbers (thousands) by age.

| Year and Area | Type Data | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1999 German Bank Acoustic Overall (newag | \% catch wt. | 0\% | 0\% | 4\% | 14\% | 34\% | 31\% | 12\% | 3\% | 1\% | 0\% | 0\% | 100\% |
| 2000 German Bank Overall (newages) | \% catch wt. | 0\% | 3\% | 3\% | 24\% | 28\% | 17\% | 15\% | 7\% | 1\% | 0\% | 0\% | 100\% |
| 2001 German Bank Acoustic (newages) | \% catch wt. | 0\% | 4\% | 40\% | 12\% | 18\% | 13\% | 8\% | 2\% | 2\% | 0\% | 0\% | 100\% |
| 2002 German Bank Overall (newages) | \% catch wt. | 0\% | 1\% | 16\% | 42\% | 22\% | 7\% | 4\% | 3\% | 2\% | 1\% | 1\% | 99\% |
| 2003 German Bank Acoustics (newages) | \% catch wt. | 0\% | 3\% | 33\% | 20\% | 29\% | 8\% | 4\% | 1\% | 1\% | 1\% | 1\% | 99\% |
| 2004 Acoustics German Bank (newages) | \% catch wt. | 0\% | 0\% | 19\% | 46\% | 16\% | 10\% | 3\% | 1\% | 3\% | 0\% | 1\% | 99\% |
| 2005 German Bank Acoustics (newages) | \% catch wt. | 0\% | 0\% | 11\% | 47\% | 20\% | 8\% | 8\% | 4\% | 1\% | 0\% | 1\% | 99\% |
| 2006 German Bank Acoustics (newages) | \% catch wt. | 0\% | 0\% | 8\% | 21\% | 37\% | 19\% | 12\% | 3\% | 0\% | 0\% | 0\% | 100\% |
| 2007 German Bank Acoustics (newages) | \% catch wt. | 0\% | 1\% | 8\% | 12\% | 17\% | 38\% | 21\% | 2\% | 1\% | 0\% | 0\% | 100\% |
| 2008 German Bank Acoustics (newages) | \% catch wt. | 0\% | 0\% | 24\% | 12\% | 9\% | 13\% | 24\% | 12\% | 5\% | 1\% | 0\% | 100\% |
| 2009 German Bank Acoustics-v2 | \% catch wt. | 0\% | 1\% | 16\% | 49\% | 8\% | 5\% | 6\% | 8\% | 4\% | 1\% | 0\% | 100\% |
| 2010 German Bank Acoustics Overall (w/o | \% catch wt. | 0\% | 0\% | 11\% | 20\% | 45\% | 6\% | 3\% | 6\% | 5\% | 2\% | 1\% | 100\% |
| 1999 German Bank Acoustic Overall (newag | \% numbers | 0\% | 0\% | 6\% | 17\% | 36\% | 28\% | 10\% | 2\% | 1\% | 0\% | 0\% | 100\% |
| 2000 German Bank Overall (newages) | \% numbers | 0\% | 8\% | 5\% | 28\% | 26\% | 14\% | 12\% | 5\% | 1\% | 0\% | 0\% | 100\% |
| 2001 German Bank Acoustic (newages) | \% numbers | 0\% | 8\% | 50\% | 12\% | 15\% | 9\% | 5\% | 1\% | 1\% | 0\% | 0\% | 100\% |
| 2002 German Bank Overall (newages) | \% numbers | 0\% | 4\% | 20\% | 44\% | 20\% | 5\% | 3\% | 2\% | 1\% | 0\% | 0\% | 100\% |
| 2003 German Bank Acoustics (newages) | \% numbers | 0\% | 6\% | 41\% | 19\% | 23\% | 6\% | 3\% | 1\% | 1\% | 0\% | 0\% | 100\% |
| 2004 Acoustics German Bank (newages) | \% numbers | 0\% | 1\% | 26\% | 48\% | 12\% | 7\% | 2\% | 1\% | 2\% | 0\% | 1\% | 99\% |
| 2005 German Bank Acoustics (newages) | \% numbers | 0\% | 0\% | 14\% | 50\% | 19\% | 7\% | 6\% | 3\% | 1\% | 0\% | 0\% | 100\% |
| 2006 German Bank Acoustics (newages) | \% numbers | 0\% | 0\% | 12\% | 22\% | 36\% | 17\% | 9\% | 2\% | 0\% | 0\% | 0\% | 100\% |
| 2007 German Bank Acoustics (newages) | \% numbers | 0\% | 1\% | 12\% | 15\% | 17\% | 34\% | 18\% | 2\% | 1\% | 0\% | 0\% | 100\% |
| 2008 German Bank Acoustics (newages) | \% numbers | 0\% | 0\% | 36\% | 14\% | 8\% | 11\% | 19\% | 9\% | 3\% | 0\% | 0\% | 100\% |
| 2009 German Bank Acoustics-v2 | \% numbers | 0\% | 2\% | 23\% | 52\% | 7\% | 4\% | 4\% | 5\% | 2\% | 1\% | 0\% | 100\% |
| 2010 German Bank Acoustics Overall (w/o | \% numbers | 0\% | 0\% | 16\% | 24\% | 43\% | 5\% | 2\% | 4\% | 3\% | 1\% | 1\% | 100\% |
| 1999 German Bank Acoustic Overall (newag | Catch wt. (t) |  | 82 | 20,275 | 64,082 | 156,669 | 141,083 | 55,806 | 15,607 | 4,213 | 1,726 | 1,280 | 460,823 |
| 2000 German Bank Overall (newages) | Catch wt. (t) | - | 11,254 | 12,282 | 86,545 | 101,223 | 60,508 | 54,444 | 24,364 | 3,954 | 1,329 | 467 | 356,372 |
| 2001 German Bank Acoustic (newages) | Catch wt. (t) | - | 6,761 | 77,041 | 23,033 | 35,156 | 25,112 | 15,986 | 3,598 | 3,410 | 396 | - | 190,494 |
| 2002 German Bank Overall (newages) | Catch wt. (t) | 52 | 5,107 | 62,843 | 167,061 | 85,780 | 28,917 | 17,045 | 11,138 | 8,662 | 3,049 | 3,468 | 393,121 |
| 2003 German Bank Acoustics (newages) | Catch wt. (t) | - | 9,507 | 112,696 | 67,780 | 99,837 | 27,194 | 13,970 | 4,477 | 3,513 | 2,068 | 2,445 | 343,486 |
| 2004 Acoustics German Bank (newages) | Catch wt. (t) | - | 1,486 | 70,123 | 170,087 | 59,916 | 36,320 | 10,979 | 4,713 | 9,571 | 1,052 | 3,382 | 367,629 |
| 2005 German Bank Acoustics (newages) | Catch wt. (t) | - | 205 | 22,372 | 100,193 | 42,169 | 17,344 | 17,060 | 7,550 | 2,122 | 422 | 1,523 | 210,959 |
| 2006 German Bank Acoustics (newages) | Catch wt. (t) | - | 320 | 20,746 | 50,548 | 90,762 | 45,815 | 28,381 | 7,326 | 805 | 539 | 238 | 245,480 |
| 2007 German Bank Acoustics (newages) | Catch wt. (t) | - | 1,782 | 25,749 | 41,552 | 57,675 | 127,509 | 69,264 | 7,873 | 4,291 | 869 | 628 | 337,192 |
| 2008 German Bank Acoustics (newages) | Catch wt. (t) | - | - | 49,681 | 23,880 | 17,720 | 25,789 | 49,830 | 24,853 | 9,912 | 1,521 | 221 | 203,407 |
| 2009 German Bank Acoustics-v2 | Catch wt. (t) |  | 2,997 | 50,191 | 152,788 | 24,885 | 16,561 | 20,001 | 24,304 | 12,700 | 3,520 | 768 | 308,713 |
| 2010 German Bank Acoustics Overall (w/o | Catch wt. (t) | - | 179 | 21,824 | 42,061 | 91,991 | 12,782 | 6,874 | 12,497 | 10,613 | 4,590 | 2,011 | 205,422 |
| 1999 German Bank Acoustic Overall (newag | Numbers ( $\times 1,000$ ) | - | 832 | 153,058 | 403,585 | 877,171 | 664,394 | 233,385 | 57,062 | 13,860 | 5,352 | 3,362 | 2,412,061 |
| 2000 German Bank Overall (newages) | Numbers ( $\times 1,000$ ) | - | 175,500 | 110,521 | 594,633 | 558,315 | 302,698 | 251,590 | 105,361 | 13,780 | 4,298 | 1,171 | 2,117,866 |
| 2001 German Bank Acoustic (newages) | Numbers ( $\times 1,000$ ) | - | 105,643 | 654,813 | 156,616 | 190,336 | 113,455 | 63,690 | 12,901 | 13,236 | 1,241 | - | 1,311,930 |
| 2002 German Bank Overall (newages) | Numbers ( $\times 1,000$ ) | 2,021 | 89,756 | 504,599 | 1,102,271 | 493,104 | 134,970 | 69,343 | 43,173 | 36,391 | 11,165 | 12,237 | 2,499,028 |
| 2003 German Bank Acoustics (newages) | Numbers ( $\times 1,000$ ) |  | 154,745 | 1,018,475 | 477,351 | 578,705 | 143,619 | 63,515 | 18,151 | 14,263 | 8,160 | 9,889 | 2,486,873 |
| 2004 Acoustics German Bank (newages) | Numbers ( $\times 1,000$ ) |  | 23,650 | 638,371 | 1,197,723 | 310,760 | 183,630 | 53,172 | 19,343 | 42,320 | 3,373 | 13,418 | 2,485,760 |
| 2005 German Bank Acoustics (newages) | Numbers ( $\times 1,000$ ) | - | 4,212 | 196,739 | 683,438 | 258,828 | 92,400 | 79,193 | 34,675 | 8,605 | 1,550 | 6,205 | 1,365,846 |
| 2006 German Bank Acoustics (newages) | Numbers ( $\times 1,000$ ) | - | 4,567 | 178,930 | 322,966 | 523,053 | 239,322 | 134,161 | 32,351 | 3,208 | 2,040 | 839 | 1,441,435 |
| 2007 German Bank Acoustics (newages) | Numbers ( $\times 1,000$ ) |  | 17,815 | 210,166 | 268,885 | 309,544 | 621,725 | 330,001 | 29,818 | 16,301 | 3,030 | 2,134 | 1,809,417 |
| 2008 German Bank Acoustics (newages) | Numbers ( $\times 1,000$ ) | - | - | 418,278 | 156,610 | 93,175 | 123,733 | 213,104 | 102,230 | 37,838 | 5,239 | 731 | 1,150,937 |
| 2009 German Bank Acoustics-v2 | Numbers ( $\times 1,000$ ) | - | 43,736 | 457,872 | 1,057,905 | 141,452 | 79,524 | 84,240 | 96,383 | 48,112 | 12,595 | 2,574 | 2,024,393 |
| 2010 German Bank Acoustics Overall (w/o | Numbers ( $\times 1,000$ ) | - | 2,652 | 221,594 | 334,499 | 601,995 | 69,790 | 31,717 | 52,678 | 43,049 | 18,218 | 7,791 | 1,383,983 |

Table 24. Biological characteristics from sampling for German Bank acoustic surveys from 1999-2010 with average length (cm) and average weight $(g)$ by age .

| Year and Area | Type Data | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1999 German Bank Acoustic Overall (newages) | Avg. len (cm) |  | 23.2 | 25.4 | 26.9 | 27.9 | 29.4 | 30.5 | 31.9 | 33.1 | 33.6 |  | 28.4 |
| 2000 German Bank Overall (newages) | Avg. len (cm) | - | 21.0 | 24.9 | 27.0 | 28.8 | 29.7 | 30.5 | 31.1 | 33.2 | 33.6 |  | 27.9 |
| 2001 German Bank Acoustic (newages) | Avg. len (cm) | - | 20.9 | 25.1 | 26.8 | 28.6 | 30.2 | 31.4 | 32.4 | 31.6 | 33.7 |  | 26.3 |
| 2002 German Bank Overall (newages) | 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 (newages) | Avg. len (cm) | - | 20.4 | 24.6 | 26.5 | 28.2 | 29.0 | 30.3 | 31.4 | 31.4 | 31.6 |  | 26.1 |
| 2004 Acoustics German Bank (newages) | 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 (newages) | 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 (newages) | 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 (newages) | Avg. len (cm) | - | 23.8 | 25.2 | 27.0 | 28.5 | 29.3 | 29.4 | 31.5 | 31.5 | 32.2 |  | 28.4 |
| 2008 German Bank Acoustics (newages) | 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-v2 | Avg. len (cm) | - | 21.2 | 24.3 | 26.3 | 27.9 | 29.2 | 30.4 | 31.0 | 31.4 | 32.0 | 32.7 | 26.5 |
| 2010 German Bank Acoustics Overall (w/o 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 |
| 1999 German Bank Acoustic Overall (newages) | Avg. wt. (g) | 2 | 99 | 132 | 159 | 179 | 212 | 239 | 274 | 304 | 322 |  | 191 |
| 2000 German Bank Overall (newages) | Avg. wt. (g) | 2 | 64 | 111 | 146 | 181 | 200 | 216 | 231 | 287 | 309 |  | 168 |
| 2001 German Bank Acoustic (newages) | Avg. wt. (g) | 2 | 64 | 118 | 147 | 185 | 221 | 251 | 279 | 258 | 319 |  | 145 |
| 2002 German Bank Overall (newages) | Avg. wt. (g) | 2 | 57 | 125 | 152 | 174 | 214 | 246 | 258 | 238 | 273 |  | 157 |
| 2003 German Bank Acoustics (newages) | Avg. wt. (g) | 2 | 61 | 111 | 142 | 173 | 189 | 220 | 247 | 246 | 253 |  | 138 |
| 2004 Acoustics German Bank (newages) | Avg. wt. (g) | 2 | 63 | 110 | 142 | 193 | 198 | 206 | 244 | 226 | 312 |  | 148 |
| 2005 German Bank Acoustics (newages) | Avg. wt. (g) | 2 | 49 | 114 | 147 | 163 | 188 | 215 | 218 | 247 | 272 |  | 154 |
| 2006 German Bank Acoustics (newages) | Avg. wt. (g) | 2 | 70 | 116 | 157 | 174 | 191 | 212 | 226 | 251 | 264 |  | 170 |
| 2007 German Bank Acoustics (newages) | Avg. wt. (g) | 2 | 100 | 123 | 155 | 186 | 205 | 210 | 264 | 263 | 287 |  | 186 |
| 2008 German Bank Acoustics (newages) | Avg. wt. (g) | 2 | - | 119 | 152 | 190 | 208 | 234 | 243 | 262 | 290 |  | 177 |
| 2009 German Bank Acoustics-v2 | Avg. wt. (g) | 2 | 69 | 110 | 144 | 176 | 208 | 237 | 252 | 264 | 279 | 298 | 152 |
| 2010 German Bank Acoustics Overall (w/o CIF) | Avg. wt. (g) | 2 | 67 | 98 | 126 | 153 | 183 | 217 | 237 | 247 | 252 | 258 | 148 |

Table 25. Progress against biological objectives in the management plan of the SWNS/BoF herring spawning component for the 2010 fishery.

| Objective | 2010: Observations |
| :--- | :--- |
| Persistence of all spawning components | Spawning observed in Scots Bay and German Bank. Spawning activity could not be determined <br> on Seal Island or Browns due to a lack of fishing or survey effort. Trinity Ledge again had <br> minimal spawning. |
| Maintain biomass of each component | Acoustic biomass estimates decreased substantially for each of the major survey areas. SSB for <br> Trinity is extremely low. The overall SSB has been well below average for 4 of the past 6 years. |
| Maintain broad age composition | Appears to be a broad range of ages in the commercial catch (1-9), as well as in the acoustic <br> survey catch at age (3-11). |
| Maintain long spawning period | Start of spawning in 2010 for German Bank was earlier based on survey results. Spawning in <br> Scots Bay appeared to start earlier and end earlier than in previous years. Virtually no spawning <br> occurred on Trinity Ledge. |
| Fishing mortality at or below F 0.1 | Fishing mortality could not be determined. Relative exploitation rates based on acoustic SSB <br> estimates and catch increased in 2010. |
| Maintain spatial and temporal diversity of |  |
| spawning | Similar spatial and temporal distribution of spawning on German Bank. Duration of spawning in <br> Scots was extended and similar to 2009. Trinity spawning is very restricted in space and time. <br> There is a lack of documented spawning in other areas. |
| Maintain biomass at moderate to high levels | There was an decrease in acoustic SSB for Scots Bay and German Bank; however, SSB <br> appears to be well below the 1999-2009 average. |

Table 26. Herring catch at age for the 2010 Offshore Banks fisheries with numbers caught (thousands), weight (t) and percent, average length and average weight by age.

4W Offshore purse seine
Catch at age (numbers and weight)

|  | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Numbers (x1,000) | - | 1,073 | 19,108 | 13,601 | 26,363 | 9,231 | 3,004 | 4,190 | 3,317 | 2,084 | 830 | 82,801 |
| \% numbers |  | 1\% | 23\% | 16\% | 32\% | 11\% | 4\% | 5\% | 4\% | 3\% | 1\% | 100\% |
| Catch wt. (t) | - | 54 | 1,565 | 1,582 | 3,906 | 1,578 | 603 | 971 | 812 | 522 | 244 | 11,837 |
| \% catch wt. |  | 0\% | 13\% | 13\% | 33\% | 13\% | 5\% | 8\% | 7\% | 4\% | 2\% | 100\% |
| Avg. len (cm) | - | 19.9 | 22.8 | 25.2 | 26.9 | 28.0 | 29.4 | 30.7 | 31.2 | 31.4 | 32.9 | 26.3 Avg. Len |
| Avg. wt. (g) | - | 50.1 | 81.9 | 116.3 | 148.2 | 170.9 | 200.7 | 231.8 | 244.7 | 250.3 | 293.8 | 143.0 Avg. wt |

Table 27. Herring abundance indices from the July bottom trawl survey (stratified numbers per tow): 1970-2010. Note 2005 had duplicate coverage of the entire area with comparative surveys by the Alfred Needler and Templeman.

| Year | Cruise | 4WX area combined strata 453/495 |  |  | 4W Only strata 453/466 Mean | $\left\|\begin{array}{r}\text { 4X Only } \\ \text { strata 470/495 } \\ \text { Mean }\end{array}\right\|$ | 4X BOF <br> strata 480/495 <br> Mean | 4V only strata 440/452 Mean | Offshore Banks strata 455/478 <br> Mean |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Mean | SE | N |  |  |  |  |  |
| 1970 | A175/176 | 4.1 | 1.5 | 95 | 4.9 | 1.6 | 1.0 | 12.8 | 5.7 |
| 1971 | A188/189 | 4.0 | 1.9 | 86 | 2.6 | 3.6 | 1.4 | 4.4 | 5.3 |
| 1972 | A200/201 | 1.4 | 0.6 | 105 | 1.7 | 0.5 | 0.3 | 4.5 | 2.0 |
| 1973 | A212/213 | 0.9 | 0.3 | 96 | 0.4 | 1.0 | 1.0 | 19.2 | 0.9 |
| 1974 | A225/226 | 0.7 | 0.3 | 102 | 0.2 | 1.0 | 1.4 | 0.0 | 0.5 |
| 1975 | A236/237 | 0.9 | 0.4 | 104 | 0.8 | 0.7 | 1.3 | 2.2 | 0.7 |
| 1976 | A250/251 | 0.4 | 0.2 | 103 | 0.1 | 0.5 | 0.9 | 0.0 | 0.1 |
| 1977 | A265/266 | 0.5 | 0.3 | 106 | 0.0 | 0.8 | 1.5 | 1.6 | 0.1 |
| 1978 | A279/280 | 0.3 | 0.3 | 103 | 0.5 | 0.1 | 0.1 | 0.0 | 0.5 |
| 1979 | A292/293 | 0.6 | 0.5 | 106 | 0.0 | 1.0 | 1.5 | 0.0 | 0.2 |
| 1980 | A306/307 | 0.5 | 0.5 | 105 | 0.0 | 0.8 | 1.6 | 0.0 | 0.0 |
| 1981 | A321/322 | 1.5 | 1.4 | 104 | 0.0 | 2.3 | 4.6 | 0.0 | 0.0 |
| 1982 | H080/081 | 1.5 | 0.9 | 108 | 0.5 | 1.9 | 0.8 | 0.0 | 2.5 |
| 1983 | N012/013 | 2.4 | 0.8 | 106 | 2.6 | 2.2 | 3.1 | 0.1 | 2.1 |
| 1984 | N031/032 | 7.0 | 3.5 | 102 | 3.3 | 10.5 | 4.6 | 4.0 | 8.5 |
| 1985 | N048/049 | 3.4 | 1.8 | 111 | 6.6 | 0.3 | 0.4 | 0.0 | 5.0 |
| 1986 | N065/066 | 23.2 | 14.9 | 118 | 30.8 | 16.0 | 24.9 | 0.5 | 23.4 |
| 1987 | N85/86/87 | 10.4 | 5.6 | 135 | 17.0 | 4.0 | 6.3 | 117.4 | 12.9 |
| 1988 | N105/106 | 2.1 | 0.6 | 127 | 2.7 | 1.5 | 2.3 | 0.3 | 2.0 |
| 1989 | N123/124 | 8.4 | 1.8 | 124 | 11.8 | 4.5 | 4.9 | 3.6 | 9.8 |
| 1990 | N139/140 | 5.6 | 1.9 | 156 | 7.4 | 3.4 | 3.4 | 0.3 | 6.5 |
| 1991 | N154/H231 | 10.6 | 5.8 | 137 | 13.0 | 5.0 | 4.9 | 10.2 | 14.3 |
| 1992 | N173/174 | 16.5 | 4.9 | 136 | 16.2 | 40.8 | 41.8 | 0.2 | 23.6 |
| 1993 | N189/190 | 18.7 | 4.5 | 137 | 6.3 | 30.4 | 27.6 | 1.0 | 15.0 |
| 1994 | N221/222 | 76.4 | 30.2 | 140 | 108.4 | 45.9 | 51.1 | 25.7 | 91.1 |
| 1995 | N226/227 | 63.5 | 24.2 | 140 | 100.5 | 28.4 | 11.4 | 7.9 | 92.7 |
| 1996 | N246/247 | 40.2 | 14.2 | 135 | 53.2 | 27.1 | 32.1 | 0.2 | 46.5 |
| 1997 | N726/734 | 31.8 | 15.3 | 137 | 34.6 | 51.3 | 72.8 | 0.2 | 29.3 |
| 1998 | N827/832 | 99.52 | 20.65 | 131 | 147.6 | 54.76 | 45.6 | 0.8 | 130.3 |
| 1999 | N925/929 | 229.8 | 83.8 | 133 | 264.2 | 199.4 | 251.4 | 24.9 | 226.2 |
| 2000 | NED2000-426/431 | 90.6 | 20.0 | 146 | 146.3 | 38.7 | 29.5 | 2.0 | 124.7 |
| 2001 | NED2001-032/037 | 145.9 | 47.7 | 139 | 152.7 | 139.5 | 181.3 | 53.9 | 132.4 |
| 2002 | NED2002-037/040 | 161.9 | 48.6 | 147 | 172.7 | 151.9 | 170.9 | 4.9 | 162.6 |
| 2003 | NED2003-036/042 | 130.6 | 70.5 | 153 | 207.8 | 58.7 | 50.3 | 4.9 | 175.8 |
| 2004t | TEL2004-529/530 | 295.9 | 100.2 | 128 | 307.6 | 285.0 | 198.0 | 1.4 | 355.6 |
| 2005t | TEL2005-605/633 | 74.1 | 13.7 | 118 | 13.7 | 130.5 | 51.8 | 7.4 | 88.0 |
| 2005n | NED2005-027/034 | 63.1 | 20.9 | 150 | 36.0 | 88.2 | 61.0 | 13.6 | 66.2 |
| 2006 | NED2006-030/036 | 85.7 | 29.7 | 150 | 133.3 | 40.7 | 26.7 | 15.2 | 118.6 |
| 2007 | TEL2007-745 | 40.7 | 9.8 | 121 | 20.0 | 59.9 | 85.8 | 0.9 | 19.0 |
| 2008 | TEM2008-830 | 43.7 | 12.9 | 118 | 46.8 | 40.9 | 50.8 | 2.0 | 40.2 |
| 2009 | NED2009-027 | 53.3 | 11.9 | 136 | 44.6 | 61.4 | 85.4 | 6.1 | 38.6 |
| 2010 | NED2010-027 | 211.5 | 115.4 | 137 | 163.4 | 256.4 | 50.8 | 38.4 | 300.5 |
| Overall Mean |  | 49.1 | 17.7 | 123 | 54.3 | 45.1 | 39.2 | 9.3 | 56.7 |
| Minimum |  | 0.3 | 0.2 | 86 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 |
| Maximum |  | 295.9 | 115.4 | 156 | 307.6 | 285.0 | 251.4 | 117.4 | 355.6 |

Table 28. Coastal Nova Scotia spawning component summary of a) herring landings (t) from gillnet fisheries 1996-2010, b) spawning biomass from acoustic surveys in the Coastal Nova Scotia spawning component from 1998-2010, and c) estimated exploitation as calculated as catch/SSB.
a - Landings by spawning area for coastal Nova Scotia with 5 year and overall averages

| Landings (t) | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Average <br> Catch Last <br> 5 yr . | Average <br> Catch All <br> Years |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Little Hope/Port Mouton | 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 | 2,517 | 2,437 |
| Halifax/Eastern Shore | 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 | 3,591 | 2,694 |
| Glace Bay | 1,730 | 1,040 | 834 | 1,204 | 3,058 | 1,905 | 1,481 | 626 | 85 | 7 | 12 | 4 | 11 | 24 | 869 |
| Bras d'Or Lakes | 120 | 31 | 56 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36 |
| Total | 4,120 | 5,618 | 4,283 | 6,006 | 10,375 | 9,162 | 6,924 | 6,311 | 6,566 | 5,240 | 3,500 | 9,780 | 5,573 | 6,132 | 5,816 |

b - Acoustic SSB for coastal Nova Scotia with 5 year and overall averages (with CIF since 2003; w/o CIF pre-2003)

| Survey SSB (t) | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | $10 \%$ SSB Average Last 5 yr | $\begin{aligned} & 10 \% \text { SSB } \\ & \text { Average All } \\ & \text { vears } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 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 | 2,094 | 2,595 |
| Halifax/Eastern Shore | 8,300 | 20,200 | 10,900 | 16,700 | 41,500 | 92,600 | 28,400 | 36,950 | 68,900 | 28,300 | 30,300 | 54,200 | 27,700 | 4,188 | 3,577 |
| Glace Bay |  | 2,000 |  | 21,200 | 7,700 | 31,500 |  | 3,180 | $\mathrm{n} / \mathrm{s}$ | 240 | 500 | 100 | 8 | 21 | 738 |
| Bras d'Or Lakes |  | 530 | 70 | $\mathrm{n} / \mathrm{s}$ | $\mathrm{n} / \mathrm{s}$ | $\mathrm{n} / \mathrm{s}$ | $\mathrm{n} / \mathrm{s}$ | $\mathrm{n} / \mathrm{s}$ | n/s | n/s | n/s | n/s | $\mathrm{n} / \mathrm{s}$ | n/s | 30 |

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 for 1998-2002 calculated without the Calibration Integration Factor (CIF).
c - Exploitation estimates for coastal Nova Scotia spawning components with 5 year and overall averages (with CIF since 2003; w/o CIF pre-2003)

| Survey SSB (t) with CIF | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 10\% SSB <br> Average <br> Last 5 yr | 10\% SSB Average All years |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Little Hope/Port Mouton | 8\% | 18\% | 39\% | 14\% | 7\% | 9\% | 6\% | 5\% | 13\% | 54\% | 8\% | 10\% | 12\% | 19\% | 16\% |
| Halifax/Eastern Shore | 13\% | 8\% | 12\% | 11\% | 8\% | 3\% | 15\% | 9\% | 5\% | 13\% | 8\% | 11\% | 9\% | 9\% | 10\% |
| Glace Bay |  | 52\% |  | 6\% | 40\% | 6\% |  | 20\% |  | 3\% | 2\% | 4\% | 138\% | 37\% | 30\% |

Table 29. Herring catch at age for the 2010 Coastal Nova Scotia gillnet fisheries with numbers caught (thousands), weight (t) and percent, average length and average weight by age.

Coastal NS gillnet
Catch at age (numbers and weight)

|  | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ | Total |
| :--- | :---: | :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Numbers (x1,000) | - | - | 32 | 741 | 5,788 | 1,583 | 1,250 | 1,755 | 2,039 | 1,128 | 716 | 15,033 |
| $\%$ numbers |  |  | $0 \%$ | $5 \%$ | $39 \%$ | $11 \%$ | $8 \%$ | $12 \%$ | $14 \%$ | $8 \%$ | $5 \%$ | $100 \%$ |
| Catch wt. (t) | - | - | 5 | 118 | 1,027 | 308 | 258 | 405 | 506 | 291 | 173 | 3,091 |
| \% catch wt. |  |  | $0 \%$ | $4 \%$ | $33 \%$ | $10 \%$ | $8 \%$ | $13 \%$ | $16 \%$ | $9 \%$ | $6 \%$ | $100 \%$ |
| Avg. len (cm) | - | - | 27.3 | 28.0 | 28.9 | 29.7 | 30.2 | 31.3 | 31.9 | 32.4 | 32.5 | 30.2 Avg. Len |
| Avg. wt. (g) | - | - | 147.3 | 159.4 | 177.4 | 194.6 | 206.6 | 230.9 | 248.0 | 258.1 | 262.5 | 206.6 Avg. wt |

Table 30. Monthly landings (t) from weirs located in New Brunswick for 1978-2010.

|  | MONTH |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| YEAR | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Year Total |
| 1978 | 3 |  |  |  | 512 | 802 | 5,499 | 10,275 | 10,877 | 4,972 | 528 | 132 | 33,599 |
| 1979 | 535 | 96 |  |  | 25 | 1,120 | 7,321 | 9,846 | 4,939 | 5,985 | 2,638 | 74 | 32,579 |
| 1980 |  |  |  |  | 36 | 119 | 1,755 | 5,572 | 2,352 | 1,016 | 216 |  | 11,066 |
| 1981 |  |  |  |  | 70 | 199 | 4,431 | 3,911 | 2,044 | 2,435 | 1,686 | 192 | 14,968 |
| 1982 |  | 17 |  |  | 132 | 30 | 2,871 | 7,311 | 7,681 | 3,204 | 849 | 87 | 22,181 |
| 1983 |  |  |  |  | 65 | 29 | 299 | 2,474 | 5,382 | 3,945 | 375 |  | 12,568 |
| 1984 |  |  |  |  | 6 | 3 | 230 | 2,344 | 2,581 | 3,045 | 145 |  | 8,353 |
| 1985 |  |  |  |  | 22 | 89 | 4,217 | 8,450 | 6,910 | 4,814 | 2,078 | 138 | 26,718 |
| 1986 | 43 |  |  |  | 17 |  | 2,480 | 10,114 | 5,997 | 6,233 | 2,564 | 67 | 27,516 |
| 1987 | 39 | 21 | 6 | 12 | 10 | 168 | 2,575 | 10,893 | 6,711 | 5,362 | 703 | 122 | 26,621 |
| 1988 |  | 12 | 1 | 90 | 657 | 287 | 5,993 | 11,975 | 8,375 | 8,457 | 2,343 | 43 | 38,235 |
| 1989 |  | 24 |  | 95 | 37 | 385 | 8,315 | 15,093 | 10,156 | 7,258 | 2,158 |  | 43,520 |
| 1990 |  |  |  |  | 93 | 20 | 4,915 | 14,664 | 12,207 | 7,741 | 168 |  | 39,808 |
| 1991 |  |  |  |  | 57 | 180 | 4,649 | 10,319 | 6,392 | 2,028 | 93 |  | 23,717 |
| 1992 |  |  |  | 15 | 50 | 774 | 5,477 | 10,989 | 9,597 | 4,395 | 684 |  | 31,981 |
| 1993 |  |  |  |  | 14 | 168 | 5,561 | 14,085 | 8,614 | 2,406 | 470 | 10 | 31,328 |
| 1994 |  |  |  | 18 |  | 55 | 4,529 | 10,592 | 3,805 | 1,589 | 30 |  | 20,618 |
| 1995 |  |  |  |  | 15 | 244 | 4,517 | 8,590 | 3,956 | 896 | 10 |  | 18,228 |
| 1996 |  |  |  |  | 19 | 676 | 4,819 | 7,767 | 1,917 | 518 | 65 |  | 15,781 |
| 1997 |  |  |  | 8 | 153 | 1,017 | 6,506 | 7,396 | 5,316 |  |  |  | 20,396 |
| 1998 |  |  |  |  | 560 | 713 | 3,832 | 8,295 | 5,604 | 525 |  |  | 19,529 |
| 1999 |  |  |  |  | 690 | 805 | 5,155 | 9,895 | 2,469 | 48 |  |  | 19,063 |
| 2000 |  |  |  |  | 10 | 7 | 2,105 | 7,533 | 4,940 | 1,713 | 69 |  | 16,376 |
| 2001 |  |  |  |  | 35 | 478 | 3,931 | 8,627 | 5,514 | 1,479 |  |  | 20,064 |
| 2002 |  |  |  |  | 84 | 20 | 1,099 | 6,446 | 2,878 | 1,260 | 20 |  | 11,807 |
| 2003 |  |  |  |  | 257 | 250 | 1,423 | 3,554 | 3,166 | 344 | 10 |  | 9,003 |
| 2004 |  |  |  |  | 21 | 336 | 2,694 | 8,354 | 8,298 | 913 | 3 |  | 20,620 |
| 2005 |  |  |  |  |  | 213 | 802 | 7,145 | 3,729 | 740 | 11 |  | 12,639 |
| 2006 |  |  |  |  | 8 | 43 | 1,112 | 3,731 | 3,832 | 2,328 | 125 | 462 | 11,641 |
| 2007 | 182 |  | 20 | 30 | 84 | 633 | 3,241 | 11,363 | 7,637 | 6,567 | 314 | 73 | 30,145 |
| 2008 |  |  |  |  |  | 81 | 1,502 | 2,479 | 1,507 | 389 | 49 | 32 | 6,041 |
| 2009 |  |  |  |  | 5 | 239 | 699 | 1,111 | 1,219 | 330 |  |  | 3,603 |
| 2010 |  |  |  | 6 | 64 | 1,912 | 2,560 | 3,903 | 1,933 | 247 | 46 |  | 10,671 |
| NB Average Catch (t) | 160 | 34 | 9 | 38 | 134 | 331 | 3,673 | 8,390 | 5,657 | 3,087 | 682 | 119 | 21,829 |
| NB Minimum Catch (t) | 3 | 12 | 1 | 6 | 5 | 3 | 230 | 1,111 | 1,219 | 48 | 3 | 10 | 3,603 |
| NB Maximum Catch (t) | 535 | 96 | 20 | 95 | 690 | 1,912 | 8,315 | 15,093 | 12,207 | 8,457 | 2,638 | 462 | 43,520 |

Table 31. Herring catch at age for the 2010 New Brunswick juvenile fisheries (weir and shutoff combined) with numbers caught (thousands), weight (t) and percent, average length and average weight by age.

|  | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11+ |
| :--- | :---: | :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Total |  |  |  |  |  |  |  |  |  |  |  |
| Numbers $(x 1,000)$ | 7 | 371,401 | 16,968 | 523 | 463 | 29 | 22 | 29 | 16 | 6 | 1 |
| $\%$ numbers | $0 \%$ | $95 \%$ | $4 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ |
| Catch wt. $(\mathrm{t})$ | 0 | 10,066 | 742 | 59 | 69 | 6 | 5 | 7 | 4 | $100 \%$ |  |
| $\%$ catch wt. | $0 \%$ | $92 \%$ | $7 \%$ | $1 \%$ | $1 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | $0 \%$ | 0 |
| Avg. len $(\mathrm{cm})$ | 16.5 | 16.2 | 18.5 | 25.0 | 27.2 | 29.3 | 30.1 | 30.8 | 30.9 | 31.0 | 31.5 |
| Avg. wt. $(\mathrm{g})$ | 27.9 | 27.1 | 43.7 | 113.0 | 148.6 | 192.7 | 209.4 | 228.2 | 231.0 | 234.4 | 253.0 |



Figure 1. Management units for herring in NAFO Divisions $4 V W X$ and $5 Y Z$ showing locations of known current (solid) and historical (open) spawning locations.


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


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


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


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


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


Figure 7. The 2009-2010 quota year herring purse seine catches (t) for NAFO Division 4X (from Statistics Division MARFIS database).


Figure 8. Herring purse seine catches as a proportion of overall landings for selected fishing grounds in the SWNS spawning component from 1985-2010.


Figure 9. Fall 2009 herring purse seine catches by month in NAFO Division 4X (part of 2009-2010 quota year).


Figure 10. 2010 herring purse seine catches by month in NAFO Divisions 4WX for calendar year 2010 (from Statistics Division MARFIS database).


Figure 11. Annual herring purse seine catches for the German Bank area from 1985-2010 with prespawning and spawning period catches based on an August 15 start date for the defined spawning period and overall German Bank catches as a proportion of the TAC.


Figure 12. Herring purse seine pre-spawning period catches (January 1 to August 14) for German Bank from 2005-2010 with catch totals for the overall catch area, the middle 'Spawn Box' and the inner 'Strata Box', which was used as the primary search area in acoustic surveys.


Figure 13. Herring purse seine spawning period catches (August 15 to October 31) for German Bank from 2005-2010 with catch totals for the overall catch area, the middle 'Spawn Box' and the inner 'Strata Box', which was used as the primary search area in acoustic surveys.


Figure 14. The 2000-2010 daily purse seine herring catches (t) [bars] for German Bank with the cumulative total catch [solid line] over the defined spawning season from August 15 to October 30 (note 2010 includes catch from August 1 to August 14).


Figure 15. Annual herring purse seine catches for the Scots Bay area from 1987-2010 with duration of fishery in days (start date to end date).


Figure 16. Herring purse seine catches for the Scots Bay area from 2005-2010 with catch totals for the overall area, the middle 'Spawning' area and the inner 'Strata' area, which is used as the primary search area in acoustic surveys.


Figure 17. The 2000-2010 Scots Bay daily purse seine herring catches (t) [bars] for Scots Bay with the cumulative total catch [solid line] over the entire fishing season.


Figure 18. The 2010 Trinity Ledge herring gillnet catches in the survey strata box and spawning area box areas.


Figure 19. Trinity Ledge herring catches and acoustic survey biomass estimates from 1999-2010. All acoustic estimates prior to 2003 were calculated without the Calibration Integration Factor (CIF).


Figure 20. Nova Scotia herring weir catches by location for the 2010 calendar year.


Figure 21. Purse seine catch (top panel), effort (middle panel) and catch per unit effort (CPUE; bottom) from 1989 to 2010 annual 4WX herring landings data for the SWNS/BoF spawning component.


Figure 22. SSB index from acoustic surveys for the SWNS/BoF spawning component for the German Bank and Scots Bay areas with 95\% confidence intervals (equivalent to two times standard error (SE)).


Figure 23. Herring spawning stock biomass from acoustic surveys for the combined SWNS/BoF spawning component with $95 \%$ confidence intervals (equivalent to two times SE).


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


Figure 25. 2010 herring sampling coverage by location from all sources (numbers of length frequency samples grouped by 10 mile squares).


Figure 26. Fishery catch at age by month (\% numbers and \% weight) from the 2010 SWNS/BoF summer purse seine fishery.


Figure 27. Fishery catch at age by ground (\% numbers and \% weight) from the 2010 SWNS/BoF summer purse seine fishery.


Figure 28. Fishery catch at age by gear component (\% numbers and \% weight) from the 2010 SWNS/BoF spawning component


Figure 29. Overall fishery catch at age (\% numbers and \% weight) from the 2010 SWNS/BoF spawning component.


Figure 30. Historical catch at age (bubble size for numbers) for the SWNS/BoF herring spawning component from 1965-2010. Several of the stronger year-classes are highlighted including the 1970, 1978, 1983, 1998, 2001 and 2005 year-classes.


Figure 31. Total landings (t) and total removals (millions) for the combined annual catch from the SWNS spawning component for 1965 to 2010.


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


Figure 33. Average weights at age (kg) for the SWNS/BoF component of the 4WX herring fishery (fishery weighted) for 1965-2010.


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


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


Figure 36. Scotian Shelf Banks herring landings from all gears for 1996-2010 with the overall average for the period.


Figure 37. 2010 herring purse seine on the offshore Scotian Shelf banks with embayment and offshore 25 and 50 mile lines shown.


Figure 38. Fishery catch at age (\% numbers and \% weight) for the 2010 offshore Scotian Shelf herring component.


Figure 39. Herring catches from the DFO summer bottom trawl research survey for 2001-2010. Mean numbers per standard tow and count of sets in Scots, Trinity and German spawning areas.


Figure 40. The 2000-2010 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 41. The 2010 herring gillnet catch locations for landings in statistical districts 23-31 with amount caught within the Little Hope Fishing Area.


Figure 42. Herring landings and acoustic survey biomass ('000t) for the Little Hope/Port Mouton gillnet fishery from 1997-2010.


Figure 43. Gillnet herring catches for the 2010 fall fishery along the Eastern Shore Fishing Area (catches by 1 mile squares).


Figure 44. Herring landings and acoustic survey biomass ('000t) for the Halifax/Eastern Shore gillnet fishery from 1997-2010.


Figure 46. Herring landings and acoustic survey biomass ('000t) for the Glace Bay gillnet fishery from 1997-2010.


Figure 46. Fishery catch at age (\% numbers and \% weight) for the 2010 Coastal Nova Scotia herring component.


Figure 47. New Brunswick herring weir catches by location for the 2010 fishing season.


Figure 48. Herring landings from the SWNB weir and shutoff fishery for 1963-2010 with the overall long term average.


Figure 49. Fishery catch at age (\% numbers and \% weight) for the 2010 SWNB migrant juvenile herring component.

## APPENDIX A: OBSERVER REPORTS FOR HERRING DIRECTED TRIPS FROM 2009-2010

2009 observer data:

- Fourteen trips, 28 sets monitored, purse seine gear only.
- Five trips in area 4W ('The Patch' area) in June and rest in 4X/5Y during July and September.
- By-catch of only small amounts of mackerel and dogfish; protocols checked for observers.

All Divisions JAN-DEC 2009-2009, total catch


| Catch Composition (Metric tonnes) |  |  |
| :--- | :---: | :---: |
| Species | Kept 2010 | Discarded 2010 |
| HERRING(ATLANTIC) | 981.545 | 0 |
| MACKEREL(ATLANTIC) | 0.01 | 0 |
| SPINY DOGFISH | 0 | 0.005 |

Figure A1. Species report for 2009 herring trips.

2010 observer data:

- Twenty-two trips, 43 sets monitored, purse seine gear only.
- Five trips in area 4W ('The Patch' area) in June and rest in $4 \mathrm{X} / 5 \mathrm{Y}$ during July to September.
- No by-catch with small amounts of several other species released; protocols checked for observers again; additional species appearing for one observer in particular.

All Divisions JAN-DEC 2010-2010, total catch


| Catch Composition (Metric tonnes) |  |  |  |
| :--- | :---: | :---: | :---: |
| Species | Kept 2010 | Discarded 2010 |  |
| HERRING(ATLANTIC) | 1518.31 | 0 |  |
| OCEAN SUNFISH | 0 | 2.81 |  |
| SEALS (NS) | 0 | 1.228 |  |
| SOOTY SHEARWATER | 0 | 0.099 |  |
| THRESHER SHARK | 0 | 0.09 |  |
| SHORT-FIN SQUID | 0 | 0.041 |  |
| STRIPED BASS | 0 | 0.025 |  |
| THORNY SKATE | 0 | 0.003 |  |
| CEPHALOPODA C. | 0 | 0.002 |  |

Figure A2. Species report for 2010 herring and mackerel trips combined.


[^0]:    * Survey SSB calculated with Calibration Integration Factor after 2003 inclusive

[^1]:    * 2009-2010 observer samples in observer database only
    ${ }^{\wedge}$ Dockside Monitoring Program for purse seine in the Bay of Fundy began in Aug. 2010

