



STOCK STATUS UPDATE OF 4VWX HERRING FOR THE 2021 FISHING SEASON

Context

Maritimes Fisheries and Oceans Canada (DFO) Resource Management has requested that DFO Science provide an update on the science advice for North Atlantic Fisheries Organization (NAFO) Divisions 4VWX Atlantic Herring¹ (*Clupea harengus*) management unit in support of the 2021 fishery. The last full assessment of the 4VWX Herring stock was conducted in March 2018 (DFO 2018), and the last update was conducted in May 2020 (DFO 2020). The biological and fishery information for the 4VWX Herring stock forms the basis for establishing harvest levels for the 2021 fishery, as required in the Integrated Fisheries Management Plan (IFMP). A review and update of biological and fishery information for the 4VWX Herring stock are provided in this Science Response.

This Science Response Report results from the Regional Science Response Process of April 7, 2021, on the Stock Status Update of Herring in Northwest Atlantic Fisheries Organization (NAFO) Fishing Area 4VWX.

Background

The 4VWX Herring management unit contains a number of spawning areas, separated to various degrees in space and time. For the purposes of evaluation and management, the 4VWX Herring fishery is divided into five components (see the Appendix for map of place names):

- Southwest Nova Scotia/ Bay of Fundy (SWNS/BoF) spawning component,
- Offshore Scotian Shelf spawning component,
- Coastal Nova Scotia (NS) spawning component,
- Southwest New Brunswick (SWNB) migrant juveniles (NB weirs), and
- Georges Bank spawning component.

Each component, except SWNB migrant juveniles, has several spawning areas, and there is mixing of fish among spawning components outside of the spawning period. The Total Allowable Catch (TAC) for the SWNS/BoF was 35,000 t in 2020. The Offshore Scotian Shelf has an allocation of 12,000 t (DFO 2018). In the absence of recent information, there is no basis for evaluating the offshore allocation. The coastal NS fishing areas have allocations based on the recent 5-year average of observed Spawning Stock Biomass (SSB²).

The 2020 Integrated Fisheries Management Plan for Atlantic Herring in the Maritimes Region set out principles, conditions, and management measures for the 4VWX Herring fisheries (DFO 2020). The main principle stated in the plan is “the conservation of the herring resource and the

¹ Throughout this document, 4VWX Atlantic Herring is referred to as 4VWX Herring.

² Throughout this document, Spawning Stock Biomass (SSB) refers to the spawning stock biomass observed at the time of the acoustic surveys.

preservation of all of its spawning components”. The three conservation objectives are: to maintain the reproductive capacity of Herring in each management unit, to prevent growth overfishing, and to maintain ecosystem integrity/ecological relationships (“ecosystem balance”). Progress against these conservation objectives was evaluated during the March 2018 assessment (DFO 2018). A review of the assessment framework was conducted in 2006/2007 (DFO 2007), followed by another framework meeting in 2011 to review assessment models. An analytical model was not chosen at that time; however, recommendations for the assessment methodology were provided (DFO 2011). In 2012, a Limit Reference Point (LRP) for the SWNS/BoF Herring spawning component (German Bank and Scots Bay) was defined as the 2005–2010 average acoustic survey biomass (371,067 t), below this point the risk of serious harm is unacceptable (Clark et al. 2012). At the 2018 assessment, revisions to the method for estimating acoustic SSB turnover on the Scots Bay and German Bank spawning grounds was presented and accepted. This revision resulted in revised SSB estimates over the entire time series, including the LRP of 316,316 t³ (DFO 2018). The total SSB in these two areas is estimated based on the 3-year moving average of acoustic biomass with respect to this LRP (DFO 2018).

Landings from the Herring fishery in 4VWX are dominated by purse seine (81–99%, 1981–2020). Other gear types include weir, gillnet, shutoff, and trap net.

Analysis and Response

Landings

The landings for the period January 1, 2020, to December 31, 2020, (the 2020 quota year) were 34,146 t against a TAC of 35,000 t for the SWNS/BoF component (Table 1). The quota year in previous fishing seasons were from October 15th of proceeding calendar year to October 14th of the current quota year. Landings are reported for the 4VWX SWNS/BoF area from October 14, 2018, to December 31, 2019.

Table 1. Reported landings (rounded to thousands of tonnes) and total allowable catch for the 4VWX Herring management unit by component from 2010 to 2020, with decadal averages from 1970 to 2019.

Year	Avg. 1970-79	Avg. 1980-89	Avg. 1990-99	Avg. 2000-09	Avg. 2010-19	2013	2014	2015	2016	2017	2018	2019	2020
4VWX SWNS/BoF													
TAC ¹	106	106	112	69	48	50	50	50	50	42.5	42.5	35	35
4VWX SWNS/BoF ¹	131	131	96	66	45	47	50	49	50	39	40	30	34
4VWX Coastal NS ²	<1	<1	4	7	7	4	5	5	8	8	10	13	18
Offshore Scotian Shelf ²	38	<0.1	13	6	4	2	<0.1	2	1	4	3	6	<0.1
SW New Brunswick ²	26	24	24	15	5	6	2	<0.2	4	2	12	5	4
Total Landings	172	155	137	93	60	58	57	56	63	53	65	53	56

¹ - Quota year from October 15th of the preceding year to October 14th, 2019. In 2020, quota year was changed to match calendar year (January 1st to December 31st). - 2019 landing values include (1,896 t) catches from October 15, 2018, to December 31, 2019, in SWNS/BoF

² - Calendar year from January 1st to December 31st

Additional landings of 21,747 t were taken in the non-quota stock components (outside the SWNS/BoF area) for a total of 55,893 t for all of 4VWX. Landings for SWNB weirs and shutoffs were lower in 2020 (3,817 t) compared to 2019 (5,055 t) (Table 1). Landings were lower for the Offshore Scotian Shelf and remained below the 12,000 t allocation. There has been a concerted

³ Due to calculation error, this value was revised to 317,846 t.

effort by the purse seine fleet to keep the percentage of the TAC caught in the German Bank fishing box below 40% since 2014.

Southwest Nova Scotia/Bay of Fundy

Age Structure

The sampling and reading of otoliths could not occur prior to the completion of this report due to COVID-19 restrictions; therefore, age-structure information will not be reported within this document.

Acoustic Surveys

The results of the 2020 acoustic surveys for the SWNS/BoF component are summarized in Table 2. Inbox and outbox refer to survey tracks within and outside the designated survey boxes, respectively. There were 9 surveys in Scots Bay, 6 on German Bank, 6 on Seal Island, 4 on Trinity Ledge, and 6 in the Spectacle Buoy area. Surveys on Trinity Ledge, Spectacle Buoy, and Seal Island are typically conducted a minimum of 10 days apart. If surveys are completed within 10 days of each other, the maximum biomass estimate value is taken, and a single survey value is used to report the total biomass estimate.

The overall stock area acoustic biomass estimates (Scots Bay, Trinity Ledge, Spectacle Buoy, and German Bank) decreased from 322,895 t (95% C.I.: +/- 17,243 t) estimated in 2019 to 321,558 t (95% C.I.: +/- 23,856 t). The overall acoustic biomass estimate (which includes Seal Island and Browns Bank) is 12% below the long-term average (1999–2020) of 367,898 t. Scots Bay acoustic biomass increased from 133,332 t (95% C.I.: +/- 8,481 t) in 2019 to 185,979 t (95% C.I.: +/- 19,605 t) in 2020. The 2020 German Bank biomass estimate (108,882 t, 95% C.I.: +/- 34,574 t) is 48% below the long-term average (1999–2019) and is the second lowest estimate on record. For a third year, surveys were completed on Seal Island, and a biomass of 3,998 t (95% C.I.: +/- 521 t) was estimated. The biomass on Trinity Ledge decreased from 19,528 t (95% C.I.: +/- 4,532 t) in 2019 to 13,794 t (95% C.I.: +/- 5,781 t) in 2020.

Maritimes Region

Table 2. Acoustic surveys spawning biomass index for Southwest Nova Scotia/Bay of Fundy spawning component average for 1999–2004 and biomass for 2006 to 2020 (rounded to thousands of tonnes).

Location	Avg. 1999-2004	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Avg. 2005-2010	Avg. 1999-2020
Scots Bay (inbox)	121	31	45	21	72	37	91	123	59	187	228	98	133	129	80	147	38	101
Scots Bay (outbox)	0	0	1	0	5	10	32	38	8	4	21	3	9	10	53	39	3	11
Scots Bay total	121	31	46	21	78	47	123	161	66	191	249	101	142	140	133	186	40	112
German Bank (inbox)	304	250	440	214	323	192	249	219	200	188	140	163	166	95	147	109	273	234
German Bank(outbox)	-	4	4	2	1	16	9	7	9	2	-	-	-	-	-	-	6	6
German Bank total	304	254	444	216	324	208	258	226	209	190	140	163	166	95	147	109	278	236
German + Scots	425	285	490	237	402	255	381	387	275	381	390	264	308	235	280	295	318	348
Trinity Ledge	9	16	3	1	2	2	7	3	1	5	1	1	14	7	20	14	6	7
Spec Buoy (spring)	1	-	-	-	-	2	0	-	-	-	-	-	-	-	-	-	1	1
Spec Buoy (fall)	88	-	-	-	-	-	-	-	-	-	-	-	9	10	23	13	-	24
Overall Stock Area	523	301	493	237	403	259	388	390	276	386	390	265	330	251	323	322	324	362
Seal Island	6	10	-	-	-	-	1	-	-	-	-	-	-	21	30	4	10	10
Browns Bank	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	26
Total All Areas	573	311	493	237	403	259	390	390	276	386	390	265	330	272	353	326	327	368
Overall SE (t)	19	17	29	21	22	8	20	8	15	20	14	9	13	13	8	11		
Overall SE (%)	5%	6%	7%	10%	6%	4%	6%	2%	6%	5%	4%	4%	5%	5%	2%	3%		

* Note: Average 2005-2010 = Limit Reference Point (German Bank and Scots Bay total only). Number for Scots Bay and German Bank are adjusted for turnover.
 - = no data for that year in that category
 Zero = surveys conducted but the numbers recorded were either 0 or less than 500 t (rounds to 0 thousand t)

In 2020, the relative exploitation rate for SWNS/BoF spawning component estimated from acoustic SSB and landings was 11%, compared to a long-term average (1999–2020) of 16% and is the lowest exploitation rate in the past five years (11–19%).

Stock Status

The annual acoustic survey SSB estimates for the past five years have been below the LRP. The acoustic survey estimate for Scots Bay and German Bank increased from 280,470 t in 2019 to 294,861 t in 2020. The 3-year moving average (arithmetic mean) decreased from 274,250 t in 2019 to 269,950 t in 2020, and it remains below the LRP, in the Critical zone (Figure 1). The DFO Precautionary Approach strategy (DFO 2006) states that when a stock is in the Critical zone, productivity is sufficiently impaired to cause serious harm.

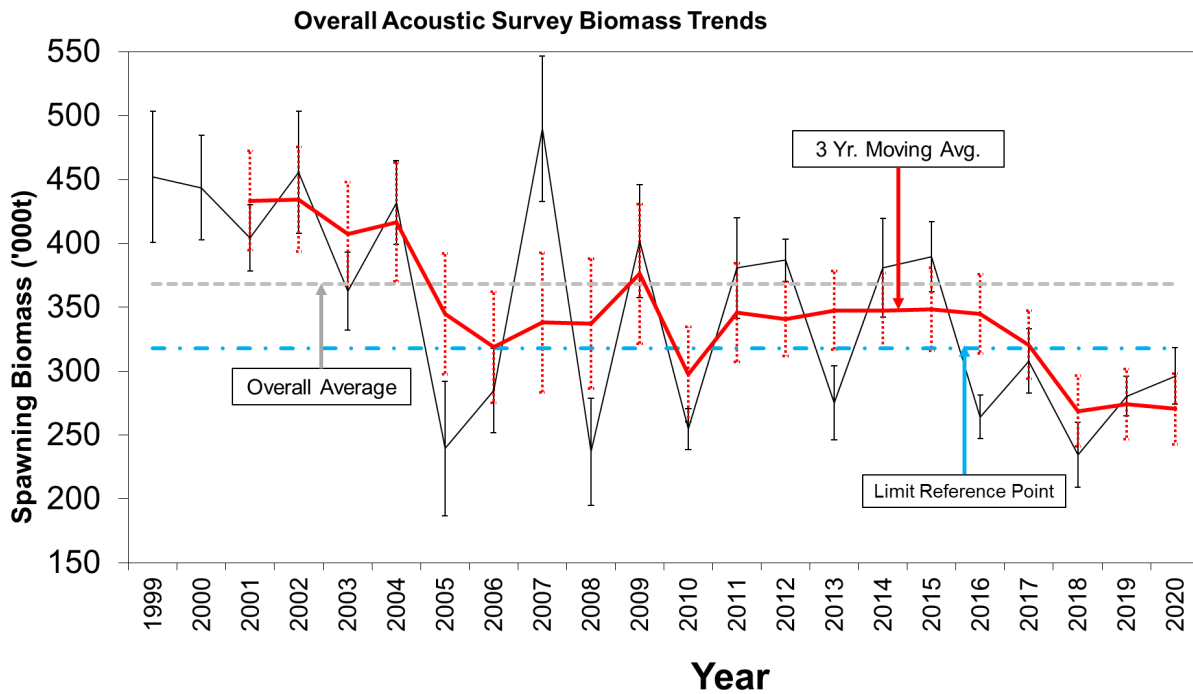


Figure 1. Spawning stock biomass (in thousands of metric tons) index (with 95% confidence intervals), the calculated 3-year moving average, the overall average since 1999, and the Limit Reference Point for the Southwest Nova Scotia/Bay of Fundy spawning component (German Bank and Scots Bay).

Offshore Scotian Shelf Component

Offshore landings decreased from 6,896 t in 2019 to 37 t in 2020 (Table 1). These landings are negligible compared to the allocation limit of 12,000 t.

Coastal Nova Scotia Spawning Component

Due to the large variation in annual SSB indices for coastal stocks, allocations for the coastal NS spawning component are based on the recent 5-year average of the observed acoustic SSB. Furthermore, due to restrictions caused by the COVID-19 pandemic, samples from the coastal gillnet surveys that provide estimates of the target strength of Herring were unable to be collected. Instead, a standard target strength is applied (DFO 2018), and, once samples are processed, SSB estimates for the coastal Little Hope/Port Mouton and Halifax/Eastern Shore areas will be updated. Landings in the Little Hope/Port Mouton area increased from 9,757 t (2019) to 10,630 t (2020) against the 2020 allocation of 10,676 t (Table 3). In the Halifax/Eastern Shore area, landings increased from 6,871 t (2019) to 6,862 t (2020) against an allocation of 7,303 t. In Glace Bay, landings of 2 t were reported in 2020. The Bras d’Or Lakes area remained closed to Herring fishing.

In 2020, the SSB for the Little Hope/Port Mouton area decreased to 42,271 t from 92,019 t in 2019 and is below the recent 5-year average of 86,315 t (Table 4).

In 2020, the SSB for the Halifax/Eastern Shore area decreased to 35,835 t from 141,198 t in 2019 and is below the recent 5-year average of 66,488 t (Table 4). As in previous years, caution is warranted in applying the survey SSB as an absolute tonnage of Herring in the water.

Since 2013, no survey has been completed in Glace Bay.

Maritimes Region

Table 3. Recorded landings and allocations (tonnes) of Herring from major gillnet fisheries on the Coastal Nova Scotia spawning component average for 1998 to 2010 and biomass for 2011–2020.

Landings and Allocations (t)		Avg.										
		98-10	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Little Hope/Port	Catch	2,588	2,576	2,150	2,499	3,596	4,160	5,943	5,557	7,353	8,707	10,630
Mouton	Allocation	2,549	2,094	2,188	2,387	3,577	3,772	6,151	6,803	7,884	9,757	10,676
Halifax/Eastern	Catch	2,867	908	771	1,390	1,163	1,001	1,837	2,259	2,553	4,544	6,871
Shore	Allocation	3,323	4,188	2,920	2,427	2,240	1,066	1,884	2,856	3,960	4,671	7,303
Glace Bay	Catch	9,26	0	7	2	1	0	4	0	9	1	2
Bras d'Or Lakes	Catch	16	0	0	0	0	0	0	0	0	0	0

Table 4. Estimated Herring acoustic spawning stock biomass (SSB) (tonnes) average for 1998-2010, biomass for 2011 to 2020, and recent 5-year average for the Coastal Nova Scotia spawning component areas.

Acoustic Survey SSB (t)	Avg.											
	98-10	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	last 5 years
Little Hope/Port Mouton (SSB)	25,954	28,796	12,756	73,992	46,077	145,395	61,408	66,815	168,164	92,019	42,671	86,215
Allocation	2,549	2,094	2,188	2,387	3,577	3,772	6,151	6,803	7,884	9,757	10,676	8,254
Halifax/Eastern Shore (SSB)	35,765	5,498	3,668	6,870	9,586	68,562	54,312	58,681	42,416	141,198	35,835	66,488
Allocation	3,323	4,188	2,920	2,427	2,240	1,066	1,884	2,856	3,960	4,671	7,303	4,135
Glace Bay	7380	8	51	-	50	-	-	-	-	-	-	-
Bras d'Or Lakes	300	-	-	-	-	-	-	-	-	-	-	-

"-" = no survey

Southwest New Brunswick Migrant Juveniles

Landings from the New Brunswick weir and shutoff fishery were 3,817 t in 2020, which is lower than the 5,055 t landed in 2019. The degree to which this reflects abundance is unknown.

Conclusions

Southwest Nova Scotia/Bay of Fundy Spawning Component

The overall acoustic SSB estimate for the SWNS/BoF spawning component remained similar in 2020 relative to 2019. Although there is uncertainty associated with the annual acoustic biomass estimates (DFO 2015), longer-term trends in biomass are evident. The SSB index (German Bank and Scots Bay) 3-year moving average remains below the LRP, in the Critical zone. German Bank SSB has decreased since 2007 and Scots Bay SSB has increased since 2005. These trends indicate that continued caution is warranted. The SSB for Trinity Ledge decreased since 2019, but it remains at levels observed in recent years.

Age-structured data were not available for the publication of this stock status update due to restrictions in activity caused by the COVID-19 pandemic. Therefore, there is uncertainty in the age composition of the catch. Otolith samples were collected from the fishery, and when processed, the age-structured data will be reviewed and documented.

The precautionary approach requires that exploitation be kept at the lowest possible level until the stock is out of the Critical zone. Harvest rate must be kept to an absolute minimum to promote stock growth and contribute to rebuilding the stock above the Critical zone.

A summary of the observations and conclusions for each of the corresponding objectives in the IFMP are presented in Table 5. Table 6 summarizes the conclusions on the short-term rebuilding plan objectives for SW Nova Scotia/Bay of Fundy spawning component in 2020.

Table 5. Observations and conclusions on conservation objective elements from the management plan for SW Nova Scotia/Bay of Fundy spawning component in 2020.

Objectives in Management Plan	2020: Observations and Conclusions
Persistence of all spawning components	Fish were captured in spawning condition in Scots Bay and on German Bank. There was a decrease in spawning biomass on Trinity Ledge, Spectacle Buoy area, and the Seal Island area.
Maintain biomass of each component	The 2020 acoustic survey SSB estimates remains below historical values. However, there is an increasing trend in Scots Bay since 2005 but a decreasing trend on German Bank since 2007. In 2018, German Bank biomass decreased to a historical low; 2020 was the second lowest estimate on record. The biomass for Trinity Ledge has decreased since 2019 but is similar to values observed in 2017. The biomass for Spectacle Buoy has decreased since 2019, but it is greater than the biomass estimate observed in 2017-2018.
Maintain broad age composition	There were no data available to determine age composition currently.
Maintain long spawning period	The start of spawning in 2020 was the same as previous years for Scots Bay (June to end of September), and German Bank (mid-August to end of October) was about the same as in the past few years based on survey and sampling. Fish were captured in spawning condition in Trinity Ledge and Spectacle Buoy early August to mid-September and early August to mid-September.
Fishing mortality at or below $F_{0.1}$	Fishing mortality rate could not be estimated. The relative exploitation rate of 11% based on acoustic SSB and landings was below the long-term average of 16%.
Maintain spatial and temporal diversity of spawning	Fish in spawning condition were captured in Trinity Ledge, Spectacle Buoy, Seal Island, German Bank, and Scots Bay. Spatially, spawning in the German Bank area and Scots Bay area were similarly distributed to previous years. In 2020, duration of spawning in Scots Bay and German Bank was similar to previous years.
Maintain biomass at moderate to high levels	The overall acoustic biomass estimates remained at 12% below the long-term average (1999–2020). The SSB increased in Scots Bay and decreased for German Bank in 2020. The 2020 German Bank SSB is the second lowest estimate in the time series and is part of a decreasing trend since 2007.
Maintain 3-year moving average above the Limit Reference Point	The 3-year moving average for SSB (Scots Bay and German Bank, combined) remains below the LRP, in the Critical zone. The precautionary approach requires that exploitation be kept at the lowest possible level until the stock is out of the Critical zone. Harvest rate must be kept to an absolute minimum to promote stock growth and contribute to rebuilding the stock above the Critical zone.

Table 6. Observations and conclusions on short-term rebuilding plan objectives for SW Nova Scotia / Bay of Fundy spawning component in 2020.

Short term Rebuilding Plan Objectives	2020: Observations and Conclusions
Rebuild the Herring resource to an interim target of the 2001–2004 SSB level	Not being met. Stock remains below the LRP.
Have a statistically significant positive trajectory in the reference point indicator;	Not being met.
Limit small fish removals to increase productivity of the resource	There were no data available to determine age composition currently.
Maintain spatial and temporal objectives related to spawning grounds	This objective is mostly being met. Fish in spawning condition were captured in Trinity Ledge, Spectacle Buoy, Seal Island, German Bank, and Scots Bay. Where data are available, there is maintenance of temporal spawning for the major spawning ground.

Maritimes Region

Short term Rebuilding Plan Objectives	2020: Observations and Conclusions
Maintain biomass of each component	The combined German Bank and Scots Bay SSB estimate was similar to the 2019 estimate. However, there continues to be an increasing trend in Scots Bay since 2005 and a decreasing trend on German Bank since 2007.

Offshore Scotian Shelf Spawning Component

There was a decrease in the landings from the offshore banks from 5,896 t in 2019 to 37 t in 2020, well below the allocation limit of 12,000 t. The decrease in catch reflects the absence of fishing activity and not fishery status. In the absence of information about stock status, there is no basis for evaluating the current catch allocation of 12,000 t (DFO 2018). Structured acoustic surveys are needed to obtain data on the stock in the offshore area.

Coastal Nova Scotia (South Shore, Eastern Shore, and Cape Breton) Spawning Component

Overall, the 5-year moving averages decreased for Halifax/Eastern Shore (106,760 t to 86,215 t) and Little Hope/Port Mouton (73,034 t to 66,488 t) from 2019 to 2020. The SSB for the Eastern Shore area decreased to 35,835 t, which is similar to 2017 and 2018 estimates. There was a decrease in the biomass estimated for the Little Hope/Port Mouton area to 43,671 t, which is the lowest value since 2012. There have been no research or acoustic surveys completed in the Bras d’Or Lakes since 2000. Anecdotally and through direct reporting, catches have increased outside of the allocation boxes or fishing seasons. To date, there has been no work to determine the implications of these landings on the coastal component fishery status.

Southwest New Brunswick Migrant Juveniles

The landings in the weir and shut-off fishery decreased to 3,817 t. The degree to which this reflects abundance is unknown.

Contributors

Name	Affiliation
Allan Debertin (Lead)	DFO Science, Maritimes Region
Claire Mussels	DFO Science, Maritimes Region
Tim Barrett	DFO Science, Maritimes Region
François Turcotte	DFO Science, Gulf Region
Rod Bradford	DFO Science, Maritimes Region
Christa Waters	DFO Fisheries Management, Maritimes Region
Lottie Bennett	DFO Science, Maritimes Region

Approved by

Alain Vézina
Regional Director of Science
DFO Maritimes Region
Dartmouth, Nova Scotia
Ph. 902-426-3490

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Sources of Information

- Clark, D.S., Clark, K.J., Claytor, R., Leslie, S., Melvin, G.D., Porter, J.M., Power, M.J., Stone, H.H., Waters, C. 2012. [Limit Reference Point for Southwest Nova Scotia / Bay of Fundy Spawning Component of Atlantic Herring, \(*Clupea harengus*\) \(German Bank and Scots Bay\)](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2012/025. iii + 14 p.
- DFO. 2006. [A Harvest Strategy Compliant with the Precautionary Approach](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2006/023.
- DFO. 2007. [Proceedings of the Maritimes Provinces Regional Advisory Process on the Assessment Framework for 4VWX Herring Stocks: 31 October–1 November 2006 and 9–11 January 2007](#). DFO Can. Sci. Advis. Sec. Proceed. Ser. 2007/002.
- DFO. 2011. [Proceedings of the Maritimes Provinces Regional Advisory Process on the Assessment Framework for Southwest Nova Scotia/Bay of Fundy Herring: 24–28 January 2011](#). DFO Can. Sci. Advis. Sec. Proceed. Ser. 2011/031.
- DFO. 2015. [2015 Assessment of 4VWX Herring](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2015/040.
- DFO. 2018. [2018 Assessment of 4VWX Herring](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2018/052.
- DFO. 2020. [Stock Status Update of 4VWX Herring for the 2019/2020 Fishing Season](#). DFO Can. Sci. Advis. Sec. Sci. Resp. 2020/050.
- DFO. 2020. [Integrated Fisheries Management Plan, Atlantic herring in the Maritimes Region](#). Fisheries and Oceans Canada.

Appendix

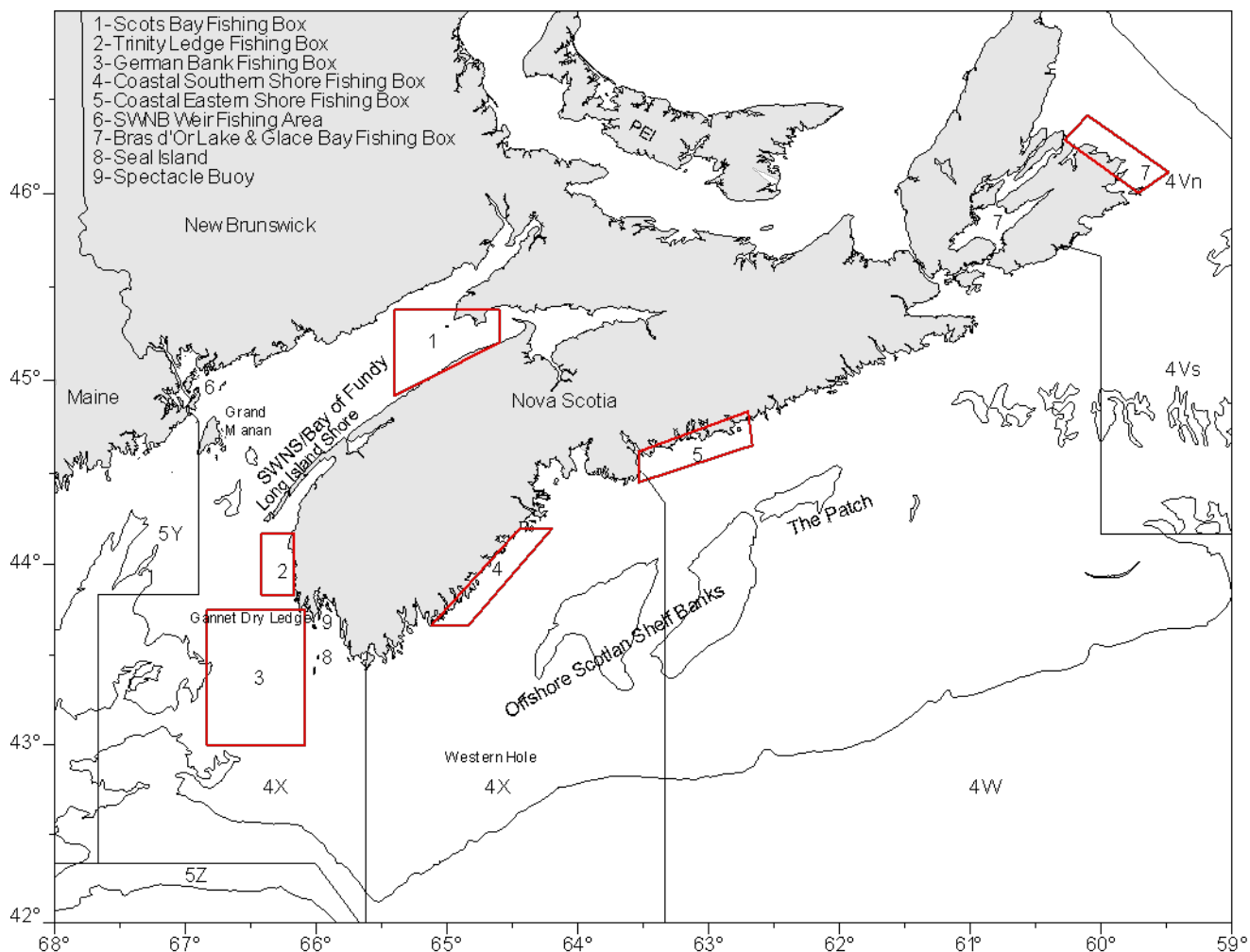


Figure A1. Place names and fishing locations for Southwest Nova Scotia/Bay of Fundy, coastal NS (South Shore, Eastern Shore, Cape Breton), Offshore Scotian Shelf, and SWNB weirs. The vertical line between the two 4X labels indicates the outer boundary of the SWNS/BoF stock component. The southwest corner of the map labelled 5Z indicates the Georges Bank spawning component boundary.

This Report is Available from the:

Center for Science Advice (CSA)
Maritimes Region
Fisheries and Oceans Canada
Bedford Institute of Oceanography
1 Challenger Drive, PO Box 1006
Dartmouth, Nova Scotia B2Y 4A2

Telephone: 902-426-7070

E-Mail: MaritimesRAP.XMAR@dfo-mpo.gc.ca

Internet address: www.dfo-mpo.gc.ca/csas-sccs/

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