New England Fishery Management Council
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MEMORANDUM

DATE: October 21, 2026

TO: Scientific and Statistical Committee (SSC)

CC: Groundfish Committee

FROM: Groundfish Plan Development Team

SUBJECT: Possible overfishing limits (OFLs) and acceptable biological catches (ABCs) for Atlantic halibut for fishing years (FY) 2027 through 2031, including exploration of sources of best available science and alternative catch setting options

The Groundfish Plan Development Team (PDT) met by webinar on September 10, 2026, September 28, 2026, and October 8, 2026, to discuss possible OFLs and ABCs for Atlantic halibut for FY 2027-2031, including exploration of sources of best available science and possible alternative catch setting options. The PDT worked with Maine Department of Marine Resources (MEDMR) staff to prepare a review of sources of best scientific information available.

This memorandum includes several appendices:
Appendix I - Detailed summary of past U.S. assessments and related reports
Appendix II - White paper on Atlantic halibut connectivity between the U.S. and Canada, including recent studies on tagging, migration, and genetics
Appendix III - History of Maine state waters halibut fishery management

Overview

In June 2026, the Council initiated Framework Adjustment 74 to set groundfish specifications and included in the scope to "set FY2027-FY2031 specifications for Atlantic halibut, exploring sources of best available science to support catch setting methods." The Groundfish Committee later tasked the PDT with the following:

> *Task the PDT to review sources of best available science for Atlantic halibut and develop alternative methods for setting halibut catch advice, working with DMR staff who have expertise in halibut tagging data, halibut biology, and associated state regulations.*

This was in response to concerns raised and recognition that misalignment and inconsistencies between Canadian and U.S. assessments and management for Atlantic halibut have become

problematic. While the U.S. assessment has resulted in relatively stable total ABCs, the proportion set aside to account for expected Canadian catch that occurs within the U.S. assessment area has increased to the point that there is insufficient quota for the U.S. fishery. Stock structure is a major uncertainty with the current data-limited assessment approach, and together with increasing Canadian landings, is leading to management challenges with resulting catch advice in recent years.

In the U.S., Atlantic halibut is managed as a non-directed fishery (unallocated to sectors with a one-fish per trip possession limit for all permit types) in federal waters. Coordination between the federal fishery and a small state waters directed fishery in the state of Maine has also occurred with the implementation of an output control management system for the state fishery. A U.S. analytical stock assessment does not exist, and the stock is still officially considered overfished based on the outdated assessment. The low catch rates in bottom trawl surveys result in a data-poor assessment. The current assessment method for generating catch advice is based on a simple empirical approach using survey indices and federal commercial fishery trends. Total catch in the assessment includes Canadian landings (from NAFO areas 5Y and 5Z) and assumes Canadian discards are minimal.

The Department of Fisheries and Oceans Canada (DFO) assessment does not consider U.S. catch from U.S. waters, but does include Canadian catch on the northeast peak of Georges Bank as well as foreign landings in the 3NOPs areas (south of Newfoundland). A Canadian halibut longline survey and a subsequent analytical model was developed by DFO. The longline survey and DFO analytical model suggest improvements in stock biomass from 2008 to 2020. Canadian catch advice increased through 2019, and has remained stable since then. Additionally, directed longline halibut landings increased on the northeast peak of Georges Bank in 2020 and have remained high.

There has been increasing scientific evidence suggesting that halibut movement rates are not confined to the U.S. stock area assumed in the U.S. stock assessment (Georges Bank and Gulf of Maine). The biology suggests greater movement of adult halibut than previously known. The only documented spawning of an adult Gulf of Maine halibut occurred off the shelf in Canadian waters. However, the state of Maine inshore surveys suggest there may be some recruitment occurring in U.S. waters from the capture of small halibut (~10 cm) inshore. Halibut in U.S. waters are likely a small component of a much larger stock complex that extends north into Canadian waters and perhaps further north into international waters on the Grand Banks. U.S. catches of halibut are a small fraction of the much larger Canadian assessment, and U.S. catch advice is less than 1 percent of the Canadian catch advice. A transboundary assessment is not likely to occur in the foreseeable future due to resource constraints.

In light of this, the PDT developed an interim approach for setting a U.S. ABC that better reflects the current understanding of the Atlantic halibut stock and incorporates the best scientific information available, including information from the Canadian assessment. The PDT recommends setting a U.S. ABC equal to the maximum U.S. catch of the recent time series (calendar years 2018-2025). This is not expected to be detrimental to halibut in U.S. waters, given the evidence of biomass increases in the larger halibut stock complex from the Canadian longline survey and stock assessment, and evidence of higher transboundary movement rates

than previously known. Continuation of the non-directed federal fishery and maintaining the small state waters fishery to constrain effort and targeting of halibut may be the best course of action until a formal opportunity emerges for evaluating stock definition and recognizing the change in stock biomass in U.S. waters.

In the longer term, the Council plans to consider whether certain stocks in the Northeast Multispecies FMP are suitable candidates for alternative management, such as ecosystem components. Atlantic halibut, especially when considered as the larger trans-boundary stock complex, could be one of the stocks included in this consideration.

Review of Sources of Best Available Science

Information Reviewed

Information reviewed included: past US assessments from 2015-2024; the 2026 data update; Canadian stock assessment information; published studies on Atlantic halibut tagging, migration, and genetics; information on connectivity between Atlantic halibut in U.S. and Canadian waters; additional U.S. survey information; fishery catch information; and socioeconomic information.

1. U.S. Assessment History and Main Uncertainties

The PDT summarizes key points from past assessments and the main uncertainties with the current assessment approach. For additional information on all past assessments since 2015, see Appendix I.

2015 Assessment

The benchmark model from 2008 was updated in 2012 and again in 2015. At the 2015 Groundfish Operational Updates, the Peer Review Panel concluded that the Atlantic halibut model was not acceptable as a scientific basis for catch advice, and that stock status and catch advice should be based on an alternative approach. The panel concluded for Atlantic halibut that overfishing status was unknown, but based on the long-term exploitation history and survey trends, the stock was still overfished. The panel recommended a new benchmark assessment to determine stock identity, to develop a new stock assessment model, and to reconsider the overfishing definition. The panel further recommended that all information on stock identity should be considered, and new information should be collected if necessary. The panel suggested developing a transboundary assessment if the U.S. resource is a portion of the larger northwest Atlantic resource but recommended a data-limited assessment if the U.S. resource is a self-sustaining stock.

2017 "Plan B" Alternative Assessment Approach

In 2017, the Council contracted Dr. Paul Rago to develop an alternative "Plan B" assessment approach to allow for the development of catch advice for the current specification-setting period in the absence of an approved benchmark assessment. Dr. Rago proposed a method that uses catch, discards, and survey information to develop catch advice: the First and Second Derivative

(FSD) method. An ad hoc subcommittee of the SSC reviewed the 2017 Halibut Assessment Report and concluded that the FSD approach was the best scientific information available with which to base catch advice for the U.S. stock of Atlantic halibut, and that the FSD approach is scientifically valid as a basis for catch advice (i.e., to determine an ABC, but not to set an OFL). Performance of the FSD method for setting catch limits was tested by simulation on known data and by comparison with two other halibut stocks with age-structured assessments. The peer review panel recommended that future halibut assessments evaluate the available relative abundance indices more systematically, recognizing the limitations within the "Plan B" approach. The panel provided research recommendations for a future assessment, including the subject of stock structure and investigating the stock identity of the U.S. stock with respect to the Canadian Atlantic halibut stock. The SSC again raised concerns about the stock definition and recommended investigating halibut stock structure and distribution to improve the management of this species.

2019 and 2020 Assessments

The 2019 and 2020 assessments were both updates to the empirical FSD assessment approach with minimal changes other than adding new years of information.

2022 Management Track Assessment

The 2022 Management Track Assessment was an update to the empirical FSD assessment and underwent a Level 2 peer review. Uncertainties included missing 2020 surveys (including the imputation of missing values), in addition to uncertainties carried forward from previous assessments: data limited assessment, stock structure, lack of biological reference points (BRPs), low catchability in NEFSC surveys, and uncertainty associated with time lags in using the catch advice from the FSD method for the out years. Additionally, the large increase in Canadian catch estimates in 2020 and 2021 was an additional source of uncertainty and a focus of discussion. The 2022 Peer Review Panel raised a primary concern with this assessment regarding the intersection of the US fishery and stock with the Canadian fishery and stock, and the question of stock identity. The Panel concluded the stock status should be considered unknown, given that there is no accepted previous assessment to provide stock status and that the "Plan B" approach does not generate BRPs. The SSC highlighted the uncertainty with the increased Canadian landings and impacts on U.S. ABC catch advice. The SSC again recommended a better understanding of the Atlantic halibut stock structure and possible population connectivity in the U.S. and Canadian waters (specifically Eastern Georges Bank).

2024 Management Track Assessment

The 2024 Management Track Assessment was an update to the empirical FSD approach. The 2024 assessment considered treatment of zero values in the fall bottom trawl survey index for 2018 and 2019 and recommended continued treatment as missing values. The assessment also explored the impact of including Canadian discards, which are not included in the assessment. There appears to be little impact on U.S. quotas from including Canadian discards. The SSC discussed key data needs to better inform the assessment and to move towards an analytical model that couldn't quantify BRPs and make forward projections. Key data needs include: 1)

additional length and age data, 2) a better understanding of connectivity between the Canadian and US populations, 3) estimates of Canadian discards, and 4) consideration of additional survey indices.

Main Uncertainties with, and Assumptions in, the Current Assessment Method

The main uncertainties with, and assumptions in, the empirical FSD assessment method include:

- Assessment is based on a simple empirical approach.
- Time lags with using the catch advice in subsequent years, inherent with an approach that uses a change in trend, as it can take a few years to adjust the catch advice as the population abundance changes either up or down.
- Low catchability in surveys and offshore trawl fisheries.
- Potential that the fall NMFS bottom trawl survey is not sampling during times of migration of halibut between U.S. and Canadian waters.
- Uncertainty with stock structure – the FSD assessment may be measuring changes in availability in one portion of a much larger stock rather than stock abundance.

Stock Status and Rebuilding Plan

Stock status is unknown as the assessment method cannot determine BRPs. The NOAA official stock status is that the stock is overfished, and overfishing is unknown. The stock is in a rebuilding plan with an end date of 2055, but rebuilding progress cannot be evaluated. Due to an absence of data and BRPs to make an updated determination, the overfished status has been maintained based on the last accepted assessment in 2012, and the recommendations of the 2015 peer review panel, when the model was rejected. The stock was considered to be experiencing overfishing as well, until 2022, when NMFS used the guidance for changing from known to unknown status, on the basis of the amount of time since the last accepted assessment. The rebuilding plan was established in Amendment 16, but without BRPs, it is not possible to determine whether adequate progress is being made.

2. Stock Structure/Connectivity

Tagging/Migration studies

Over the past 20 years, Atlantic halibut have been tagged within the Gulf of Maine with a mixture of tags: conventional (plastic coated wire tags), data storage tags (DSTs), and pop-up satellite archival tags (PSATs). MEDMR and other organizations (e.g., University of Massachusetts School for Marine Science & Technology, University of New England, and University of Maine) have tagged numerous halibut in the region. Many of these fish are recaptured close to release locations. However, halibut have been recorded dispersing over long distances between the Gulf of Maine and the Laurentian Channel and completing migration cycles. In reviewing primary literature and MEDMR files, tagging data suggests connectivity between the Atlantic Halibut in Maine waters and Canadian waters of the Scotian Shelf and Southern Grand Banks region.

Appendix II elaborates on tagging studies from the Gulf of Maine. Of note is that very few halibut tagged in the Gulf of Maine travel to the Gulf of St. Lawrence. This aligns with data from the Department of Fisheries and Oceans Canada (DFO) which considers the Gulf of St. Lawrence and the Scotian Shelf separate Atlantic halibut stock areas based on tagging and genetics. Shackell, et. al. (2022) summarized tagging studies in the north Atlantic in a single map demonstrating the two stock areas and fish from the western breeding grounds migrating between US and Canadian waters (figure 1). Furthermore, Shackell, et. al. (2026) analysis covered US and Canadian waters (Figure 2) and concluded a single stock with fish in Canadian waters accounting for 94% of the overall stock.

Figure 1- Summary of conventional and electronic archival tagging studies on Atlantic halibut in the Northwest Atlantic. Source: Shackell, et. al. (2022)

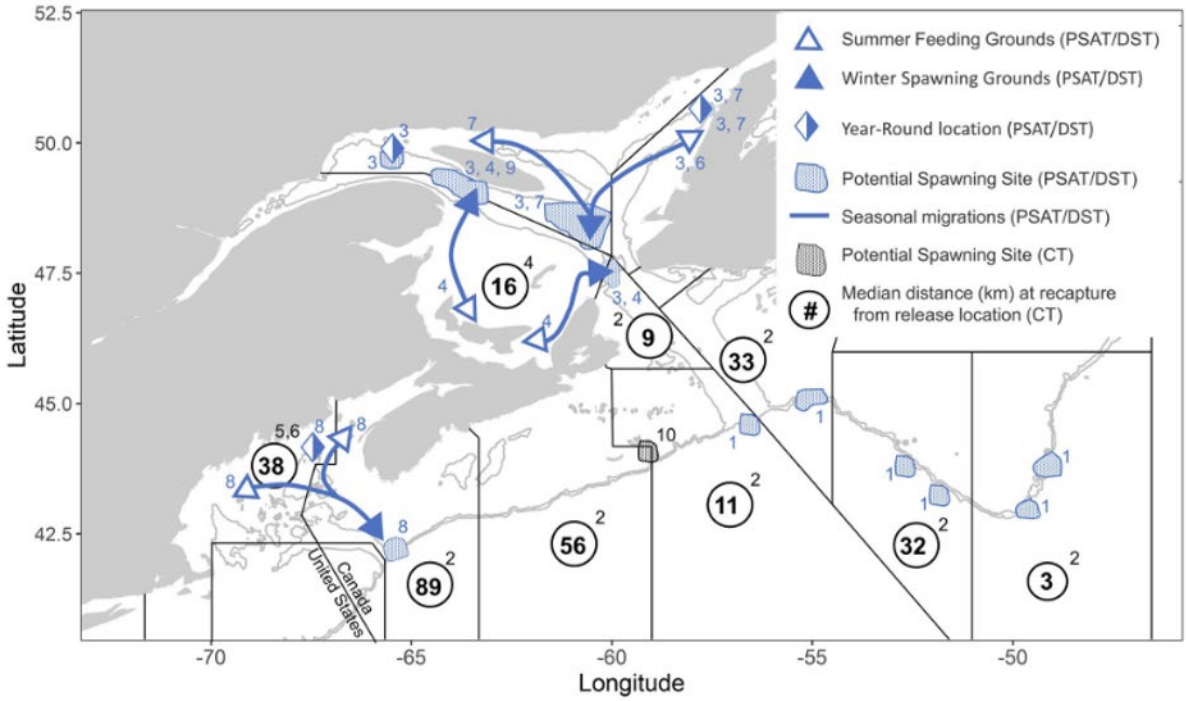


Figure 6. Summary of conventional and electronic archival tagging studies on Atlantic halibut in the Northwest Atlantic. PSAT: pop-up satellite archival tags; DST: data storage tags; CT: conventional tagging. Sources: 1. Armsworthy et al. (2014); 2. den Heyer et al. (2013); 3. Gatti et al. (2020); 4. James et al. (2020); 5. Kanwit (2007); 6. Kersula and Seitz (2019); 7. Le Bris et al. (2018); 8. Liu et al. (2019); 9. McCracken (1958); 10. Stobo et al. (1988).

Figure 2- Atlantic halibut stock area. Source: Shackell, et. al. (2026)

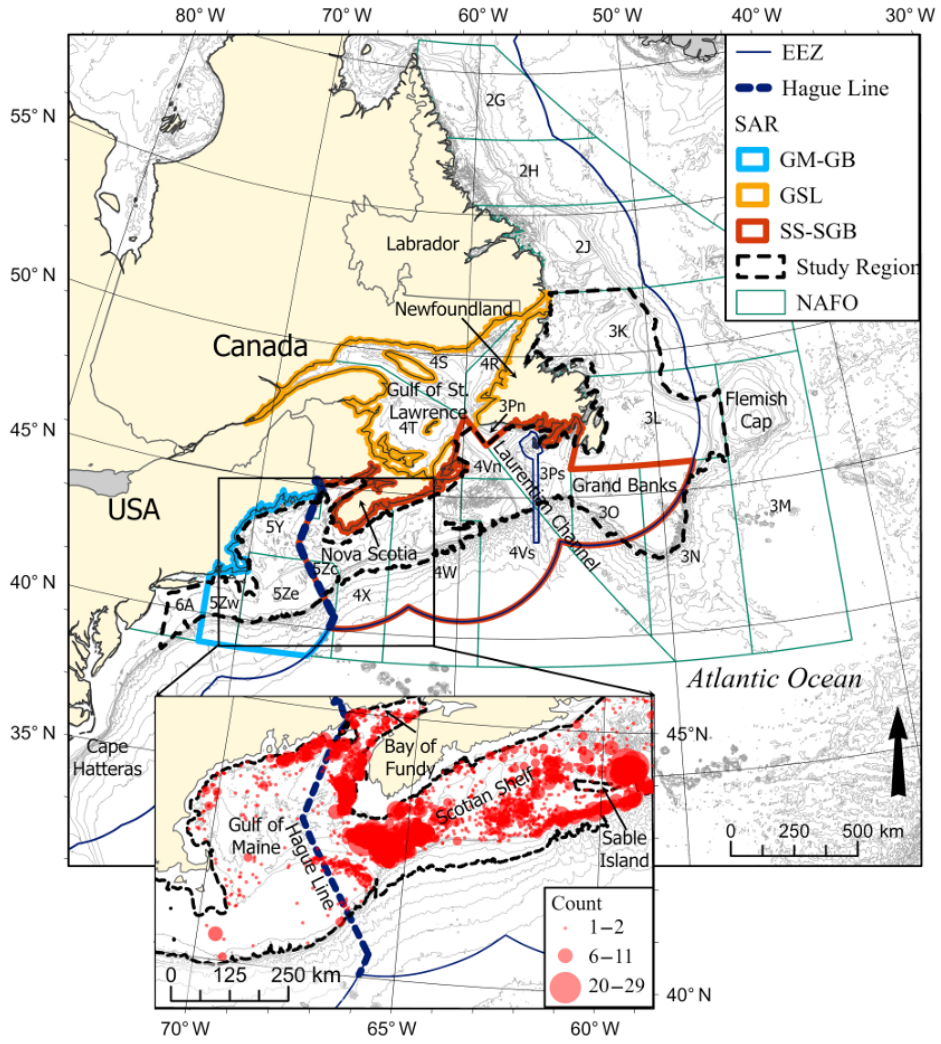


FIGURE 1 Northwest Atlantic Ocean. The study region (dashed black line) for this analysis represents the range of Atlantic halibut (*Hippoglossus hippoglossus*) in the United States (NOAA NEFSC) and Canada (DFO Maritimes and Newfoundland) covered by research vessel (RV) surveys. Atlantic halibut in the northwest Atlantic are managed in three Stock Assessment Regions (SAR): the Gulf of Maine and Georges Banks (GM-GB, blue), the Scotian Shelf and Southern Grand Banks (SS-SGB, red), and the Gulf of Saint Lawrence (GSL, yellow). The inset map shows the distribution of RV survey abundance counts (1990–2023) across the Hague line (dashed navy), which represents the border between US and Canadian waters. The Exclusive Economic Zone (EEZ, solid navy) demarcates waters where coastal states hold sovereign rights over natural resources, and Northwest Atlantic Fisheries Organization (NAFO) divisions (solid green) are the standardized geographic management areas. Depth contours are at every 100 m up to 500 m and then every 500 m up to 5000 m.

Genetic studies

Recent genomic evidence suggests two genomic stocks in the western north Atlantic: one stock across the U.S. and Canadian continental shelf and another distinct stock in the Gulf of St. Lawrence (Kess, et. al., 2021). There are no detectable genetic differences between Scotian Shelf-Grand Banks, Gulf of Maine, and Georges Bank halibut. Demographic reconstructions suggest divergence and expansion coinciding with the Mid-Holocene Warm Period and the Last Glacial Maximum (Kess, et. al., 2021). Moreover, forces beyond drift have driven the contemporary population structure with only a small portion explained by environmental

variation. Loci dispersal across the genome exhibits association with environmental variations in temperature, oxygen, and salinity gradients. Appendix II provides additional discussion on genetic studies.

3. Canadian DFO Assessment

DFO implemented an Atlantic halibut total allowable catch (TAC) in 1988 and a minimum fish size limit in 1994. The DFO Research Vessel (RV) survey was used to provide a recruit index. In 1998, an industry-DFO longline survey was initiated to provide an index of exploitable biomass of Atlantic halibut on the Scotian Shelf and southern Grand Banks. In 2014, a Statistical Catch-at-Length model and assessment procedures were peer reviewed and adopted to set catch advice. Between assessment years, interim stock status is derived from the Halibut Survey and the 4VWX RV survey.

In 2021 and 2022, a two-part assessment framework was peer reviewed and adopted by DFO (DFO 2024). The Atlantic halibut Scotian Shelf and southern Grand Banks management unit (NAFO areas 3NOPs4VWX5Zc) is assessed utilizing a new spatially integrated statistical catch-at-age and length model which provides maximum sustainable yield (MSY)-based reference points ([SISCAL] Johnson, et. al., 2024). Harvest strategies are then evaluated through closed loop simulations. DFO assumes Canadian landings in 5YZ are in the Canadian portion and are included in the 4VWX5Zc values, however, foreign landings in 5YZ are not included.

The SISCAL assessment uses annual catch data by gear for all NAFO countries fishing in the 3NOPs regions and Canadian catch by gear for the 4VWX5Zc areas. Gear specific catch length composition is estimated using at-sea observer and port sampling for the 3NOPs and 4VWX5Zc areas separately. Mortality is informed by the Halibut All Sizes Tagging (HAST) program and indices of abundance are derived from the Maritimes Summer Ecosystem Research Vessel Survey, Newfoundland and Labrador Spring Ecosystem Research Valley Survey, Industry-DFO Longline Fixed Station Survey, Industry-DFO Longline Random Stratified Survey, 4Vn Sentinel Survey, and a Commercial Index (Li et al 2025).

The SISCAL model estimates biomass, fishing mortality, recruitment, and biological reference points. Stock status is defined by estimating the spawning stock biomass (SSB). The 2021 SSB was estimated at a time series high of 20.6 kilotons (kt). Additionally, maximum sustainable yield-based reference points are defined for the Atlantic Halibut spawning biomass, fixed station survey biomass, and stratified random survey biomass. Reference points include the Limit Reference Point (LRP), Upper Stock Reference (USR), B_{MSY}, and catchability (Table 1).

Table 1- BRPs for Canadian SISCAL model. Source: Johnson, et. al., 2024

Table 2. Maximum sustainable yield based reference points for Atlantic Halibut spawning biomass, and fixed station and stratified random Industry-DFO Halibut Longline Survey biomass. Survey biomass reference points are derived from model equilibrium survey biomass at long term fishing mortality rates that produce the female spawning biomass levels shown. Biomass reported in kilotons (kt).

Biomass	LRP	USR	B_{MSY}	Catchability (*q*)
Female Spawning Biomass	5.3 kt	10.6 kt	13.3 kt	-
Fixed station survey biomass	11.8 kt	23.52 kt	29.4 kt	0.0046
Stratified random survey biomass	10.9 kt	21.84 kt	27.3 kt	0.0020

In 2025, DFO performed an interim year update of the stock assessment (DFO 2026). Interim year updates define harvest advice based on the three-year mean exploitable biomass index from the Stratified Random Halibut Survey. Inter-annual changes have been minimal. The 2025 update indicated the stratified random survey three-year mean, using a catchability of 0.002, estimated to be 49.4 kt (05% confidence interval: 35.8, 63.1). Based on the three-year mean, exploitable biomass was 51.1 kt. This value is above the 21.8-kt USR with a very high probability of being in the healthy zone. Abundance was at the lowest level in the last 5 years; however, it remains higher than the long-term mean.

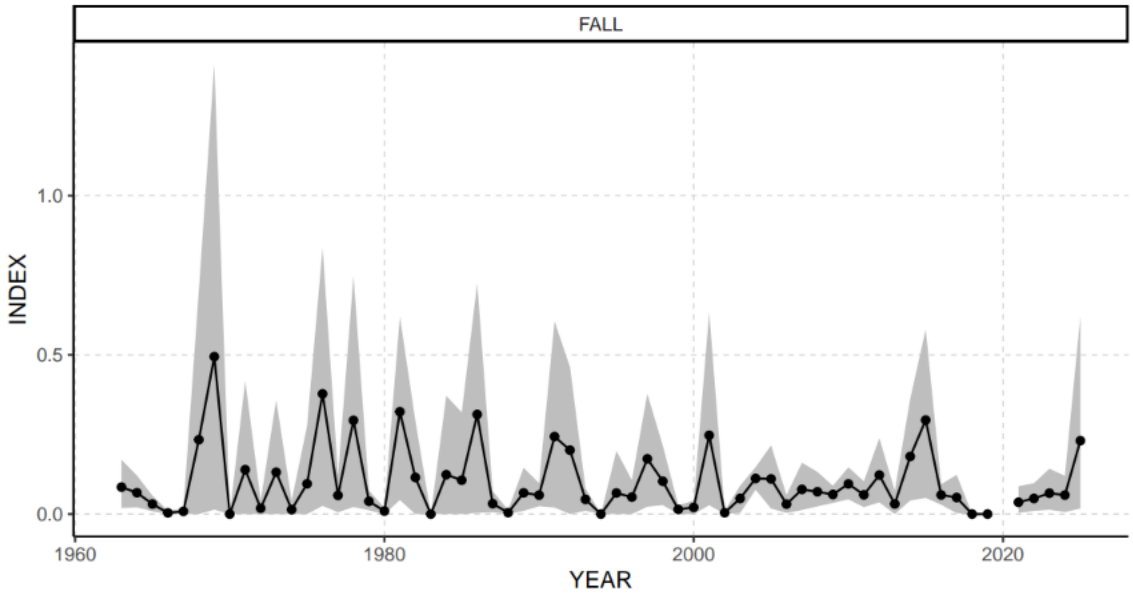
4. U.S. Survey Information

NMFS Bottom Trawl Survey

Catchability of Atlantic halibut in the NMFS bottom trawl survey is low, generally well below 0.5 kg/tow (Figure 3). The FSD assessment only uses the fall survey, and the fall survey is currently the only fishery independent survey used in the FSD assessment approach. The fall survey index shows slight increases in the most recent years from 2021 through 2024, followed by a large increase in 2025.

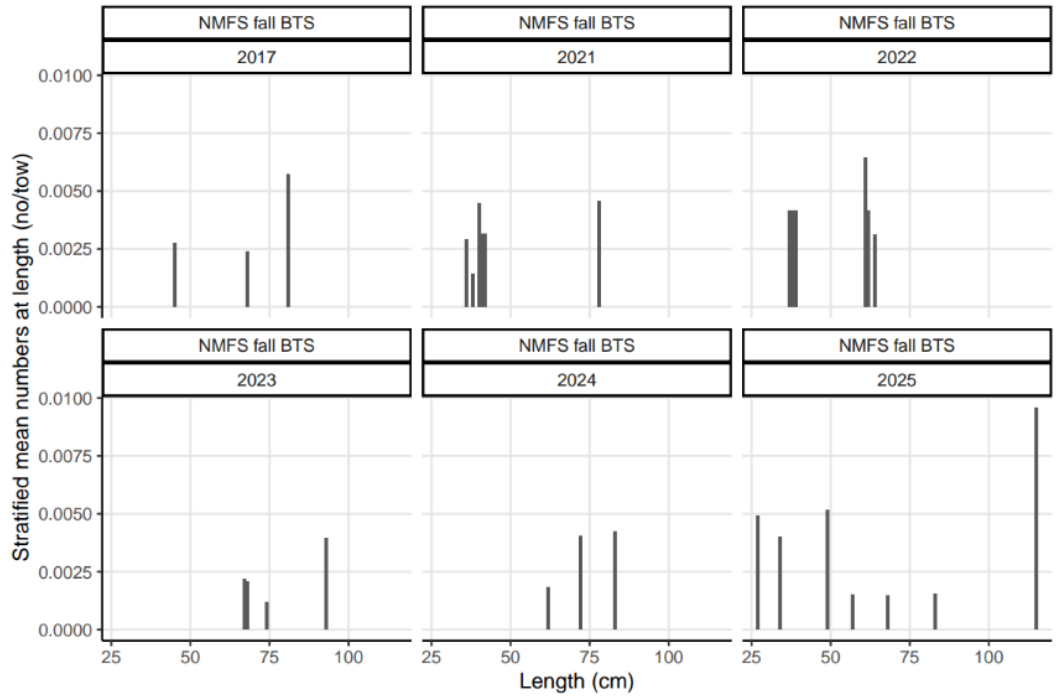
The fall survey typically catches only halibut less than 75 cm in length and this is thought to be related to gear selectivity with larger halibut likely able to out swim the trawl (Figure 4). The 2025 survey caught more halibut and halibut of more sizes than recent years (2017-2024).

Figure 3- Fall bottom trawl survey index (biomass, kg/tow) of Atlantic halibut from 1963 through 2025.



Source: 2026 NEFSC Data Update

Figure 4- Stratified Mean Indices at Length for the Bottom Trawl Survey of Atlantic halibut from 2017 through 2025.

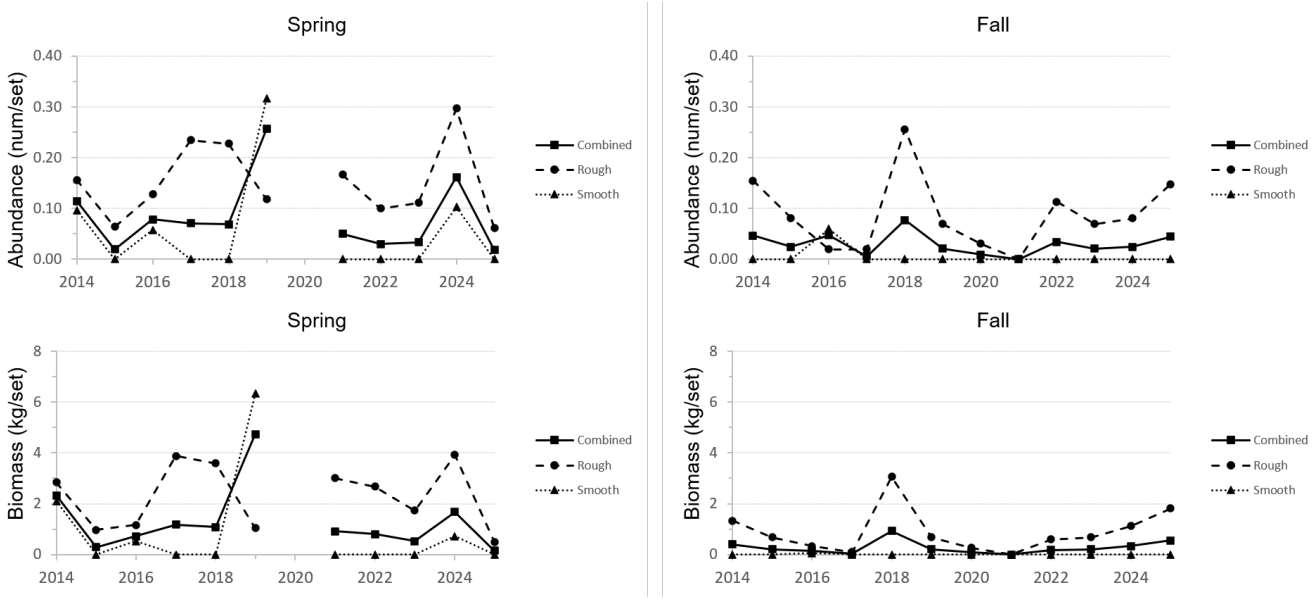


Source: 2026 Data Update

NMFS Bottom Longline Survey (BLLS)

The NMFS BLLS catches Atlantic halibut, but in relatively low numbers (Figure 5). The survey footprint only covers the central portion of the Gulf of Maine, and does not include the northern portion of the Gulf of Maine where the majority of catches occur in U.S. waters. Halibut caught by the NMFS bottom longline survey are generally smaller than the sizes caught by the fishery. This is likely due to gear selectivity because the Maine state fishery requires a minimum 14/0 hook while the BLLS uses a 12/0 hook.

Figure 5- NMFS BLLS fall and spring indices for Atlantic halibut.



Source: NEFSC Cooperative Research Branch

Maine-New Hampshire (MENH) Trawl Survey

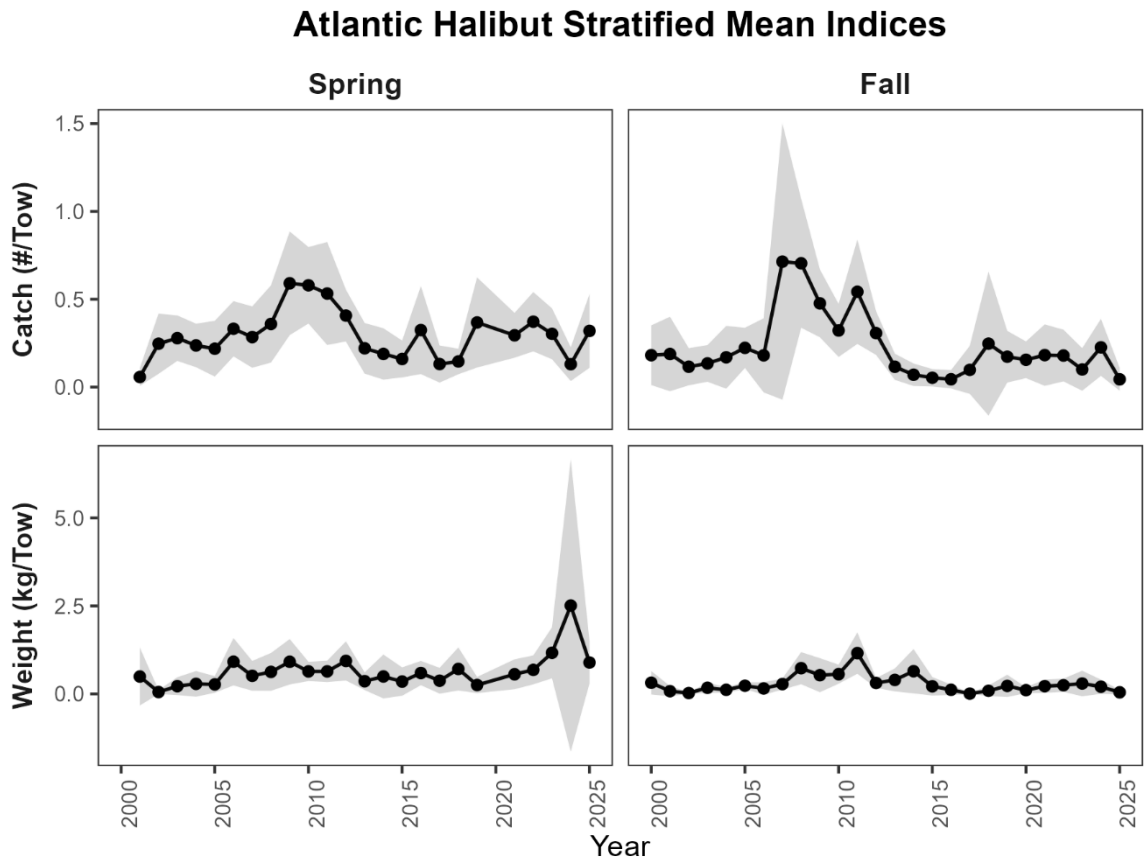
Catch of Atlantic halibut in the MENH trawl survey is low, with indices generally <0.5 for both numbers/tow and kg/tow (Figure 5). Indices were slightly higher for both numbers/tow and kg/tow from the mid-2000s to mid-2010s, but do not show a clear trend.

The MENH trawl survey catches a wide range of halibut sizes, with the majority being <40 cm (TL) in most years. In some seasons and years, the length frequencies skew smaller, with a mode at around 10 or 20 cm (for example, in Fall 2007 and Spring 2019). Large halibut are caught on occasion, up to 132 cm, but at least in recent years, these larger halibut are usually encountered in the most northeastern stations off the Downeast region of Maine.

The PDT discussed that the smaller halibut encountered in the MENH trawl survey seems to suggest that some recruitment is occurring in the area, perhaps originating from fish spawning

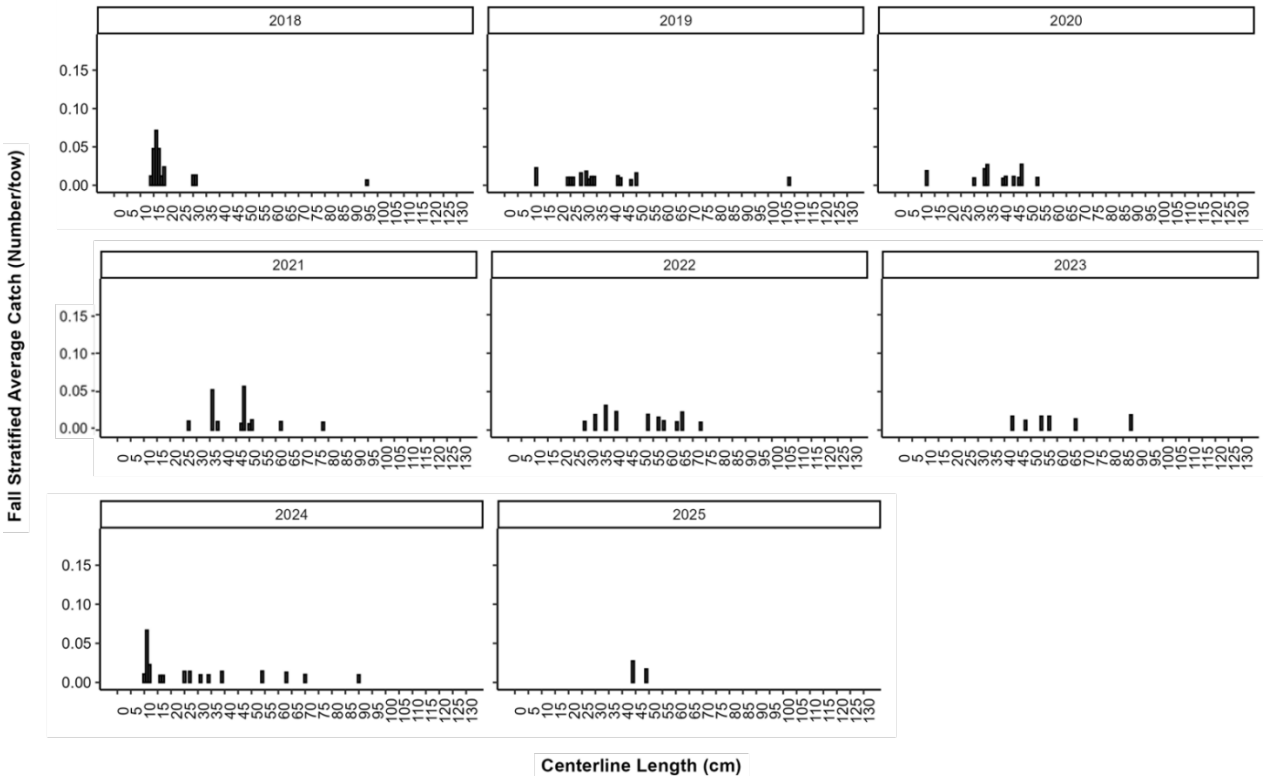
off the continental shelf of Georges Bank, and transported inshore by currents to the Maine coast (Figure 6 and Figure 7). The PDT highlights this as an area for further research.

Figure 6- MENH trawl survey stratified mean indices of abundance from 2000 through 2025.



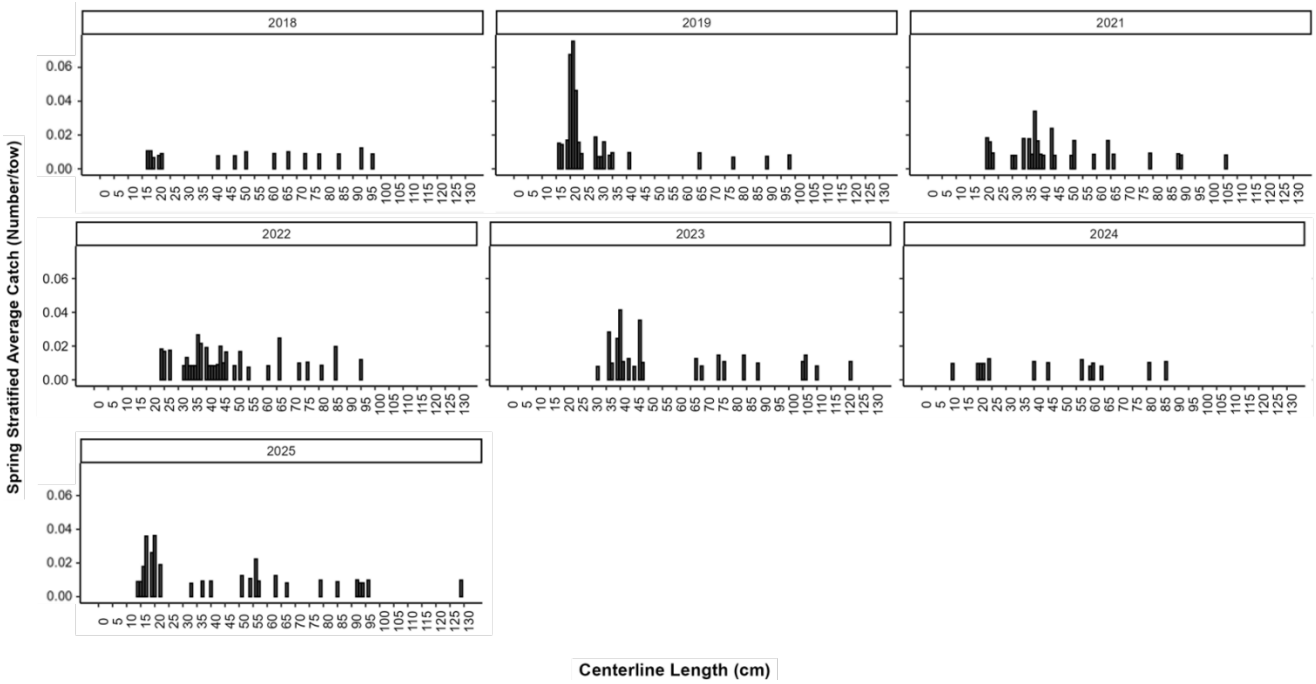
Source: Maine DMR

Figure 7- Halibut length frequencies from the fall MENH trawl survey from 2018-2025.



Source: Maine DMR

Figure 8- Halibut length frequencies from the spring MENH trawl survey from 2018-2025.



Source: Maine DMR

The footprint of the NMFS BLLS and the limited catchability of halibut in trawl surveys continues to limit access to robust data needed for an analytical assessment. An industry longline survey, similar to the Canadian DFO industry longline survey, would fill a large data gap in U.S. waters. A state waters survey would cover the footprint of the fishery, however, expanding the survey footprint into federal waters would likely better characterize the stock dynamics and habitat use within the Gulf of Maine.

5. Fishery Catch Trends

U.S. and Canadian Catch Trends

Figure 9 shows calendar year U.S. catch (mt) and Canadian catch (mt) in recent years. The assessment includes Canadian catch from areas 5Z and 5Y (transboundary areas). Figure 9 shows landings and discards. U.S. commercial landings and discards begin in 2002, Canadian commercial landings begin in 2002, and Canadian commercial discards begin in 2015. U.S. catch increased to a high in 2019 before declining steadily for several years. Meanwhile at the same time, Canadian catch increased sharply from 2019-2020, followed by decreases through 2023. Canadian catch began increasing again in 2024 and 2025, while U.S. catch remained relatively stable. The 2026 Data Update includes the full time series of catch data.

Figure 9- U.S. catch (mt) and Canadian catch (mt) from calendar years 2004 through 2025.

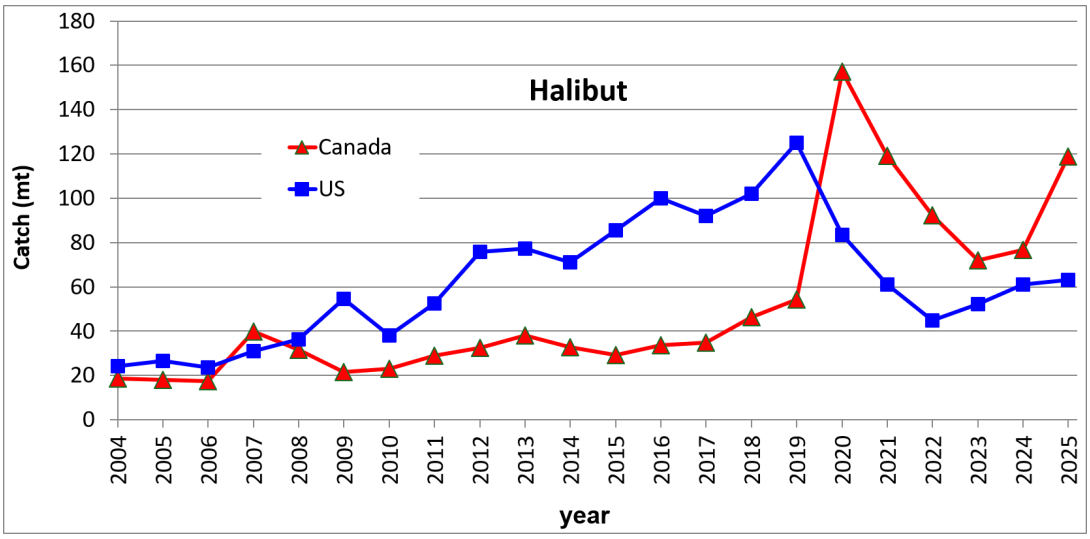
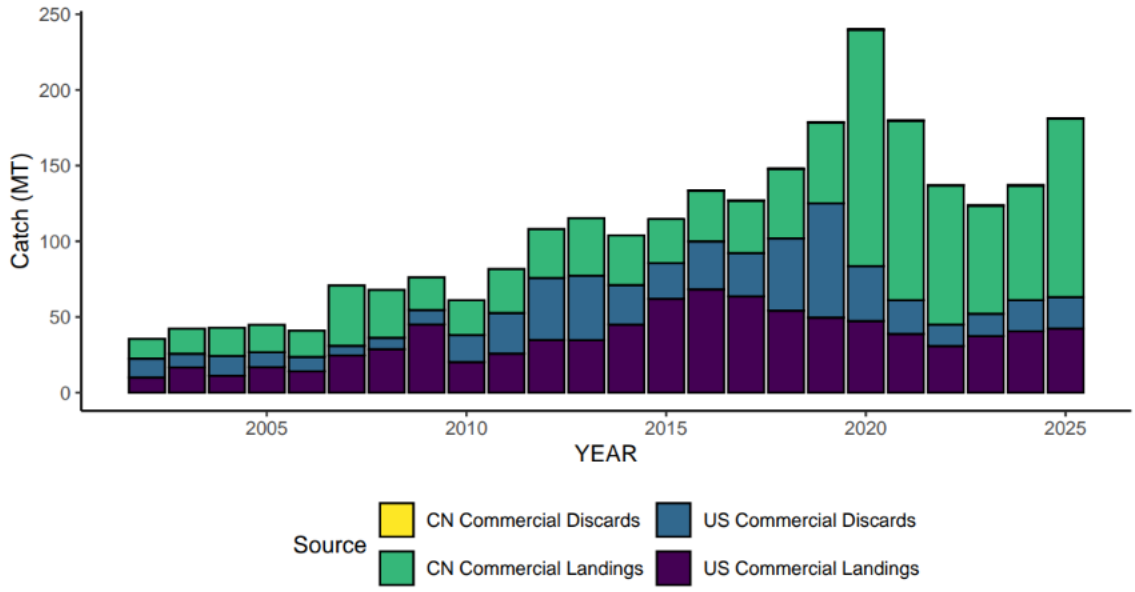


Figure 10- Landings (mt) and discards (mt) of Atlantic halibut from calendar year 2002 through 2025.



Source: 2026 Data Update

Federal Commercial Groundfish Fishery

Catches by the commercial groundfish fishery have increased slightly in recent years. Utilization by the commercial groundfish fishery has been increasing and increased sharply in FY2025 following the large decline in ACL (Table 2). Atlantic halibut is an unallocated stock, and commercial groundfish vessels are permitted to land only one legal-size fish per trip. The one fish per trip measure has been in place since the stock was added to the FMP in 1999.

Table 2- Commercial groundfish fishery catch (mt) and utilization from FY2010-2025.

Fishing Year	ACL (mt)	Catch (mt)	Utilization (% of ACL)	Landings (mt)	Discards (mt)
2010	30	27.8	92.8	8.0	19.9
2011	33	42.6	129.1	11.4	31.2
2012	36	60.7	168.7	15.5	45.3
2013	52	54.7	105.2	14.3	40.4
2014	57	47.8	83.9	21.2	26.6
2015	64	59.0	92.2	22.0	37.0
2016	91	56.9	62.5	20.3	36.6
2017	91	68.3	75.1	25.7	42.6
2018	77	70.8	91.9	27.1	43.7
2019	75	79.8	106.4	32.7	47.1
2020	77	51.9	67.5	33.4	18.6
2021	73	42.5	58.3	25.1	17.4
2022	73	33.6	45.8	21.5	12.1
2023	64	36.6	57.1	22.4	14.2
2024	58	43.3	74.7	26.7	16.6
2025 preliminary	23	47.3	204.8	29.3	18.0

Source: Multispecies Fishing Year-End Final Catch Reports; FY2025 Quota Monitoring, GARFO.

Sectors - Table 3 compares the performance of the Quota Change Model (QCM) since FY2012 to the realized outcomes for Atlantic halibut. While Atlantic halibut is not an allocated stock, the QCM can be used to compare predicted values to realized values for catch and revenue. From FY2017-2022, the model tended to over-predict catch. In the most recent years (FY2024-2025), the model has under-predicted catch. Revenue was under-predicted in recent years.

Table 3- Atlantic halibut stock-level catch and revenue predictions from the Quota Change Model (QCM) for each fishing year between 2012 and 2025 compared to realized catch and revenue (in 2025$).

	FY	Sector sub-ACL	Catch (mt)		*Utilization (%)*		Gross Rev ($mil, 2025)	
			Realized	Predicted	*Realized*	*Predicted*	Realized	Predicted
Halibut	2012	N/A	57	23	*N/A*	*N/A*	0.3	0.3
	2013	N/A	54	42	*N/A*	*N/A*	0.3	0.3
	2014	N/A	46	44	*N/A*	*N/A*	0.4	0.1
	2015	N/A	59	47	*N/A*	*N/A*	0.4	0.3
	2016	N/A	57	45	*N/A*	*N/A*	0.4	0.4
	2017	N/A	68	74	*N/A*	*N/A*	0.5	0.5
	2018	N/A	70	73	*N/A*	*N/A*	0.5	0.5
	2019	N/A	77	89	*N/A*	*N/A*	0.5	0.6
	2020	N/A	49	72	*N/A*	*N/A*	0.5	0.5
	2021	N/A	41	72	*N/A*	*N/A*	0.4	0.5
	2022	N/A	29	43	*N/A*	*N/A*	0.2	0.3
	2023	N/A	32	35	*N/A*	*N/A*	0.2	0.3
	2024	N/A	41	31	*N/A*	*N/A*	0.3	0.2
	2025	N/A	42	25	*N/A*	*N/A*	0.4	0.2

Maine state waters directed fishery

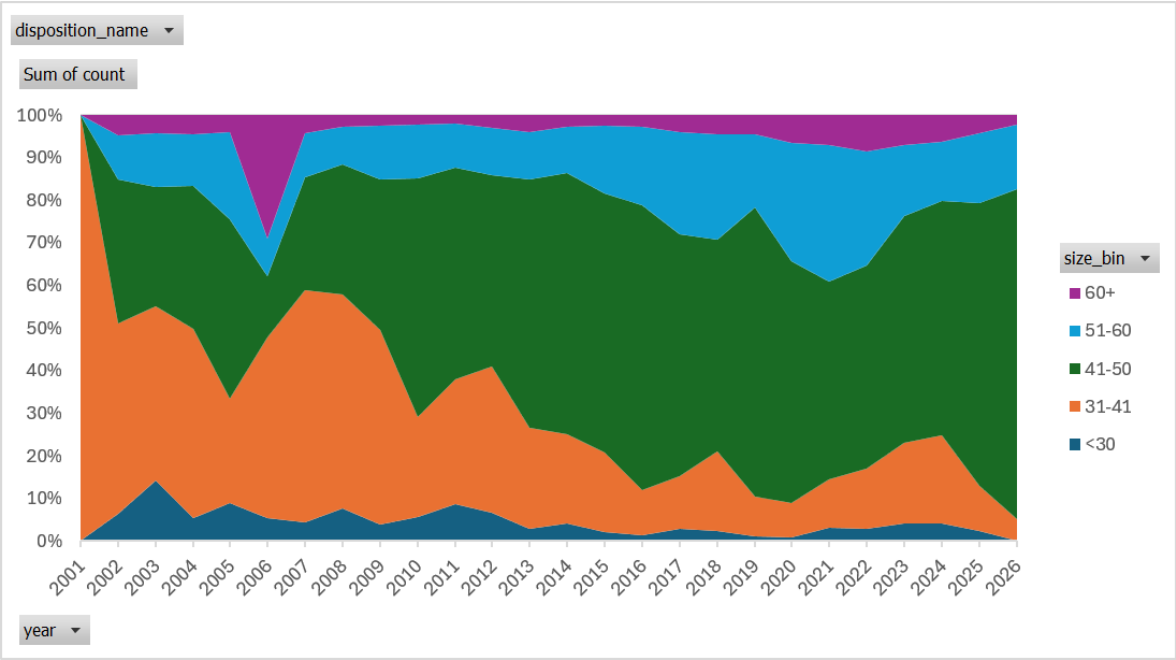
In 2021, Maine implemented revised regulations to constrain landings in the State fishery. The regulations were successful in reducing annual catch, and since then the landings and discards have remained consistent (Table 4). The majority of landings during this time were in the 41- to 50-inch range (Figure 10). Moreover, very few discards were over 41 inches. Since 2021, the distribution in size classes and trends for each size class have remained similar. State landings and length data trends suggest a robust size distribution and availability of fish in Maine waters.

Table 4- Maine state halibut landings and fish counts from harvester reported data, 2015-2025.

Year	TOTAL POUNDS	# FISH REPORTED	FISH DISPOSITION
2015	7,805	423	Discard
2015	69,095	1,659	Kept
2016	5,614	325	Discard
2016	111,049	2,656	Kept
2017	5,482	325	Discard
2017	77,363	1,711	Kept
2018	6,119	359	Discard
2018	62,608	1,350	Kept
2019	3,933	207	Discard
2019	69,350	1,579	Kept
2020	2,280	128	Discard
2020	66,898	1,413	Kept
2021	2,190	137	Discard
2021	40,721	790	Kept
2022	3,181	169	Discard
2022	37,849	761	Kept
2023	6,433	361	Discard
2023	45,382	1,069	Kept
2024	4,655	255	Discard
2024	44,408	950	Kept
2025*	1,834	105	Discard
2025*	42,849	974	Kept

*2025 data are preliminary and subject to change without notice.
Note: Logbook reported discards are not included in GARFO catch accounting
Source: Maine DMR

Figure 11- Maine fishery halibut lengths from logbook data



Source: Maine DMR

6. U.S. Management Summary

Federal groundfish fishery

Federally permitted groundfish vessels are currently limited to landing one halibut per trip (of legal size) for all permit types. There is no in-season management of halibut, and sectors are not allocated ACE for the stock. If the overall ACL is exceeded by catch from the Federal and state fisheries by any amount more than the management uncertainty buffer, accountability measures (AM) are implemented. In Framework 66 (2024) the Council added a provision that if the ACL was exceeded by more than the management uncertainty buffer, NMFS would consider the amount of Canadian catch that had occurred, and if, after accounting for that, the total ABC was not exceeded, the AMs would not be implemented. However, recent catch levels have made this provision moot.

The AMs for halibut include zero possession of halibut for all vessels issued a Federal permit for any fishery management plan, except for vessels issued *only* a charter/party permit and/or an HMS angling permit and/or an HMS charter/headboat permit. The possession prohibition applies to the full fishing year after the overage has been determined. Additionally, vessels with a limited access multispecies permit have a seasonal gear-restricted area for trawl gear and a separate gear-restricted area for gillnet gear.

Maine state directed fishery

The Maine state waters directed halibut longline fishery is managed by a fish tag program and a combination of seasonal restrictions, gear requirements, and minimum fish size. All legal sized

Atlantic halibut caught and intended to be retained by a Commercial Fishing license holder or a recreational fisherman are required to be immediately tagged with a landing tag approved by the MEDMR. Commercial, party, or charter vessels may land no more than 25 Atlantic halibut per year. Recreational vessels may land no more than five Atlantic halibut per year. Atlantic halibut landing tags also have reporting requirements. The only gear allowed for harvesting halibut is a circle hook, sizes 14/0, 15/0, or 16/0. Each vessel (and person) is limited to deploying 200 hooks (beginning 2025). The current season (began in 2021) is from May 18-June 13, and (beginning in 2025) fishing is prohibited on Wednesdays and Thursdays with gear out of the water.

For a complete history of Maine state waters halibut fishery management, see Appendix III.

Options for Catch Advice Setting

The current total ABC is based on the FSD assessment approach, which is then reduced using an estimate of Canadian catch to set a U.S. ABC. The 2026 ABC is 106 mt, with 71 mt set aside to account for Canadian catch, resulting in a U.S. ABC of 35 mt. The OFL is unknown and the empirical assessment method cannot estimate BRPs.

The current ABC was calculated as the terminal year catch multiplied by the catch multiplier from the FSD method:

ABC = 2023 catch (125 mt) X multiplier (0.848) = 106 mt

The PDT discussed the challenge with using the data update to evaluate the appropriateness of status quo catch advice. The data update provides the fall bottom trawl survey indices, but interpretation is challenging given low catchability of halibut in the NMFS bottom trawl survey. The FSD assessment approach uses three indices of abundance: the NMFS fall survey index, a trawl discard to kept (d:k) index, and a gillnet d:k index. The two catch indices were not updated or provided in the data update. Given the information available, and discussion on stock structure and connectivity that addresses the main uncertainties with the current FSD assessment method, the PDT recommends an alternative option for setting catch advice for Atlantic halibut for FY2027-2031.

The PDT identified two options for setting catch advice for the U.S. fishery, using catch data provided in the 2026 data update:

1. Maximum U.S. catch from 2018-2025 time period: **125 mt** (PDT recommended)

2. Average U.S. catch from 2018-2025 time period: **74 mt**

U.S. catch (landings and discards) from 2018-2025 calendar years, based on 2026 data update is provided in Table 5. Catch advice for these fishing years was set using the FSD assessment approach.

Table 5- U.S. halibut catch (mt) from CY2018-2025.

Calendar Year	U.S. Landings (mt)	U.S. Discards (mt)	U.S. Catch (mt)
2018	54.16	47.75	101.91
2019	49.58	75.55	125.13
2020	47.32	36.22	83.54
2021	38.78	22.27	61.05
2022	30.78	14.22	45
2023	37.37	14.75	52.12
2024	40.54	20.54	61.08
2025	42.37	20.72	63.09

Source: 2026 Data Update

PDT Discussion:

The PDT discussed the basis of these two options. The U.S. fishery catches that have occurred during this time period (beginning in 2018) under catch advice set using the FSD assessment approach have not had a negative impact on the larger halibut stock, given the "healthy" status assessed by DFO as of 2025 As an interim approach, catch advice would be used to set the U.S. ABC, and would not include setting an overall ABC. The goal for interim catch advice is to maintain the U.S. fishery at current catch levels, including federal commercial groundfish fishery incidental catches and the Maine state directed halibut fishery. As a non-allocated stock limited to landing 1 fish per trip, there is no expectation that federal fishery catch would increase beyond incidental levels. There is also no expectation that the State of Maine would liberalize or greatly change state fishery regulations. The State of Maine has made concerted efforts to restrict its directed fishery since the issue was first raised by the Council.[1] Incentives are maintained for not triggering AMs and impacting the federal commercial groundfish fishery and other federal fisheries.

The PDT recommends the option to set the U.S. ABC at the maximum level of U.S. catches that has occurred in the recent time period, at 125 mt, as a *de minimis* amount. Given the goal of providing an interim approach for catch advice that maintains the U.S. fishery, the PDT is concerned that the use of average catch from this time period would not provide sufficient allowable catch should incidental encounter rates with Atlantic halibut increase (consistent with apparent expansion of the stock and/or increase availability in U.S. waters), and may unnecessarily constrain the U.S. fishery when there is not a biological concern given the status of the larger halibut stock. For context, the PDT considered information from a recent study that developed a Vector Autoregressive Spatio-Temporal (VAST) model for Atlantic halibut based on the DFO assessment (Shackell et al, 2026), and interprets this as suggesting it would be

[1] See past PDT memo for background: https://d23h0vhsm26o6d.cloudfront.net/3d_160907-PDT-Memo-to-the-Committee-re-Atlantic-Halibut.pdf

reasonable for U.S. catches to account for 3-6% of the Canadian TAC for the Scotian Shelf and southern Grand Banks management unit. At the current Canadian TAC, 6% would be approximately 328 mt. Thus, the value of 125 mt the PDT recommends for setting a U.S. ABC is well within this potential limit. For context, Canada apportions 3% of this TAC to France (for waters associated with St. Pierre et Miquelon.

The PDT has begun discussing potential next steps for Atlantic halibut, including consideration of whether it would be more appropriate to treat the stock as an Ecosystem Component Species (ECS) or another alternative management approach because there is no directed Federal fishery and the vast majority of total catch is outside the U.S while the only directed U.S fishery is actively managed by the State of Maine. However, this is not being considered in Framework 74. It is expected the Council will consider developing ECS designation for several stocks as a priority as soon as 2027. Thus, specification setting could be considered an interim approach.

Table 6- Possible ABCs for Atlantic halibut for FY2027-2031 (bold is PDT preferred).

	Total ABC	Canadian Share	U.S. ABC
Status Quo	106 mt	71 mt	35 mt
Average catch (2018-2025)	n/a	n/a	74 mt
Maximum catch (2018-2025)	n/a	n/a	125 mt

Appendix I - Detailed summary of Atlantic halibut assessment history

This appendix provides a detailed summary of past Atlantic halibut assessments, beginning with the 2015 assessment update. References to assessment documents, Peer Review reports, and SSC reports are provided, with key points highlighted.

2015 Assessment

The benchmark model from 2008 was updated in 2012 and again in 2015. At the 2015 Groundfish Operational Updates, the peer review concluded that the Atlantic halibut model was not acceptable as a scientific basis for catch advice, and that stock status and catch advice should be based on an alternative approach. The panel concluded for Atlantic halibut that overfishing status was unknown, but based on the long-term exploitation history and survey trends, the stock was still overfished. The panel recommended a new benchmark assessment to determine stock identity, to develop a new stock assessment model, and to reconsider the overfishing definition. The panel further recommended that all information on stock identity should be considered, and new information should be collected if necessary. The panel suggested developing a transboundary assessment if the U.S. resource is a portion of the larger northwest Atlantic resource but recommended a data-limited assessment if the U.S. resource is a self-sustaining stock.

2015 assessment report and Peer Review Report: From the reviewer comments -

Recommendation: The Panel concluded that the updated assessment was not acceptable as a scientific basis for management advice. The updated assessment produced an unstable and unrealistic solution. Estimates of current stock size were highly sensitive to initial conditions and slight changes in assumed parameter values. The Panel agreed that the exclusion of distant water catches and revised discard estimates were acceptable.

The GARMIII benchmark assessment and the 2012 update assessment concluded that the stock was overfished but overfishing was not occurring. All information available in the update assessment indicates that stock size has not substantially increased. Therefore, based on the long-term exploitation history and survey trends, the Panel concludes that the stock is still overfished. However, the overfishing status is unknown. Considering the instability of the assessment model, the overfishing threshold was not updated.

Alternative Assessment Approach: The Assessment Oversight Panel recommended that the alternative basis for catch advice should be status quo catch. However, considering that status quo catch was produced with low trip limits, and the increase in recent discards suggest greater availability, the Operational Assessment Panel recommends that the over shing limit be based on status quo OFL (198 mt) rather than status quo catch.

Sources of Uncertainty: The major sources of uncertainty are limited information available for stock assessment and stock identity. The surveys catch few halibut, there is limited contrast in survey time series, and there are insufficient data to estimate survey conversion coefficients. Connectivity with the much larger stock in the northwest Atlantic has been documented, but stock identity is unknown. The omission of Canadian catches from the eastern Gulf of Maine (area 5Y) in previous assessments and the estimate of OFL is also a source of uncertainty.

Research Needs: The Panel recommends that a new benchmark assessment is needed to determine stock identity, to develop a new stock assessment model and to reconsider the overfishing definition. All information on stock identity should be considered, and new information should be collected if necessary. If the US resource is a portion of the larger northwest Atlantic resource, a transboundary assessment should be developed. If the US resource is self-sustaining stock, a data- limited assessment should be developed that considers all information available. New information on discard mortality of Atlantic halibut should be considered in future assessments.

2015 SSC Report: "The peer review panel rejected the operational assessment for halibut due to a variety of diagnostic concerns. However, one important concern is whether the assumed stock definition adequately reflects contemporary conditions. Specifically, some evidence suggests that the halibut stock straddles the U.S.-Canada boundary, and that its distribution might be shifting more into Canadian waters as temperatures rise. If that is the case, then stock dynamics estimated using only data from U.S. waters will be incomplete and inaccurate. A new benchmark assessment for halibut is warranted, but the assessment should be preceded by a thorough re-examination of stock boundaries."

2017 Assessment

In 2017, the Council contracted Dr. Paul Rago to develop an alternative "Plan B" assessment approach to allow for the development of catch advice for the current specification-setting period in the absence of an approved benchmark assessment. Dr. Rago proposed a method that uses catch, discards, and survey information to develop catch advice: the First and Second Derivative (FSD) method. An ad hoc subcommittee of the SSC reviewed the 2017 Halibut Assessment Report and concluded that the FSD approach was the best scientific information available with which to base catch advice for the US stock of Atlantic halibut, and that the FSD approach is scientifically valid as a basis for catch advice (i.e., to determine an acceptable biological catch [ABC], but not an overfishing limit [OFL]). Performance of the FSD method for setting catch limits was tested by simulation on known data and by comparison with two other halibut stocks with age-structured assessments.

2017 assessment report: "This is a "Plan B" assessment. It is a consequence of the unsuitability of the existing benchmark approach as a basis for deriving suitable catch limits for resource management. The Plan B assessment was conceived as an interim approach that could bridge the gap between the rejection of an existing methodology and a revised approach."

"**While the stock in US waters is considered to be depleted, the immediately adjacent stock in Canada (NAFO areas 3NOPs4VWX5Zc) has been certified by MSC as sustainably harvested** (emphasis added). Given the abundant tagging evidence of migrations of fish between the US and Canada, debates about stock definition will likely be a major component of a future benchmark assessment (Shackell et al. 2016, Tryzinski and Bowen 2016, Seitz et al. 2016)."

"Much of the available data suggests that the stock of halibut residing in US waters is increasing. Encounter rates in nontargeted fisheries and various fishermen reports support such perceptions. Various fishery independent surveys weakly support this hypothesis, however none of the current trawl surveys are efficient at capturing halibut. Perhaps the most compelling evidence for stock increase is the rapid changes observed in the Canadian stock. Large changes have occurred

not only in targeted longline surveys but also in their trawl surveys which have low capture efficiency similar to US bottom trawl surveys."

2017 Peer Review Report: "The choice of relative abundance indices to include was constrained by the guidelines on Operational Assessments... Future halibut assessments need to evaluate the available relative abundance indices more systematically."

Stock Status: Based on the information reviewed, the Panel recommends that the stock be classified as overfished, but overfishing status unknown.

"Research recommendations for a future assessment:

- Stock structure – investigate the stock identity of the US stock with respect to the Canadian Atlantic halibut stock."
- Data-limited size-based approaches may be possible as more length-frequency samples become available.

The sensitivity of catch projections to assumptions about discard mortality was investigated. Assumptions about discard mortality do not affect the catch quota estimated with FSD as long as the balance of landings among gear types remains constant. However, if the balance of discards shifts to a less lethal gear, there may be some room for increased landings or less penalty for discards (Page 29). Future assessment should consider gear-specific discard rates for Atlantic halibut – especially for gillnets as these are based on dogfish. The assessment method, management allocations and catch monitoring should apply consistent assumptions about discard mortality.

2017 SSC Report:

The SSC considered uncertainties that exist for this stock in addition to those accounted for in the analysis. The discussion was informed by both Dr. Rago's presentation and analysis document, the PDT's presentation and report, and the peer review document. As noted in 2015, stock structure and stock identity for Atlantic halibut remains an area that needs further research, but the management area also may not be a unit stock. The stock structure and identity comment was made during the 2015 review by the SSC as well.

The selection of indices to be used in the analysis was also highlighted as an area that needs further consideration and contributed to uncertainty in the analysis. The main reason for this uncertainty is that fishery dependent data do not cover the full range of the stock, so how the information is used needs to be carefully considered in an effort to capture important signals that may be localized in nature. Evidence suggests that the halibut stock straddles the U.S.-Canada boundary, and that the population's distribution might be shifting into Canadian waters as temperatures rise. If that is the case, then stock dynamics estimated using only data from U.S. waters will be incomplete. **The SSC recommends investigating halibut stock structure and distribution to improve the management of this species.**

The SSC recommends additional research on discard mortality to improve the analysis in the future.

2019 Assessment

2019 Assessment Report

The 2019 assessment was a Level 1 (direct delivery).

Main uncertainties include: low catchability in NEFSC surveys, and uncertainty associated with time lags in using the catch advice from the FSD method for the out years (2020-2022).

2019 SSC Report: The SSC noted "the data limited method used to assess the stock was rigorously simulation tested and performed well, which gives the SSC some confidence in the approach and advice, however other approaches of a similar nature do indicate some risk of over or under-harvesting (depending on the direction of the population change) due to the fact that it takes a few data points (in other words, years) to adjust the catch advice as the population abundance changes either up or down."

Other uncertainties considered in the recommendation to decrease catch were that the catchability experiments done on other groundfish were not able to be performed on Atlantic halibut due to the low sample size of Atlantic halibut caught during the experiment. Not having information about catchability may not have an impact as long as the trend in abundance is reflected appropriately by the index, but the lack of information on catchability remains an important uncertainty for Atlantic halibut. As noted in the stock assessment report, because the catch advice multiplier is now below 1 (and has been trending down), this may be a signal that the population is no longer increasing. This trend should be closely monitored, and further reductions may be needed in the later years of the specification period if the trend continues. And finally, discards have increased in the most recent year, and Canadian catch also increased. The discards may reflect a new cohort entering the fishery, or perhaps a change in fishing behavior, so it is a signal that should be closely observed moving forward. The magnitude of the Canadian landings during the specification period is also a source of uncertainty as this is not a jointly managed species, and future catches from Canadian waters represents an additional uncertainty.

2020 Assessment

The 2020 assessment was a Level 1 (direct delivery).

2020 assessment report: (search the NEFSC Stock Assessment Support Information portal)

Main uncertainties: The assessment model (FSD) used for Atlantic halibut is a 'plan B' assessment method. It uses recent trends in 3 abundance indices as well as recent changes in those trends to adjust the previous year's catch. For example, if the abundance indices are increasing, the catch will be adjusted up. If that increasing trend in abundance is increasing in magnitude over time, the adjustment to catch will be commensurately higher. The FSD method was rigorously tested in simulation (Rago, 2018) and should perform well for Atlantic halibut in the US. Sources of uncertainty in the FSD method include process error related to potential changes in stock productivity over time, the choice of relative weights for the control parameters used in the model and the lag in information inherent in using change in trend as one of the control parameters, which requires dropping one data point from the regression fit to generate a comparison. Other sources of uncertainty include the observation error in the abundance indices. The FSD method also relies on the assumption that abundance can be described with linear

dynamics, but that assumption should be relatively unimportant if the stock abundance is well below its theoretical carrying capacity.

2020 SSC Report: "The FSD approach used for Atlantic halibut continues to perform well for recommending catch advice. There was an anomaly in the 2019 catch data with missing Canadian catch, so the PDT used the NAFO database to fill in that missing catch. The SSC accepted the modified catch information as provided by the PDT, but the missing data represent an important uncertainty. Additional uncertainties considered by the SSC are: (1) catch appears to be increasing at a faster rate than the stock is increasing, and (2) stock boundary definitions continue to be considered uncertain."

2022 Management Track Assessment

The 2022 assessment updated the 2019 "Plan B" assessment use of the FSD model with additional commercial fishery catch data, commercial discard indices and fall bottom trawl survey indices of abundance through 2021.

2022 Assessment Report:

Main sources of uncertainty included missing 2020 surveys (including the imputation of missing values), data limited assessment, stock structure, lack of BRPs, low catchability in NEFSC surveys, and uncertainty associated time lags in using the catch advice from the FSD for the out years. In addition, there had been relatively large increases in the Canadian catch on Georges Bank in 2020 and 2021. It was unclear if those catches will continue.

2022 Peer Review Report: "The Panel considered the analyst's recommendation that Atlantic halibut's stock status should be considered unknown. Given that there is no accepted previous assessment to provide stock status and that the "Plan B" approach does not generate reference points, the Panel strongly recommended listing stock status as unknown."

"The Panel raised two concerns with this assessment. The first was the intersection of the US fishery and stock with those of Canada's fishery and stock. Even though the US assessment tries to account only for the portion of the Atlantic halibut stock that is found on Georges Bank and the Gulf of Maine, it is possible (perhaps likely) that this is only one part of a larger stock of Atlantic halibut that extends onto the Canadian Scotian shelf. Tracking data available from halibut released in the Gulf of Maine suggest a significant number of these fish travel into Canadian waters. The recent high catches of halibut by Canadian fisheries on Georges Bank (e.g., in area 5ZEJ) can only be sustainable if the area is part of a larger stock. As such, the Panel recommended that NMFS and DFO develop a more coordinated approach to the assessment of Atlantic halibut across the region. The Panel endorses at the least a scientific workshop to discuss the stock's science."

2022 SSC Report: "The PDT highlighted uncertainty of Canadian catch estimates in 2020 and 2021 in Eastern Georges Bank being four times higher than the previous 20 years. Canadian catch is included in the FSD model and increased Canadian catch has impacts on U.S. ABC advice. The SSC noted that potential changes in stock productivity over time may be possible. The SSC also highlighted that the FSD model does not consider possible observational errors associated with the three sets of abundance indices used, which may introduce uncertainty."

"The SSC supported the change in status from "overfished" to "unknown" recommended by the Management Track Peer Review Panel."

"The SSC recommends a better understanding of the Atlantic halibut stock structure and possible population connectivity in the US and Canadian waters (Eastern Georges Bank). The SSC supported an annual evaluation of the Canadian catch estimates proposed by the PDT to promptly respond to possible increases in the Canadian catches and impacts on the US ABC.

2024 Management Track Assessment

The 2024 Management Track Assessment was a Level 1 direct delivery.

2024 Management Track Assessment Report:

Main uncertainties: Unchanged from 2020 and 2022 assessment. The assessment model (FSD) used for Atlantic halibut is a 'plan B' assessment method. It uses recent trends in 3 abundance indices as well as recent changes in those trends to calculate catch advice from the final model year of observed catch. For example, if the abundance indices are increasing, the catch will be adjusted up. If that increasing trend in abundance is increasing in magnitude over time, the adjustment to catch will be commensurately higher. The FSD method was rigorously tested in simulation (Rago, 2018) and should perform well for Atlantic halibut in the US. Sources of uncertainty in the FSD method include process error related to potential changes in stock productivity over time, the choice of relative weights for the control parameters used in the model and the lag in information inherent in using change in trend as one of the control parameters, which requires dropping one data point from the regression fit to generate a comparison. Other sources of uncertainty include the observation error in the abundance indices. The FSD method also relies on the assumption that abundance can be described with linear dynamics, but that assumption should be relatively unimportant if the stock abundance is well below theoretical carrying capacity.

Key points: Canadian catch in 2022 and 2023 in area 5Z (eastern Georges Bank) has declined consistently since a peak in 2020 (see SASINF). Despite the combination of declining Canadian catch, and the catch multiplier < 1 in 2018 and 2019, the catch advice increased for 2020 and 2021 because the observed Canadian landings increased. Managers should be aware of this issue when recommending catch levels for Atlantic halibut.

2024 SSC Report: "A long-term goal for this stock is to obtain additional data to better inform the assessment and to move towards an analytical model that can quantify reference points and make forward projections. Key data needs include: 1) additional length and age data, 2) a better understanding of connectivity between the Canadian and US populations, 3) estimates of Canadian discards, and 4) consideration of additional survey indices.

The SSC recommends investigating the utility of integrating other data sources into the assessment to reduce the chance of zero values in the indices. It was noted during discussion that the use of the NEFSC bottom trawl survey as an index would need to be reconsidered should more situations of consecutive zero catches of halibut occur. Other data sources that may be useful to combine with the bottom trawl survey include the NEFSC Gulf of Maine Bottom Longline Survey, the Maine-New Hampshire trawl survey, the Maine-New Hampshire sentinel survey, and commercial catch-per-unit-effort (CPUE) data. The SSC also felt this stock would

benefit from greater collaboration between science and industry to address many of the data limitations."

Appendix II – White paper on Atlantic halibut connectivity between the U.S. and Canada, including recent studies on tagging, migration, and genetics

Atlantic Halibut U.S.-Canada Connectivity

Introduction

In the western Atlantic, Atlantic Halibut range from Virginia to Greenland. Halibut are considered a data-poor species in US waters. Stock structure, life history, and abundance trends are lacking data.

Limited data, uncertainty of stock identity, and an unstable and unrealistic model solution led to the stock assessment failing peer review (NEFSC 2015). Currently the stock assessment is assessed with a 'plan B' assessment method which suggests a low stock biomass (NEFSC 2024). The First Second Derivative (FSD) model uses commercial fishery catch data, and commercial and survey indices of abundance. Survey data is from the Fall Bottom Otter Trawl Survey. However, trawl surveys may not be good indicators of halibut biomass due to low gear catchability and drastic annual variability, adding uncertainty in the ability of those indices, and the current Plan B approach, to assess stock trends.

To address trawl survey shortcomings in the Canadian halibut fishery, Fisheries and Oceans Canada (DFO) developed an industry collaborative Halibut Longline Survey. The longline survey and ongoing Halibut research (aging, mark-recapture, and pop-up archival satellite tagging) have become informative data sets for Canadian waters. DFO assesses the Scotian Shelf and Southern Grand Banks management unit (NAFO Divisions 3NOPS4VWX5ZC; Figure 1) with a spatially integrated statistical catch-at-age model (Johnson et al. 2024). This management unit is based on tagging results that indicate halibut move extensively throughout the region. The model estimates biomass, fishing mortality, recruitment, and biological reference points (BRPs). The model includes data from 4VWX+5Zc. Canadian landings in 5YZe are assumed in the Canadian portion and are included, however, foreign landings in 5YZe are not included in the assessment (DFO 2026).

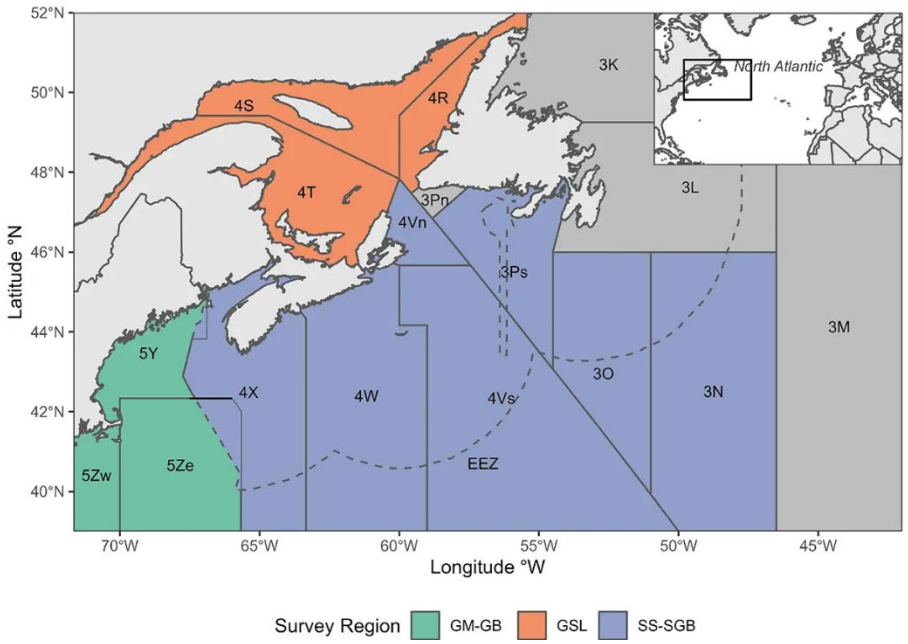


Figure 1: Northwest Atlantic Fisheries Organization management units. 3NOPS4VWX5ZC in blue

Questions about halibut stock structure have persisted for over a decade. Halibut spawning grounds have not been identified in US waters, and halibut larvae are rarely captured in US waters during ichthyoplankton surveys (Cargnelli et al., 1999; Sigourney et al., 2006). This suggests that halibut either spawn in the deep waters along the continental slope where they are undetected by our fisheries and surveys, or that there are source/sink dynamics between the US and Canadian halibut stocks. If the latter hypothesis is correct, the halibut population in US waters is likely sustained by spawning in Canada (Shackell et al., 2016). Tagging studies have provided insight into the movement patterns of halibut in the northwest Atlantic. Numerous authors (e.g., Stobo et al., 1988; Kanwit, 2007; Armsworthy et al, 2016) have expressed support for the hypothesis of "compensatory emigration" to describe the stock structure of halibut in US and Canadian waters. In short, this hypothesis presumes that spawning takes place on the Grand Bank and Scotian Shelf, and that the larvae are transported by the prevailing deep-water currents towards the south and west. Once halibut are ready to spawn, they undertake long distance migrations to the north and east, to return to their natal spawning grounds, thus closing their life cycle.

Tagging Data

Tagging studies are important sources of data for assessing stocks. Tagging studies use conventional tags (e.g. plastic-coated wire marker tags), data storage tags (DSTs), and pop-up satellite archival tags (PSATs).

These tags are externally attached to halibut, however DSTs can also be surgically implanted into the body cavity of fish, typically with an external conventional tag also attached to indicate an implanted tag. Conventional tags are the most cost effective, least invasive, and most common tags used in research. With conventional tag returns and possible subsequent fish data (length, age, sex, maturity, etc.) scientists can possibly inform distance traveled between release and recapture sites, growth rates, and spawning locations. Conventional tags and DSTs require recapture of the fish to obtain data. DSTs record data on geolocation, depth, temperature, and light at set time intervals. Due to memory limitations, DSTs may not record data for the entire time at liberty. PSATs, on the other hand, automatically pop off fish and upload data to a satellite network when data recording is complete or death is detected. PSATs record geolocation, depth, temperature, light, and acceleration data. However, PSATs are expensive and have data challenges due to requiring surface time for reliable geolocation and light source data. Additionally, biological data on the PSAT tagged fish is only recorded at the time of tagging.

Atlantic Halibut Tagging

In reviewing primary literature and Maine Department of Marine Resources (MEDMR) files, tagging data suggests connectivity between the Atlantic Halibut in Maine waters and the Scotian Shelf and Southern Grand Banks region. Over the past 20 years, MEDMR has tagged over 3,000 Atlantic halibut with a mixture of tags: conventional (plastic coated wire tags), DSTs, and PSATs. Additionally, other organizations (e.g., University of Massachusetts School for Marine Science & Technology, University of New England, and University of Maine) have tagged numerous halibut in the region. These halibut have been recorded dispersing over long distances between the Gulf of Maine and the Laurentian Channel. Shackell et al (2022) summarized tagging efforts across this region, indicating summer feeding grounds, winter spawning grounds, year-round locations, potential spawning sites, and seasonal migrations (Figure 2). Of note is that very few halibut tagged in Maine go to the Gulf of St. Lawrence. This aligns with data from DFO which considers the Gulf of St. Lawrence and the Scotian Shelf separate stock areas based on tagging and genetics.

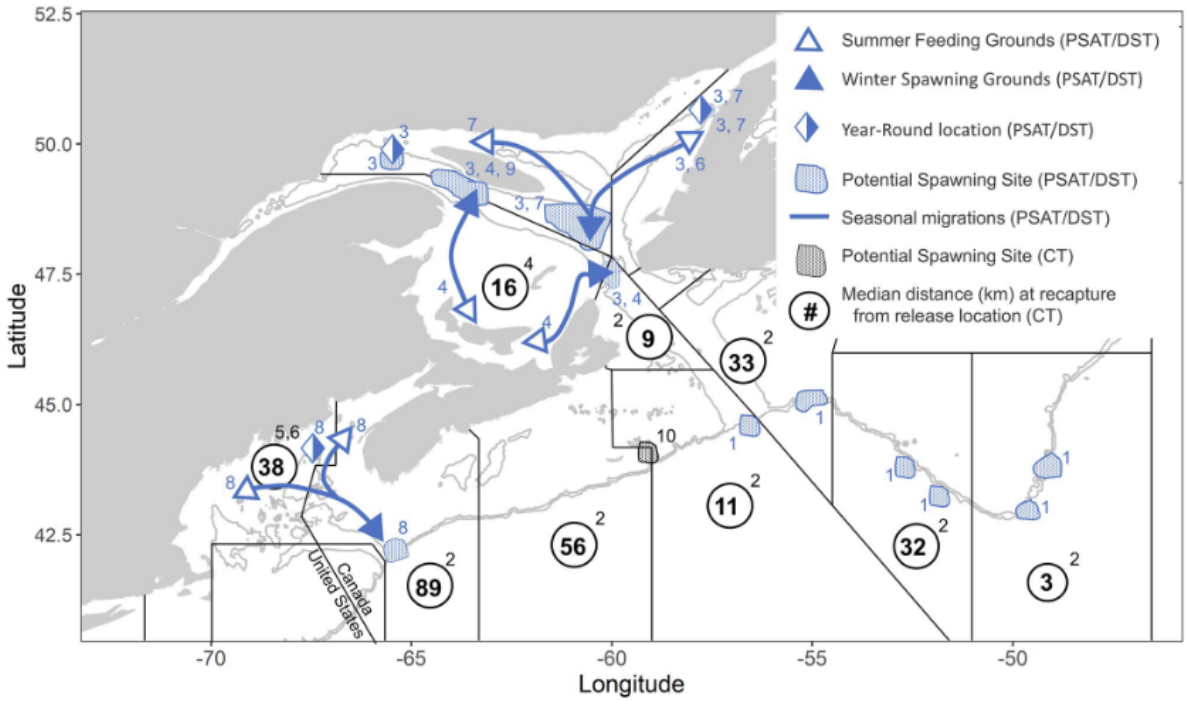


Figure 6. Summary of conventional and electronic archival tagging studies on Atlantic halibut in the Northwest Atlantic. PSAT: pop-up satellite archival tags; DST: data storage tags; CT: conventional tagging. Sources: 1. Armsworthy et al. (2014); 2. den Heyer et al. (2013); 3. Gatti et al. (2020); 4. James et al. (2020); 5. Kanwit (2007); 6. Kersula and Seitz (2019); 7. Le Bris et al. (2018); 8. Liu et al. (2019); 9. McCracken (1958); 10. Stobo et al. (1988).

Figure 2: Figure 6 from Shackell et al (2022) paper. Summary of tagging data from other studies.

Conventional Tags

Conventional tag returns are dependent on fishing effort. In Maine, returns from nearshore waters are limited to the state season. Federal waters of the Gulf of Maine are not limited to a season, but less effort occurs offshore. However, many fish are recaptured close to their tagging locations. Since conventional tags only indicate release and catch locations, a portion of returns close to tagging locations can be attributed to site fidelity across long annual migration areas. The halibut may have seasonally migrated long distances between release and recapture, but since returns are dependent on fishing effort during the state waters season they may be captured near release sites due to returning to the same area annually. Since Canada has a winter deep water fishery, there are returns over the continental shelf.

One MEDMR study based on conventional tagging between 2000-2017 tagged 2,573 halibut along the Maine coast (Kersula and Seitz, 2019; Figure 3). There were 412 tag recaptures (16%) reported. Of those returns, 43.2% were from Canadian waters. Although median return distance was 38km, some fish traveled at least 1,564km. Kanwit (2007) analyzed conventional tagging data from the 2000-2004 Federal Experimental Fishery. This

study had an 11% return rate of the 825 tagged halibut, 28% of these returns were from Canadian waters (Figure 4). While 68% of captures averaged only 9 km from release, 32% traveled between 50 – 1,758km.

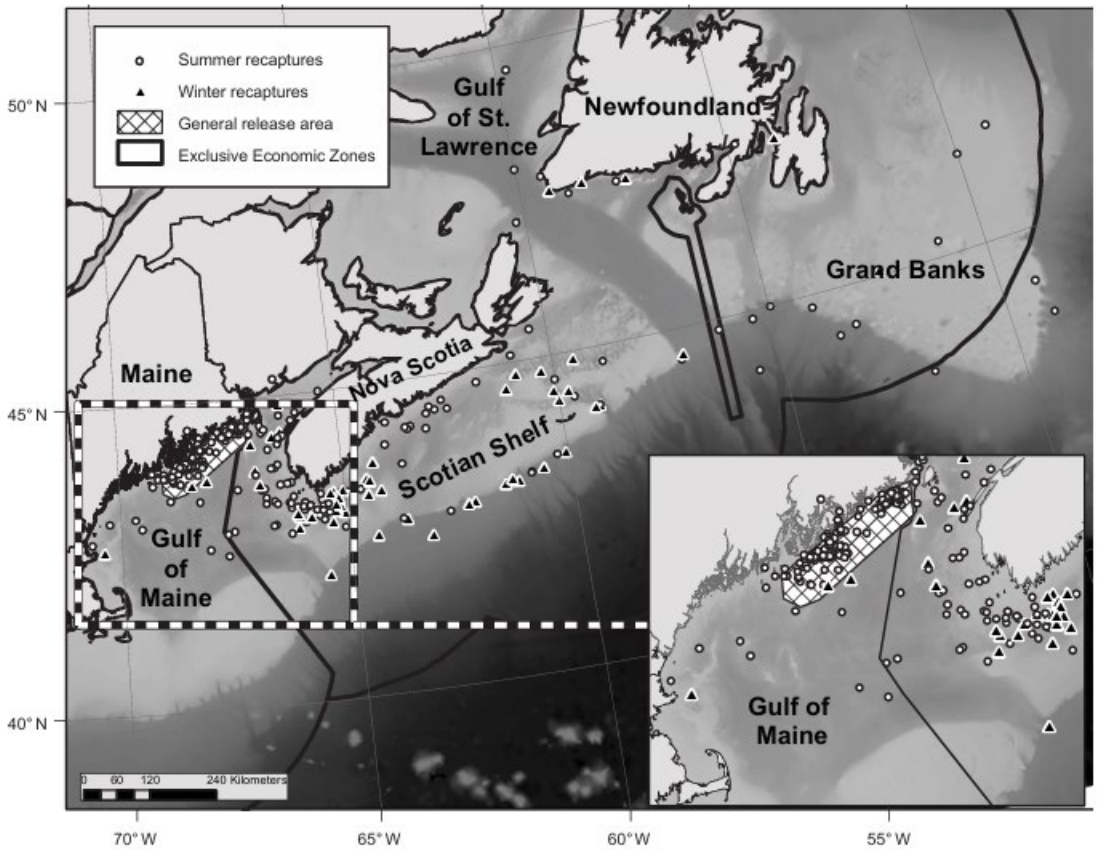


Figure 3: Kersula and Seitz (2019) recapture locations of Atlantic Halibut by season (n=378). Bathymetry data from General Bathymetric Chart of the Oceans. The release area in a general illustration to adhere to State of Maine confidentiality rules.

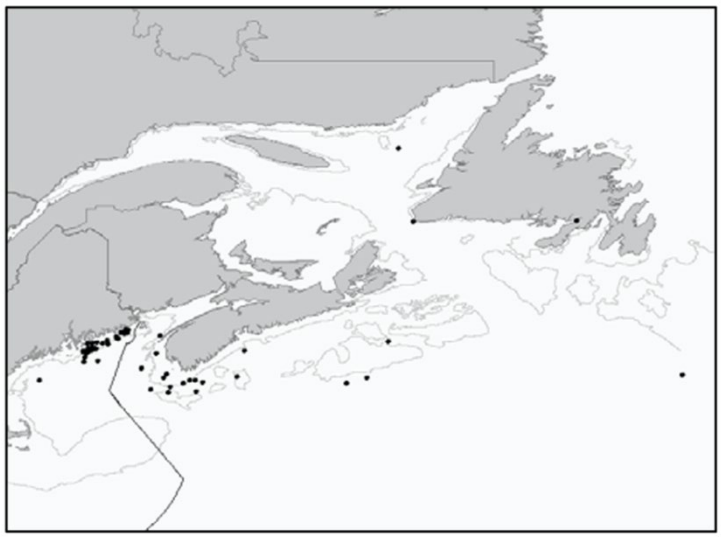


Fig. 4. Recapture locations of tagged Atlantic halibut.

Figure 4: Kanwit (2007) Figure 4

Electronic Tags

Electronic tags (DSTs, PSATs, and acoustic tags) provide data on migrations across the Scotian Shelf and, at times, environmental parameters. The Ocean Tracking Network (OTN), a global aquatic research, data management, and partnership platform, maintains the world's longest underwater acoustic receiver array known as the Halifax Line (Figure 5). This array stretches 205km from Nova Scotia to the Scotian Shelf with hydrophone moorings spaced 800m apart. The Halifax Line provides a unique opportunity to quantify halibut migration eastward and westward on the Scotian Shelf. Between 2021 and 2024, MEDMR released 170 halibut double tagged with acoustic and archival tags off Downeast and Midcoast Maine. These acoustic tags will ping for 10 years, though some have already been recaptured. As of July 2026, 61 tagged fish (35%) have been detected crossing the OTN Halifax line eastward, typically in the fall months. Of these, 26 (15%) have been detected returning toward the Gulf of Maine in the spring, with 25 halibut (15%) detected returning to coastal Maine. This is likely an underrepresentation of halibut returning to Maine waters due to the wide spacing of receivers off Maine. Of the halibut that have been detected returning to Maine waters, a slightly higher percentage were originally tagged off Midcoast Maine. This indicates connectivity between Maine and Scotian Shelf halibut is not specific to Downeast Maine.

Several MEDMR tagged halibut have been detected completing migrations to the Gully, Laurentian Channel, and Northeast Channel multiple years in succession (Figure 5). These are known spawning areas across the Scotian Shelf. In one case, a MEDMR double tagged (DST and acoustic) halibut demonstrated 5 annual trips to the Gully. All halibut activity

associated with spawning in these tagged fish has occurred in Canadian waters. Liu et al (2019) research also indicated fish migrate to the Northeast Channel to spawn from the Gulf of Maine and the Bay of Fundy (Figure 2). This study investigated movements of Atlantic halibut in the Gulf of Maine using 25 pop-up satellite tags with a 9-month data transmission. Halibut in this study traveled between 36 – 1,701km from their release point. Thirteen halibut traveled into Canadian waters. Two of these fish made long-distance migrations to known spawning grounds in the Northeast Channel, as evidenced by the pop location of one tag and the tidal-temperature oscillations present in many other tags since, which occur due to the strong deep tidal flow in the Northeast Channel.

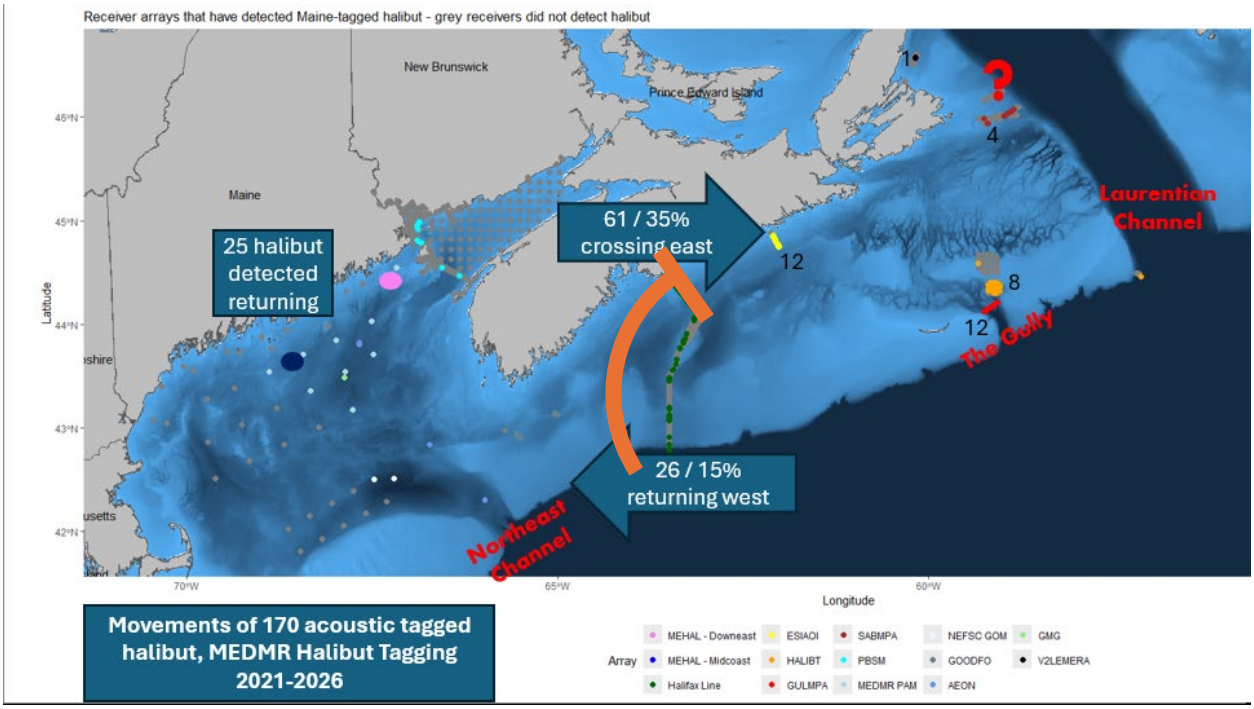


Figure 5: Receiver array detections of MEDMR Halibut electronic tags, 2021-2026. Movement of 170 acoustic tagged halibut. Halifax Line indicated by orange line.

Genetics and Spatial Ecology

Recent genomic evidence suggests two genomic stocks in the western north Atlantic: one across the continental shelf and another in the Gulf of St. Lawrence (Kess et al., 2021). There are no detectable genetic differences between Scotian Shelf-Grand Banks, Gulf of Maine, and Georges Bank halibut. Demographic reconstructions suggest divergence and expansion coinciding with the Mid-Holocene Warm Period and the Last Glacial Maximum (Kess et al., 2021). Moreover, forces beyond drift have driven the contemporary population structure with only a small portion explained by environmental variation. Loci dispersal

across the genome exhibits association with environmental variations in temperature, oxygen, and salinity gradients. This genetic structure is bolstered by spatial structure in life history traits and the migratory contingents (Shackell et al., 2022). Timing, fish size, maturity, and distance between summer feeding and over wintering grounds were all identified as influences to spawning migration patterns. However, the level of mixing among and within subpopulations on spawning grounds is only partially understood.

Moving Forward

In 2015, the benchmark peer review panel suggested developing a transboundary assessment if the U.S. resource is a portion of the larger northwest Atlantic resource. These tagging studies strongly indicate connectivity of Atlantic Halibut in the Gulf of Maine with the DFO managed Atlantic Halibut of the Scotian Shelf and Southern Grand Banks. The halibut tagged in US waters share spawning grounds and habitat within Canadian waters. Many potential spawning sites have been identified in Canadian waters (Figure 2). However, zero sites have been identified within US waters, and halibut larvae are rarely captured during US waters ichthyoplankton surveys (Cargnelli et al., 1999; Sigourney et al., 2006). This suggests that the DFO Assessment of Atlantic Halibut on the Scotian Shelf and Southern Grand Banks (NAFO Divisions 3NOPS4VWX5ZC; DFO 2026) could provide another strong source of information on the Atlantic halibut found in US waters. Considering the DFO assessment as best available science, new approaches should be considered on how to define catch limits within the Gulf of Maine.

A recent case study used Atlantic halibut to integrate United States and Canada fisheries-independent surveys that sample juveniles within a vector autoregressive spatiotemporal (VAST) modeling framework to analyze shifts in distribution (Shackell et al., 2026). This study looked at regional and focal area abundance trends. Abundance increased in all focal areas from 2006-2023. Throughout that time, 94% of the total Atlantic halibut abundance was in Canadian waters. Additionally, shifts in the Center of Gravity (COG), leading and trailing edges of the range, and habitat depth were indicated. However, distances from COG and the Hague line have not changed. Overall, the population is expanding, but there is no evidence of shifts within focal areas.

Norway recently assessed the status of the stock north of 62°N, the most economically significant Norwegian halibut population (Lindgård et al. 2025). Minimal data was available on this stock, much like the stock in the United States. An index of relative abundance was derived with a model-based approach using reconstructed historic landings and a non-target survey to inform a Surplus Production Model. The surplus production model uses time series catches and biomass production (the production function).

The red crab fishery, which is currently managed by the New England Fishery Management Council, provides another example of how to set specifications for data poor stocks. In 2023, specifications for this fishery were set considering commercial landings, incidental landings, estimated fleet LPUE, and port sampled length frequencies (NEFSC 2023). Council-recommended specifications were projected for 2025 through 2027. There have been efforts to estimate red crab MSY, including a depletion-correction average catch (DCAC) model and a two-boundary model. Due to many factors, these approaches were not widely accepted for red crab, however, these models, as well as the LPUE approach, highlight ways to move forward with interim methodologies and long-term assessments of stocks.

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Appendix III - State of Maine Directed Atlantic Halibut Fishery Management

Overview of Maine State Waters Halibut Longline Fishery 2002-2016

Regulations

2002 – 2009

Applies to commercial, recreational, and party/charter

Season: East – (Maine territorial waters east of a line running due south magnetic of Schoodic Pt.) May 1 through July 31

West – (west of above line) April 1 through June 30

Minimum size: 38 inches (96.5 CM)

Possession Limits: Illegal to possess or land marine species other than Atlantic halibut aboard commercial vessels. It is Illegal to possess or land Atlantic halibut smaller than 38 inches total length, head-on or off. No more than one halibut per day for recreational, party or charter vessels. Commercial, recreational, party, or charter vessels may land no more than 50 Atlantic halibut per season.

All legal sized Atlantic halibut caught and intended to be retained by a Commercial Fishing license holder or recreational fisherman shall be immediately tagged with a landing tag approved by the Maine Department of Marine Resources.

Commercial fishing license holders must declare the vessel at the time of license issuance or renewal, to which the license holder's tags will be allocated pursuant this endorsement. The owner of the vessel will be given priority in the issuance of tags.

Gear Types and Limits: Only method allowed is using circle hooks, sizes 14/0, 15/0, or 16/0. No more than 450 circle hooks per vessel. All longlines or tub trawls must be marked with name, commercial fishing license number or for recreational fishermen, name and "Halibut Trawl".

2010 – 2018

Applies to commercial, recreational, and party/charter

Season: May 1 through June 30

Minimum size: 41 inches (104.1 CM)

Possession Limits: Illegal to possess or land marine species other than Atlantic halibut aboard commercial vessels. Illegal to possess or land Atlantic halibut smaller than 41 inches total length, head-on or 32 inches head-off. No more than one halibut per day for recreational, party or charter vessels. Commercial, party, or charter vessels may land no more than 25 Atlantic halibut per year. Recreational vessels may land no more than 5 Atlantic halibut per year. No individual or vessel will be issued more than 25 tags per calendar year with the exception of

Federal Multispecies Permit Holders. Federal groundfish permit holders may be issued more than 25 tags per person, but the 25 tag per vessel limit still applies.

- Tags must be declared to a vessel at the time of issuance.
- **Vessels may land a maximum of 25 Atlantic halibut per year.**
- Additionally, federal regulations restrict vessels to one halibut per trip whether fishing in State or Federal waters.
- Illegal for more than one type (recreational or commercial) of landing tag to be assigned to any one vessel per year.
- No individual may possess more than one type of landing tag per year.

All legal size Atlantic halibut caught and intended to be retained by a Commercial Fishing license holder or recreational fisherman shall be immediately tagged with a landing tag approved by the Maine Department of Marine Resources, regardless of when or where taken either inside the Three Mile Limit or in Federal Waters. Three types of tags are issued: Maine State Commercial for individuals that do not possess a federal multispecies permit and are therefore restricted to Maine territorial waters, Commercial Federal for individuals who possess a federal multispecies permit and can access federal waters(these individuals may also access ME waters if they possess the proper licenses), and Recreational for halibut caught in ME or federal waters by recreational, party or charter vessels No individual or vessel may possess more than 1 type of tag per year.

Commercial fishing license holders must declare the vessel at the time of license issuance or renewal, to which the license holder's tags will be allocated pursuant this endorsement. The owner of the vessel will be given priority in the issuance of tags. The license holder may only fish for halibut from the vessel that was declared and that the tags were allocated. Commercial fishing license holders who also hold a Federal Multispecies Permit shall be exempted from the individual tag limit provided that no federally permitted vessel is assigned more than 25 tags per year.

Gear Types and Limits: Only method allowed is using circle hooks, sizes 14/0, 15/0, or 16/0. No more than 450 circle hooks per vessel. Recreational fishermen or commercial fishing license holders without the halibut endorsement when fishing for personal use, using a tub trawl, are restricted to 100 hooks. All longline or tub trawls must be marked with name, commercial fishing license number or for recreational fishermen, name and "Halibut Trawl".

Reporting Requirements:

Persons who obtain an Atlantic halibut endorsement will be required to maintain a log. The log must include the following information:

1. Harvester name & license number
2. Boat name and hull ID
3. Designate negative report period if no harvesting activity occurred
4. Date fished & landed
5. Number of crew (including captain)
6. Gear type & quantity
7. Number of sets

8. Set time (hours gear fished)
9. Depth (in fathoms)
10. Area fished (Latitude/Longitude in dd/mm/ss, or Loran bearings, or NMFS statistical area and distance from shore)
11. Sea time (including steaming time)
12. Species caught including bycatch and sub-legal halibut, quantity & unit of measurement
13. Total length of halibut retained or released
14. Research tag number of halibut released or recaptured
15. License number of dealer sold to or if not sold to a licensed dealer, disposition of catch.
16. Port landed
17. Signature written or electronic

They are encouraged to make negative reports, but it's not required to obtain future halibut endorsements.

The number of endorsements issued for 2016 is 858, which translates to 21,450 landings tags.

2018-present

Season: May 11-June 13

Possession Limits: Illegal to possess or land marine species other than Atlantic halibut aboard commercial vessels. Illegal to possess or land Atlantic halibut smaller than 41 inches total length, head-on or 32 inches head-off. Commercial, party, or charter vessels may land no more than 25 Atlantic halibut per year. Recreational vessels may land no more than 5 Atlantic halibut per year. No individual or vessel will be issued more than 25 tags per calendar year.

Allows charter/party boat captains to fillet Atlantic halibut at sea if the halibut carcass (rack) remains in their possession until all customers have landed on shore. This rule allows a single Atlantic halibut to be shared with several fishing customers instead of one customer retaining the entire fish.

Gear Types and Limits: Only method allowed is using circle hooks, sizes 14/0, 15/0, or 16/0. No more than 250 circle hooks per vessel. Recreational fishermen or commercial fishing license holders without the halibut endorsement when fishing for personal use, using a tub trawl, are restricted to 100 hooks (per person and per vessel). All longline or tub trawls must be marked with name, commercial fishing license number or for recreational fishermen, name and "Halibut Trawl".

2021

Season: May 18-June 13

This action is intended to protect and conserve the halibut resource in compliance with the federal management plan and avoid future implementation of accountability measures.

2025

Season: May 18-June 13. Fishing prohibited Wednesdays and Thursdays with gear out of the water.

Gear Types and Limits: Only method allowed is using circle hooks, sizes 14/0, 15/0, or 16/0. No more than 200 circle hooks per vessel. Recreational fishermen or commercial fishing license holders without the halibut endorsement when fishing for personal use, using a tub trawl, are restricted to 100 hooks (per person and per vessel). All longline or tub trawls must be marked with name, commercial fishing license number or for recreational fishermen, name and "Halibut Trawl".

This regulation aligns expected halibut catch in Maine's territorial waters with the state waters sub-component established in the New England Fishery Management Council's Framework 69 to the Northeast Multispecies Fishery Management Plan.