2021 MARITIMES WINTER RESEARCH VESSEL SURVEY TRENDS ON GEORGES BANK

Context

Fisheries and Oceans Canada (DFO) has conducted winter Research Vessel (RV) surveys in the Maritimes Region, Northwest Atlantic Fisheries Organization (NAFO) Area 5Z (Georges Bank), using a standardized protocol, since 1987. Results from these surveys provide information on trends in abundance for groundfish species in the Maritimes Region for ecosystem monitoring. While these data reflect trends in biomass and abundance, and are a critical part of science-based stock assessments, a full assessment, including other sources of data, would be required to evaluate the impacts of management measures on population status.

The 2021 Winter RV Survey was conducted on the *CCGS Teleost.* Fisheries Management (FM) requested a review of the DFO Winter RV Survey information on the following species in Strata 5Z1–5Z4: Atlantic Cod, Haddock, Pollock, Yellowtail Flounder, Smooth Skate, Thorny Skate, Barndoor Skate, Winter Skate, Little Skate, Longhorn Sculpin, Ocean Pout, and American Lobster. The survey information will be used by FM as background for discussions with various industry stakeholders on recommendations for management measures, and to determine which stocks should be reviewed in more detail in 2022.

This Science Response Report results from the Regional Science Response Process of May 25, 2021 on the Maritimes Research Vessel Survey Trends on Georges Bank.

Background

The Winter RV Survey has covered a standard set of strata on Georges Bank (5Z) annually since 1987. The survey follows a stratified random sampling design and includes sampling of fish and invertebrates using a bottom otter trawl. These surveys are the primary data source for monitoring trends in species distribution, abundance, and biological condition on Georges Bank (for details see Stone and Gross 2012).

This survey was initially designed to provide abundance trends for fish and invertebrates between depths of about 30 m and 200 m—the depth range found in Strata 5Z1–5Z8 (Figure 1). Stratum 5Z9 covers the deeper water of the Fundian Channel and has been sampled annually since 2010. Sampling is generally conducted between mid-February and late March, with 103 stations allocated within Strata 5Z1–5Z9. Coverage of 5Z5–5Z8 has been irregular in recent years, due to vessel mechanical issues and poor weather; however, the survey has covered 5Z1–5Z4 in all years. Survey indices are expected to be proportional to abundance for species that are found primarily in the shallower water on top of Georges Bank, but they may not be useful for species that primarily inhabit depths greater than 200 m in winter.

Sampling in the winter survey was undertaken in 4X strata in the late 1970s and early 1980s. These strata have been sampled periodically in the past decade when time allowed. Inclusion of this broader sampling area is useful in understanding the distribution and abundance of deeper water fish, as the shallow water over Georges Bank is outside their prime habitat.

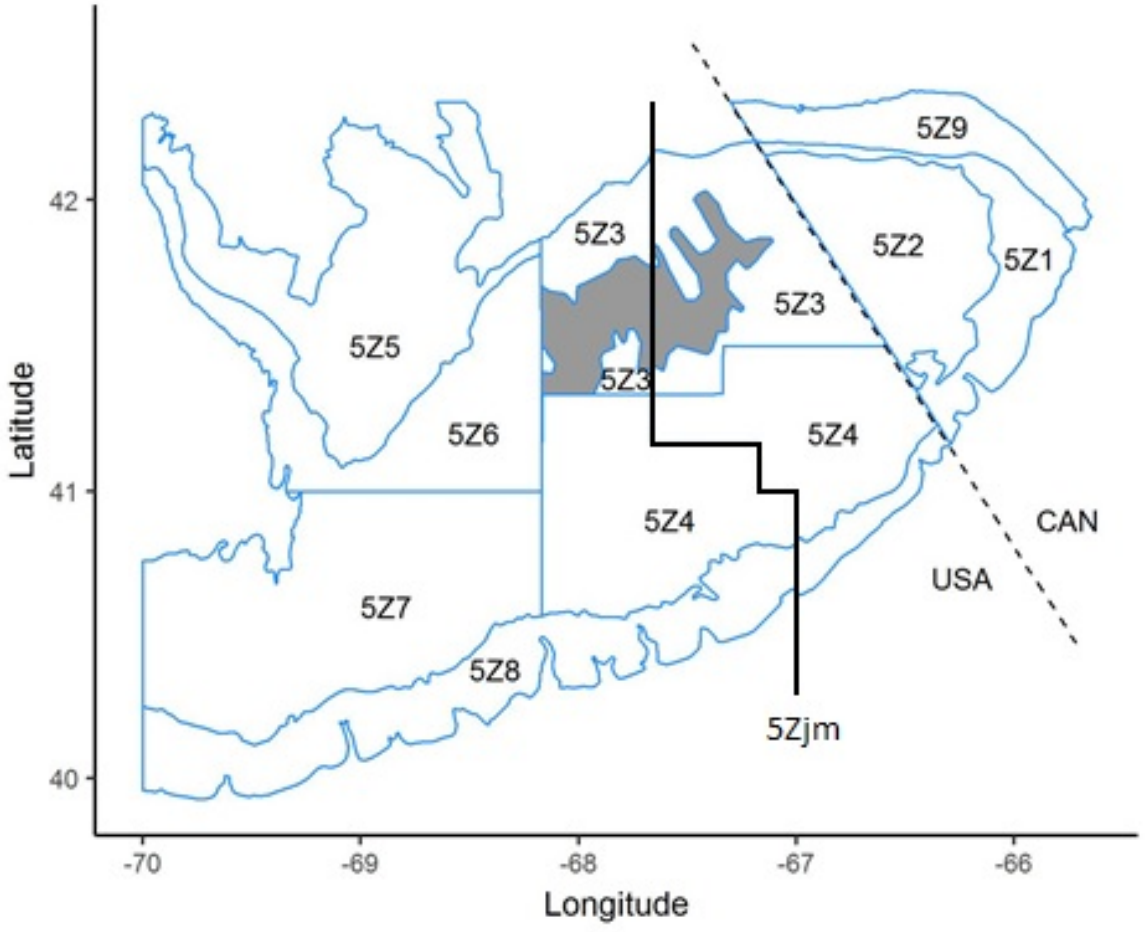

Figure 1. Winter RV Survey strata in 5Z. No sets are made in the shoals of Georges Bank (grey shaded area in 5Z3). The line bisecting 5Z3 and 5Z4 is the 5Zjm line, which is used for management of some species.

Analysis and Response

The 2021 Winter RV Survey successfully completed 54 tows in 5Z1–5Z4 and two tows in 5Z9 between March 17 and March 31, 2021. The start of the survey was delayed due to mechanical issues with the *CCGS Teleost*. All sets were conducted by the *CCGS Teleost*. Catch distribution plots are provided for each species. Biomass index trends are shown for 5Z1–5Z4. Comparisons of 2020 and 2021 length frequencies (total abundance-at-length) from the survey catch in 5Z1–5Z4 to the long-term median (1987–2019) are also included for the selected stocks.

The time-series of survey biomass indices and the 3-year running Geometric Mean (3-yr GM), are compared to 40% and 80% of the long-term GM to provide context for biomass levels. The GM was selected for these comparisons to reduce the impact of very high values observed in some years. The values are presented in Table 1. Information on the calculation of these indices is contained in Stone and Gross (2012).

For species that are normally found in water deeper than 5Z1–5Z4 on Georges Bank in the winter, including Barndoor Skate, Smooth Skate and Pollock, inclusion of a broader area may be needed to provide indices that are useful for monitoring abundance trends. The 3-yr GM of biomass indices in Strata 5Z1–5Z4 + 5Z9, which includes the adjacent Fundian Channel stratum where depth ranges from 183 to 370 m, is included as an illustration of this. For some these species, however, a broader geographic area may be needed for monitoring stock trends. Broader geographic coverage was not completed in the 2021 spring survey due to vessel issues.

Winter Skate and Little Skate cannot be reliably distinguished at lengths less than about 40 cm (for more information see McEachran and Musick 1973). The practice at-sea in most years was to record small skates as Winter Skate and to only record Little Skate when individuals displayed the diagnostic characteristics for adults of this species. Since 2013, those individuals that could not be clearly identified to species were recorded under a separate species code. Summaries of Winter Skate data presented here exclude all individuals smaller than 40 cm from earlier years, as fish in this length range likely included a mix of Little Skate and Winter Skate.

Table 1. Winter RV survey biomass indices (tonnes) by species for 2019, 2020, 2021, and 40% and 80% of the long-term (1987–2020) geometric mean. No time-period averages were provided for mixed Little Skate and Winter Skate because sampling began in 2014 (NA).

Species	2019	2020	2021	Current 3-yr GM	40% long-term GM	80% long-term GM
Atlantic Cod	4,271	4,207	1,868	3,226	4,695	9,390
Haddock	96,907	33,258	28,891	45,325	21,640	43,281
Pollock	170	465	100	199	530	1,060
Yellowtail	57	125	138	99	1,269	2,538
Smooth Skate	3	15	26	10	2	4
Thorny Skate	1	0	59	4	28	57
Barndoor Skate	28	17	37	26	34	67
Winter Skate	5,294	2,899	938	2,511	3,189	6,378
Little Skate	2,547	1,586	2,464	2,151	2,327	4,654
Mixed Winter/Little Skate	1,942	1,118	992	1,372	NA	NA
Longhorn Sculpin	365	1,988	1,428	1,012	1,441	2,882

Species	2019	2020	2021	Current 3-yr GM	40% long-term GM	80% long-term GM
Ocean Pout	8	20	59	21	131	262
Lobster	3,932	2,665	4,021	3,480	158	315

Atlantic Cod

Atlantic Cod catches were concentrated on the northeast portion of Georges Bank in 5Z2 (Figure 2a). The 2021 survey biomass index was below 40% of the long-term GM for the third year in a row, and the 3-yr GM fell below 40% of the long-term GM for the first time since 2016 (Figure 2b). The indices at-length for 5Z1–5Z4 in 2021 were generally lower than in 2020. These indices were generally below the long-term median except at length below 30 cm where the long-term median is zero (Figure 2c).

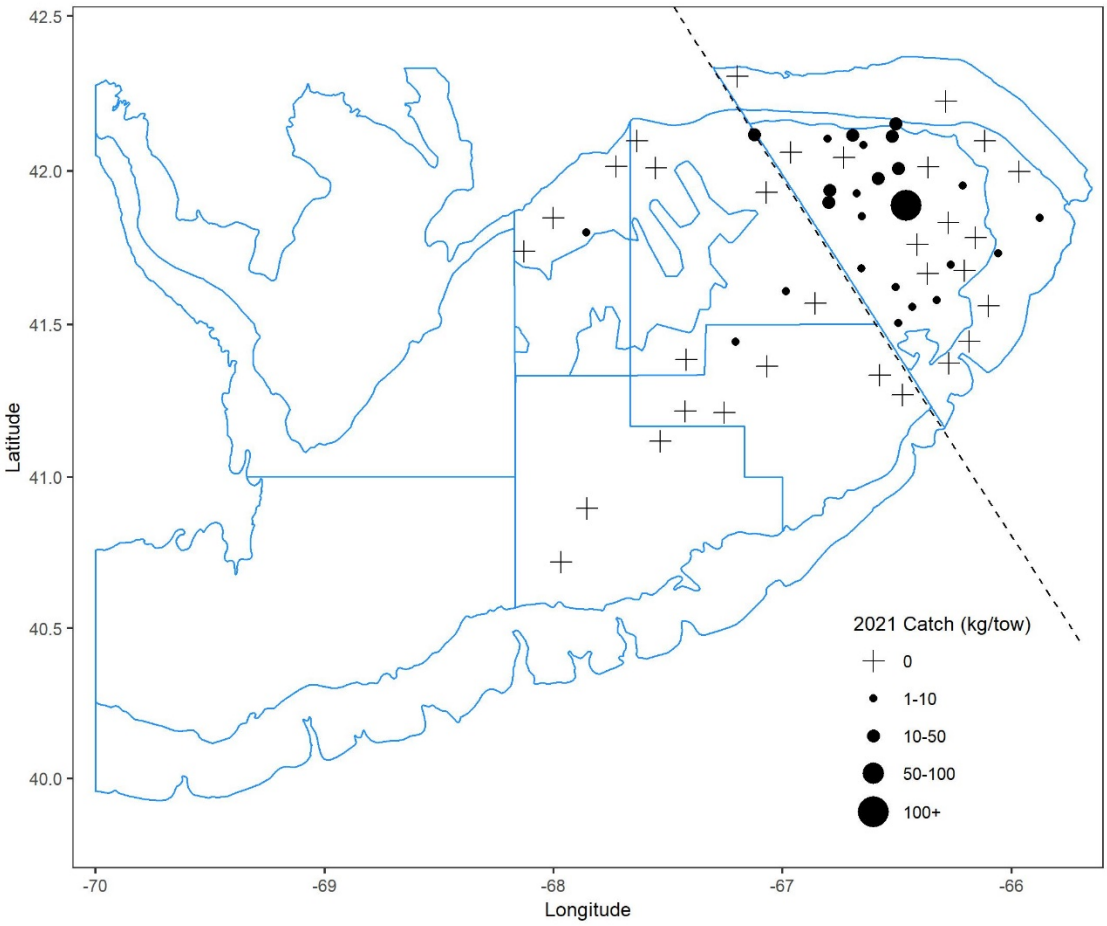

Figure 2a. Distribution of Atlantic Cod catches during the 2021 Winter RV Survey. Black circles represent catches. The circle area is proportional to the 2021 catch size. Zero catch is represented by the + symbol.

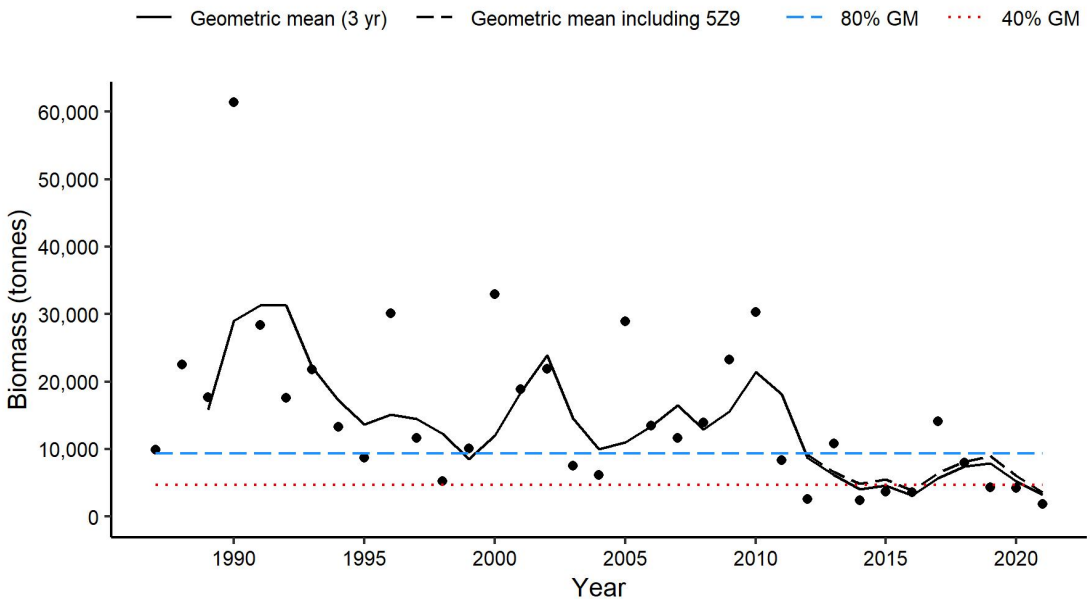

Figure 2b. Biomass index for Atlantic Cod in Strata 5Z1–5Z4 from the Winter RV Survey. The 3-yr geometric mean biomass for 5Z1–5Z4 is represented by the solid black line. The dashed black line represents the combined 3-yr geometric mean biomass (since 2010) of 5Z1–5Z4 and 5Z9. The dashed and dotted horizontal lines represent 80% and 40% of the long-term geometric mean (1987–2020), respectively. The large black dots represent the biomass estimate (5Z1–5Z4) for that year.

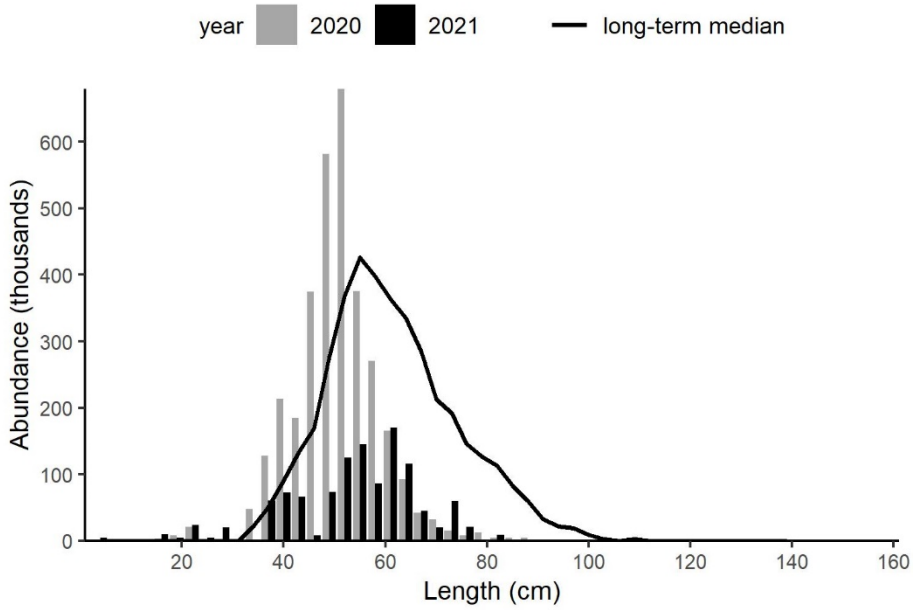

Figure 2c. Length-frequency indices for Atlantic Cod in Strata 5Z1–5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at-length from the 2020 survey. The black bars represent the number in thousands at-length from the 2021 survey. The solid black line represents the median number in thousands at-length for the time period 1987–2019.

Haddock

Haddock were present in over 91% of sets in 2021 (Figure 3a). However, the biomass index has decreased since 2020, and the 3-yr GM has been on a downward trend for the past five years, remaining just above 80% of the long-term GM (Figure 3b). The 3-yr GM with and without 5Z9 are virtually identical. Indices at-length are higher than the long-term median for lengths < 50 cm, but larger fish are virtually absent from the catch (Figure 3c).

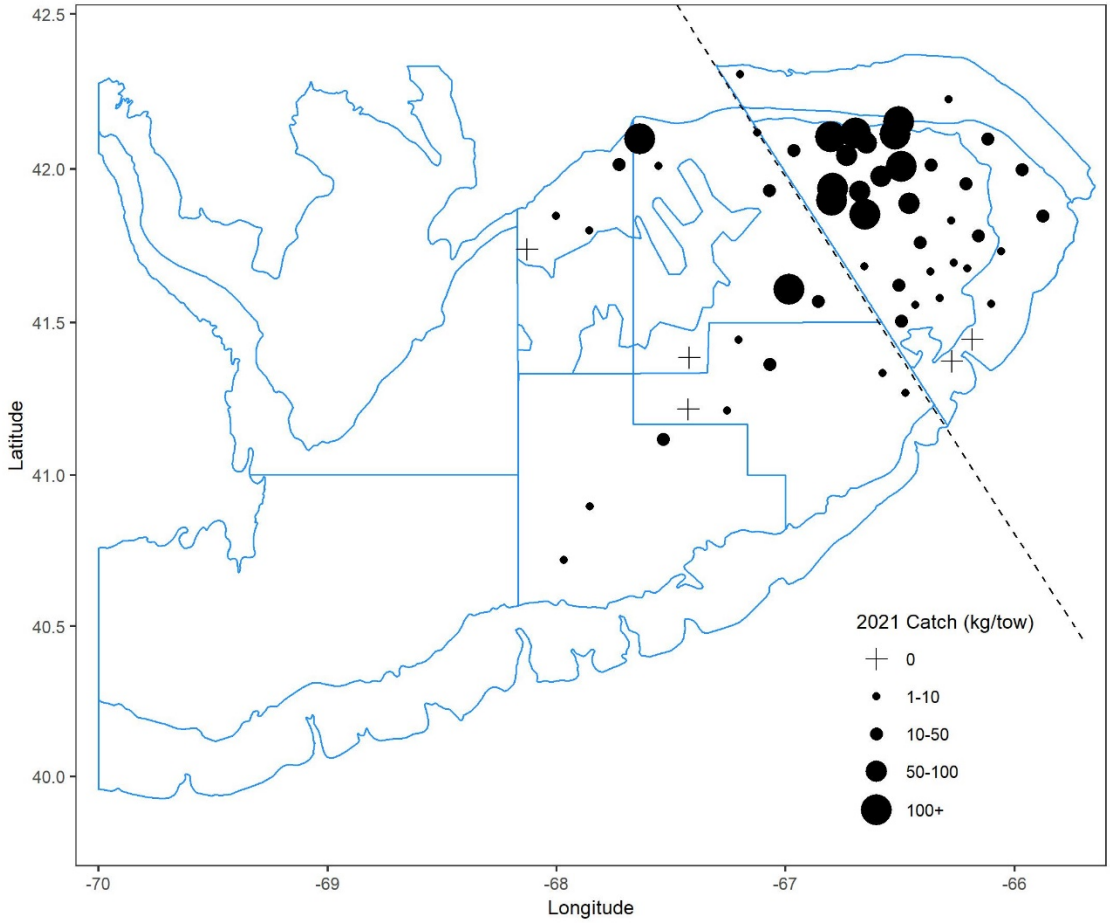

Figure 3a. Distribution of Haddock catches during the 2021 Winter RV Survey. Black circles represent catches. The circle area is proportional to the 2021 catch size. Zero catch is represented by the + symbol.

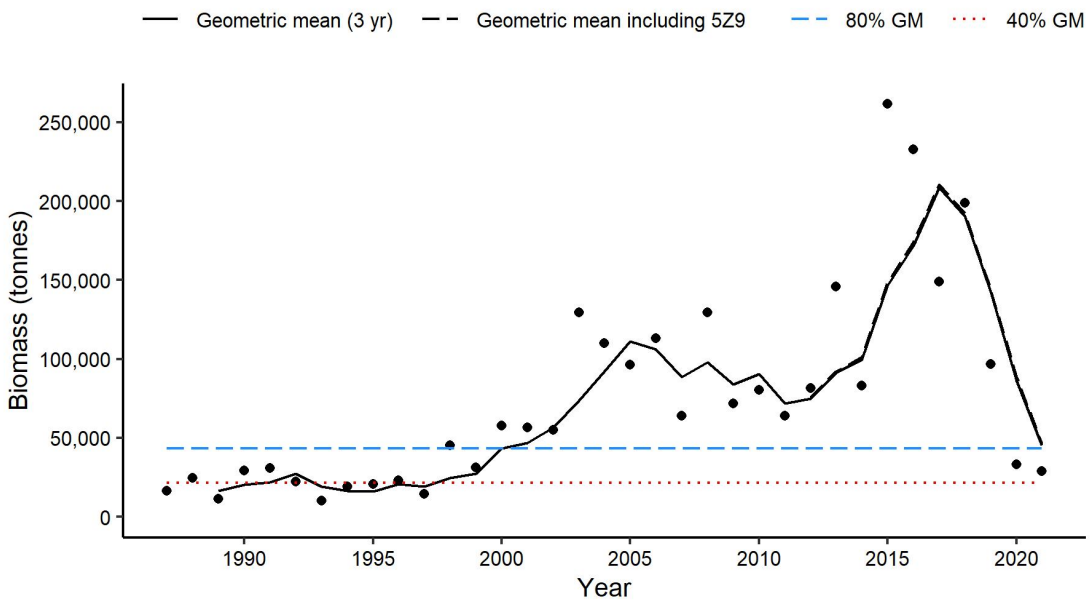

Figure 3b. Biomass index for Haddock in Strata 5Z1–5Z4 from the Winter RV Survey. The 3-yr geometric mean biomass (5Z1–5Z4) is represented by the solid black line. The dashed black line represents the combined 3-yr geometric-mean biomass (since 2010) of 5Z1–5Z4 and 5Z9. The dashed and dotted horizontal lines represent 80% and 40% of the long-term geometric mean (1987–2020), respectively. The large black dots represent the biomass estimate (5Z1–5Z4) for that year.

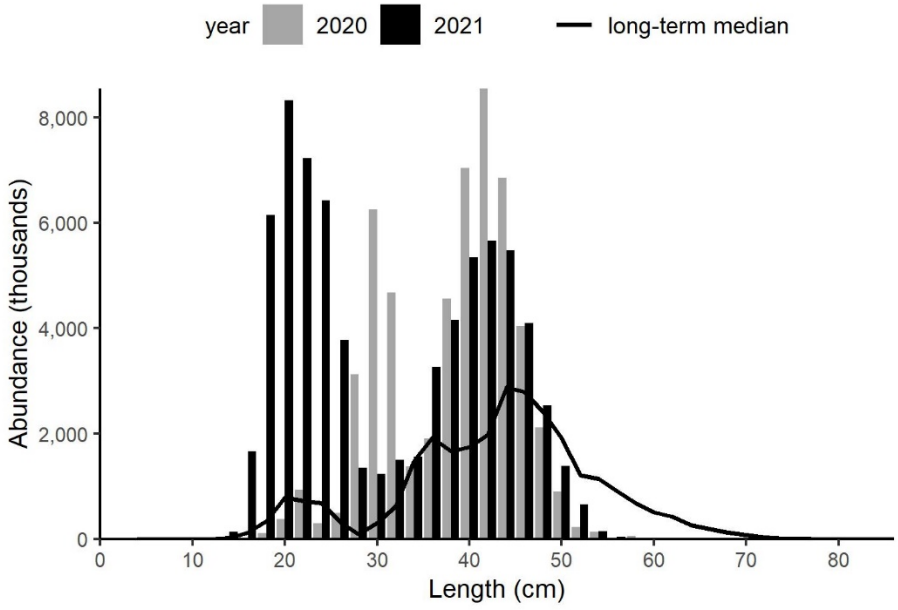

Figure 3c. Length-frequency indices for Haddock in Strata 5Z1–5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at-length from the 2020 survey. The black bars represent the number in thousands at-length from the 2021 survey. The solid black line represents the median number in thousands at-length for the time period 1987–2019.

Pollock

Pollock were only caught in three sets and were absent through the deeper water in 5Z9 (Figure 4a). The biomass index and the 3-yr GM are both below 40% of the long-term GM (Figure 4b). The 3-yr GM with and without 5Z9 are identical this year as no Pollock were caught in 5Z9. Inclusion of a broader area may be needed to provide indices that are useful for monitoring abundance trends as the 3-yr GM including 5Z9 has been significantly higher in all previous years. Only eight individuals were caught in 2021; therefore, no trends can be observed in the indices at-length (Figure 4c).

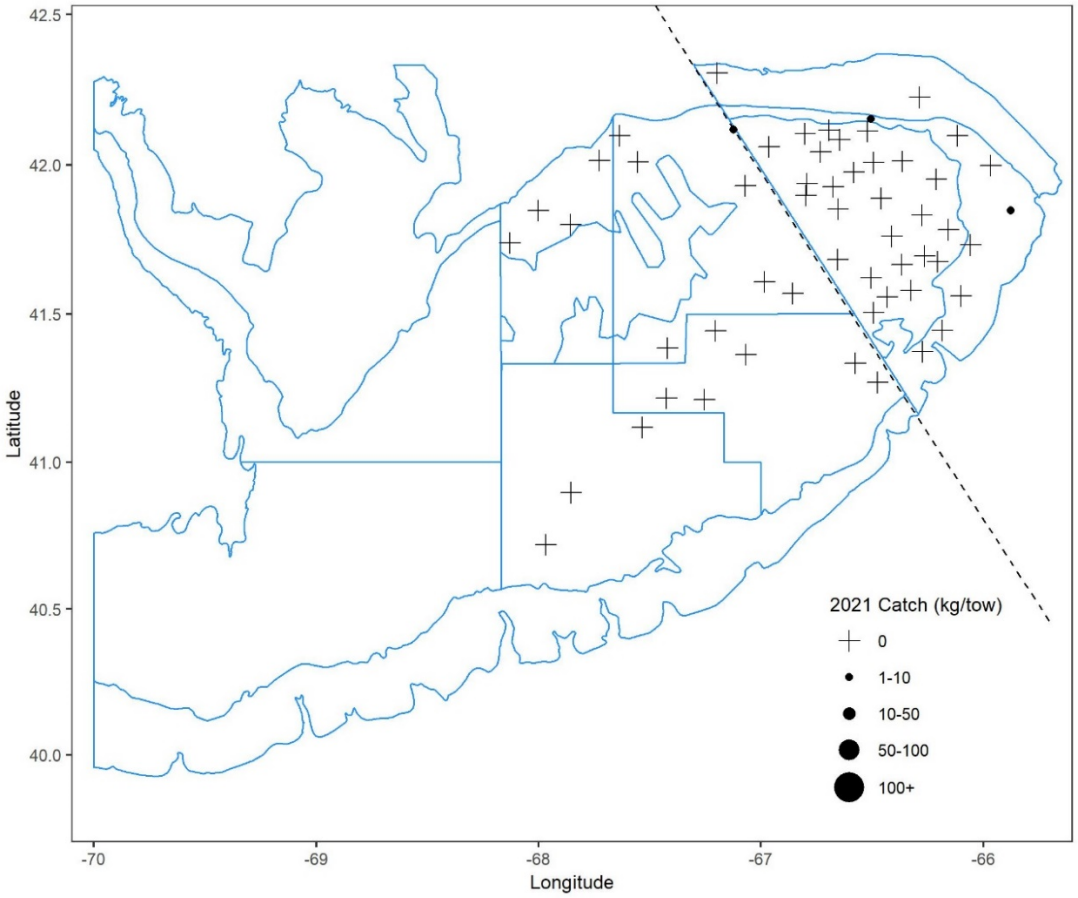

Figure 4a. Distribution of Pollock catches during the 2021 Winter RV Survey. Black circles represent catches. The circle area is proportional to the 2021 catch size. Zero catch is represented by the + symbol.

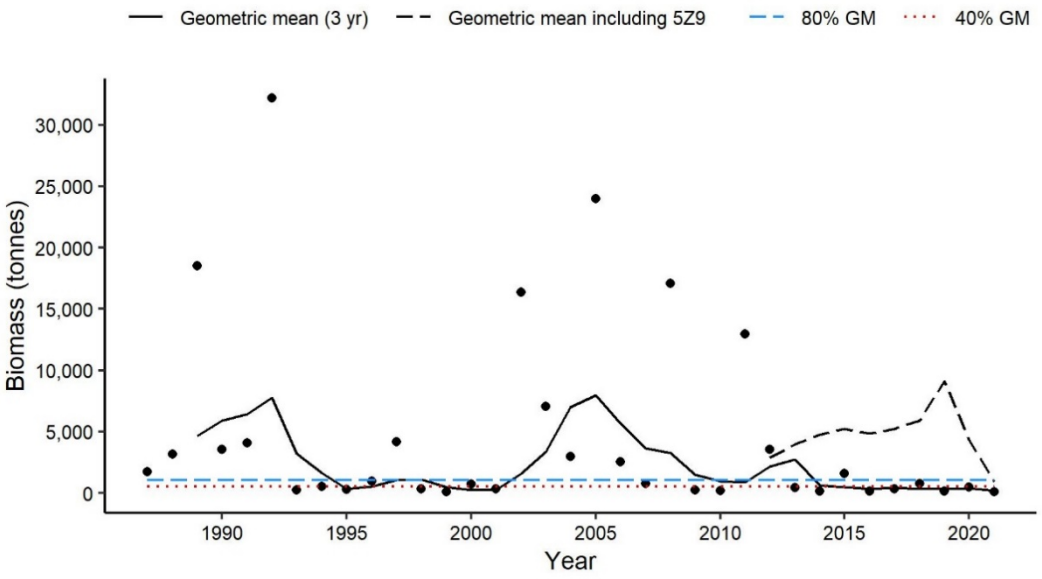

Figure 4b. Biomass index for Pollock in Strata 5Z1–5Z4 from the Winter RV Survey. The 3-yr geometric mean biomass (5Z1–5Z4) is represented by the solid black line. The dashed black line represents the combined 3-yr geometric mean biomass (since 2010) of 5Z1–5Z4 and 5Z9. The dashed and dotted horizontal lines represent 80% and 40% of the long-term geometric mean (1987–2020), respectively. The large black dots represent the biomass estimate (5Z1–5Z4) for that year.

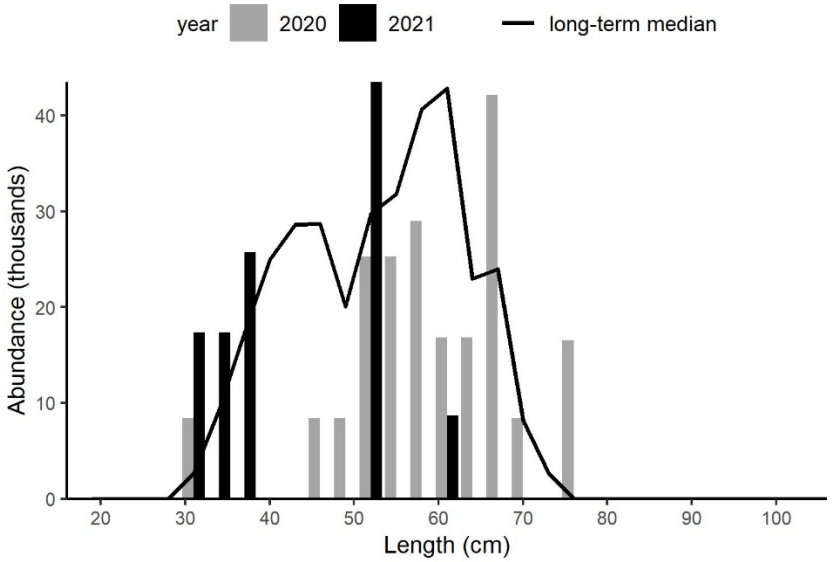

Figure 4c. Length-frequency indices for Pollock in Strata 5Z1–5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at-length from the 2020 survey. The black bars represent the number in thousands at-length from the 2021 survey. The solid black line represents the median number in thousands at-length for the time period 1987–2019.

Yellowtail Flounder

Yellowtail flounder were found primarily in 5Z1 and 5Z2 (Figure 5a). Catches were low in all areas. The 3-yr GM remained below 40% of the long-term GM for the eighth year in a row (Figure 5b). The 3-yr GM with and without 5Z9 were virtually identical. Indices at-length for 2021 remained well below the long-term median for most lengths (Figure 5c).

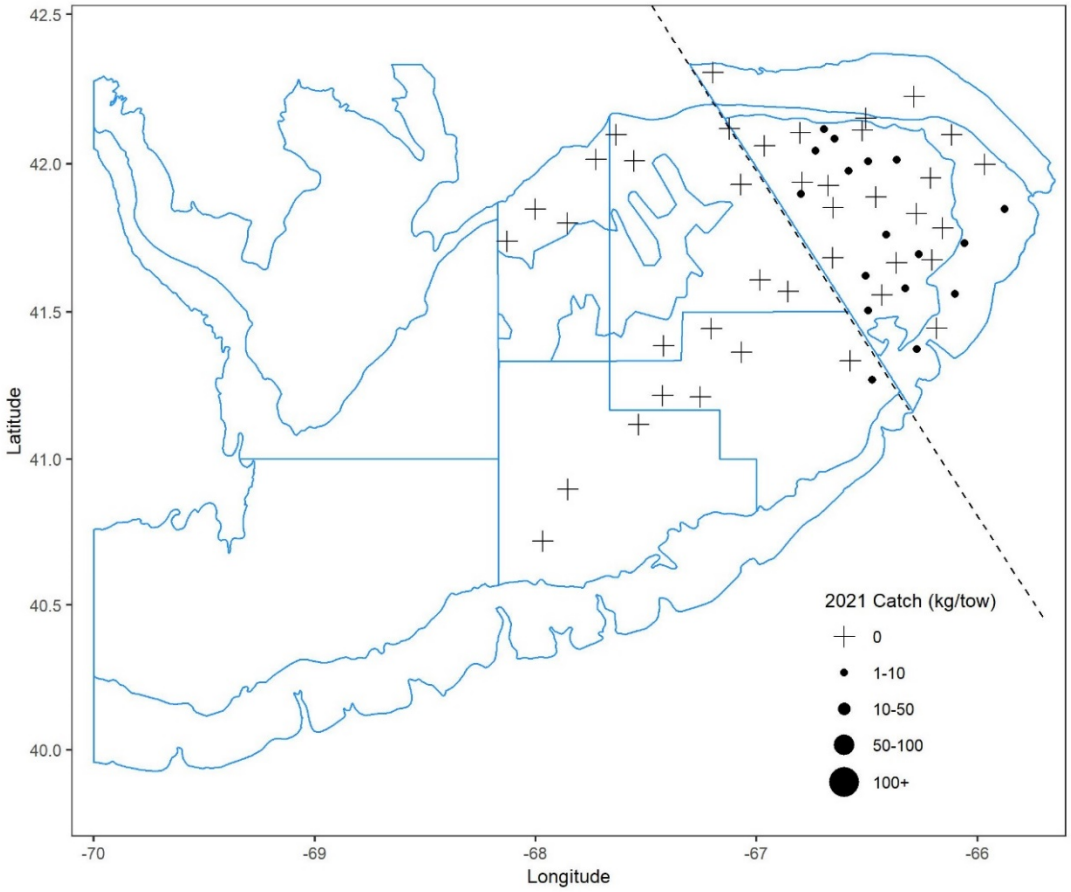

Figure 5a. Distribution of Yellowtail Flounder catches during the 2021 Winter RV Survey. Black circles represent catches. The circle area is proportional to the 2021 catch size. Zero catch is represented by the + symbol.

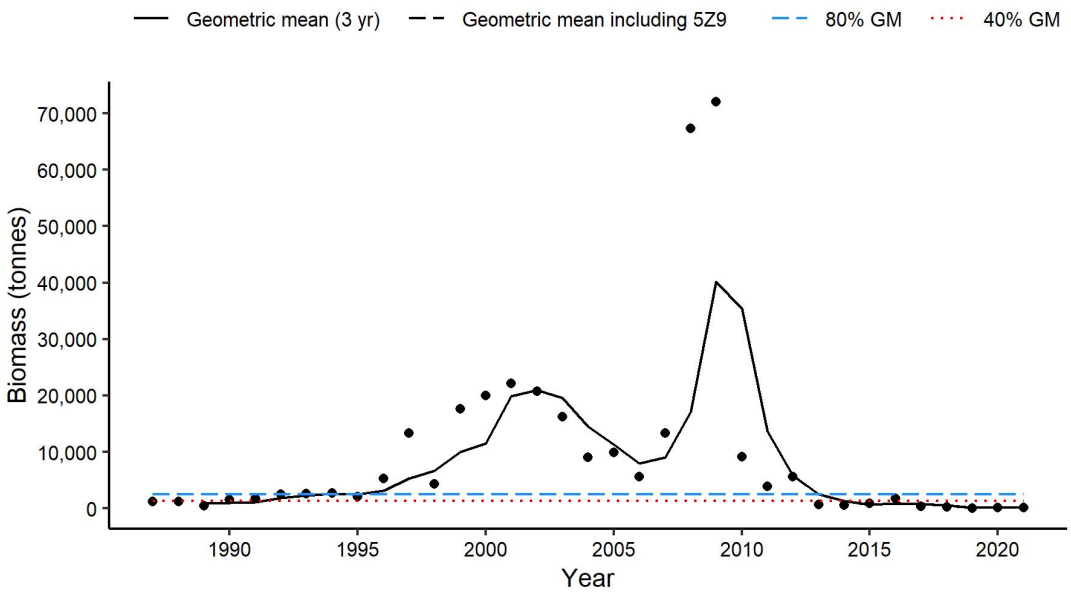

Figure 5b. Biomass index for Yellowtail Flounder in Strata 5Z1–5Z4 from the Winter RV Survey. The 3-yr geometric mean biomass (5Z1–5Z4) is represented by the solid black line. The dashed black line represents the combined 3-yr geometric mean biomass (since 2010) of 5Z1–5Z4 and 5Z9. The dashed and dotted horizontal lines represent 80% and 40% of the long-term geometric mean (1987–2020), respectively. The large black dots represent the biomass estimate (5Z1–5Z4) for that year.

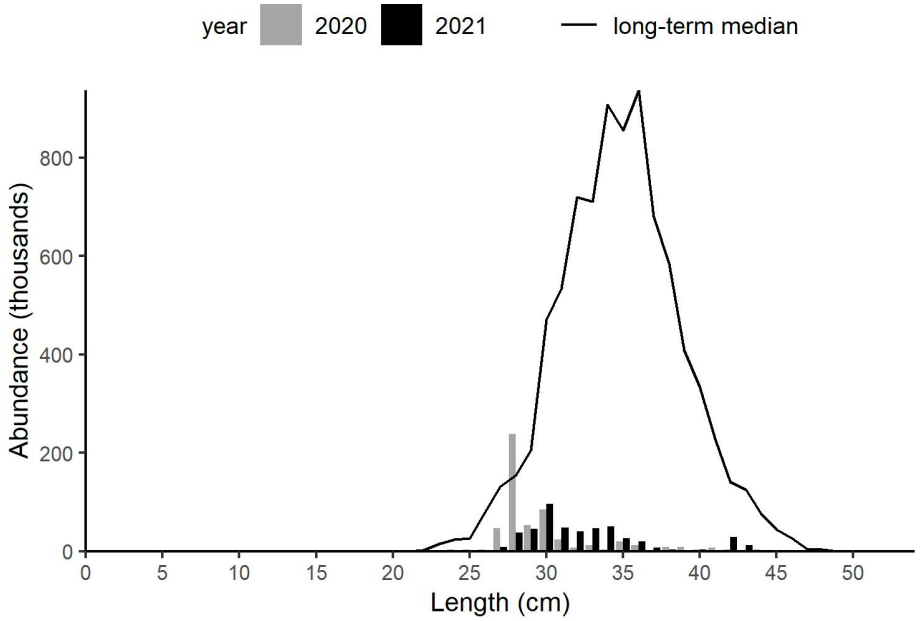

Figure 5c. Length-frequency indices for Yellowtail Flounder in Strata 5Z1–5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at-length from the 2020 survey. The black bars represent the number in thousands at-length from the 2021 survey. The solid black line represents the median number in thousands at-length for the time period 1987–2019.

Smooth Skate

Smooth Skate were caught in two sets, only one set within the 5Z1–5Z4 index area (Figure 6a). Despite only being caught in one set within the index area, the 3-yr GM is above 80% of the long-term GM (Figure 6b). Including 5Z9 in the biomass index gives a much higher 3-yr GM, with the highest value coming from 2020. Only six individuals were caught in the 5Z1–5Z4 index area in 2021; therefore, no trends can be observed in the indices at-length (Figure 6c). The long-term median is 0 kg/tow for all lengths, which indicates that the survey infrequently captures Smooth Skate at any length within the 5Z1–5Z4 area.

In the winter RV survey, Smooth Skate are most commonly found in the Fundian Channel (5Z9), the Great South Channel (5Z5), and at the mouth of the Bay of Fundy. Due to 4X not being surveyed in the 2021 Spring Survey because of vessel issues, Figures 6d–f have not been updated since 2020. Biomass indices for Smooth Skate are far higher in 4X than in 5Z1–5Z4 during the winter (Figure 6d), and, in recent years, indices have been higher in 4X than in the late 1970s and early 1980s. Smooth Skate are generally low in abundance over Georges Bank in 5Z1–5Z4 in either winter or summer (Figure 6e), indicating they do not seasonally migrate on and off the Bank. Biomass indices in 4X5, however, are higher in winter surveys than in summer surveys (Figure 6f). Either distribution changes seasonally, such that the population is more available to the survey in winter than in summer, or the behavior changes seasonally making them more susceptible to capture by the survey trawl in winter.

Given the distribution of Smooth Skate, monitoring trends for 5Z separately from 4X may not be informative. The higher catch in winter surveys suggests this is a better seasonal survey for monitoring biomass trends for this species.

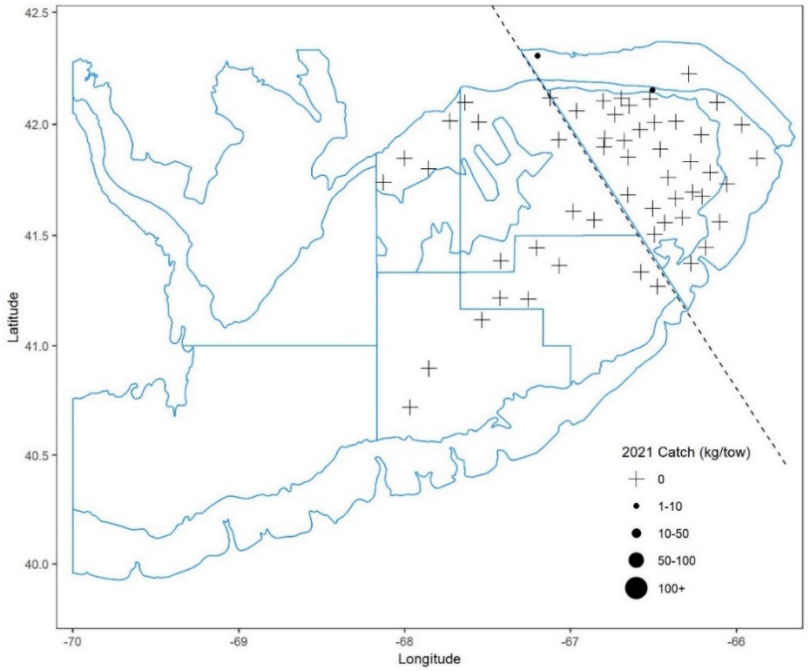

Figure 6a. Distribution of Smooth Skate catches during the 2021 Winter RV Survey. Black circles represent catches. The circle area is proportional to the 2021 catch size. Zero catch is represented by the + symbol.

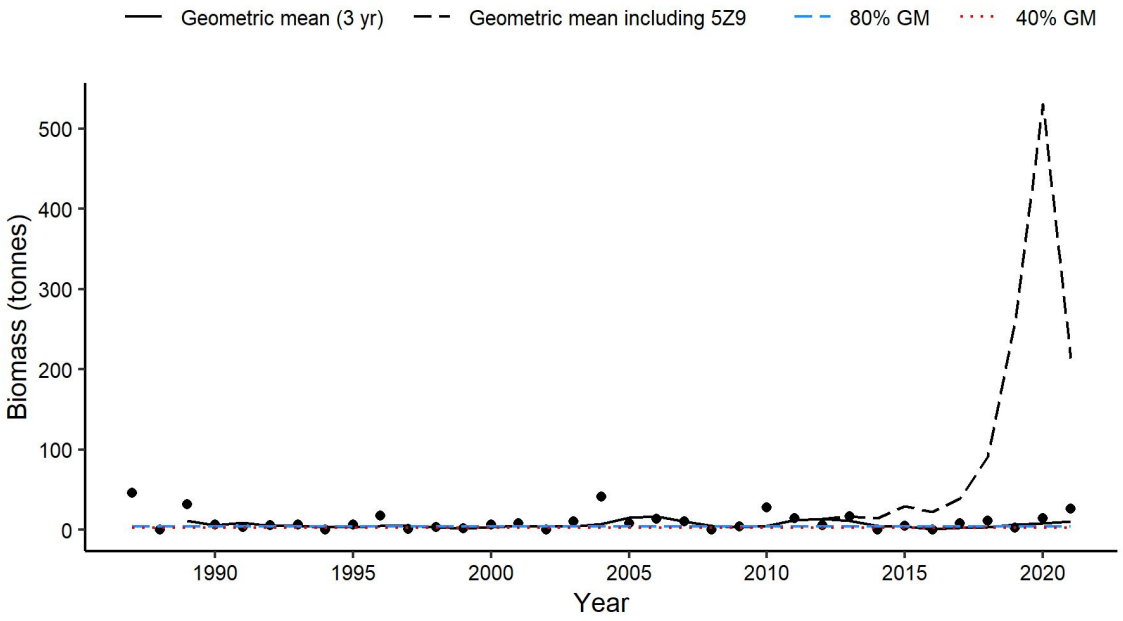

Figure 6b. Biomass index for Smooth Skate in Strata 5Z1–5Z4 from the Winter RV Survey. The 3-yr geometric mean biomass for 5Z1–5Z4 is represented by the solid black line. The dashed black line represents the combined 3-yr geometric mean biomass (since 2010) of 5Z1–5Z4 and 5Z9. The dashed and dotted horizontal lines represent 80% and 40% of the long-term geometric mean (1987–2020), respectively. The large black dots represent the biomass estimate (5Z1–5Z4) for that year.

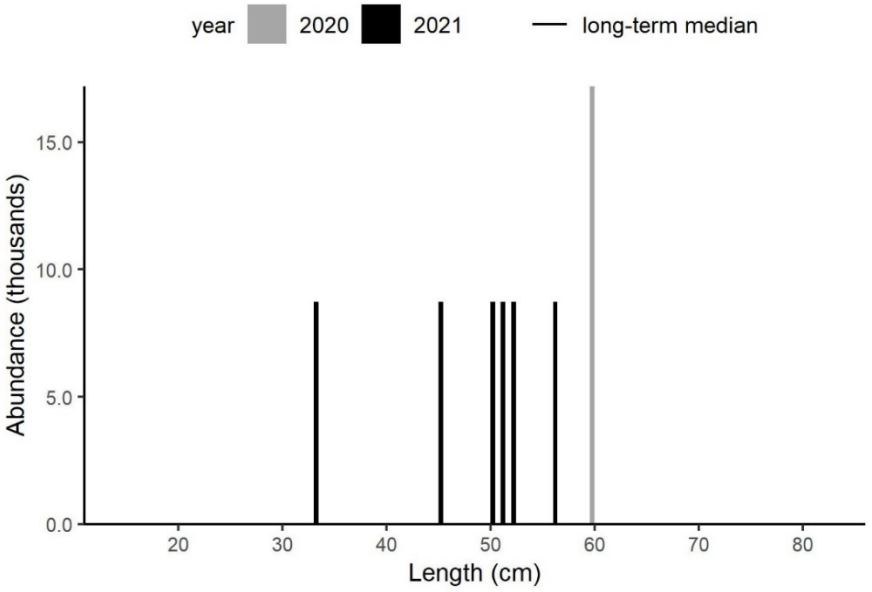

Figure 6c. Length-frequency indices for Smooth Skate in Strata 5Z1–5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at-length from the 2020 survey. The black bars represent the number in thousands at-length from the 2021 survey. The long-term median is 0 for all lengths.

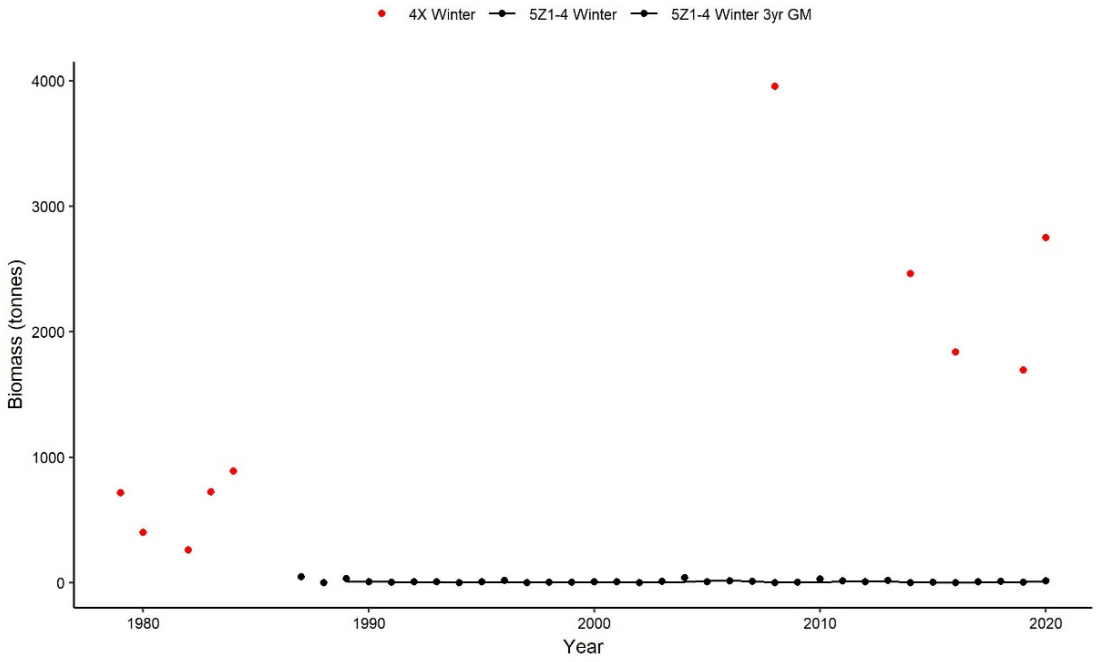

Figure 6d. Winter survey biomass indices for Smooth Skate in 4X (red dots) and 5Z1–5Z4 (black dots), and the 3-yr GM for 5Z1–5Z4 (black line).

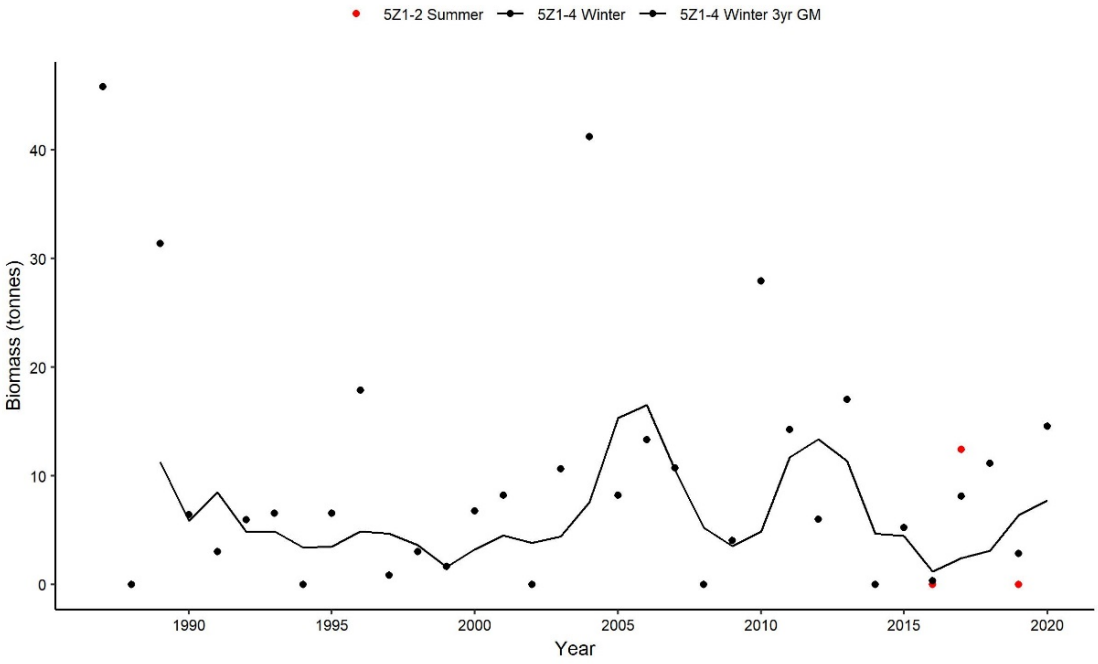

Figure 6e. Annual biomass index for Smooth Skate in Strata 5Z1–5Z4 (black dots) and the 3-yr geometric mean biomass for 5Z1–5Z4 (solid black line) from the Winter RV Survey (1987–2020), and the annual biomass index for Strata 5Z1–5Z2 (red dots) from the Summer RV Survey for years with sufficient survey coverage (2016–2017, 2019).

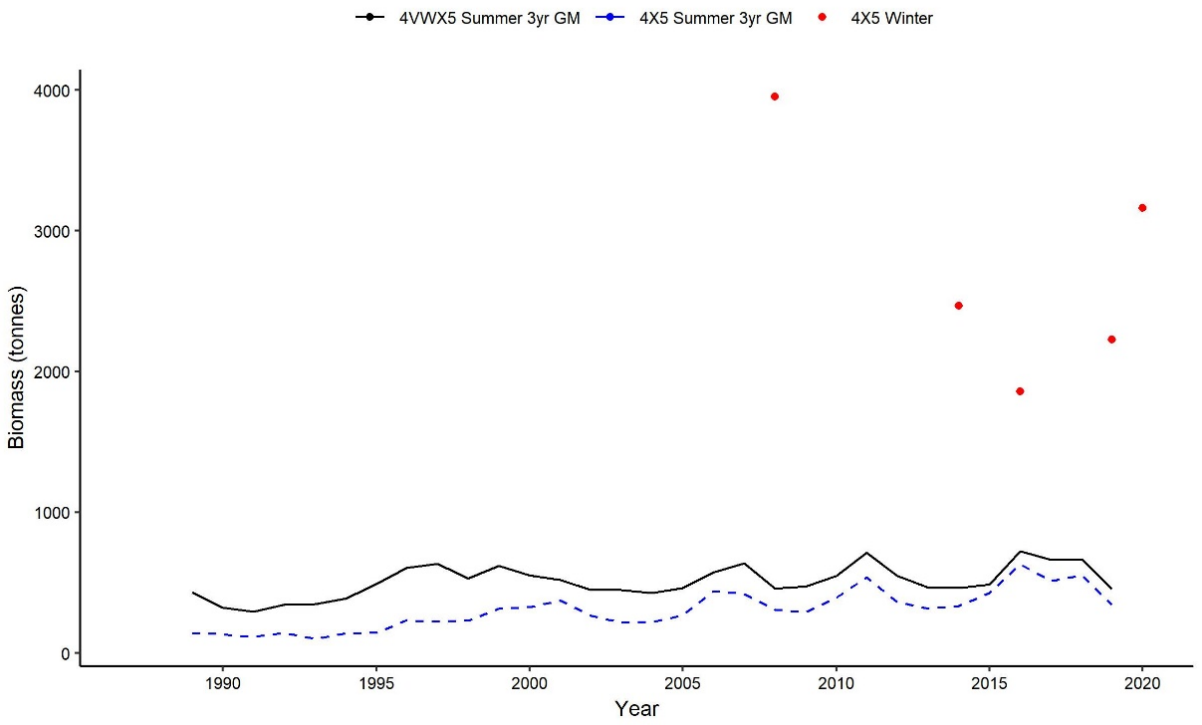

Figure 6f. The 3-yr geometric mean biomass index for Smooth Skate from survey strata representing NAFO areas 4VWX5 (solid black line) and 4X5 (dashed blue line) from the Summer RV Survey (1987–2019), and the annual biomass index from survey strata representing NAFO Areas 4X5 (red dots) from the Winter RV Survey for years with sufficient survey coverage (2008, 2014, 2016, 2019, 2020).

Thorny Skate

Thorny Skates were caught in two sets in 5Z1 (Figure 7a). Despite only being caught in two sets, the biomass index is over 80% of the long-term GM. The 3-yr GM remains below 40% of the long-term GM for the third year in a row (Figure 7b). The 3-yr GM does not differ greatly with or without the inclusion of 5Z9 and follows the same trend. The Summer RV surveys indicate the same overall declining trend for Thorny Skate in 4VWX, as do surveys conducted by the National Oceanic and Atmospheric Administration (NOAA) in the Gulf of Maine (NEFSC 2019).

A total of ten individuals were caught in 2021; therefore, no trends can be observed in the indices at-length (Figure 7c). The long-term median is 0 kg/tow for all lengths, which indicates that the survey infrequently captures Thorny Skate at any length within the 5Z1–5Z4 area.

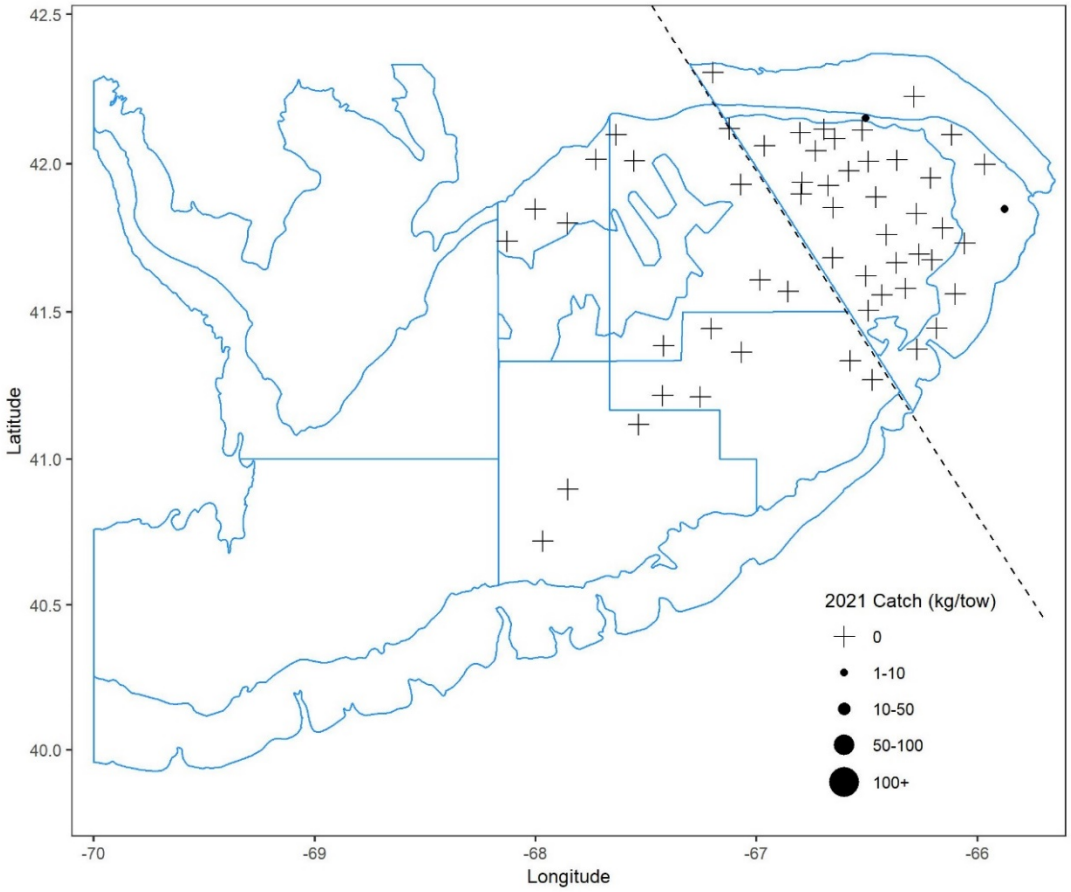

Figure 7a. Distribution of Thorny Skate catches during the 2021 Winter RV Survey. Black circles represent catches. The circle area is proportional to the 2021 catch size. Zero catch is represented by the + symbol.

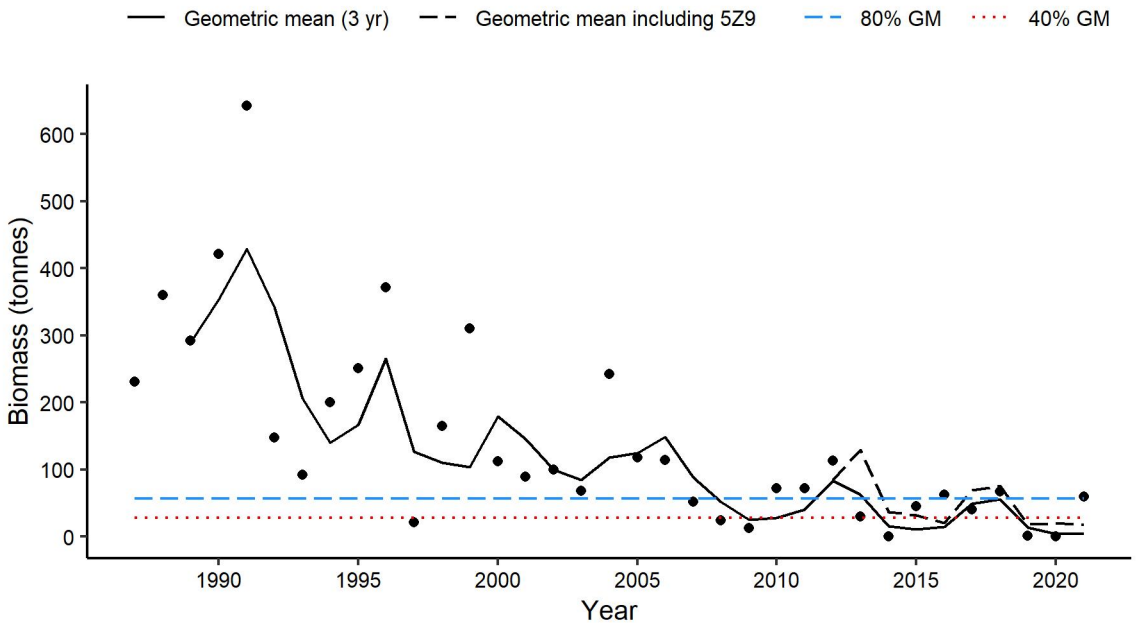

Figure 7b. Biomass index for Thorny Skate in strata 5Z1–5Z4 from the Winter RV Survey. The 3-yr geometric mean biomass for 5Z1–5Z4 is represented by the solid black line. The dashed black line represents the combined 3-yr geometric mean biomass (since 2010) of 5Z1–5Z4 and 5Z9. The dashed and dotted horizontal lines represent 80% and 40% of the long-term geometric mean (1987–2020), respectively. The large black dots represent the biomass estimate (5Z1–5Z4) for that year.

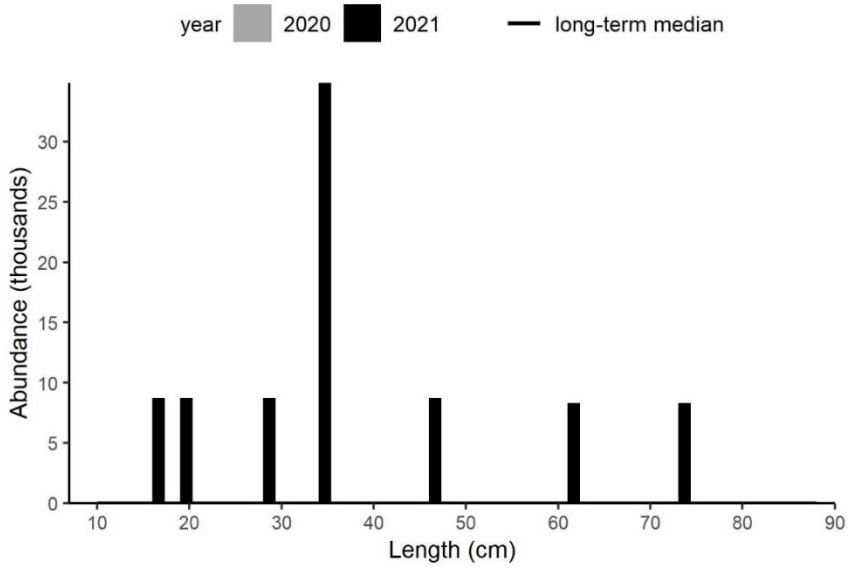

Figure 7c. Length-frequency indices for Thorny Skate in Strata 5Z1–5Z4 from the Winter RV Survey. No Thorny skates were caught during the 2020 survey. The black bars bar represents the number in thousands at-length from the 2021 survey. The long-term (1987–2019) median is 0 for all lengths.

Barndoor Skate

Barndoor Skate were caught in eight sets, seven within the 5Z1–5Z4 index area (Figure 8a). The 3-yr GM has fallen below 40% of the long-term GM for the first time since 2009 (Figure 8b). Including 5Z9 in the index area gives a much higher biomass index. In this area, there has been a large decline in the 3-yr GM since last year.

Sixteen individuals were caught in 5Z1–5Z4 in 2021; therefore, no trends can be observed in the indices at-length (Figure 8c). A single individual was caught in 5Z9. The largest Barndoor Skate caught in 5Z1–5Z4 was 54 cm (Figure 8c). The long-term median for 5Z1–5Z4 is 0 kg/tow for all lengths, which indicates that the survey infrequently captures Barndoor Skate at any length within the 5Z1–5Z4 area.

While few Barndoor Skate are caught during winter RV surveys in 5Z1–5Z4, biomass indices are higher in summer surveys on Georges Bank, indicating that they seasonally migrate on and off the bank (Figure 8d). Biomass indices for summer and winter RV surveys are similar in magnitude (Figure 8e), suggesting either may be suitable for monitoring population trends for this species in waters of the Maritimes Region. Due to 4X not being surveyed in the 2021 Spring Survey because of vessel issues, Figures 8d–e have not been updated since 2020.

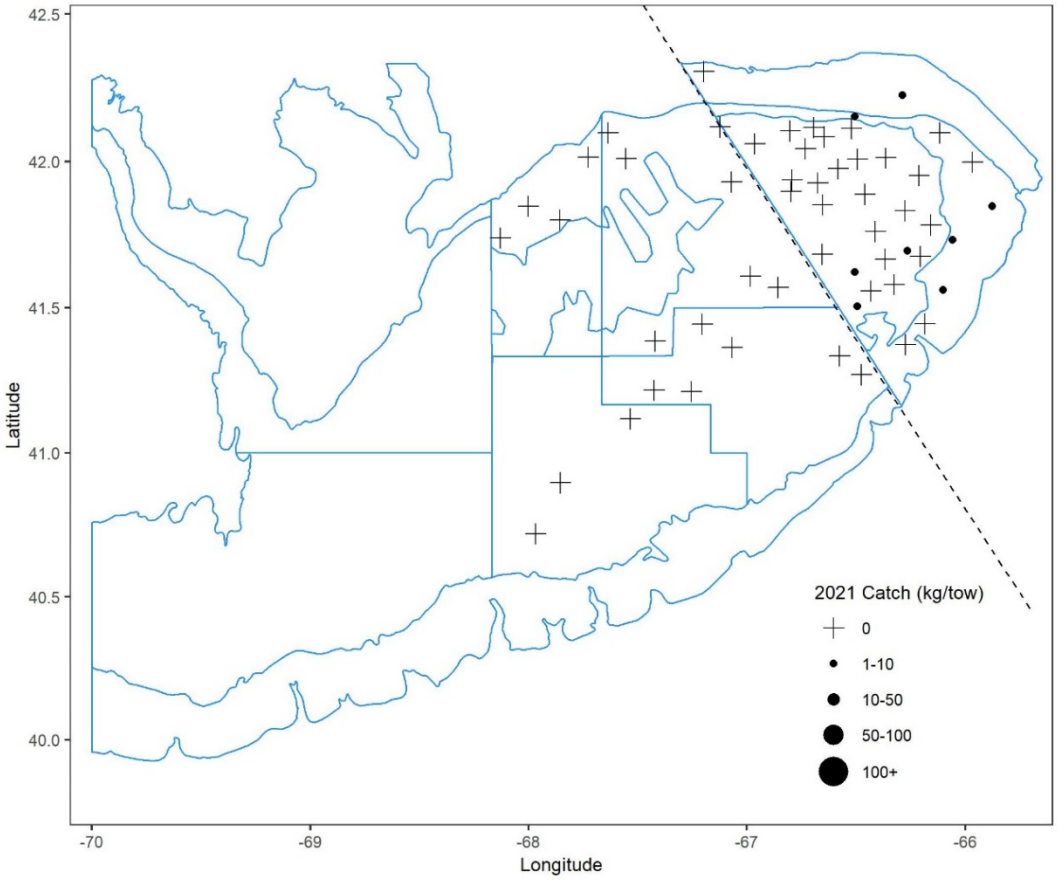

Figure 8a. Distribution of Barndoor Skate catches during the 2021 Winter RV Survey. Black circles represent catches. The circle area is proportional to the 2021 catch size. Zero catch is represented by the + symbol.

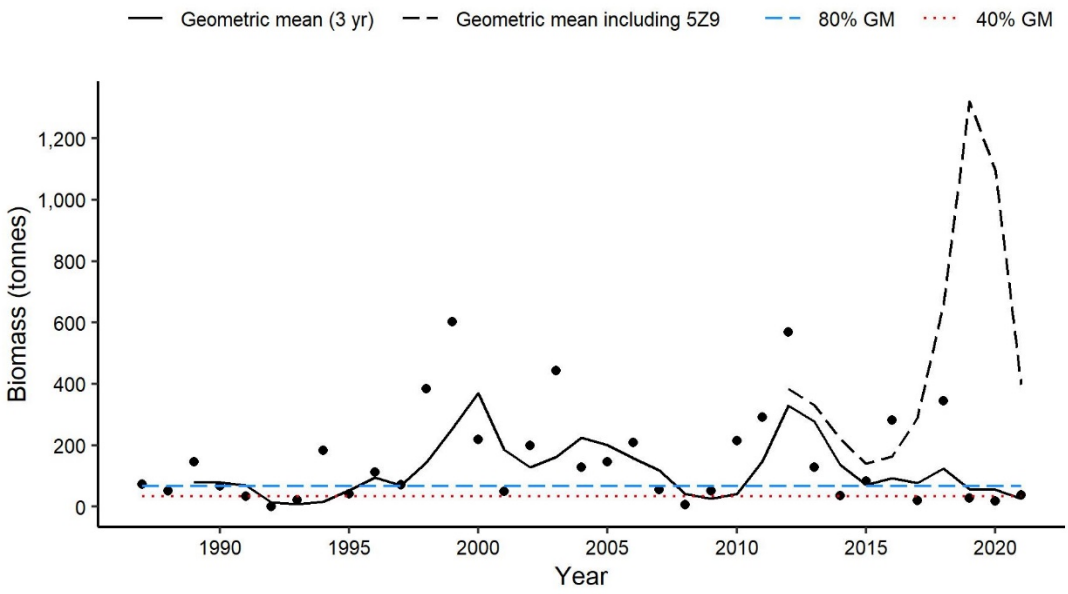

Figure 8b. Biomass index for Barndoor Skate in Strata 5Z1–5Z4 from the Winter RV Survey. The 3-yr geometric mean biomass for 5Z1–5Z4 is represented by the solid black line. The dashed black line represents the combined 3-yr geometric mean biomass (since 2010) of 5Z1–5Z4 and 5Z9. The dashed and dotted horizontal lines represent 80% and 40% of the long-term geometric mean (1987–2020), respectively. The large black dots represent the biomass estimate (5Z1–5Z4) for that year.

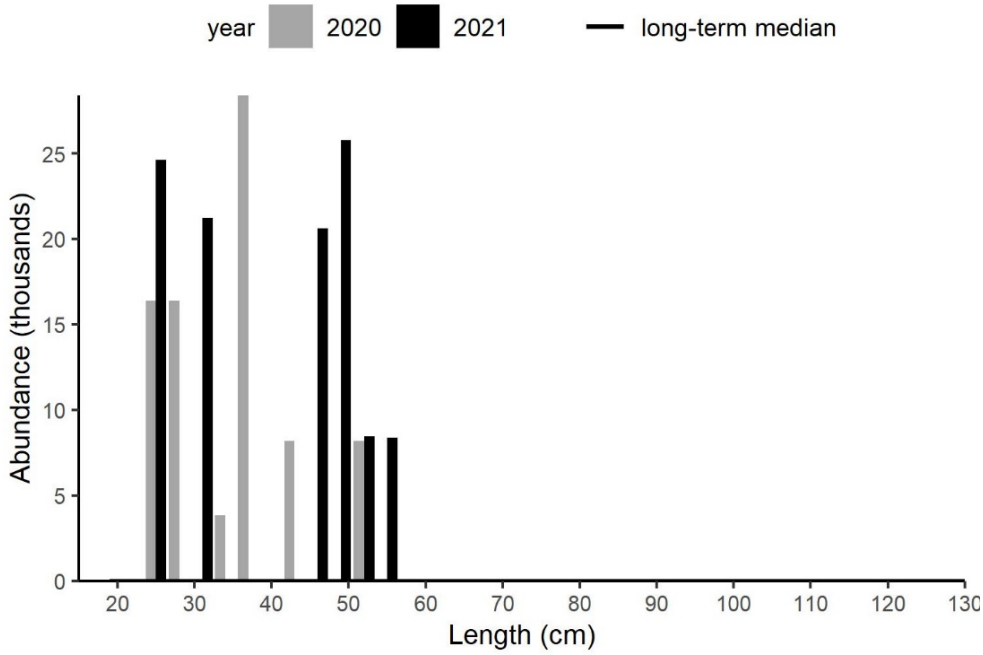

Figure 8c. Length-frequency indices for Barndoor Skate in Strata 5Z1–5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at-length from the 2020 survey. The black bars represent the number in thousands at-length from the 2021 survey. The long-term median is 0 for all lengths.

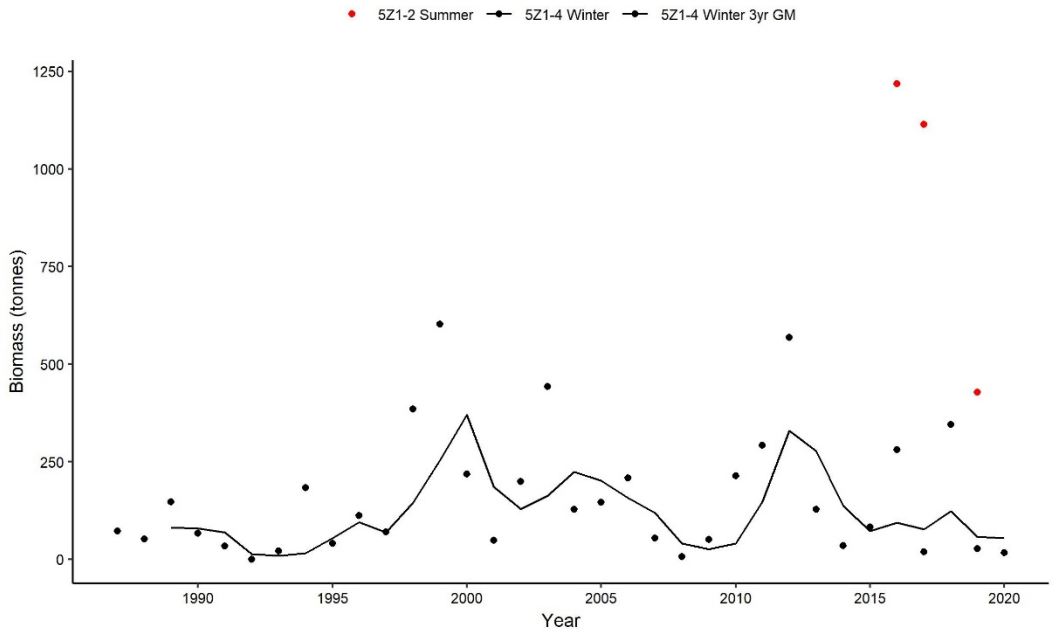

Figure 8d. Annual biomass index for Barndoor Skate in Strata 5Z1–5Z4 (black dots) and the 3-yr geometric mean biomass for 5Z1–5Z4 (solid black line) from the Winter RV Survey (1987–2020), and the annual biomass index for Strata 5Z1–5Z2 (red dots) from the Summer RV Survey for years with sufficient survey coverage (2016–2017, 2019).

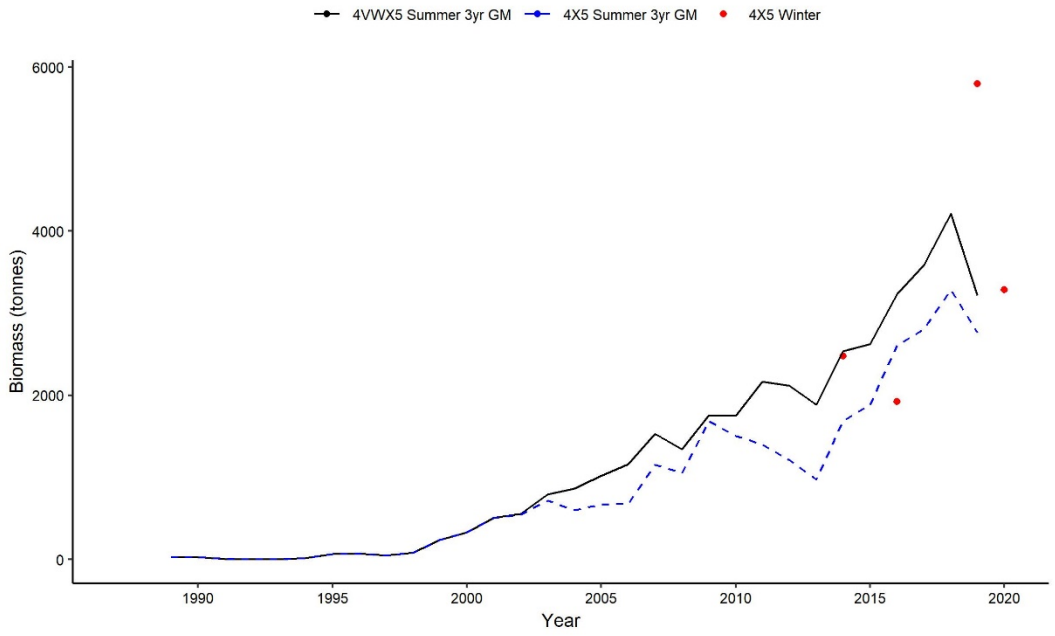

Figure 8e. The 3-yr geometric mean biomass index for Barndoor Skate from survey strata representing NAFO areas 4VWX5 (solid black line) and 4X5 (dashed blue line) from the Summer RV Survey (1987–2019), and the annual biomass index from survey strata representing NAFO Areas 4X5 (red dots) from the Winter RV Survey for years with sufficient survey coverage (2014, 2016, 2019, 2020).

Winter Skate

At lengths below 35 to 40 cm, it is very difficult to distinguish Little Skate and Winter Skate. Common practice at-sea in the past was to group all small skates as Winter Skate if they lacked the features of sexual maturity used to identify Little Skate. These small skates (< 40 cm) are now separated from either Little Skate or Winter Skate at-sea. For purposes of comparisons over time, only data for Winter Skate above 39 cm were included in these summaries.

Winter Skate were well distributed across Georges Bank (Figure 9a). The 3-yr GM is below 40% of the long-term GM for the second time in the time series (Figure 9b). The 3-yr GM is slightly higher with the inclusion of 5Z9 in some years, but 5Z1–5Z4 accounts for the bulk of the biomass index for this species. The indices at-length are well below the long-term median at most lengths, with very few Winter Skate over 65 cm caught in 2021 (Figure 9c).

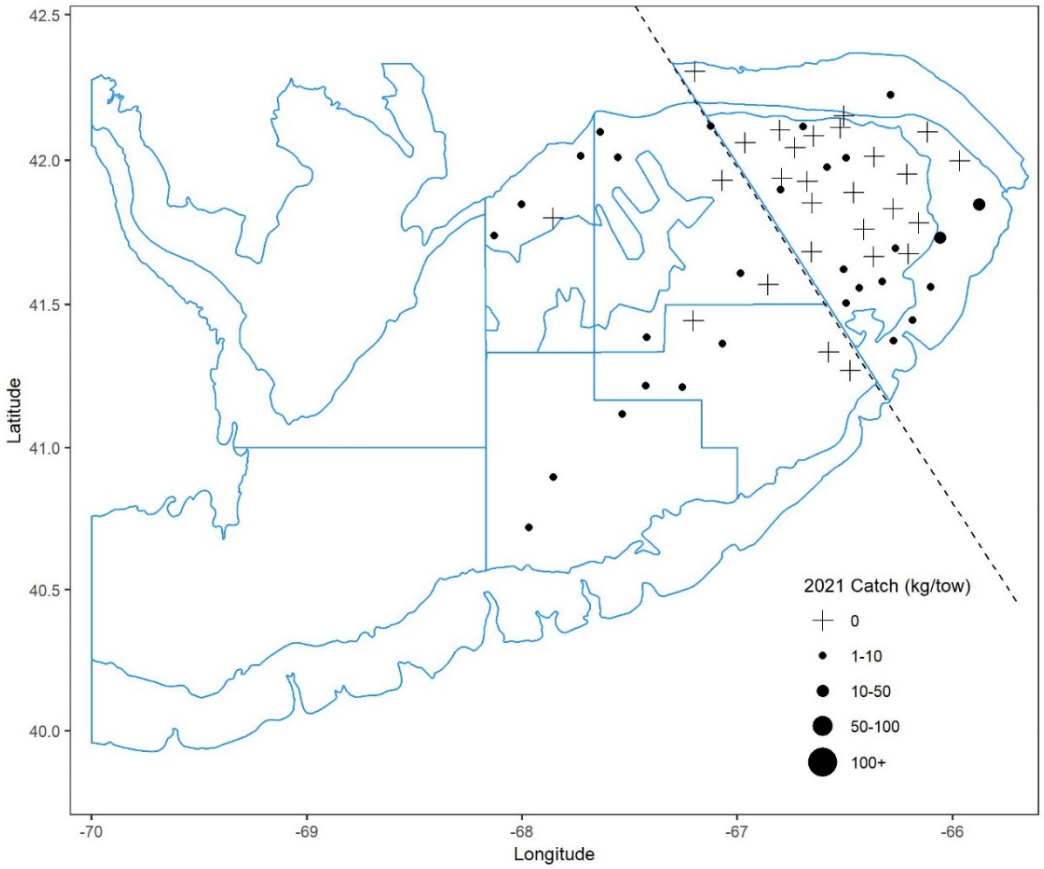

Figure 9a. Distribution of Winter Skate catches during the 2021 Winter RV Survey. Black circles represent catches. The circle area is proportional to the 2021 catch size. Zero catch is represented by the + symbol.

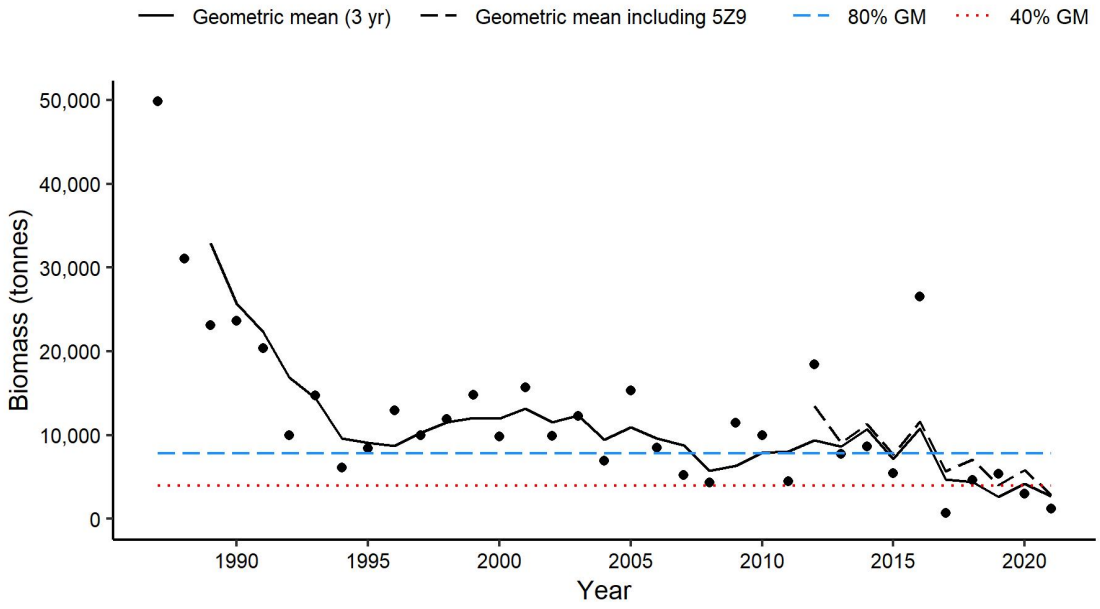

Figure 9b. Biomass index for Winter Skate in Strata 5Z1–5Z4 from the Winter RV Survey. The 3-yr geometric mean biomass for 5Z1–5Z4 is represented by the solid black line. The dashed black line represents the combined 3-yr geometric mean biomass (since 2010) of 5Z1–5Z4 and 5Z9. The dashed and dotted horizontal lines represent 80% and 40% of the long-term geometric mean (1987–2020), respectively. The large black dots represent the biomass estimate (5Z1–5Z4) for that year.

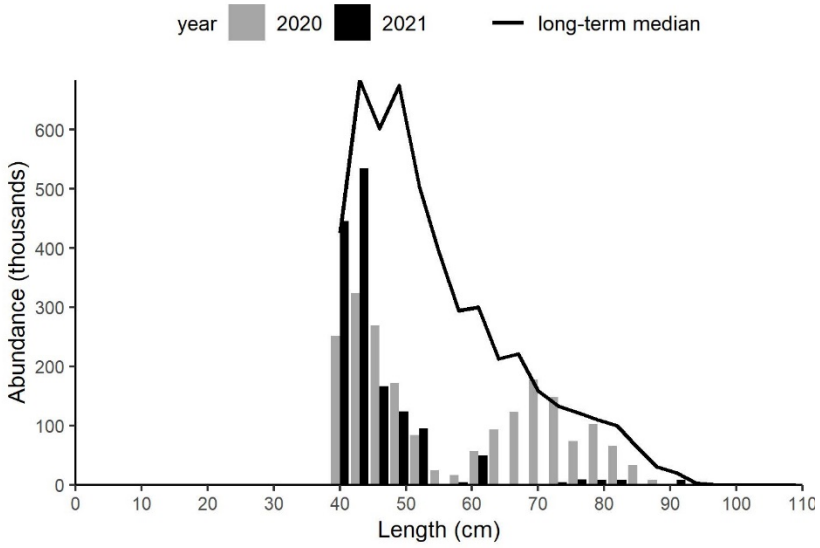

Figure 9c. Length-frequency indices for Winter Skate in Strata 5Z1–5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at-length from the 2020 survey. The black bars represent the number in thousands at-length from the 2021 survey. The solid black line represents the median number in thousands at-length for the time period 1987–2019.

Little Skate

Little Skate were well distributed across Georges Bank (Figure 10a). The 3-yr GM has fallen below 40% of the long-term GM for the first time in the time series (Figure 10b). The 3-yr GM with and without 5Z9 are virtually identical. The indices at-length were at, or above, the long-term median at most lengths under 45 cm but below in larger fish (Figure 10c).

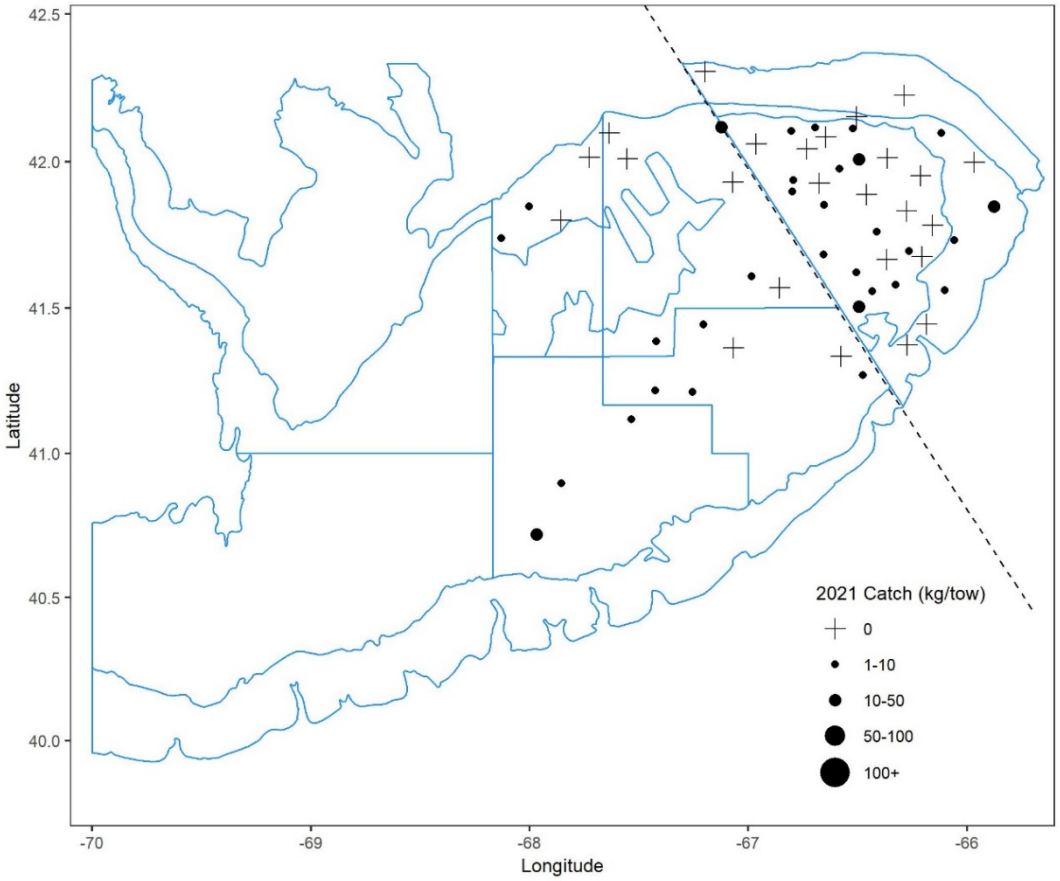

Figure 10a. Distribution of Little Skate catches during the 2021 Winter RV Survey. Black circles represent catches. The circle area is proportional to the 2021 catch size. Zero catch is represented by the + symbol.

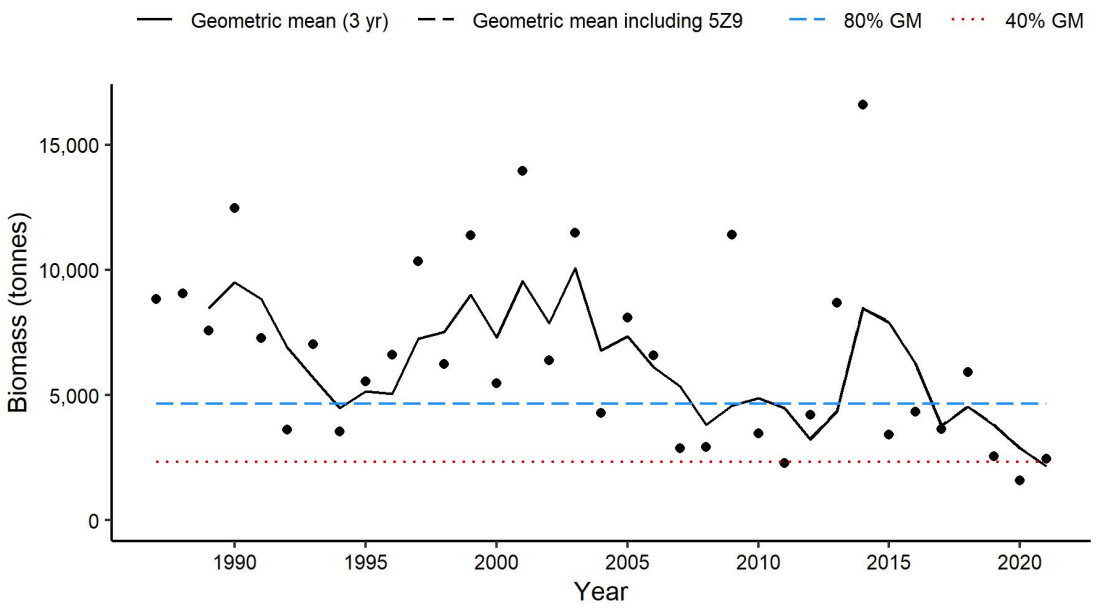

Figure 10b. Biomass index for Little Skate in Strata 5Z1–5Z4 from the Winter RV Survey. The 3-yr geometric mean biomass for 5Z1–5Z4 is represented by the solid black line. The dashed black line represents the combined 3-yr geometric mean biomass (since 2010) of 5Z1–5Z4 and 5Z9. The dashed and dotted horizontal lines represent 80% and 40% of the long-term geometric mean (1987–2020), respectively. The large black dots represent the biomass estimate (5Z1–5Z4) for that year.

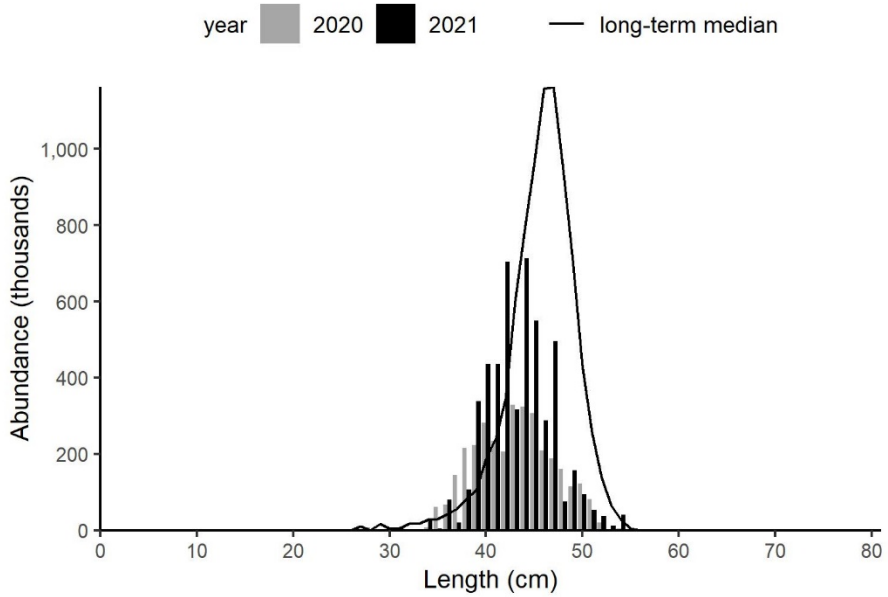

Figure 10c. Length-frequency indices for Little Skate in Strata 5Z1–5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at-length from the 2020 survey. The black bars represent the number in thousands at-length from the 2021 survey. The solid black line represents the median number in thousands at-length for the time period 1987–2019.

Juvenile Little and Winter skates

At lengths below 35 to 40 cm, it is very difficult to distinguish Little Skate and Winter Skate. Common practice at-sea in the past was to group all small skates as Winter Skate if they lacked the features of sexual maturity used to identify Little Skate. These small skates (< 40 cm) are now separated from either Little Skate or Winter Skate at-sea. For purposes of comparisons over time, data for Winter Skate less than 40 cm were included in these summaries.

Juvenile skates were well distributed across Georges Bank with the exception of the northeast peak (Figure 11a). The 3-yr GM biomass index has remained above 80% of the long-term GM for the fourth year in a row (Figure 11b). The indices at-length were above the long-term median for most lengths but below between 10–15 cm and 21–25 cm (Figure 10c).

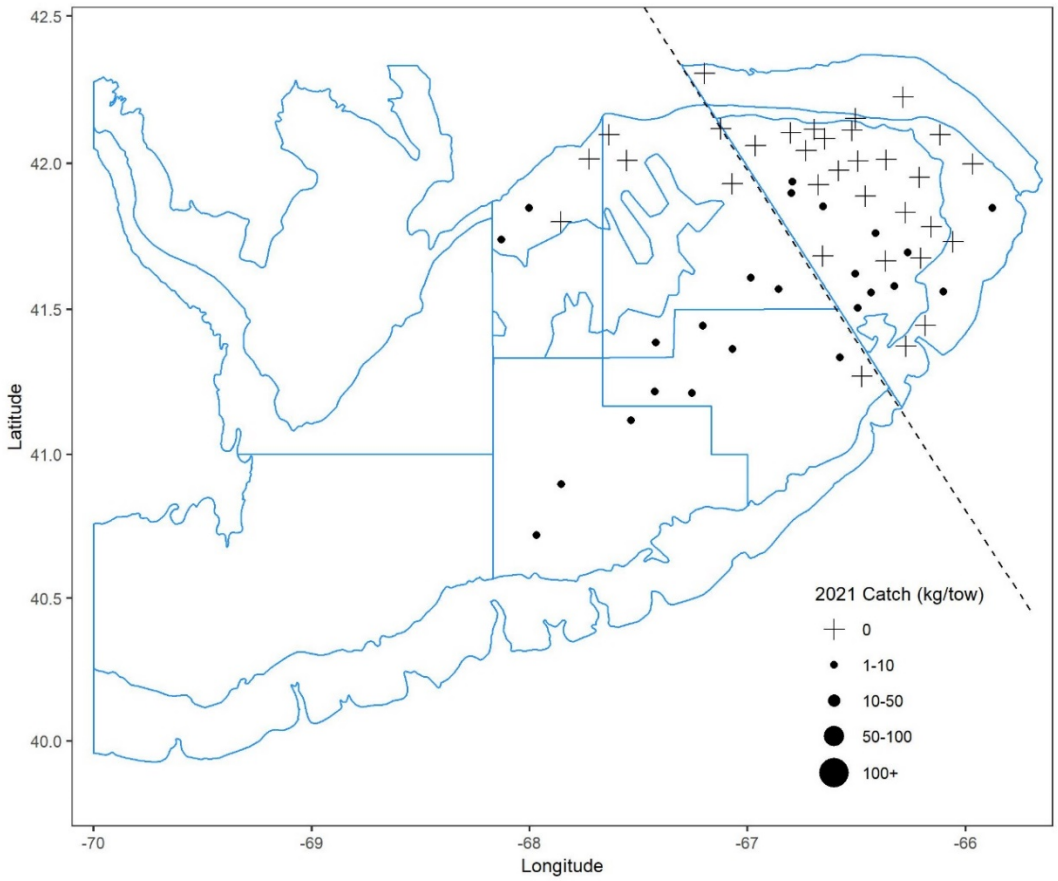

Figure 11a. Distribution of juvenile Little Skate and Winter Skate combined catches during the 2021 Winter RV Survey. Black circles represent catches. The circle area is proportional to the 2021 catch size. Zero catch is represented by the + symbol.

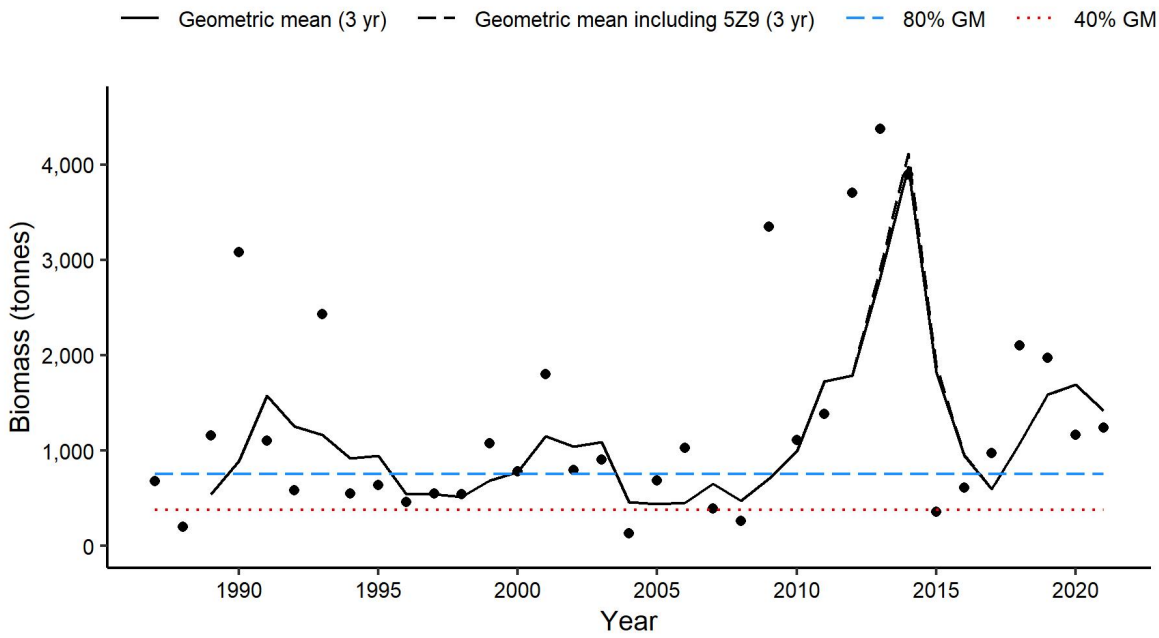

Figure 11b. Biomass index for juvenile Little Skate and Winter Skate combined in Strata 5Z1–5Z4 from the Winter RV Survey. The 3-yr geometric mean biomass (5Z1–5Z4) is represented by the solid black line. The dashed black line represents the combined 3-yr geometric mean biomass (since 2010) of 5Z1–5Z4 and 5Z9. The dashed and dotted horizontal lines represent 80% and 40% of the long-term geometric mean (1987–2020), respectively. The large black dots represent the biomass estimate (5Z1–5Z4) for that year.

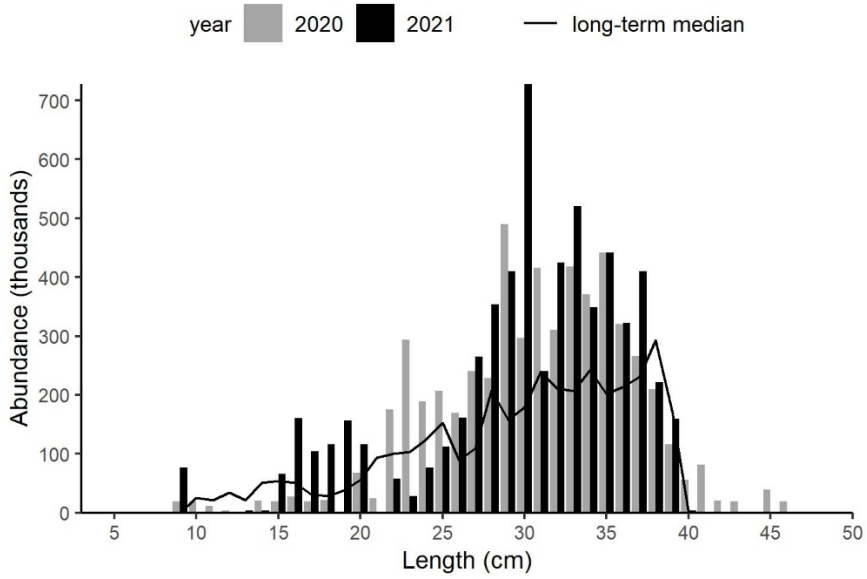

Figure 11c. Length-frequency indices for juvenile Little Skate and Winter Skate combined in Strata 5Z1–5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at-length from the 2020 survey. The black bars represent the number in thousands at-length from the 2021 survey. The solid black line represents the median number in thousands at-length for the time period 1987–2019.

Longhorn Sculpin

Longhorn Sculpin were widely distributed across Georges Bank (Figure 12a). The 3-yr GM remains below 40% of the long-term GM for the fourth year in a row (Figure 12b). The 3-yr GM with and without 5Z9 are virtually identical. The indices at-length are above the median at lengths < 13 cm and > 30 cm, but at, or below, the median for lengths in between (Figure 12c).

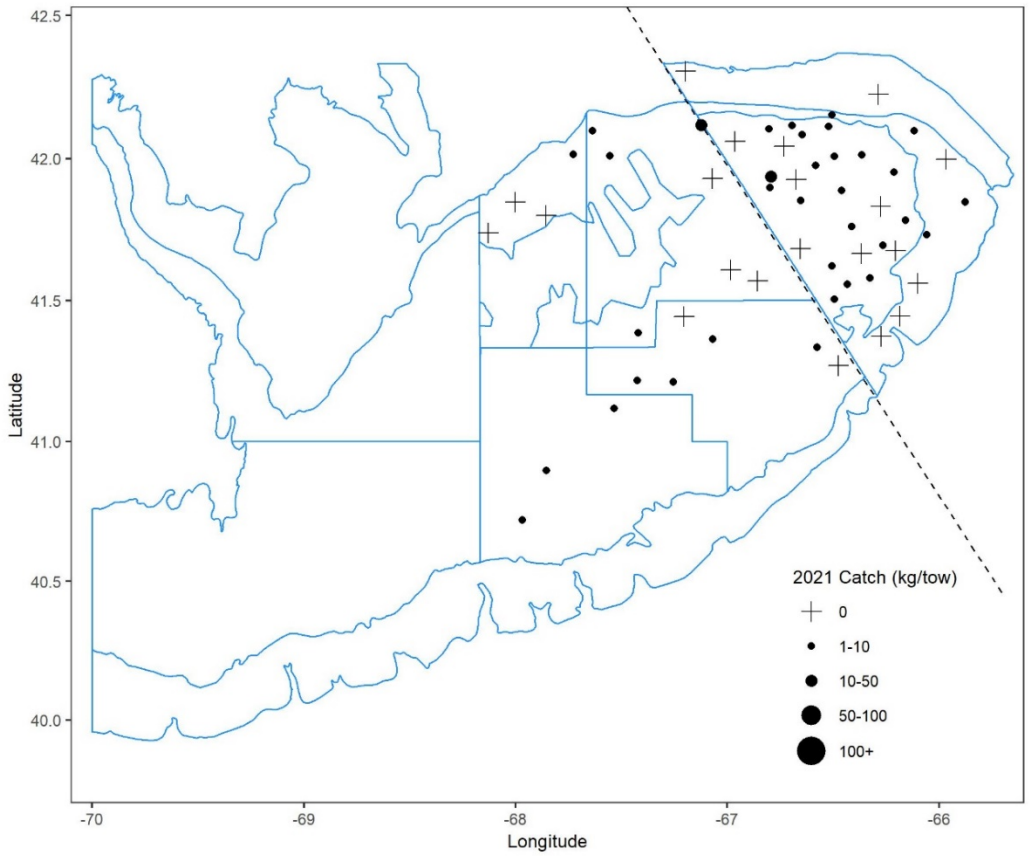

Figure 12a. Distribution of Longhorn Sculpin catches during the 2021 Winter RV Survey. Black circles represent catches. The circle area is proportional to the 2021 catch size. Zero catch is represented by the + symbol.

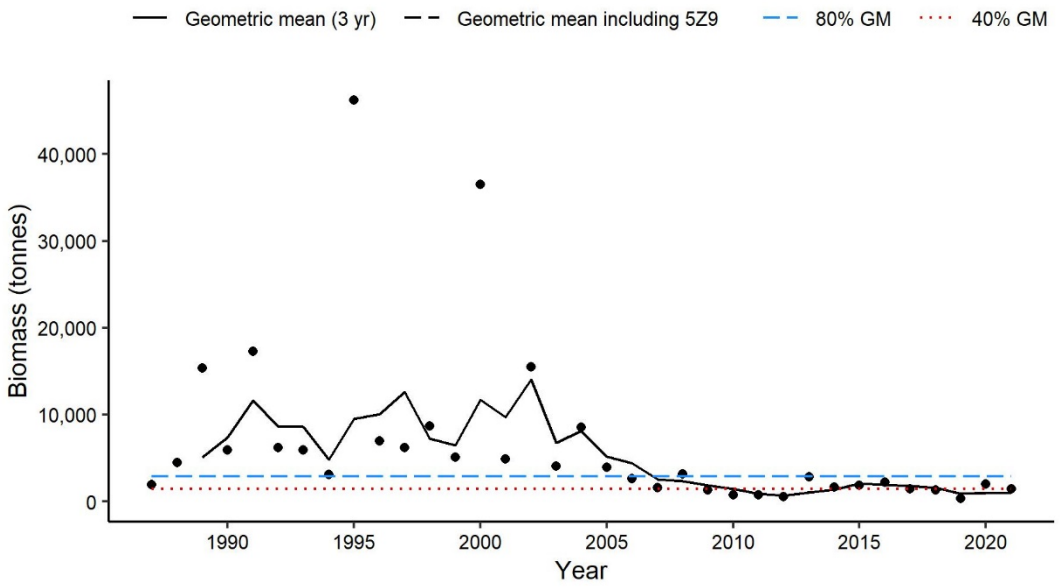

Figure 12b. Biomass index for Longhorn Sculpin in Strata 5Z1–5Z4 from the Winter RV Survey. The 3-yr geometric mean biomass for 5Z1–5Z4 is represented by the solid black line. The dashed black line represents the combined 3-yr geometric mean biomass (since 2010) of 5Z1–5Z4 and 5Z9. The dashed and dotted horizontal lines represent 80% and 40% of the long-term geometric mean (1987–2020), respectively. The large black dots represent the biomass estimate (5Z1–5Z4) for that year.

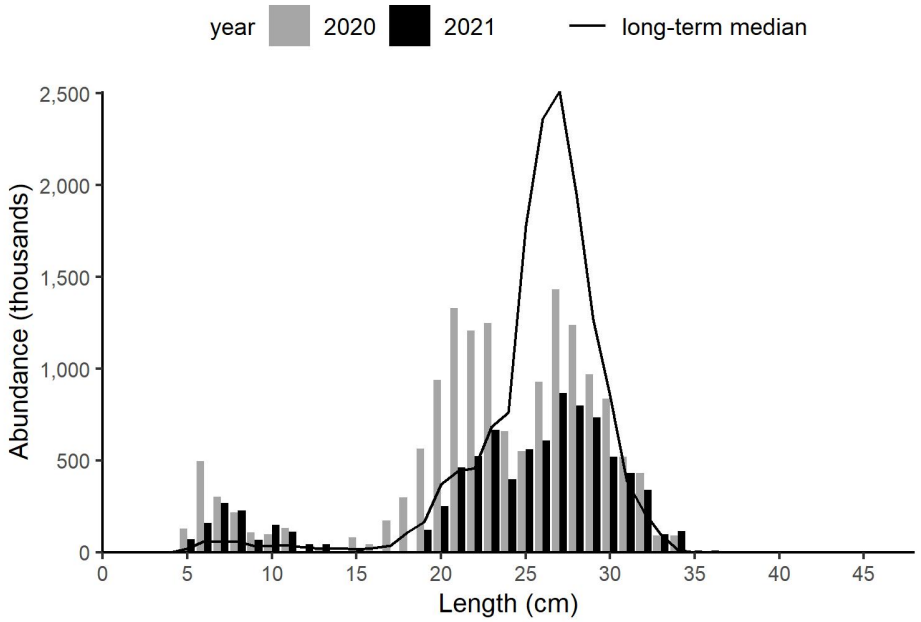

Figure 12c. Length-frequency indices for Longhorn Sculpin in Strata 5Z1–5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at-length from the 2020 survey. The black bars represent the number in thousands at-length from the 2021 survey. The solid black line represents the median number in thousands at-length for the time period 1987–2019.

Ocean Pout

Ocean Pout were caught primarily in the northeast portion of Georges Bank (Figure 13a). The 3-yr GM has been below 40% of the long-term GM since 2011 (Figure 13b). The 3-yr GM does not change with the inclusion of 5Z9, as this species is not generally found in deeper water. The indices at-length in 2021 were below the long-term median for most lengths but above the median at lengths < 40 cm where the median is zero (Figure 13c).

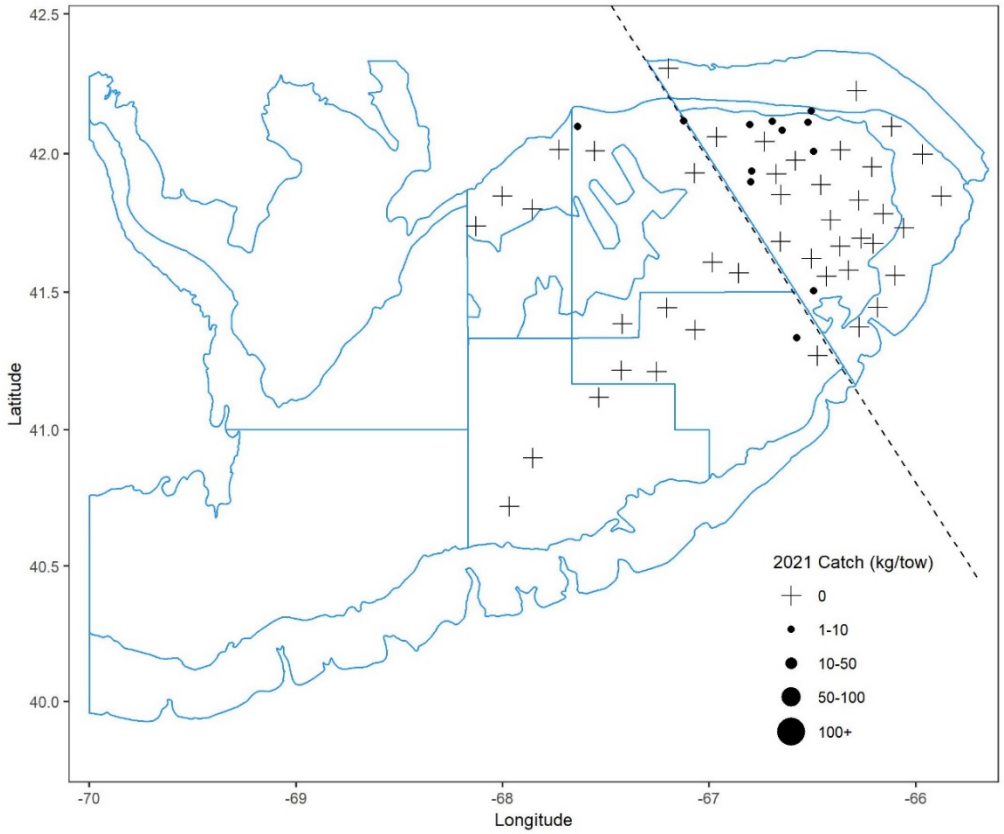

Figure 13a. Distribution of Ocean Pout catches during the 2021 Winter RV Survey. Black circles represent catches. The circle area is proportional to the 2021 catch size. Zero catch is represented by the + symbol.

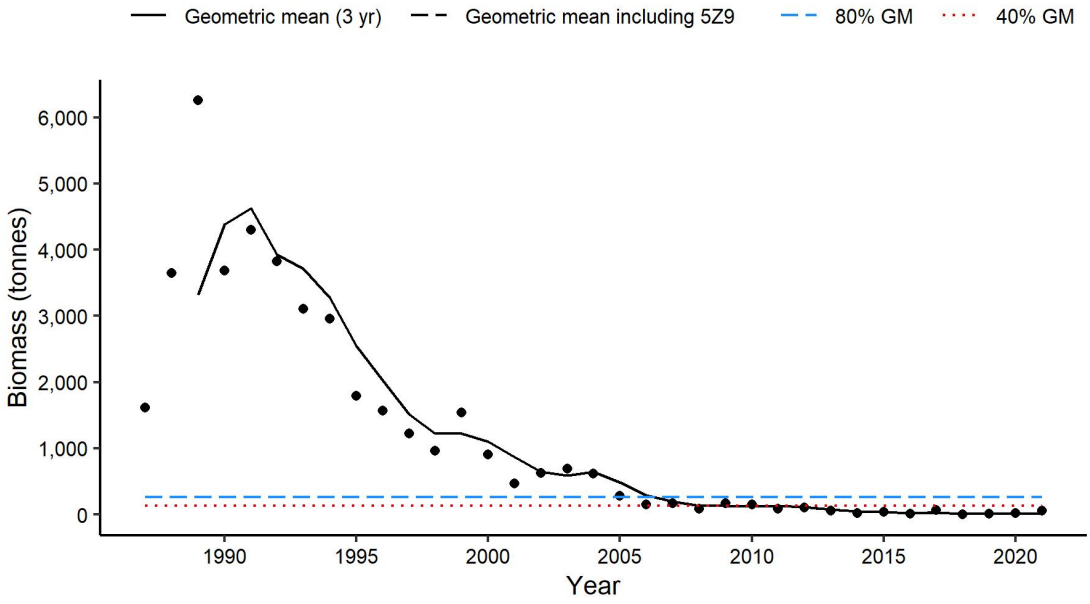

Figure 13b. Biomass index for Ocean Pout in Strata 5Z1–5Z4 from the Winter RV Survey. The 3-yr geometric mean biomass for 5Z1–5Z4 is represented by the solid black line. The dashed black line represents the combined 3-yr geometric mean biomass (since 2010) of 5Z1–5Z4 and 5Z9. The dashed and dotted horizontal lines represent 80% and 40% of the long-term geometric mean (1987–2020), respectively. The large black dots represent the biomass estimate (5Z1–5Z4) for that year.

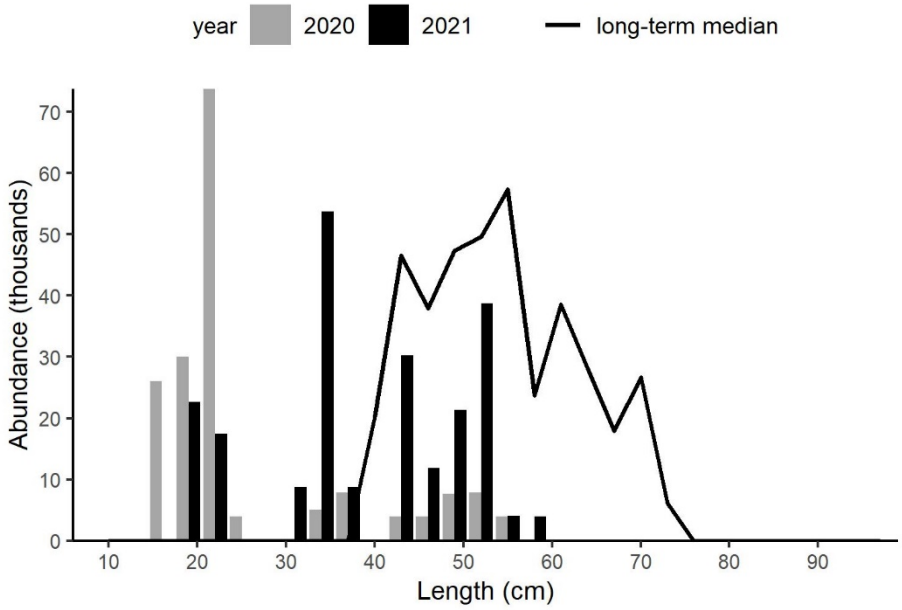

Figure 13c. Length-frequency indices for Ocean Pout in Strata 5Z1–5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at-length from the 2020 survey. The black bars represent the number in thousands at-length from the 2021 survey. The solid black line represents the median number in thousands at-length for the time period 1987–2019.

American Lobster

American Lobster catches were concentrated on the northern portion of Georges Bank in 5Z1 with the largest catches in 5Z1 (Figure 14a). The 2021 biomass index for 5Z1–5Z4 is the highest in the series, and the 3-yr GM is well above 80% of the long-term GM. Including 5Z9 in the biomass index greatly increases the indices (Figure 14b). The long-term median for 5Z1–5Z4 is 0 kg/tow for all lengths, which reflects the infrequent catches of American Lobster at any length within the 5Z1–5Z4 area over most of the time series (Figure 14c). More recently, American Lobster are being captured at greater abundances for a wide range of lengths (Figure 14c).

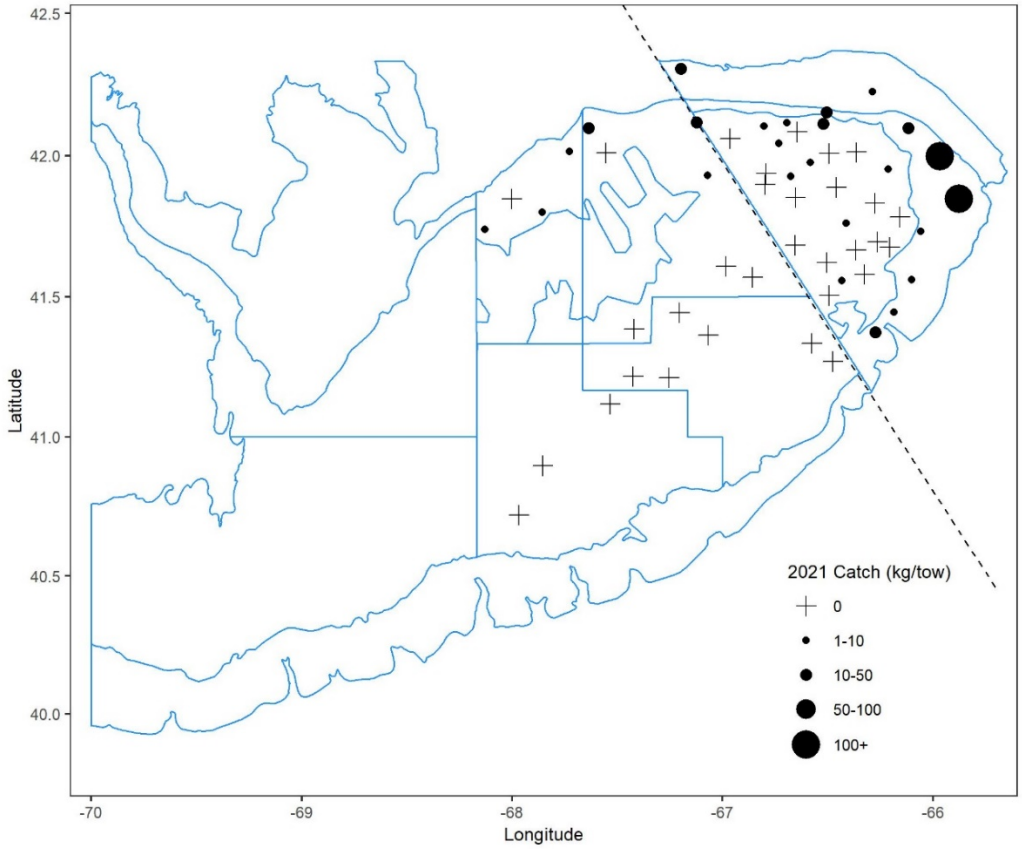

Figure 14a. Distribution of American Lobster catches during the 2021 Winter RV Survey. Black circles represent catches. The circle area is proportional to the 2021 catch size. Zero catch is represented by the + symbol.

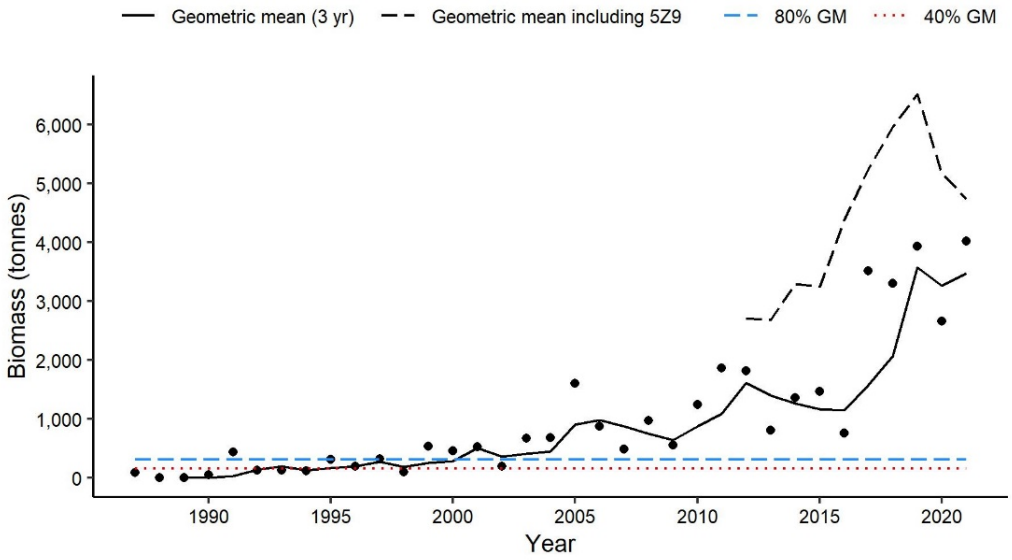

Figure 14b. Biomass index for American Lobster in Strata 5Z1–5Z4 from the Winter RV Survey. The 3-yr geometric mean biomass for 5Z1–5Z4 is represented by the solid black line. The dashed black line represents the combined 3-yr geometric mean biomass (since 2010) of 5Z1–5Z4 and 5Z9. The dashed and dotted horizontal lines represent 80% and 40% of the long-term geometric mean (1987–2020), respectively. The large black dots represent the biomass estimate (5Z1–5Z4) for that year.

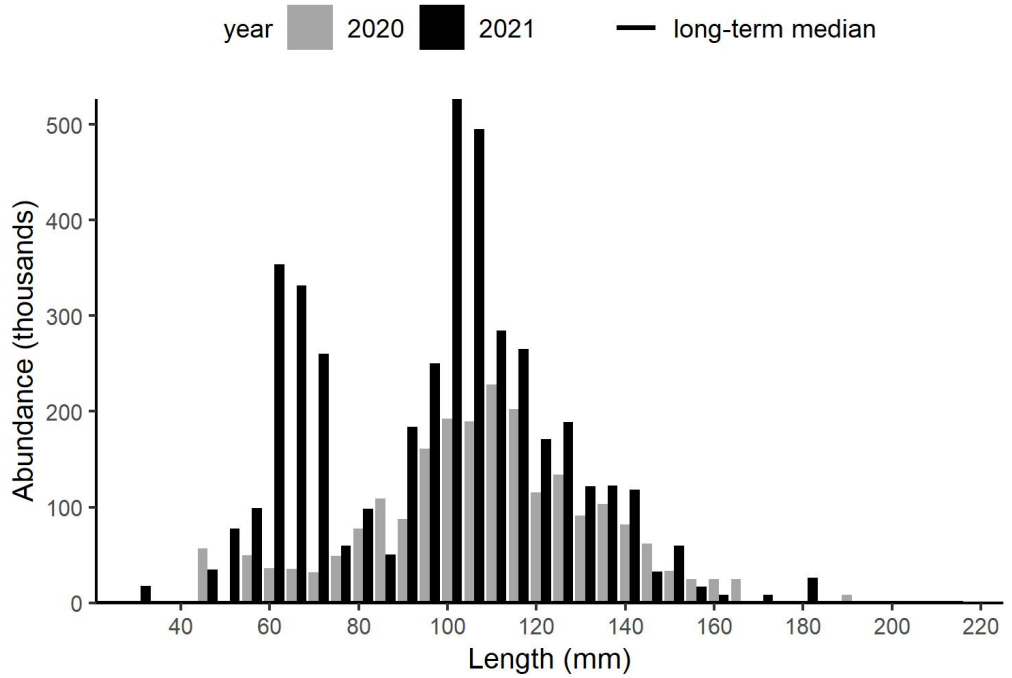

Figure 14c. Length-frequency indices for American Lobster in Strata 5Z1–5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at-length from the 2020 survey. The black bars represent the number in thousands at-length from the 2021 survey. The long-term median is 0 for all lengths.

Conclusions

The 3-year GM biomass indices in 2021 for Strata 5Z1–5Z4 from the Winter RV Survey were below 40% of the long-term GM (1987–2020) biomass for Atlantic Cod, Pollock, Yellowtail Flounder, Thorny Skate, Barndoor Skate, Winter Skate, Little Skate, Longhorn Sculpin, and Ocean Pout. For species such as Smooth Skate, Barndoor Skate, Pollock, and American Lobster, inclusion of Stratum 5Z9 made a clear difference to the 3-yr GM. Monitoring abundance trends for skates and Pollock, which have a much broader stock area and are primarily distributed in deeper water in winter, will require inclusion of data from outside the standard 5Z1–5Z4 area used for Georges Bank stocks. For some species, monitoring stock status will involve including data from additional strata, which do not have as long a time series, or using a combination of winter and summer RV survey data.

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Sources of Information

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