2017 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. 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 2017 Winter RV Survey began on the *CCGS Alfred Needler* and was completed by the *CCGS Teleost* due to mechanical issues experienced on the *CCGS Alfred Needler*. Survey indices from these two vessels are not expected to differ. Fisheries and Aquaculture Management (FAM) requested a review of the DFO Winter RV Survey information on the following species in Strata 5Z1-5Z4: Cod, Haddock, Pollock, Yellowtail Flounder, Smooth Skate, Thorny Skate, Barndoor Skate, Winter Skate, and Little Skate. The survey information will be used by FAM 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 2017.

This Science Response Report results from the Science Response Process of June 19, 2017, on the Maritimes Research Vessel Survey Trends on Georges Bank.

Background

The Georges Bank (5Z) Winter RV Survey has been conducted 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 only been sampled since 2010. Sampling is generally conducted between mid-February and mid-March with 103 stations allocated within Strata 5Z1–5Z9. Coverage of Strata 5Z5–5Z8 has been irregular in recent years, due to mechanical issues and poor weather; however, the survey has covered Strata 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 may not be useful for species that primarily inhabit depths greater than 200 m in winter.

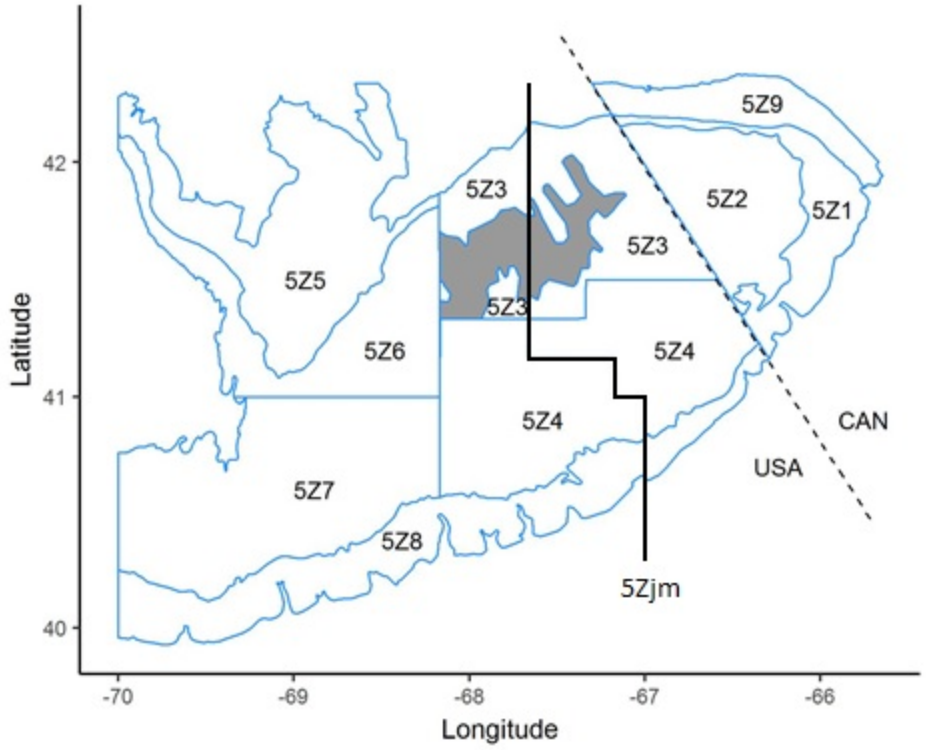

Figure 1. Georges Bank (5Z) Winter RV Survey strata. No sets are made in the shoals of Georges Bank (Grey shaded area in 5Z3). The line bisecting Strata 5Z3 and 5Z4 is the 5Zjm line, which is used for management of some species.

Analysis and Response

The 2017 DFO Winter RV Survey successfully completed 62 tows in NAFO Area 5Z between March 4 and March 29, 2017. Sampling was conducted in all Strata except 5Z8, with 50 successful sets in Strata 5Z1-5Z4. All sets in Strata 5Z1-5Z4 and in Stratum 5Z9 were conducted by the *CCGS Teleost*, while sets in Strata 5Z5-5Z7 were conducted by the *CCGS Alfred Needler*. Catch distribution plots and the long-term median catch-per-tow in each Stratum (5Z1-5Z9) are provided for the suite of species requested. Biomass index trends are shown for Strata 5Z1-5Z4. Comparisons of 2016 and 2017 length frequencies (total abundance-at-length) from the survey catch in Strata 5Z1–5Z4 to the long-term mean (1987-2015) are also included for the selected stocks. The time-series of survey biomass indices and the 3-year running geometric mean (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).

Winter Skate and Little Skate have not been reliably distinguished at lengths less than approximately 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 Skates 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 and Winter skates.

Table 1. Winter RV Survey biomass indices (tonnes) by species for 2015, 2016, 2017, 3-year geometric mean (GM), and 40% and 80% of the long-term (1987-2016) GM. No time period averages (NA) were provided for mixed Little and Winter Skates because sampling began in 2014.

Species	2015	2016	2017	Current 3yr GM	40% Long-Term GM	80% Long-Term GM
Cod	3,652	3,625	14,129	5,719	5,058	10,117
Haddock	261,529	232,880	149,090	208,625	19,969	39,937
Pollock	1,591	168	363	459	625	1,251
Yellowtail	822	1728	342	787	1,894	3,788
Smooth Skate	5	0.3	8	2	2	4
Thorny Skate	45	63	40	49	39	77
Barndoor Skate	83	281	20	77	37	74
Winter Skate	5,306	26,489	625	4,446	4,072	8,145
Little Skate	3,407	4,327	3,634	3,770	2,536	5,072
Mixed Winter/Little Skate	126	550	901	NA	NA	NA

Atlantic Cod

Consistent with historical catch patterns, Atlantic Cod were distributed primarily on the northeast portion of Georges Bank in Strata 5Z1 and 5Z2 (Figure 2a). The 2017 survey biomass estimate of Atlantic Cod is above 80% of the long-term GM; however, the 3-year GM remains low (Figure 2b). The abundance indices in 2017 were generally higher than in 2016 and above the long-term GM for most lengths (Figure 2c). The increase in modal length from 2016 to 2017 appears to be tracking the 2013 year-class, while the increase in the total number reflects variability in the estimates of abundance of this year-class.

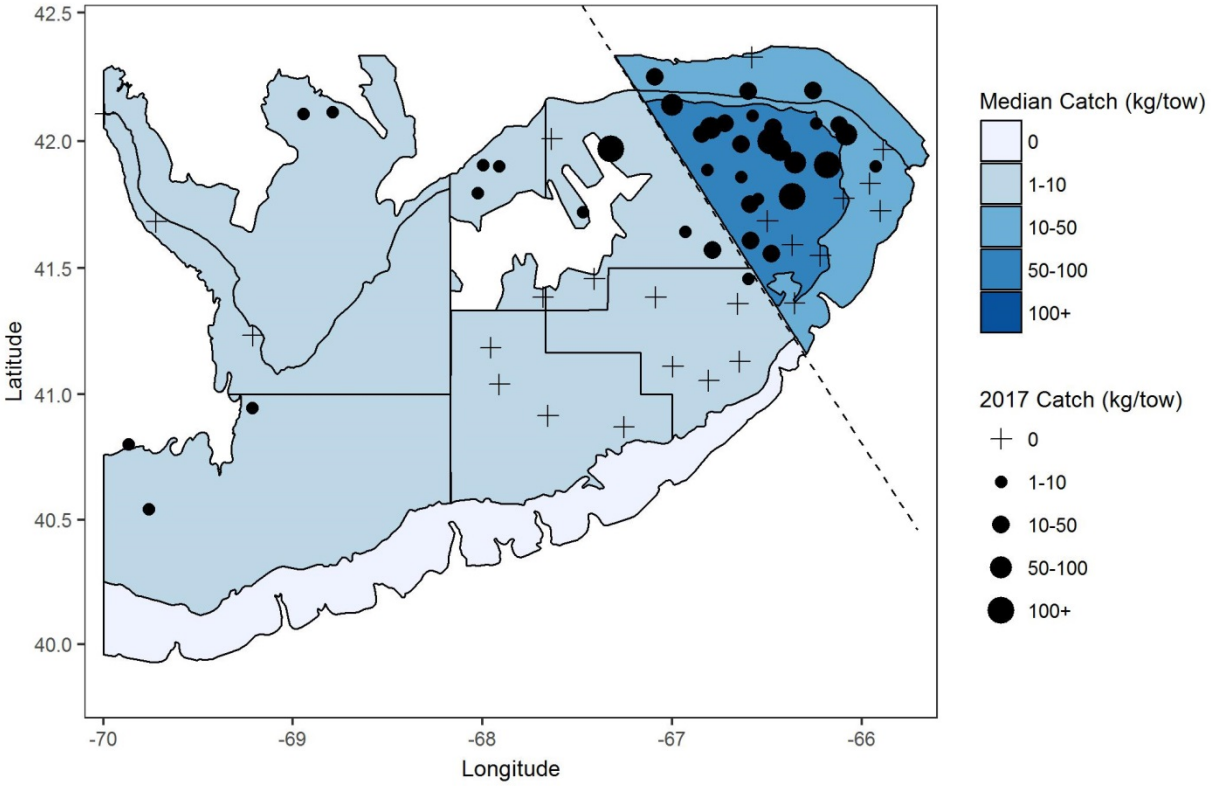

Figure 2a. Distribution of Atlantic Cod catches during the 2017 Winter RV Survey. Long-term median catch (kg/tow) of individual strata is represented by shades of blue. Black circles represent catches. The circle area is proportional to the 2017 catch size. Zero catch is represented by the + symbol.

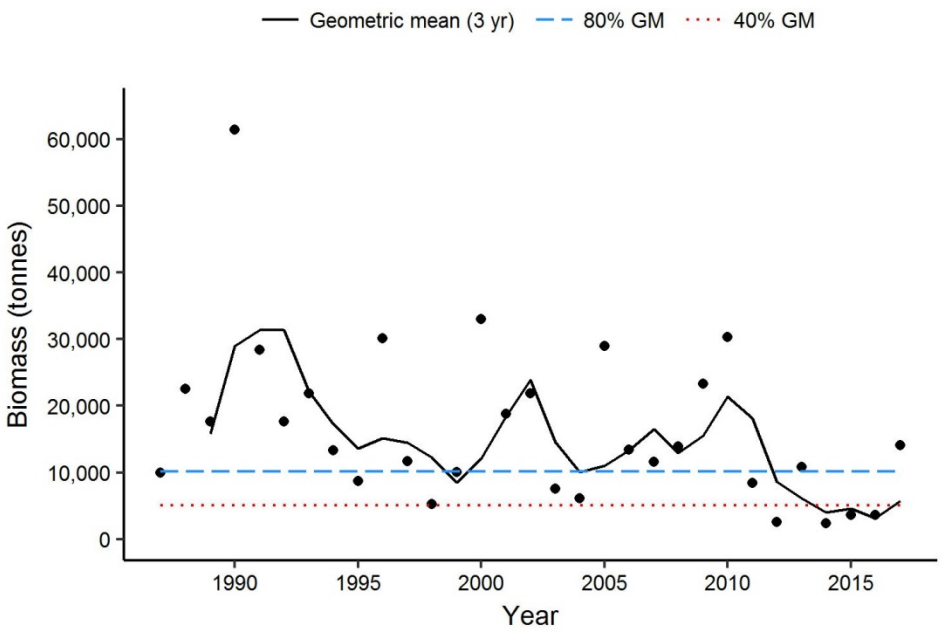

Figure 2b. Biomass index for Atlantic Cod in Strata 5Z1-5Z4 from the Winter RV Survey. The 3-year geometric mean biomass is represented by the solid black line. The dashed and dotted lines represent 80% and 40% of the long-term geometric mean (1987-2016), respectively. The large black dots represent the biomass estimate for that year.

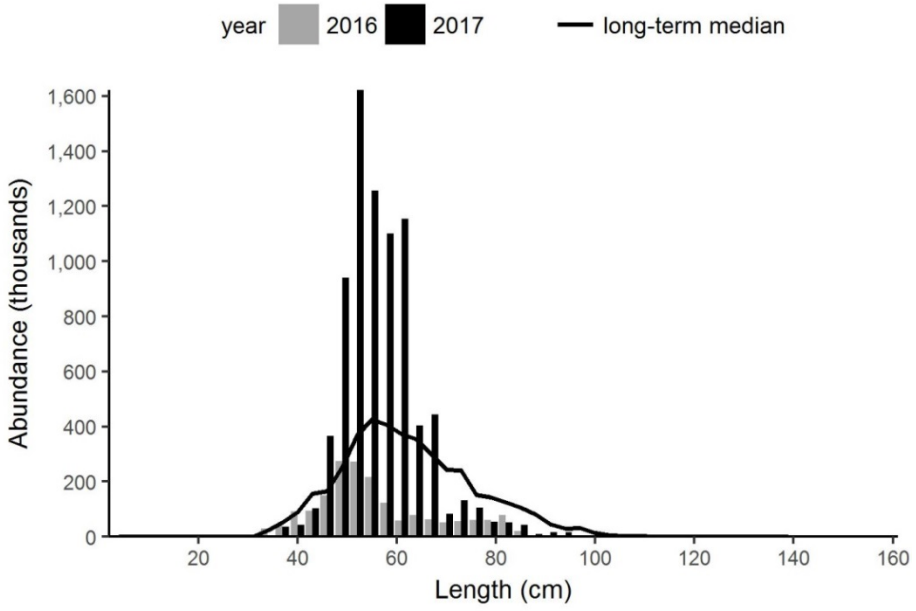

Figure 2c. Length frequency indices for Atlantic Cod in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at length from the 2016 survey. The black bars represent the number in thousands at length from the 2017 survey. The solid black line represents the median number in thousands at length for the time period 1987-2015.

Haddock

Haddock were present in all but two sets in the survey, and distribution of catches was consistent with historical catch patterns (Figure 3a). The 2017 Haddock biomass index is lower than in 2016 but is still the third highest in the time-series (Figure 3b). Abundance indices in 2017 are high between 30 and 44 cm. This is higher than the modal length in 2016 and tracks the growth of the very abundant 2013 year-class (Figure 3c). Abundance is close to the long-term median for larger Haddock and well above the median for all lengths below 45 cm.

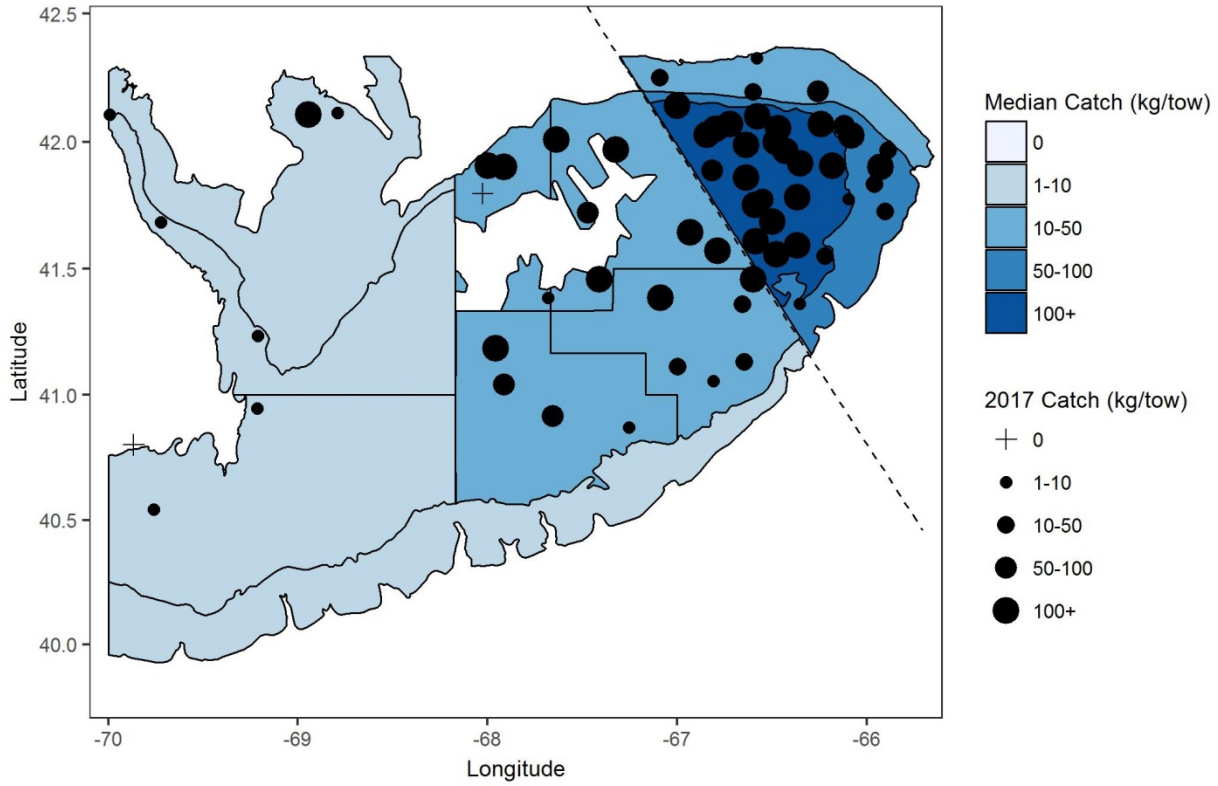

Figure 3a. Distribution of Haddock catches during the 2017 Winter RV Survey. Long-term median catch (kg/tow) of individual strata is represented by shades of blue. Black circles represent catches. The circle area is proportional to the 2017 catch size. Zero catch is represented by the + symbol.

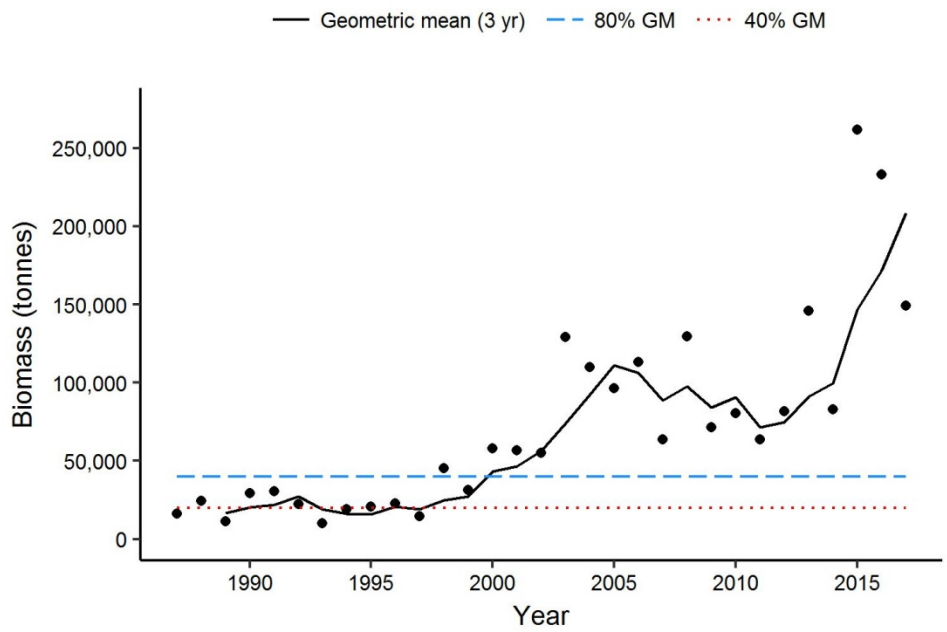

Figure 3b. Biomass index for Haddock Strata 5Z1-5Z4 from the Winter RV Survey. The 3-year geometric mean biomass is represented by the solid black line. The dashed blue and dotted red lines represent 80% and 40% of the long-term geometric mean (1987-2016), respectively. The black dots represent the biomass estimate for that year.

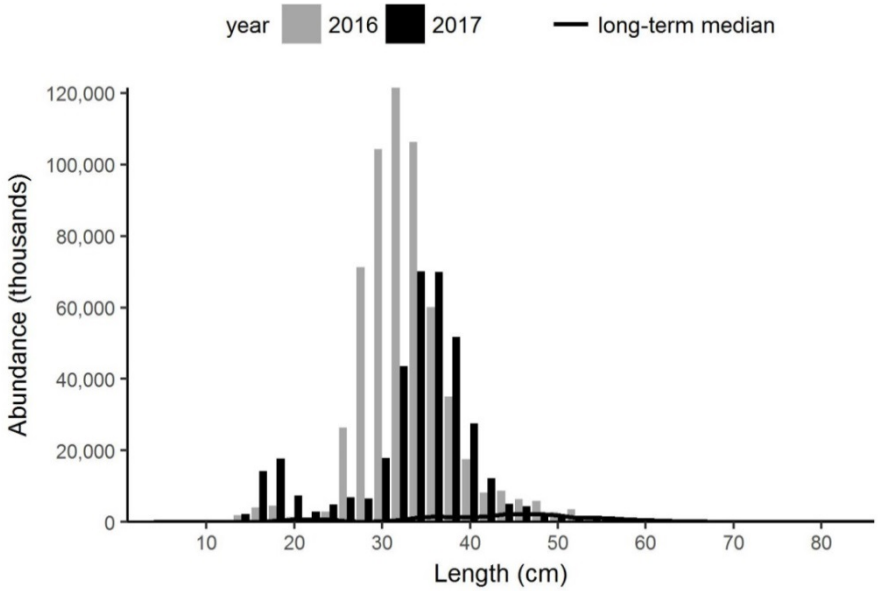

Figure 3c. Length frequency indices for Haddock in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at length from the 2016 survey. The black bars represent the number in thousands at length from the 2017 survey. The solid black line represents the median number in thousands at length for the time period 1987-2015.

Pollock

Pollock were caught primarily in Stratum 5Z9, outside the area used for developing indices (Figure 4a). The 3-year GM remains below 40% of the long-term GM for the second year in a row (Figure 4b). Abundance indices are similar to 2016 and generally below the long-term median for most lengths (Figure 4c). For species such as Pollock, which are generally found in water deeper than is found in Strata 5Z1–5Z4 on Georges Bank, inclusion of a broader area may be needed to provide indices that are useful for monitoring abundance trends.

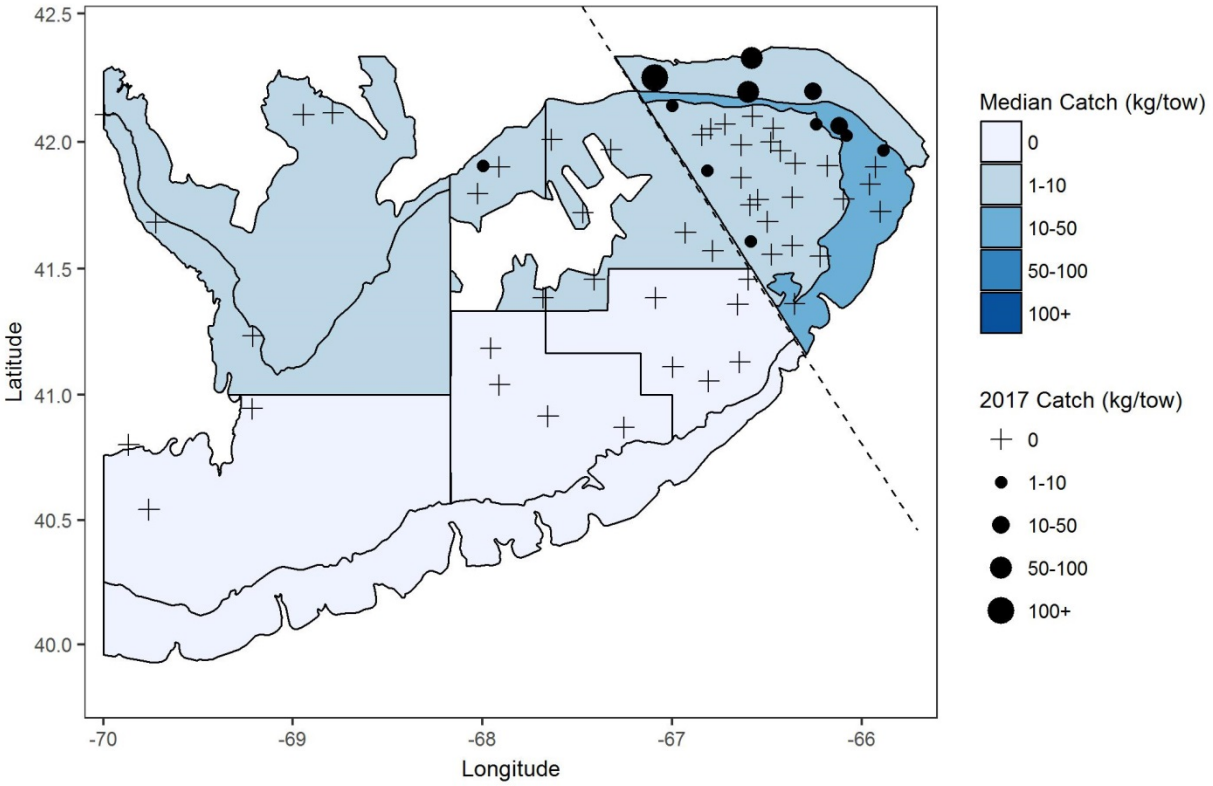

Figure 4a. Distribution of Pollock catches during the 2017 Winter RV Survey. Long-term median catch (kg/tow) of individual strata is represented by shades of blue. Black circles represent catches. The circle area is proportional to the 2017 catch size. Zero catch is represented by the + symbol.

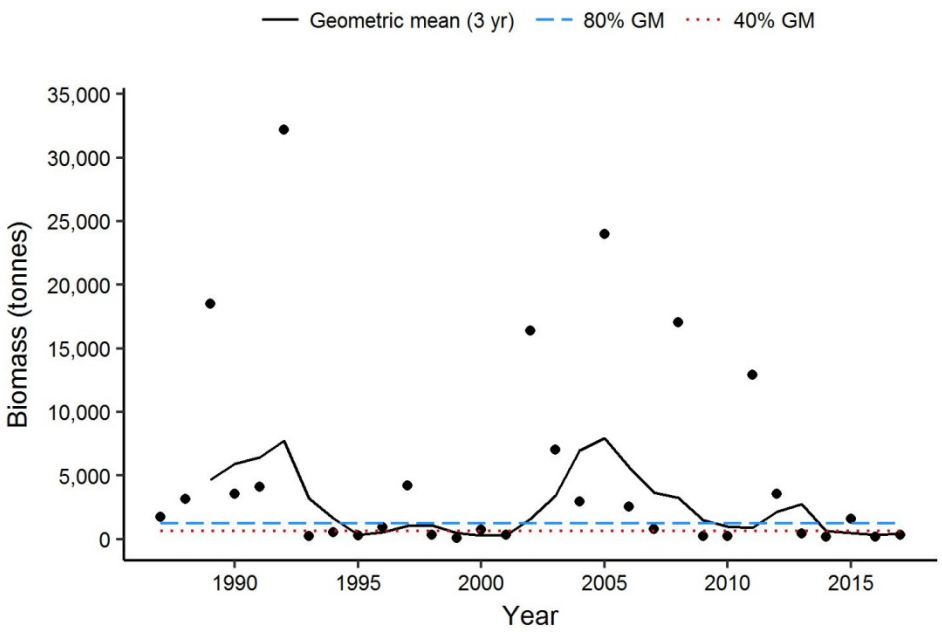

Figure 4b. Biomass index for Pollock in Strata 5Z1-5Z4 from the Winter RV Survey. The 3-year geometric mean biomass is represented by the solid black line. The dashed blue and dotted red lines represent 80% and 40% of the long-term geometric mean (1987-2016), respectively. The black dots represent the biomass estimate for that year.

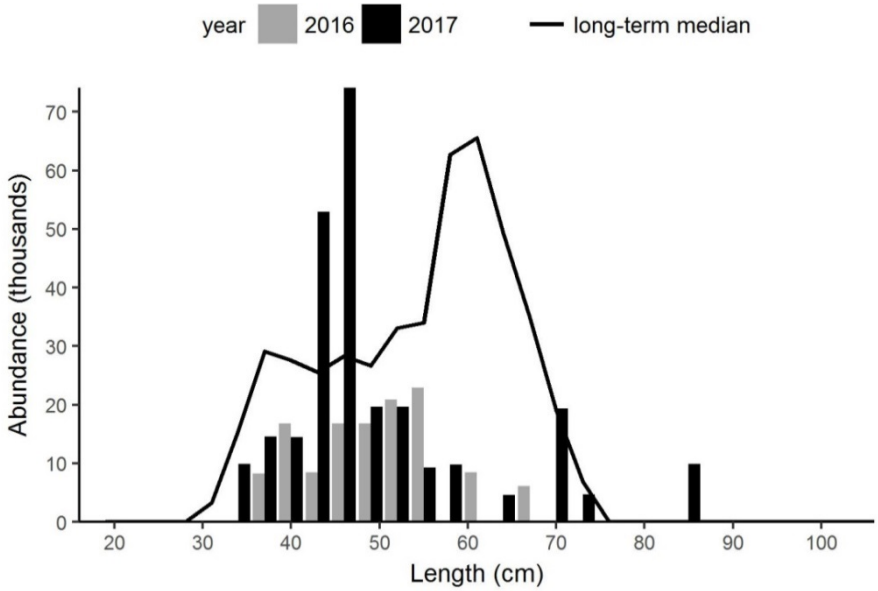

Figure 4c. Length frequency indices for Pollock in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at length from the 2016 survey. The black bars represent the number in thousands at length from the 2017 survey. The solid black line represents the median number in thousands at length for the time period 1987-2015.

Yellowtail Flounder

Yellowtail flounder were found primarily in Strata 5Z2 and 5Z4, as well as close to Cape Cod (Figure 5a). Catches were small in all areas. The biomass index for 2017 is the lowest in the time series and the 3-year GM remains below 40% of the long-term GM for the fourth year in a row (Figure 5b). Abundance indices at all lengths were lower for 2017 than for 2016 and remain well below the median (Figure 5c).

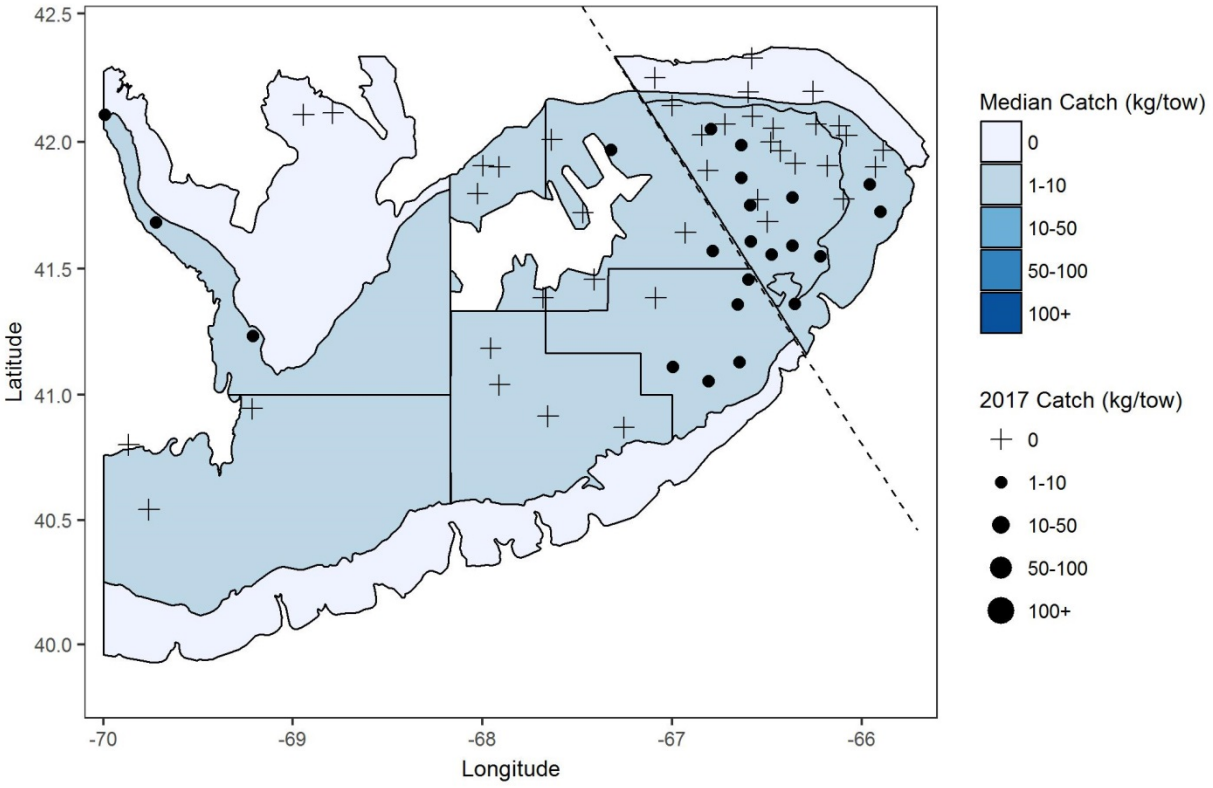

Figure 5a. Distribution of Yellowtail Flounder catches during the 2017 Winter RV Survey. Long-term median catch (kg/tow) of individual strata is represented by shades of blue. Black circles represent catches. The circle area is proportional to the 2017 catch size. Zero catch is represented by the + symbol.

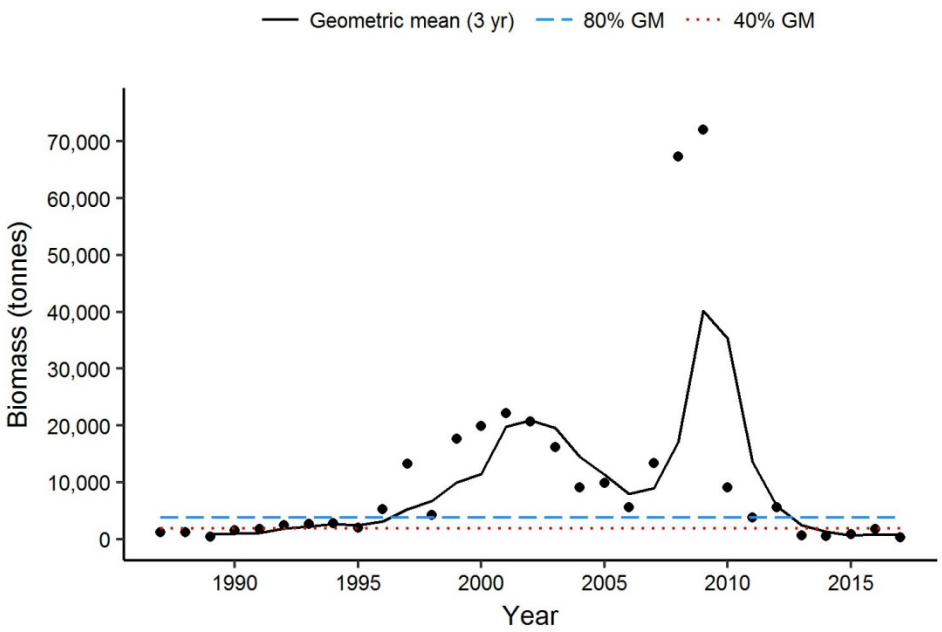

Figure 5b. Biomass index for Yellowtail Flounder in Strata 5Z1-5Z4 from the Winter RV Survey. The3-year geometric mean biomass is represented by the solid black line. The dashed blue and dotted red lines represent 80% and 40% of the long-term geometric mean (1987-2016), respectively. The black dots represent the biomass estimate for that year.

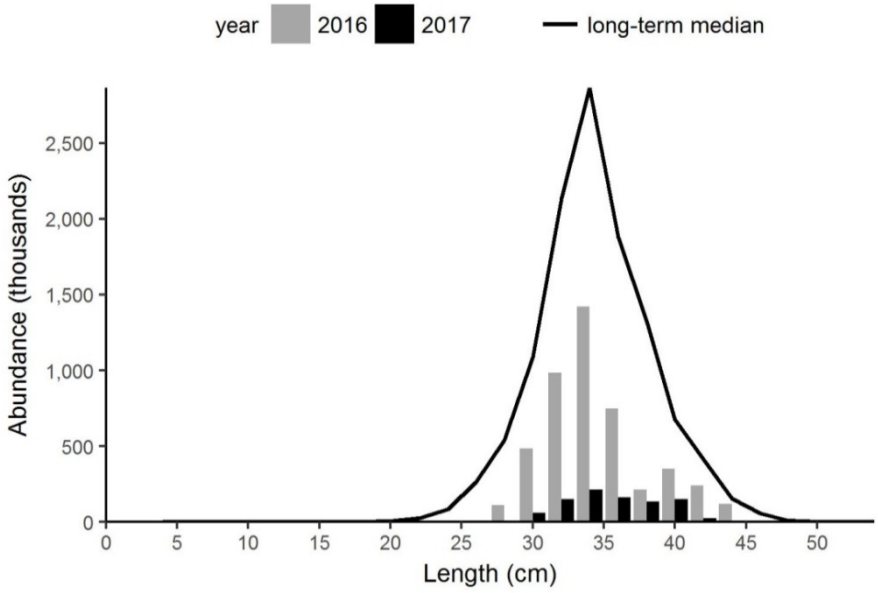

Figure 5c. Length frequency indices for Yellowtail Flounder in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at length from the 2016 survey. The black bars represent the number in thousands at length from the 2017 survey. The solid black line represents the median number in thousands at length for the time period 1987-2015.

Smooth Skate

Smooth Skate were caught in small numbers in 6 sets, only 1 of which fell within the 5Z1-5Z4 index area (Figure 6a). The biomass estimate is very low in all years (Figure 6b). Only one length group was observed in 2017 (Figure 6c). The long-term median is 0 for all lengths, which indicates that the survey infrequently captures Smooth Skate at any length within the Strata 5Z1–5Z4 area. For species such as Smooth Skate, which are generally found in water deeper than is found in Strata 5Z1–5Z4 on Georges Bank, inclusion of a broader area may be needed to provide indices that are useful for monitoring abundance trends.

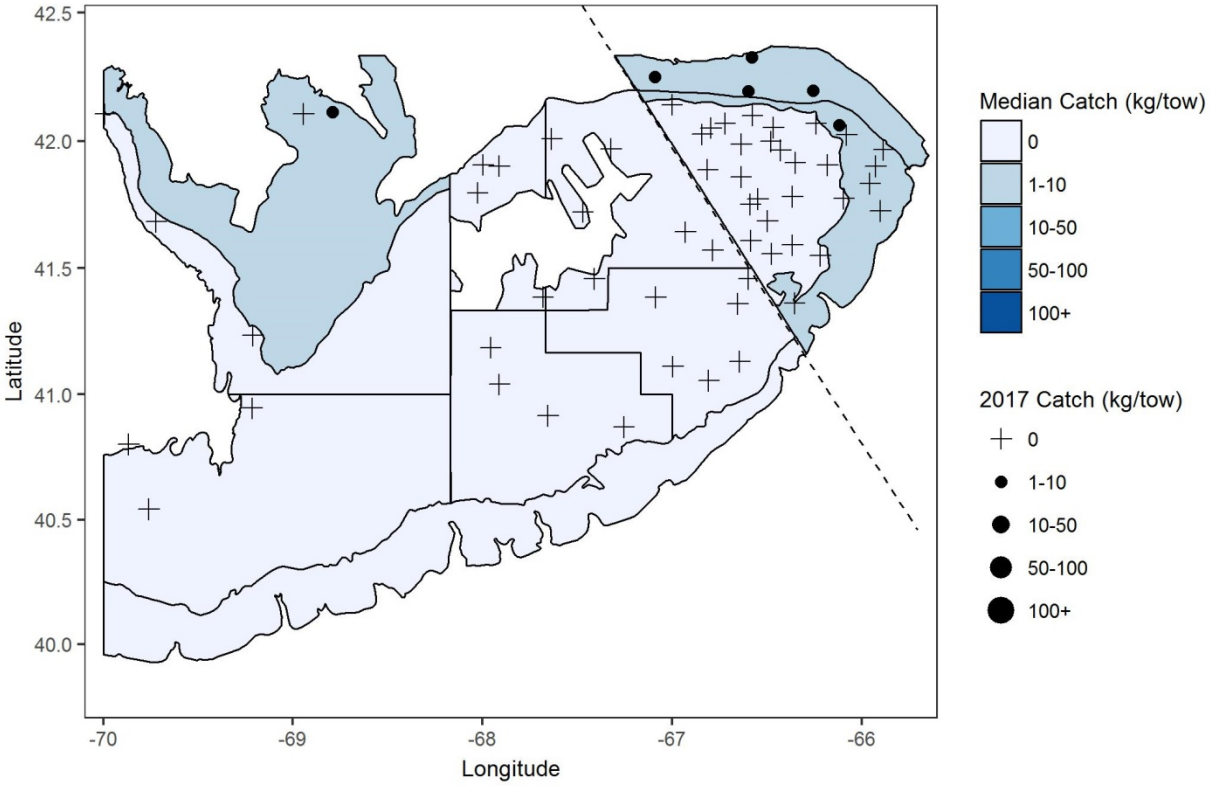

Figure 6a. Distribution of Smooth Skate catches during the 2017 Winter RV Survey. Long-term median catch (kg/tow) of individual strata is represented by shades of blue. Black circles represent catches. The circle area is proportional to the 2017 catch size. Zero catch is represented by the + symbol.

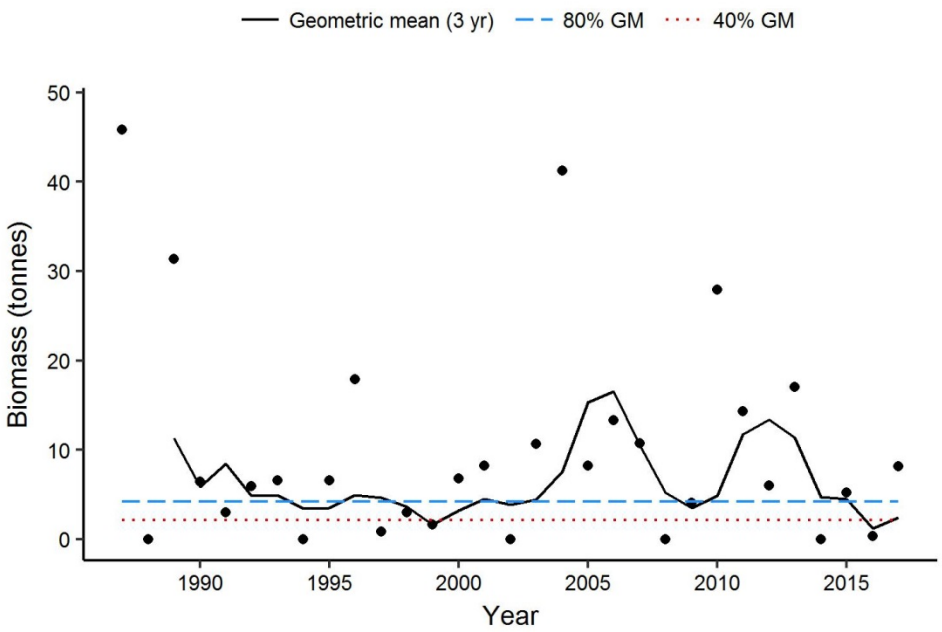

Figure 6b. Biomass index for Smooth Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The 3-year geometric mean biomass is represented by the solid black line. The dashed blue and dotted red lines represent 80% and 40% of the long-term geometric mean (1987-2016), respectively. The black dots represent the biomass estimate for that year.

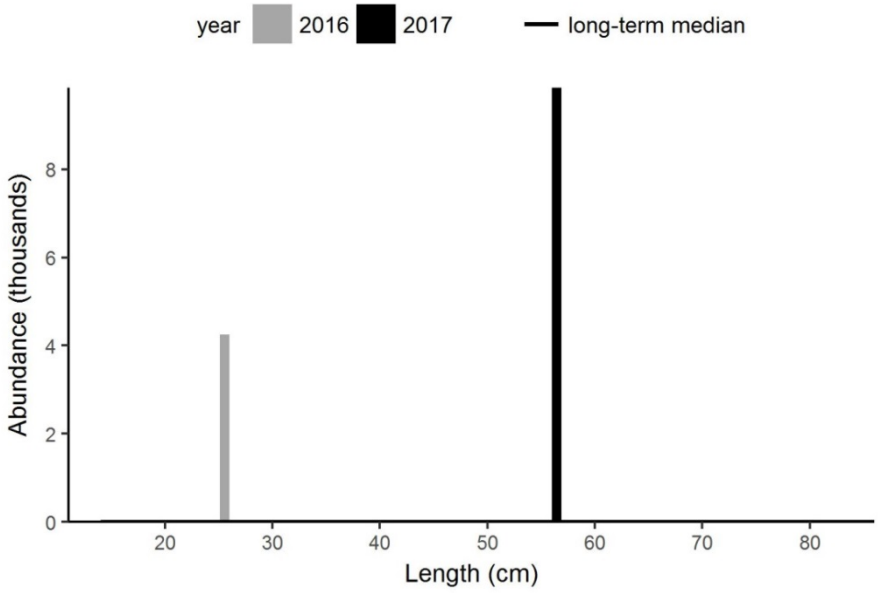

Figure 6c. Length frequency indices for Smooth Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bar represent the number in thousands at length from the 2016 survey. The black bar represent the number in thousands at length from the 2017 survey. The long-term median is 0 for all lengths.

Thorny Skate

Thorny Skate were caught in small numbers in 5 sets on Georges Bank, 3 of which were in Strata 5Z1–5Z4 (Figure 7a). The 3-year GM is above 40% of the long-term GM for the first time since 2013 (Figure 7b). While the biomass index in 2017 is lower than in 2016, the abundance index is higher, since more small fish were caught than in the 2016 survey (Figure 7c). The long-term median is 0 for all lengths, which indicates that the survey infrequently captures Thorny Skate at any length within the Strata 5Z1–5Z4 area.

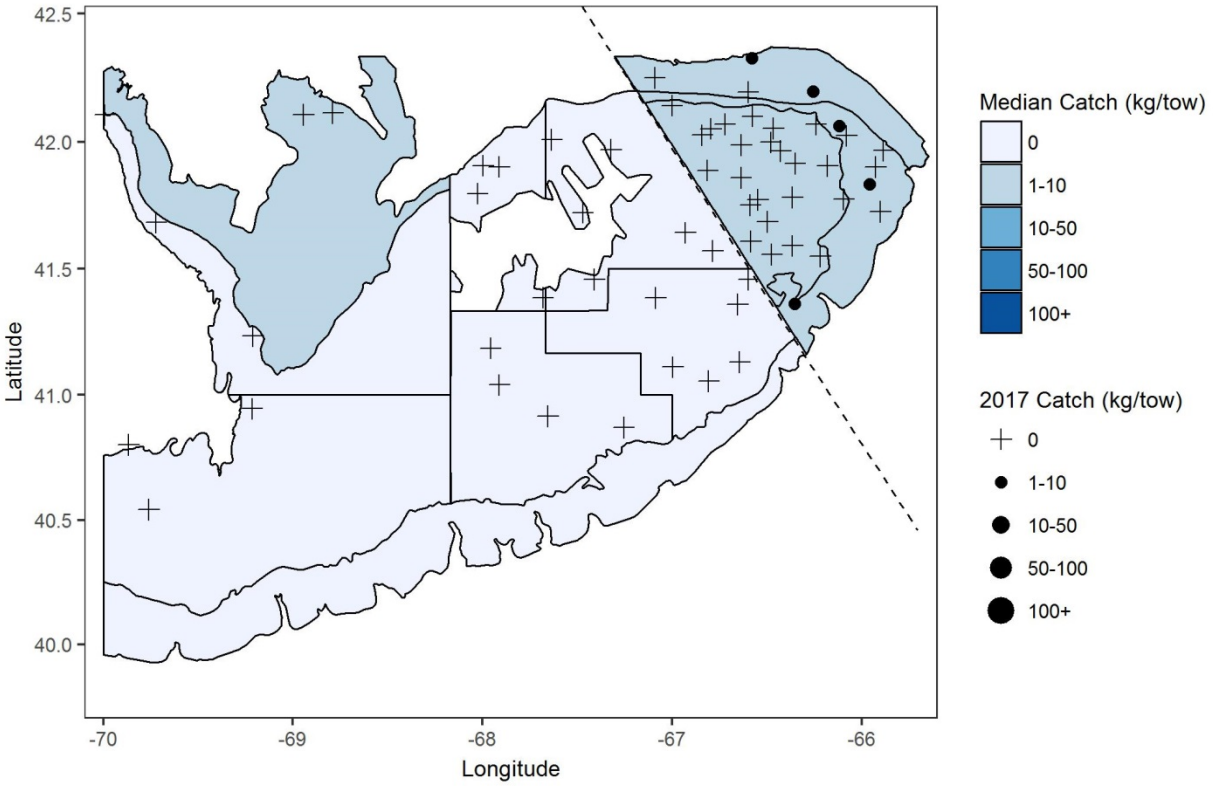

Figure 7a. Distribution of Thorny Skate catches during the 2017 Winter RV Survey. Long-term median catch (kg/tow) of individual strata is represented by shades of blue. Black circles represent catches. The circle area is proportional to the 2017 catch size. Zero catch is represented by the + symbol.

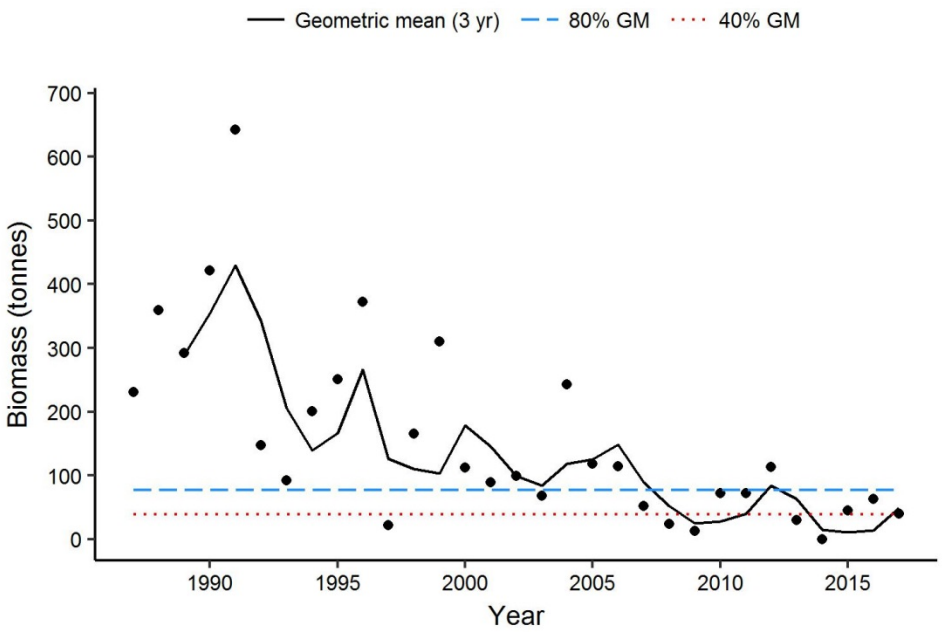

Figure 7b. Biomass index for Thorny Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The 3-year geometric mean biomass is represented by the solid black line. The dashed blue and dotted red lines represent 80% and 40% of the long-term geometric mean (1987-2016), respectively. The black dots represent the biomass estimate for that year.

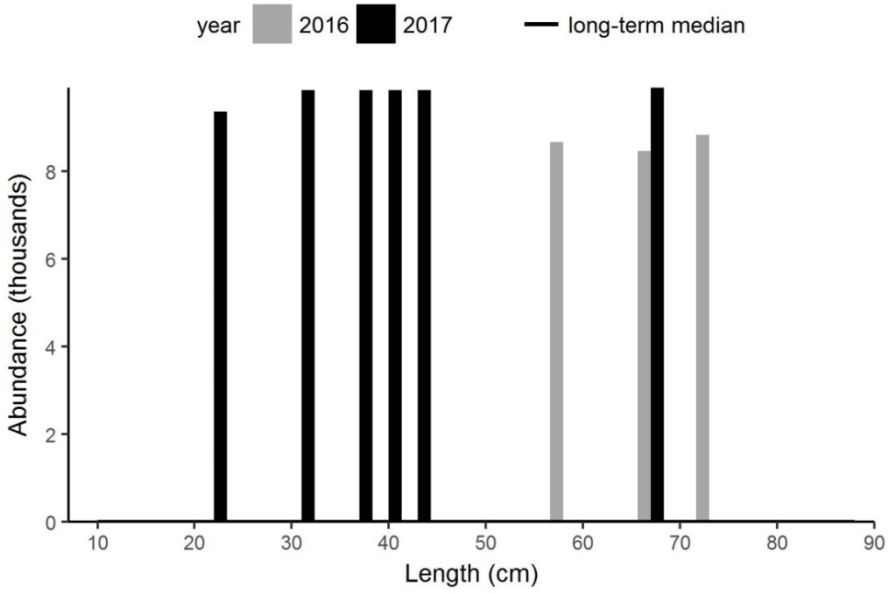

Figure 7c. Length frequency indices for Thorny Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at length from the 2016 survey. The black bars represent the number in thousands at length from the 2017 survey. The long-term median is 0 for all lengths.

Barndoor Skate

Barndoor Skate were captured along the edges of Georges Bank in small numbers (Figure 8a). The 2017 biomass estimate fell to below 40% of the long-term GM, but the 3-year GM remains above 80% of the long-term GM (Figure 8b). Only small (<50 cm) Barndoor Skates were captured in the 2017 survey (Figure 8c). The long-term median is 0 for all lengths, which indicates that the survey infrequently captures Barndoor Skate at any length within the Strata 5Z1–5Z4 area.

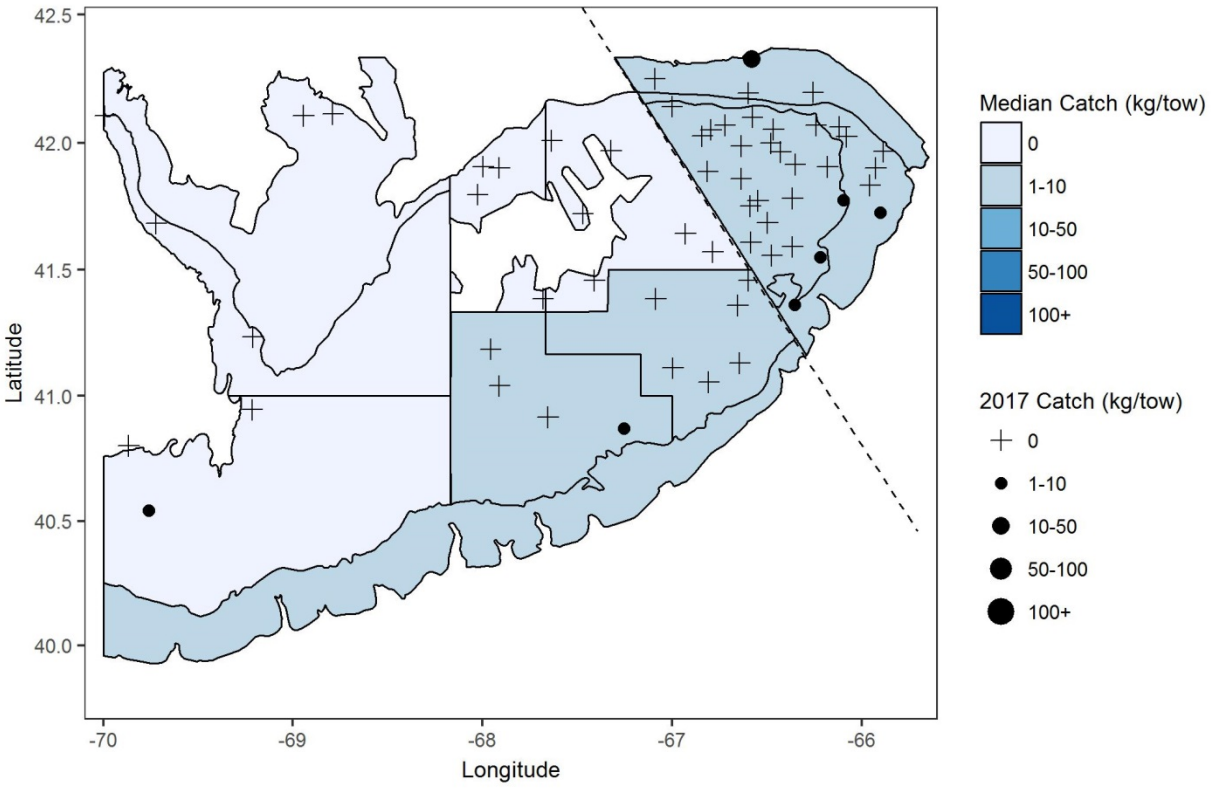

Figure 8a. Distribution of Barndoor Skate catches during the 2017 Winter RV Survey. Long-term median catch (kg/tow) of individual strata is represented by shades of blue. Black circles represent catches. The circle area is proportional to the 2017 catch size. Zero catch is represented by the + symbol.

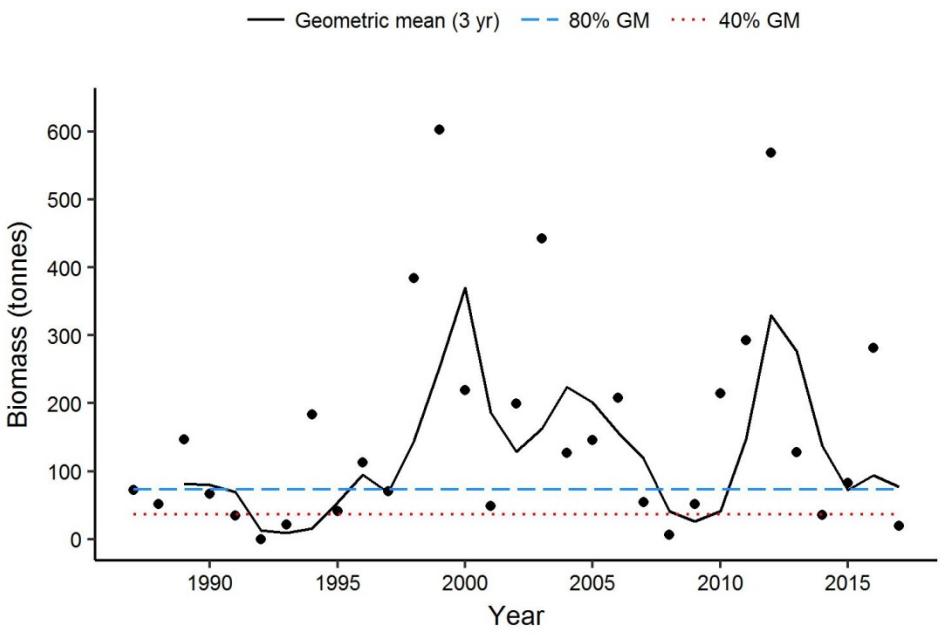

Figure 8b. Biomass index for Barndoor Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The 3-year geometric mean biomass is represented by the solid black line. The dashed blue and dotted red lines represent 80% and 40% of the long-term geometric mean (1987-2016), respectively. The black dots represent the biomass estimate for that year.

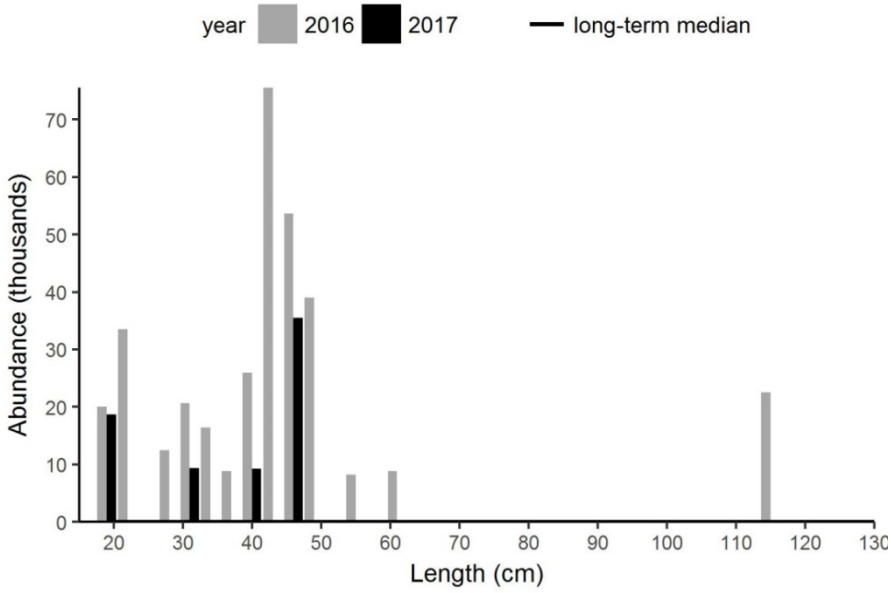

Figure 8c. Length frequency indices for Barndoor Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at length from the 2016 survey. The black bars represent the number in thousands at length from the 2017 survey. The long-term median is 0 for all lengths

Winter Skate

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

The distribution of Winter Skate catches in the 2017 survey was unusual in that they were caught primarily along the edges of the Bank in Stratum 5Z1 (Figure 9a). The biomass index in 2017 was the lowest in the time series, much lower than in 2016, when the index was the highest observed since 1988 (Figure 9b). The abundance indices are below the median for all lengths in 2017 (Figure 9c).

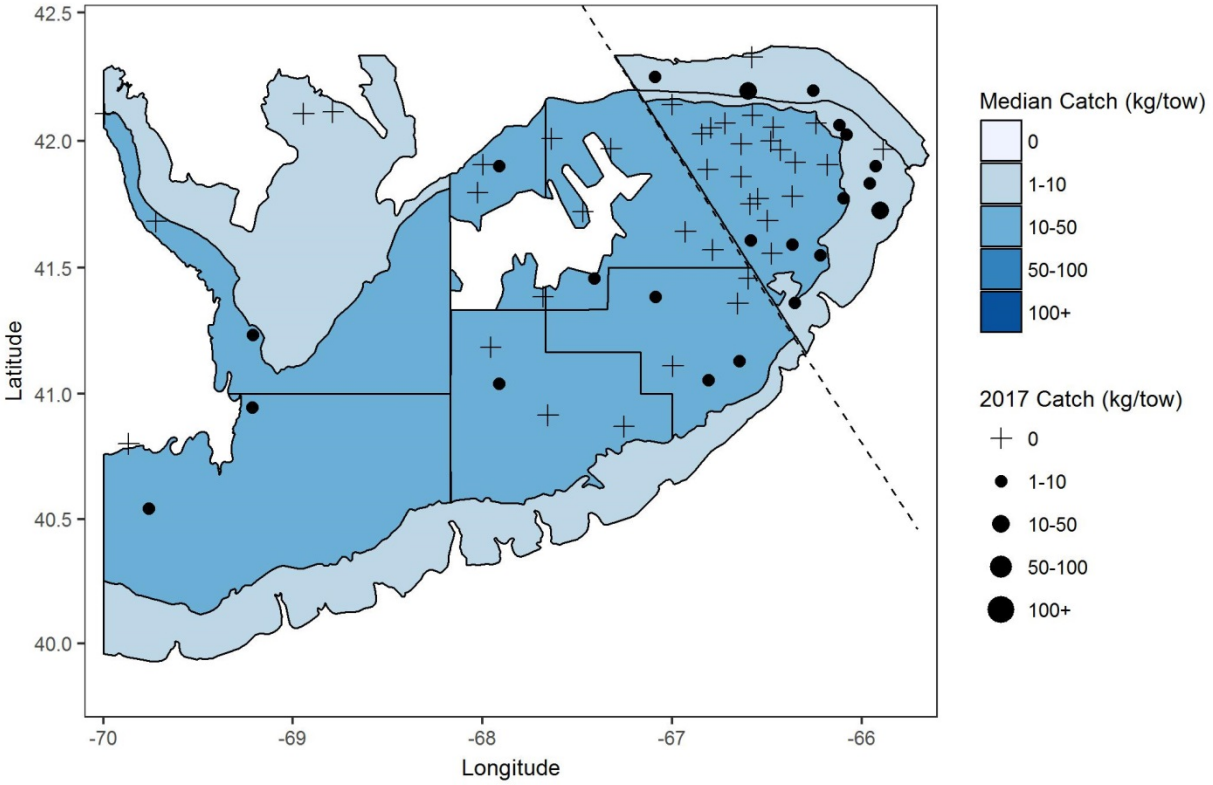

Figure 9a. Distribution of Winter Skate catches during the 2017 Winter RV Survey. Long-term median catch (kg/tow) of individual strata is represented by shades of blue. Black circles represent catches. The circle area is proportional to the 2017 catch size. Zero catch is represented by the + symbol.

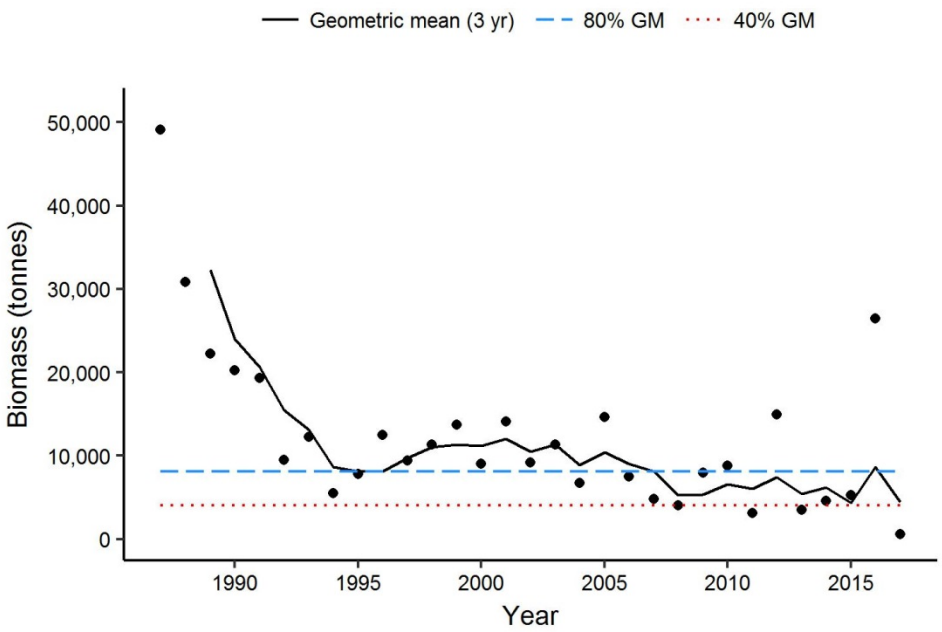

Figure 9b. Biomass index for Winter Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The 3-year geometric mean biomass is represented by the solid black line. The dashed blue and dotted red lines represent 80% and 40% of the long-term geometric mean (1987-2016), respectively. The black dots represent the biomass estimate for that year.

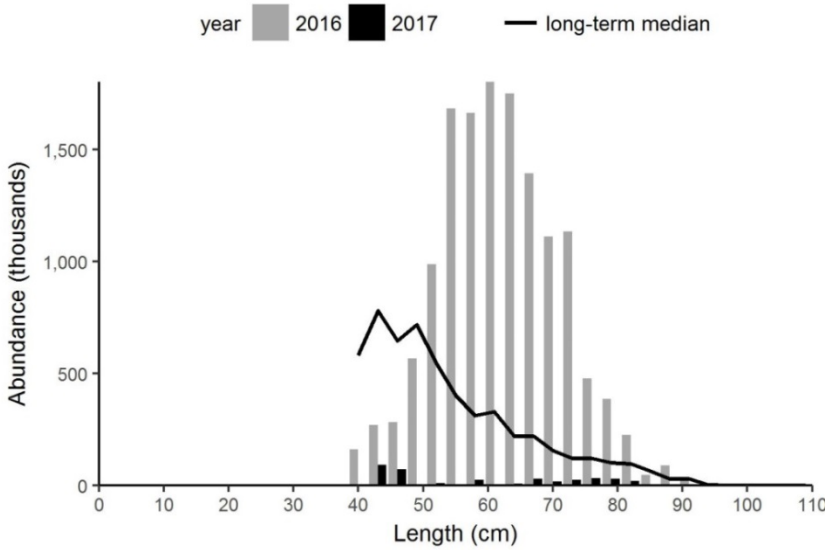

Figure 9c. Length frequency indices for Winter Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at length from the 2016 survey. The black bars represent the number in thousands at length from the 2017 survey. The solid black line represents the median number in thousands at length for the time period 1987-2015.

Little Skate

Little Skate were distributed across Georges Bank in 2017, similar to past years (Figure 10a). The 2017 biomass index was similar to those from 2015 and 2016. The 3-year GM dropped to below 80% of the long-term GM (Figure 10b). The abundance indices were average or above between 40 and 45 cm but below average for lengths above 45 cm (Figure 10c).

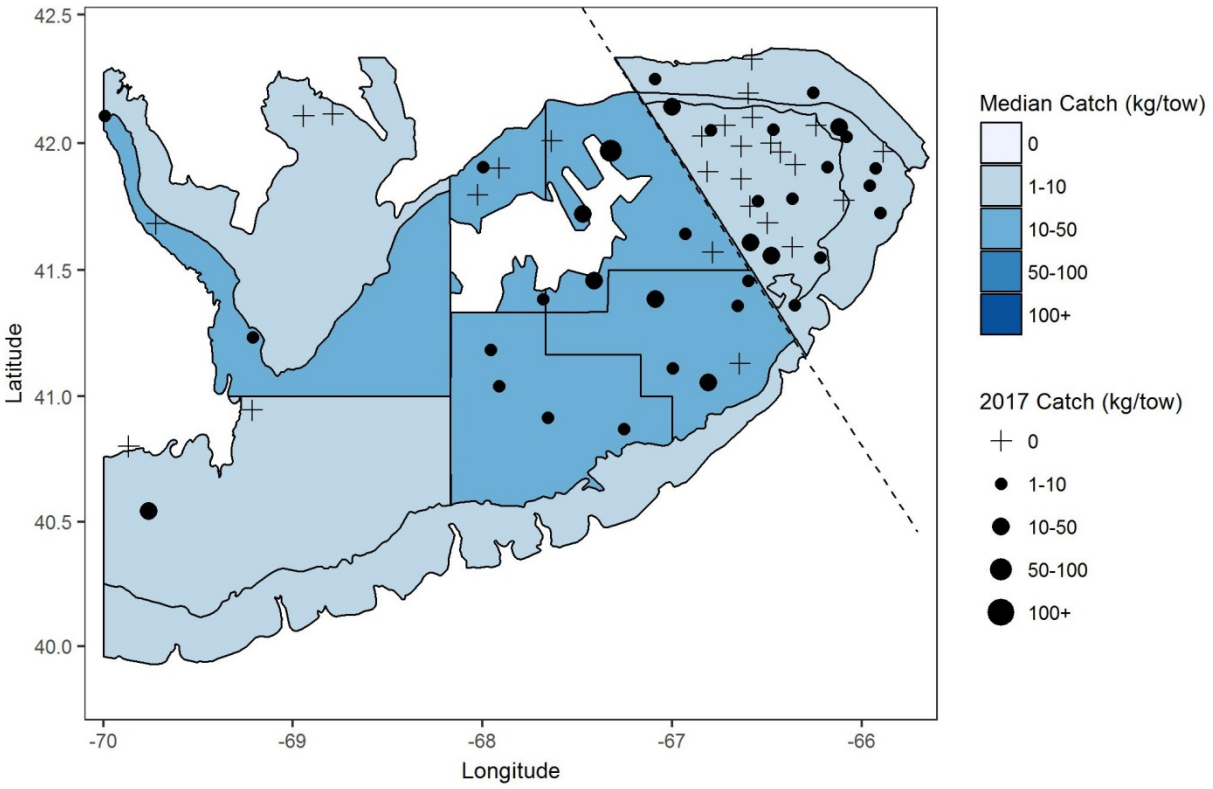

Figure 10a. Distribution of Little Skate catches during the 2017 Winter RV Survey. Long-term median catch (kg/tow) of individual strata is represented by shades of blue. Black circles represent catches. The circle area is proportional to the 2017 catch size. Zero catch is represented by the + symbol.

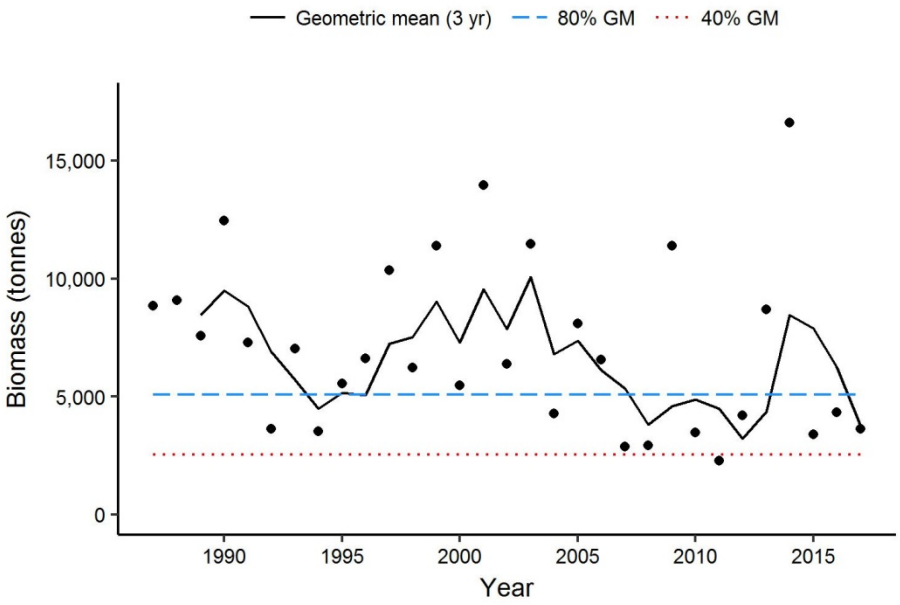

Figure 10b. Biomass index for Little Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The 3-year geometric mean biomass is represented by the solid black line. The dashed blue and dotted red lines represent 80% and 40% of the long-term geometric mean (1987-2016), respectively. The black dots represent the biomass estimate for that year.

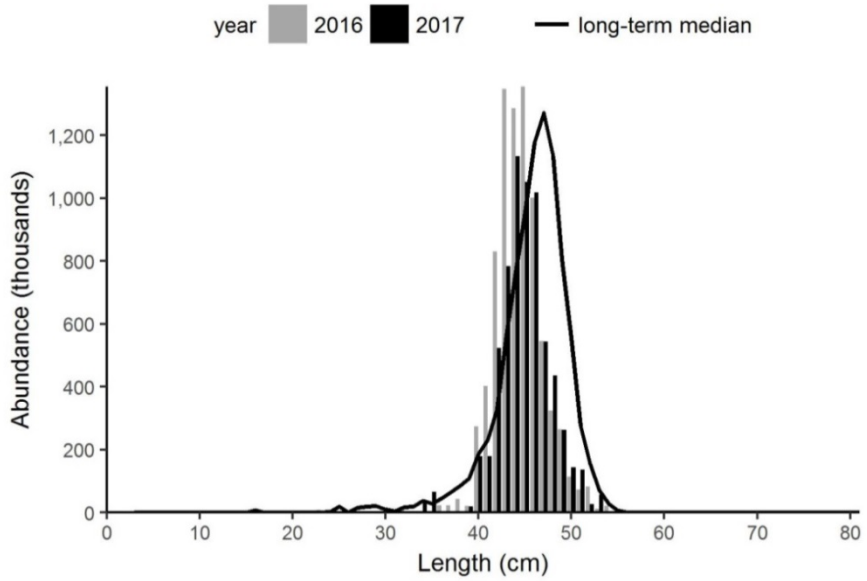

Figure 10c. Length frequency indices for Little Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the number in thousands at length from the 2016 survey. The black bars represent the number in thousands at length from the 2017 survey. The solid black line represents the median number in thousands at length for the time period 1987-2015.

Conclusions

The 3-year GM biomass indices in 2017 for Strata 5Z1-5Z4 from the Winter RV Survey were below 40% of the long-term GM (1987-2015) biomass for Pollock, Yellowtail Flounder, and Winter Skate. For Haddock, the 3-year GM biomass index was the highest in the series. For species such as Smooth Skate and Pollock, which are generally found in water deeper than is found in Strata 5Z1-5Z4 on Georges Bank, inclusion of a broader area may be needed to provide indices that are useful for monitoring abundance trends.

Contributors

Name	Affiliation
Donald Clark (Lead)	DFO Science, Maritimes
Catriona Regnier-McKellar	DFO Science, Maritimes
Heath Stone	DFO Science, Maritimes
Daphne Themelis	DFO Science, Maritimes
Lottie Bennett	DFO Science, Maritimes
Laura Hussey-Bondt	DFO Resource Management, Maritimes

Approved by

Alain Vézina
Regional Director of Science
DFO Maritimes Region
Dartmouth, Nova Scotia
Ph. 902-426-3490
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Center for Science Advice (CSA)
Maritimes Region
Fisheries and Oceans Canada
Bedford Institute of Oceanography
1 Challenger Drive, PO Box 1006
Dartmouth, Nova Scotia B2Y 4A2

Telephone: 902-426-7070
E-Mail: XMARMRAP@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs/

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