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Yellowtail Flounder Catches in the Virginia Institute of Marine Science Scallop Dredge Survey, 2016-2018

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ABSTRACT

The Virginia Institute of Marine Science (VIMS) conducted a fine scale spatial dredge survey of the Closed Area II (CAII) access area and surrounds in 2016, 2017, and 2018 for the purposes of examining scallop abundance and distribution. In 2018, the survey domain was expanded to cover additional area along the southern flank of Georges Bank (GB). Data were collected on scallops and finfish catch. Survey catches were examined to determine whether there were trends in yellowtail flounder abundance in the surveyed area. Results suggest a decline in yellowtail flounder abundance in the area surveyed over the three-year period.

RÉSUMÉ

Introduction

The stock assessment model for Georges Bank (GB) yellowtail flounder uses an empirical assessment approach, developed at the 2014 GB yellowtail flounder Diagnostic and Empirical Approach Benchmark and subsequent Transboundary Resource Assessment Committee (TRAC) meeting in 2014, and further refined following an intersessional TRAC conference call in June 2017 (i.e., adjusted survey catchability). Three bottom trawl surveys (DFO, NMFS spring, and NMFS fall surveys) are used to create a model-free estimate of population biomass. An exploitation rate is applied to the average of these three surveys to derive catch advice.

Catches of GB yellowtail flounder by the groundfish fishery have been at historic low amounts due to low quotas, resulting in minimal fishery dependent information on the stock. There have also been uncertainties with the research vessel surveys from both the NMFS and DFO. In the case of the R/V *Bigelow* (NMFS survey vessel), there have been several investigations of the catchability used to convert the survey indices into biomass, and in the past year there have been concerns raised about the accuracy of the area swept by the survey vessel at different depths. In the fall of 2017, a different research vessel was used because the R/V *Bigelow* suffered from a mechanical casualty, and the spring DFO survey also used a different vessel than normal. As a result of the uncertainty caused by these factors, additional information on recent abundance trends could be helpful when interpreting the results of the empirical approach.

The U.S. Atlantic Sea Scallop fishery has an extensive research program funded by a set-aside of the annual quota. A key part of this program is the funding of surveys using several different gears: commercial dredges, a standardized sea scallop survey dredge, and cameras. The VIMS dredge survey focuses primarily on areas of sea scallop abundance, but also collects biological information related to finfish and other biota as a secondary objective. Surveys on GB often overlap areas of historic yellowtail founder distribution, such as the VIMS dredge surveys of Closed Area II (CAII) Access Area and surrounds in 2016, 2017, and 2018. Here, the VIMS time series in CAII and surrounds was examined for short-term trends in yellowtail flounder abundance.

Data and Methods

For the years 2016 through 2018, VIMS received scallop research set-aside funding to conduct a high resolution, stratified random dredge survey to sample the GB CAII access area, as well as a rotational closure area south of the access area and additional area on the southern flank of GB (Figure 1). A total of 100 stations were sampled in CAII and surrounds during the 2016 and 2017 survey campaigns.

A total of 123 stations were sampled in 2018 when the survey domain was expanded to the southern flank of GB. While the focus of the survey was to conduct a high-resolution survey of the scallop resource in these areas, a secondary objective was to collect information on finfish catch. Two finfish species of most interest were yellowtail flounder and windowpane flounder because the scallop fishery catches of these species are limited to a small allocation.

As noted above, the CAII survey domain remained the same in 2016 and 2017 (Figure 1), and was expanded in 2018. Stratification is based on the NEFSC shellfish strata. While the survey does not cover all of GB, it does focus on the area of historic yellowtail abundance that corresponds to an area with limited coverage by the NMFS bottom trawl spring and fall surveys in 2016-17 (Figure 2).

Stratification, Allocation and Sample Size

The survey consisted of one annual cruise that sampled survey domains in and around CAII using a stratified random survey design. For a stratified random design, relative gains in precision are realized from a number of different sources. Compared to simple random sampling, effective stratification that accurately reflects scallop abundance and divides the population into homogenous subgroups (strata) is a critical initial step. Additional gains are realized by allocating sampling stations to those strata to result in the minimization of within-strata variance (Cochran, 1977). In 2016, stations were allocated using proportional allocation based on stratum size. In 2017 and 2018, a hybrid approach was used consisting of both proportional and optimal allocation techniques (Neyman allocation) for station allocation (Cochran, 1977). A percentage of stations were allocated based on stratum area, the number of scallops observed in the previous year, and the biomass (grams) of scallops observed in the previous year. To ensure all strata in the survey domains were sampled, all strata were allocated a minimum of two stations.

Catch Data

The project used a commercial sea scallop dredge vessel to conduct 9-day trips in the spring/summer. During the survey cruise, the vessel occupied a total of 100 pre-determined stations in the CAII and surrounds survey domain on an annual basis in 2016 and 2017. In 2018, the survey domain was expanded and 123 stations were completed throughout the survey area. Within the same the survey footprint as the 2016 and 2017 surveys, 100 stations were completed. At each station, the vessel simultaneously towed two dredges. The NMFS sea scallop survey dredge, 2.4 m in width equipped with 5.08 cm rings, 10.16 cm diamond twine top and a 3.8 cm diamond mesh liner was towed on one side of the vessel. On the other side of the vessel, a 4.27 m or 4.57 m commercial scallop dredge equipped with 10.16 cm rings, a 25 cm diamond mesh twine top and no liner was used. In this paired design, it is assumed that the dredges cover a similar area of substrate and sample from the same population of scallops.

The catch data obtained during the survey tows provide information that serves as the basis for analyses of the abundance and distribution of the sea scallop resource in the survey domain. For each paired tow, the dredges were fished for 15 minutes with a towing speed of approximately 3.8-4.0 kts. A tilt sensor (records angle of inclination, temperature, depth) was used to determine dredge bottom contact time and high-resolution navigational logging equipment was used to accurately determine vessel position and speed over ground. Time stamps for both the inclinometer and the navigational log determined both the location and duration fished by the dredges. Bottom contact time and vessel location were integrated to estimate area of gear coverage.

Catch Sampling
Sampling of the catch was conducted in the same manner described by DuPaul and Kirkley (1995) and DuPaul et al. (1989), which has been utilized during all VIMS scallop surveys since 2005. For each paired tow, the entire scallop catch from both the survey and commercial dredges was kept separate and placed in traditional scallop baskets. Total scallop catch, or a subsample depending upon the volume of the catch, was measured in to the nearest millimeter (mm) to determine size frequency. This protocol allows for the determination of the size frequency of the entire catch by expanding the catch at each shell height by the fraction of total number of baskets sampled. The result is an estimate of the number and size of the scallops caught for each dredge. This catch information was also used as the basis to assess biomass and relative efficiencies of both dredges.

Other sampled species included typical sea scallop fishery catch - groundfish, skates, crabs and starfish. All groundfish (flatfish, monkfish, cod, haddock, dogfish) were counted and measured (total length (TL)) to the nearest mm by species for each dredge. The differences in selectivity of the two dredges used can provide a holistic estimate of the age structure of the finfish bycatch population. Barndoor skates were measured (TL) and discarded. All other skates were counted and identified as unclassified skates. Crabs, starfish and snails were identified to the genus or species level and enumerated at random stations for predator monitoring. All station-level data was entered into the data acquisition program Fisheries Environment for Electronic Data (FEED). Collected data includes catch data (scallops, finfish, invertebrates, and trash), length measurements, bridge information and shell height – meat product quality data. Length measurements were recorded using an electronic Ichthystick measuring board integrated with the FEED program that allows for automatic recording of length measurements. The bridge data includes station level information: location, time, tow time (break-set/haul-back), tow speed, water depth, weather, and comments relative to the quality of the tow.

Results

For the three years of the VIMS survey, few yellowtail flounder were caught outside the boundaries of CAII (Figure 3). This is generally consistent with the results of recent bottom trawl surveys in this area, which show yellowtail flounder distribution highest in NMFS bottom trawl stratum 16. While the 2016 and 2017 surveys caught similar numbers of fish in total, the 2018 survey showed a decline (Table 2). The survey dredge showed a decline in yellowtail flounder by numbers of fish each year. The commercial dredge showed a small increase in numbers of fish from 2016 to 2017, note that a different dredge was used that year (4.27 m width rather than the 4.57 m width used in 2016 and 2018). In 2018, the commercial dredge also showed a decline in the number of yellowtail caught. This decline is evident even though there was an increase in the number of stations sampled and area covered in 2018 compared to 2016 and 2018.

The survey dredge retains smaller yellowtail flounder than the commercial dredge, which is expected since the survey dredge uses a 3.8 cm liner that is not used in the commercial dredge. In 2018, the survey dredge did not retain any yellowtail flounder smaller than 300 mm (Figure 4).

Discussion

The VIMS scallop survey provides detailed spatial coverage of a portion of the yellowtail flounder stock area. With its consistent and well-documented methods, it can provide additional information on the status of the GB yellowtail flounder stock – albeit for a limited area at one time of the year. However, the area covered by the survey is an area long-recognized as important for this stock. The information from this survey can be used as ancillary information to assist with the interpretation of the assessment results.

Over the 2016-2018 time period, the VIMS survey reflected a decline in yellowtail flounder abundance in the area of the survey. Unlike the previous two years, the 2018 survey did not catch any fish smaller than 300 mm, which may indicate a lack of recruitment. Given the limited number of fish caught this conclusion, however, is uncertain.

References

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Table 1 – Summary of VIMS survey coverage.

Year	Gear	Stations	Total Area Swept (m^2)	Average Tow Distance (m^2)	Comments
2016	Com	100	906,126.60		A 4.27 m commercial dredge was used in 2017. 2016 and 2018 had a 4.57 m commercial dredge.
	Survey		488,569.05	1,854.86	
2017	Com	100	775,880.70		
	Survey		417,055.22	1,695.52	
2018	Com	123	964,212.21		We expanded survey coverage into the southern flank this year.
	Survey		510,106.29	1,700.79	Tow distance is only calculated for survey dredge.

Table 2 – Summary of yellowtail flounder catches (number) in the VIMS scallop survey of CAII by year, 2016-2018.

Species	Year	Com Gear	Survey Gear	Total
Yellowtail Flounder	2016	22	21	43
	2017	25	15	40
	2018	8	6	14
	Total	55	42	97

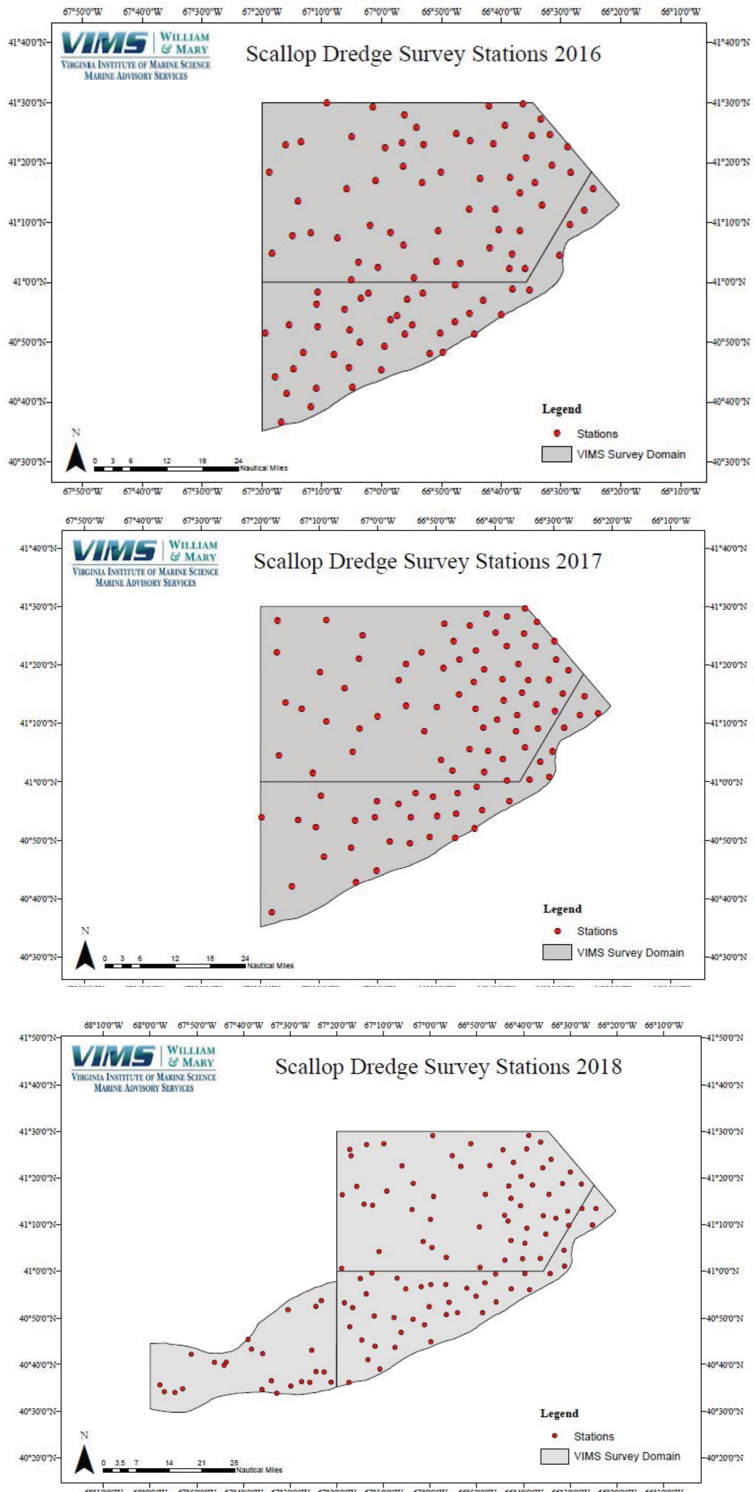

Figure 1 – VIMS survey area (grey) for CAII and surrounds showing stations completed by year.

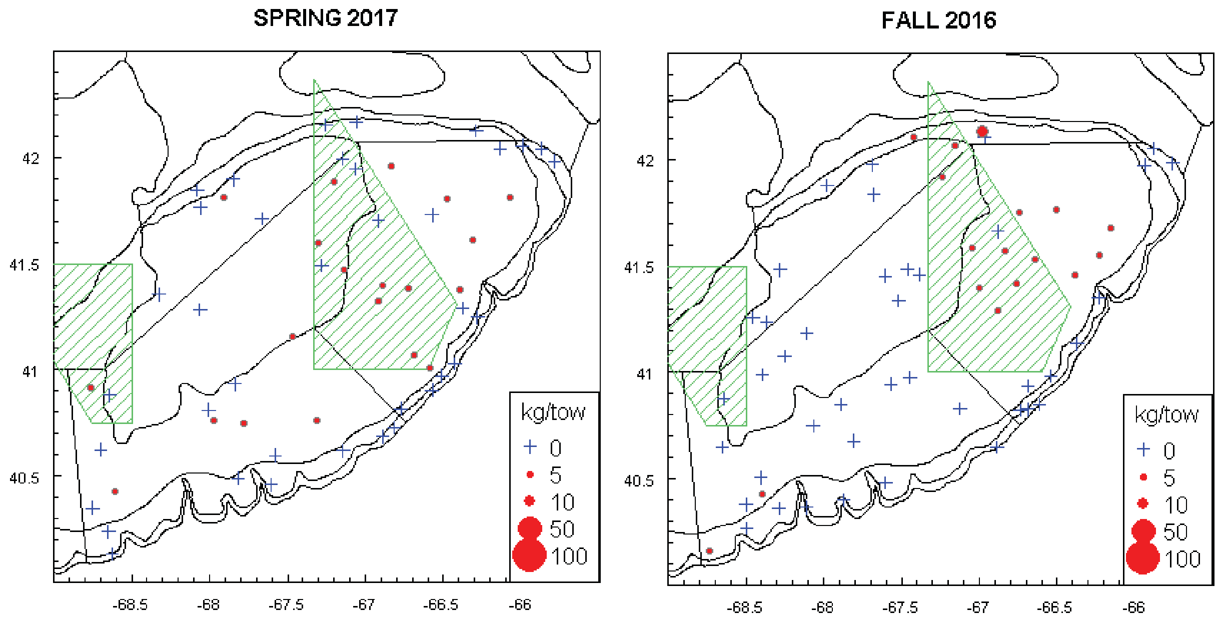

Figure 2 – NMFS spring 2017 and fall 2016 survey catches of yellowtail flounder.

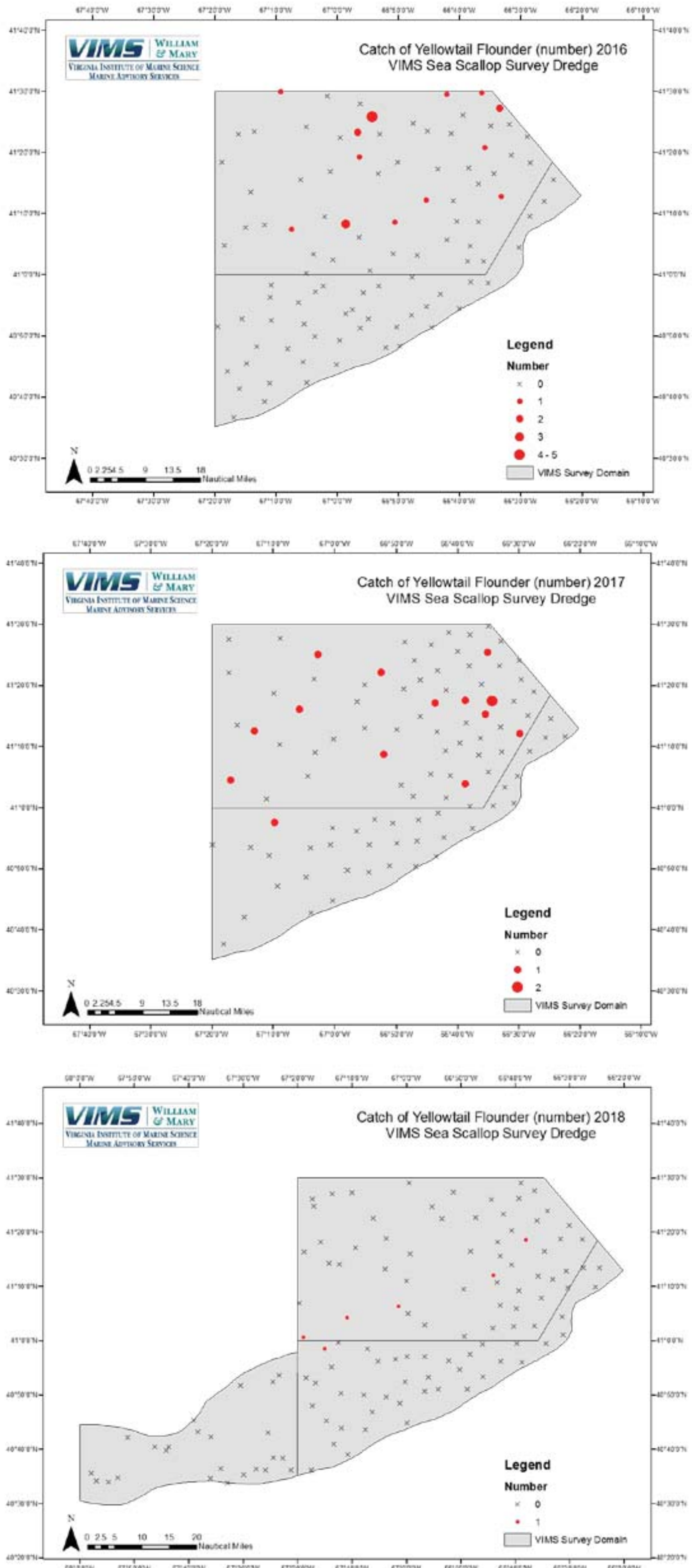

Figure 3 – VIMS scallop survey catches of yellowtail flounder (number), 2016-2018.

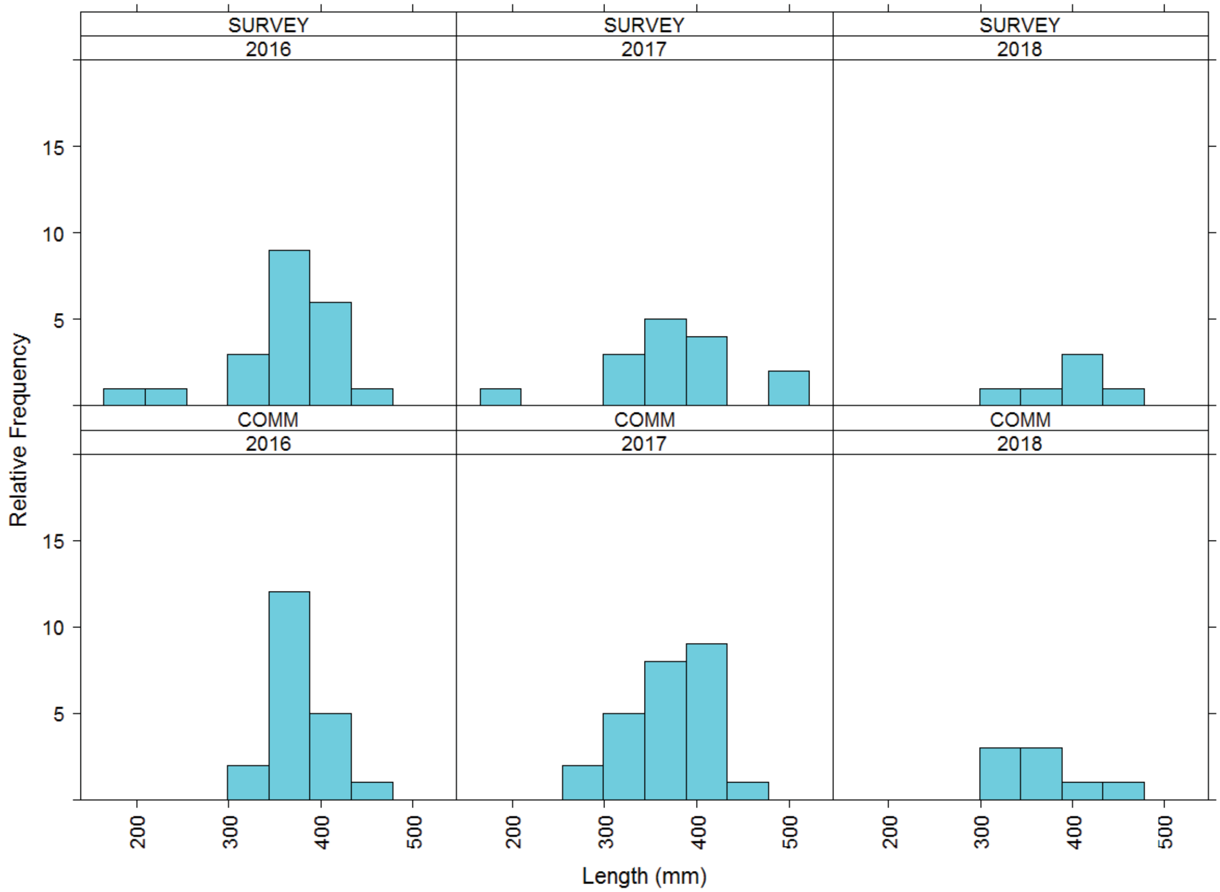

Figure 4 – Relative length-frequencies of yellowtail flounder caught in the VIMS scallop survey by year and gear. Survey gear (top) and commercial gear (bottom).