BYCATCH CHARACTERIZATION IN THE SOUTHERN NEW ENGLAND SEA SCALLOP FISHERY

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Final Report

2012 Sea Scallop Research Set-Aside

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Eastern New England Scallop Association
"Working to preserve the New England small boat scallop fishery and fishermen"

Project Summary

This project used a collaborative research approach to collect data to characterize the bycatch in the Southern New England sea scallop fishery. Bycatch data was collected onboard five sea scallop limited access general category fishing vessels. Three vessels were out of Point Judith, Rhode Island, one vessel from Stonington, CT, and one vessel from Montauk, NY. The vessels fished under normal conditions, and weight and length data was recorded on scallops as well as all bycatch species captured. A total of 361 dredge hauls in 52 trips were sampled from June 2012 through July 2013. Fishing occurred south of Block Island. Sea scallop was 27.4% of the total catch composition. Flounder bycatch was low for all species and consisted of 4.2% of the total catch. Summer, windowpane, and yellowtail flounder were the main flounder species caught. The D/K ratio was calculated for flatfish and was generally low overall with a trend that showed an increase in the winter months.

Distribution maps were plotted by year for scallop, yellowtail flounder, windowpane flounder, and skate. Higher catches of scallop were found in the southeast area in 2012; however, the distribution was fairly even between the southwest and southeast in 2013. Yellowtail flounder bycatch occurred more frequently in the southeast. For windowpane flounder, distribution changed significantly between years with bycatch occurring in the southwest in 2012 in almost all the hauls. D/K ratios were low and increased in the winter months.

This 12 month snapshot shows the low bycatch of flatfish in this fishery but also the dynamic nature of scallops and other species sampled and the importance of sampling this type of data continually. The goal of the project was to provide managers and the fishing industry information to aid in the management of scallops in the SNE/MA management area with less uncertainty and with greater confidence.

Introduction

The Atlantic sea scallop (*Placopecten magellanicus*) is found along the eastern North American continental shelf from North Carolina to Newfoundland (Hart and Chute 2004). The sea scallop stock is divided into Georges Bank (GB), Mid-Atlantic, Southern New England (SNE), and Gulf of Maine, however, for assessment purposes, SNE is considered to be part of the Georges Bank region (NEFSC 2004; NEFSC 2010). Dredges (specifically toothless) are the primary gear used to harvest scallops, however in the Mid-Atlantic there is also the use of trawl net gear (NOAA 2011a). Bycatch in the sea scallop fishery includes a variety of finfish species including flatfishes such as yellowtail flounder (*Limanda ferruginea*), summer flounder (*Paralichthys dentatus*), winter flounder (*Pseudopleuronectes americanus*) and windowpane flounder (*Scophthalmus aquosus*) as well as skates.

The sea scallop fishery is managed by the New England Fishery Management Council (NEFMC) under the Atlantic Sea Scallop Fishery Management Plan (FMP) which was initially implemented on May 15, 1982. Throughout the years from 1982 to now, management actions have included meat count, limited access, effort control, gear regulations, days-at-sea (DAS), minimum ring size, crew limits, as well as, area closures on Georges Bank and the Mid-Atlantic and rotational closures. Sea scallops were formally declared overfished in 1997, however, due to the management measures put into place, there was a rapid increase in biomass (Hart and Rago 2006) and they were rebuilt by 2001.

The sea scallop fishery is divided into two types of vessel permit categories, limited access (LA) and limited access general category (LAGC). About 350 vessels hold limited access (LA) permits and two types of allocations are given to each vessel. The first are trips to rotational access areas that had been closed to scallop fishing in the past and the second are days at sea (DAS), which can be used in areas outside the closed and access areas (NEFSC 2010). About 60% of sea scallop landings are from the access landings. The remainder of landings comes from vessels operating under “General Category” permits. These vessels are restricted to 600 lbs meat (272 kg) per trip with a maximum of one trip per day. In the late 1990s, landings from these vessels were less than 1% of total landings. From 2007-2009, this number increased to about 10% and currently landings constitute about 6-7% of total landings (NEFSC 2010). General Category permits had been open access but in March 2010 this type of permit was converted to an individual transferable quota (ITQ) permit.

A number of Amendments and Framework Adjustments have been implemented since 1982 when the Scallop FMP came into effect. These have included a variety of major actions that have impacted the fishery and shaped the scallop resource. One example is Accountability Measures (AMs) which are management controls to prevent annual catch limits (ACLs) from being exceeded and were required by new provisions in the reauthorized Magnuson Stevens Act of January 2007. For the scallop fishery, the AM requirements were implemented in Amendment 15 and Framework 22. There are 2 types of AMs in the scallop FMP. Proactive measures which include the use of an annual catch target and reactive measures which include DAS or IFQ deductions to account for overages incurred in a previous fishing year. Besides a scallop annual catch target, there is also an ACL for yellowtail flounder. Implementation measures for ACLs and AMs include sub-ACLs administered for the LA and LAGC fisheries at 94.5% and 5.5% of the overall ACL, respectively. To account for the yellowtail flounder catch, the NEFMC sets ACLS for the Southern New England/Mid-Atlantic (SNE/MA) and George Bank yellowtail flounder for the scallop fishery. If the ACL of yellowtail flounder is exceeded for the year then the AM goes into place the following year to account for the overage. For SNE/MA, the statistical areas that are included in the closure areas are 537, 539, and 613 (Figure 1).

At the time of the funding cycle for this project, management actions in the sea scallop fishery were being considered through Framework 23 to the FMP. Under Framework 23 there was consideration for the implementation of an AM for the LAGC fishery in the SNE/MA fishery if the yellowtail flounder sub-ACL is exceeded. That AM would have created substantial closures in the SNE area posing potential hardships on that fleet. One data source that was being utilized was 2010 observer data to estimate the yellowtail flounder catch in the scallop fishery as it relates to the yellowtail flounder sub-ACL. After the original data was presented, concerns were expressed by the fishing industry over the high bycatch estimate for the SNE/MA yellowtail flounder for the LAGC fishery. The data was reviewed by the NEFMC and after being stratified by gear type, permit category, and area, it was discovered that the LAGC trawl fishery was the fleet with the higher SNE/MA yellowtail bycatch and not the LAGC dredge fishery.

In light of the new data specifications, the Council realized that actions on the yellowtail AMs for the LAGC fishery in the SNE/MA area needed to be delayed and reconsidered. Therefore it became clear to the LAGC fishery that it was important to collect and provide additional information on the bycatch characterization of that fishery, specifically the fleet in statistical area 537, 539, and 613 because potential closures in that area would be all year and the LAGC fleet consists of small vessels that don't have the ability to travel long distances and this management action would potentially cost these fishermen their livelihood.

Realization of the need for more directed data collection in the SNE LAGC led to this project being funded. Since that time the proposed AMs in Framework 23 were not implemented as originally proposed. However, the need for bycatch rates including seasonal, spatial, and temporal distribution patterns for yellowtail flounder as well as other key bycatch species is still a priority for the scallop resource. This project provides preliminary data that can address these needs.

Project Objectives

The overall goal of this project was to collect information on the bycatch in the Southern New England scallop fishery in order to accurately characterize the fishery to provide managers and the fishing industry data with which management measures can be potentially based on.

The main objectives of this study were to:

- Characterize the quantity and composition of yellowtail bycatch, as well as other bycatch species captured, in the SNE LAGC sea scallop fishery
- Compare catch rates of scallops and bycatch species temporally and spatially to estimate the average bycatch percentages in the SNE area fishing area
- Characterize the SNE sea scallop dredge fishing fleet
- Provide data to management agencies that will have greater fishing industry confidence

Methods

Sampling Design

Sea sampling was conducted onboard commercial fishing vessels. Three vessels out of Point Judith, Rhode Island were used (F/V Mister G, F/V Harvest Moon, and F/V Brooke C), one vessel out of Stonington, CT (F/V Florence) and one vessel out of Montauk, NY (F/V New Species). These vessels fished using standard fishing practices and methods. Tow duration was approximately one hour. Vessel speed and wire out as well as areas fished were determined by the captain and were consistent with typical day to day fishing operations.

Sea sampling started in June 2012 and was completed in July 2013. Sampling was conducted in every month except for January and February of 2013 due to inclement weather which prevented vessels from fishing. A total of 361 dredge hauls in 52 trips were sampled. The number of hauls per day depended on the vessel and ranged from 4 to 13 per day. All trips were conducted south of Block Island(Figure 2).

Trained sea samplers were deployed aboard the vessels for each trip to collect the necessary data required for the project. Sea samplers completed a gear description form to characterize the gear used aboard each vessel. This was done on the first cruise. Sea samplers collected data in a manner consistent with NMFS databases and on the NMFS issued observer data forms relating to fishing operations, sea conditions and catch composition. Sub-sampling was used to determine the catch weight for scallops in order to get an accurate weight without interfering with normal fishing operations. Sea scallop weights were recorded as shell weight and then converted to meat weight by dividing by the conversion factor of 8.33 which is the conversion factor used by the statistics branch (Deidre Boelke, NEFMC, personal communication, October 23, 2012). Lengths for scallops and finfish were taken. Lengths were measured in cm. For scallops, lengths were taken in 5 cm increments and for finfish, lengths were measured to the nearest whole cm. All finfish bycatch were sorted. Total weights of each species captured were recorded. The observers performed whole haul sampling for weights.

Gear Description

All vessels fished with a single dredge and dredge sizes ranged from 8.0 ft to 10.4 ft width (Table 1, Figures 3-6). All dredges had a twine top of at least 10 inches (26 cm) with an inside ring size that was no less than 4 inches (10.2 cm).

Table 1. Scallop dredge gear used in the characterization study.

Vessel	Dredge Width	Dredge Type
F/V Harvest Moon	8.0 ft	Bluefleet New Bedford style
F/V Florence	8.0 ft	Bluefleet New Bedford style
F/V Mister G	9.5 ft	P-town Dredge
F/V New Species	10.0 ft	Bluefleet New Bedford style
F/V Brooke C	10.4 ft	New Bedford style

*The P-town dredge has a straight neck making it ideal for use when towing the dredge in a straight line with few obstacles. The New Bedford style dredge has an upturned neck or “goose neck” allowing it to be towed through rougher, hard bottom, substrates.

Data Analysis

Percentages of catch composition of scallops and other key species were calculated. Means, standard errors, and minimum and maximums by haul were calculated in SAS and graphed.

Distribution plots were developed for scallop, yellowtail flounder, windowpane flounder, and skate using ArcGIS to show possible concentration of fish by location and year. Each haul was plotted and divided into high or low based on the mean catch per haul for scallop and skate. For yellowtail and windowpane flounder, because catches were so low, the hauls were designated as catch or no catch.

Yellowtail flounder discards as well as other flatfish were evaluated based on D/K ratios. D/K was calculated as the ratio of discarded yellowtail flounder to kept meat weight of scallops.

Length frequency distributions were graphed and mean lengths calculated for scallop and other flatfish.

Results

Sea scallop meat weight ranged from 0.0 to 150.9 pounds per haul with a mean catch weight of 61.3 pounds per haul (Table 2, Figure 7). Yellowtail flounder was caught in 264 tows and ranged in weight from 0.1 to 15.0 pounds. Mean catch was 3.9 pounds. Windowpane flounder was caught in 230 hauls. Weight ranged from 0.1 to 27.0 pounds. Other species can be found in Table 2.

Table 2. Mean catch of key species sampled including standard error, minimum, and maximum catch per haul.

Species	N	Mean	Std Error	Min	Max
Sea Scallop (meats)	361	61.3	1.32	0.0	150.9
Yellowtail Flounder	264	3.0	0.17	0.1	15.0
Windowpane Flounder	230	3.6	0.29	0.1	27.0
Winter Flounder	151	1.9	0.12	0.1	8.1
Summer Flounder	169	6.9	0.55	0.3	39.0
Witch Flounder	22	1.0	0.11	0.3	2.5
Gulf Stream Flounder	46	0.2	0.03	0.0	1.1
Fourspot Flounder	257	1.0	0.06	0.1	11.9
Monkfish	326	22.7	1.01	0.0	93.9
Winter Skate	335	21.8	1.48	0.8	437.0
Little Skate	354	54.2	1.89	3.8	236.0
Skate NK	284	11.8	1.09	0.5	144.0
Clearnose Skate	3	5.6	2.53	1.3	10.0
Barndoor Skate	89	2.0	0.18	0.2	9.0

Note: Values are in pounds
Skate NK may include small little and winter skate

Sea scallop was 27.4% of the catch composition when all data was combined. Skate was the highest proportion at 37.4% with little skate and winter skate consisting of almost 88% of all the skate caught (63.5 and 24.2%, respectively). It is important to note, however, that there was some difficulty in species identification for the skate so the skate nk category may include little skate and winter skate and therefore those individual percentages may be higher (little skate, winter skate, and skate nk consist of 99% of all skate). Therefore, the total skate proportion is the most accurate. Flounder bycatch was low for all species caught, consisting of 4.2% of the total catch. Summer flounder, windowpane, and yellowtail flounder had the highest catch percentage and combined were 82.5% of the total flounder catch (34.2, 24.5, and 23.8%, respectively). Of the total catch, winter flounder was 1.4%, and windowpane and yellowtail were each 1.0%.

Catches of scallop, yellowtail flounder, windowpane flounder, and skate were plotted spatially by year (Figures 8-11). Hauls were separated into low and high by the mean for each year. In 2012, scallop catches were generally higher in the southeast area with 62% of the catch per haul above the mean of 62.2 lbs compared to 24% in the southwest area (Figure 8). The fishermen also conducted almost twice as much fishing in that area. In 2013, a larger percentage of high catches of scallop were found in the western area. In general, however, there was a fairly even distribution in the catch of scallop in both areas.

Distribution of yellowtail flounder bycatch was higher in the southeast with 84% of the hauls conducted having a bycatch of yellowtail flounder compared to 47% in the southwest in 2012 (Figure 9). In 2013, catch percentage was higher in the southeast (86%) but was still greater than no catch in the west (65%). Please note that yellowtail flounder bycatch is extremely low therefore, distribution plots were done based on catch or no catch and not on the mean.

The catch distribution of windowpane flounder changed significantly between 2012 and 2013 (Figure 10). As was done with yellowtail flounder, based on the very low numbers of catch, the hauls were plotted based on if there was any catch of windowpane flounder or no catch. In 2012, in the southwest sampling area, windowpane flounder was caught in 96% of the 76 dredge hauls conducted. Whereas in 2013, in the same general area, only 31% of the dredge hauls conducted had a catch of windowpane flounder. In the southeast area, the distribution of catch of windowpane flounder is fairly similar between years with around 60% of the dredge hauls having windowpane flounder. Again, please note that the bycatch of windowpane flounder is low.

Mean total skate per tow was 94.0 lbs in 2012 and 70.1 lbs in 2013. Distribution of the catch of skate in 2012 was similar to scallops and yellowtail flounder with higher levels of catches found in the southeast area (Figure 11). In 2013, lower catches were still found in the southwest area, however, in the southeast area the catches of low to high were equally distributed.

Depth ranged from 20 to 30.7 fathoms. Mean catch per depth was calculated for yellowtail, windowpane, and winter flounder (Figure 12). Catch of windowpane flounder declined with depth. Yellowtail flounder and winter flounder catch remained fairly constant in relation to water depth.

D/K ratios were calculated for all flounder species (Table 3). The mean D/K ratio for yellowtail flounder for all hauls was 0.04 and for windowpane flounder was 0.05. D/K ratios by month for all flatfish can be found in Table 3 and Figure 13. Generally D/K is higher in winter months. The percentage of D/K is below 5% in almost all cases except for summer flounder, windowpane flounder, and yellowtail flounder in the winter months, as well as windowpane flounder in August of 2012 and yellowtail flounder in April of 2013.

Table 3. D/K ratios of flatfish captured during study.

		Yellowtail	Windowpane	Winter	Summer	Fourspot	Witch	Gulfstream
2012	June	0.0315	0.0176	0.0577	0.0000	0.0082	0.0000	0.0015
	July	0.0124	0.0191	0.0129	0.0022	0.0141	0.0003	0.0003
	August	0.0129	0.0770	0.0124	0.0024	0.0132	0.0000	0.0000
	September	0.0108	0.0061	0.0086	0.0403	0.0098	0.0000	0.0000
	October	0.0117	0.0314	0.0031	0.1239	0.0077	0.0000	0.0000
	November	0.1119	0.1579	0.0304	0.2725	0.0172	0.0000	0.0002
	December	0.1362	0.0941	0.0167	0.1853	0.0097	0.0010	0.0001
2013	January							
	February							
	March	0.0320	0.1153	0.0192	0.0252	0.0014	0.0000	0.0000
	April	0.0511	0.0272	0.0069	0.0329	0.0010	0.0017	0.0000
	May	0.0368	0.0060	0.0007	0.0371	0.0152	0.0023	0.0008
	June	0.0244	0.0013	0.0071	0.0113	0.0108	0.0000	0.0009
	July	0.0166	0.0197	0.0365	0.0088	0.0079	0.0000	0.0012
	Mean	0.0407	0.0477	0.0177	0.0618	0.0097	0.0004	0.0004

Lengths were taken on scallop and all finfish species and graphed for key species. A subsample of scallop lengths were taken on discarded and kept scallops (Figure 14). The mean length of yellowtail flounder caught in all tows was 35.5 cm (Figure 15). The minimum legal size of yellowtail flounder is currently 12 inches (30.5 cm). 94% of the yellowtail flounder caught were above the minimum legal size. The mean length of windowpane flounder caught in all tows was 27.6 cm (Figure 16).

Discussion

Bycatch of yellowtail flounder in the scallop dredge fishery has always been an area of concern. Regulatory measures have been implemented throughout the years to reduce the impact this fishery has on bycatch species. The LAGC fishery is a smaller component of the dredge fishery. The LAGC scallop fishing fleet can be characterized by fairly small vessels, fishing single dredges limited in size to no greater than 10.5 ft wide with many vessels fishing dredges less than that. The fishermen involved have continually stated that due to the nature of the gear they use, the bycatch rate of yellowtail flounder as well as other finfish is fairly low.

The overall objective of this project was to characterize the bycatch of the LAGC fishery. The results from this study indicated a low bycatch rate of yellowtail flounder as well as other flatfish. For example, the catch rate of flatfish was 4.2% of the total catch and discard/kept ratios for yellowtail and windowpane flounders was 0.04. The majority of the yellowtail caught, >90%, were above the commercial minimum legal size. The distribution maps that represent the catch of each haul of scallops, yellowtail, and windowpane flounder broken out by year, which combined actually represent 12 months, show how much the fish and fishery changes and moves in a short amount of time.

All fisheries are dynamic and the same is true for scallops even though they are not swimming species, they are still quite mobile. The finfish species captured in the complex are certainly mobile. Sampling in one year doesn't provide an accurate representation of the species or fishery. Surveys are generally multi-year due to year to year variability. In land surveys, annual variations detected in small mammal assemblages support the need for multi-year surveys (Robitaille & Linley 2006). The same can be said for surveys in the sea. In order to accurately characterize the bycatch of the Southern New England scallop fishery, ideally a multi-year sampling project is required.

There have been persistent reports of beds of scallops "migrating" or at least moving away from their known locations (Posgay 1963). Hurricanes which are quite frequent in the Southern New England region can cause major changes to occur in the ocean environment and affect the scallop population in a variety of ways. Even in the one year sampled in this project, in can be seen how the fishermen shift their fishing locations.

Fishermen observations are important to take into consideration. Marine ecologist Robert E. Johannes and colleagues warned that by ignoring fishermen's knowledge, we could "miss the boat" in regards to fisheries sustainability (Johannes et al. 2000). Fisheries management decisions should be made based the "best available science", but in many cases there is not enough available data about fishery ecosystems, species biology, and the effects of human activities, to make informed management decisions for fishery sustainability (Johannes 1998; Pauly 2006). Some fishery researchers and managers are increasingly recognizing that fishermen's knowledge of fishery resources and their ecosystems is a potentially useful, but underutilized source of crucial ecological knowledge (Berkes et al. 2000; Garcia-Quijano 2007; 2009; Valdes-Pizzini and Garcia-Quijano 2009; Huntington 2011; Johannes 1981; 2000; 2001).

Again, the observations reported by the fishermen indicate the a one year snap shot of the Southern New England scallop fishery is not an accurate representation. This project provided important knowledge of the scallop fishery resource; however, it only provided a short term view. The goal for the future would be to increase and expand this knowledge base of the Southern New England LAGC fishery.

References

Berkes F., J. Colding and C. Folke. 2000. Rediscovery of Traditional Ecological Knowledge as Adaptive Management. Ecological Applications 10(5): 1251-1262.

Garcia-Quijano, C.G.. 2007. Fishers' Knowledge of Marine Species Assemblages: Bridging Between Scientific and Local Ecological Knowledge in Southeastern Puerto Rico. American Anthropologist 109(3): 529-536.

Garcia-Quijano, C.G. 2009. Managing Complexity: Ecological Knowledge and Success in Puerto Rican Small-Scale Fisheries. Human Organization 68(1):1-17.

Hart, D.R., and A.S. Chute. 2004. Essential fish habitat source document: Sea scallop, *Placopecten magellanicus*, life history and habitat characteristics, 2nd ed. NOAA Tech Memo NMFS NE-189.

Hart, D.R., and P.J. Rago. 2006. Long-term dynamics of US Atlantic sea scallop *Placopecten magellanicus* populations. North American Journal of Fisheries Management. 26:490-501.

Hungtinton, H. 2011. Artic Science: The Local Perspective. Nature 478:182-183.

Johannes, R.E. 1981. Words of the Lagoon: Fishing and Marine Lore in the Palau District of Micronesia. Berkeley: University of California Press. 245 p.

Johannes, R.E. 1998. The Case for Data-less Marine Resource Management: Examples from Tropical Fisheries. Trends in Ecology and Evolution 13(6):243-246.

Johannes, R.E., M.M.R. Freeman, and R.J. Hamilton. 2000. Ignore Fisher's Knowledge and Miss the Boat. Fish and Fisheries 1: 257-271.

National Oceanic and Atmospheric Administration [NOAA]. 2011b. Commonly Asked Questions About 2011 Atlantic Sea Scallop Regulations. NOAA Fisheries Service Fact Sheet.

National Oceanic and Atmostpheric Administiation [NOAA]. 2011a. FishWatch – U.S. Seafood Facts: Atlantic Sea Scallop (*Placopecten magellanicus*). September 2011. http://www.nmfs.noaa.gov/fishwatch/species/atl_sea_scallop.htm

Northeast Fisheries Science Center [NEFSC]. 2004. 39th Northeast Regional Stock Assessment Workshop (39th SAW) Assessment Summary Report & Assessment Report. NEFSC Ref Doc. 04-10.

Northeast Fisheries Science Center [NEFSC]. 2010. 50th Northeast Regional Stock Assessment Workshop (50th SAW) Assessment Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 10-17; 844 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://www.nefsc.noaa.gov/nefsc/publications/

Posgay, J. A. 1963. Tagging as a technique in population studies of the sea scallop. ICNAF Spec. Pub. 4, 268-271.

Robitaille, J.-F. and R. D. Linley. 2006. Structure of forests used by small mammals in the industrially damaged landscape of Sudbury, Ontario, Canada. 2006. Forest Ecology and Management 225: 160-167.

Valdes-Pizzini M. and C. Garcia-Quijano. 2009. Coupling of Humans, Habitats and other Species: Cognition, Culture and the Economic Behavior of Fishermen in La Parguera, Puerto Rico. Caribbean Journal of Science 45(3):363-371.

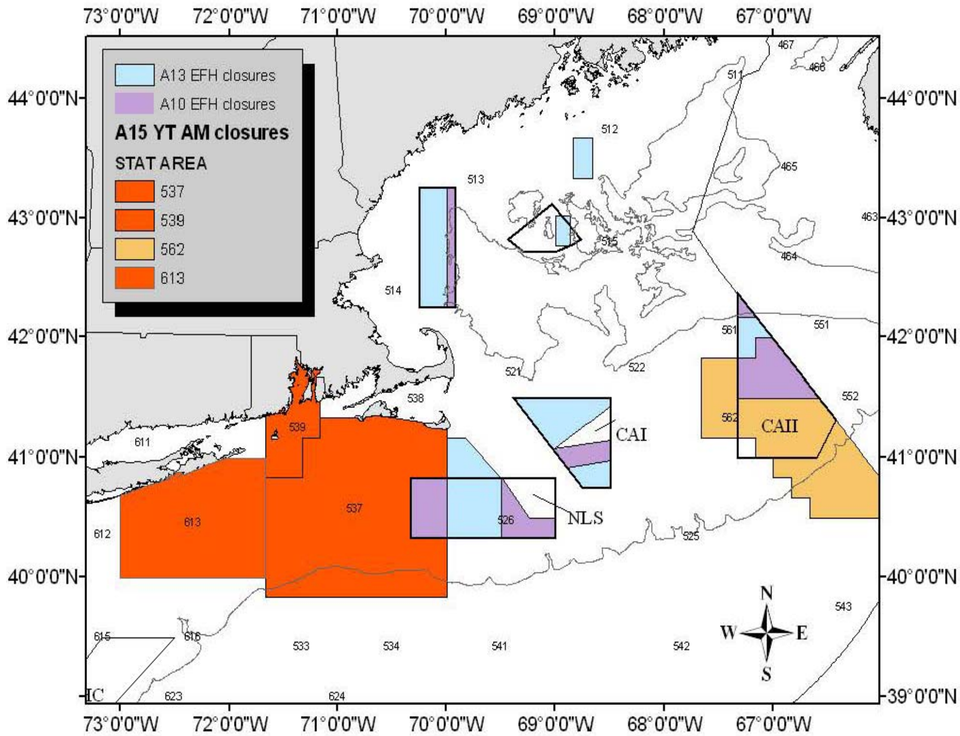
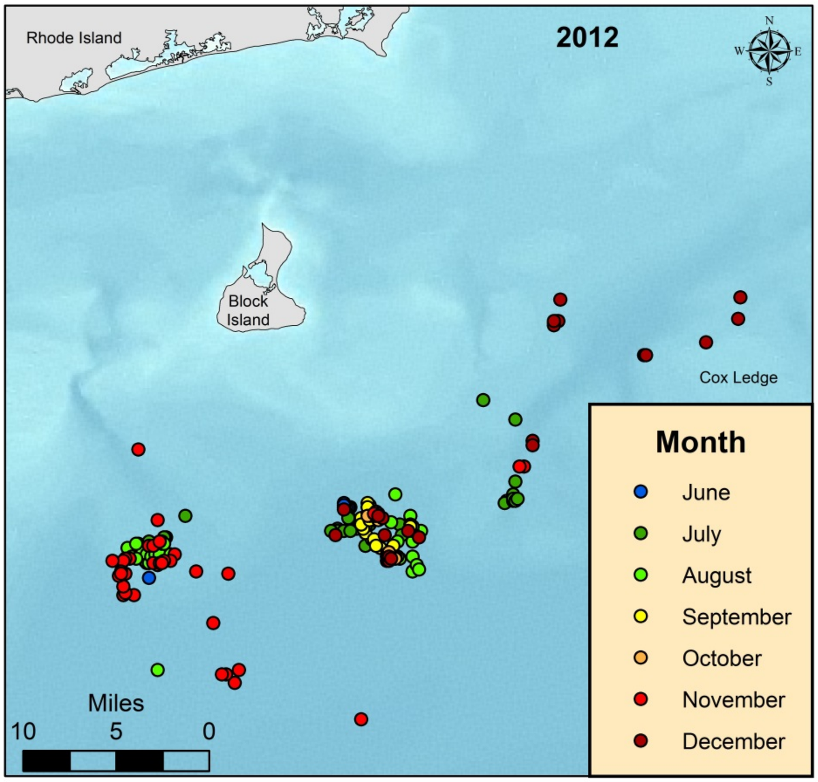


Figure 1. Map of the SNE/MA area showing statistical areas 537, 539, and 613 in orange.



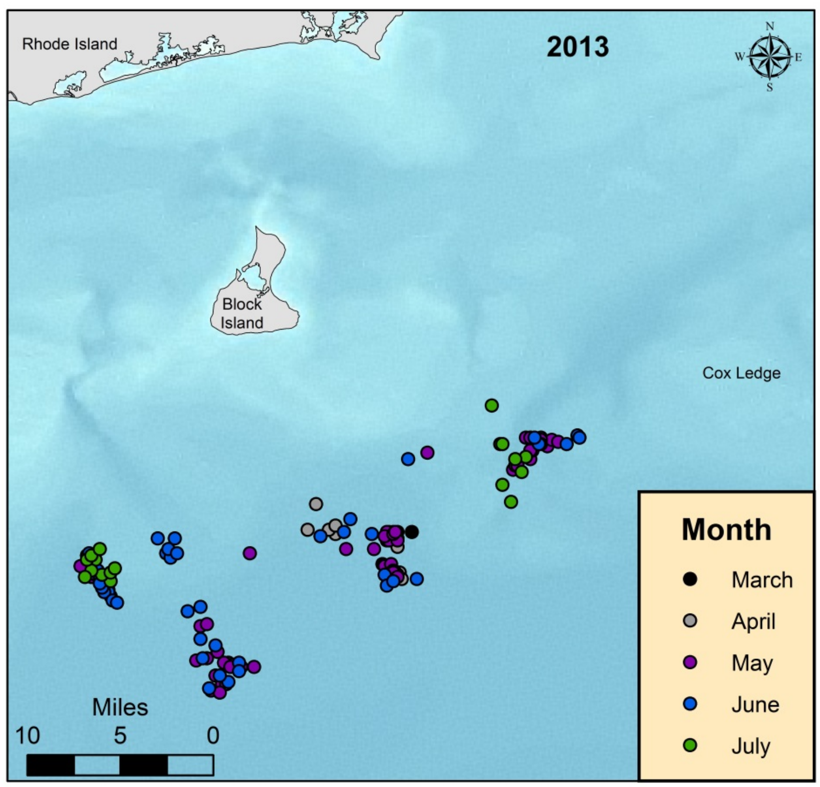


Figure 2. Haul locations broken down by month conducted in 2012.

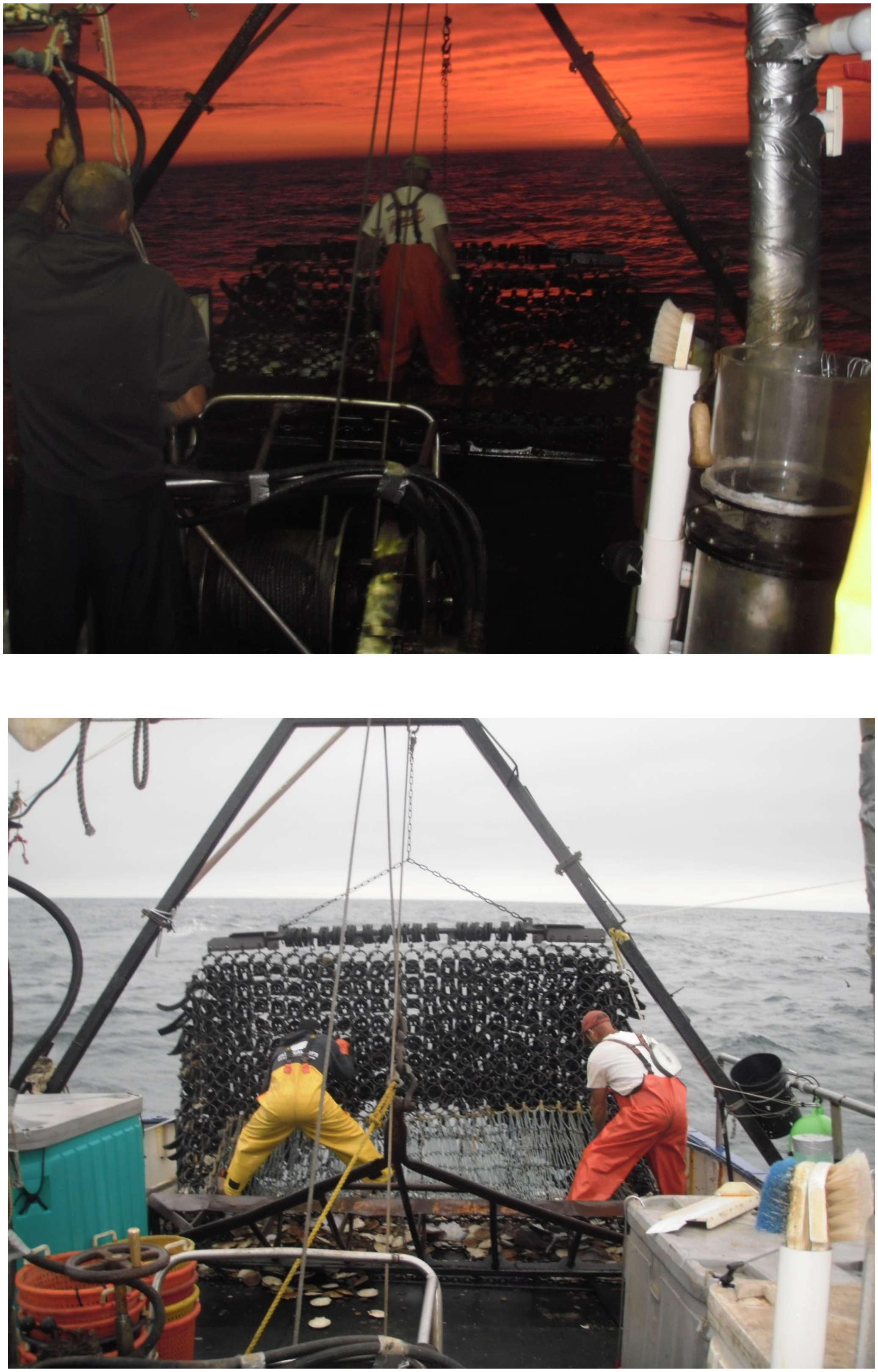


Figure 4. 10.4 ft wide New Bedford style scallop dredge used on LAGC vessel during study.

Figure 5. 9.5 ft wide P-town scallop dredge used on LAGC vessel during study.

Figure 6. 10.0 ft wide New Bedford style scallop dredge used on LAGC vessel during study.

Figure 7. 9.5 ft wide P-town scallop dredge used on LAGC vessel during study.

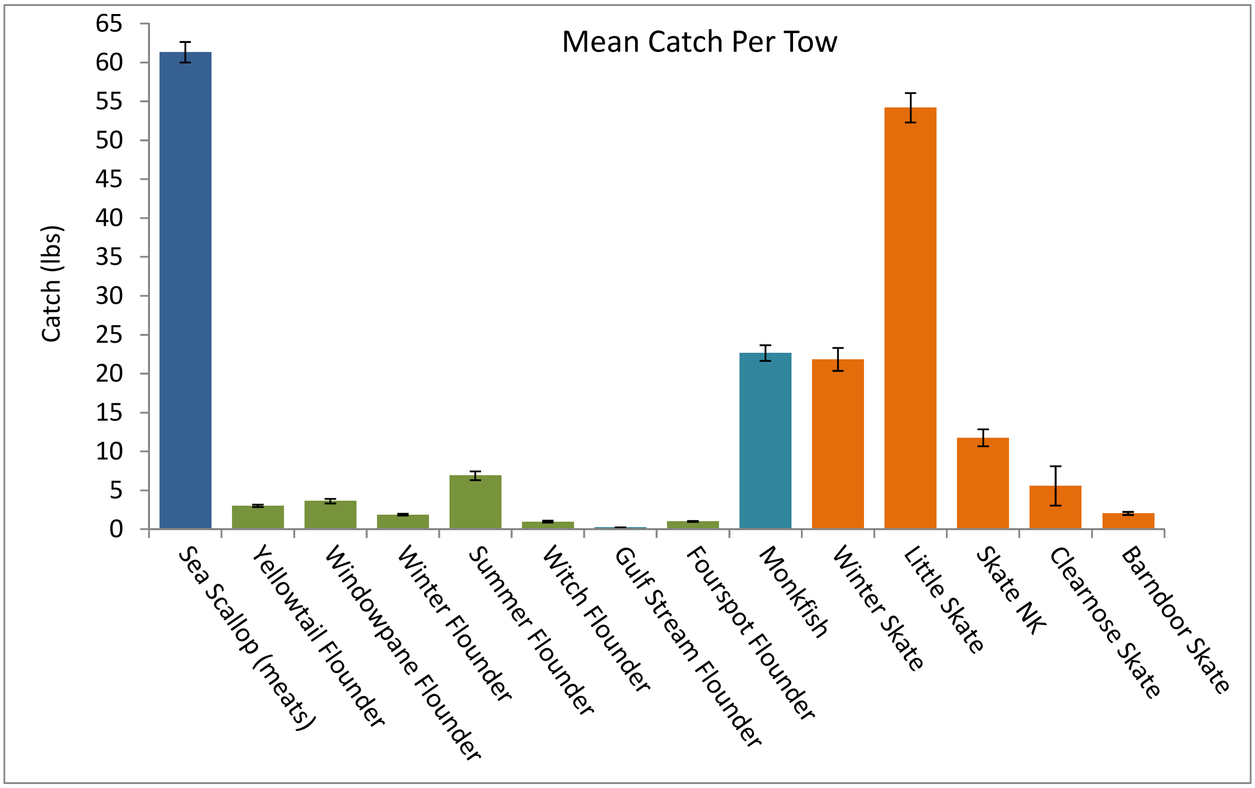


Figure 8. Mean catch per tow of scallops and other species in 53 trips sampled on board LAGC vessels.

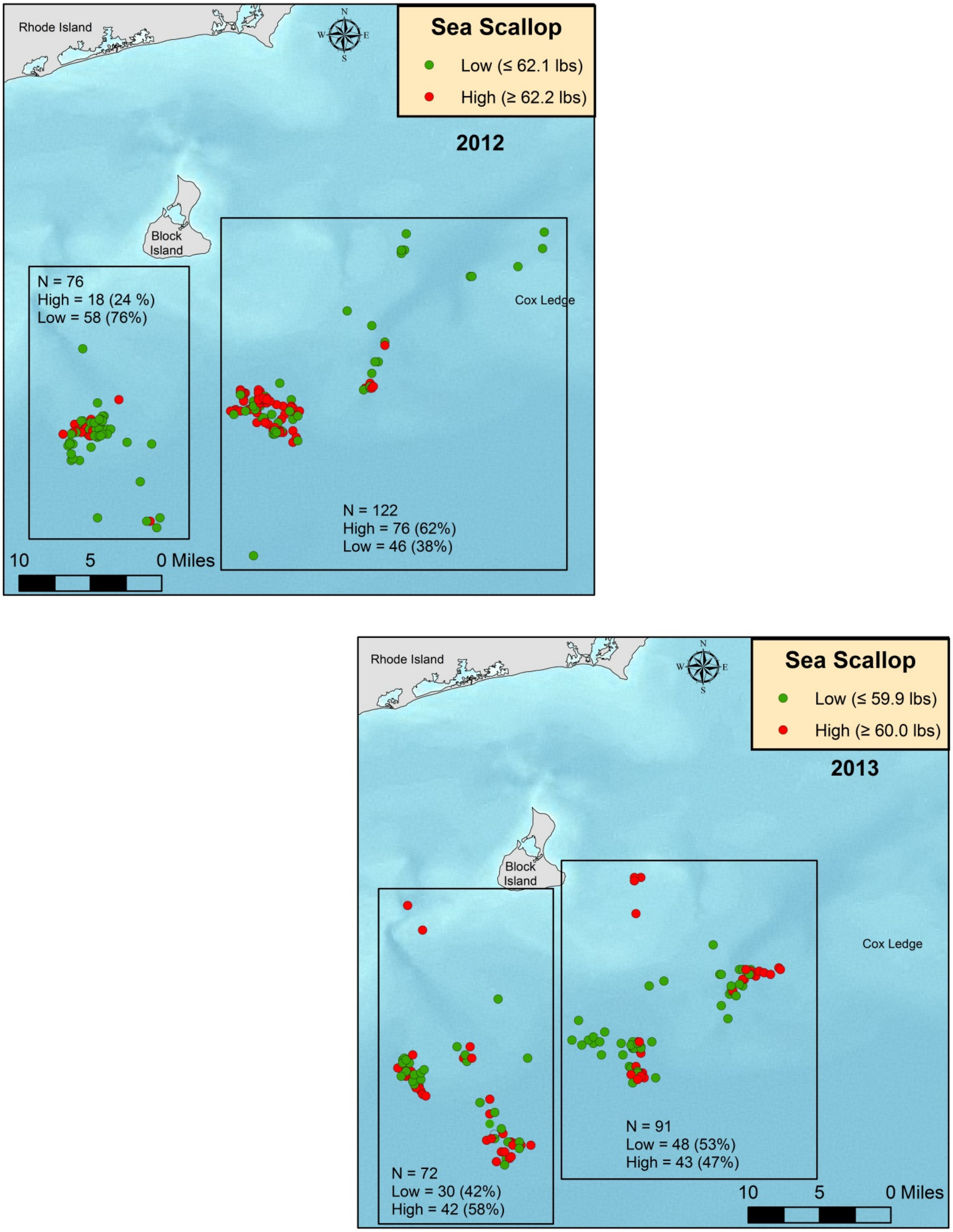


Figure 9. Scallop catch distribution by area divided by low and high catch based on mean values.

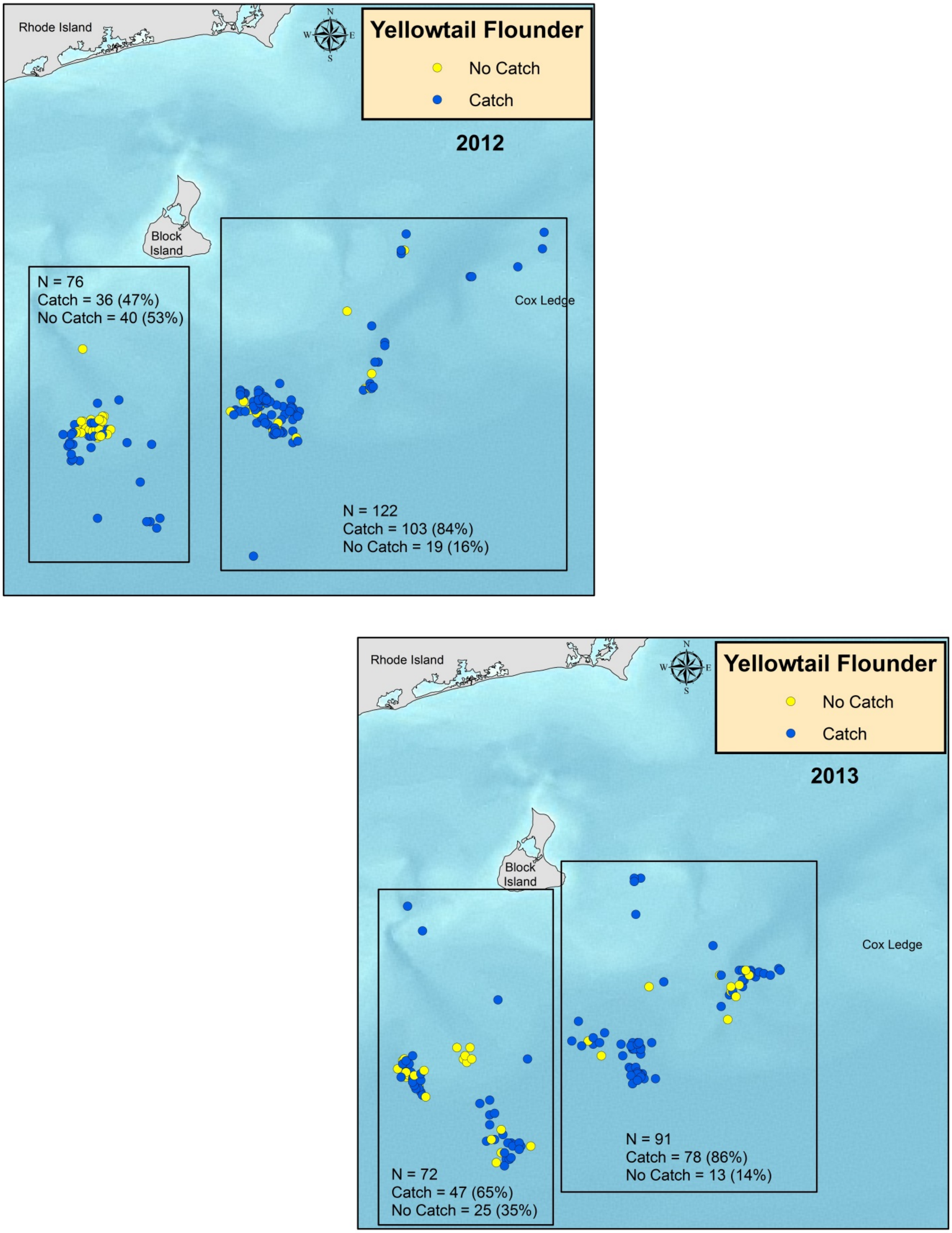
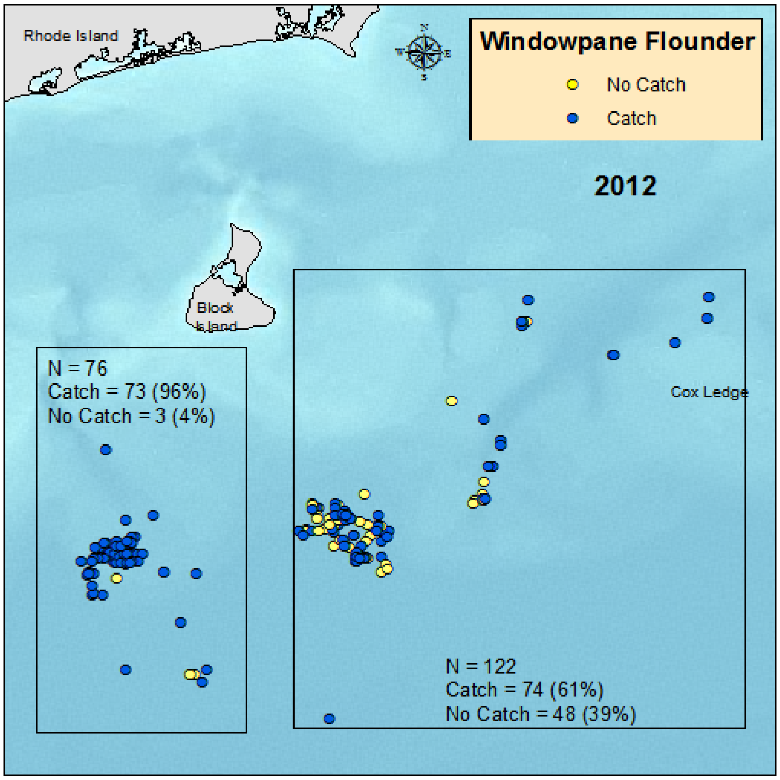


Figure 10. Yellowtail flounder catch distribution.



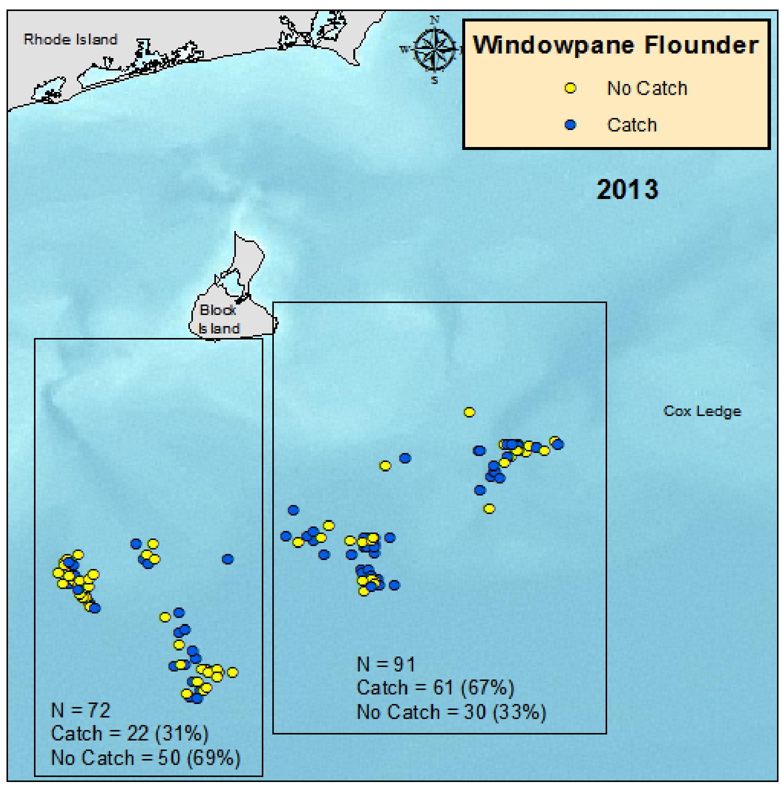


Figure 11. Windowpane flounder catch distribution.

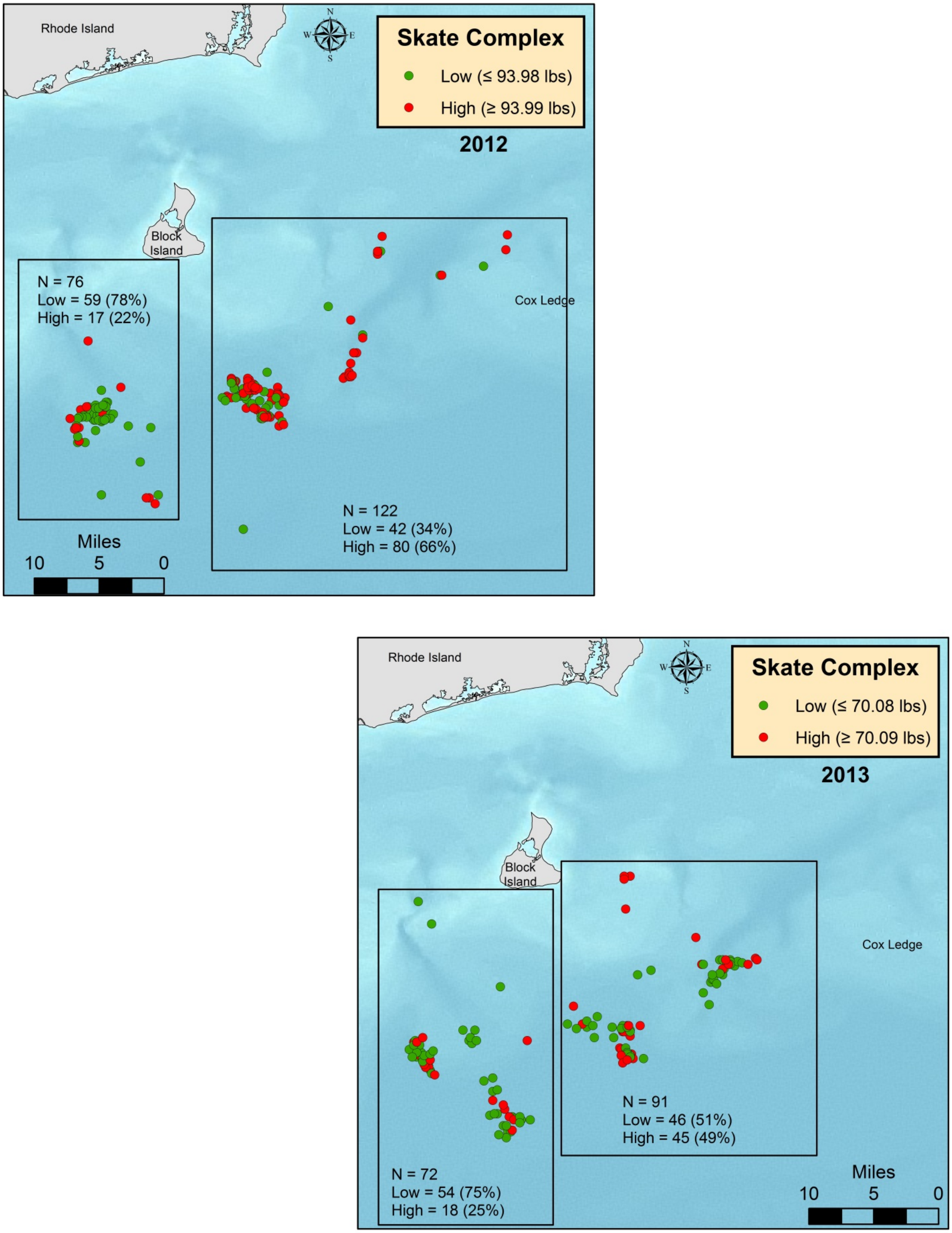


Figure 12. Skate complex catch distribution.

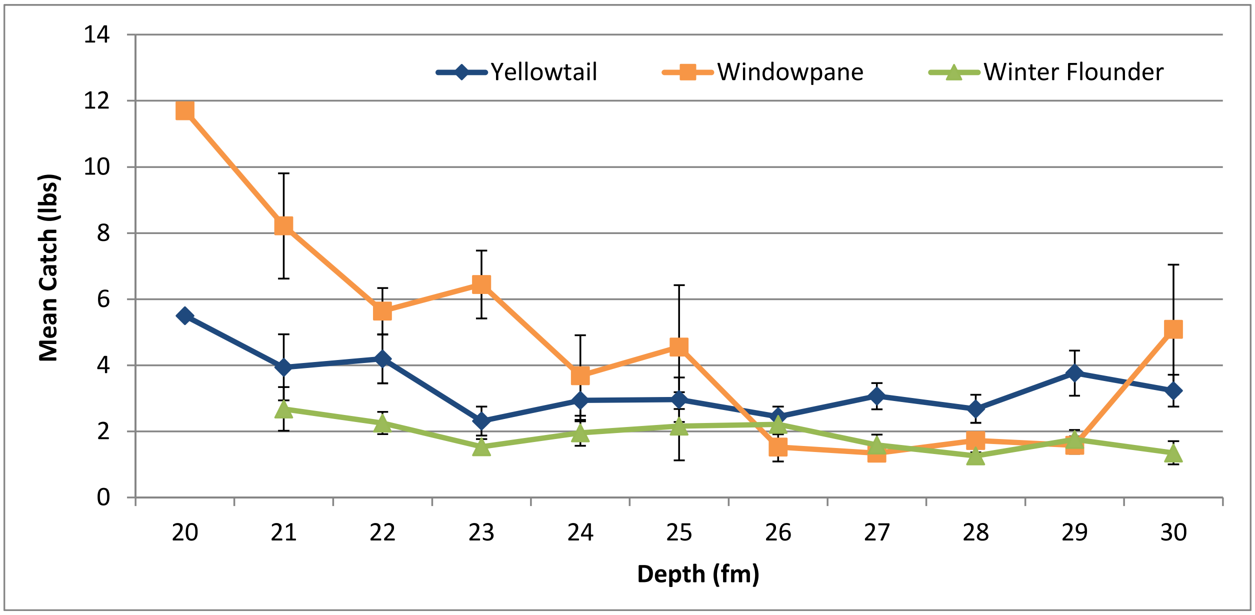


Figure 14. Mean catch at depth for yellowtail, windowpane, and winter flounder.

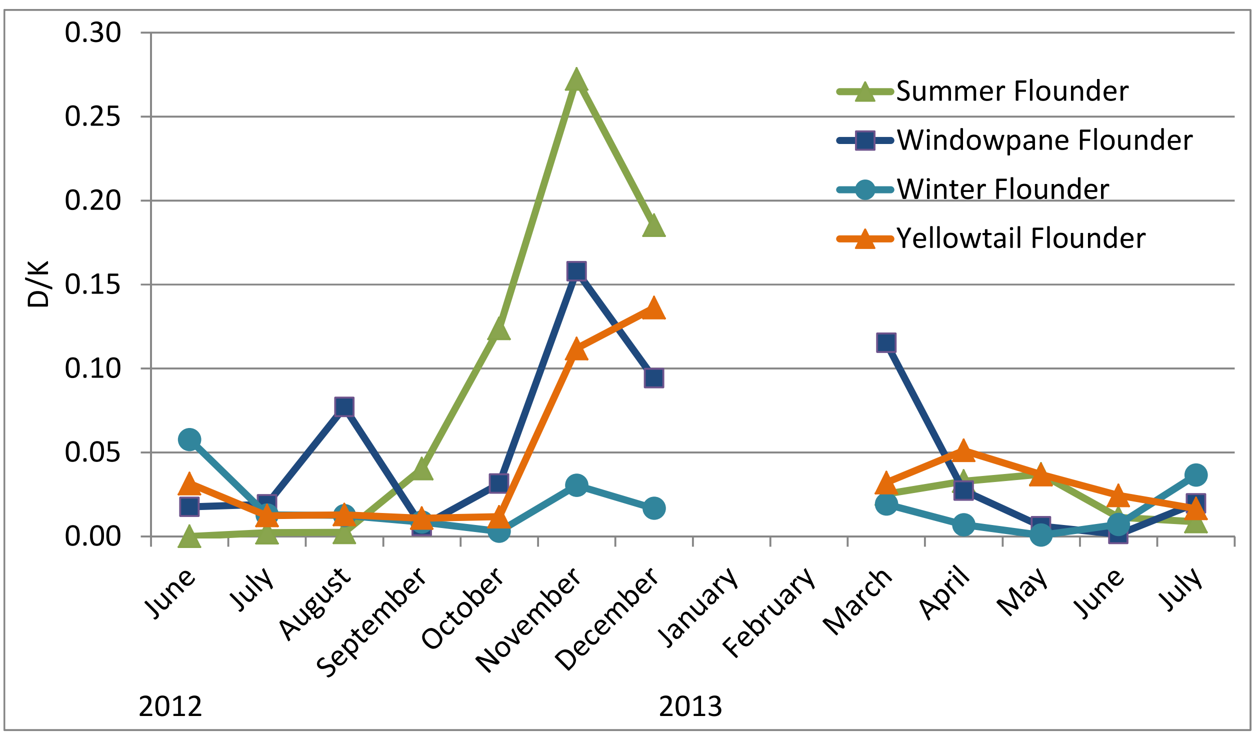


Figure 15. D/K ratios by month for key flounder species.

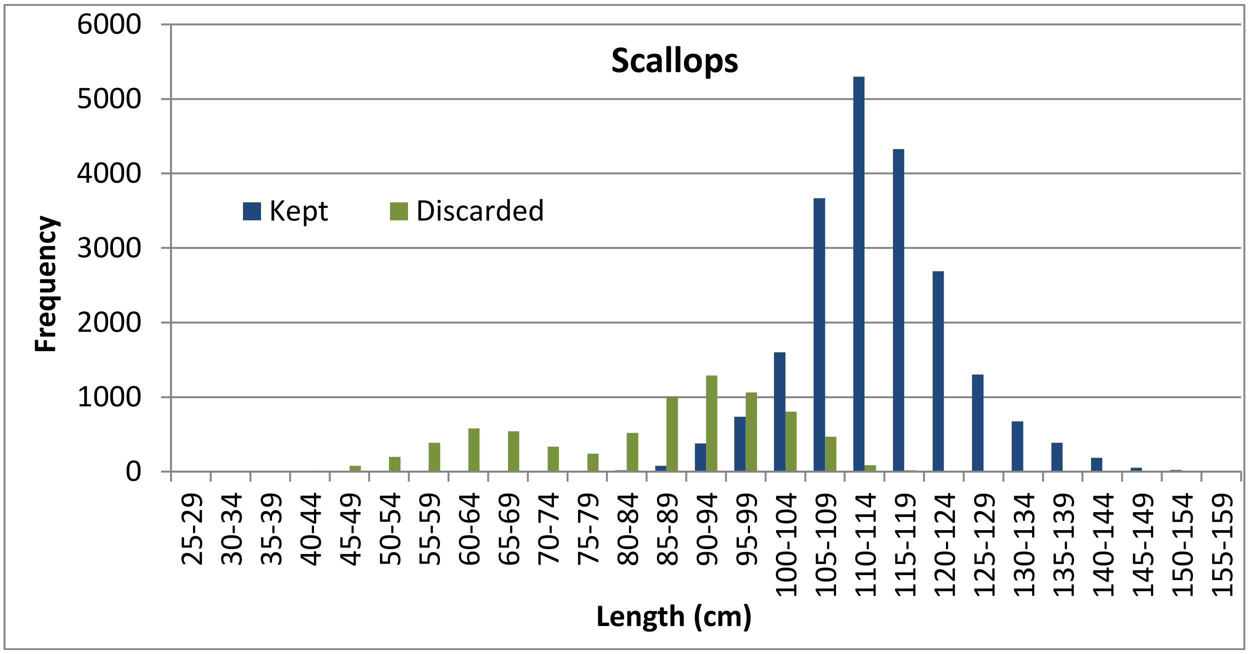


Figure 16. Length frequency distribution of scallop.

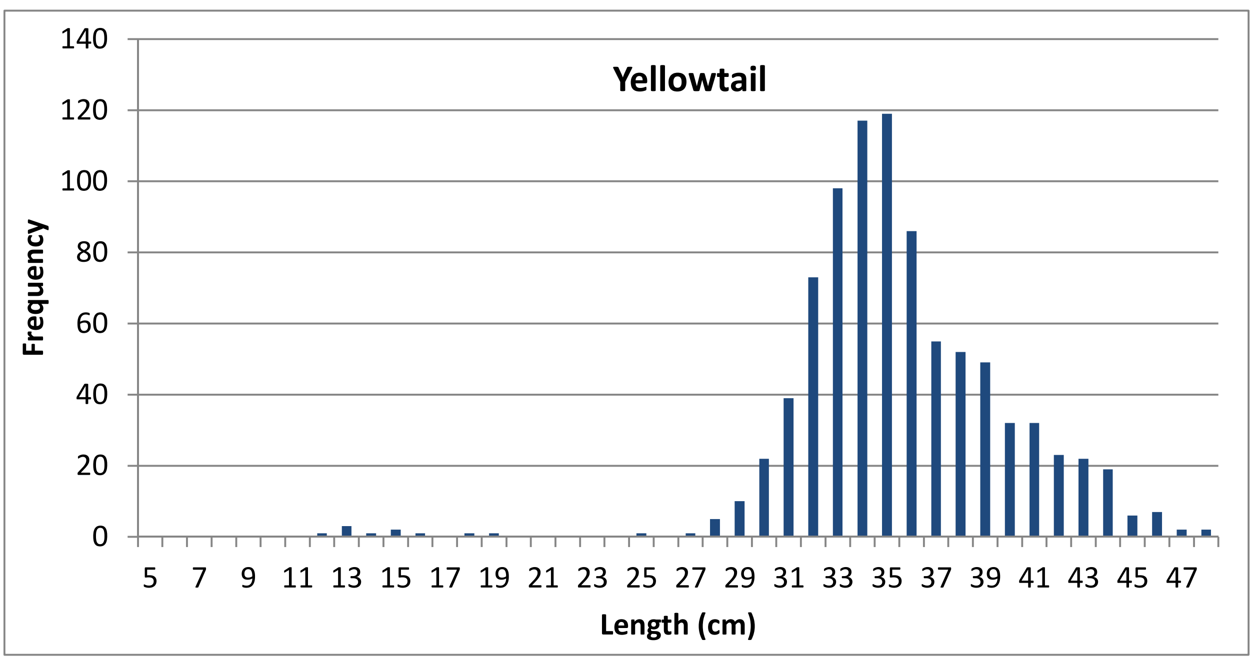


Figure 17. Length frequency distribution of yellowtail flounder.

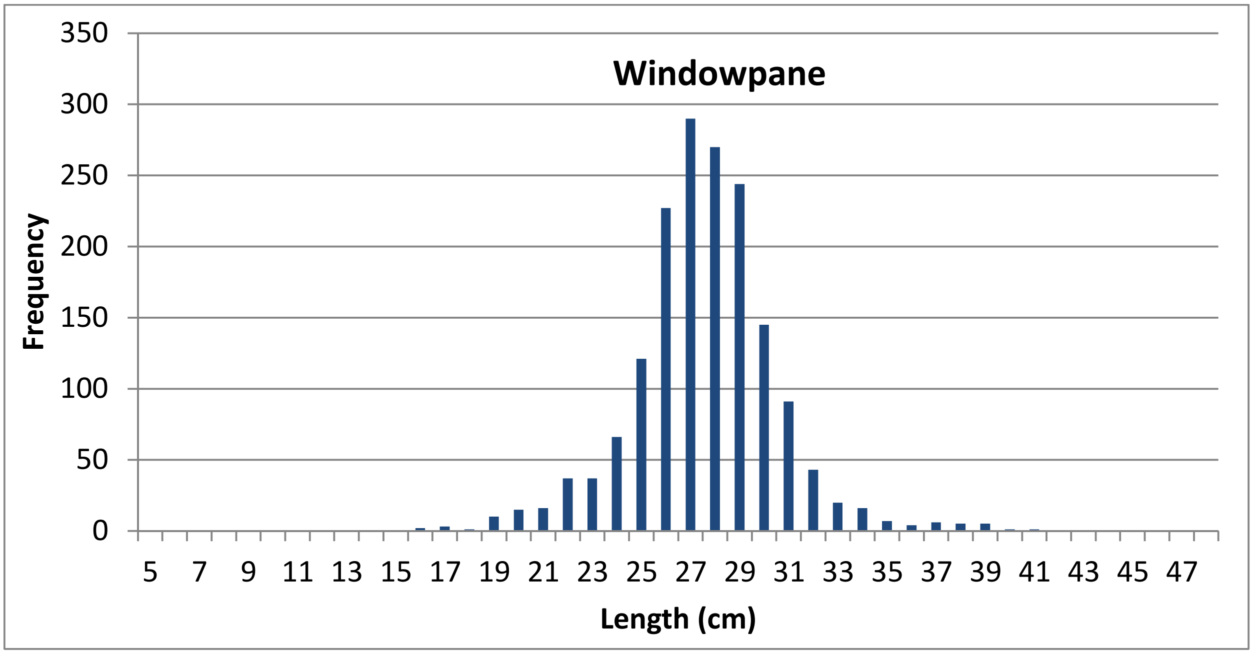


Figure 18. Length frequency distribution of windowpane flounder.

Appendix

Additional photos from the study

Financial Report

Measuring yellowtail flounder during study.

Catch from LAGC vessel using a 9.5 ft wide P-town dredge during study

Baskets of scallops sampled in study.

Catch from 10.0 ft wide Blueleet New Bedford style scallop dredge used on LAGC vessel during study.

Hauling of 9.5 ft wide P-town scallop dredge.

2014 Financial Report

Project Title: Bycatch Characterization in the Southern New England (SNE) Sea Scallop Fishery

NOAA RSA Grant Number: 12-SCA-12

Grantee: Fisheries Specialists
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Financial Information

Five vessels participated in the research aspects of this project (F/V *Mr G*, F/V *Harvest Moon*, F/V *Brooke C*, F/V *New Species*, and F/V *Florence*) and three vessels participated solely in the compensation fishing component (F/V *Yankee Pride*, F/V *Regulus* and F/V *Shearwater*). One research vessel F/V *Harvest Moon* also participated in the compensation fishing to fulfill quota allotment.

The research set-aside amounts that were allotted through the proposal process were:
Scallops: 62,036 lbs
Total budget: $584,375.

Research sampling was conducted from June 2012 to July 2013. Detailed accounting of both the research fishing and compensation fishing is as follows:

VESSEL	PERMIT	# TRIPS
Mr G	146636	23
Harvest Moon	147926	8
Brooke C	231025	9
Foxy Lady II	241372	0
Florence	242413	3
New Species	943394	10
	TOTAL	**53**

VESSEL	PERMIT	SPECIES	TOTAL
Yankee Pride	410514	Scallops	19,820
Regulus	410547	Scallops	19,994
Shearwater	320394	Scallops	19,900
Harvest Moon	147926	Scallops	2,322
Total Landings:			**62,036**

The resulting revenue from the landings was $228,455, $5293 lower than the approved budget of $233,748. The F/V *Foxy Lady II* was lost at sea on the first year of the project. This event reduced the number of research trips that were performed in the first year. As a result, the decision was made to extend the project duration from 15 months to 30 months with an end date of 8/29/2014.

The F/V *Foxy Lady II* was replaced with the F/V *Florence* in year 2 of the project. The fishermen decided to reduce their daily charter rate from $1800 to $500 in an effort to significantly increase the number of sampling days. This caused an increase to the personnel costs due to the amount of data input and analysis necessary as well as project management needed. The personnel were originally to be hired directly through Fisheries Specialists. However, it became necessary to support those personnel directly through the University of Rhode Island (URI) where their main jobs were located. In order to do that, money was rebudgeted as a subcontract to URI in the amount of $108,806 and an added expense of the URI overhead was included at 53%. This overhead was taken from the Fisheries Specialists overhead costs. The duties of the personnel hired through the subcontract with URI included data input and analysis, data editing, GIS analysis, a project coordinator, and an added observer for the additional sea sampling days.