

Optimizing the Georges Bank Scallop Fishery by Maximizing Meat Yield and Minimizing Bycatch

A Proposal Prepared for the 2011

Sea Scallop Research Set-Aside

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Submitted By

Ronald Smolowitz, Matt Weeks - Coonamessett Farm Foundation, Inc

In Collaboration with

**Kevin Stokesbury, Cate O'Keefe, Steve Cadrin -SMAST
William Dupaul, David Rudders- Virginia Institute of Marine Sciences**

277 Hatchville Road

East Falmouth, Massachusetts, USA 02536

508-564-5516 FAX 508-564-5073

cfarm@capecod.net

Project Title: **Optimizing the Georges Bank scallop fishery by maximizing meat yield and minimizing bycatch**

Project Duration: One Year

Applicant: Coonamessett Farm Foundation, Inc
277 Hatchville Road
East Falmouth, MA 02536
Phone: 508-564-5516
FAX: 508-564-5073
Email: cfarm@capecod.net

Principal Investigators:

Ronald Smolowitz, Matt Weeks	-Coonamessett Farm Foundation, Inc
William DuPaul, Dave Rudders	-Marine Advisory Service, VIMS
Kevin Stokesbury, Cate O’Keefe, Steve Cadrin	-SMAST

Participants for the Fishing Industry: Fisheries Survival Fund

Project Goals and Objectives:

This project will examine temporal and spatial influences on bycatch of groundfish species, specifically yellowtail flounder, in the Atlantic sea scallop fishery on Georges Bank and Southern New England. The objective is to quantify yellowtail flounder bycatch rates in comparison to scallop meat yield in order to optimize the harvest of scallops while minimizing impacts to the yellowtail flounder stock. We will accomplish this goal through a year-long, site-specific experimental survey.

The secondary goals of this study are to evaluate the effectiveness of the CFarm turtle excluder dredge for reduction of groundfish bycatch and to examine the feasibility of establishing a long-term bycatch survey time series in conjunction with the traditional NMFS, VIMS and SMAST/Industry resource surveys.

Project Summary:

The proposed research will consist of a year-long survey of bycatch rate and scallop meat yield in the closed and open areas of Georges Bank and Southern New England utilizing a traditional New Bedford-style scallop dredge and the CFarm turtle excluder dredge deployed from commercial scallop vessels. Trips will occur once per month from March through October with an additional two trips between November and February depending on weather. A minimum of 80 randomly selected locations in the access portions of Closed Area I (CAI), Closed Area II (CAII), Nantucket Lightship Closed Area (NLCA) and in the open areas of the Southeast Parts

and southern Great South Channel will be sampled on 7 day trips to quantify groundfish bycatch rates and scallop shell height/meat weight relationships. These are areas where yellowtail bycatch rates are potentially the most significant. Data will also be collected on other important bycatch species, such as winter and summer flounder, which are also found in these areas.

Results from the research will provide spatially and temporally specific information to optimize scallop harvest and minimize groundfish bycatch. This information will be useful for managers in setting and adhering to scallop and groundfish Annual Catch Limits (ACLs) as well maintaining the success of rotational area-based scallop management.

Identification of Problem:

The sea scallop is one of the most economically valuable commercial species in the northeast United States and supports the most valuable wild scallop fishery in the world (Hart and Chute, 2004). The stock has been rebuilt and no overfishing is occurring. However, the harvest of this important resource is currently restricted due to bycatch of yellowtail flounder on Georges Bank and in Southern New England. Management measures to constrain the harvest of sea scallops have resulted in the loss of millions of dollars to the communities of the Northeast and Mid Atlantic regions of the United States.

Under Amendment 10 to the Sea Scallop Fishery Management Plan (FMP; NEFSC 2004) the scallop resource is harvested through rotational area-based management to allow for identification and protection of juvenile scallops. Despite the success of this program for scallop harvest, the spatial and temporal influences on bycatch of groundfish species has not been quantified. Currently, there are large aggregations of harvestable scallops in the three Closed Areas of Georges Bank that contain populations of yellowtail flounder. Restrictions on the timing of scallop harvest in these areas may result in high bycatch ratios of yellowtail flounder and reduced meat yield of scallops.

Framework 16/39 to the Scallop and Groundfish FMPs defined the access season for scallop vessels from June 15 to January 31 (NEFMC, 2004). According to the rationale in the joint Framework, the Council made this decision based on unknown but potential risks to spawning groundfish and unknown but potential higher bycatch rates during the spring “when bycatch could not be predicted based on existing data”. The document pointed out as part of the rationale that data may become available from future research. The scallop industry, according to the document, supported year round access to reduce the effect of concentrating landings in a shorter season, improve meat yields by avoiding harvest during scallop spawning in the fall, and address safety and weather concerns during the fall and winter seasons.

A report was prepared for the NEFMC (January 27, 2004) by the Ad Hoc Working Group examining ways to limit incidental catches of yellowtail flounder in scallop access programs. The Working Group noted that “neither the Groundfish Oversight Committee nor the Scallop Oversight Committee had recommended restricting the seasons of access” to the three groundfish closures on Georges Bank. Furthermore, the report indicated that “all the available data on bycatch in scallop dredges in those areas came from the period mid-June to January.” The report

made the Council aware that “bycatch rates in the late winter and through the spring could be very different from the available estimates based on summer and fall data.”

In addition to existing bycatch regulations in the closed areas of Georges Bank, the reauthorized Magnuson-Stevens Act (U.S. DOC, 2007) established new requirements to end and prevent overfishing through the implementation of ACLs and Accountability Measures (Section 303(a)(15)) for all stocks and stock areas. For the US sea scallop fishery, these requirements apply to the target stock, Atlantic sea scallops, as well as to non-target species, including three yellowtail flounder stocks (Georges Bank, Cape Cod/Gulf of Maine and Southern New England/Mid Atlantic). To comply with the new requirements, the scallop fishery will be restricted in all fishing areas by a yellowtail flounder ACL determined by the NEFMC beginning in fishing year 2010 (NEFMC, 2009).

There is currently limited information pertaining to groundfish bycatch and scallop meat yield in the Georges Bank closed areas from February through mid-June due to the absence of fishing during this time period. Furthermore, minimal information exists on the optimization of scallop catch and yellowtail bycatch reduction in open areas. Spatial and temporal variation in scallop meat yield has been observed on Georges Bank in relation to depth, flow velocity and water temperature (Sarro and Stokesbury, 2009). Also, variation in yellowtail flounder bycatch rates has been noted in the open and closed areas of Georges Bank through observer data (Bachman, 2009). The lack of spatially and temporally specific data on meat yield and bycatch rates must be addressed.

Project Design:

We propose to conduct a year-long study aboard commercial scallop vessels in the closed and open areas of Georges Bank to determine spatial and temporal bycatch rates of yellowtail flounder and scallop meat yield. We will tow simultaneously one 15-foot wide standard New Bedford-style scallop dredge and one 15-foot wide CFarm turtle excluder dredge on each trip. The two dredge frames will be rigged with identical configuration of tickler and rock chains, 10-inch twine top, and 4-inch ring bag.

We propose to conduct 10 trips in the closed and open areas of Georges Bank and Southern New England. These trips will occur once a month between March (the beginning of the fishing year) and October. Two more trips will be conducted (weather depending) between November and February (the end of the fishing year).

The survey will be conducted in areas of Georges Bank and Southern New England between 30 and 100 m depth, west of 67°W, east of 70°W, north of 40°N and south of 42°N. We will survey a minimum of 80 randomly selected locations during each survey trip. For example, we may decide to survey 20 stations in the access portion of CAII, 20 stations in the Southeast Parts open area, 15 stations in the access portions of each CAI and the NLCA and 10 stations in the southern region of the Great Couth Channel.

Allocation of stations for the survey will be based on the relative within-stratum variance to efficiently sample spatial variation in yellowtail bycatch rates and scallop meat yield. The

relationship between yellowtail bycatch and scallop meat yield has been sampled by observers, but the sampling is not based on a random statistical design, it is spatially auto-correlated, and is not conducted from all open and closed areas synoptically. For these reasons, an adaptive design will be used to efficiently allocate survey stations in consultation with the NEFSC.

Allocation of stations in the first months of sampling will be based on stratum areas. Following each survey, the stratified mean yellowtail bycatch to scallop meat weight ratio and its variance will be calculated using Cochran's ratio estimator for each monthly survey (Wigley et al., 2007). The estimated variance will be used to allocate stations in the next survey using Neymann allocation:

$$n_h = n \times \left(\frac{s_h}{\sum s_i} \right)^2$$

n_h : stations in stratum h

n : total possible stations in stratum h (determined by area swept and stratum area)

s_h : standard deviation in stratum h, sqrt(variance)

s_i , i : stations, total and standard deviation in each stratum i

Finally, stratum variance estimates will be updated after each monthly survey to re-allocate stations for the next survey, thereby responding to changes in the yellowtail bycatch, scallop meat yield relationship and its variance in an attempt to provide the most efficient estimator of the relationship.

Dredge towing parameters, other than tow time and tow direction, will be standardized. Tow time would be set at each location based on industry tow times which are based on scallop catch rates. Tow direction will be based on weather and hauling back into the tide to maximize retention of fish catch. Exact tow start (when vessel is in gear) and end (when vessel starts hauling back) locations will be recorded using ArcPad GIS®.

Data Collection

Aboard each vessel fishermen and scientists will work a single 16 hour shift per day. During fishing, depth, surface and bottom water temperature and air temperature will be collected using TidBit ® data loggers. Sea state and weather condition will be recorded at the beginning of each tow according to observer protocol. Catch from each dredge will be analyzed separately so that each location will have two sets of data collection. Following each tow the entire scallop catch will be sorted into bushel baskets and basket counts recorded. One basket from each side will be sub-sampled, counted, and measured. All measurements will be recorded using a Lat37® wireless measuring board and integrated Juniper Systems Inc. Allegro Cx handheld computer to avoid data entry errors and provide real time data analysis. Weights will be recorded using motion compensating Marel marine scales. A sub-sample of scallops will be dissected from each tow (see below). Clappers will be counted separately for estimates of natural mortality. All fish (including, but not limited to all flounder species, cod, haddock, monkfish and skates) will be sorted by species, sampled for length, weight, sex, and reproductive state. If time allows other invertebrates (crabs, lobsters, sea stars etc.) will be sorted by species, counted and weighed.

Scallop shell height/meat weight relationship

Alternative 1:

Shell height/meat weight data will be collected and analyzed based on Sarro and Stokesbury (2009). A subsample of at least 10 scallops from each 10 mm size bin will be dissected at sea. For each scallop whole weight will be recorded to the nearest 0.01 g. The meat will be removed and the shell measured from the umbo to the margin (± 1 mm). Meat and gonad will be removed from the viscera, and the foot and intestine will be removed from the gonad before it is weighed. Meat will be blot-dried and weighed. Gonads will be sexed by color (red = female and white = male), staged, blot-dried and weighed for use in gonadosomatic analysis.

Alternative 2:

Shell height/meat weight data will be collected and analyzed based on DuPaul and Rudders (2006). A subsample of at least 10 scallops from each 10 mm size bin will be shucked at sea. For each scallop whole weight will be recorded to the nearest 0.01 g. The meat will be removed and the shell measured from the umbo to the margin (± 1 mm). Meats will be frozen at sea and returned to land to weigh.

Yellowtail flounder biological data

The entire yellowtail flounder catch will be counted, measured and weighed. Five or all live yellowtail flounder (the smaller number) will be assessed for Reflex Action Mortality Predictors (RAMP) scores (see below). Ten or all yellowtail flounder (the smaller number) will be sexed and staged.

Yellowtail flounder Reflex Action Mortality Predictors (RAMP)

The RAMP method that will be used to assess fish condition in relation to discard mortality is based on Barkley (2008) and Davis (2007). RAMP have been used to assess the relationships between fish reflex impairment and delayed mortality on the west coast of the United States (Davis 2007; Davis and Ottmar 2006; Stoner et al. 2008). RAMP scores will be calculated by evaluating the presence or absence of seven reflexes in each fish (Table 1). Presence/absence values will be averaged to obtain a RAMP score for each fish, and across all fish to obtain the RAMP score for the station. The average RAMP score will be evaluated to estimate area specific monthly discard mortality rates for yellowtail flounder in the scallop dredge fishery.

Table 1. This table provides a list of RAMP reflexes that will be examined.

Reflex	Description
Resistance	Test for the fish's resistance to being restrained
Mouth	Tested for the ability of the fish to resist the forced opening of the mouth
Operculum	Tested the ability of the fish to tightly close its operculum after being opened
Gag	Response to insertion of probe into the throat
Fin Control	Response to a brushing stimulus on the fins of the fish
Natural righting	Attempt to dorso-ventrally right itself in water
Evade	Test the attempt to actively swim away after being reflex testing

Rationale:

The rationale for the proposed approach is to provide the most information on bycatch reduction in an economically viable manner. Choosing sampling sites in the access and open areas known to have high scallop catch rates will provide information on anticipated bycatch rates by season in key areas of the fishery with the two commercial gear types.

If this study is conducted strictly as a research effort no collected species will be retained for sale. All scallops and fish species will be returned to the water after data collection is complete. The impact of 10 trips of 80 paired tows each (800 tows total) is estimated to be as follows: flatfish (30 mt), skates (40 mt), monkfish (25 mt), and gadoids/others (4 mt). Relative to the mortality of these species from the multispecies and scallop fisheries overall, these amounts are not significant. Another alternative is to use vessels on allocated trips exempt from the seasonal requirement but this approach would require a Council FMP Framework action.

Contribution and Relevance of Proposed Work:

The data collected will enhance understanding of groundfish bycatch and scallop yield as they relate to access and open area management, providing fisheries managers with critical information required to adhere to ACLs and AMs and optimize the harvest of scallops while minimizing bycatch. There is limited data regarding groundfish bycatch and scallop yield in the Georges Bank closed areas between February and June due to the absence of fishing during this time period. Furthermore, because groundfish bycatch in the scallop fishery has not previously been regulated in open areas of Georges Bank and Southern New England, there is limited spatially and temporally specific data on bycatch ratios.

The results will be provided to the Scallop Plan Development Team (PDT) to be used in the Council management process. This research will provide specific information on the quantity, distribution, size frequency and discard mortality rate of groundfish bycatch, particularly yellowtail flounder. This research will estimate the true variance in the yellowtail bycatch rate, which is critical in calculating the number of observed trips required to accurately estimate bycatch ratios. The research will also provide information on variations in the scallop shell height/meat weight relationship as influenced by water temperature and depth in closed and open areas. In addition to identifying the timing of optimal yield, such information can be used in conjunction with resource wide surveys to provide spatially and temporally specific biomass estimates. Finally, data will be collected on the bycatch rates of the two common dredge frames now in use; the Cfarm turtle excluder dredge and the standard New Bedford dredge.

Sea Turtle Handling

Since we plan to work on Georges Bank and we may encounter sea turtles. Ronald Smolowitz and Matt Weeks are Investigators (PI's) on the Coonamessett Farm Foundation ESA Sea Turtle Permit and have been trained in sea turtle handling/sampling. Any sea turtles brought aboard that are comatose or inactive turtles shall be handled in accordance with Sea Turtle Resuscitation Regulations at 50 CFR 223.206(d)(1). Sea turtles that are actively moving shall be released by the crew of the vessel over the stern of the boat when gear is not deployed and engine gears are in neutral position, in areas where they are unlikely to be recaptured or injured by vessels. When possible live injured turtles will be transferred to a cooperating U.S. Coast Guard Vessel and delivered to an authorized rehabilitation facility. Loggerhead turtles injured within 36 hours of anticipated return will be brought in to the dock, unless arrangements can be made for a U.S. Coast Guard vessel to pick up the animal. All sea turtle interactions will be reported.

Vessels

The project will probably use ten different vessels for the research trips; four are identified below:

F/V Celtic	Captain Charles Quinn
F/V Westport	Captain Edward Welch
F/V Diligence	Captain Scott Larsen
F/V Tradition	Captain Ronnie Shrader

Each participating vessel will be given a compensation trip; area and catch limit to be determined. The vessels will operate under an MOU with Cfarm Foundation (attached) and compensation catch will be tracked by daily reporting through Boatracs to the Foundation.

Specific Exemptions Requested:

Exemption to scallop special access area closures and seasons: Ten research trips into the scallop special access areas within NLSA, CAI and CAII (no catch retained; 70 DAS fishing). This exemption is requested in that these three special access areas are the locations where there currently is a significant bycatch of yellowtail flounder and sea scallops. These are the areas where the bycatch rates need to be identified temporally and spatially. Four of the trips will occur between February 1 and June .

An LOA may also be required to exempt the vessels from DAS. The vessels will be under the control of Coonamessett Farm Foundation, Inc, a Massachusetts non-profit research and education entity classified by the IRS as a 501c (3) corporation. No catch will be retained for sale.

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