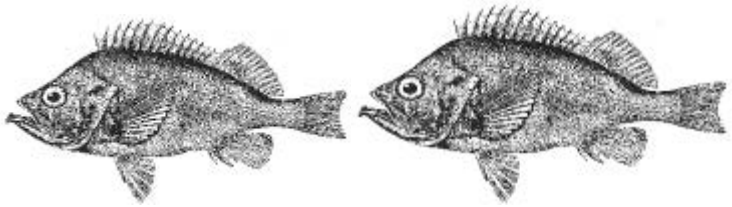
REDNET - A Network to Redevelop a Sustainable Redfish (*Sebastes fasciatus*) Trawl Fishery in the Gulf of Maine



COMPLETION REPORT – Component 2

16 April 2012

Written by Kohl Kanwit, Mike Pol and Pingguo He

Funded by the Cooperative Research Partners, Northeast Fisheries Science Center, National Marine Fisheries Service

Introduction & Background

Acadian redfish (*Sebastes fasciatus* – hereafter referred to as "redfish") were targeted for the research and development of a sustainable harvest strategy through the Northeast Cooperative Research Partners Program 2010 funding cycle. The comparatively large Annual Catch Limit (ACL) for redfish is not realized by the current multispecies fishery and the recent implementation of sectors with catch retention rules and accountability measures makes targeting redfish with smaller than the regulated mesh size possible. The Maine Department of Marine Resources, the Massachusetts Division of Marine Fisheries and the University of Massachusetts School for Marine Science and Technology joined with other members of the scientific community and the industry to develop a research plan that draws on wide-ranging expertise in order to conduct comprehensive research on the development of a sustainable, directed, redfish trawl fishery in the Gulf of Maine, including bycatch assessment, gear testing, processing and marketing, outreach and implementation.

The redfish cooperative research project or "REDNET" seeks to achieve three fishery conservation and management goals:

- Redirecting fishing effort in the multispecies fishery away from stocks that are overfished to stocks that are considered rebuilt (e.g. redfish).

- Achieving optimum yield, by increasing commercial landings of redfish through development of a directed fishery under the adaptive management ability of groundfish sectors.

- Increasing the economic viability of groundfish sectors by providing access to the ACL of a recovered species and thus generating much-needed revenue for the industry.

Groundfish management in the Northeast made a dramatic shift in May of 2010 from primary input-based controls to primary output based controls. Amendment 16 to the Northeast Multispecies Fishery Management Plan (FMP) established the rules for sector management, as well as catch limits and accountability measures mandated by the reauthorization of the Magnuson-Stevens Act. If multispecies sector management is to be successful, the fleet must be able to catch and land stocks of high abundance like redfish while exercising their ability to avoid limiting species (e.g. most recently, Gulf of Maine cod).

Historically, redfish represented a significant fishery in the region, and the best available estimates assert that the resource can support a larger fishery. The directed redfish fishery began in the 1930's and total landings rose from 100 mt to a peak of over 117,000 mt in 1951 and then steadily declined. By 1983, the total US landings of redfish were 5,328 mt., and in 2008 landings were 1,189 mt. The redfish fishery in the Gulf of Maine was traditionally prosecuted by vessels using otter trawls with relatively small mesh, in the range of 70-80 mm (2.5-3 in). The population of redfish declined, likely as a result of overexploitation. In 1977, the minimum mesh size increased from 114 to 130 mm (4.5 and 5 in) and increased again in 1994 to 152 mm (6 in). Today the minimum mesh size mandated by the Multispecies FMP is 165 mm (6.5 in). These mesh restrictions, combined with low biomass levels between 1980 and 1995 eliminated the prosecution of a directed redfish fishery in the Northeastern United States in any meaningful way. In recent years, the combined restrictions in the multispecies FMP have resulted in the recovered status of the redfish resource. The most recent stock assessment of redfish was completed and reviewed at the 2008 Groundfish Assessment Review Meeting (GARM III). It indicated that redfish is not overfished and overfishing is not occurring.

Redfish (*Sebastes* spp.) are harvested in directed and non-directed fisheries throughout their global range. In Iceland, the fishery for *Sebastes marinus* (golden redfish) is prosecuted with bottom trawls and a minimum codend mesh size of 100 mm (4 in) in the directed fishery. A suite of management measures including sorting grids are required in other small mesh fisheries to minimize redfish bycatch and exclusion zones are used for the protection of juveniles, and temporary closures if juvenile catches are high. *Sebastes mantella* or oceanic redfish is targeted in Iceland, with pelagic trawls. Oceanic redfish are also called the "deepwater" redfish, inhabiting waters 350-700 m and are considered exclusively pelagic. This behavior makes them susceptible to midwater gears, unlike Acadian redfish (*Sebastes fasciatus*) which are primarily benthic. Norwegian fishery management has banned the directed fishery for golden redfish since 2003 but allows a bycatch limit of 15% in the mixed trawl fishery which uses 135 mm mesh (5.3 in). Other countries that operate in the eastern

Atlantic and harvest *Sebastes* spp. include Russia, Germany and Denmark which operate under European Union regulations.

The Canadian redfish fishery in the northwestern Atlantic takes place in deep waters from Nova Scotia to Newfoundland. They primarily manage the resource with quotas in three stock units. The fishery is permitted to use 110 mm (4.3 in) diamond mesh versus the 130 mm (5.1 in) square mesh required in the groundfish fishery. To avoid large catches of small redfish there are permanent closed areas. It is not clear if the small redfish in the closed areas are segregated juveniles or just a smaller subpopulation of adults. Bycatch is managed with quotas and a percent of the total catch.

Development of a redfish fishery in the Northeastern United States is critical to the economic survival of fishermen and to the success of sectors. The problem is defined as follows: sectors were recently implemented through Amendment 16 to the multispecies FMP, they are assigned percent allocations based on the historic catches of their members and the allocations of redfish cannot be achieved under current regulations because the minimum mesh size is too large to effectively retain redfish. At the same time, allocations of other groundfish species are extremely small due to the very low ACLs recommended. These limiting allocations ("choke" species) will affect the fishing behavior of the sectors and potentially shut them down before more abundant allocations are realized. It is critically important to the success of sectors to find a way to allow them to access allocations of healthy stocks while avoiding those which are depressed.

Project Design

REDNET is a multifaceted, comprehensive project to determine how best to access the redfish ACL for the groundfish sectors. Our goal is a complete project, from conception to regulatory implementation, to marketing, that supports environmentally and economically sustainable harvesting. REDNET includes individuals with the expertise to accomplish this vision. There are six components of the project:

Component 1: Network Meetings
Component 2: Baseline Catch and Bycatch Evaluation
Component 3: Codend Selectivity
Component 4: Conservation Engineering and Bycatch Reduction
Component 5: Processing/Marketing
Component 6: Outreach/Implementation

This report summarizes the results from Component 2: Baseline Catch and Bycatch Evaluation. While the entire REDNET project is still ongoing, Component 2 is complete and this is the final report on the data gathered through this year-long effort.

Redfish are rarely targeted in the modern groundfish fishery due to mesh size restrictions (6.5 inch minimum), and therefore there are no recent data to describe commercial availability of the target species and associated non target species. However, before Component 2 was initiated, existing databases on occurrence and catch rates of redfish

were examined from Vessel Trip Reports (VTR), Observer data (OBDBS) and NMFS survey database (SVDBS; see Attachment A).

Methods

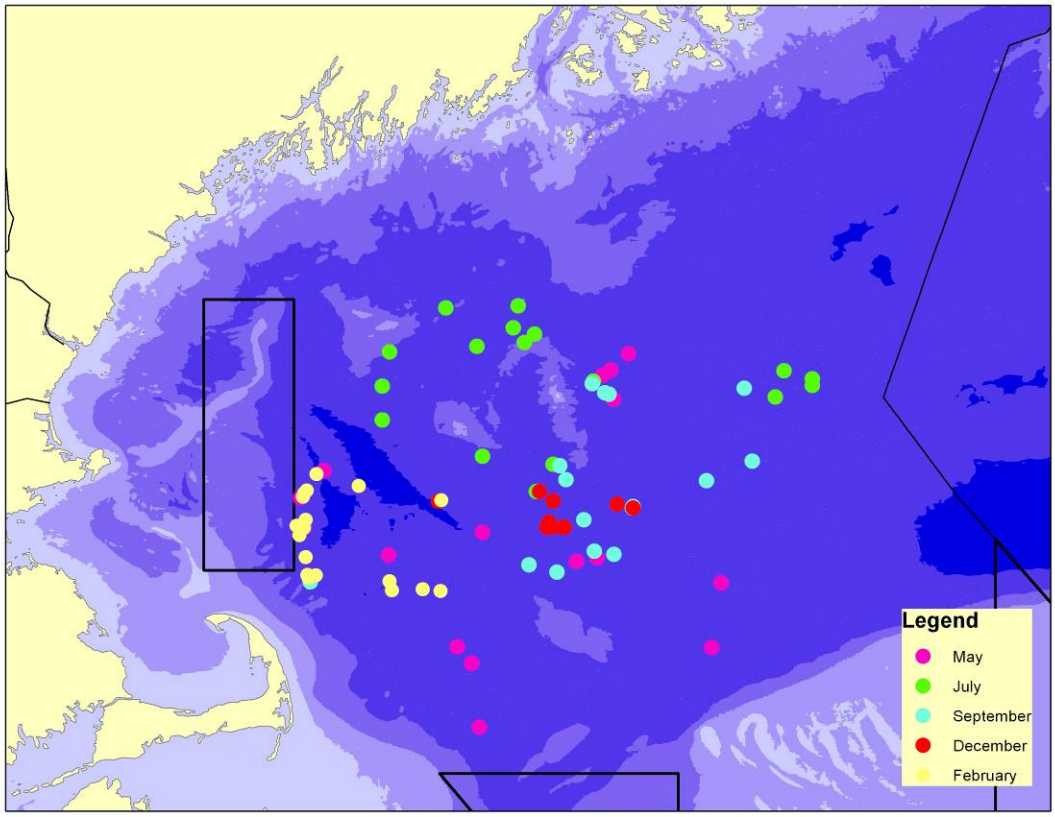
An Experimental Fishing Permit was applied for and later received by the REDNET partners in March 2011 (Attachment B). The industry partners rotated trips with a total of five vessels participating, each making a five day trip over the course of a year. A trip was made every two to three months in order to capture seasonal variation in availability or occurrence of the target species or incidental/bycatch. The participating vessels used their own, standard groundfish trawl nets with a 114 mm (4.5 in), diamond mesh codend provided by the project. The entire Gulf of Maine was defined as the study area and year-round sampling was targeted. Fishermen were asked to fish in a commercial manner to maximize their redfish catches and minimize discards. All regulated groundfish were counted against the sector ACLs, incentivizing the fishermen to avoid bycatch and insuring mortality was accounted for appropriately. The participating sector members donated their redfish allocation to the project which was used to offset the guaranteed daily vessel rate. The project also reimbursed the participating vessel for fuel in order to encourage fishing activity throughout the Gulf of Maine.

Two observers were on board every trip and documented all bycatch encountered following NMFS protocols. The observers estimated the total catch of legal and sublegal redfish per tow and then identified, weighed and measured all other species. A special protocol was agreed on by the NMFS habitat group and the project participants in the event that deep sea corals were encountered. All catch data were entered and uploaded into the DMR biological database (MARVIN). Catch and bycatch data were plotted in GIS so that seasonal target species concentration and bycatch "hot spots" could be identified.

Results

Five vessels participated in the demonstrating fishing, or Component 2 of the REDNET project. These vessels are members of two sectors in the northeast multispecies fishery, each of whom have considerable allocations of redfish. The first trip departed at the end of May, followed by trips in July, September, December and January. All trips successfully fished five full days with a total of 85 tows, ranging from 15 to 20 tows per trip. Minimum depths fished ranged from 77 fm to 101 fm and maximum depths ranged from 102 fm to 138 fm. The average depth fished over a five day trip ranged fro 89 fm to 112 fm with the deepest trip fished occurring in the winter (February) and the shallowest trip occurring in the summer (July). Trips were distributed throughout the central portion of the Gulf of Maine (Figure 1). All vessels made daylight tows with the earliest start time at 4:38 am on the June trip and the latest start time at 5:33 pm also in June. Tow times ranged from 15 minutes to a little over an hour and a half. The average tow time was 37 minutes, but varied by trip from an average tow time of 26 minutes to 46 minutes.

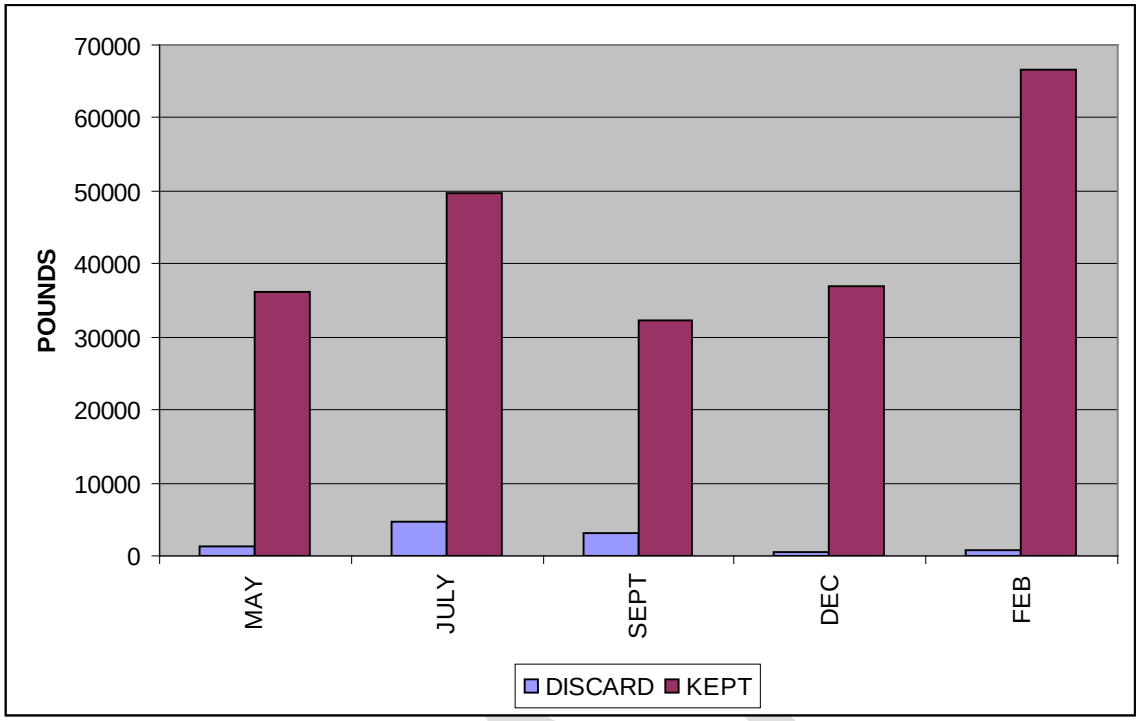
FIGURE 1. Location of tows identified by trip and season



The total catch of redfish for the entire 25 days of demonstration fishing was 232,380 lbs. The amount of redfish caught per trip ranged from over 35,000 lbs to over 67,000 lbs and the catch per tow raged from 0 lbs. (4 tows with no redfish) to 13,655 lbs, averaging 2,766 lbs. The catch per unit effort (CPUE; pounds of redfish per minute towed) averaged 84 lbs. with a maximum of 701 lbs. The CPUE of one vessel was twice that of three other vessels and a third higher than the remaining vessel, suggesting either a more efficient fishing technique or an objective to maximize catch instead of exploring historic redfish fishing grounds.

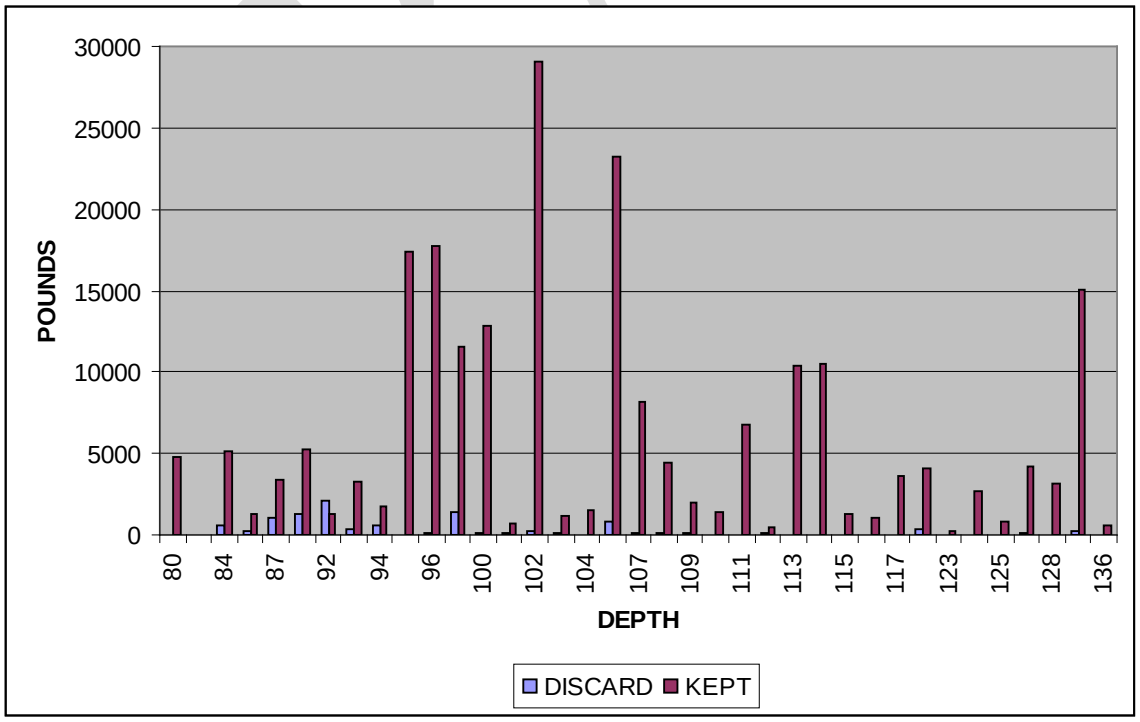
The minimum size for redfish is nine inches (23 cm). The multispecies fishery now operates under total retention rules for legal size fish and therefore discards are equated with sublegal fish or estimated in the event of gear failures. The demonstration fishing activity resulted in a kept redfish catch of 221,957 lbs and discards of 10,423 lbs or about 4.5%. When the kept redfish catch was plotted with the discarded redfish catch based on time of year fished, the highest levels were seen on the July and September trips (Figure 2).

FIGURE 2. Kept and discarded redfish by month fished



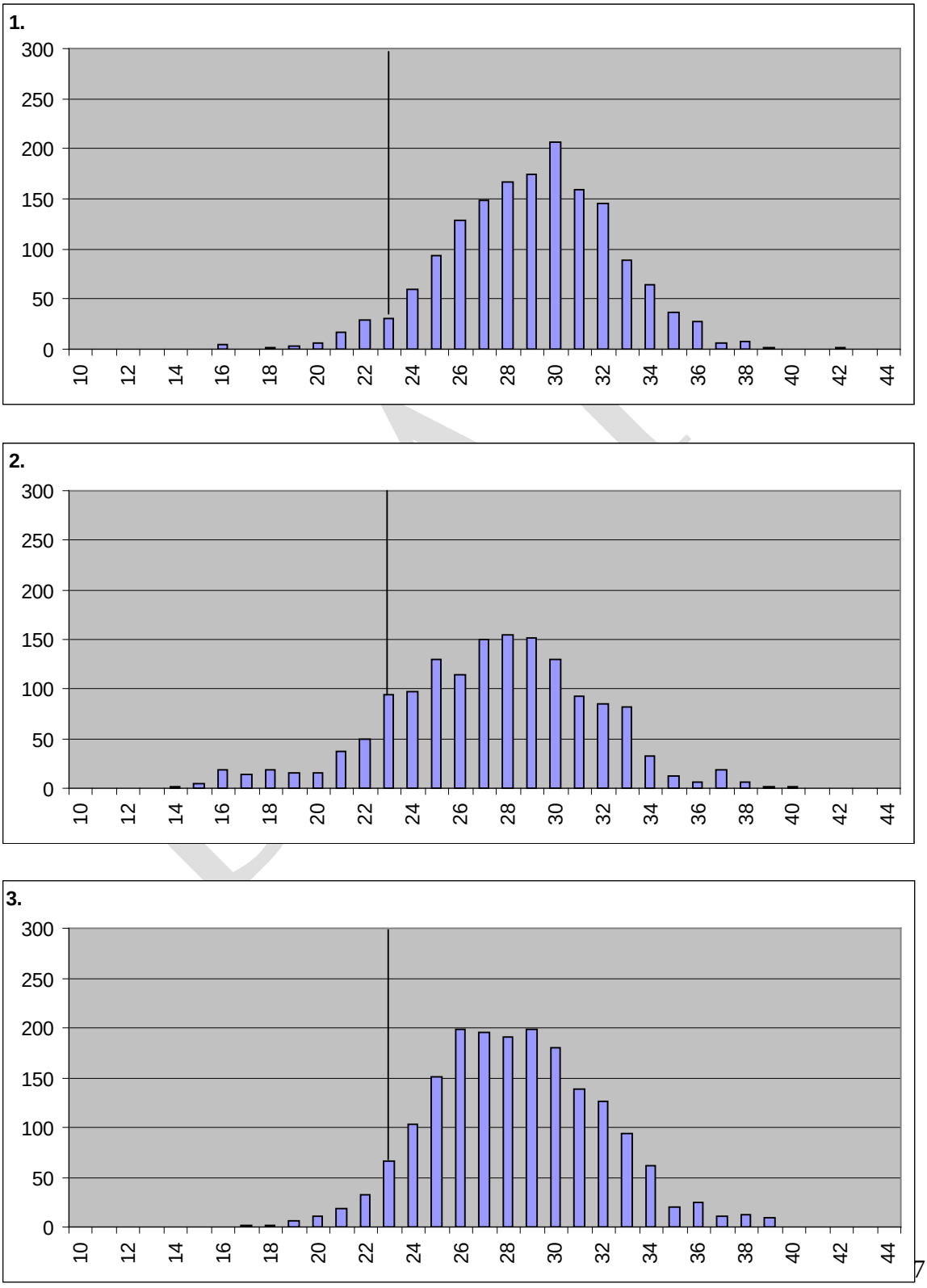
The redfish catch data were also plotted against the depth fished and suggested catches of smaller fish at shallower depths (Figure 3).

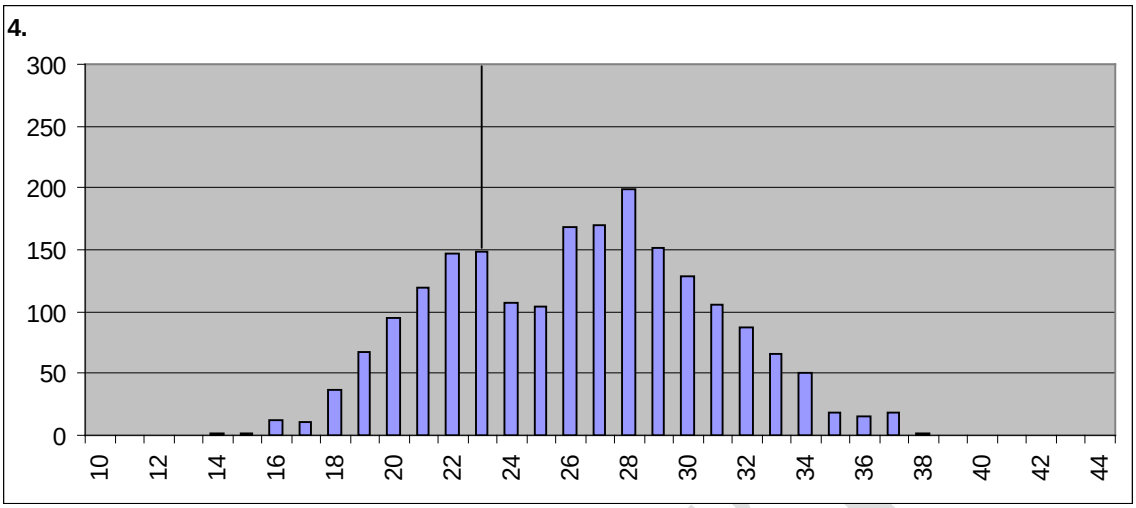
FIGURE 3. Kept and discarded redfish by depth fished (fm)

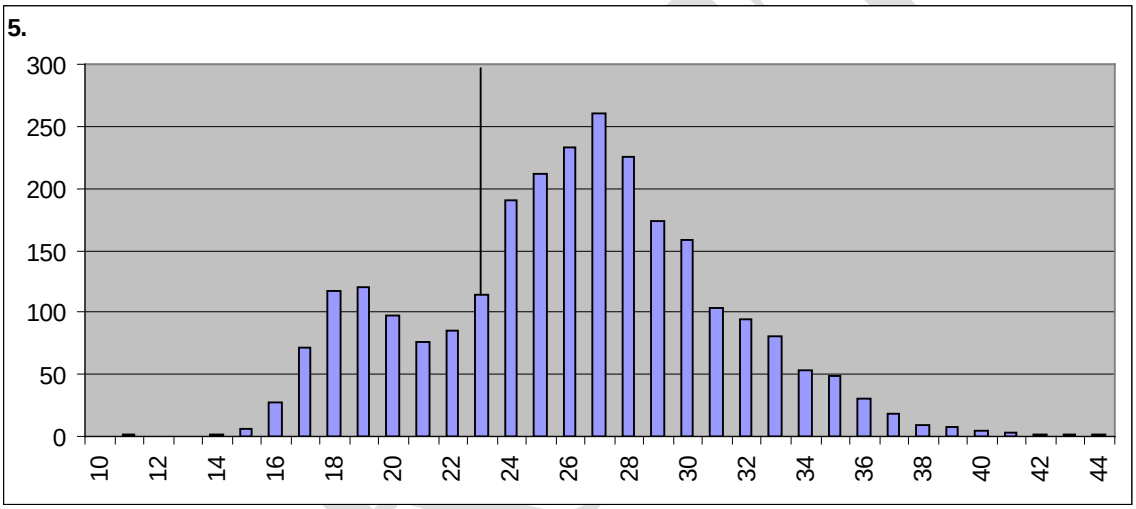


The length frequencies of the redfish catch were plotted for each trip. These frequencies are based on a sample of 100 fish per tow and then summed over the five day trip to represent the total catch distribution (Figures 4.1.-4.5.).

FIGURE 4: Length frequencies by trip; 1. May, 2. July, 3. September, 4. December, 5. February, line represents the minimum size







All bycatch and incidental catches were identified and enumerated. A total of 36 species were recorded along with "rock" (Table 1). One piece of coral was also caught, preserved and transported to the Smithsonian for identification per the agreed coral bycatch protocol. The largest bycatch was spiny dogfish, followed by pollock and then more distantly by white hake, Atlantic cod and haddock. All other species were caught at extremely low levels. Figure 5 plots the kept pounds of regulated multispecies by tow, meaning anything over the minimum size for the respective species. These values can be compared to the following figure which plots kept redfish by tow (Figure 6; note the scale difference).

Table 1: Bycatch and incidental catch

SPECIES	POUNDS	SPECIES	POUNDS
dogfish spiny	26377	skate smooth	36
pollock	10052	skate winter	34
hake white	2071	shad American	25
cod atlantic	1180	rosefish black bellied	8
haddock	1059	crab northern stone	8
cusk	251	anemone frilled	5
lobster american	237	cucumber sea	2
sea raven	198	Anemones	2
monkfish	186	flounder fourspot	2
hake silver (whiting)	125	Cunner	2
flounder atlantic witch (gray sole)	125	Lumpfish	2
skate barndoor	124	skate little	2
hake atlantic red	81	Starfish	1
rock	58	sponge finger	1
skate thorny	55	herring atlantic	1
plaice american (dab)	52	scad round	1
squid short-finned	49	Alewife	1
wolffish atlantic	42	**TOTAL**	**42451**

FIGURE 5: Kept multispecies by tow (everything of legal size)

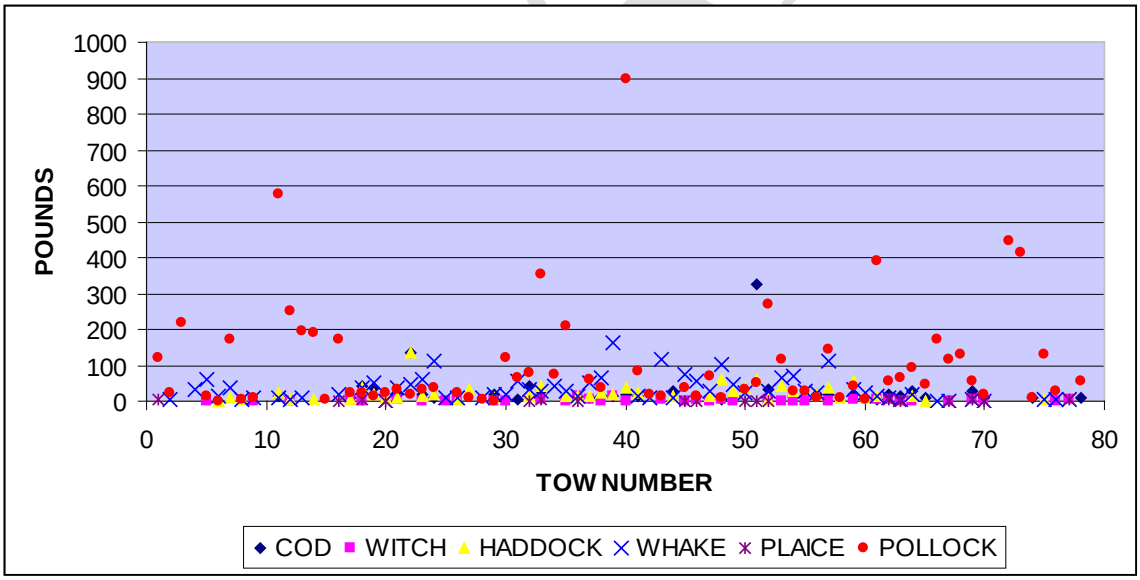
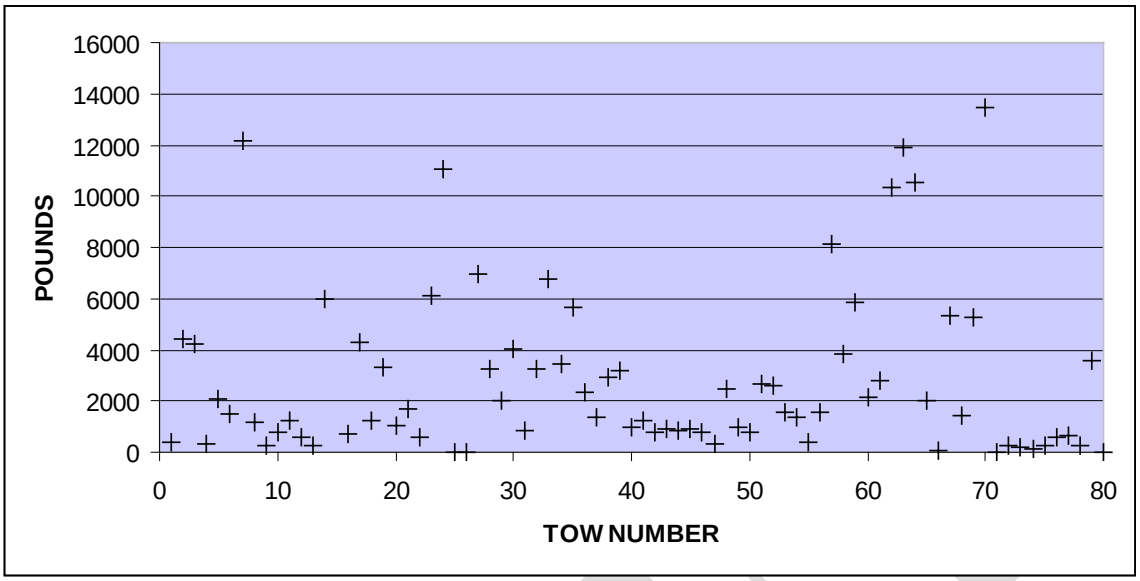
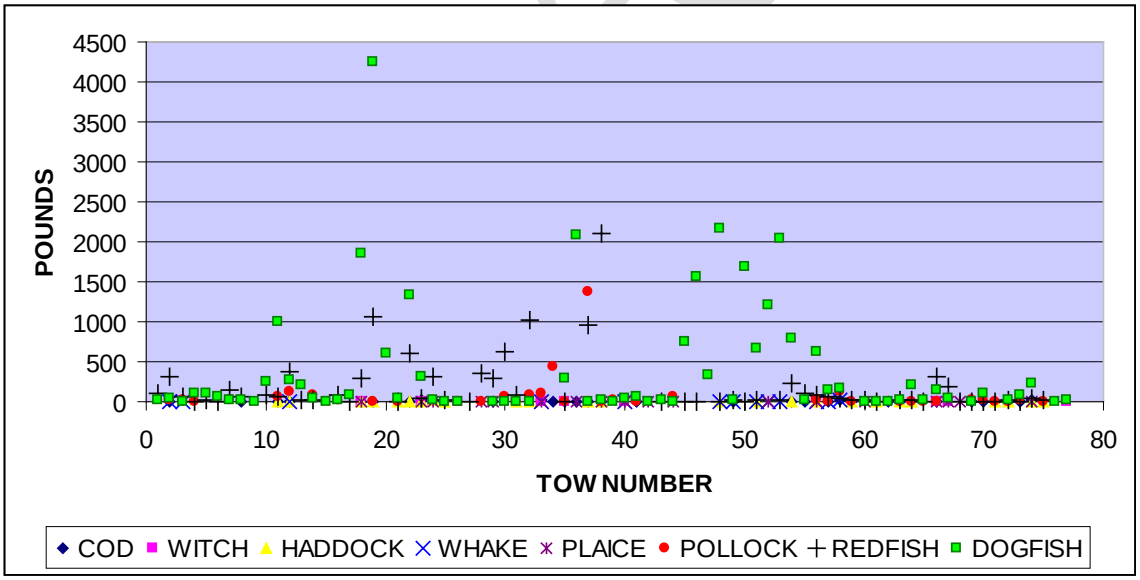


FIGURE 6: Kept redfish by tow



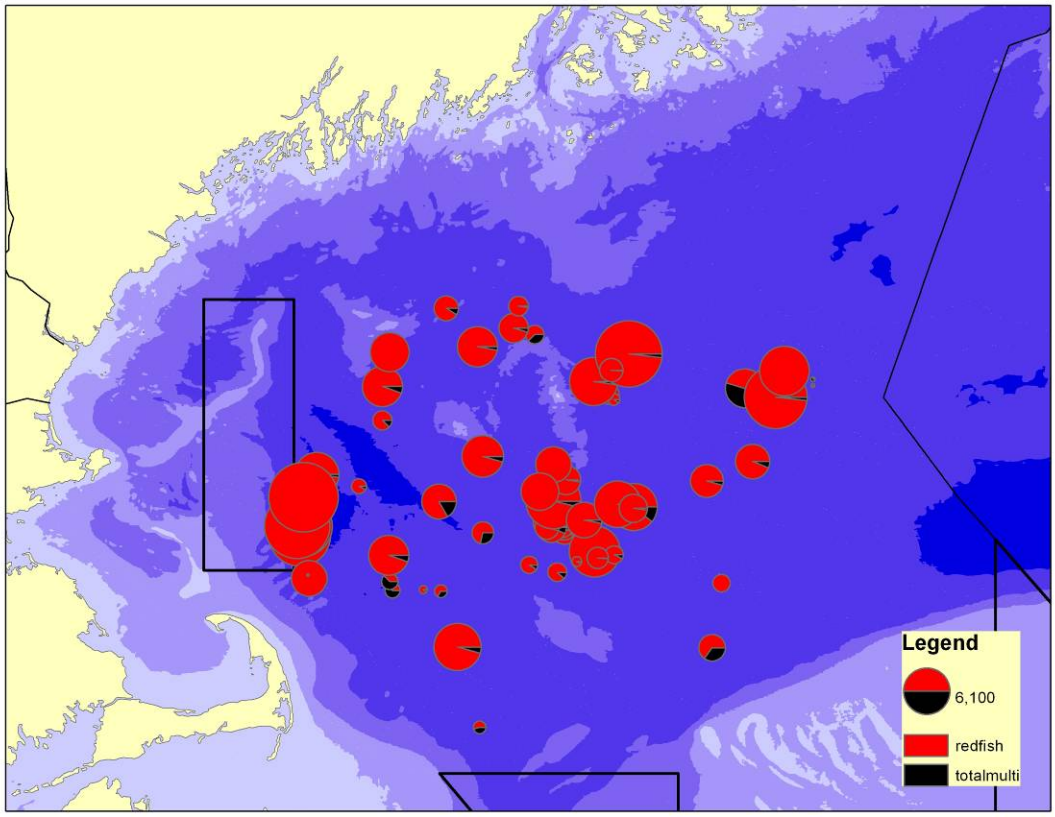
Regulated species, along with dogfish discards were also plotted by tow. Figure 7 shows all multispecies including redfish. Although white hake should be 100% retention, it is included in Figure 7 because the captain of one vessel mistakenly discarded 37 pounds.

FIGURE 7: Discards of multispecies, including redfish and dogfish by tow



The ratio of redfish caught to multispecies caught (both kept and discarded) was plotted spatially, showing both depth and physical location (Figure 8).

FIGURE 8: Redfish and multispecies catch by tow location



Discussion

The demonstration component of the RENET project was very successful. The five trips resulted in economically viable catches of redfish using a 4.5 in mesh codend without significant incidental/bycatch of regulated species. The industry partners did an excellent job distributing their efforts over a large portion of the Gulf of Maine and successfully scheduled trips to represent seasonal shifts in abundance of the target species or incidental/bycatch. Depth does appear to effect the size composition of redfish as historic participants in the redfish fishery indicated. Pollock is clearly the most significant incidental catch, also as anticipated based on historic knowledge and other redfish fisheries (e.g. Canada). However, only two tows resulted in comparatively large numbers of sublegal pollock (~ 500 and ~1500 lbs respectively). The data collected through this effort show promise and suggest a targeted redfish fishery could be successful using a small mesh codend.