Assessing Harvest Efficiencies and Consumer Demand for North Carolina Lionfish

Project Narrative

Participants: Janelle Fleming, Debby Boyce, Barry Nash, Libby Eaton, James Morris

Abstract

Maine lobster traps and a Crab Pot Christmas Tree (CPCT) concept were deployed in the waters of Bogue Sound to determine the potential for a commercial fishery for lionfish. Deployment locations were surveyed by SCUBA, the traps were deployed by vessel, and retrieved by SCUBA approximately 3-4 weeks after deployment. Lionfish caught were counted, if present. Bycatch, if present, was recorded and returned to the ocean. Consumer preference for the lionfish is also noted in a consumer sensory survey.

Introduction

The invasive lionfish is now one of the most dominant predators on offshore artificial and hard bottom reefs in North Carolina. Lionfish overwinter off North Carolina at depths greater than 100 ft given the warming influence of the GulfStream current. They pose a significant threat to reef-fish communities throughout the region due to their high densities (up to 500 lionfish per hectare) (Morris and Whitfield 2009) and generalist dietary habits (Morris and Akins 2009). Negative impacts to the biodiversity of reef communities have been observed in many locations with lionfish consuming greater than 70 percent of the forage base on some reefs. A significant number of juvenile grouper and snapper are among the species consumed by lionfish and both are important to commerce. Gut analyses of lionfish captured in North Carolina have shown these predators are capable of consuming dozens of prey per day. Lionfish are long lived and are sexually mature as early as one year old. Fecundity is high resulting in millions of eggs produced by one female per year. Due to venomous spines and protective coloration, they have no significant natural predators in North Carolina.

Lionfish pose a unique threat to artificial reefs. By design, artificial reef programs provide habitat and nursery grounds for economically and ecologically important species such as grouper and snapper. Lionfish settle on artificial reefs at a higher rate than natural reefs, a likely function of high rugosity (complexity) and height compared to natural reefs. The high affinity of lionfish to artificial reef structures suggests a large number of juvenile lionfish are found around bridge pilings, seawalls, and artificial reefs throughout the Southeast U.S., Gulf of Mexico, and Caribbean (J. Morris, pers. obs).

Presently, there is no commercial fishery for lionfish because they are difficult to capture with standard commercial gear. To date, the only effective method for collecting lionfish has been through spearfishing and hand-netting. These methods are labor intensive and costly. Also, lionfish cannot be captured via hook and line fishing. Several studies have attempted to develop trapping methods specifically for lionfish based on conventional gear; however, none have been successful at developing devices specifically for lionfish. Furthermore, bycatch of other reef fish is high making conventional trapping impractical. Lionfish are being landed regularly as bycatch in the Florida Keys spiny lobster fishery. It is believed that lionfish are recruiting into and around the spiny lobster trap because of the structural attributes of the trap. In this study the traps will not be baited, which may reduce the bycatch of other reef fish.

Methods

A chain of five Maine Lobster Traps (MLTs) and a chain of five Crab Pot Christmas Tree attraction devices with traps (CPCTs) were deployed four locations during the summer of 2014. The chain of traps were spaced approximately 30-50 feet apart in a series, connected by random sized lengths of white nylon line. Deployment locations varied between proximity of an artificial reef (a wreck, the Naeco), a natural hard-bottom location, and a flat, sandy area with minimal relief. Depths ranged between 90 and 130 feet for the deployments on May 23, 2014 and June 22, 2014 (figure 1 and 6).

Traps were deployed from the stern of the commercial diving vessel the Outrageous V to simulate actions of commercial fishermen (figure 3). After deployment, SCUBA divers verified the presence of lionfish using standardized lionfish monitoring methods (Morris 2012). Once deployed, the traps and the area were surveyed by divers to determine the following: a) presence/absence of lionfish; b) approximate numbers and sizes of lionfish, and 3) a random-diver survey of the surrounding area to determine the other types of fish at the site. For this deployment, the traps were covered with various types of landscape fabric in the hopes of simulating a "cave-like" environment. After a soak time of 3-4 weeks, the traps were retrieved. SCUBA divers surveyed the traps prior to retrieval for in-situ lionfish catch and by-catch data. Upon surfacing the traps, by-catch was recorded and returned. Any spiny lobsters that had egg masses were kept in the water and released.

Results

On May 23, 2014, we headed out of Beaufort Inlet to deploy 2 strings of 5 lobster traps at two different locations: a) Bow of the Naeco (figure 1) and b) Porgy Rocks (figure 1). The Bow of the Naeco rests in approximately 42.6 m (140') of water and the area is known for large accumulations of lionfish, baitfish, and other reef fish that are important to the grouper-snapper reef complex system. The Porgy Rock location was chosen as a non-artificial reef location that had natural protrusions of rock surrounded by sandy bottom. There was not as large a population of lionfish at this location and they were widely dispersed. The Porgy Rocks sit in about 33.5m (110') of water.

Immediate inspection of the bow of the Naeco confirmed the presence of large numbers of lionfish that were from various sizes of 0.01m to 0.45 m. During the diver survey, over 50 were noted and an example figure is presented in figure 4 where at least 5 0.2m sized lionfish are congregating around area of 4 m^2. The traps themselves were approximately 6m to the southwest of the bow of the Naeco, sitting in open sand. Initially, they rested upright, but were eventually placed resting on the long axis of the trap. Inspection of the trap location indicates the presence of lionfish nearby (at least 6 within the 0.2m size range) and large schools of baitfish also present (figure 5).

From the Bow of the Naeco, we moved to the above mentioned Porgy Rocks in order to test whether the influence of structure within a location would influence the aggregation of lionfish to the traps. As with the bow of the Naeco, a string of 5 traps were attached via random size lengths of white nylon line. Some of the traps were also wrapped in landscape fabric to simulate a "cave-like" environment. The traps were deployed of the stern of the Outrageous V and a survey of the area conducted. No baitfish schools were present at this location and the amounts of snapper-grouper complex reef fish were greatly reduced than at the Bow of the Naeco location (figure 5).

On June 22, 2014, after a soak time of 30 days, we were able to retrieve the lobster traps, count bycatch and determine the lionfish trapping and aggregating success. We traveled to Porgy Rocks, retrieved traps, documented bycatch and lionfish catch in the traps. Then, we traveled to the bow of the Naeco to

retrieve traps, document bycatch and lionfish catch in the traps. Finally, we attached the CPCT to the traps, and redeployed both strings at a separate location (figure 6).

Upon return to Porgy Rocks, we noted that the Lobster traps worked effectively at aggregating the lionfish (figure 7). Two lionfish were caught in these traps, 6 were directly outside the traps, and there were 10 slipper lobsters, 1 spiny lobster, and a snail as bycatch in the traps. The bycatch was released after floating the traps to the surface.

Similar aggregation effects were noted at the Bow of the Naeco as well. Despite the fact that there was larger structure at this location, lionfish could be seen around the traps (figure 8). These traps had 4 lionfish inside the traps when they were floated to the surface (figure 9). The traps had a little more bycatch in them, presumably to do proximity to the wreck. There were 14 slipper lobsters, 2 spiny lobsters, 3 groupers, and 4 snails. Bycatch was released after floating the traps to the surface.

After collecting the traps, we moved to the Bottom Rocks location on Figure 6 and deployed both strings of lobster traps with CPCT attached (figure 10). Unfortunately, Hurricane Arthur swept through Carteret County on July 4th. We were able to survey the traps on August 20, 2014 and again on September 17, 2014, almost two and three months after deployment.

We returned to the initial location of the Bottom Rocks as seen in Figure 1. At that time, we were unable to locate the traps due to the presumed movement due to storm surge associated with Hurricane Arthur. The Outrageous V relocated and completed another search of the lionfish traps (Bottom Rocks #2, Figure 11). We were unsuccessful at locating the traps again and our divers were out of appropriate bottom time to complete another search.

Working with scientists at Seahorse Coastal Consulting, using their ADCIRC storm surge and hydrodynamic model, we estimated approximate movement distances and directions from the available data. On September 17, 2014, with a break in the weather, we were able to explore two more sites in search of the lionfish traps. These sites were based on presumed directional movement as well as bottom topography scans. When divers were deployed, they were unable to locate the traps. We have learned from the manufacturer that the welds holding the trap together will deteriorate within 45 days and therefore the traps are not ghost fishing.

During this time, we were informed by NOAA that we needed to secure a specialized permit for placing the traps on the bottom of the ocean. Our efforts, therefore, went into securing additional traps for continued deployments and the Exemptive Fishing Permit (EFP). We are happy to state that on March 6, 2015, we secured the EFP and with this, we are able to redeploy traps. At this time, we are awaiting the arrival of our new Maine Lobster traps, which is based more on the wooden Spiny Lobster traps used in Florida.

The final piece of this grant included a consumer sensory session in cooperation with Barry Nash of NC SeaGrant and Libby Eaton of Bistro by the Sea. As of this writing, the sensory session will be conducted on April 29th at Bistro by the Sea. Mr. Nash will be preparing the consumer surveys and we will have results to present in May.

Discussion

We successfully deployed the MLTs and CPCTs twice during the 2014 summer season. Deployment was easy and all traps landed in such a way as to allow fish entry into the traps. With the surveys conducted

in August and September, we have GPS coordinates for excellent locations for future deployments. Securing the Exemptive Fishing Permit (EFP) has opened the way for different trap design and deployment and recovery ideas.

Bycatch was minimal in the traps, presumably due to the lack of baiting. Primary by-catch were slipper lobsters and spiny lobsters. Any lobsters with egg masses were immediately returned to the water. All by-catch was counted and logged. We would like to try baiting the traps with lionfish gonads as this seems to attract lionfish (J. Morris, personal communication).

We would also like to experiment with the MLTs, employing wooden structures similar to the ones they use in the Caribbean for the Spiny Lobster industry. We are acquiring the traps and hope to have them ready by summer field season 2015. Presentations to commercial fishermen about this research has led to a brainstorming of ideas for trapping mechanisms.

A final piece to the commercial fishing puzzle is the retrieval of traps for commercial vessels. It is unlikely that commercial fishermen will use SCUBA to retrieve the traps and hence some type of marker buoy and retrieval system will need to be devised.

While the full consumer sensory survey has yet to be completed, initial tastings with the general public have proved favorable. Lionfish “bites” have been presented at the Big Rock weigh-in as well as literature related to the invasion. Public outreach continues and the demand for the fish is growing.

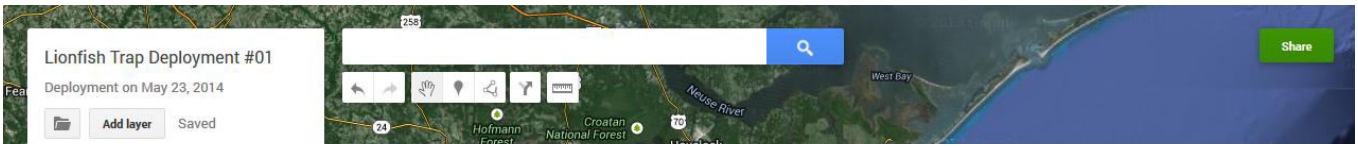

Figure 1. Deployment locations for the May 23, 2014 deployment

Figure 2. Deployment of the Lobster traps off the stern of the Outrageous V.

Figure 3. Example sitings of lionfish at one location of the Bow of the Naeco.

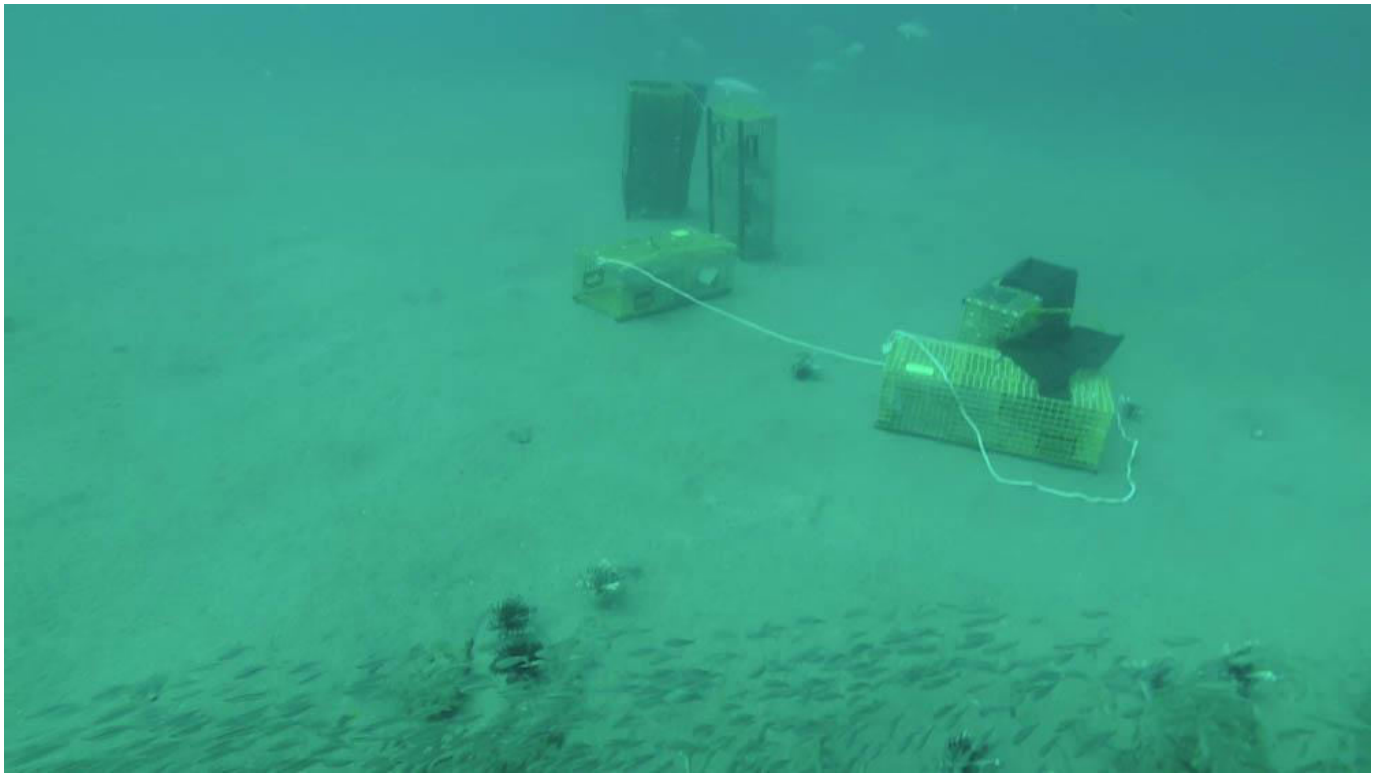

Figure 4. Initial deployment of lionfish traps at the bow of the Naeco. Note the 8 lionfish and the surrounding baitfish.

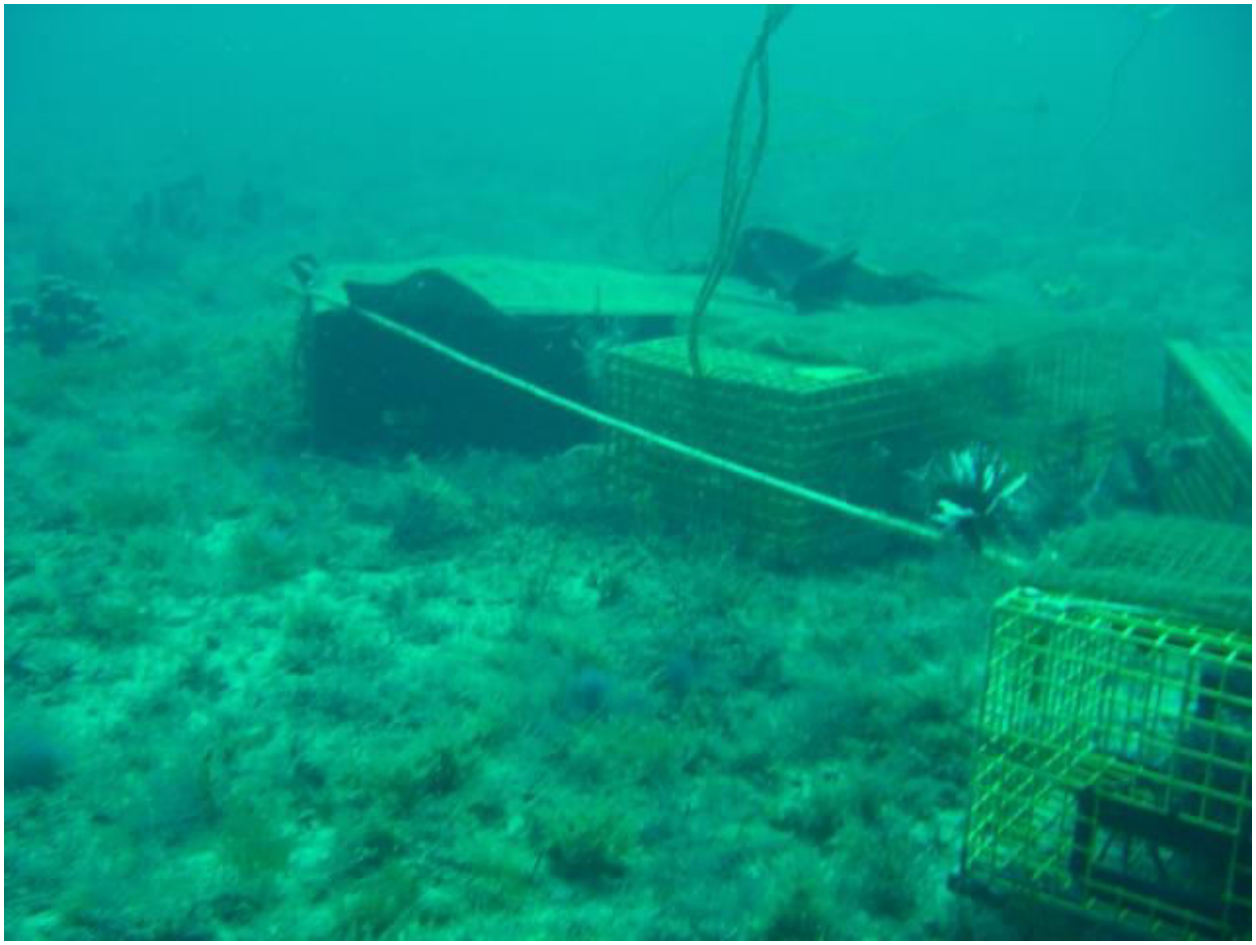

Figure 5. Lionfish Trap deployment at Porgy Rocks

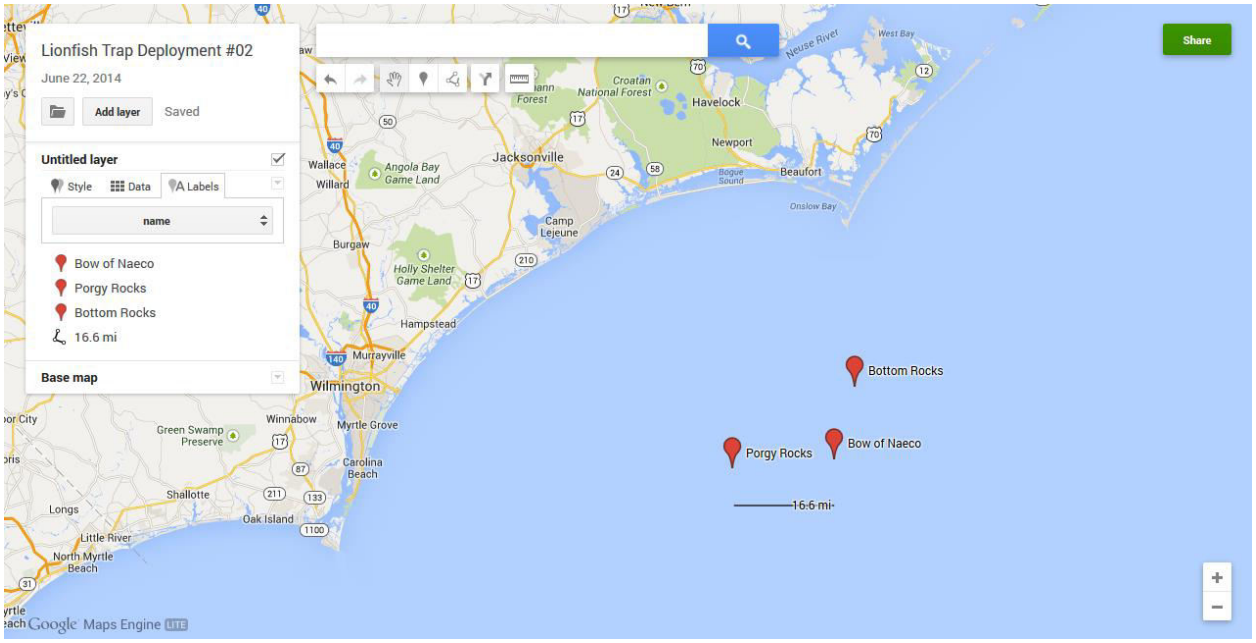

Figure 6. Locations for the June 22, 2014 lobster trap retrieval and Redeployment.

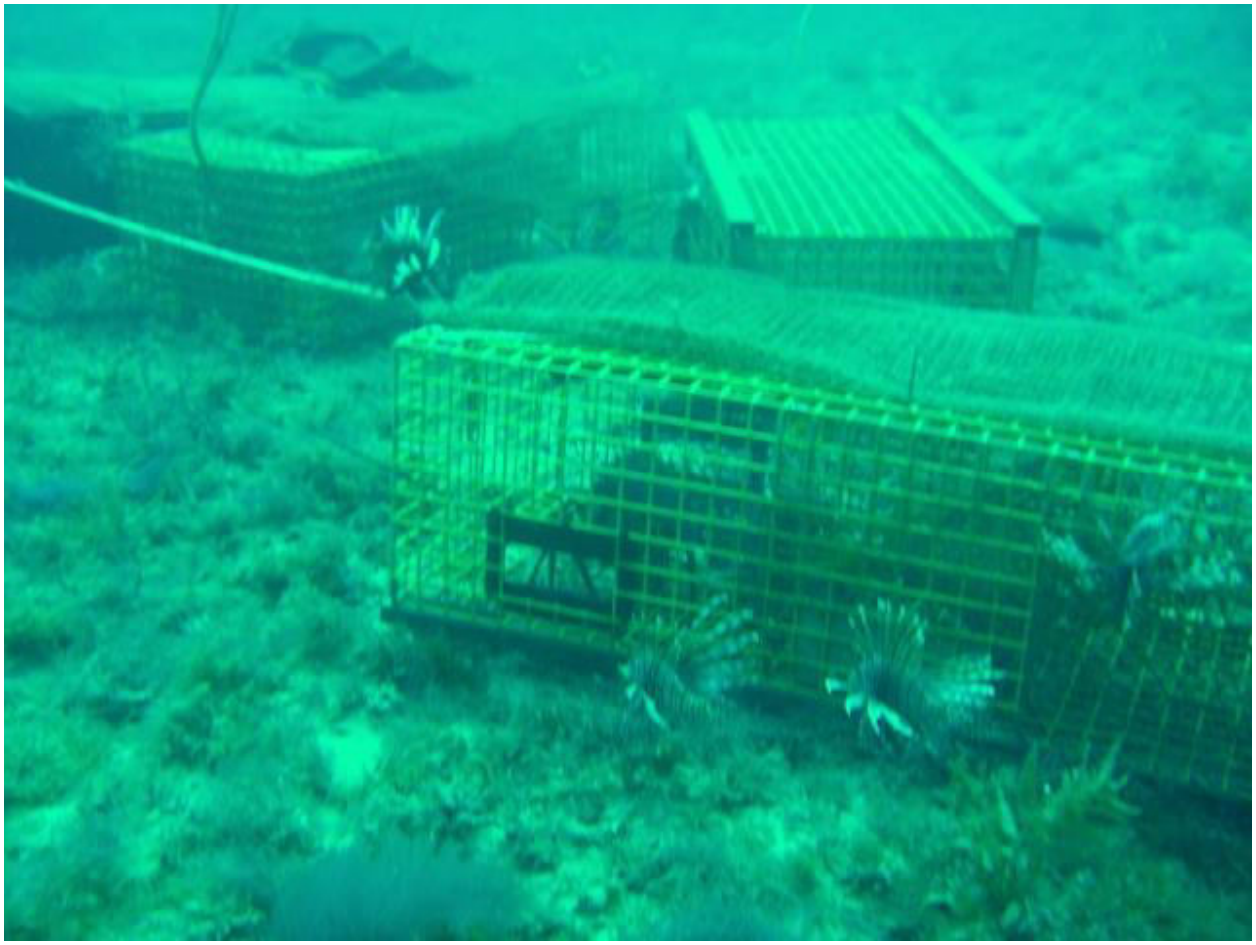

Figure 7. Aggregation of lionfish around the lobster traps at Porgy Rocks.

Figure 8. Aggregation of Lionfish around Lobster Traps at the Bow of the Naeco.

Figure 9. Lifting the lobster traps to the surface via lift-bags.

Figure 10. Lobster and CPCT trap deployment at Bottom Rocks location

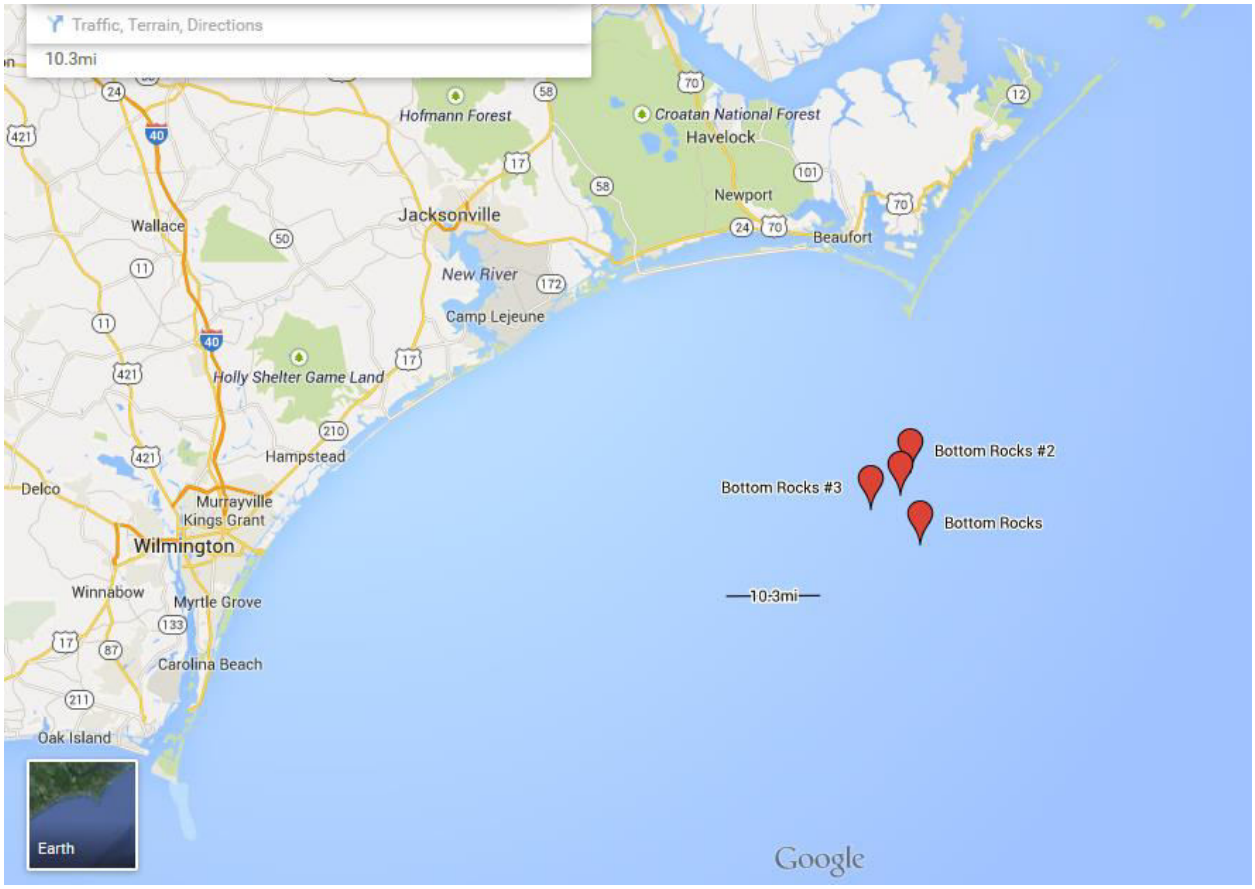

Figure 11. Trap search locations for August 20, 2014 and September 17, 2014