Exempted Fishing Permit Request

Brief summary of the situation or problem to be addressed:

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 Gulf Stream 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.

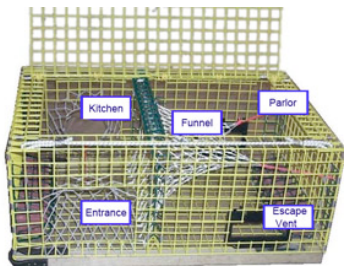
Lionfish pose a unique threat to artificial reefs. By design, artificial reef programs provide habitat and nursery grounds for economically and ecologically important species such as grouper and snapper. Lionfish settle on artificial reefs at a higher rate than natural reefs, a likely function of high 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.

We propose to test three trapping methods for lionfish off North Carolina: the Maine lobster trap, a Crab Pot Christmas Tree (CPCT) concept, and a horizontal structure (HS) concept. The Maine lobster trap is larger than the spiny lobster trap providing additional structure and a larger funnel. Due to their size, a larger trap design is needed. The CPCT idea is based on developing a lionfish attracting device that can be deployed away from the reef. The CPCT provides a high relief (reef height) and complexity (lots of folds and corners) that may attract lionfish out away from the reef and to the device. The HS concept is based on replicating overhanging reefs, an habitat type that is preferred by lionfish. The HS concept will involve elevating a horizontal and concave structure off the bottom similar to an upside down satellite dish. This structure type has been documented to attract large aggregations of lionfish.

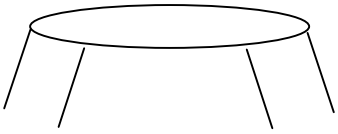
Purposes (objectives) of the project:

To evaluate potential trapping methods for Lionfish in North Carolina as an effort to create a viable trap design. We propose to test three methods: the Maine lobster trap (MLT) and a crab pot Christmas tree (CPCT).



Maine lobster trap

CPCT (lights will be removed)



Horizontal structure

Anticipated outcomes of the project:

We will obtain preliminary data on the catch rate of lionfish using the two methods described above. This information will be used to determine if either or both of these concepts are viable and if additional testing is warranted. The potential for these concepts to have an impact on invasive lionfish control is significant. At present, there are no lionfish attracting devices or trap targeted trapping technique that is being used by reef managers. Should either of these concepts prove useful, the impact could be very high on this invasive species problem. Further research is anticipated to develop the most viable trap design and to grow the burgeoning commercial demand for lionfish as an exotic food.

Methods

We propose to deploy the MLT, HS, and CPCT at three reef sites off North Carolina. Sites will be selected based on lionfish densities to ensure that the possibility of lionfish entrapment is high, but generally, these sites will include an artificial reef, a natural, rocky reef bottom, and a flat, sandy area. Depths of the sites will vary between 90 and 120 feet, based on previous assessments of lionfish abundance.

A series of five MLTs, HS, and CPCTs will be tethered together and spaced approximately 30-50 feet apart along the reef. The MLT distance will vary in order to randomly sample the reef. Prior to deployment of the MLTs, divers will assess the densities of lionfish using standardized lionfish monitoring methods (Morris 2012). After deployment, divers will verify the position of the trap to the reef to ensure that the trap is in close (between 20-30 ft) proximity to the reef. The MLT and CPCTs will be deployed for at least 48 hours with a maximum of one week, weather depending. After 48 hours, divers will observe (count and identify the number of fish inside and around) the MLT and CPCT and record video prior to hauling. For the MLT, all catch will be quantified to the lowest possible taxon. The experiment will be replicated at least twice during the summer season, weather depending. The objective of this experimental design is to determine if either of these trapping/aggregating approaches may be worth pursuing on a larger scale.

Dimensions of the aggregating devices:
The CPCTs will be approximately 24” in base diameter and 48” in height. The HS will not exceed 5’ in diameter and will be approximately 1-2’ off the bottom supported by frame legs. The MLT are approximately 36”x18”x18” wide.

Impacts to sensitive habitat and protected species:
The devices will be deployed in sandy substrate and will not be deployed directly in reef habitats. The objective is to aggregate the lionfish away from the reef habitat to the device. Devices will be secured to the substrate using weight amounts similar to those used on traps. All devices will be deployed and retrieved by divers to ensure accurate placement. No vertical lines will be used in order to avoid entanglement interactions with protected species.

Literature Cited:
Morris, J.A., Jr. and P.E. Whitfield. 2009. Biology, Ecology and Control Management of the Invasive Indo-Pacific Lionfish: An Updated Integrated Assessment. NOAA Technical Memorandum NOS NCCOS 99. 57 pp.

Morris, J.A., Jr. and J.L. Akins. 2009. Feeding ecology of invasive lionfish (*Pterois volitans*) in the Bahamian archipelago. Environmental Biology of Fishes 86: 389-398.

Morris, J.A., Jr (ed.) 2012 *Invasive Lionfish: A Guide to Control and Management.* Gulf and Caribbean Fisheries Institute Special Publication Series Number 1, Marathon, Florida, USA 113 pp.