Efforts to Develop a Lionfish-Specific Trap for Use in Bermuda Waters

Los Esfuerzos para Desarrollar una Trampa Especial para el Pez León para su Uso en el Entorno Marino de las Bermudas

Les Efforts pour Développer un Piège Spécialisé pour Poisson-lion pour L'utilisation en Milieu Marin des Bermudes

JOANNA PITT* and TAMMY TROTT
Department of Environmental Protection, Government of Bermuda, 3 Coney Island Road, St. Georges CR04 Bermuda.
**jpitt@gov.bm*.

ABSTRACT

In Bermuda lionfish are presently concentrated in deeper water (30 - 60 m) inaccessible to volunteer cullers, but they are caught as bycatch in commercial lobster traps set at these depths. Bermuda has banned fish pots, so developing a lionfish-specific trap for commercial fishers would help control this invasive species in deeper waters. Using insights gained from monitoring lobster traps with self-contained underwater cameras, the traps and practices used by the commercial lobster fishery will be modified to increase the catch of lionfish, reduce catch of spiny lobster, and maintain the low levels of finfish bycatch for which this standardized trap was developed. Proposed modifications include shading the traps, varying the funnel shape and varying baiting practices. A lionfish trap fishery would operate alongside the lobster fishery in the autumn when offshore conditions are favorable, and could be extended into the summer closed season if lobster bycatch can be sufficiently reduced.

KEY WORDS: Lionfish, trap, Bermuda

INTRODUCTION

The invasive lionfish population in Bermuda is expanding in terms of both numbers and distribution, but is presently concentrated in deeper waters (30 - 60 m) that are inaccessible to volunteer cullers. However, lionfish have been caught as bycatch in commercial lobster traps since at least 2003, and regularly since 2008. Lionfish bycatch occurs predominantly in the deeper 'offshore' traps which are set outside the reef line at depths of 120 - 240' (40 - 80 m) during the first half of the September - March season (Table 1). The Department of Environmental Protection is presently working to develop a lionfish-specific trap for commercial fishers to facilitate large-scale, long-term removal of this invasive species from deeper waters. This approach is necessary because Bermuda banned 'fish pots' in 1990. The goal is to modify the traps and deployment protocols used by the commercial lobster fishery in order to increase the catch of lionfish, reduce the catch of spiny lobster, and maintain the low levels of finfish bycatch for which this standardized trap was developed. Monitoring commercial lobster traps with self-contained underwater cameras will help assess lionfish density and distribution in the deeper areas where the offshore lobster trap fishery operates, and provide insights into their behavioural interactions with the standard traps. This information will, in turn, suggest ways in which these traps can be modified in order to produce a more lionfish-specific trap.

Bermuda Lionfish Timeline

1999 – Bermuda is the first location outside the U.S. to detect invasive lionfish
2003 – First lionfish reported from a commercial lobster trap (although now that the fishers know what they are, it seems some specimens may have been caught as early as 1995!)
2008 – Lionfish as regular bycatch in lobster traps; Chris Flook starts culling program
2009 – Deep "tech divers" report lots of lionfish at 200'
2010 – Marine Resources Section releases 15-year strategy that includes plans for a lionfish fishery
2011 – First attempt at trapping lionfish
2013 – Full pilot study of modified lobster traps funded, and beginning with 'in situ' observations of lionfish interacting with commercial lobster traps…

METHODS

GoPro Hero2 cameras with external controller cards from Cam-Do and deepwater ScoutPro HH2 housings from Group B are currently being used to monitor the behaviour of lionfish in and around standard commercial lobster traps (Figure 1). The GoPros are set to the widest field of view and programmed to take time-lapse photographs at a rate of one picture per second when the camera is switched on. The external controller card plugs into the HDMI port and switches the camera on for 5 seconds every 15 minutes. The series of 5 images is adequate for detecting fish movement, including swimming form and direction. The housing is attached with cable ties to the float line approximately 4' above the trap in order to give a view of the surrounding area as well as the inside of the trap.

Table 1. Lionfish bycatch in Bermuda's commercial lobster trap fishery over the past four seasons.

	2009 - 2010	2010 - 2011	2011 – 2012	2012 - 2013
Total number caught offshore (reported)	608	200	371	487
Total number caught inshore (reported)	6	2	5	6
Total number of fishers reporting	17	14	13	15
Number reporting significant catch	5	2	5	8
Factors affecting lionfish bycatch	All traps offshore Sept-Nov	5 traps allowed inshore from Sept	5 traps allowed inshore from Sept	5 traps allowed inshore from Sept

Figure 1. GoPro Hero2 camera with Cam-Do external controller card and Group B ScoutPro HH2 housing rated to 5,000 feet.

RESULTS

Initial Observations

Initial camera observations of lobster traps seem to concur with the observations of technical dive teams, in that lionfish appear to be present at low levels (approximately 3 fish per 250 m^2) across most of the 120' to 240' (40 - 80 m) depth range but that some areas appear to be hot spots with much greater densities in the order of 25 to 30 fish per 250 m^2. In most cases, 2 or 3 lionfish were observed investigating the trap over the course of a 4 to 6 day set. Behaviours observed included 'circling' the trap, 'investigating' the funnel, and 'perching' on top of the trap (Figure 2 A and B). One lionfish was observed 'sheltering' in the mouth of the funnel from early morning through late afternoon (Figure 2 C), but leaving as dusk approached. However, in one instance, there were 3 lionfish in the vicinity when the trap was deployed and numbers increased rapidly within hours, such that 26 lionfish were observed around the trap by dawn of the following day (Figure 2 D).

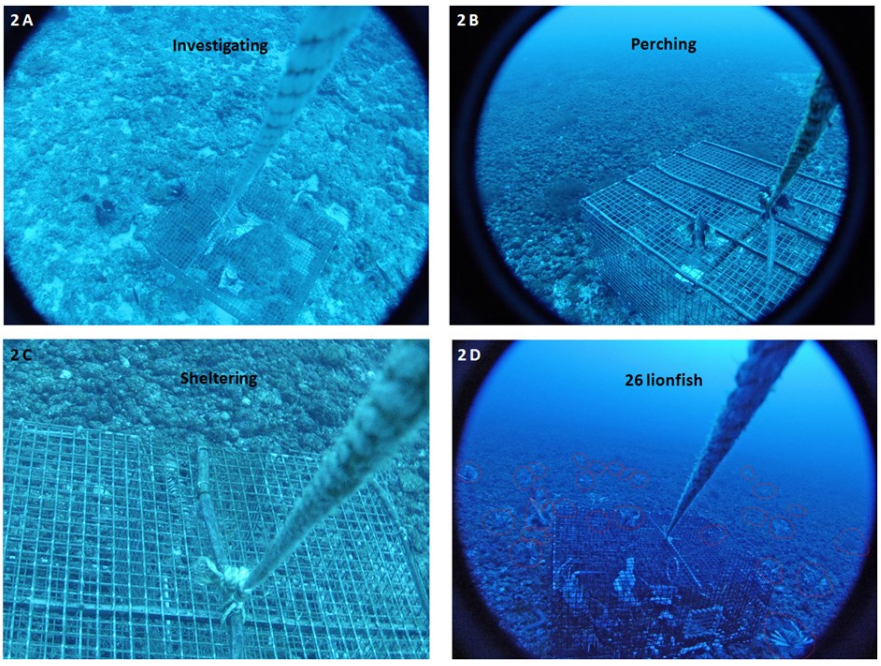

Figure 2. Photos, described in text.

Proposed Trap Modifications

For initial experiments, proposed modifications include shading the traps, varying the funnel opening and varying baiting practices (Figure 3). The 'sheltering' behaviour observed suggests that shading the traps may enhance the feeling of protection they provide and entice more lionfish inside. The 'investigating' behaviour observed suggests that lionfish may be deterred from entering the traps when they see the white PVC ring that is used to hold the funnel open, so proposed alternatives include replacing this ring with a wire oval and removing the ring altogether. However, there is a concern that the lack of a ring may increase finfish bycatch. If shelter is more important than bait as an attractant for lionfish, then not baiting the traps may serve to reduce bycatch, and this will be tested in different sets.

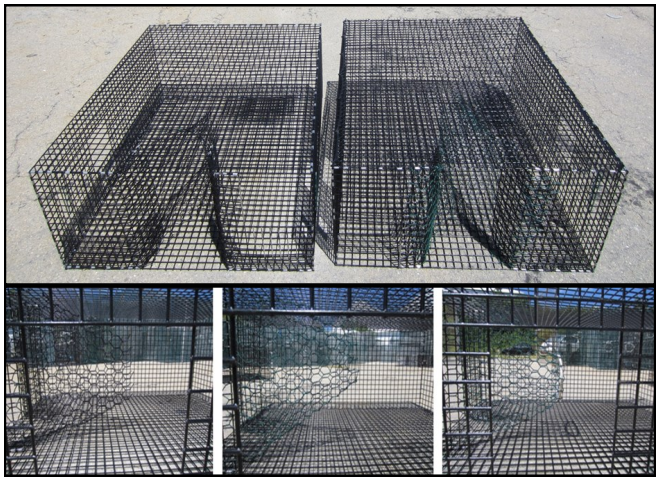

Figure 3. Experimental design. Treatment level 1: No shade vs. Shaded; Treament level 2: funnel variations – open, wire ring and pvc ring.

CONCLUSION

It is anticipated that a lionfish trap fishery would operate alongside the offshore lobster fishery from September through December. Weather conditions make it impractical to operate offshore between January and March. If lobster bycatch can be sufficiently reduced, the lionfish trap fishery could potentially operate during the summer months, but the need to protect brooding female lobsters must take priority over expanding the lionfish trapping season if lobster bycatch remains an insurmountable issue. This work is one component of the Bermuda Lionfish Control Initiative that is being supported by a Darwin Plus grant from the UK's Department of Environment, Food and Rural Affairs. Other work associated with this grant aims to create a distribution map of the local lionfish population to aid the trapping and culling programmes and determine the biological and ecological factors driving that distribution.