An Effective Artificial Habitat for Collecting Juvenile *Panulirus argus* in St. Kitts and Nevis, West Indies

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ABSTRACT

Most studies of juvenile spiny lobsters, *Panulirus argus*, have generally dealt with either quantifying settling pueruli, investigating the nearshore shallow water ecology of recently settled pueruli and early post-larvae, or studying the migration of sub-adults to offshore reefs. Few studies have investigated any aspect of juvenile spiny lobster biology between settling and migration, an important segment of the animal's development and critical to fisheries management. One reason for this may be the lack of an effective method for collecting substantial numbers of lobsters during this period of development. A simple juvenile lobster "habitat" constructed of locally available materials was developed on St. Kitt's and deployed in Major's Bay on the Southern Penninsula. Three habitats extending in a line from shore at depths from two to three metres were anchored in place and marked by a buoy attached to the inshore habitat. The habitats could be taken to a waiting surface boat where the lobsters were transferred to an onboard wet-tank to be measured and sexed. After an initial four week seasoning period, 318 juvenile lobsters from 13-61mm carapace length were taken over eight samples collected approximately every two weeks. Up to 69 individuals were taken from a single habitat in a sample, with up to 99 juveniles taken in a single sample from all three habitats.

We suggest that these habitats are an inexpensive and effective method of concentrating juvenile spiny lobsters for sampling, and would be useful tools in identifying important juvenile nurseries and in studying juvenile lobster populations.

KEY WORDS: artificial habitat, Caribbean, juvenile, spiny lobster, *Panulirus argus*.

INTRODUCTION

Information on *Panulirus argus* juveniles is extremely limited and can be difficult to obtain. Although puerulus collectors are useful quantitative devices for sampling pueruli moving inshore, they give little information about habitat requirements or ecology of post-larvae (Marx, 1986). Recent studies have

investigated the nearshore shallow-water ecology of recently settled pueruli and post-larvae (Marx, 198; Marx and Herrnkind, 1985), and previous research has reported on the migration of subadults to offshore reefs as they approached maturity, an event occurring approximately two years later (Munro, 1974; Peacock, 1974; Warner *et al.*, 1977, Kanciruk, 1980). Relatively few studies have investigated juvenile spiny lobsters between these two stages; a period representing an important segment of the animal's life history and critical to fisheries management.

Marx and Herrnkind (1985) have reported capturing a total of 43 post-larval lobsters <20mm carapace length (CL) by skin or SCUBA diving in 22 sampling days. In work associated with but outside of the present report, sampling by two to four skin and/or SCUBA divers using snares and nets regularly produced 10-40 juveniles over approximately four hours (unpublished data), or <1 to 5 juveniles per man-hour. Similarly, other studies report the capture of relatively few juveniles (especially those <40-50mm CL), whether sampled by SCUBA, slatted wooden traps, bait shrimp trawls or combinations of these and other methods (Witham *et al.*, 1968, Hunt and Lyons, 1986). Previous field studies of juvenile habitat designs have also yielded only small numbers of juvenile lobsters (see Sweat, 1968).

It was apparent that an effective method of concentrating substantial numbers of *P. argus* juveniles for collection would be beneficial to further studies. To address this requirement, an inexpensive artificial habitat designed to attract juvenile spiny lobsters was developed and tested in St. Kitts and Nevis, W.I. This study was conducted in conjunction with an on-going fisheries management and development program being conducted by Environmental Research Projects (Charleston, S.C.) in St. Kitts and Nevis, W.I., in co-operation with the Fisheries Division, Department of Agriculture, Ministry of Agriculture, Lands, Housing, Labour and Tourism.

MATERIAL AND METHODS

Initial design ideas for artificial juvenile habitats resulted from discussions with Dave Miller (pers. comm., 1985), drawing from his experiences with an artificial habitat-based spiny lobster fishery in Quintana Roo, Mexico.

Three artificial habitats (Figure 1) were subsequently constructed of wolmanized wood and corrugated galvanized sheet metal. Each habitat measured approximately 65cm long, 45cm wide and 10cm high. Two 60cm long "2x4"s formed the sides, while two pieces of sheet metal made up the top (45x62cm) and bottom (45x65cm). These were nailed to the sides, extending over the front opening so they could be bent inward to partially close the opening during collection. The top was made shorter than the bottom to allow insertion and removal of the back; a third piece of sheet metal (approximately

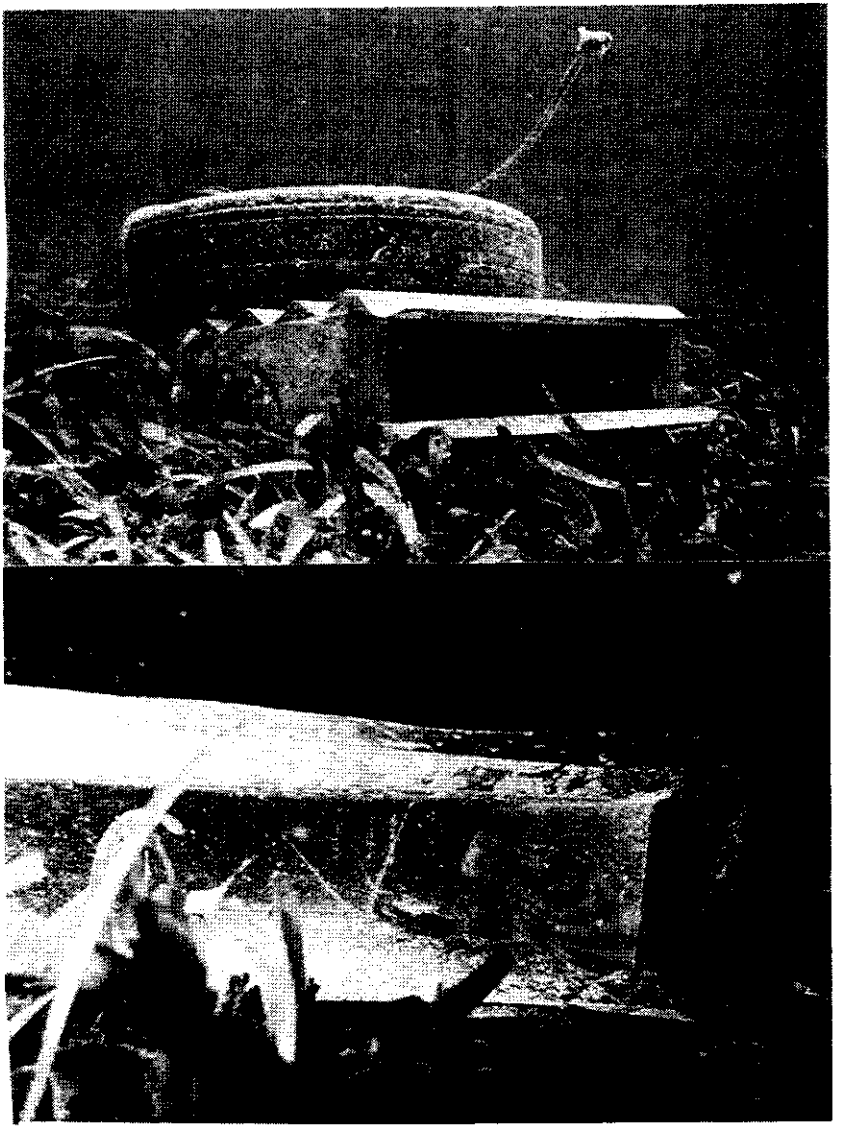

Figure 1. a) Artificial habitat designed to attract and concentrate juvenile spiny lobsters, *Panulirus argus*, and located in a *Thalassia* bed in Major's Bay, St. Kitts, W.I. **b)** Juvenile *P. argus* in an artificial habitat (photos by S. Goodwin).

10x40cm) that slid vertically into slots cut on the inside surfaces of the sides near the back of the habitat.

A concrete-filled rubber tire placed on top of each habitat served as an anchor, held in place by short lengths of polypropylene line passing through holes drilled in the sides of the habitat and knotted on the inside. A bent metal rod set in the concrete of each anchor provided a hand-hold for removing and replacing the anchor during the sampling procedure, and an attachment point for the lines holding the anchor to the habitat. The hand-holds could also be used to connect a marker buoy to facilitate relocation of the habitats.

The size of the habitats allowed them to be slipped inside a large jute bag by skin or SCUBA divers for transport to the surface, preventing the escape of smaller juveniles through the gaps made by the sheet metal corrugations. Each habitat could then be transferred to a surface vessel, with the juveniles placed in an on-board holding tank for study. For the purposes of the on-going program (see above), carapace length (CL: measured mid-dorsally from between the supra-orbital horns to the posterior edge of the carapace) and sex (when this could be determined) were recorded.

The three habitats were placed in 2-3m of water in Major's Bay on the southern penninsula of St. Kitts (Figure 2). The habitats were arranged in a line extending away from shore, with a marker buoy attached to the inshore habitat. A population of *P. argus* juveniles had previously been observed in the area, with many animals aggregating around pockets of sand under the edges of undercut *Thalassia* beds.

RESULTS

The habitats became increasingly bio-fouled during an initial four-week "seasoning" period. The galvanized surfaces of the sheet metal parts, which were brightly reflective at first, became progressively dulled over time and various organisms colonized the habitat.

Between August 30 and December 6, 1985, 318 juveniles ranging in size from 13-61mm CL were collected in eight samples (Table 1). Up to 69 lobsters were taken from a single habitat in one sample, and as many as 99 lobsters were collected in a single sample from all three habitats. Two skin divers could collect, empty and return all three artificial habitats in approximately one hour.

DISCUSSION

Previous attempts at collecting juvenile spiny lobsters for study have involved many man-hours of sampling for relatively low returns (*e. g.*, Marx and Herrnkind, 1985; 43 post-larvae in 22 days). Similarly, skin and/or SCUBA divers in the same area as this study usually collected less than five juveniles per man-hour using snares and nets (see Introduction). Over the last four samples taken from the artificial habitats in this study, an average of 35 juveniles per

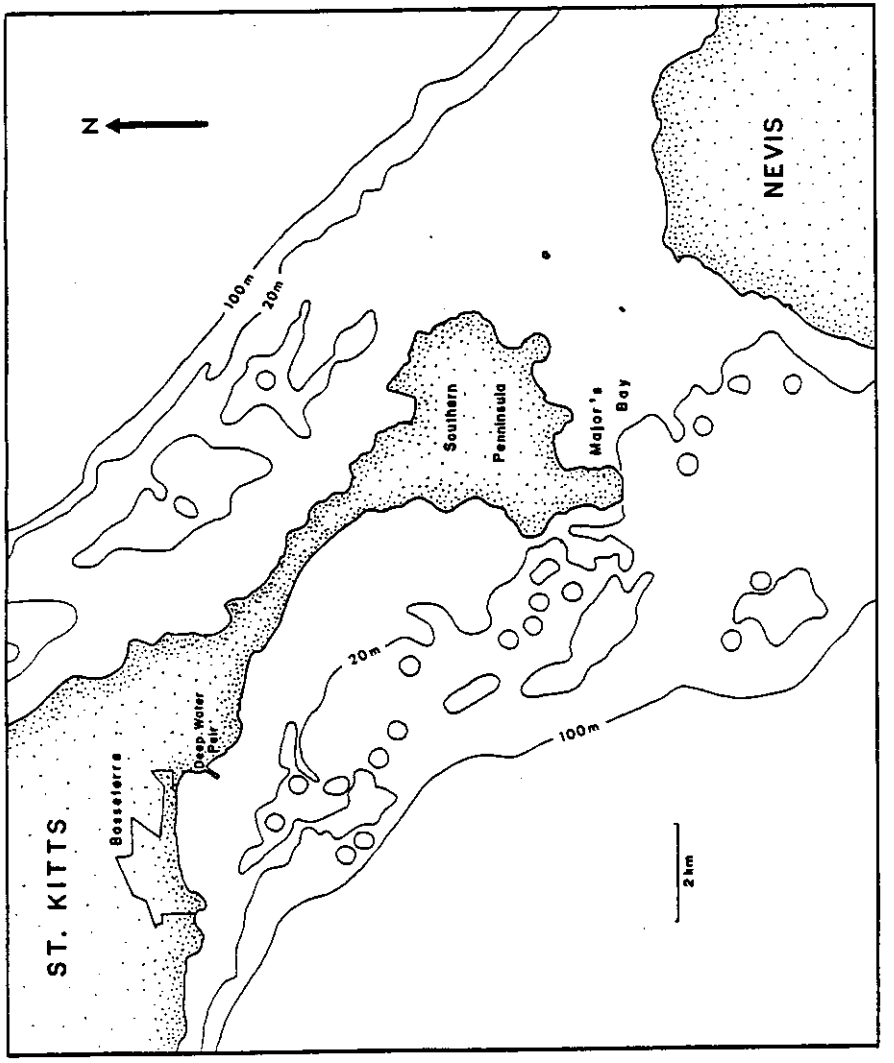

Figure 2. Map of the southern penninsula of St. Kitts and northwestern Nevis. The juvenile habitats were placed in shallow water (2-3 m depth) in Major's Bay, St. Kitts.

Table 1. Numbers and size ranges (CL:mm) of juvenile spiny lobsters, *Panulirus argus*, collected from artificial habitats (juvenile collectors: JC1, 2, 3) located in Major's Bay, St. Kitts, W.I.

Date	Habitat No.						Total Range	
	No.	Range CL(mm)	No.	Range CL(mm)	No.	Range CL(mm)		CL(mm)
Aug 30			2	20-26			2	20-26
Sept 20			3	25-33	1	25	4	25-33
Sept 27	6	21-33	13	14-35			19	14-35
Oct 11			15	13-35			15	13-35
Oct 25	13	15-33	3	20-22	2	24-42	18	15-42
Nov 8	34	14-53	23	18-48	42	18-61	99	14-61
Nov 23	19	17-47	3	23-47	69	15-56	91	15-56
Dec 6	23	18-42	1	25	46	20-49	70	18-49

man-hour were collected, ranging in size from 14-61mm CL (catch rate derived from Table 1; based on two skin divers and a one hour collecting period - see Results).

We suggest that the artificial habitats described here are an inexpensive and effective method of concentrating substantial numbers of juvenile spiny lobsters for sampling, and would be useful tools in identifying important juvenile nursery grounds and studying juvenile populations.

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