

Estimate of In-water Size Structure of Spiny Lobsters in St. Thomas

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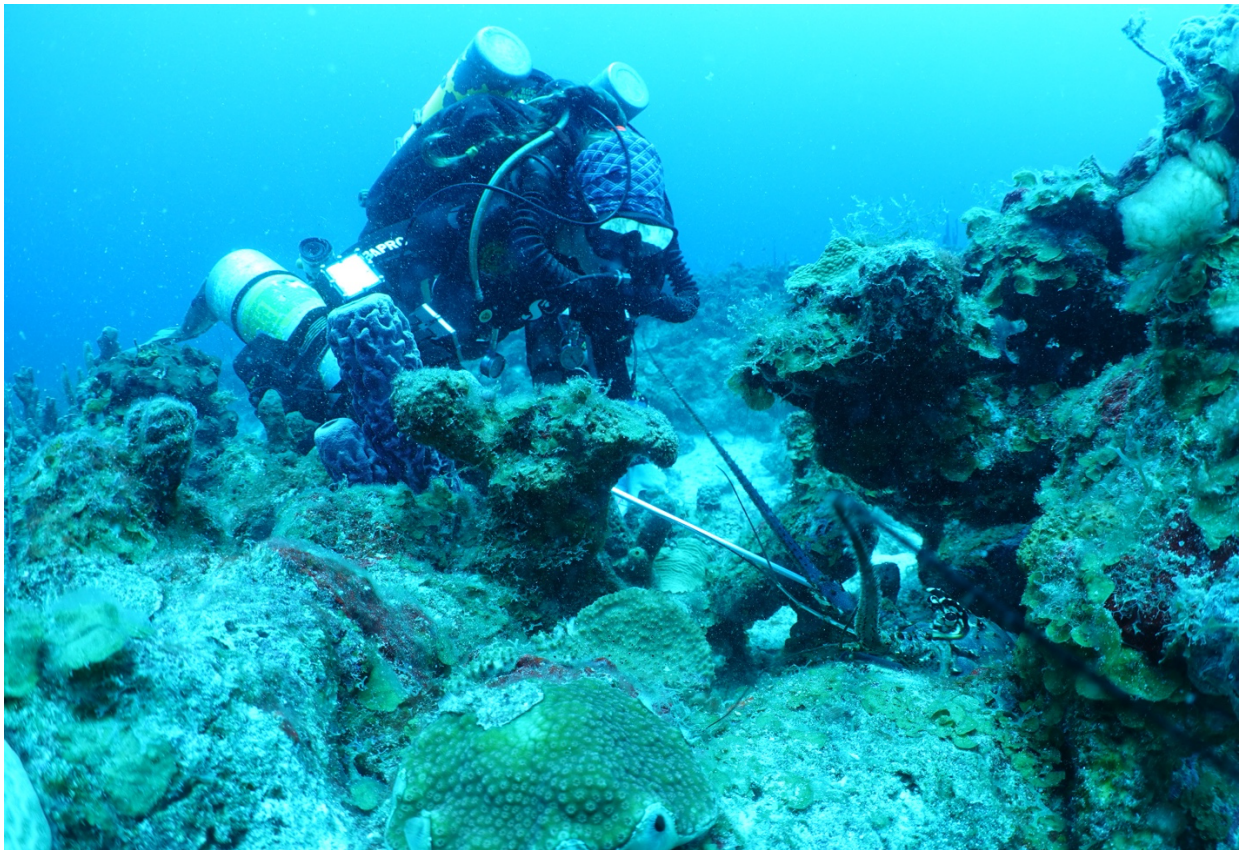


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Final Report

Estimate of In-water Size Structure of Spiny Lobsters in St. Thomas

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Cover Photo: UVI diver Rosmin Ennis coaxes a spiny lobster out of its hole for comprehensive assessment at site 208 in 30 m water depth. (credit: Sarah Heidmann)

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Introduction

The Gulf States Marine Fisheries Commission (GSMC) and the NOAA National Marine Fisheries Service Southeast Fisheries Science Center (SFSC) was seeking improved scientific information with which to manage tropical marine lobster species in the U.S. Virgin Islands. Given their expertise in scientific data collection the Center for Marine and Environmental Studies at the University of the Virgin Islands was contracted to conduct approximately 96 in shallow (0-30 m depth) and deep (30-50 m) lobster and habitat assessments in the waters south of St. Thomas, US Virgin Islands. The purpose of the in-water surveys was to determine the abundance of lobster and their biological characteristics (species, size, sex, reproductive status) as well as the characteristics of the surrounding environment using a reef visual census approach and spatially stratified random sampling design. Most of the shelf edge habitat in the northern US Virgin Islands is in water deeper than 30 m (Smith et al. 2019) and, therefore, technical (decompression) diving is required for a complete visual census of lobsters across their potential habitat. This report presents lobster visual census and ancillary data collected from April 16, 2021 to August 3, 2022.

Methods

Methods for spatial stratification and in water work were based on protocols developed by the US National Park Service (NPS; Richter et al. 2020). The team at UVI worked closely with the SFSC and NPS in translating this protocol to the sampling outlined in this report. The NPS conducted a parallel effort in the waters surrounding St. John, US Virgin Islands. A spatially stratified random design was used to allocate samples into shallow (<30m deep) and deep (30-50 m) areas south of St. Thomas. Samples were allocated into habitats identified as consolidated substrates (reef, pavement, and hardbottom) by NOAA (2001) and Costa et al. (2017) (Figure 1). Each sample site consisted of a 50 m by 50 m grid cell, within which a subset of the habitat was surveyed for lobsters. The habitat grid was the same used by the National Coral Reef Monitoring Program (NOAA 2021).

As mentioned above, in-water protocols followed Richter et al. (2020) but are briefly described here. At each site surveys were conducted by diver pairs using traditional SCUBA, technical SCUBA, or closed circuit rebreathers as dictated by the logistics of the dive. All dives were conducted as live boat “drift dives”, with the boat dropping off the diver pairs at the specified sampling point by navigating to within at least 7 m of the point using a shipboard geographic information system unit. Diver pairs descended directly to the seafloor with no prepositioned marker deployed, but maintained position within the 50 m grid cell by swimming down to the first visible seafloor object.

The divers surveyed two 15m diameter cylinders per dive, denoted as A and B within the sampling site. Diver 1 attached a surface marking flag to the bottom, and this formed the union of the two cylinders. Diver 2 took photos of the site in each cardinal direction (Figure 2) and

then a single habitat photo 2 meters above the bottom (Figure 3). Site and benthic photos were archived as products of the surveys but were not analyzed.

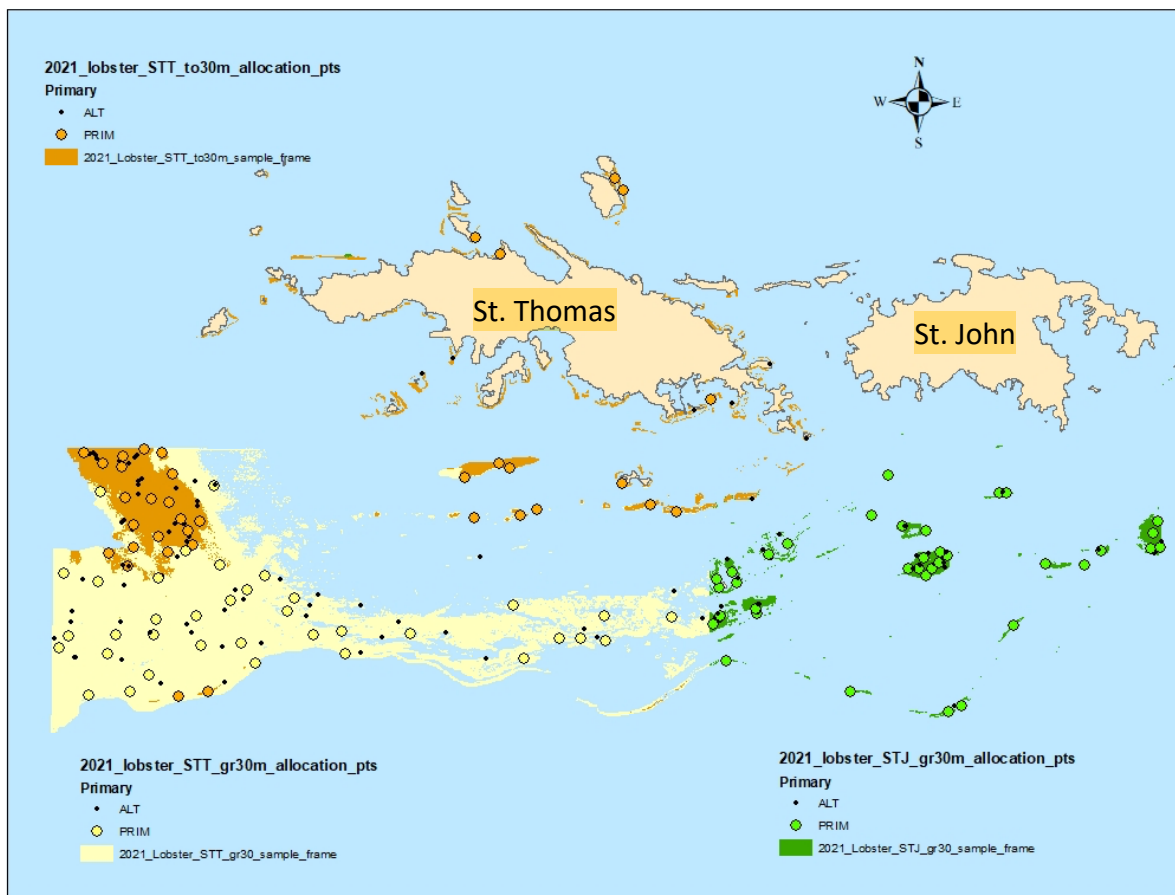
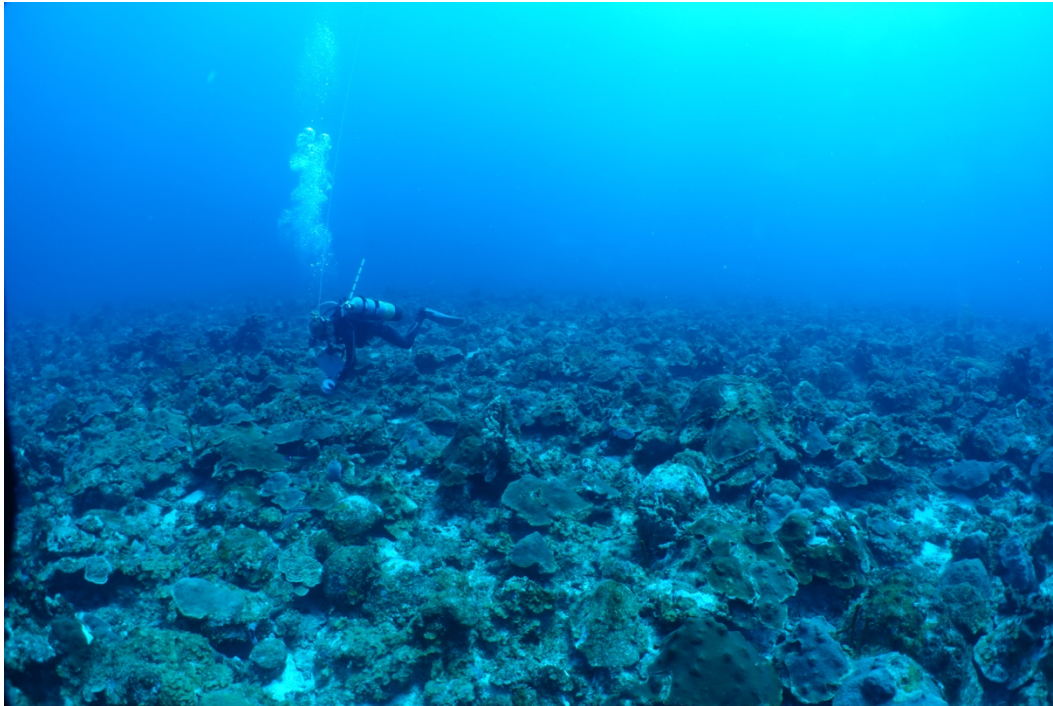


Figure 1. Primary and alternate sampling sites for UVI St. Thomas (STT) and St. John (STJ) created using a spatially stratified random sampling allocation design. Samples were used as the basis for the actual subset of sites sampled. Sites allocated in the STT draw were the focus of the data included in this report.

Diver 1 laid out a straight 15 m line away from the flag. Each diver started at the 7.5 m mark on the transect and swam 7.5 m away perpendicular to the tape, using a 1m PVC stick (“fish stick”) to measure the distance. These marks provided four reference points in which to designate a 15 m diameter cylinder on the bottom. Each diver surveyed a hemi circle on each side of the transect tape for Caribbean spiny lobsters (*Panulirus argus*) or spotted lobster (*Panulirus guttatus*). The presence of queen conch (*Alger gigas*) and black-spined sea urchins (*Diadema antillarum*) was also noted and habitat characteristics were recorded (substrate type, structure). The process was repeated on the other side of the flag to complete two 15 m diameter surveys or 354 m² of the 50 m x 50 m (2500 square meters area) grid cell.

Divers searched the areas comprehensively by inspecting under all structure for the presence of lobsters (Figure 4). When lobsters were encountered a tickle stick was used to try to coax the

lobster out of its resting hole. Caught lobster were sized along the carapace, sexed, and assessed for reproductive status (presence and condition of eggs or spermatophores). If lobster



could not be extracted the carapace size was estimated visually. All data were recorded onto underwater data sheets and entered into a spreadsheet program.

Figure 2. Example of a site photo taken at location 212 in a depth of 26 m on August 24, 2021.

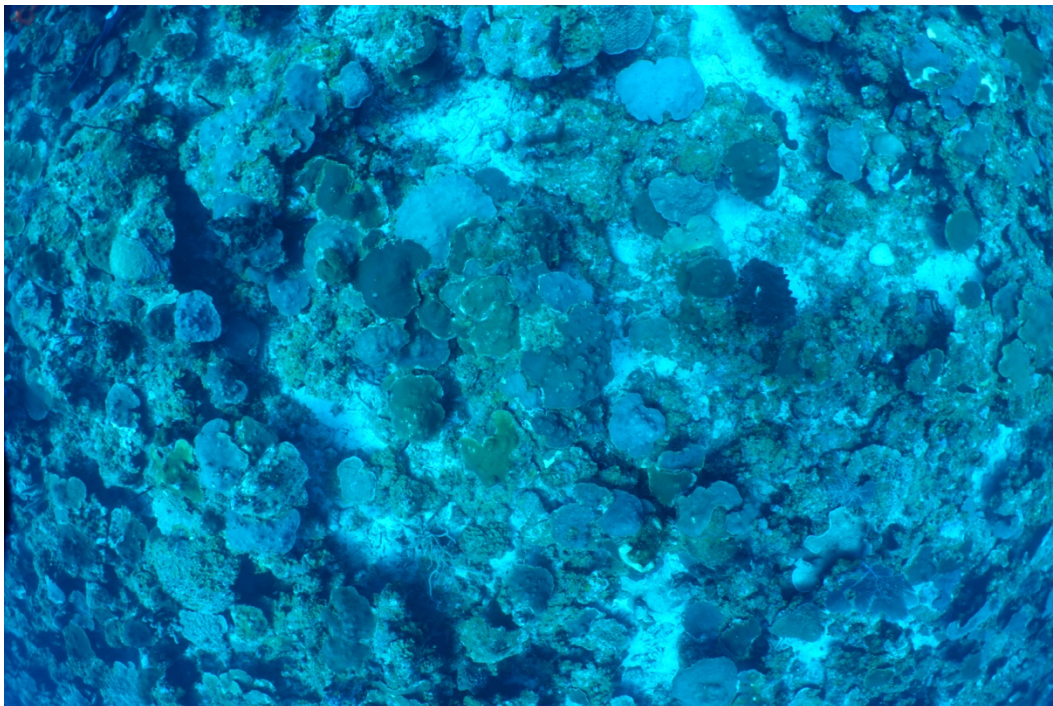


Figure 3. Example of a habitat photo taken at location 251 in a depth of 28 m on August 26, 2021. (Figure 2 and 3 credit: Rosmin Ennis)

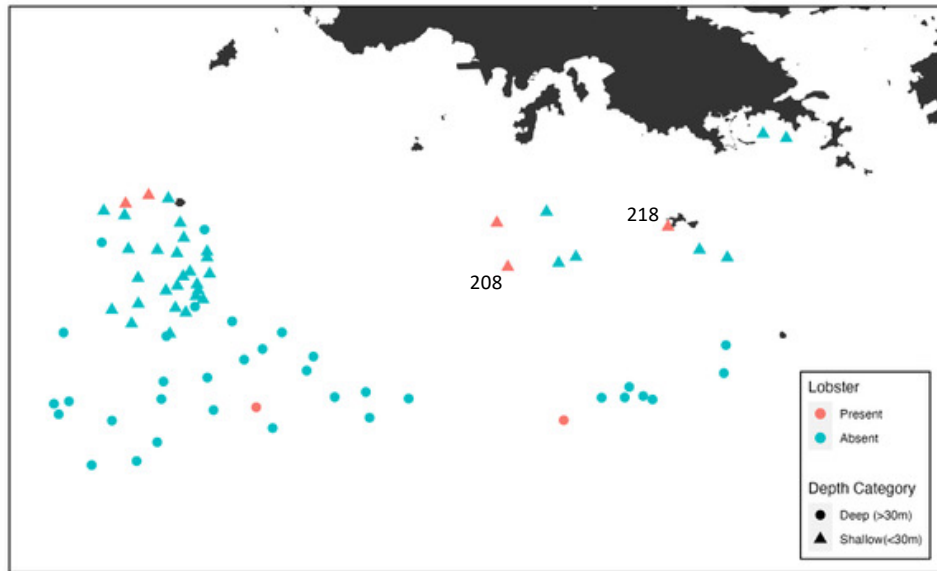


Figure 4. Diver samples half of a survey cylinder at site 212 demarcated by a 15 m long transect tape. (credit: Rosmin Ennis)

Results

A total of 77 sampling sites were assessed for lobster over 16 sampling days in water depths of 11 - 46 m (Figure 5). Detection of lobsters was rare in the sampling area, with only 14 lobsters detected across 6 sampling sites, or 7.8% of sites. Eleven of the lobsters found were *P. argus*, one was *P. guttatus* and two were of unknown species because they could not be fully visualized (i.e., were too deep in structure and were noted only by antennae) (Table 1). Average carapace size of *P. argus* was 130 mm and of *P. guttatus* was 100 mm. Detections did not seem clustered, but lobsters may have been more common in the eastern part of St. Thomas where a higher proportion of sites had lobsters present (16%). This area is typified by more hardbottom habitat near areas of open unconsolidated substrate (e.g., sand plains and rhodolith beds) with lower coral cover. In contrast, the dense mesophotic reef typical southwest of St. Thomas had many samples but much lower prevalence of lobster present (5%).

A.



B.

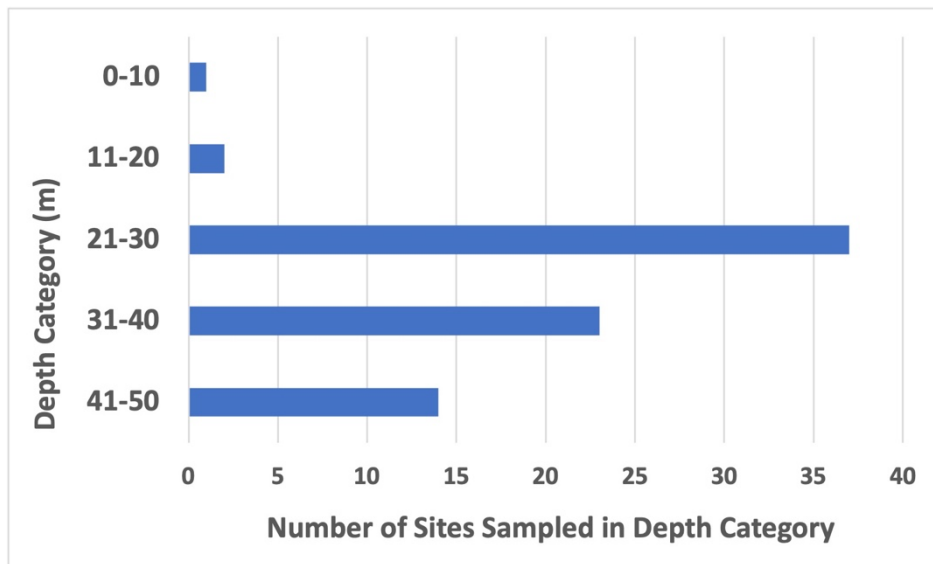


Figure 5. (A) Location of sites sampled south of St. Thomas showing presence and absence of lobsters in shallow(<30 m) and deeper (>30) depths. Site 208 had the highest number of lobsters present, with 7 seen across the sampling cylinders. Note that one observed lobster at site 218 was 4 m outside the sampling plots but is represented on the map. (B) Distribution of sampling sites by depth categories.

Table 1. Biological data from recorded lobsters across six sites. INT = Intermediate molt stage. 0 = Ovaries present. UNK = Unknown because it could not be observed.

Date	SiteID	Species	Carapace Length (mm)		Sex	Molt	Eggs	Spermatophores
			Estimate	Measured				
4/16/21	208	NA						
4/16/21	208	<i>Panulirus argus</i>	150		F	INT	O	
4/16/21	208	<i>Panulirus argus</i>	120		UNK	UNK	UNK	UNK
4/16/21	208	<i>Panulirus argus</i>	110		UNK	UNK	UNK	UNK
4/16/21	208	<i>Panulirus argus</i>	145		F	INT	UNK	
4/16/21	208	<i>Panulirus argus</i>	180	165	UNK	INT	UNK	UNK
4/16/21	208	<i>Panulirus argus</i>	165	155	UNK	INT	UNK	UNK
4/16/21	208	<i>Panulirus argus</i>	100	95	UNK	INT	UNK	UNK
5/28/21	201	<i>Panulirus argus</i>	115	111	F	INT	UNK	
5/28/21	201	<i>Panulirus argus</i>		113	F	INT	O	
8/18/21	228	<i>Panulirus argus</i>	150	160	M	INT	UNK	UNK
8/18/21	202	<i>Panulirus argus</i>		110	UNK	UNK	UNK	UNK
8/26/21	131	NA						
8/30/21	105	<i>Panulirus guttatus</i>	100		UNK	UNK	UNK	UNK

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Mesophotic reef site 127 sampled on April 25, 2022 in a depth of 38 m (credit: Tyler Smith)