



Importance

The Caribbean spiny lobster, *Panulirus argus*, is a common tropical and sub-tropical species in the western Atlantic Ocean with a distribution ranging from Bermuda and North Carolina to north-eastern Brazil. The spiny lobster life cycle includes both a free-swimming larval phase and a benthic adult life stage, has a complicated reproductive cycle, and can be affected by regional connectivity and stressors. Adult spiny lobsters feed mainly on gastropods, chitons, bivalves, corals and scavenged food remains.

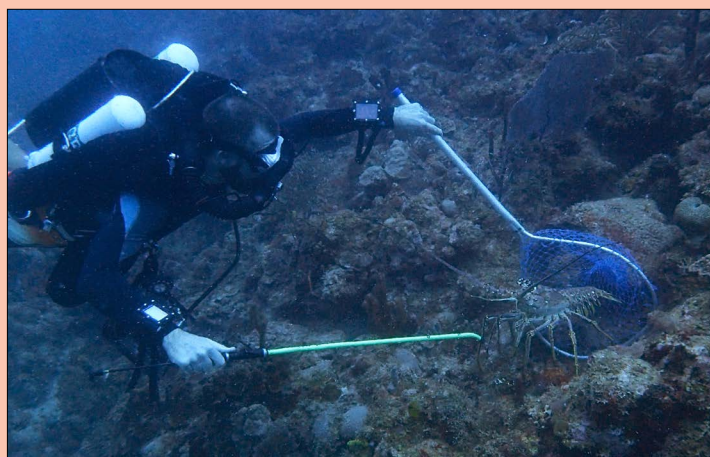
Increased consumer demand, higher market value, and expanding fishing fleets have all led to resource depletion with spiny lobsters being fully or over-exploited across much of their range. Spiny lobsters support a large commercial and recreational fishery throughout the Caribbean, including within U.S. national park boundaries. The lobster fishery has been regulated for more than half a century in some regions. Existing principal management regulations include bag limits, a minimum legal size, a closed season, and prohibition on the harvesting of egg-bearing females. South Florida/Caribbean Network (SFCN) parks include variable regulations with some parks having complete closures (e.g., Buck Island Reef National Monument, Dry Tortugas National Park) while others have more restricted bag limits (e.g., Virgin Islands National Park) or are open to commercial and recreational fisheries (Biscayne National Park offshore). Balancing fishing pressure and environmental degradation with sustainability is a key management concern. The impacts of fishery management tools such as no-take marine reserves are of interest to resource managers and the public.

Objectives and Approach

The main objectives for this protocol are to determine the status and trends in relative density, relative frequency of occurrence, and average size of exploited-phase (legal size) lobsters within the SFCN parks. Secondary objectives include obtaining size distributions, sex ratios, prevalence of reproductively active females, and molt stage ratios. Monitoring data will assist national parks with making informed management decisions.



A spermatophore (tar patchy) is seen on a female spiny lobster during a survey in Buck Island Reef National Monument.



Capturing a lobster during a pilot survey in Virgin Islands National Park.



An adult lobster walking in seagrass near a patch reef in Virgin Islands National Park.



Monitoring

The SFCN Caribbean Spiny Lobster Monitoring Protocol was most recently published in 2020. Park wide surveys were completed at Buck Island Reef National Monument (BUIS) and Salt River National Historical Park and Ecological Reserve (SARI) in 2019 and Virgin Islands National Park (VIIS) in 2021. Sampling occurs on a four-year rotating basis. Biscayne National Park will be surveyed in 2022 and Dry Tortugas National Park in 2023.

Samples are selected from a stratified-random approach on hard bottom habitat within the parks and is derived from the design used in the Reef Fish Monitoring protocols. Samples are re-randomized for each survey. Each sample consists of two adjacent 7.5-meter (24.6-foot)-radius circular plots, where a team of divers search the plots to capture, measure, record demographic information, and release all lobster encountered.

Status and Trends: Virgin Islands NP

During the first lobster study completed in Virgin Islands National Park last year (2021), 72 sites were surveyed. Of these, 58 sites were non-detections where no adult lobsters were observed which produced low values of relative density (0.18 [95% CI 0.08, 0.30]) and relative frequency of occurrence (0.11 [95% CI 0.05, 0.17]; Figure 1). A total of 31 lobster were observed on the survey, of which 61% were adults. Average size (carapace length) in the exploited phase was 125 ± 5 millimeters (SE). The sex ratio (M:F) of observed lobsters was slightly skewed towards females (7:10). Several females were reproductively active, where 20% of the females had eggs and 40% had a spermatophore

Comparison of US Virgin Islands Parks

When assessing fishery health, if the average size of exploited-phase individuals is close (or at) the legal limit, it can indicate heavy fishing pressure. In the case of Virgin Islands National Park, Buck Island Reef National Monument, and Salt River Bay National Historical Park and Ecological Preserve, the average size of exploited-phase lobsters—125, 109, and 109 millimeters respectively—is significantly larger than the legal limit (89 millimeters; Figure 2). Yet, estimates of relative density and occurrence at each of the U.S. Virgin Islands parks are considered very low. This is likely in part due to low recruitment, the sparse juvenile nursey habitat (coastal seagrass/algal beds), yet ample adult lobster habitat (reef). While the average sizes are a positive indicator, the low densities of lobsters can make them susceptible to overexploitation.



An observer measures the carapace length of a juvenile lobster in Salt River Historical Park and Ecological Preserve.

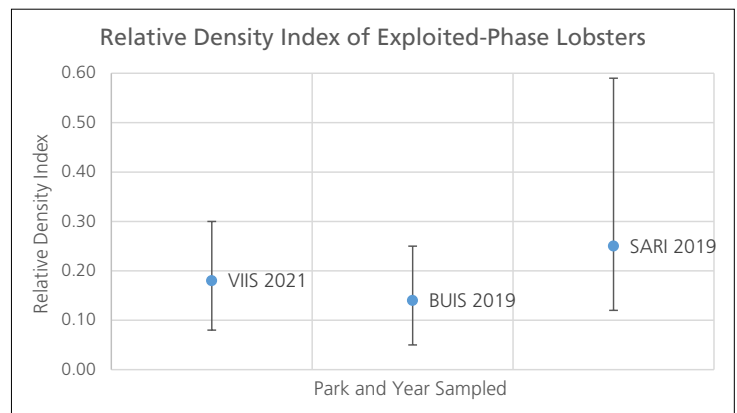


Figure 1. Relative density indices ($\pm$ 95% CI) are not significantly different among U.S. Virgin Islands parks: VIIS (0.18), BUIS (0.14), and SARI (0.25).

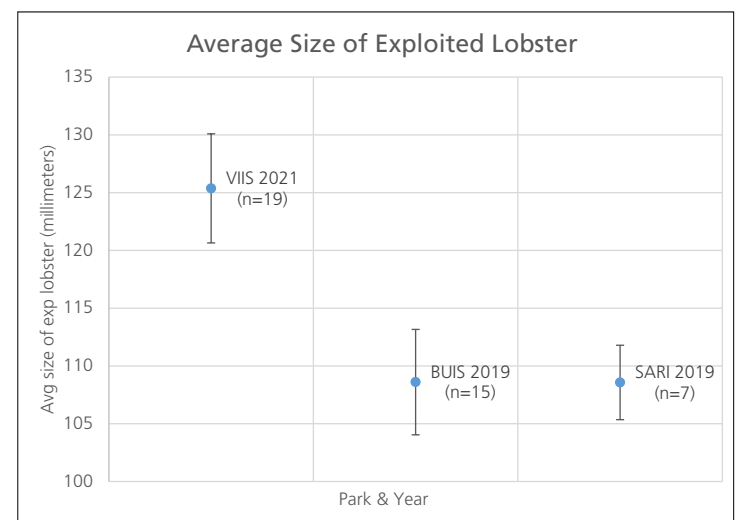


Figure 2. Average size ($\pm$ SE) of exploited-phase lobsters in three U.S. Virgin Islands parks (Virgin Islands National Park [VIIS], BUIS, SARI).

