



Importance

The Caribbean spiny lobster, *Panulirus argus*, is a common tropical and sub-tropical crustacean from the western Atlantic Ocean with a distribution ranging from Bermuda and North Carolina to northeastern Brazil. The spiny lobster life cycle includes a free-swimming larval phase and a benthic adult life stage, with a complicated reproductive cycle that 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, expanding fishing fleets, and perhaps, climate variability, have led to resource depletion with spiny lobsters being fully or over-exploited across much of their range. Spiny lobsters support large commercial and recreational fisheries throughout their range, including some South Florida/Caribbean Network (SFCN) parks. The 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 taking of egg-bearing females. The SFCN parks have variable regulations with some being complete closures [e.g., Buck Island Reef National Monument (NM), Dry Tortugas National Park (NP), and Salt River Bay National Historical Park and Ecological Preserve (NHP&EP)]; others with restricted recreational bag limits (e.g., Virgin Islands NP) and others allowing commercial and recreational fisheries (Biscayne NP offshore, complemented by five small no-lobstering Coral Reef Protection Areas). Balancing lobster catch and environmental degradation with resource sustainability is a key management concern for this valuable species.

Objectives and Approach

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



Top, a den of spiny lobster finds shelter in a “lobster hole” reflecting the sometimes gregarious nature of lobster. NPS photo / Lee Richter. Above, a diver capturing a lobster during a survey in Virgin Islands National Park. NPS photo / Jeff Miller.



A diver measures the carapace length of a juvenile lobster in Salt River Bay NHP&EP. NPS photo / Nathaniel Hanna-Holloway.



Monitoring

The SFCN Caribbean Spiny Lobster Monitoring Protocol was first published in 2018. Baseline sampling has been completed at Buck Island Reef NM and Salt River Bay NHP&EP in 2019, Virgin Islands NP in 2021, and at Biscayne NP in 2022. Sampling occurs on a four-year rotating basis. Dry Tortugas NP was sampled in 2023. Sampling sites are selected in a stratified-random survey design focused on hard bottom habitats within the parks. Samples are re-randomized for each sampling event. Each sample consists of two adjacent 7.5-meter (24.6 feet) radius circular plots, where a team of divers search the plots to capture, measure, and record demographic information. All data are recorded underwater, and all lobsters are released alive.

Status and Trends: Biscayne NP

During the 2022 lobster surveys in Biscayne NP, 100 sites were completed across four strata (Inshore Patch Reef, Mid-Channel Patch Reef, Offshore Patch and Forereef Shallow and Offshore Patch and Forereef Deep). Relative density (Figure 1) and frequency of occurrence of exploited phase lobsters per site were 0.93 (95% CI 0.60, 1.31) and 0.41 (95% CI 0.29, 0.53) respectively. Average size (carapace length) in the exploited phase was 83 ± 1 millimeter (SE; Figure 2). One hundred ninety-one lobster were observed on the survey, 36% were adults (legal size; Figure 3). The sex ratio (M:F) of observed lobsters was skewed towards males (1.5:1). Reproductive activity among females was expectedly high (43% of the females had eggs and 62% had a spermatophore). The survey occurred during closed season for lobsters in Florida, which coincides with the seasonal reproductive period for the spiny lobster.

Comparison of U.S. Virgin Islands Parks

Densities are notably higher in Biscayne NP than the lobster populations in U.S. Virgin Islands parks, likely due to comparatively high recruitment rates, coupled with an abundance of quality nearshore juvenile habitat in Biscayne Bay and Florida Bay (Kough et al. 2013). However, the average size in the exploited phase is significantly smaller compared to U.S. Virgin Islands parks. This is likely in part due to a smaller legal minimum size (FL = 76 millimeters [3 inches], USVI = 89 millimeters [3.5 inches]), and increased fishing pressure on spiny lobster in South Florida.

Literature Cited

Kough A. S., C. B. Paris, M. J. Butler IV. (2013) *Larval Connectivity and the International Management of Fisheries*. PLoS ONE 8(6): e64970. [doi:10.1371/journal.pone.0064970](https://doi.org/10.1371/journal.pone.0064970)

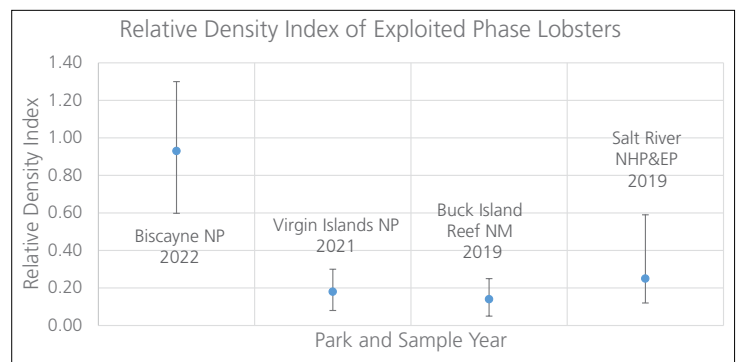


Figure 1. Relative density $\pm$ 95% CI of spiny lobsters in the exploited phase in Biscayne NP (0.93) is significantly higher than in the U.S. Virgin Islands parks: Virgin Islands NP (0.18), Buck Island Reef NM (0.14), and Salt River Bay NHP&EP (0.25).

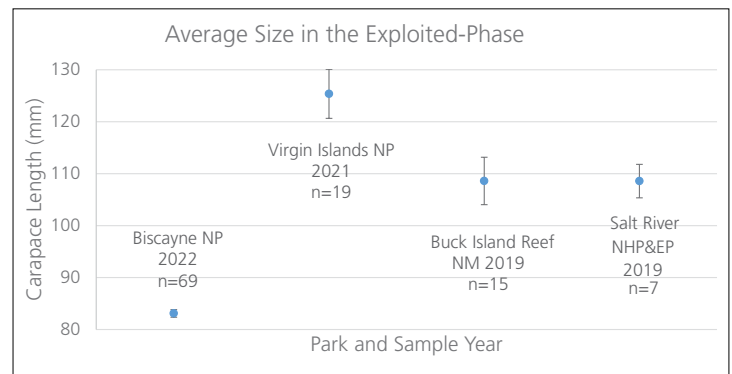


Figure 2. Average size $\pm$ SE in the exploited phase in Biscayne NP (83 millimeters [mm]) is significantly smaller than in the U.S. Virgin Islands parks: Virgin Islands NP (125 mm [5 inches]), Buck Island Reef NM (108 mm [4.3 inches]), and Salt River Bay NHP&EP (108 mm [4.3 inches]).

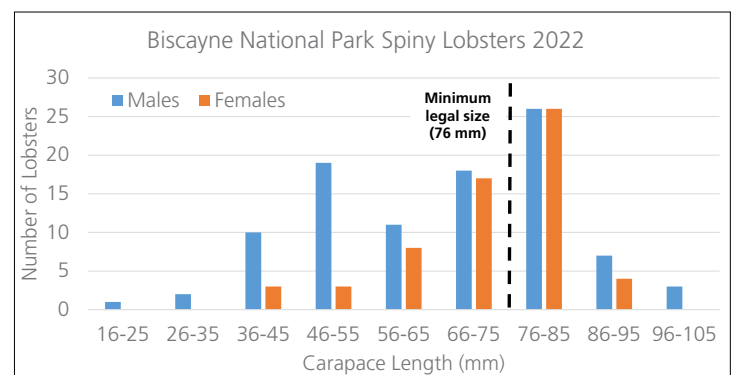


Figure 3. Size (carapace length) histogram of lobsters, by sex in the 2022 Biscayne NP survey. The dotted line shows the minimum legal size (76 mm [3 inches] carapace length).

