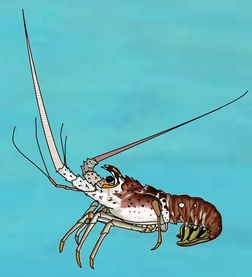
Evaluation of Marine Reserves for Spiny Lobsters, *Panulirus argus*, Using Transect Surveys in the Florida Keys National Marine Sanctuary, USA



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Introduction

In 1997, the large (30 km^2) Western Sambo Ecological Reserve (WSER), was created to protect a variety of habitats from shoreline to the reef tract. The smaller (0.3 km^2) nearby Eastern Sambo Special Use Area (ESSUA) protects only forereef and backreef habitats (Fig. 1). The performance of these marine protected areas (MPAs) for spiny lobsters has been evaluated by the Florida Fish and Wildlife Conservation Commission (FWC) using area-based surveys. Lobster populations in the MPAs were compared to populations in fished reference areas (Pelican Shoal and Middle Sambo respectively) during the closed fishing season to determine lobster size distribution, sex ratios, and abundance.

Questions

1. Are lobsters more abundant in these MPAs than in fished areas?
2. Are the sizes of the lobsters inside these MPAs larger than lobsters in fished areas?

Methods

Lobster Monitoring – Abundance Surveys

•Twenty 10m X 50m belt transect per habitat stratum (Table 1)

• All lobsters counted, measured, and sexed (Fig. 2)

Lobster - Size distribution surveys

•50+ lobsters captured per habitat stratum (Fig. 3)

•Lobsters measured, sexed, and evaluated for disease and molt condition

Table 1. Habitat Stratum

	Region (**Bold = MPA**)	Patch Reef	Forereef/backreef	Outlier Reef
East	Pelican Shoal	X	X	
↓	**ESSUA**		X	
	Middle Sambo		X	
West	**WSER**	X	X	X*

*outlier reef outside MPA

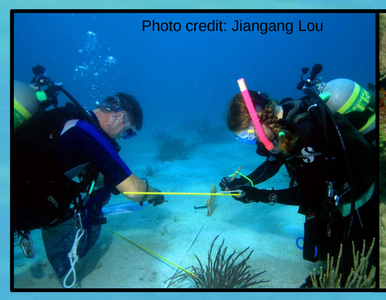
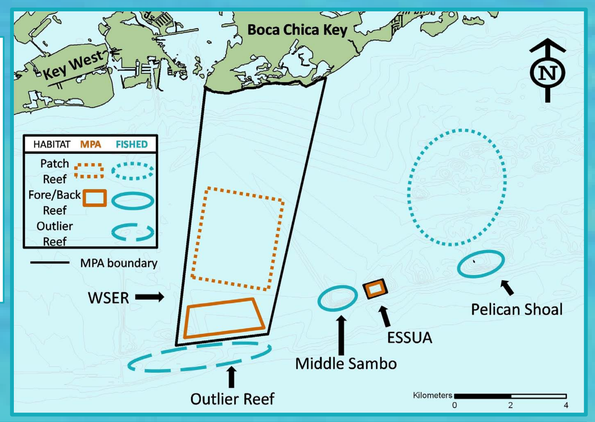


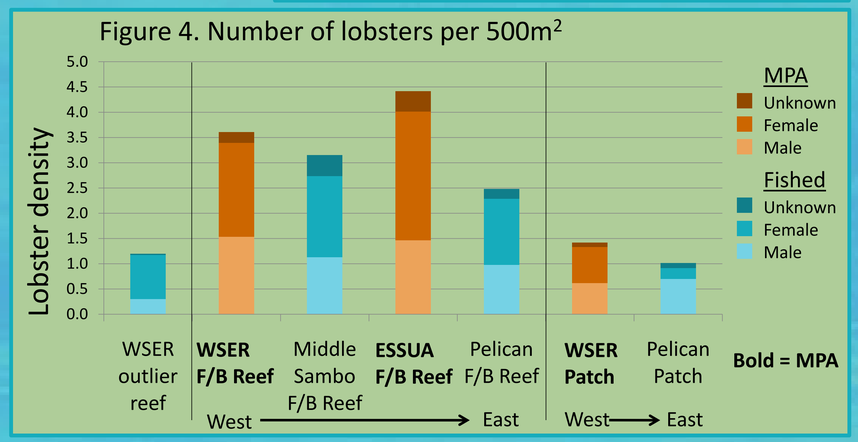
Figure 2. Divers conducting belt transect Figure 3. Catching lobsters for size distribution

Figure 1. Study Area. Four regions were surveyed for lobster abundance and size distribution. Two regions are MPAs (WSER and ESSUA) and two are fished areas (Middle Sambo and Pelican Shoal). WSER and Pelican Shoal were surveyed across habitat types.



Results

Figure 4. Number of lobsters per 500m^2



▪Densities were typically greater in MPAs than at fished sites.

▪There were more lobsters at the forereef/backreef than at the patch reefs or outlier reef, regardless of protection.

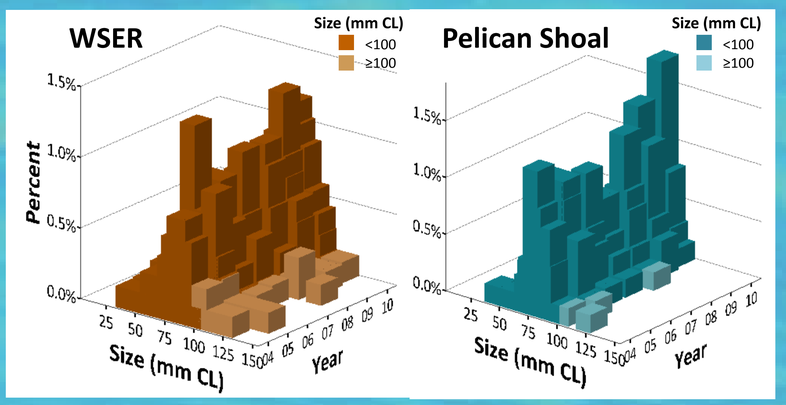
Table 2. Mean size (mm carapace length CL) by sex, habitat, and region

	Habitat	Region (**Bold = MPA**)	Males Mean ±SE	Females Mean ±SE	Overall Mean ±SE
East	Fore/backreef	Pelican Shoal	79.8 ± 0.8	75.6 ± 0.4	77.2 ± 0.4
↓		**ESSUA**	83.1 ± 0.9	79.3 ± 0.6	80.6 ± 0.5
		Middle Sambo	85.2 ± 1.0	78.1 ± 0.5	80.7 ± 0.5
West		**WSER**	86.2 ± 1.0	79.8 ± 0.5	82.3 ± 0.5
East	Patch reef	Pelican Shoal	71.4 ± 1.4	70.8 ± 1.4	71.2 ± 1.0
↓		**WSER**	79.5 ± 1.9	75.7 ± 1.3	77.5 ± 1.1
West	Outlier reef	Western Sambo	83.1 ± 1.3	78.6 ± 0.6	80.0 ± 0.6
		Overall	81.3 ± 0.5	77.5 ± 0.3	

▪In general, the mean size of male and female lobsters was greater in the large reserve, WSER, and decreased with distance from WSER.

▪This trend is likely caused by spillover of lobsters from WSER east to ESSUA, Middle Sambo, and Pelican Shoal.

Figure 5. Comparison of lobster size between WSER and Pelican Shoal over time (forereef/backreef and patch combined).



▪In WSER there are consistently more lobsters larger than 100 mm CL than at Pelican Shoal.

Conclusions

▪In WSER there appears to be a resident population of large lobsters.

▪WSER is effective in protecting lobsters, likely because of the its large size and variety of habitats.

▪The large lobsters found in ESSUA and Middle Sambo suggest spillover from nearby WSER.

Answers!

1. Are lobsters more abundant in these MPAs than in fished areas? **YES!**
2. Are the sizes of the lobsters inside these MPAs larger than lobsters in fished areas? **YES for WSER, not necessarily for ESSUA.**

Acknowledgements

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