

# Pre-closure evaluation of habitat and fish assemblages in five proposed Marine Protected Areas off the U.S. southeastern coast.

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## Introduction

Marine Protected Areas (MPAs) have gained increasing favor as a management tool in the southeastern United States, particularly for the protection of structure-associated, economically valuable species such as grouper and snapper. The South Atlantic Fishery Management Council (SAFMC) is considering the implementation of eight Type II MPAs between Cape Hatteras, NC and the Florida Keys to protect seven species of the deepwater snapper-grouper complex. These species are considered to be at risk due to currently low stock densities and to life history characteristics such as protogynous hermaphroditism and aggregate spawning, which subject them to substantial fishing mortality. The proposed MPAs are known to contain habitat which supports populations of economically valuable reef fish including the seven target species and other reef-associated fishes. Our goal was to conduct preliminary examinations of five of the proposed MPAs including Snowy Grouper Wreck (hereafter denoted as NC), Northern South Carolina (SC), Edisto (ED), Georgia (GA), and North Florida (FL), each containing two or more alternatives (Figure 1). Early in 2007, the SAFMC announced the preferred alternatives for closure. Within each proposed MPA, we characterized habitat and documented fish species composition and densities of all fish encountered with emphasis on economically important species. Surveys of MPAs are often criticized for comparing populations inside and outside closed areas rather than populations in a single area before and after implementation of fishery closures. This study provides the opportunity to obviate those criticisms.

## Objectives

- 1) establish pre-closure estimates of reef fish density and species composition associated with bottom features within and outside the preferred alternatives of the proposed MPAs
- 2) describe habitat features within and outside the preferred alternatives of the proposed MPAs
- 3) document the relationships between habitat and species assemblages.

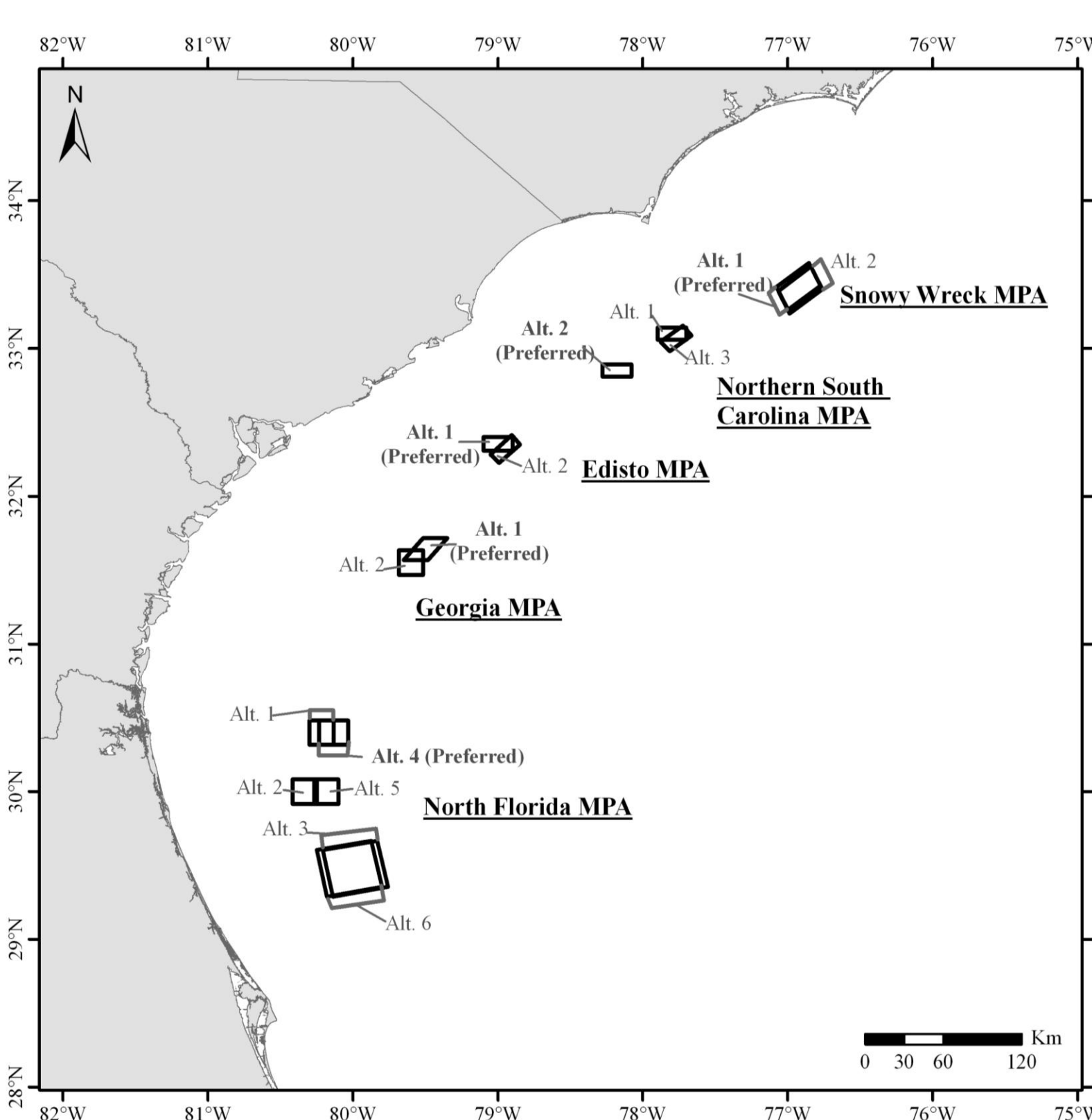
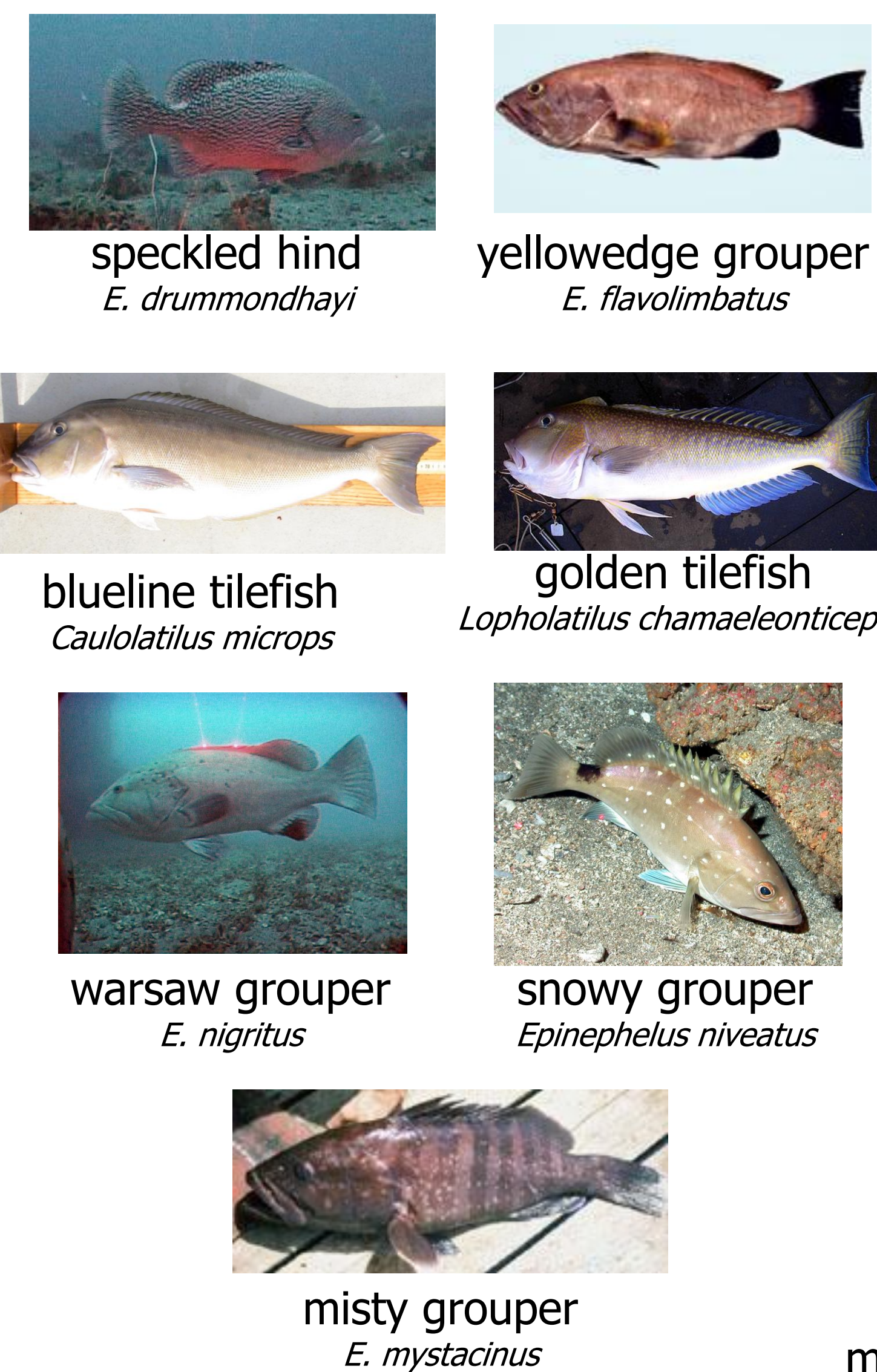


Figure 1. Locations of five proposed, natural bottom, MPA sites in the South Atlantic. The SAFMC preferred alternatives are noted.

## Targeted Species



misty grouper  
*E. mystacinus*

## Methodology



- |             |  |   |
|-------------|--|---|
| <b>Gear</b> | Remotely Operated Vehicle (ROV)                          | Stationary Camera Array                                   |
| <b>Data</b> | Estimates of fish densities and habitat characterization | Relative abundances of fish and percent cover of habitats |
| <b>Pro</b>  | Surveys large areas                                      | Does not alter fish behavior                              |
| <b>Con</b>  | Fish behavior may be affected by lights and movement     | Limited area of coverage                                  |

**ROV:** Transects provide continuous video and high resolution digital still images of fish and habitat. An ROV tracking system allows data to be georeferenced. Dives ~1hr long.  
**Camera Array:** Utilizes four orthogonally spaced video cameras to provide a ~360° view and data on fish and habitat. 30-min soak time.

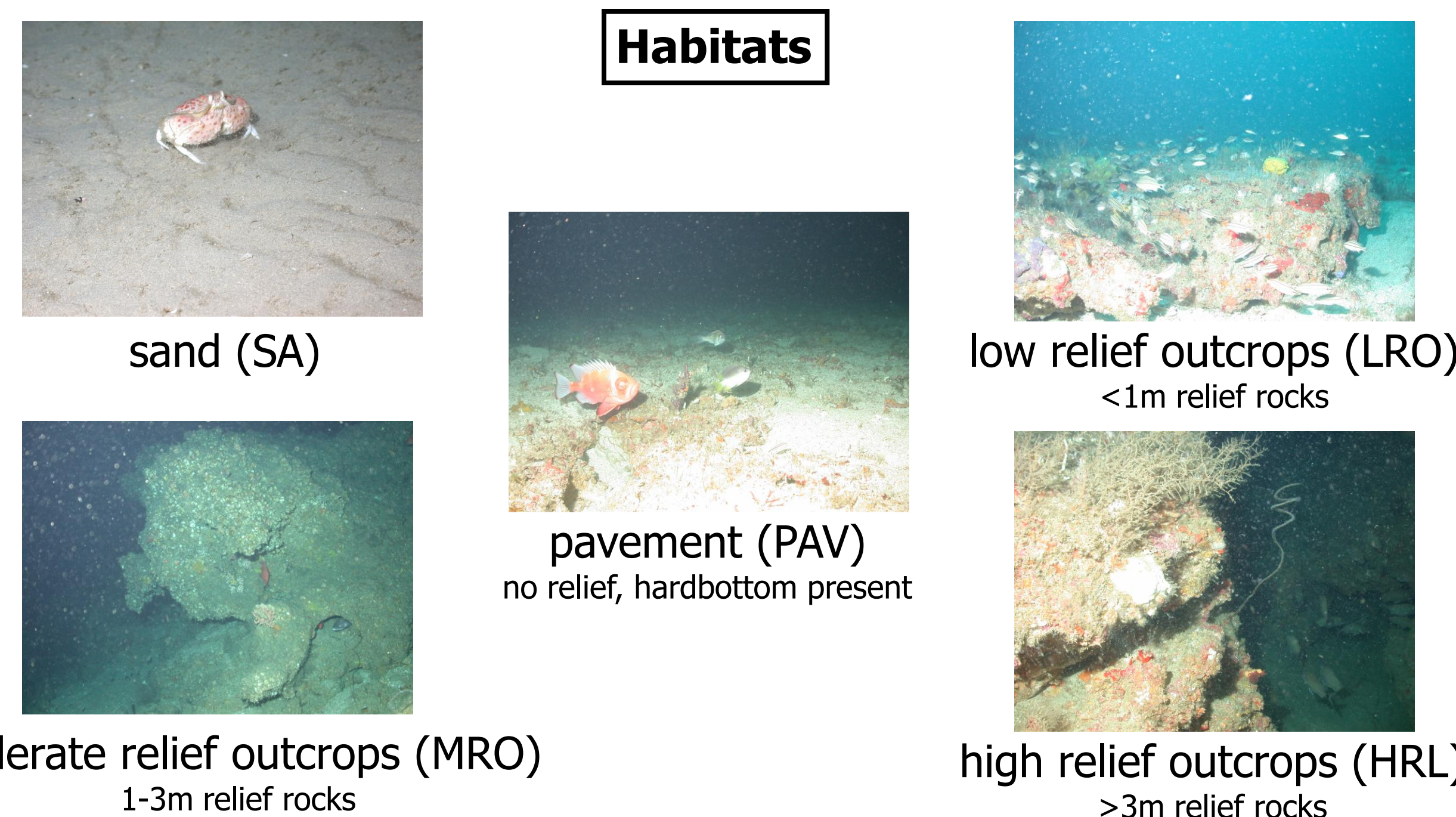
## Videotape Analysis

- ROV:**
- All fish identified and counted and habitat type noted from videotapes.
  - Dives divided into smaller transects (50-150m) within a single habitat type.
  - Fish densities calculated as #/hectare.
- Camera Array:**
- All fish identified and counted and habitat type noted in 20-min segment of tape.
  - Abundance values calculated from max. # of a given species in the field of view at any one time.

## Sampling Design

- Sampled in April/May 2004, June 2006, & August 2007
- Targeted hardbottom reef habitat
- Sites chosen based on local knowledge of the area, split beam acoustic bathymetry on ship in 2004, and knowledge accumulated on previous cruises.
- Sampled sites inside and outside the preferred MPA alternatives

## Habitats



high relief outcrops (HRL)  
>3m relief rocks

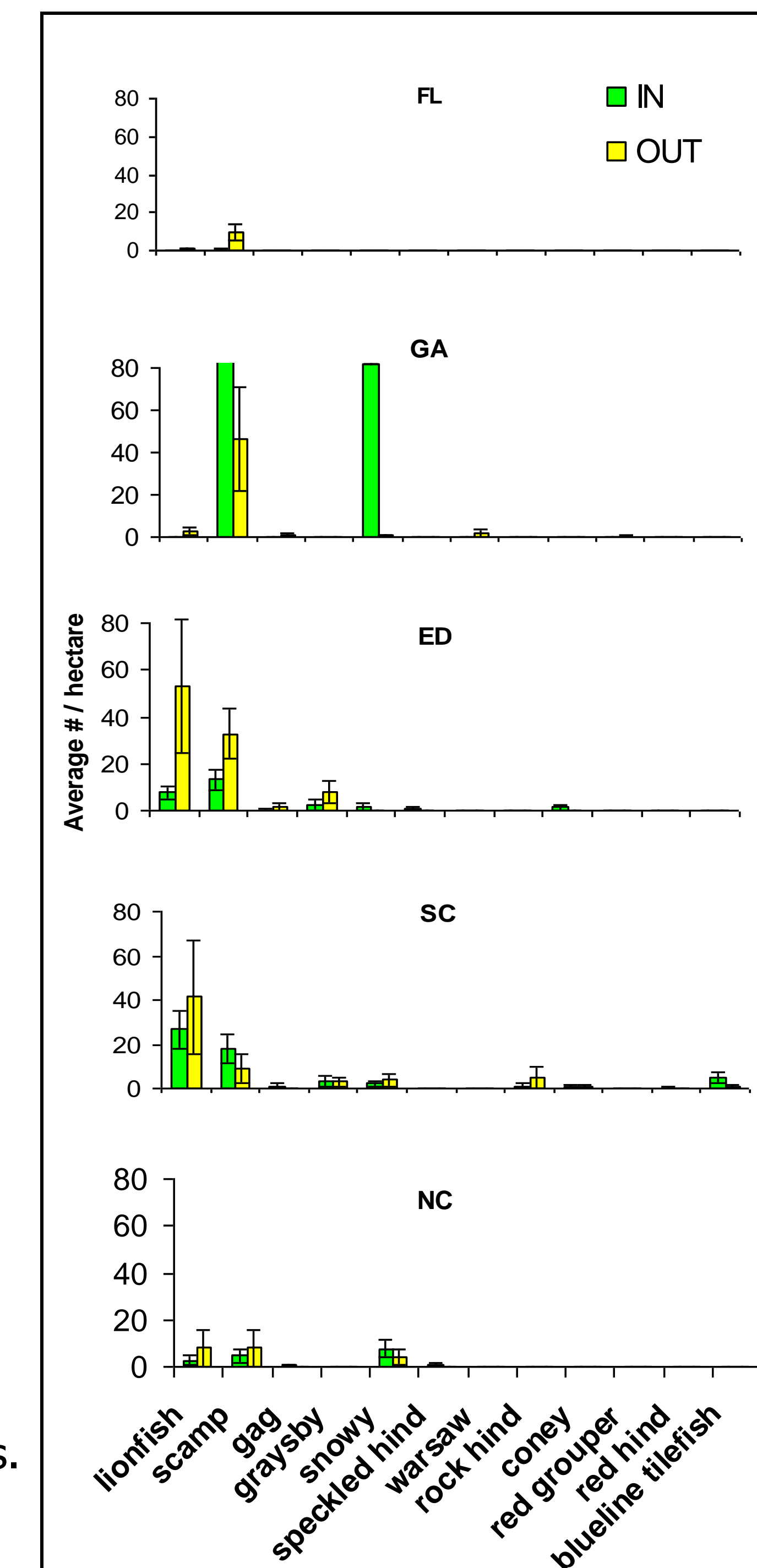


Figure 2. Densities ( S.E.) of all lionfish, grouper, and tilefish species inside (IN) and outside (OUT) each preferred MPA alternative from ROV dives. Things to note:  
 -scamp is the most abundant grouper  
 -lionfish have comparable densities to, if not higher, densities than scamp  
 -SC has the highest diversity  
 -lack of grouper at FL was surprising because considerable high relief ledge habitat was observed there - overfished?

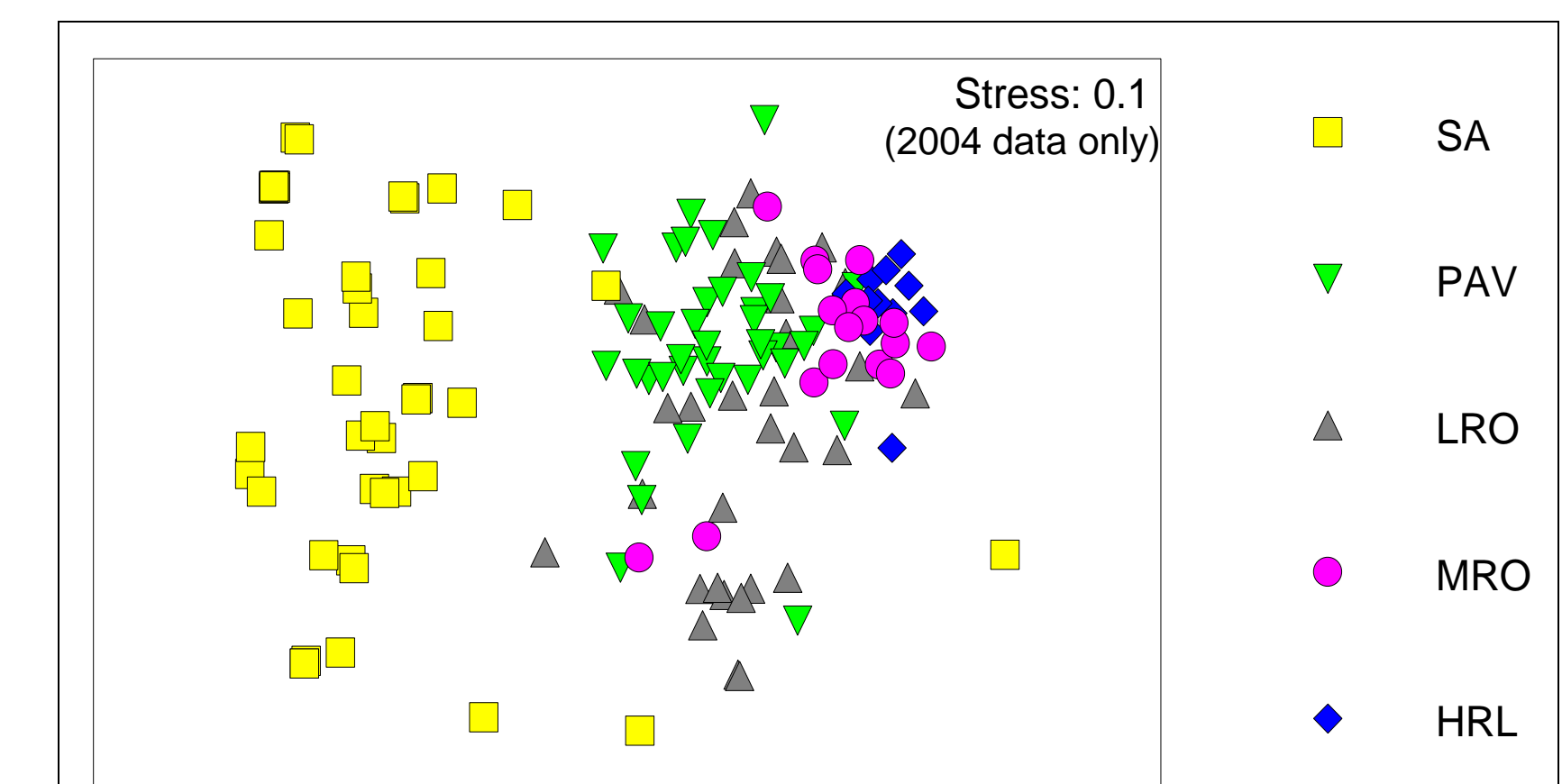
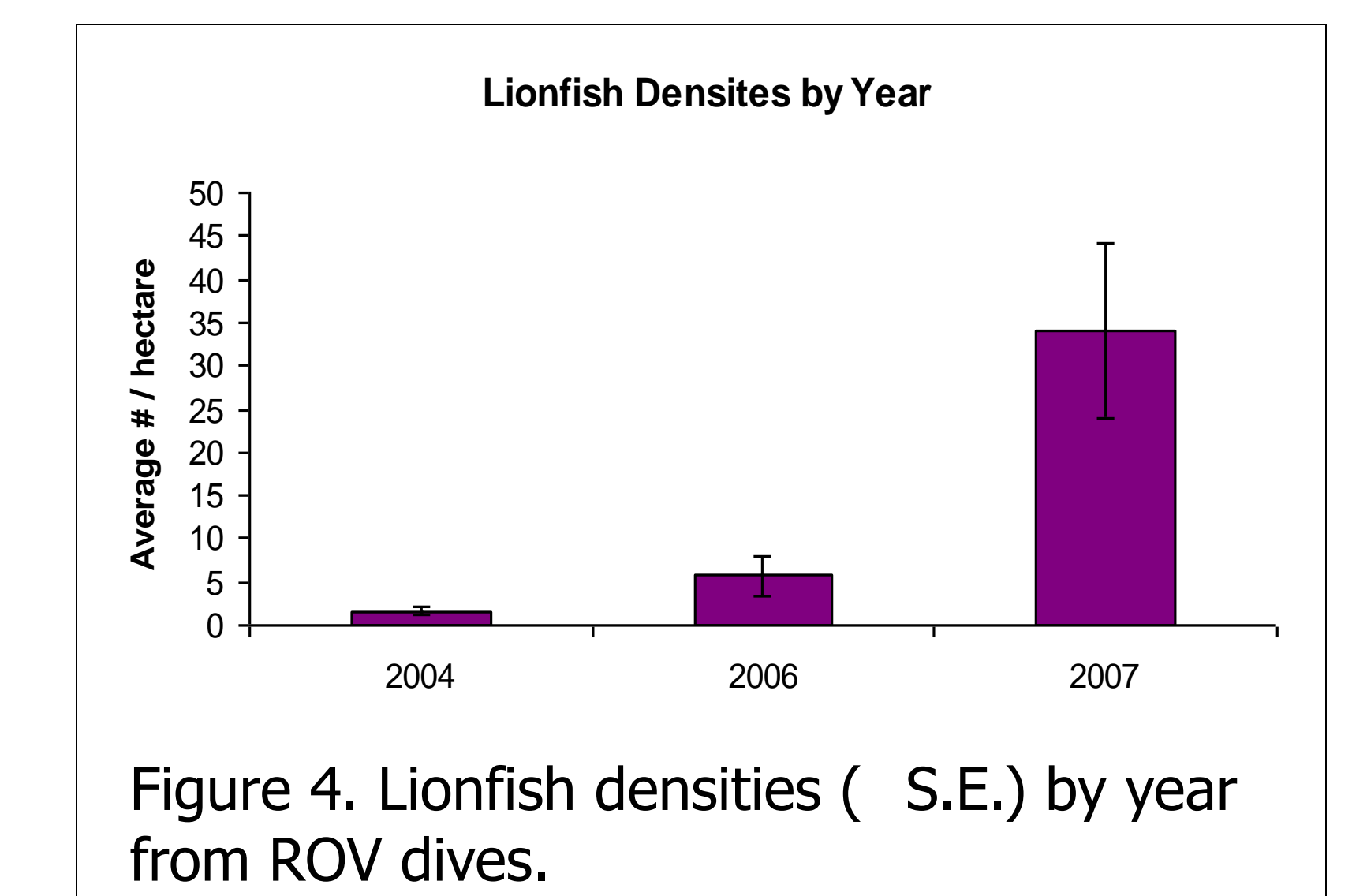


Figure 3. Multi-dimensional scaling (MDS) plot of fish assemblages by habitat type from ROV dives. SA fish assemblages appear to be distinct from those on hardbottom habitats.



MPA	IN	OUT	OUT
FL-IN	vermillion snapper	red porgy	greater amberjack
FL-OUT	vermillion snapper	anthiids	greenband wrasse
GA-OUT	grunts	scad	greater amberjack
ED-IN	yellowtail reeffish	red porgy	spotfin hogfish
ED-OUT	tomtate	reef butterflyfish	cubbyu
SC-IN	tomtate	grunts	creole-fish
SC-OUT	red porgy	wrasses	gray triggerfish
NC-IN	amberjack	rougtongue bass	tattler
NC-OUT	anthiids	greenband wrasse	scamp

Figure 5. Top three most abundant fish species observed inside (IN) and outside (OUT) each MPA from the camera array.

## Conclusions and Future Work

- 4 out of the 7 target species were observed. These included: snowy grouper, warsaw grouper, speckled hind, and blueline tilefish. Depth & habitat of ROV dives may explain why we did not see golden tilefish, misty grouper, or yellowedge grouper.
- Lionfish impacts on grouper are likely to increase due to competition for prey as lionfish densities continue to rise.
- We have collected 3 years of pre-closure data on habitat, target species densities, and species composition inside and outside the MPA areas.
- A fourth year of pre-closure data will be collected later this month (July 08). More emphasis will be placed on targeting tilefish habitat in the GA MPA.
- We plan to continue research after fishing pressure is reduced due to regulatory action to compare population levels and MPA efficacy.