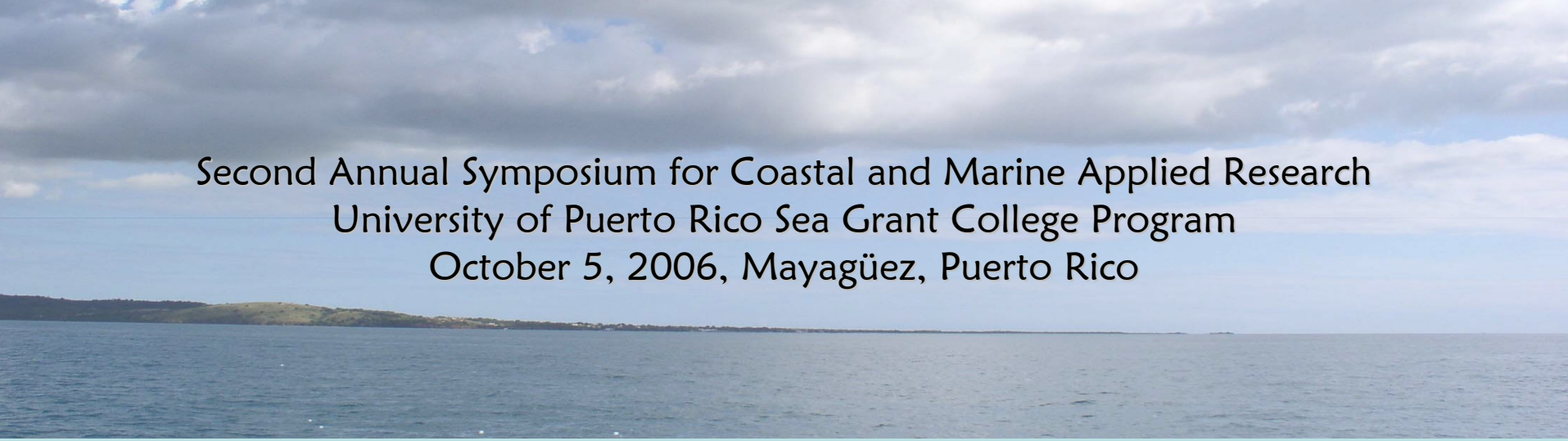


Second Annual Symposium for Coastal and Marine Applied Research
University of Puerto Rico Sea Grant College Program
October 5, 2006, Mayagüez, Puerto Rico

Mona Island Reef Fish Community Structure and Function for Marine Protected Area (MPA) Design

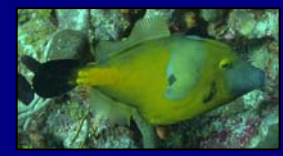
Distribution of schooling snappers and grunts

Michelle T. Schärer, Dept. of Marine Science, University of Puerto Rico

H. Ruiz

Marine Protected Areas

- Function as a control area
  - ecological processes
- Goal of an MPA
  - proposed objectives
- Criteria for designing zones:
  - biological (species and habitat)
  - governance
  - cultural
  - socioeconomic
  - compliance
- Educated guesswork
- Compromises



Bosque Insular (22 de diciembre de 1919), Reserva Natural Isla de Mona y Monito (4 de junio de 1986), Extensión Marina (30 de octubre de 1997)

Total MPA Area
= 157,575 ha

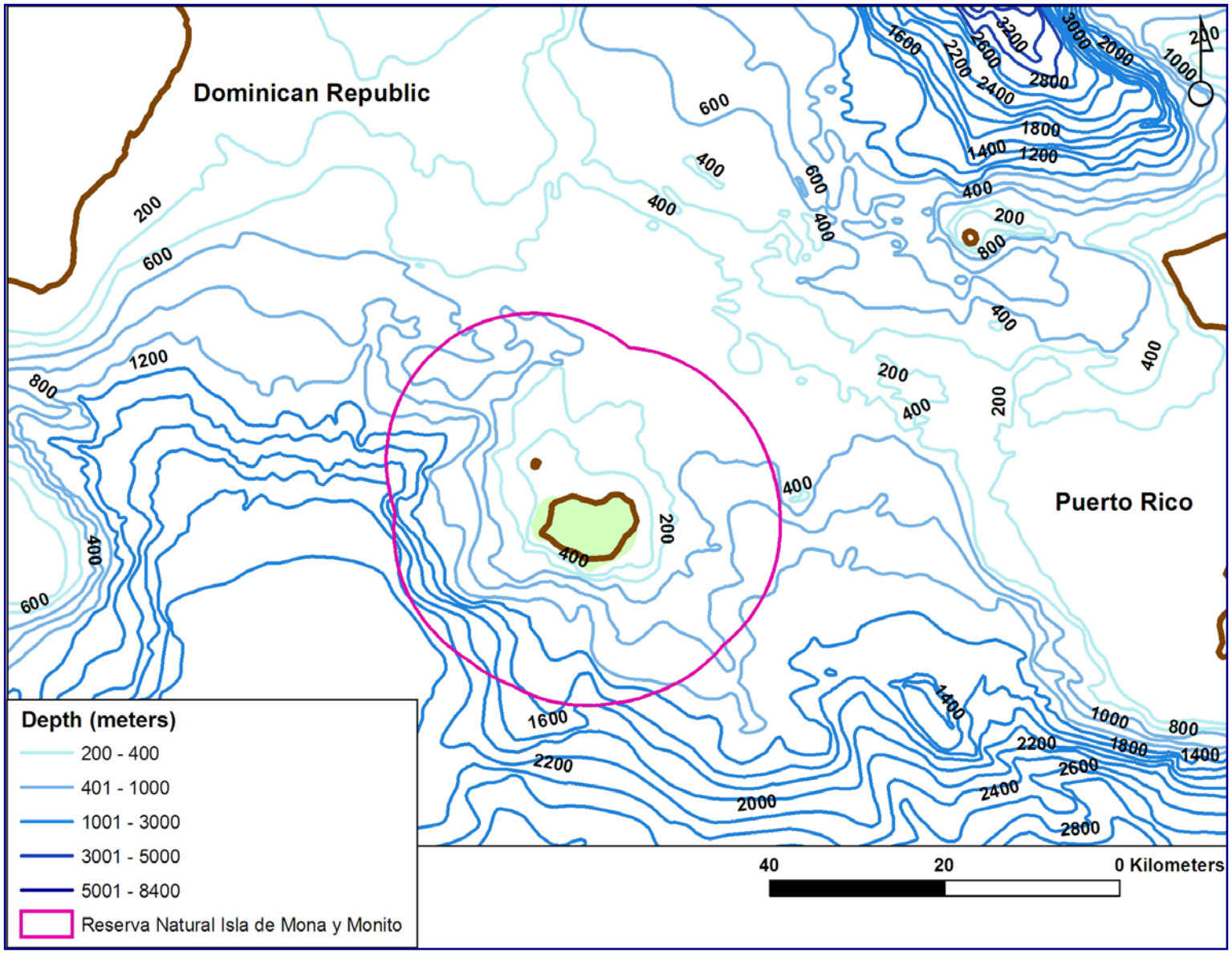
Mona Island Area
= 5,602 ha

Monito Island Area
= 14 ha

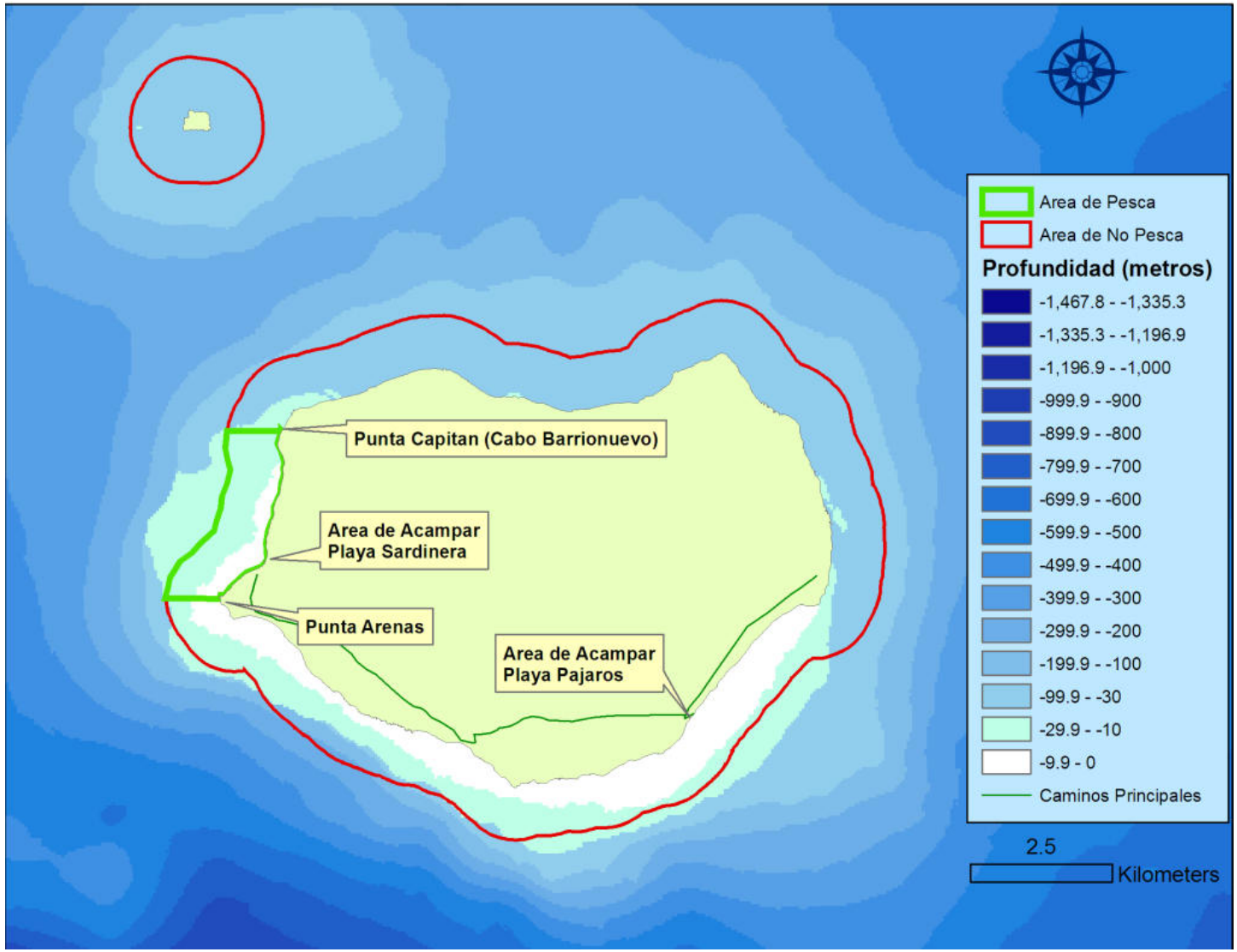
Marine Area
= 151,958 ha

Insular Platform Mona
= 8,156 ha

Submerged Insular Platform
= 2,591 ha



Reglamento de Pesca # 6768 (11 de Febrero de 2004)



Research Needs

- MPA design and evaluating management effectiveness require:
  - Ecological data
  - Where are species and habitats distributed (spatial variability)?
  - Which habitat characteristics affect species distributions?
  - What habitats are necessary for species to complete their life cycle (Ontogeny)?
  - How are habitats connected to each other based on species distributions and migrations?

Objectives

- Describe the coral reef community
- Elucidate how habitat structure reef fish community
- Determine differences in the abundance of reef fishes by:
  - Habitat type
  - Habitat patch size
  - Habitat Connectivity (distance from nursery habitats)
- Identify habitats critical for the completion of ontogenetic migrations
- Provide a spatially explicit baseline for monitoring marine reserve effectiveness

Methodology

- Benthic Habitat Surveys
  - 15 m video transect
  - 5 depth measurements
  - habitat type classification
- Fish Visual Surveys
  - 30 X 2 m belt transect
  - estimated fork length
  - ID to species

H. Ruiz

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Methodology

- Invert abundance
  - *Diadema antillarum*
  - *Panulirus argus*
  - *Strombus gigas*

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Reef Fish Community

- Species Richness (159)
- Grunts (9) & Snappers (7)
- Ontogenetic migrations reported for many grunts and snappers
- Juveniles restricted to nursery habitats (shallow water habitats)

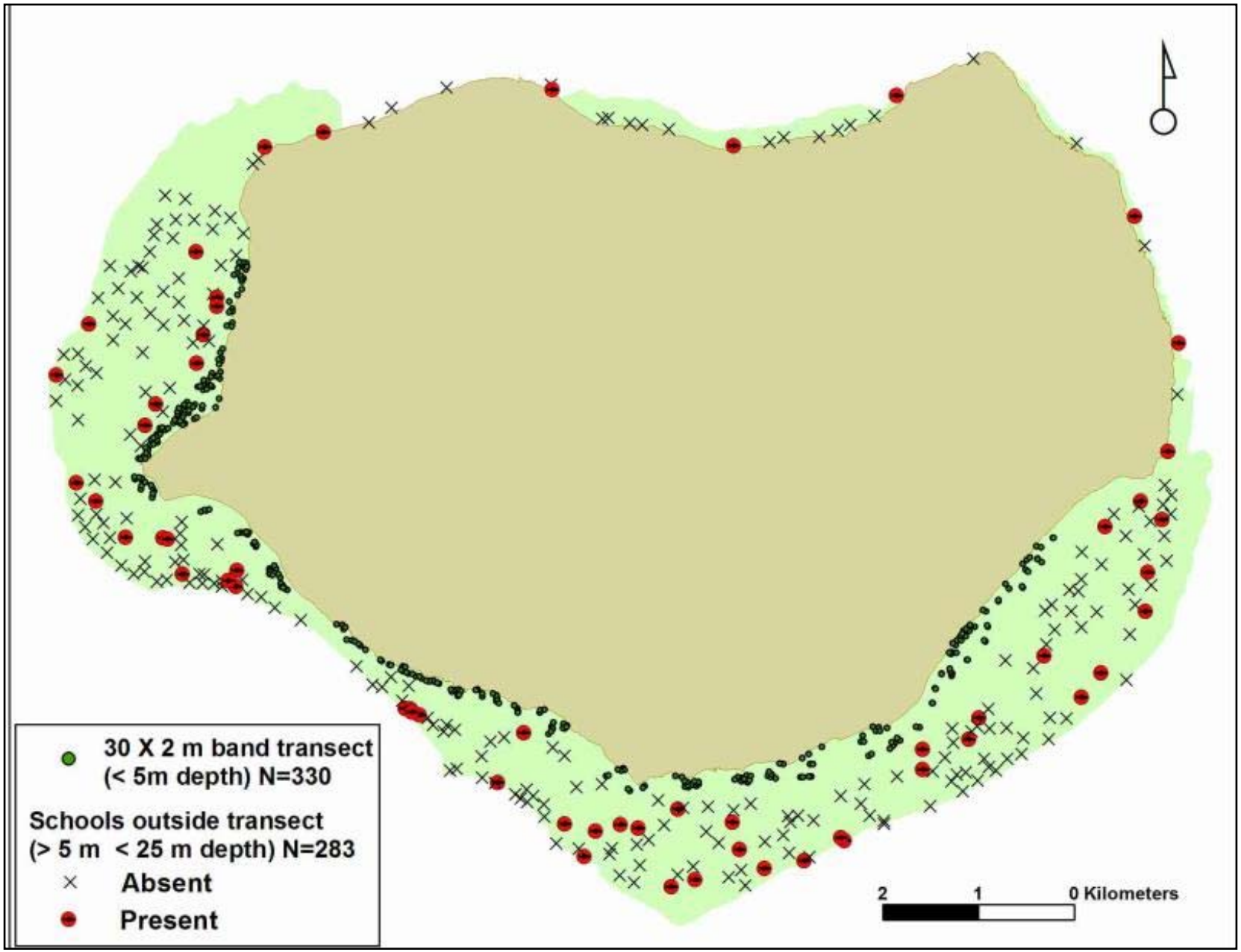
Schooling species

–Poorly represented in surveys

–Abundances underestimated

Causes poorly understood

- Risk aversion
- Diel patterns
- Socializing
- Reproduction


30 X 2 m band transect
(< 5m depth) N=330
Schools outside transect
(> 5 m < 25 m depth) N=283
Absent
Present
2
1
0 Kilometers

Randall

Haemulon parra

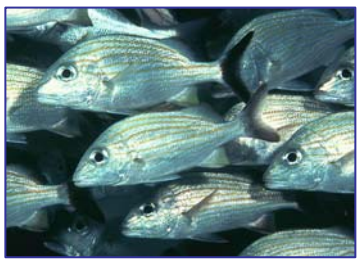
Marsden

Haemulon flavolineatum

Floeter

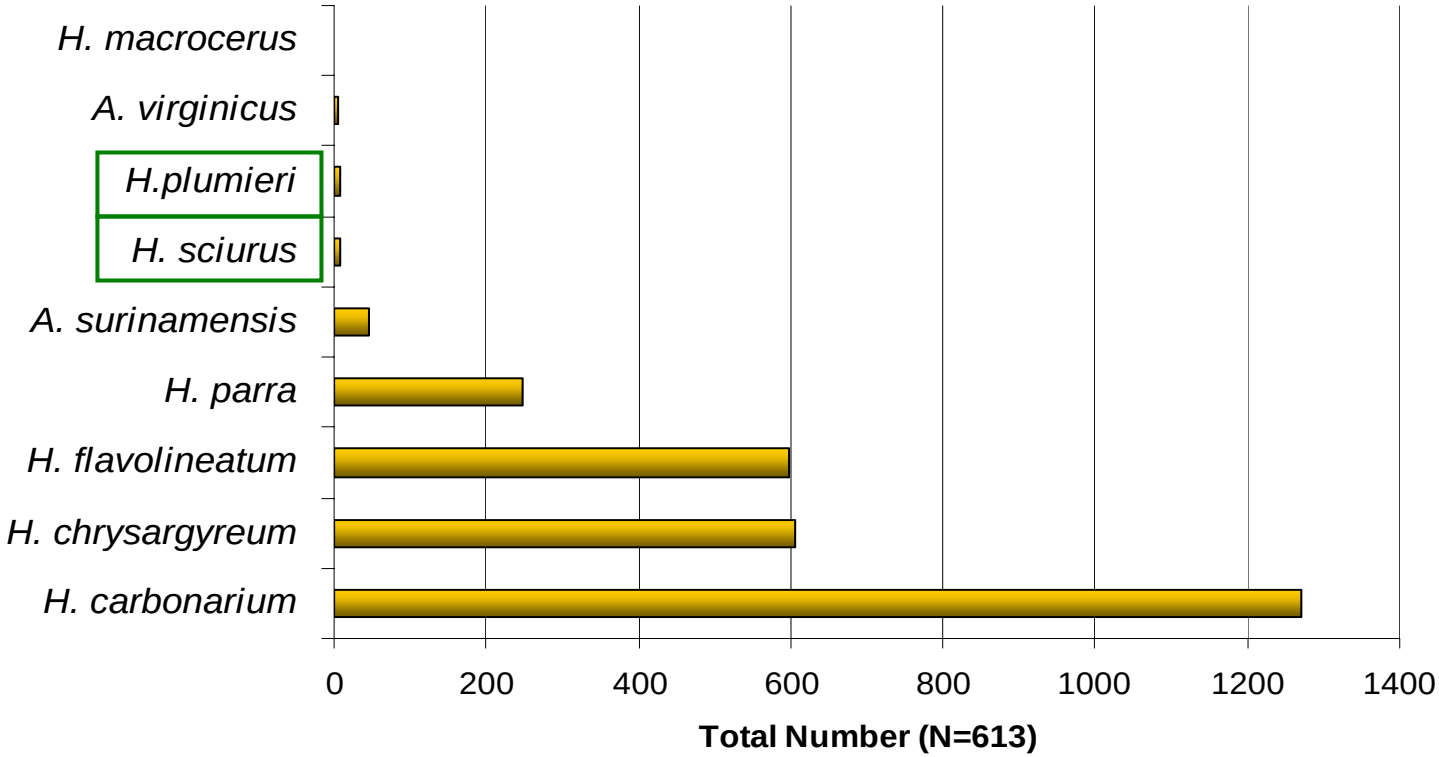
Haemulon chrysargyreum

Randall



Haemulon carbonarium

Family Haemulidae (Grunts) throughout Mona Island Natural Reserve (7% of all fish)



Ruiz

Lutjanus griseus

Ruiz

Lutjanus analis

Family Lutjanidae (Snappers) throughout Mona Island Natural Reserve (2% of all fish)

Ruiz

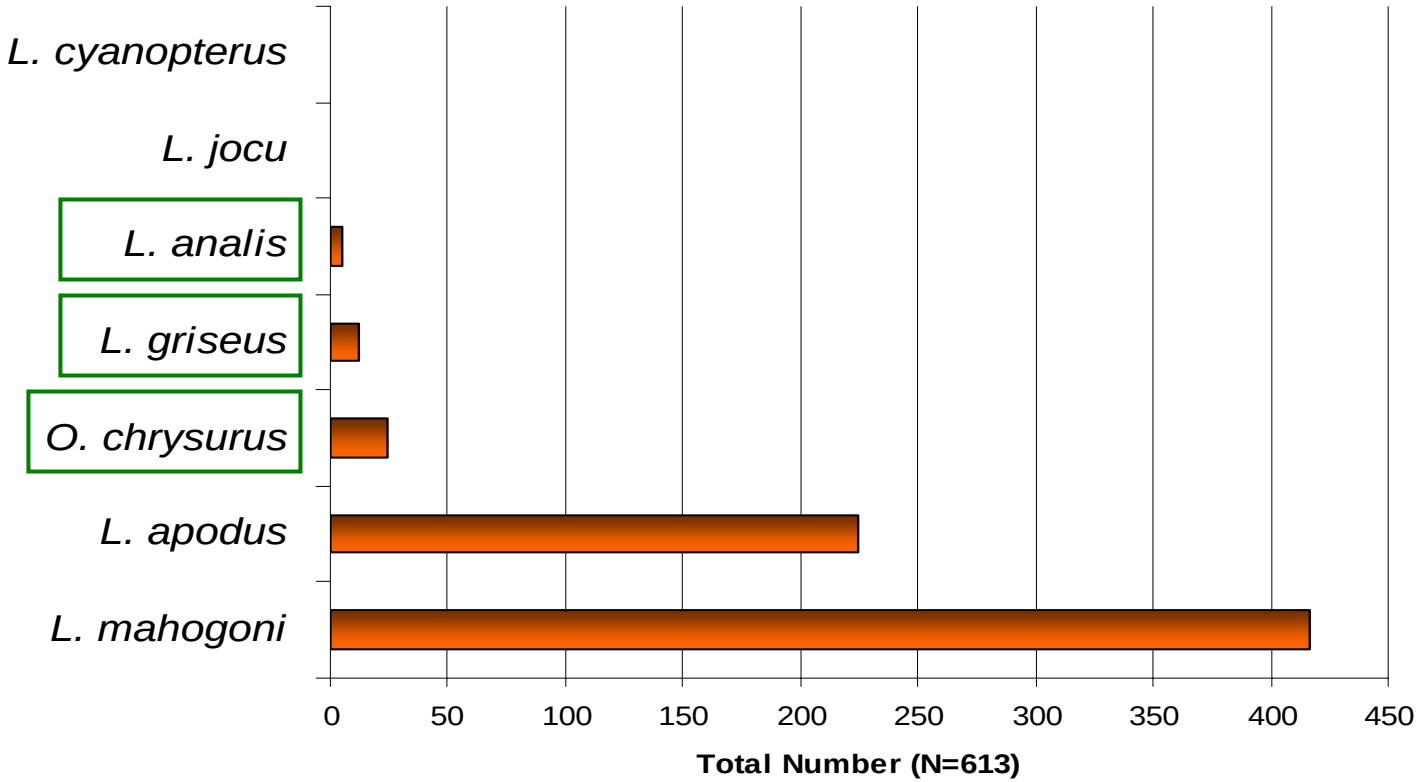
Ocyurus chrysurus

Ruiz

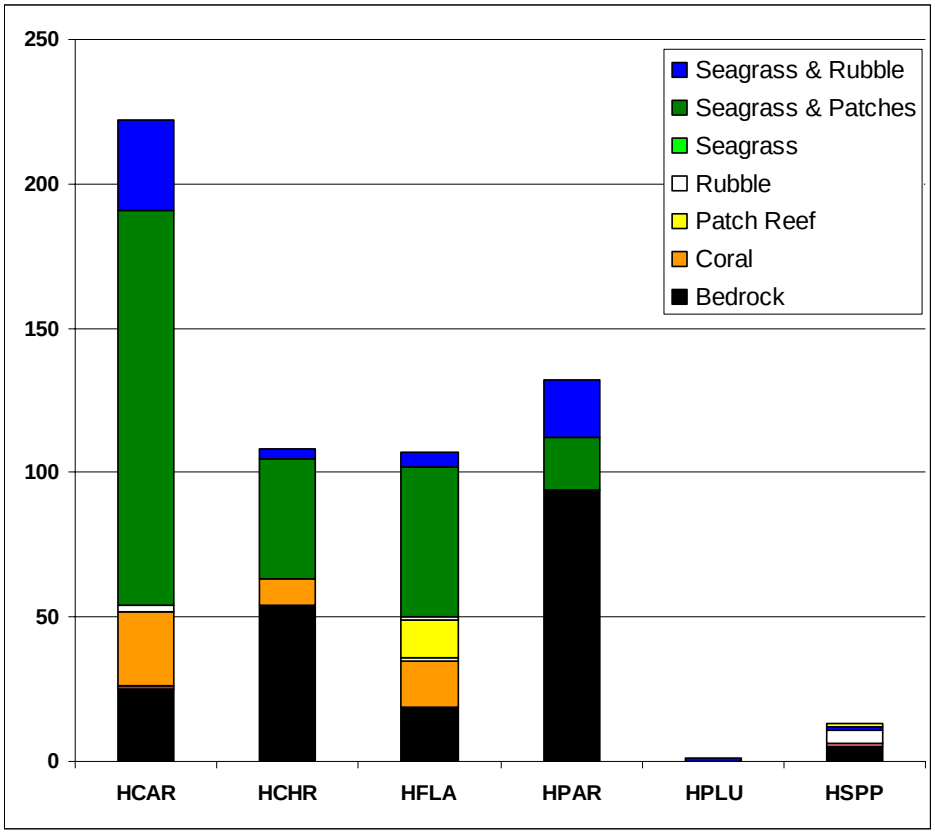
Lutjanus apodus

Randall

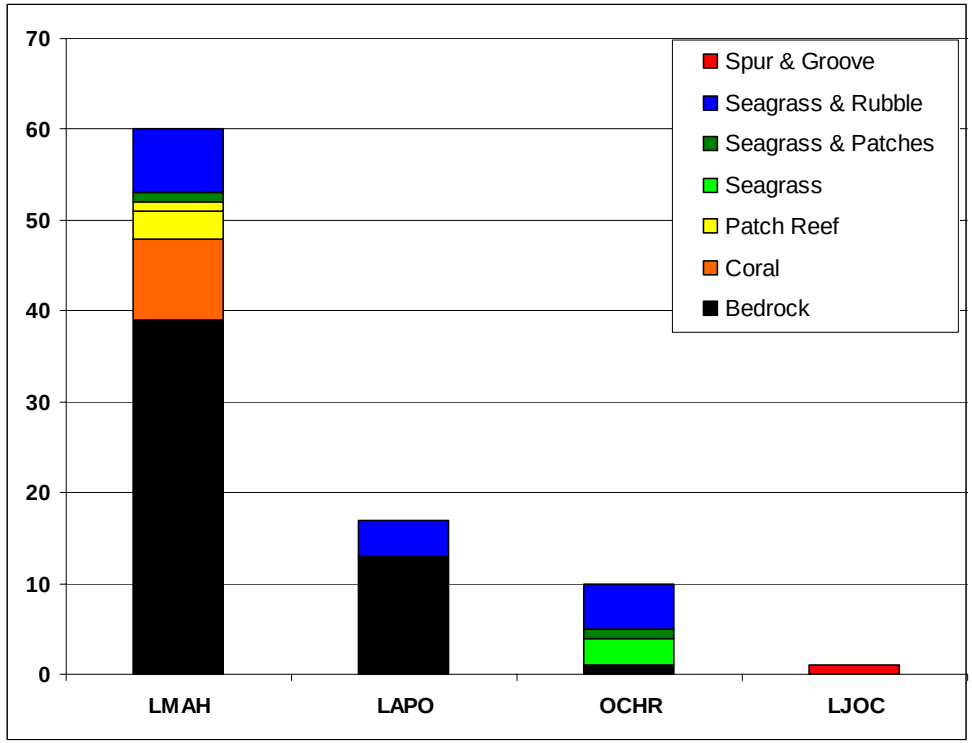
Lutjanus mahogoni



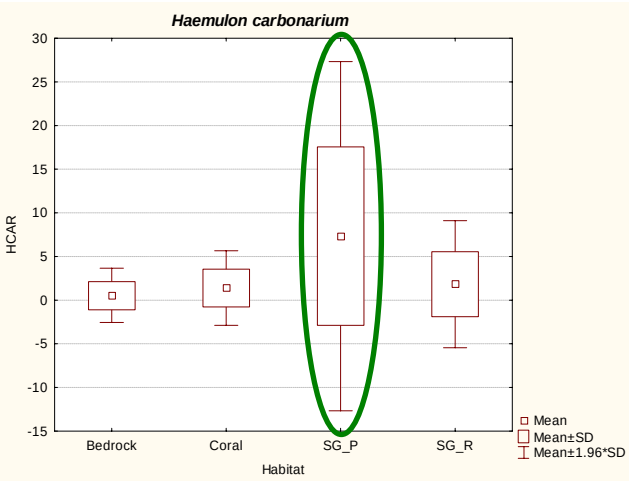
Haemulidae juveniles (FL < 100 mm)

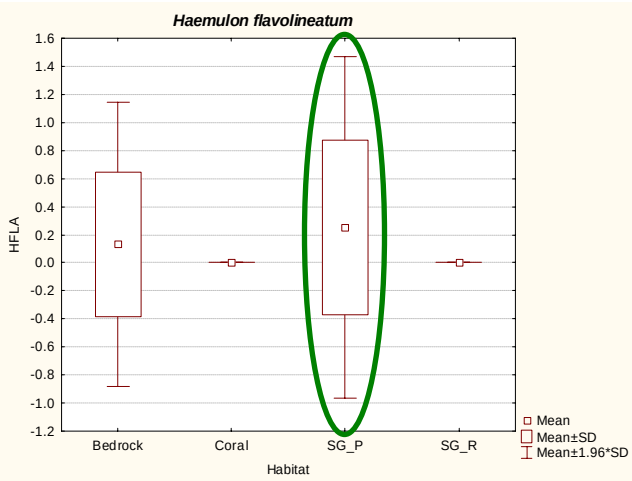


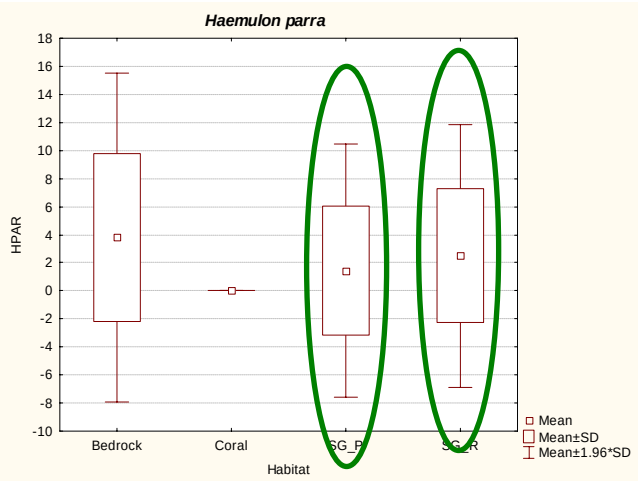
Lutjanidae juveniles (FL < 100 mm)

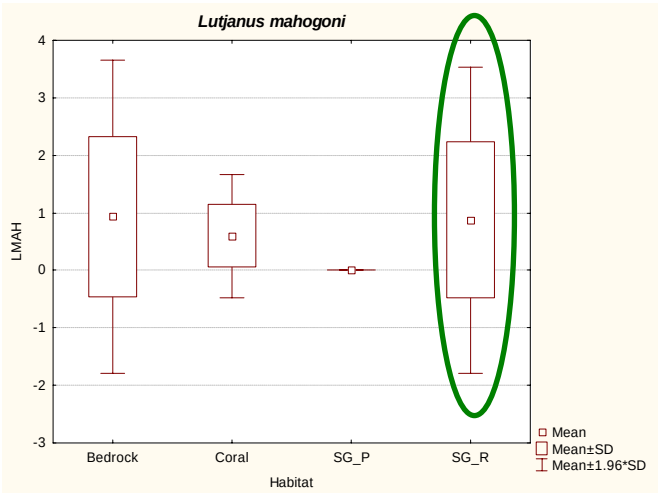


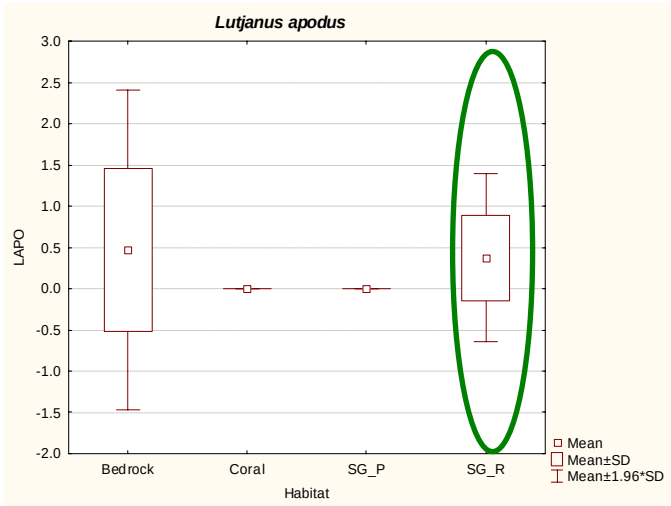
Habitat types for juveniles (FL <50 mm)

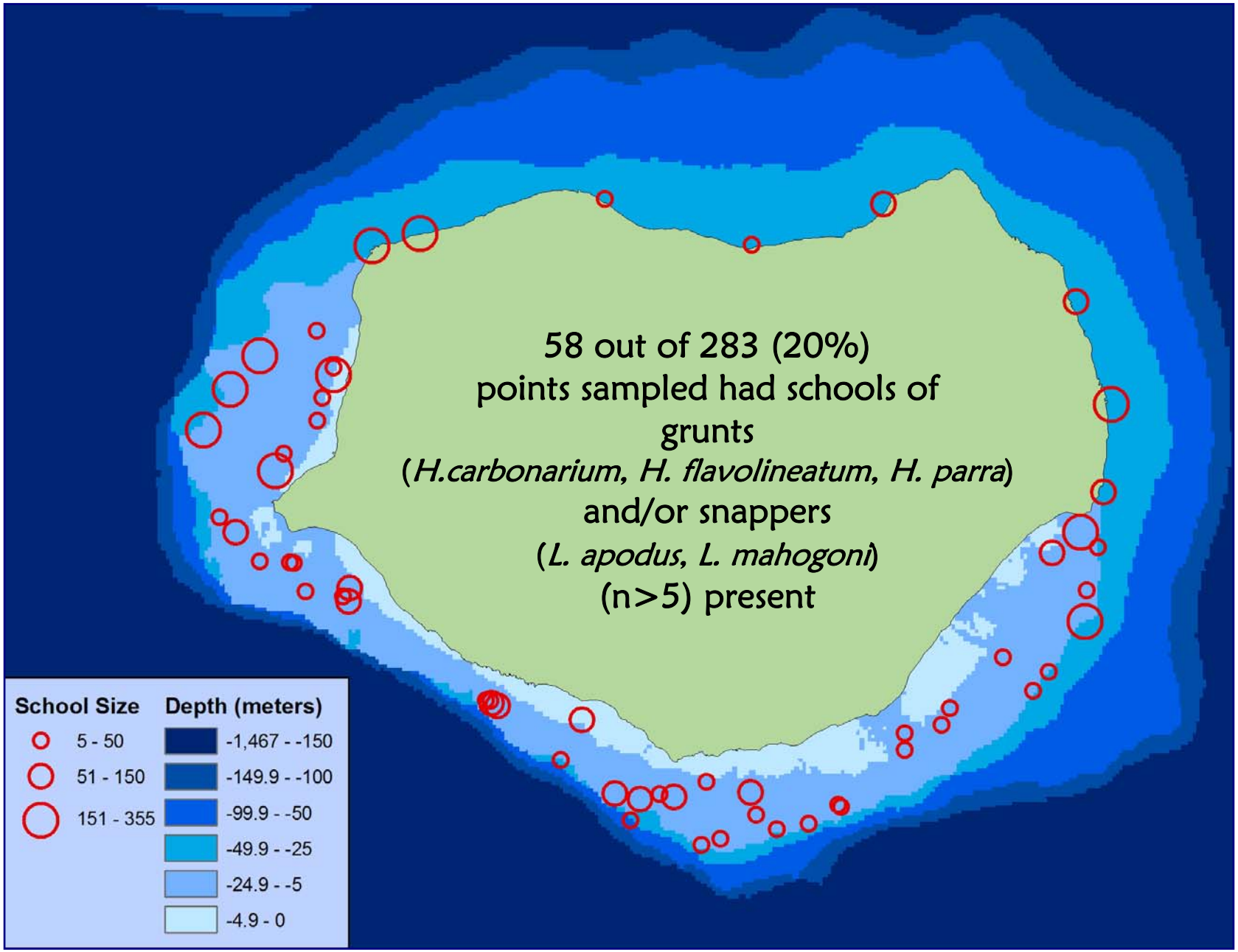




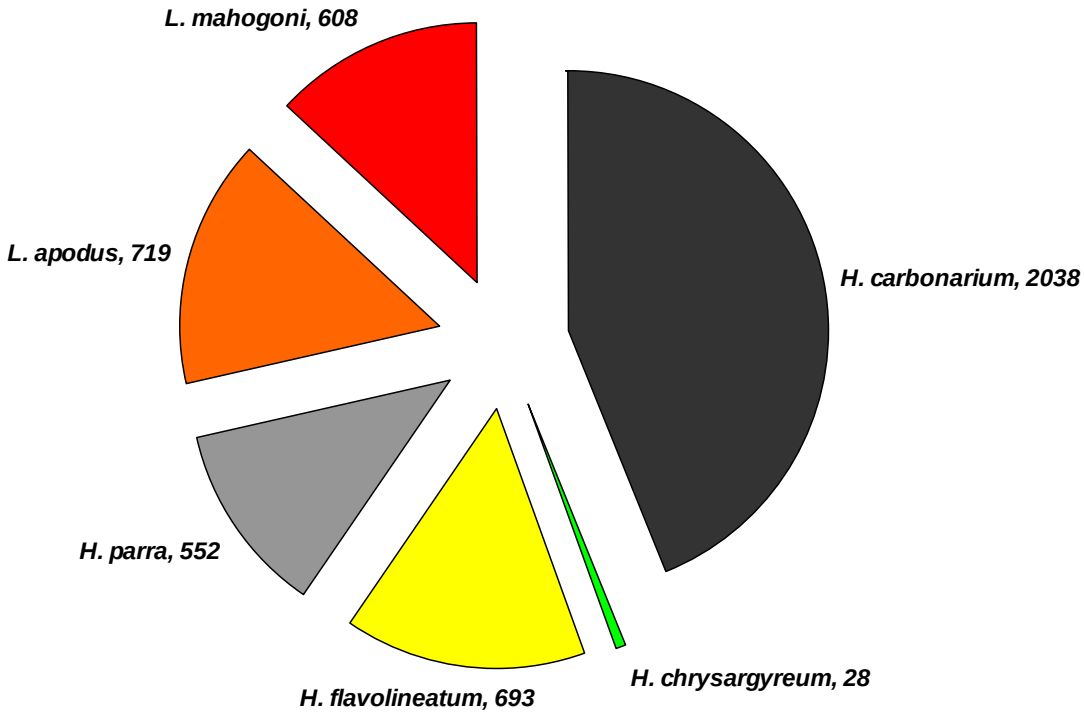


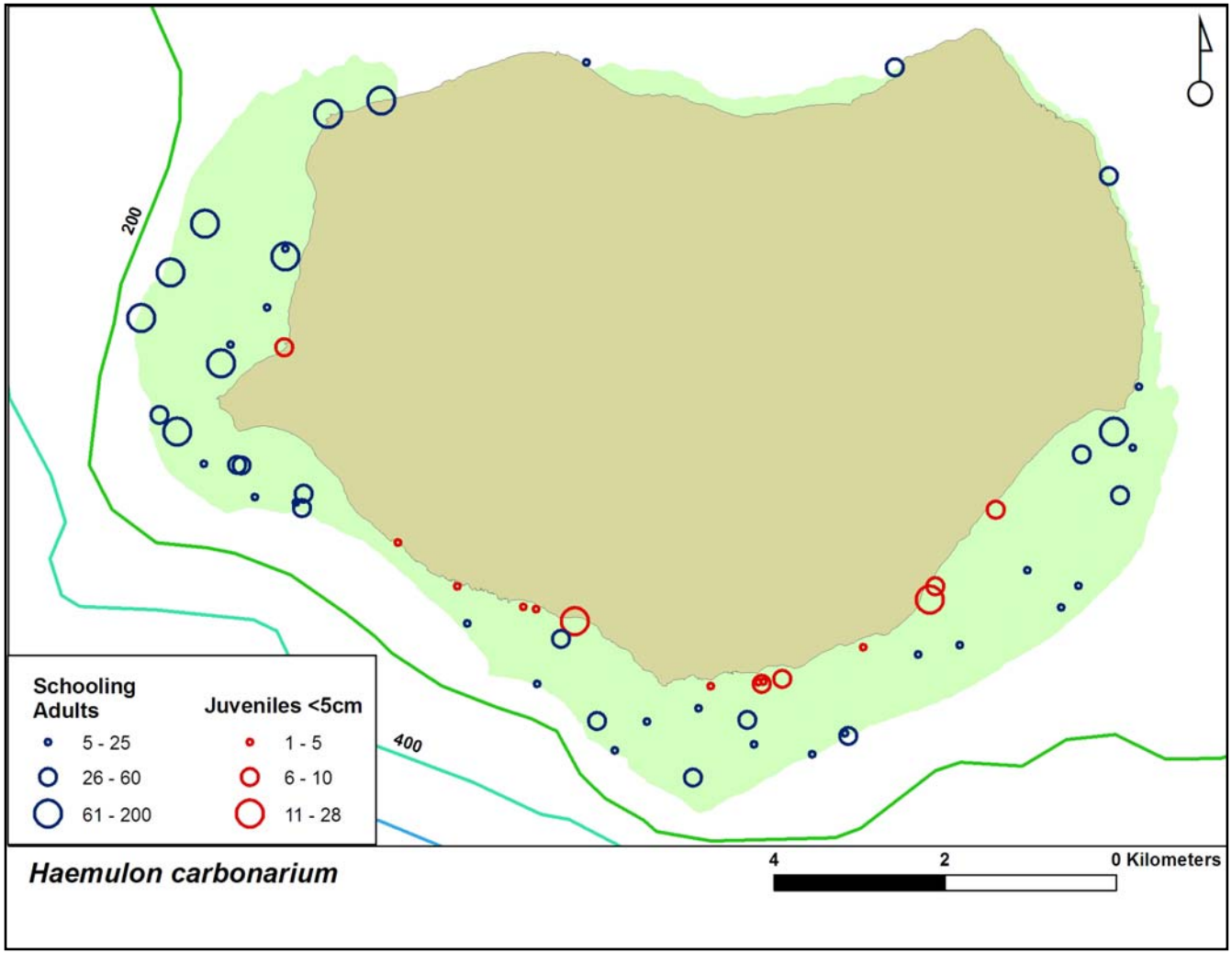




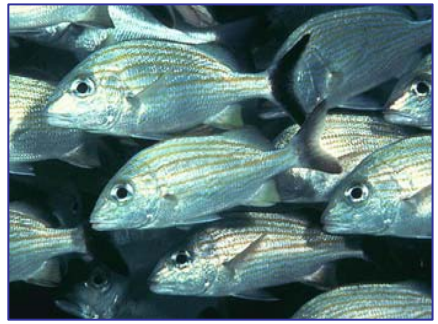

58 out of 283 (20%)
points sampled had schools of
grunts
(*H.carbonarium, H. flavolineatum, H. parra*)
and/or snappers
(*L. apodus, L. mahogoni*)
(n>5) present
School Size
5 - 50
51 - 150
151 - 355
Depth (meters)
-1,467 - -150
-149.9 - -100
-99.9 - -50
-49.9 - -25
-24.9 - -5
-4.9 - 0

Species composition in schools

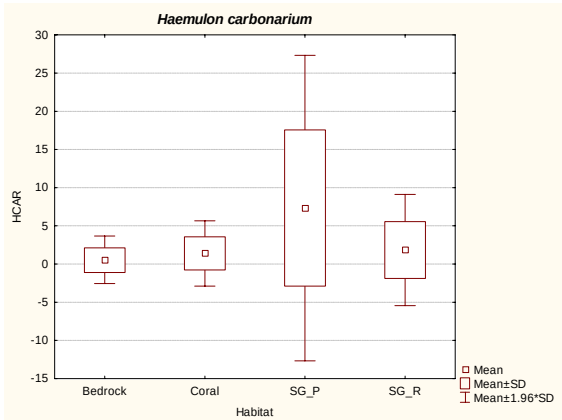


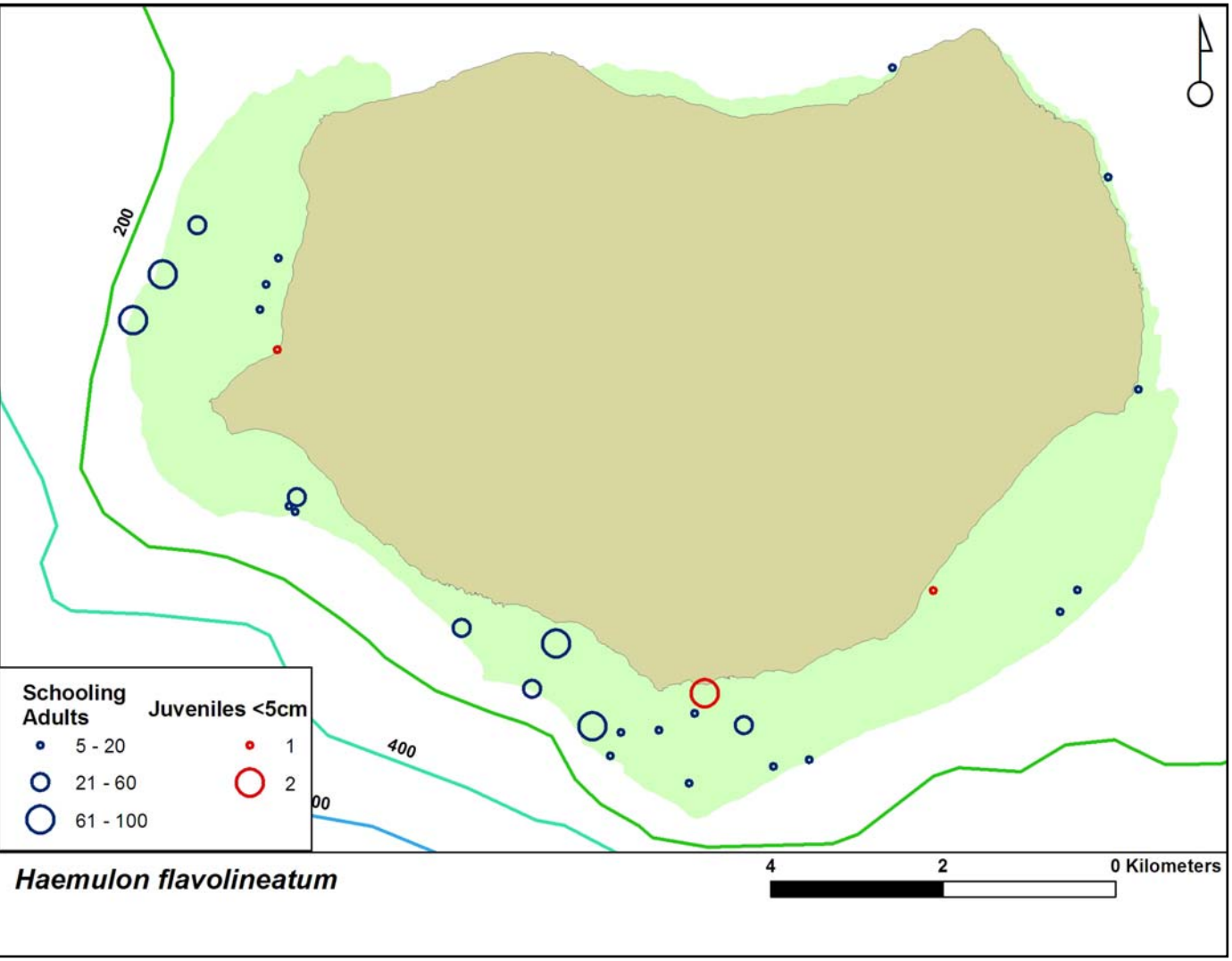


Randall



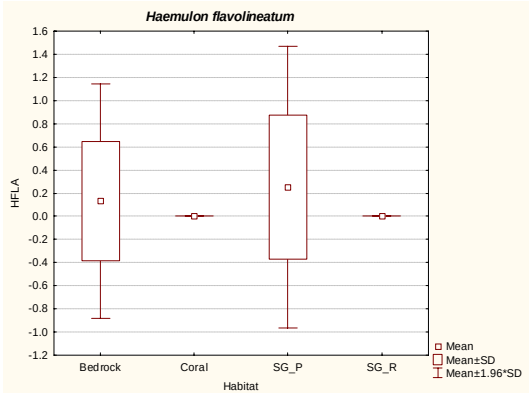
Haemulon carbonarium

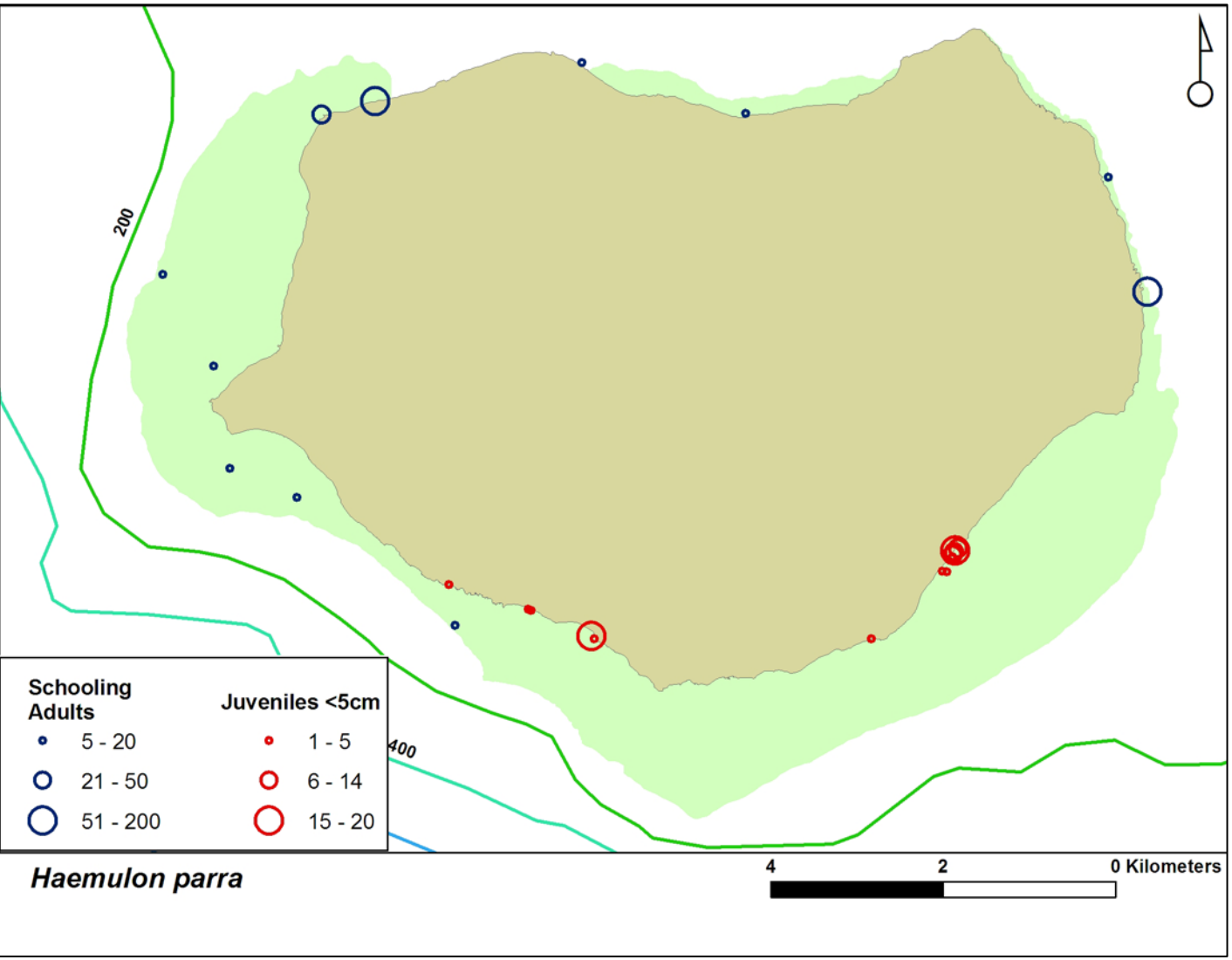




Marsden

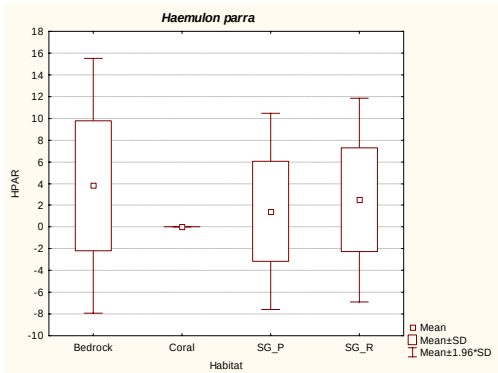
Haemulon flavolineatum

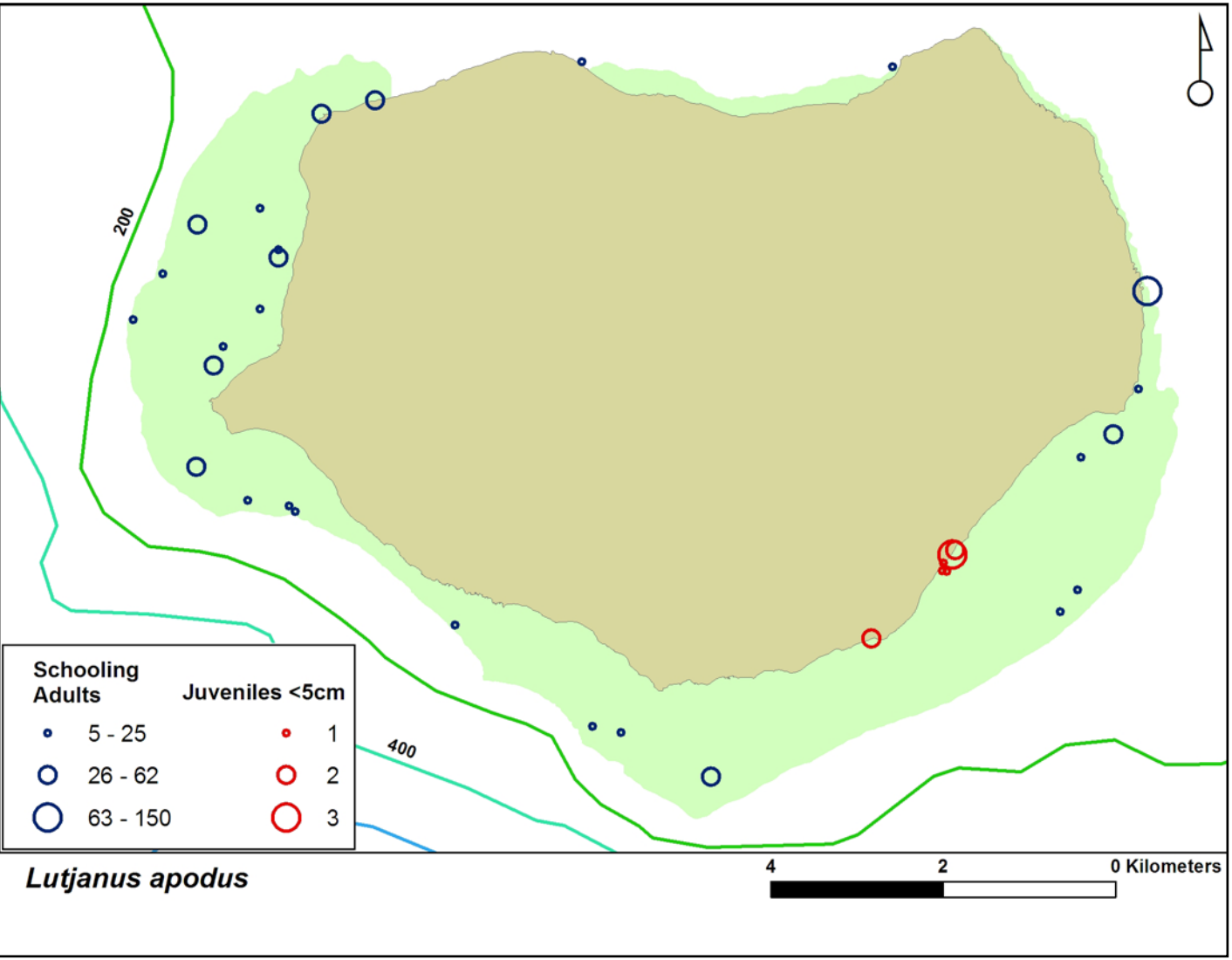




Randall

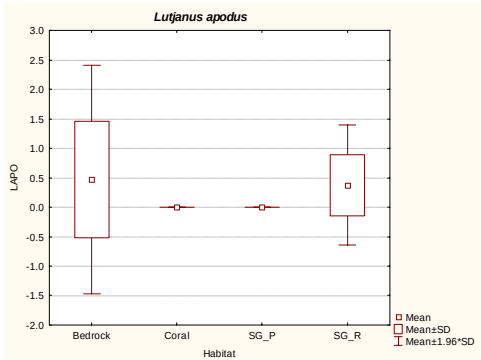
Haemulon parra

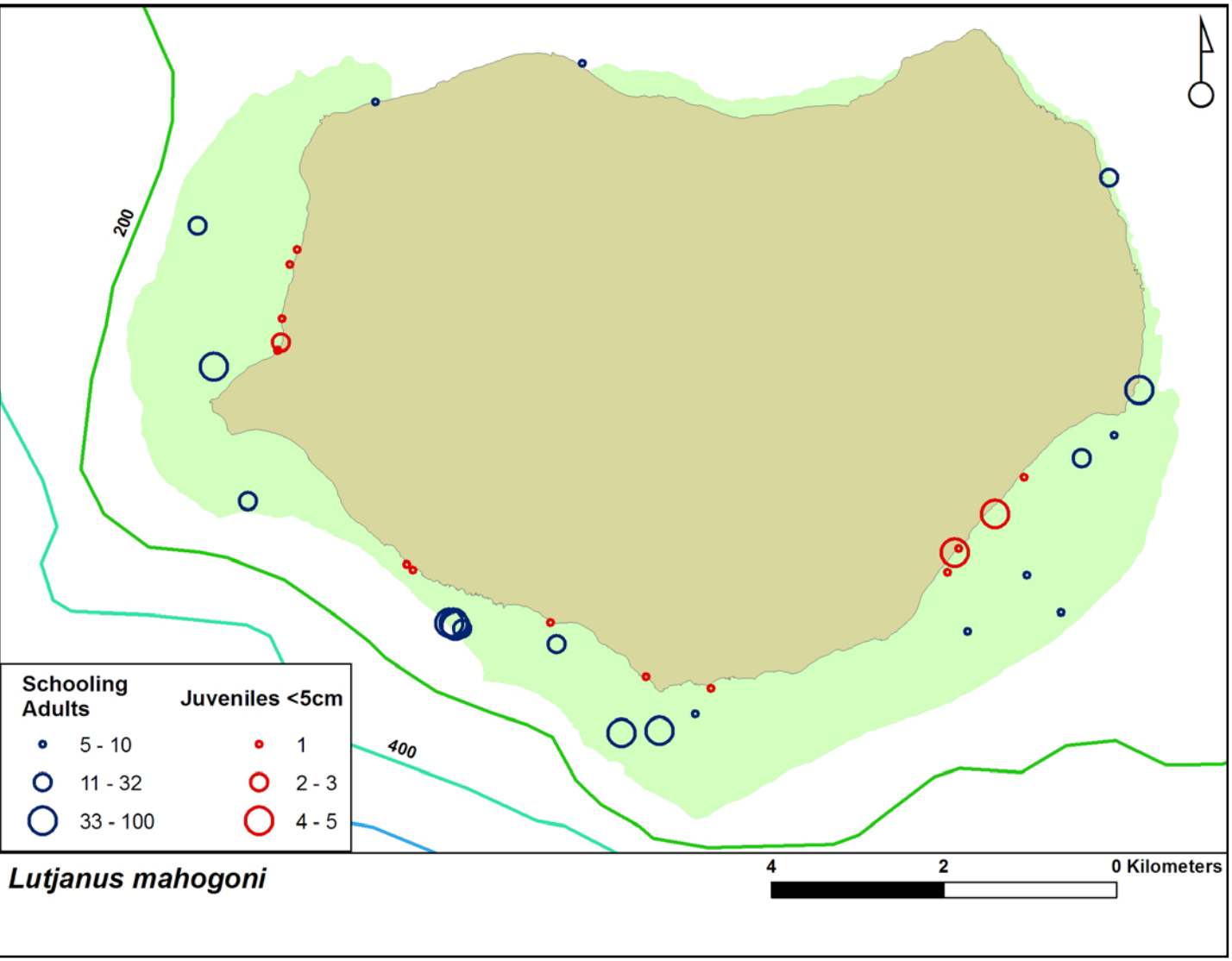




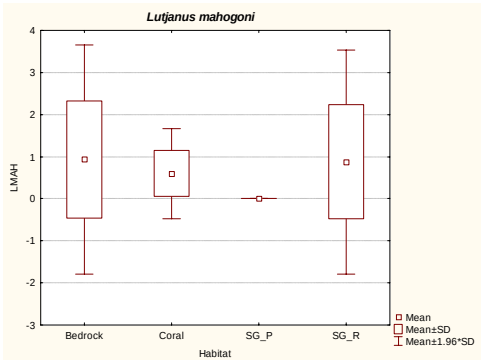
Ruiz

Lutjanus apodus

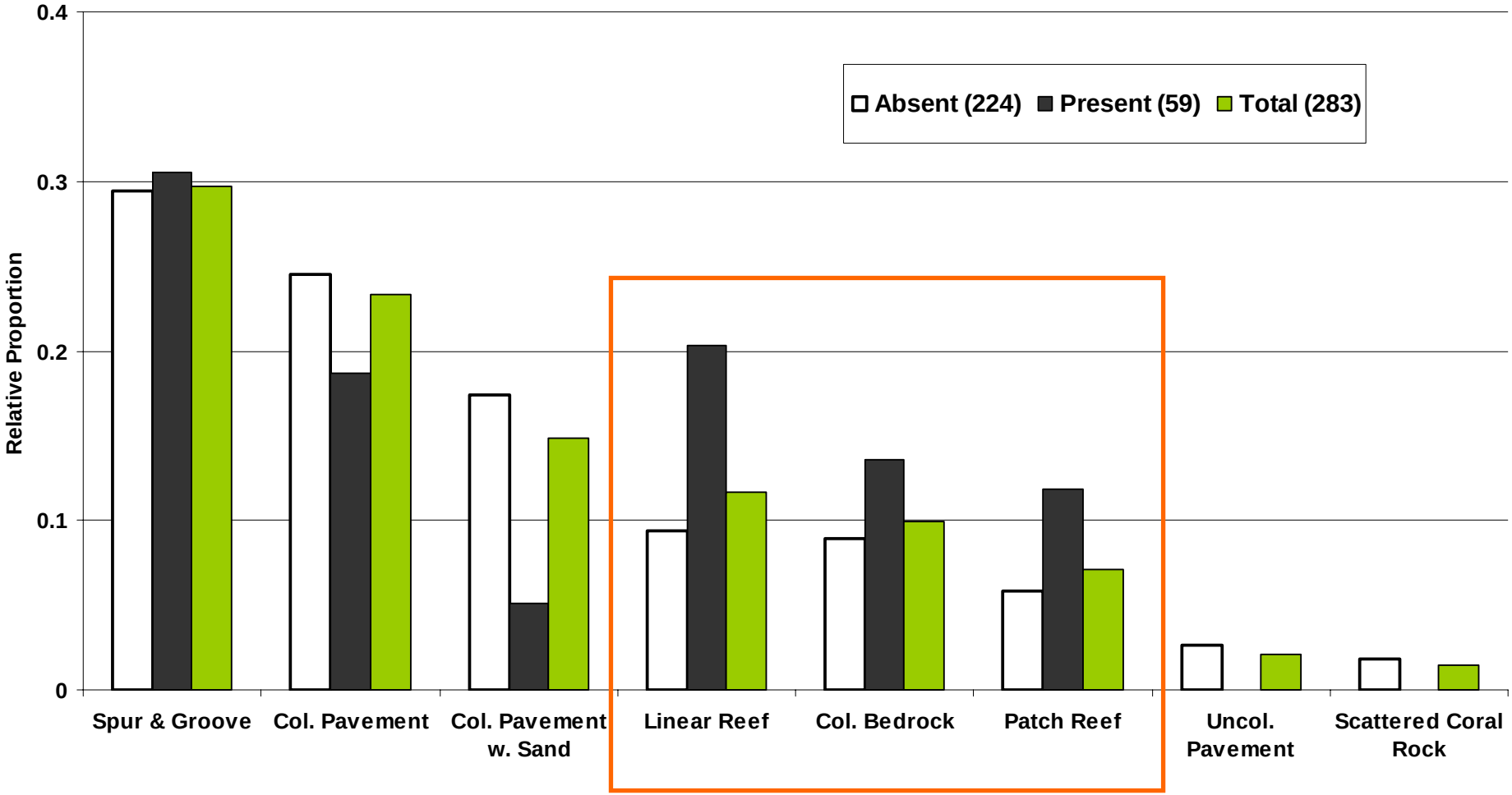




Lutjanus mahogoni

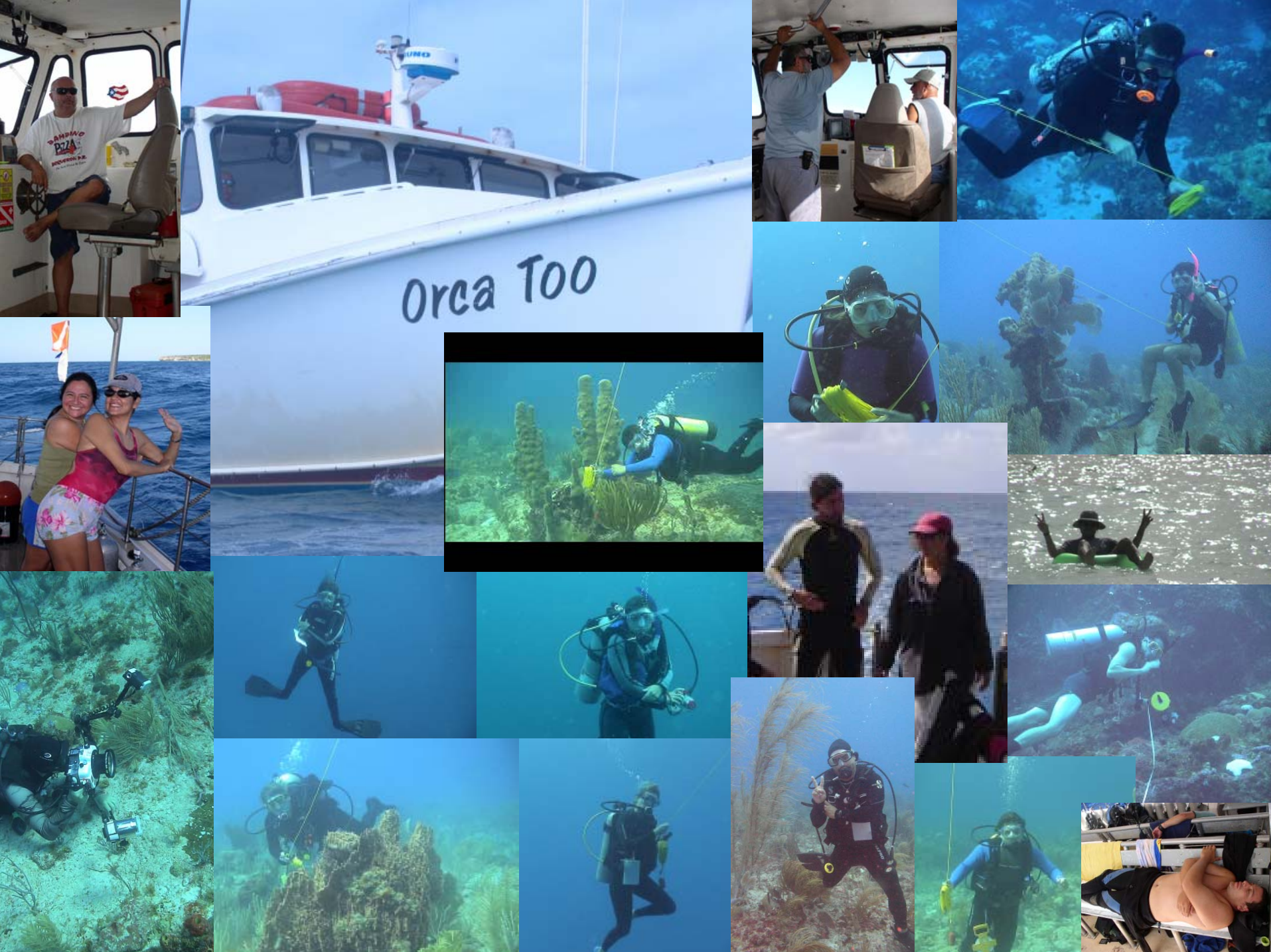


Presence of schools by habitat types



Habitat Variables

- Area of available habitat
- Habitat patch size (perimeter/area ratio)
- Distance from shore (shallow water habitats)
- Area of adjacent habitat (foraging habitats)
- Habitat types favored by schools of adult grunts and snappers
  - Linear Reef
  - Patch Reef
  - Col. Bedrock
  - Spur & Groove


Orca Too