

Fish and Invertebrate Use of Shallow Water Habitats of the Florida Keys National Marine Sanctuary

A Presentation to the FKNMS Marine Zoning and Regulatory Review Shallow Water Working Group

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Overview

- Shallow water within FKNMS composed of different habitats important to fish and invertebrates many of which are commercially and recreationally valuable
- Habitat types include beaches, nearshore seagrass beds and a mosaic of hardbottom and seagrass
- Talk will highlight the ecological importance of these habitats



Oceanside Beaches

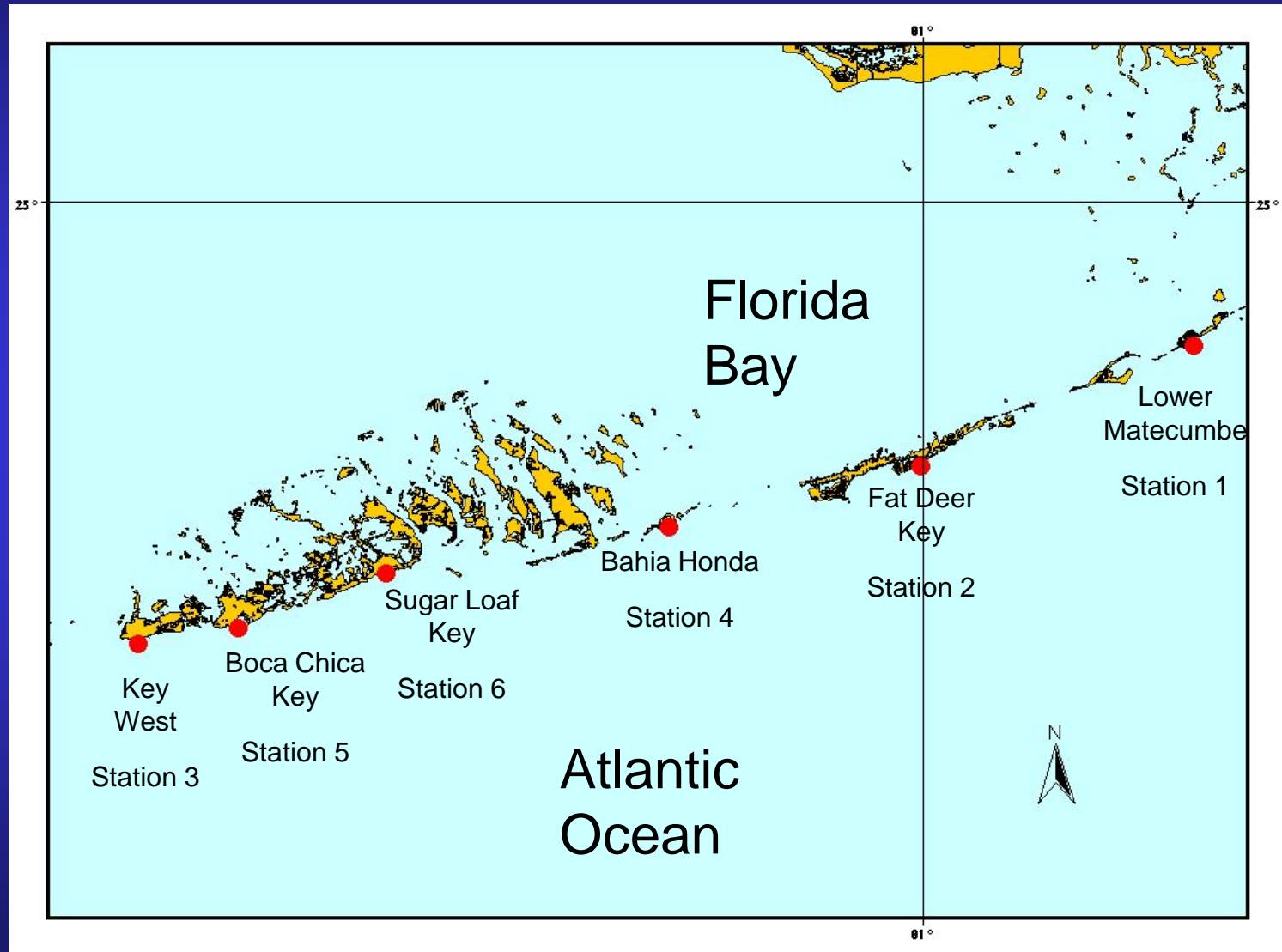


COMPOSITION OF FISH SPECIES ON OCEANSIDE BEACH HABITATS IN THE FLORIDA KEYS

- Beaches are an important settlement habitat many fishes including bonefish, snappers, & permit
- Three species groups
 - Summer-recruiting species:
 - snappers, grunts, & mojarras
 - Winter-recruiting species:
 - bonefish, mullets, & drums
 - Nearshore pelagics:
 - anchovies & herrings



Location of the beachside sampling sites in the lower and middle Florida Keys Sites were sampled from July 1994 to July 1997



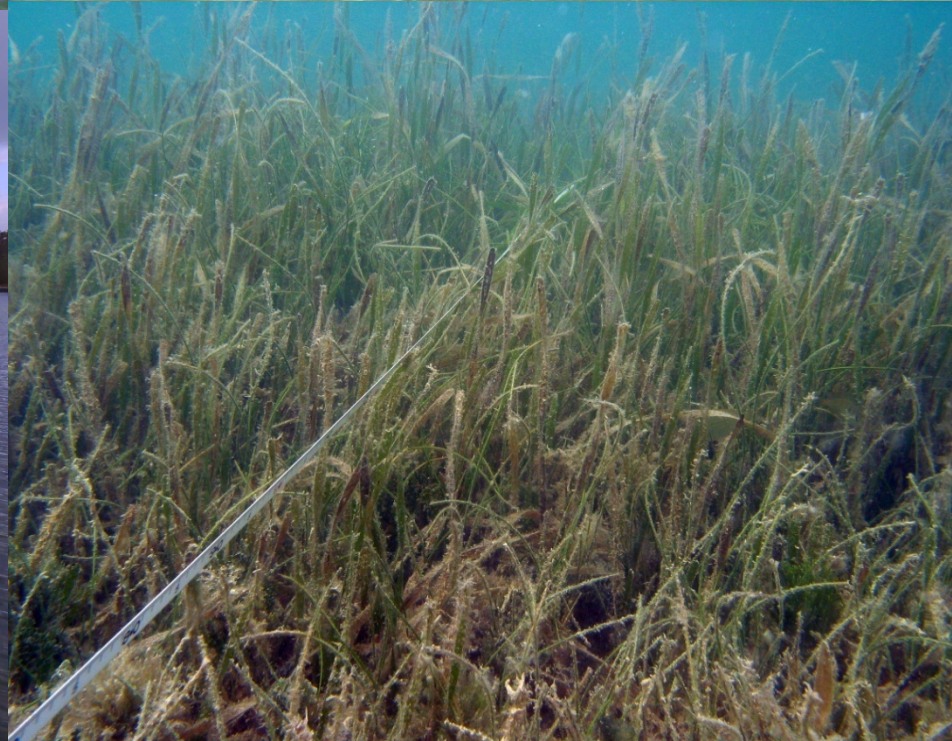
Oceanside Beaches

- 120 species or species groups were collected in 130 seine hauls
- Five taxa accounted for 91% of all of the fish collected
- Only habitat from which young-of-the-year bonefish were observed



SPECIES	TOTAL ABUNDANCE	TOTAL DENSITY(# / 100m ²)
<i>Anchovies (Anchoa spp)</i>	24,581	50.2
<i>Herrings (Harengula jaguana)</i>	5,496	11.2
<i>Mojarras (Eucinostomus spp)</i>	5,340	11.4
<i>Mullets (Mugil spp).</i>	3,856	7.9
<i>Permit (Trachinotus falcatus)</i>	3,759	7.7
<i>Bonefish (Albula spp)</i>	275	0.7
<i>School master snapper (Lutjanus apodus)</i>	263	0.5
<i>White grunt (Haemulon plumieri)</i>	119	0.5
<i>Grey snapper (Lutjanus griseus)</i>	109	0.2
<i>Pinfish (Lagodon rhomboides)</i>	104	0.2
<i>Frillfin goby (Bathygobius soporator)</i>	99	0.3
<i>Blue striped grunt (Haemulon sciurus)</i>	92	0.2
<i>Lane snapper (Lutjanus synagris)</i>	45	0.1
Subtotal	44,138	
Other	3,105	
Assemblage Total	47,243	

Nearshore Seagrass Beds

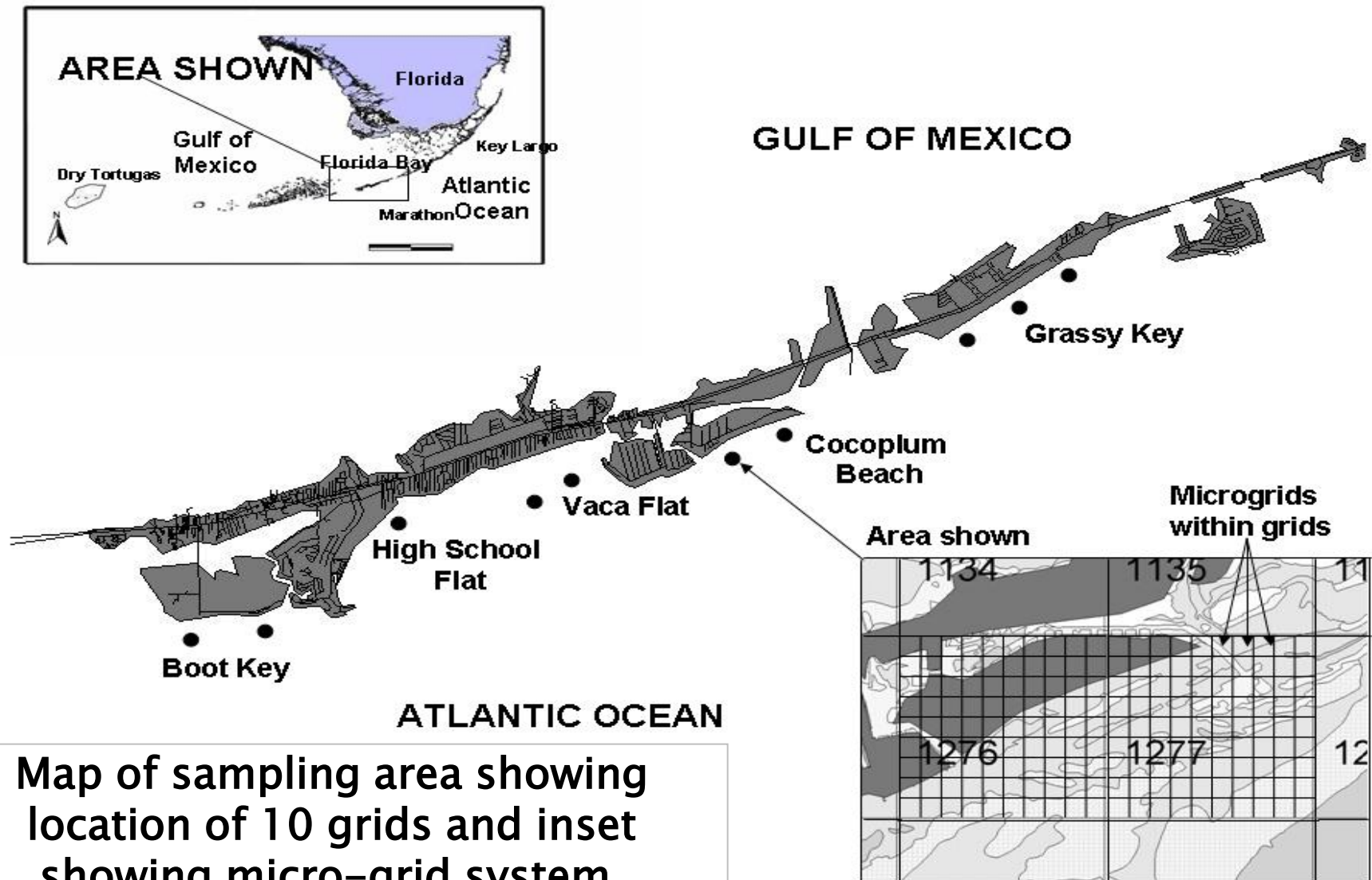


Seining in Nearshore Seagrassbeds of the Middle Keys

- Determine abundance & distribution of settlement-stage and juvenile snappers in shallow, nearshore seagrass beds in the middle Florida Keys
- Monthly since 2006



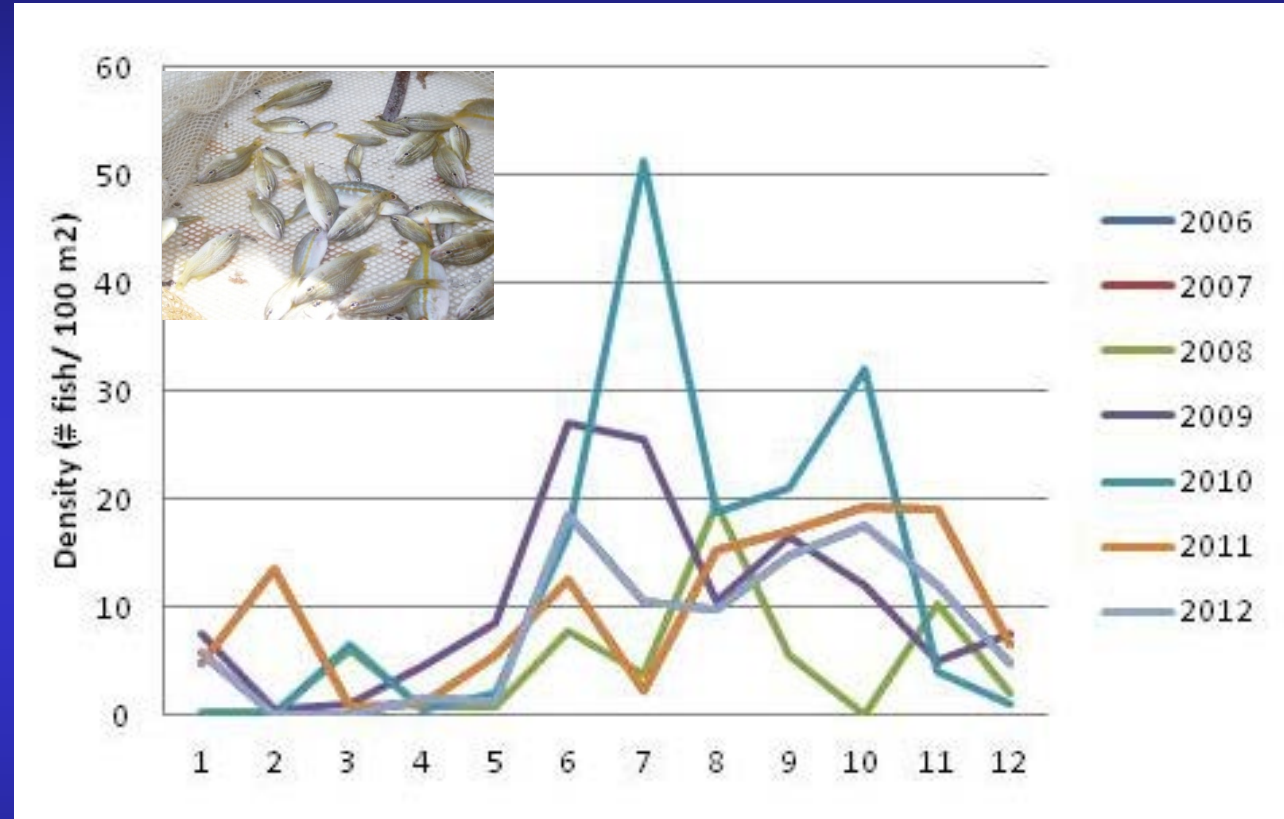
Study Area



Map of sampling area showing location of 10 grids and inset showing micro-grid system.

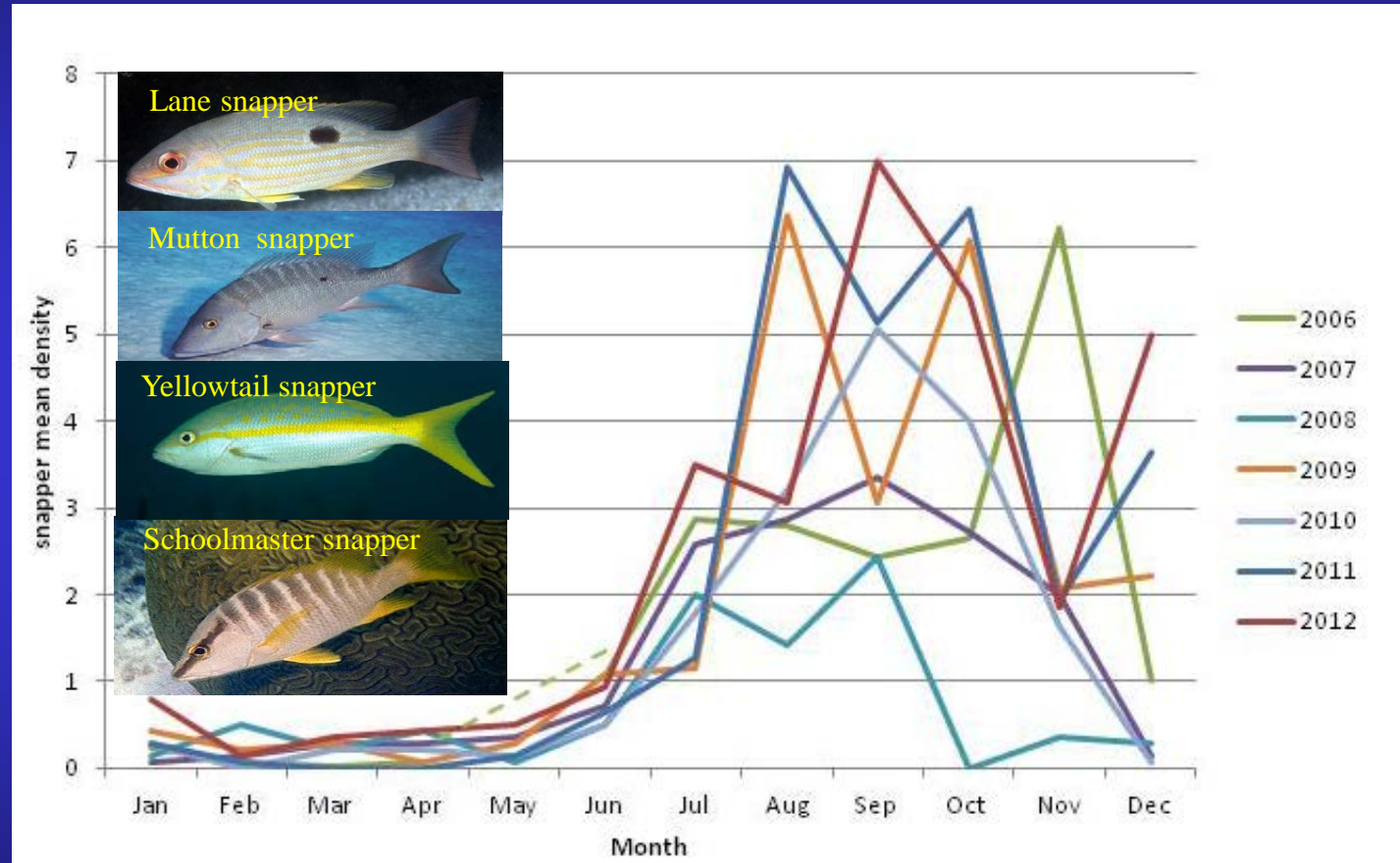
Grunts

Highest young-of-the-year densities observed during the summer and fall after the peak spawning season (April-June)



Snappers

Recruitment pulses for young-of-the-year snappers peak in late summer/fall, after the spawning season in spring and early summer



Nearshore Seagrass Beds are Diverse!



Shallow Water Seagrass Beds

An underwater photograph showing a dense bed of seagrass in the foreground. The seagrass has long, thin, green blades. The water is a clear, light blue-green color. Sunlight is visible as a bright, hazy area in the upper center of the frame, with rays of light filtering down through the water. The overall scene is a natural, serene depiction of a shallow water ecosystem.

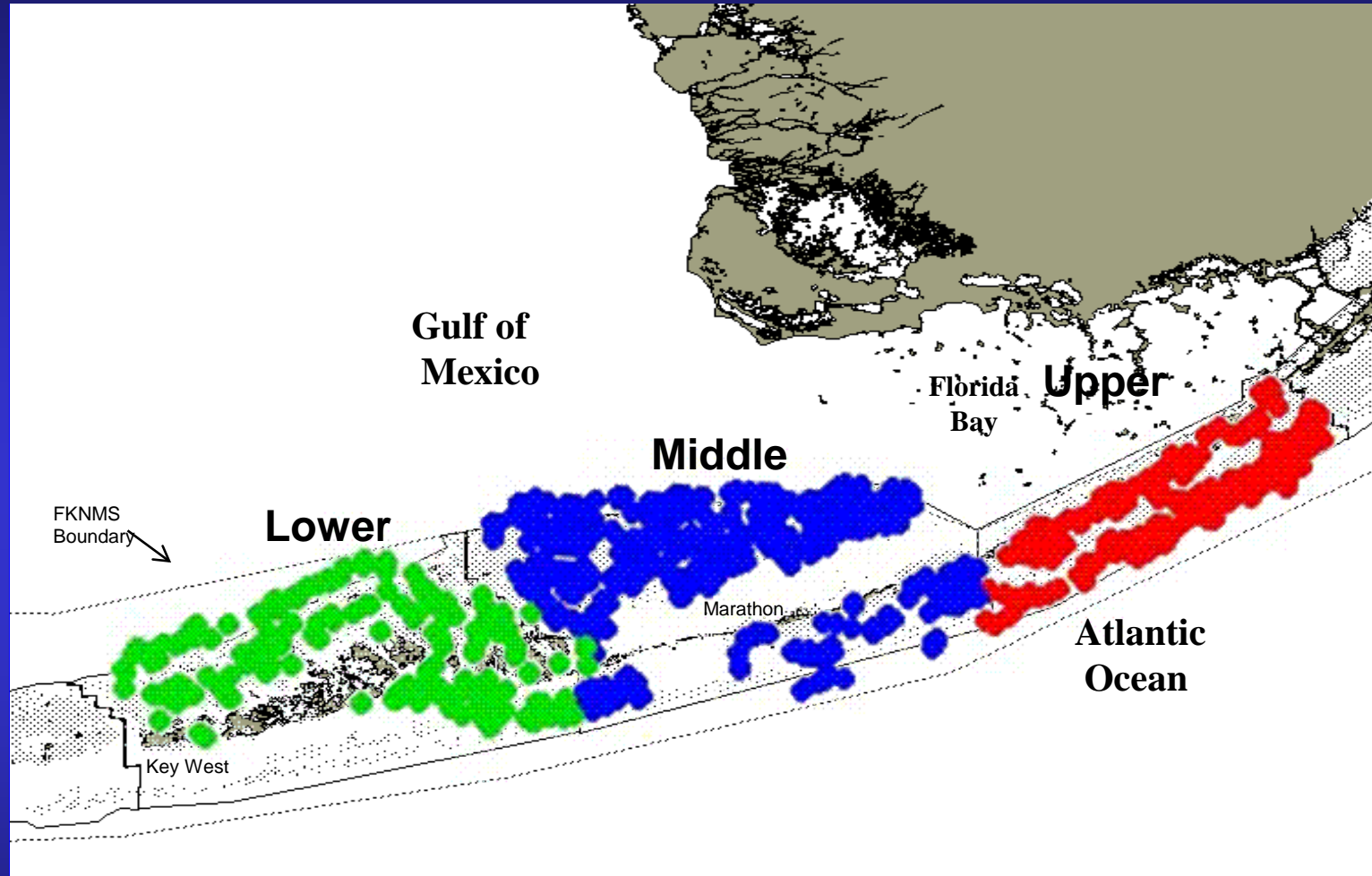
<http://www2.fiu.edu/~seagrass/Research.html>

Shallow Water Seagrass Beds

- Sampled using otter trawls
- 3-min. bottom tows using a 20' trawl with a 1/8" mesh cod-end liner.



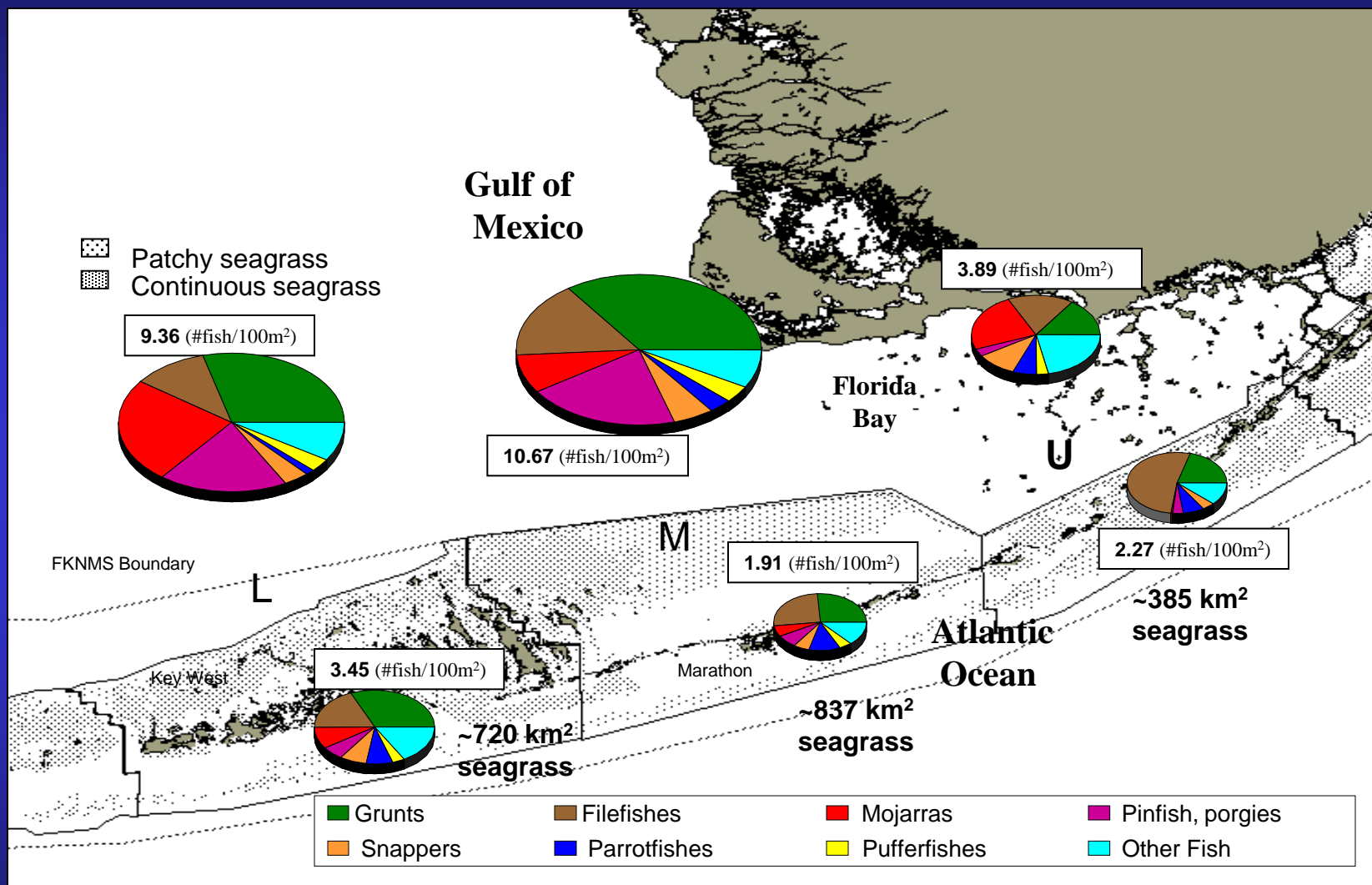
Study Area and Sampling Sites by zone(n=855)



Zone U (Upper Keys (Gulf = 94, Ocean = 142)

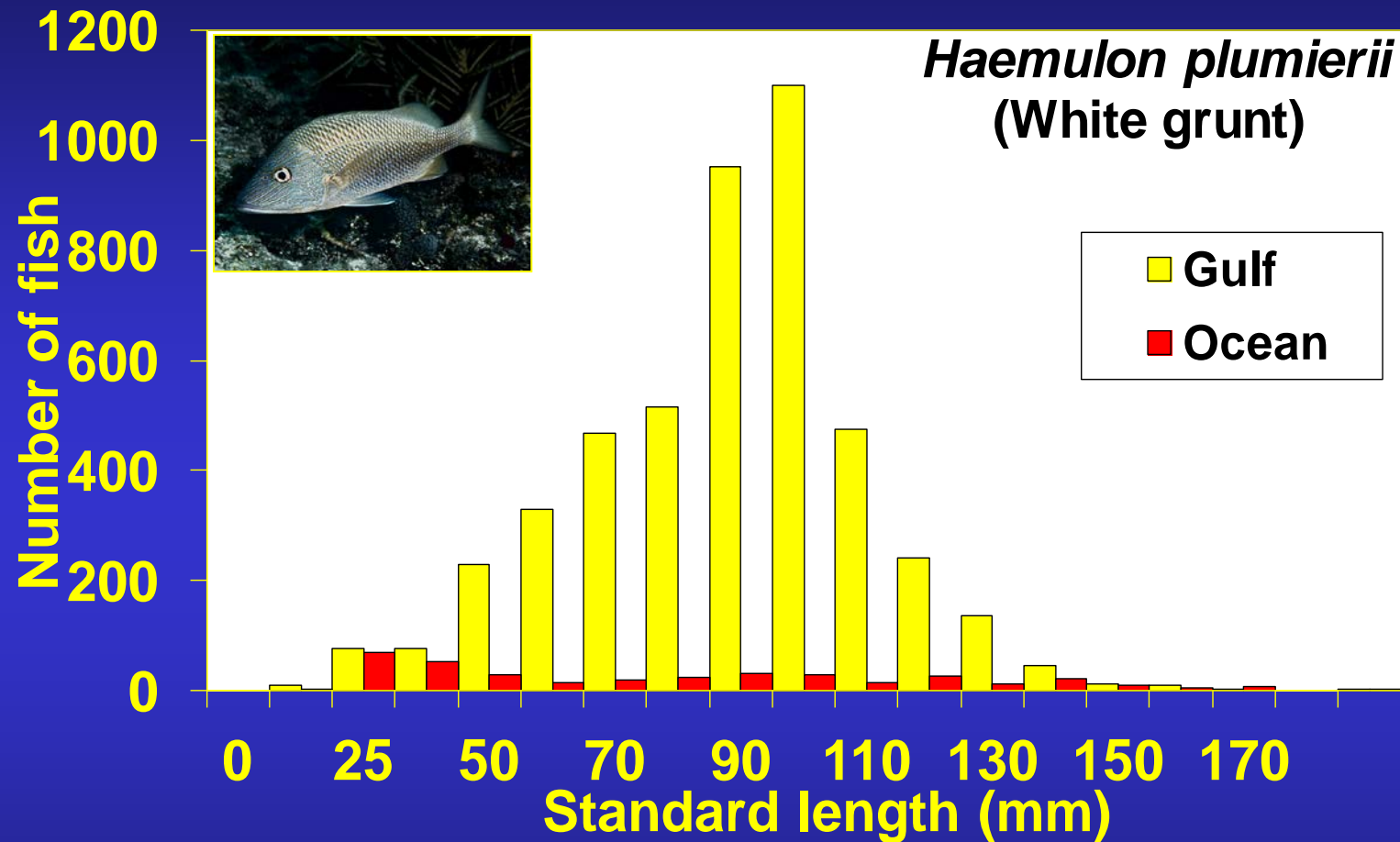
Zone M (Middle Keys (Gulf = 324, Ocean = 102)

Zone L(Lower Keys (Gulf = 194, Ocean = 42)



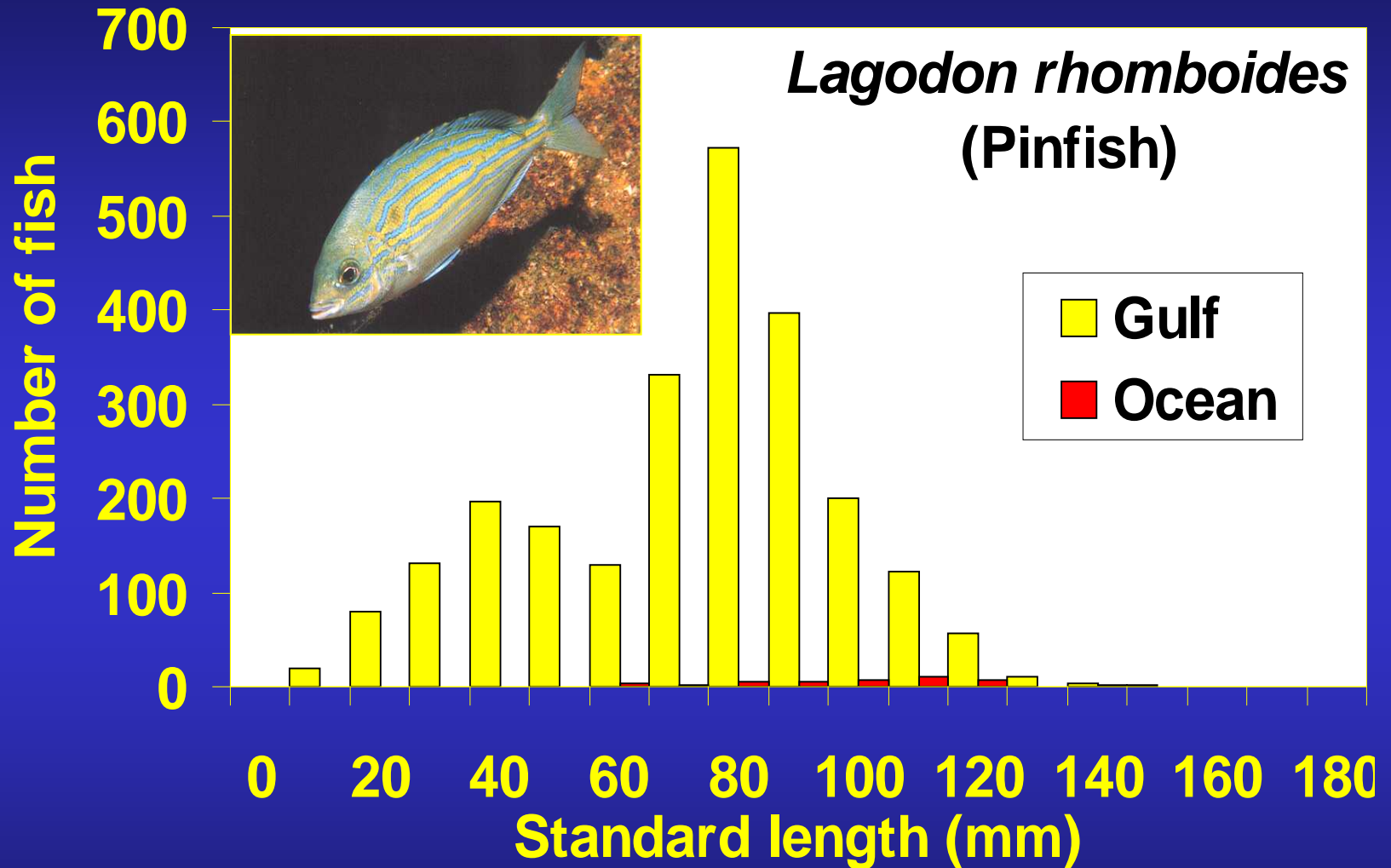
From: Acosta, A. C. Bartels, J. Colvocoresses, and M. F. D. Greenwood. 2007. Fish assemblages in seagrass habitats of the Florida Keys, Florida: Spatial and Temporal Characteristics. Bulletin of Marine Science, 81(1): 1–19

White Grunt



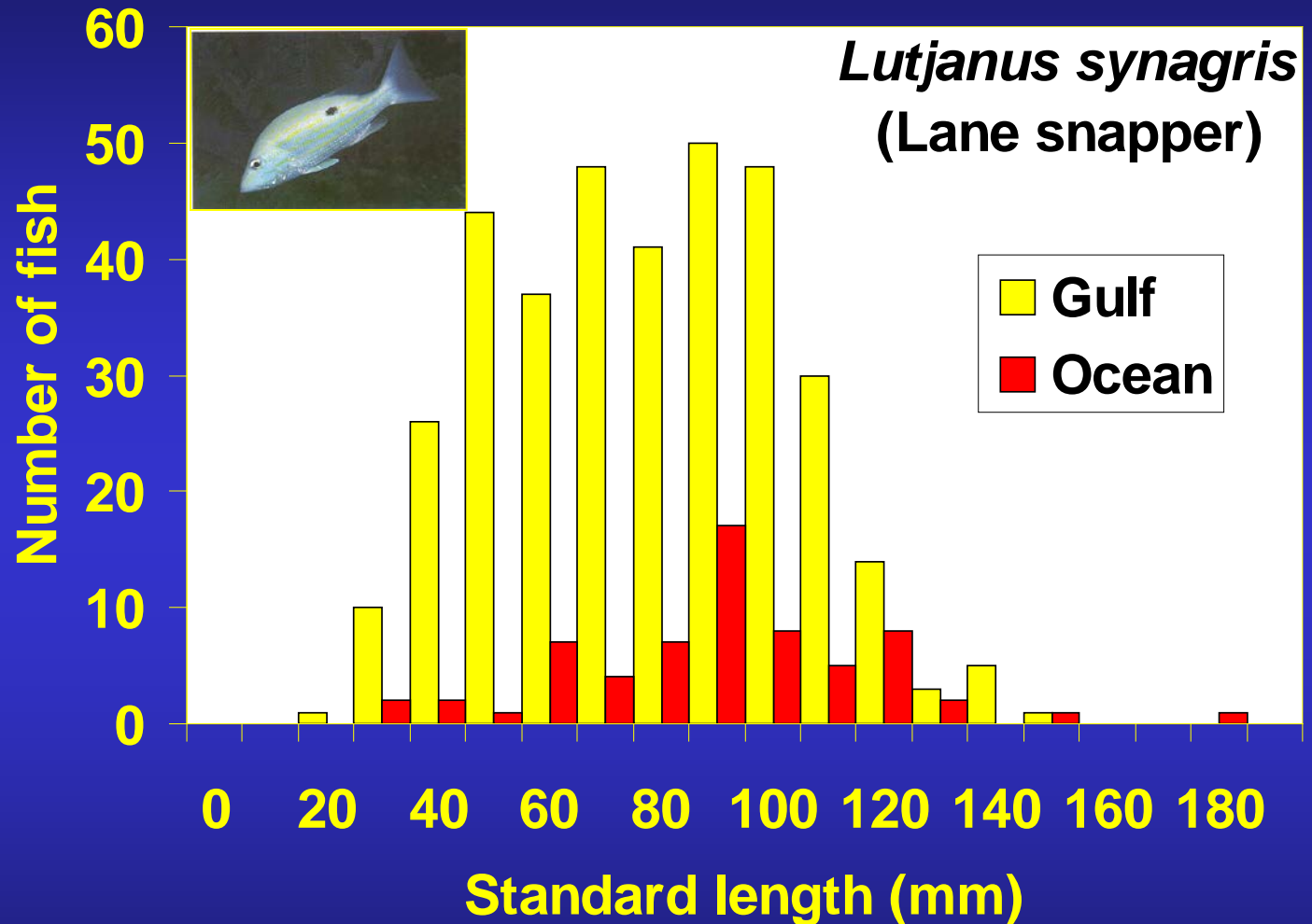
- Shallow water seagrass beds are an important habitat for grunts
- Juvenile and adult habitat

Pinfish



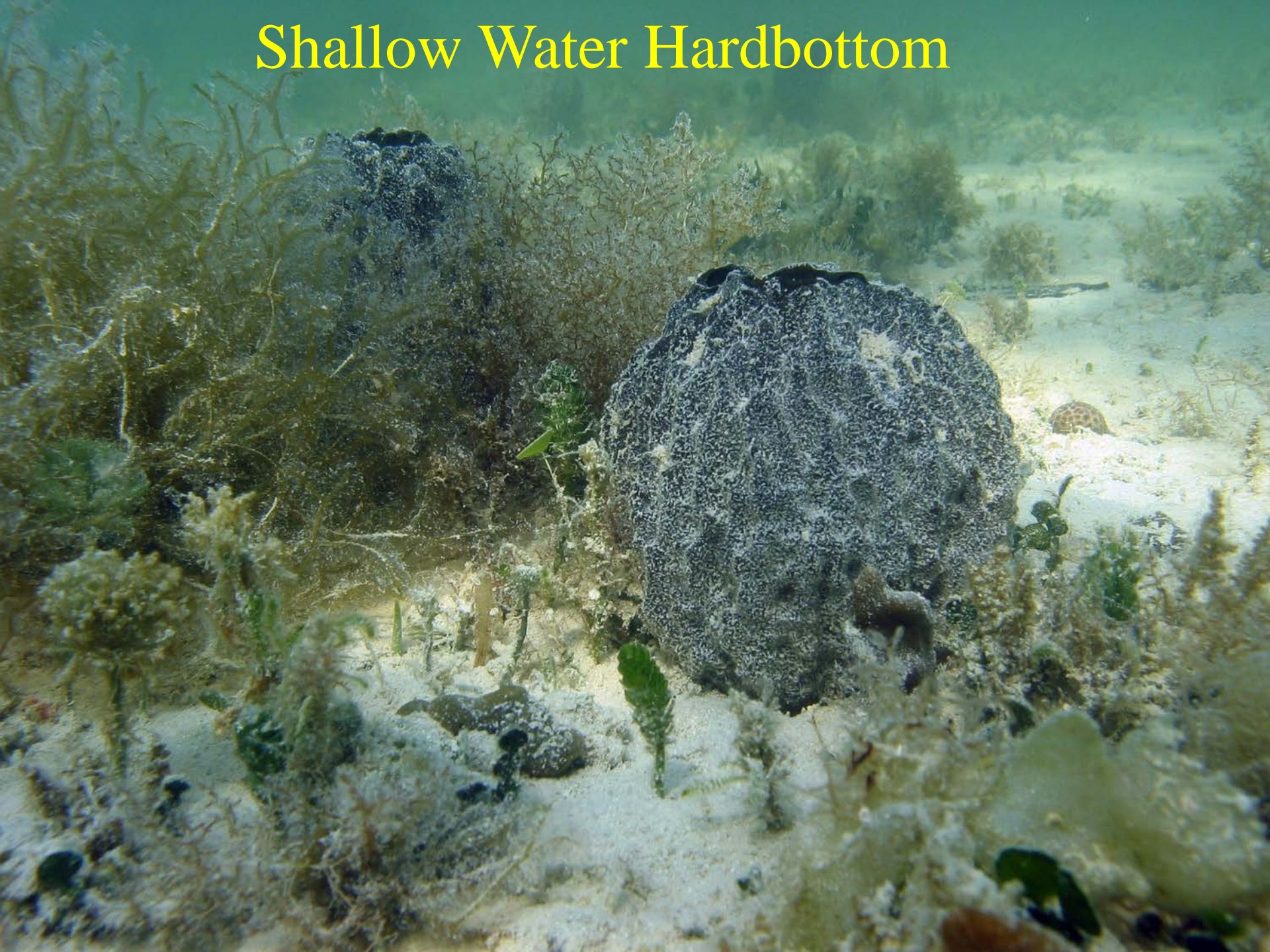
- Shallow water seagrass beds are an important habitat for pinfish
- Juvenile and adult habitat

Lane Snapper



- Shallow water seagrass beds important habitat for lane snapper
- Primarily juvenile habitat

Shallow Water Hardbottom

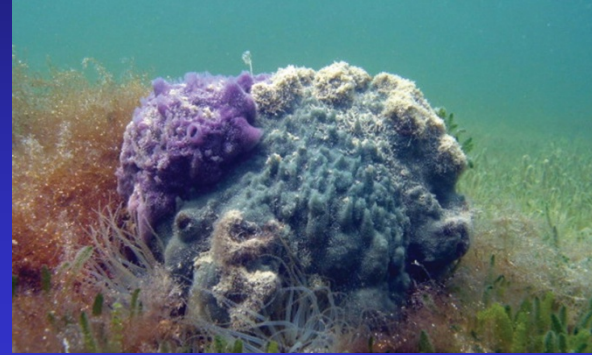


Shallow Water Hardbottom

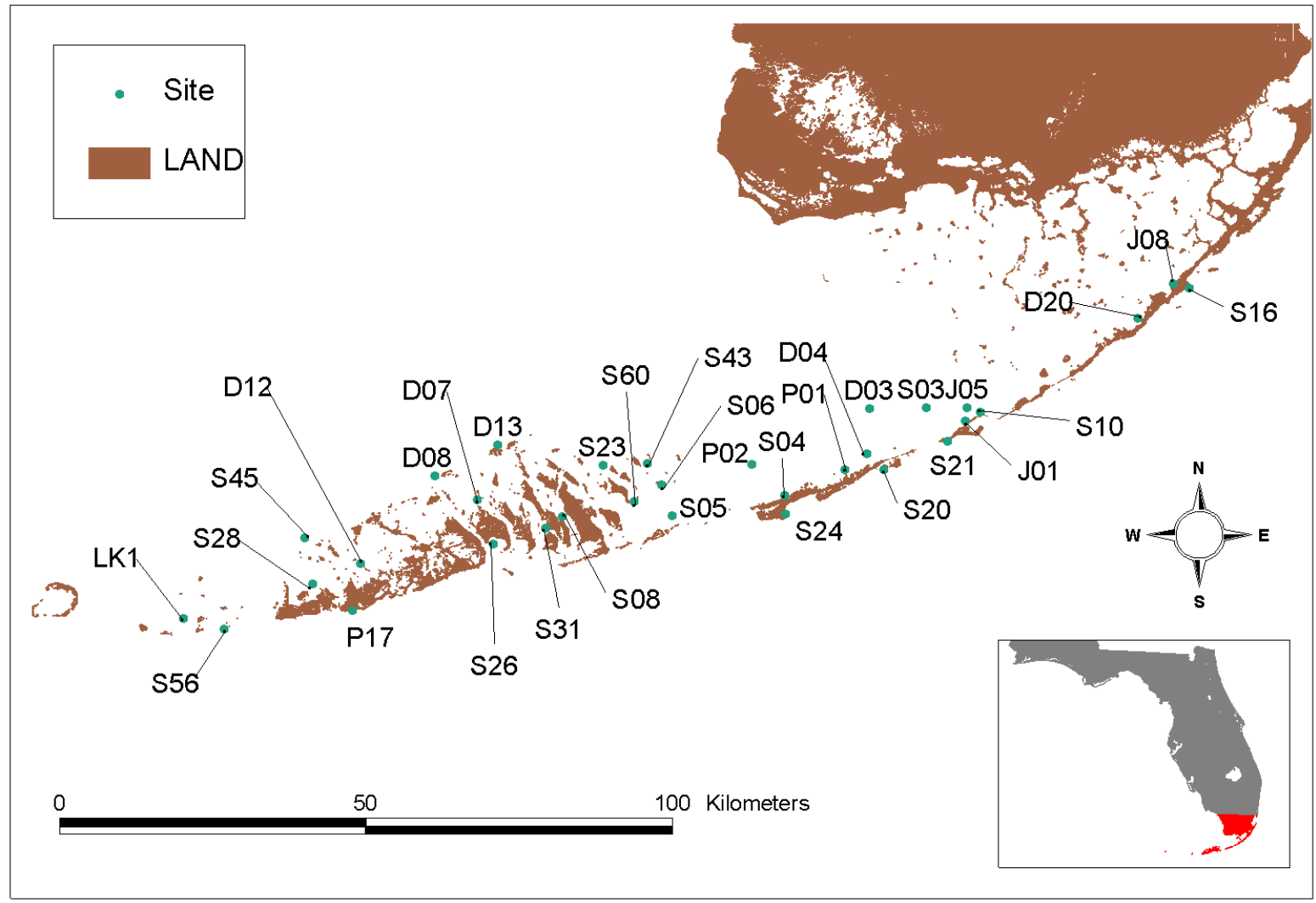


Shallow Water Hardbottom

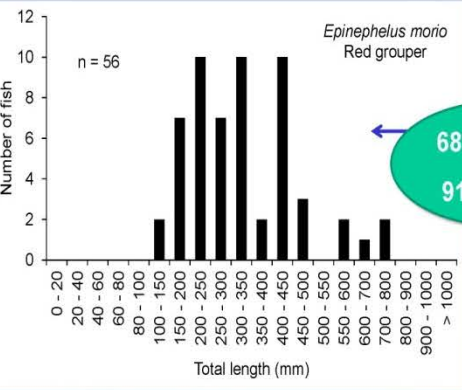
- Hardbottom habitat is one of the most common marine communities in the Florida Keys
- Supports a highly diverse fish community
- We have identified 186 species
- More than 90% of reef fish species observed were juveniles



32 Sites sampled during the Nearshore Hard-Bottom Survey in the Florida Keys



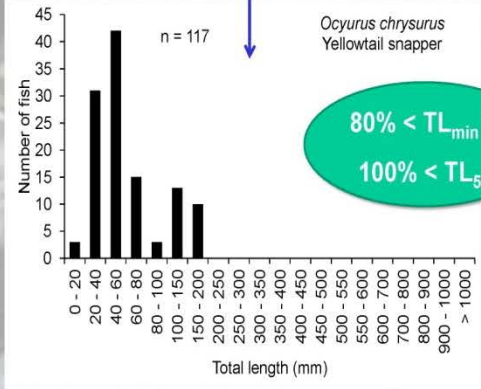
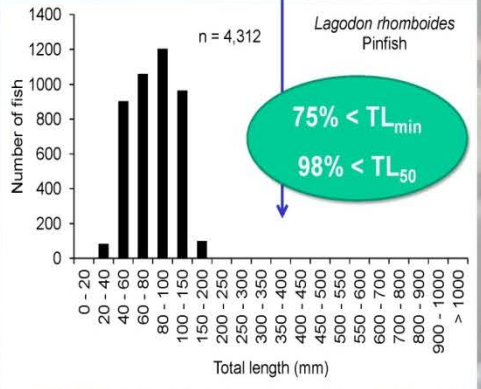
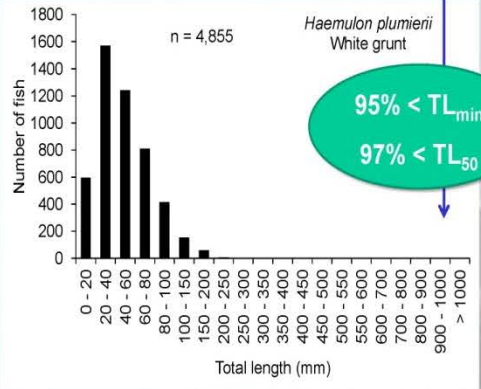
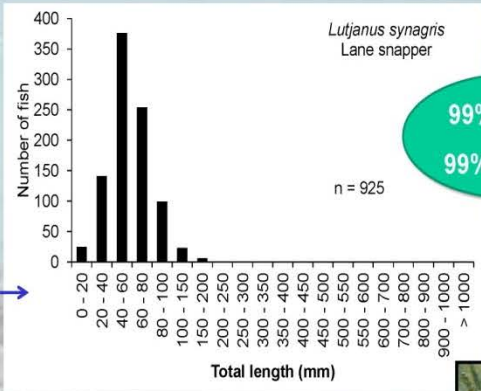
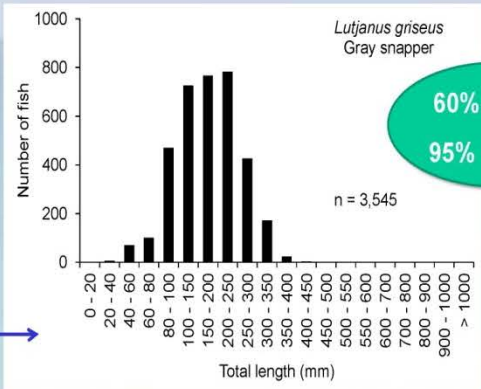
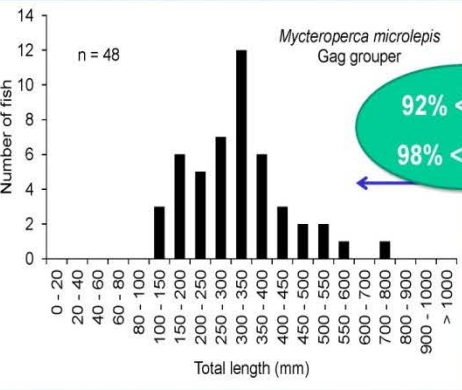
Shallow Water Hardbottom, a critical habitat for Juvenile Fish in the Florida Keys



L_{min} : the smallest length at which maturity is observed
 L_{50} : the length at first maturity, defined as the length at which 50% of fish are sexually mature.

Table 1. Minimum total length at which maturity was observed (L_{min}), and total length at which 50% of the fish were sexually mature (L_{50})

	TL_{min} (mm)		TL_{50} (mm)	
	Female	Male	Female	Male
<i>Epinephelus morio</i>	406	427	529	—
<i>Mycteroperca microlepis</i>	508	790	641	980
<i>Haemulon plumieri</i>	105	99	138	186
<i>Lagodon rhomboides</i>	122	149	174	175
<i>Lutjanus griseus</i>	247	230	445	317
<i>Lutjanus synagris</i>	161	151	201	160
<i>Ocyurus chrysurus</i>	242	140	252	283

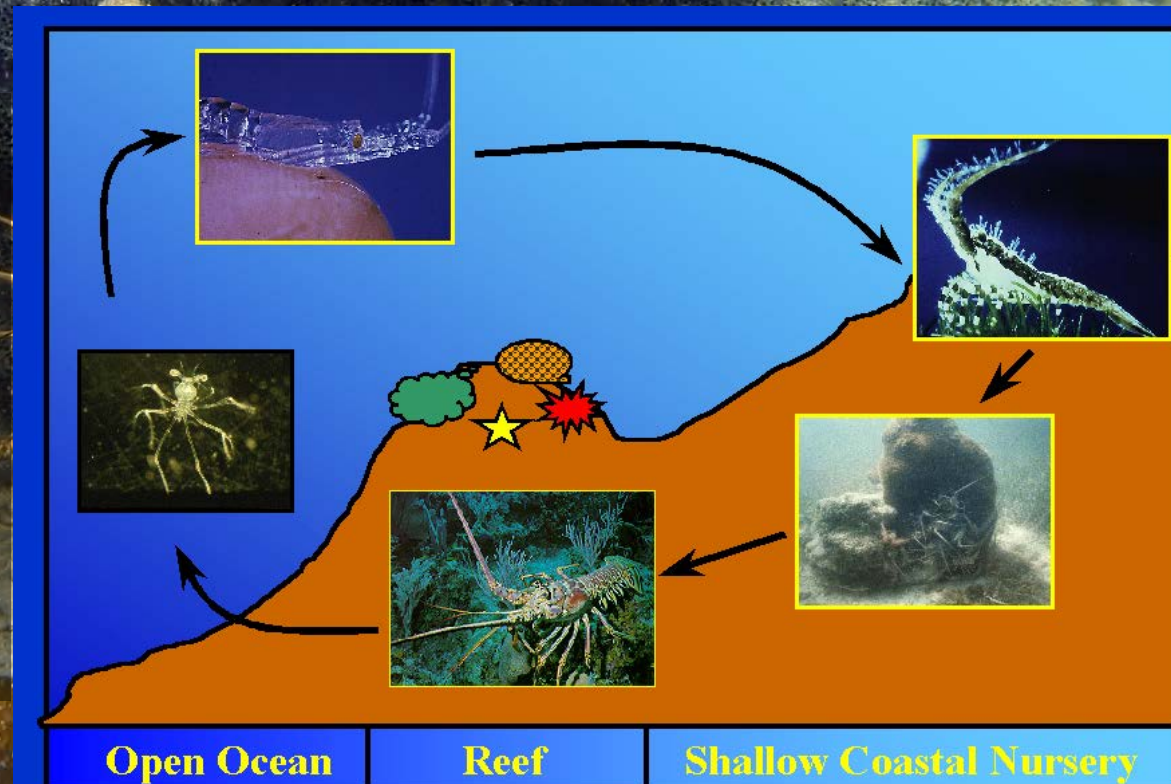


Spiny Lobster

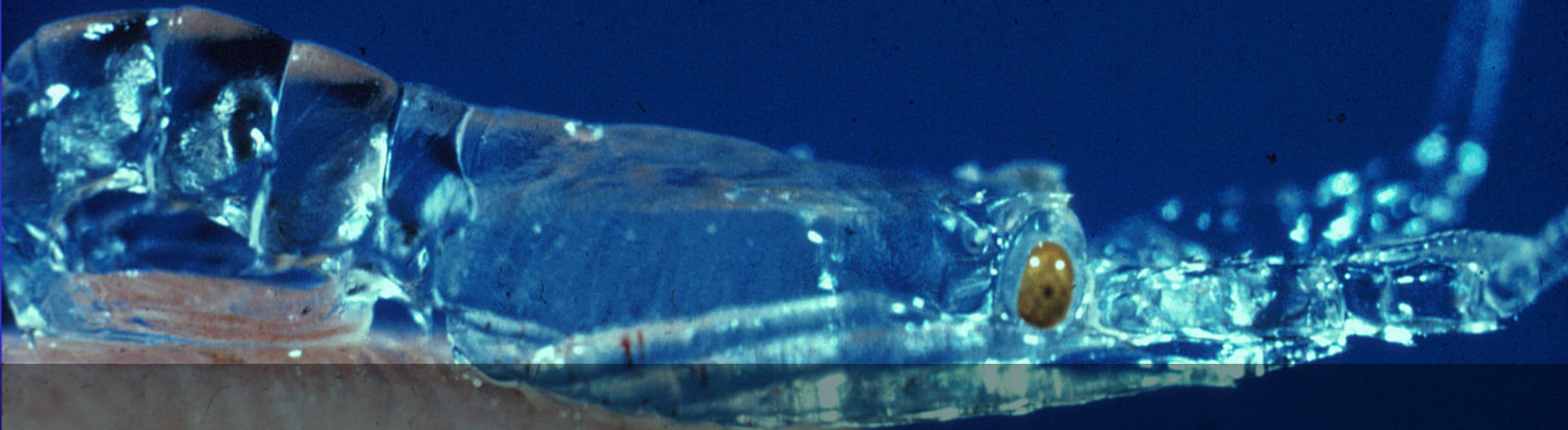


Spiny Lobster Life Cycle

- Spiny lobster use different habitats during their life cycle
- Open ocean as larvae → nearshore as juvenile → reef as adults
- Coastal chemical cues, especially from red macroalgae, are used by lobster post-larvae to locate their nearshore nursery habitat



Spiny Lobster Life Cycle



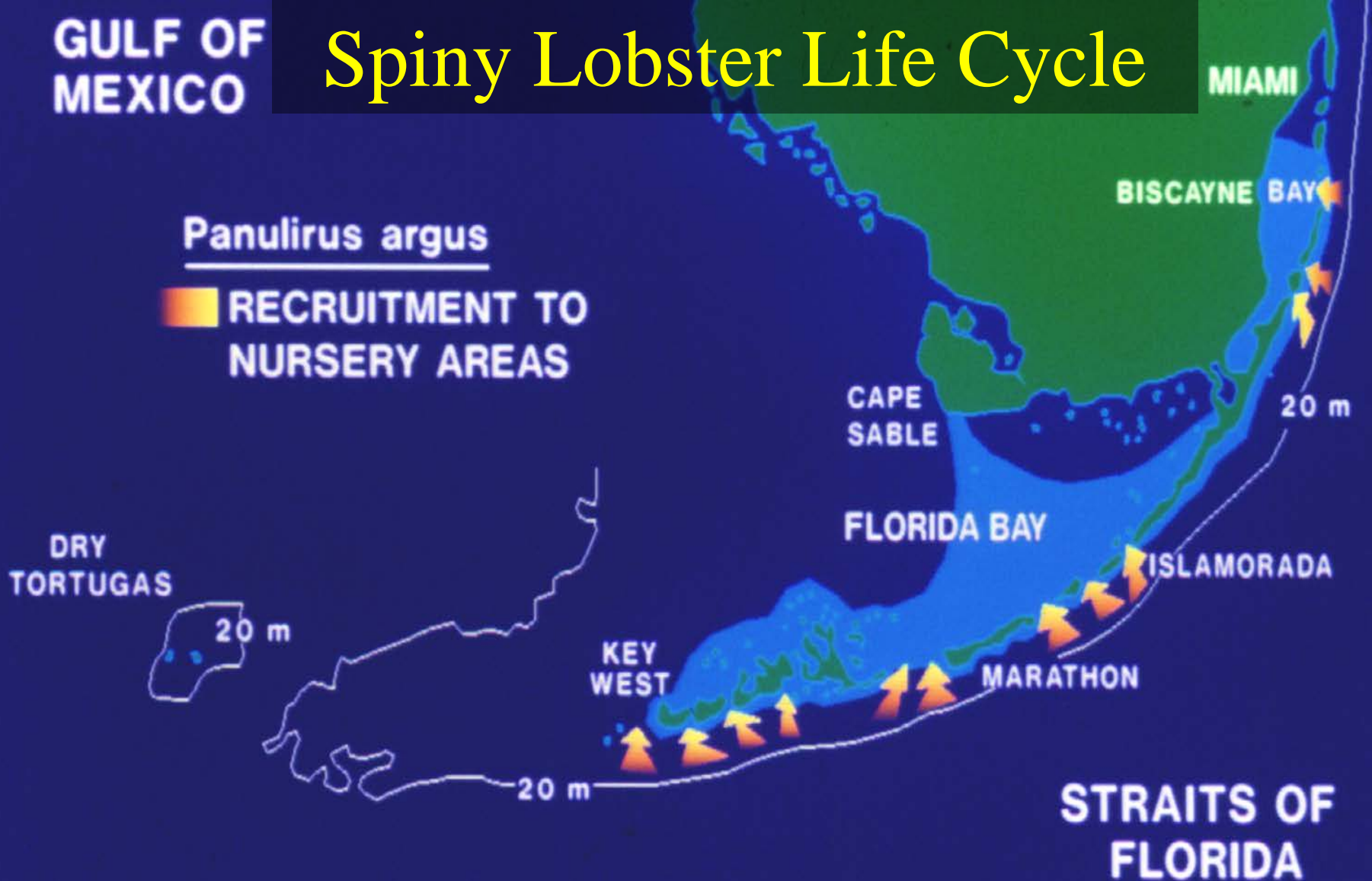
- Rapid-swimming, non-feeding stage lasting ~ 2 – 4 weeks
- Arrive inshore during each new moon, at night, to avoid predators
- Swim toward “coastal water” using chemical cues, especially red algae

GULF OF
MEXICO

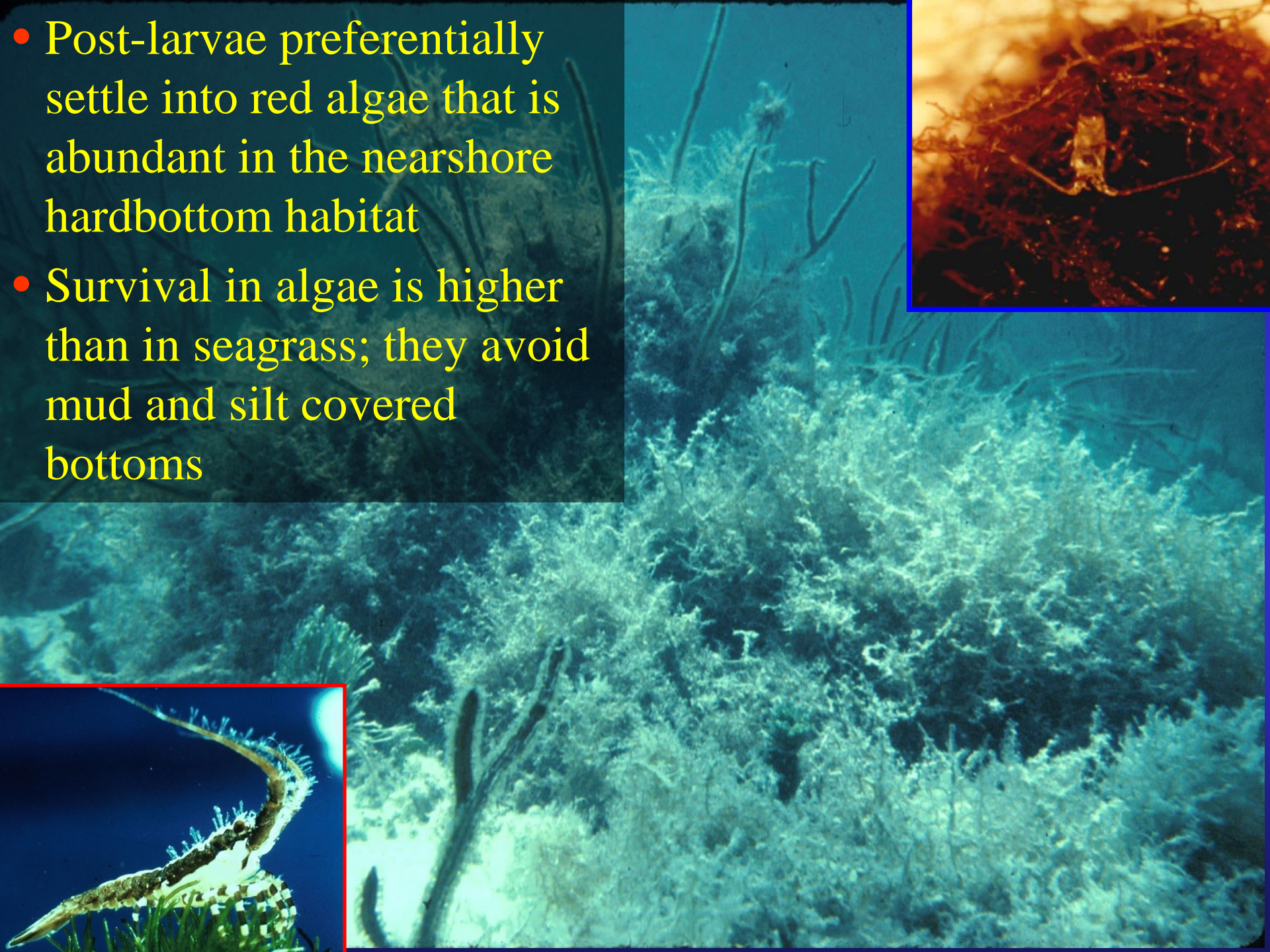
Spiny Lobster Life Cycle

Panulirus argus

 RECRUITMENT TO
NURSERY AREAS



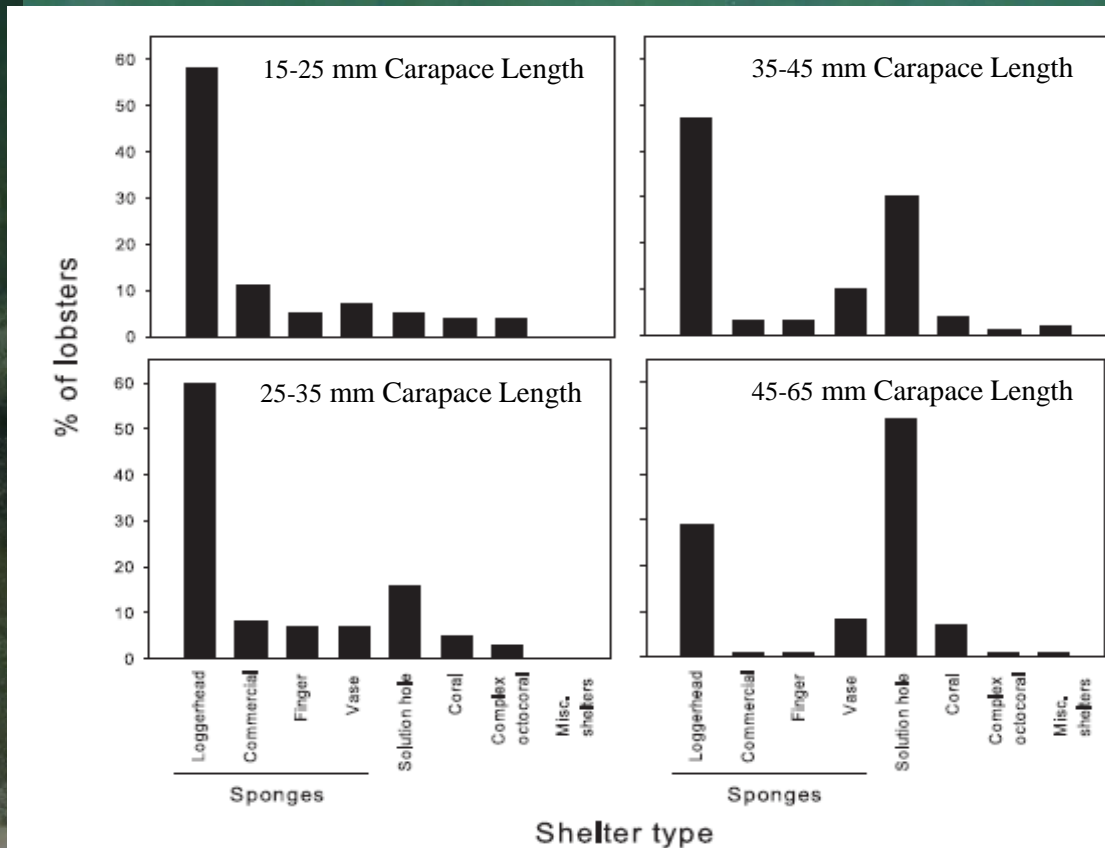
- Post-larvae preferentially settle into red algae that is abundant in the nearshore hardbottom habitat
- Survival in algae is higher than in seagrass; they avoid mud and silt covered bottoms



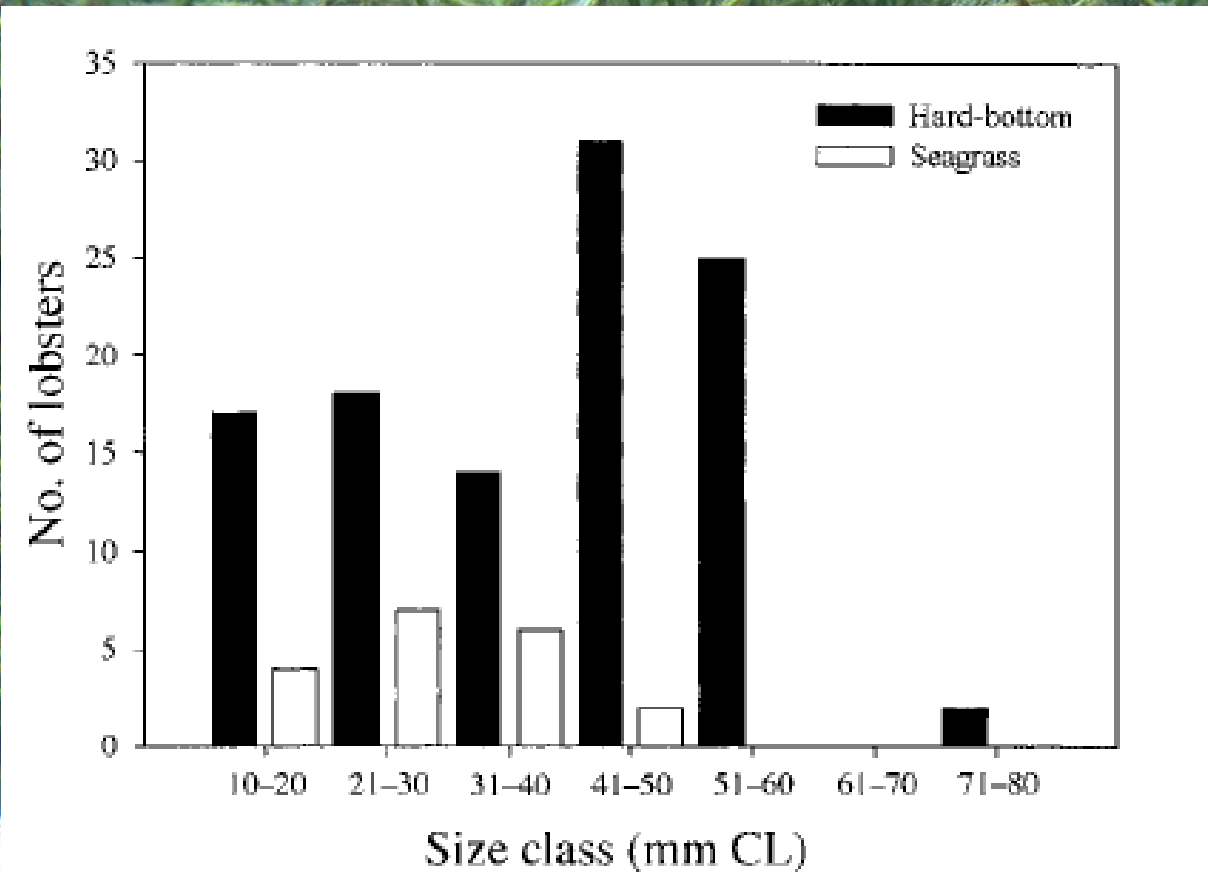
Larger juvenile lobsters use many different shelter types abundant in the hardbottom habitat; sponges, coral heads, rock ledges, & solution holes



- Preferred structures are sponges, in Florida Bay, especially loggerhead sponges
- Larger juvenile lobsters begin using crevices and solution holes before moving out to reefs as they attain maturity



Juvenile lobster do occur in the shallow seagrass beds in the Keys, but they are much less abundant there compared to the hardbottom habitat



Berhinger *et al.*, 2009

SUMMARY

- **Beaches:** Important settlement habitat for many fishes including bonefish, snappers, & permit
- **Nearshore Seagrass Beds:** Important habitat for a diverse array of fishes, including young-of-the-year snappers
- **Shallow Water Seagrass Beds:** Important habitat for a diverse array of fishes, including juvenile snappers
- **Shallow Water Hardbottom:** Essential juvenile habitat for many fishes, including many species of reef fishes and crustaceans



Questions

