



# Dwarf Seahorse in Biscayne Bay

**Ecology and spatial trends in occurrence of Dwarf  
Seahorse in the western nearshore region of Biscayne Bay**

**Emilie Stump, Ian Zink, Joe Serafy, Joan Browder**

photo © Phil Labetz

# Dwarf Seahorse

*Hippocampus zosterae*

## DISTRIBUTION

Sub-tropical species; confirmed occurrence in Bahamas, Mexico, southern US/Florida.

## HABITAT

Protected bays/lagoons, areas with low water flow, seagrass, drifting vegetation (Bruckner *et al.* 2005). Max depth 4m

## BIOLOGY

Maximum recorded adult height – 2.5 cm

Monogamous mating system; male parental care. Reproduction varies with day length and regional water temperature. In Tampa, reproduce year-around (Masonjones HD, unpublished data). At least 3 breeding events per year, more further south (Strawn *et al.* 1958)

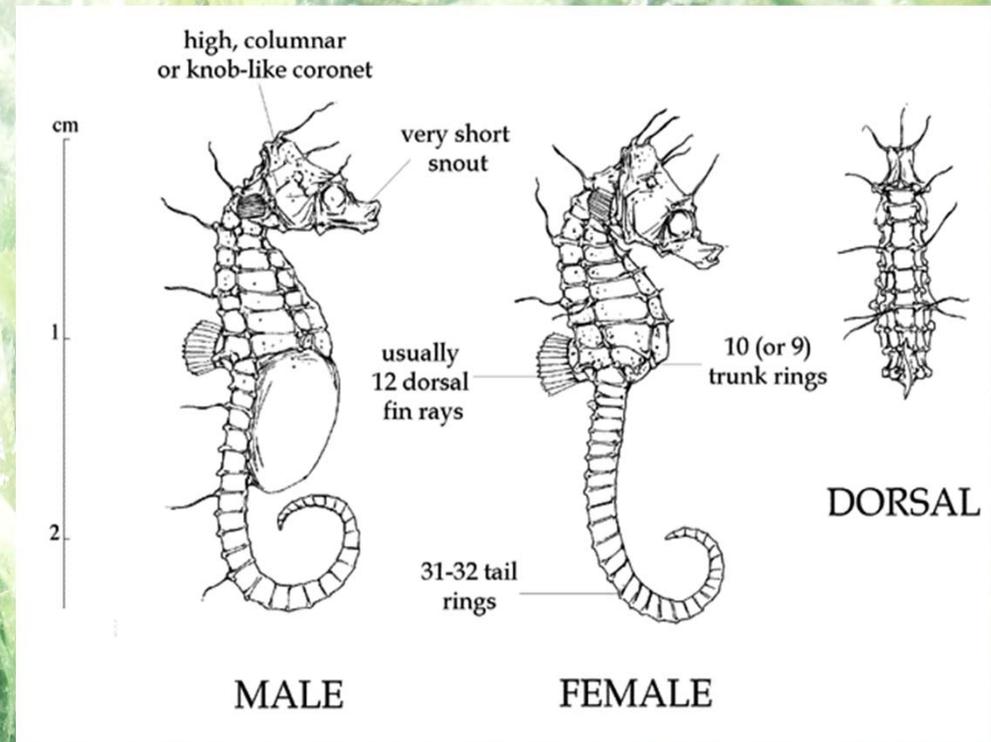


Illustration by Laurence Richardson in  
Lourie *et al.* 2004

# Dwarf Seahorse

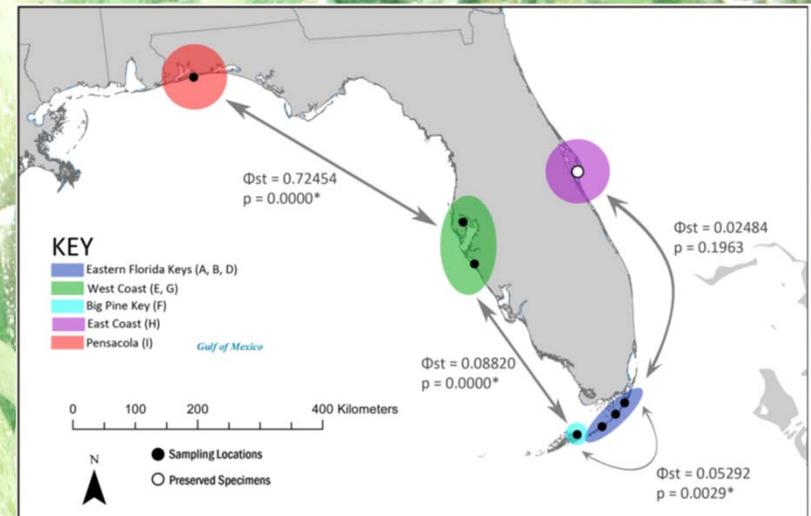
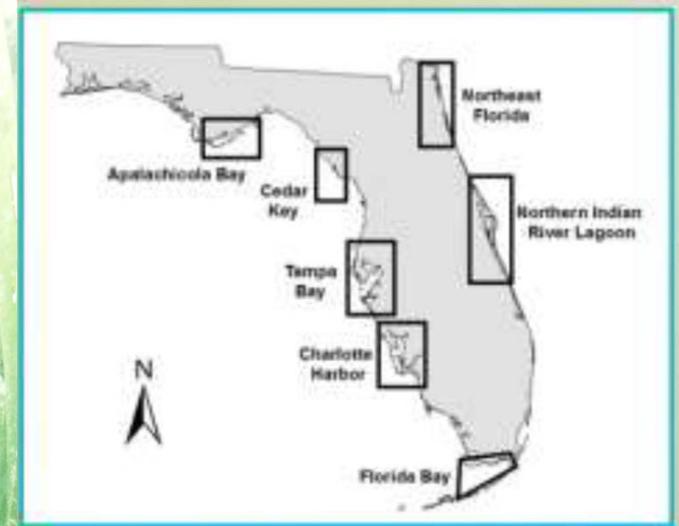
*Hippocampus zosterae*

## POPULATION STATUS – Unknown

FWRI fishery-independent seine surveys indicate decreasing abundance in the northern part of the state; relative abundances were highest in Florida Bay, Charlotte Harbor, Tampa Bay.

## POPULATION STRUCTURE

Evidence for discrete populations in Florida; Rafting likely maintains some connectivity (Fedrizzi *et al.* 2015)



# Species of Conservation Concern

## INTRINSIC VULNERABILITY

- High site fidelity, monogamous pairs, season, limited mobility, habitat specialist (seagrass)

## EXTERNAL DRIVERS

- Habitat loss caused by degradation of seagrass
- Targeted commercial collection for the aquarium and curio trade
- Recreational collection
- Bycatch mortality from bait shrimp/pink shrimp fisheries (Baum *et al.* 2003)

## LISTING AT INTERNATIONAL AND NATIONAL SCALES

IUCN (LC) – Based largely on Gulf Data  
CITES Appendix II –  
CBD Proposed listing on ESA (2011)  
Ongoing Status Review for listing on ESA



Extinct

EX

EW

Threatened

CR

EN

VU

NT

LC

Least Concern

# Subject to domestic and international regulation

## Convention on International Trade in Endangered Species (CITES)

- Appendix II listing in 2002
- Ensures international trade does not harm local wildlife
- Requires permits to export

## Managed by FWC part of the Marine Life Fishery in Florida

- Limited- entry commercial fishery
- Gear restrictions
- Commercial and recreational bag limits
- Annual commercial quota with harvest reductions
- Allowable harvest area
- State-wide seasonal closure (proposed, not well supported)

Unquantified: bycatch mortality, curio trade, recreational fishery



*H. Histrix*  
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## Study objectives and questions

Using IBBEAM epifaunal monitoring data collected along the western near-shore of Biscayne Bay, in collaboration with Ecosystem Investigations Unit (NOAA SEFSC), we are investigating:

- **Q1** – How has the abundance of *H. zosteræ* varied over time?
- **Q2** – How do seasonal dynamics affect the distribution of *H. zosteræ*?
- **Q3** – Where is *H. zosteræ* most likely to occur?
- **Q4** – What are characteristics of habitats occupied by *H. zosteræ*?
- **Q5** – How is *H. zosteræ* likely to be affected by regional management initiatives?

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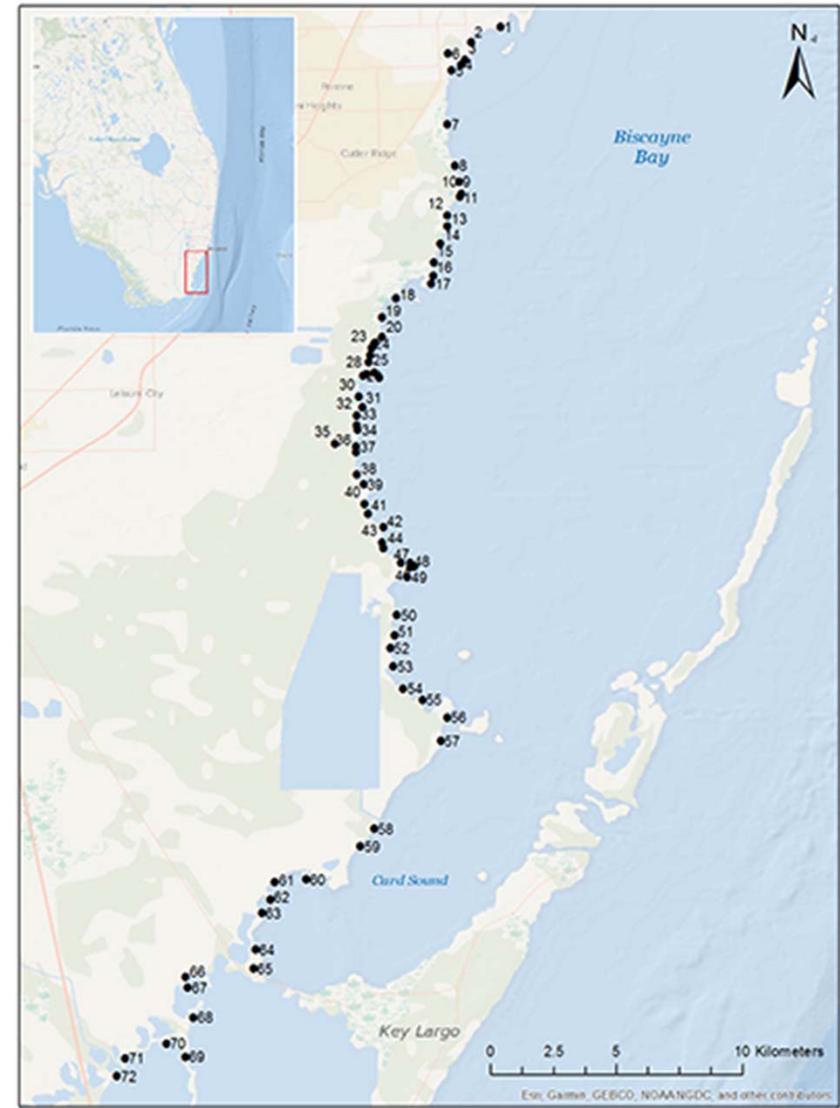
**First multi-year, multi-season study of *H. zosterae* abundance in Biscayne Bay, and an opportunity to more clearly define essential habitat for this species of conservation concern**

# Methods

**Site Description:** Epifaunal communities and SAV habitat surveyed at 72 fixed-sampling sites located along the southwestern Biscayne Bay nearshore zone ( $\pm 50$  m) during the dry (January-March) and wet (July-September) season from 2008–2011.

**Field Sampling:** Three throw traps (measuring 45 cm by 1 m<sup>2</sup>) per site (Kushlan 1981, as modified by Robblee *et al.* 1991); samples collected by sweeping 4 times inside the trap. Identification and measurement in lab.

**Statistical Analysis:** Statistical analysis performed with XLStat statistical package. Statistical analyses were performed with a Type 1 error criterion of  $\alpha = 0.05$ .



time

sites

sites	DRY 2005	WET 2005	DRY 2006	WET 2006	DRY 2007	WET 2007	DRY 2008	WET 2008	DRY 2009	WET 2009	DRY 2010	WET 2010	DRY 2011	WET 2011	DRY 2012	WET 2012	DRY 2013	WET 2013	DRY 2014	WET 2014	DRY 2015	WET 2015	DRY 2016	WET 2016	DRY 2017	WET 2017	TOTAL
1																			1				2				3
2																			1								1
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46																											1
47																											6
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63	NA	NA	NA	NA																							2
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66	NA	NA	NA	NA																							1
67	NA	NA	NA	NA																							4
68	NA	NA	NA	NA																							5
69	NA	NA	NA	NA																							3
70	NA	NA	NA	NA																							10
71	NA	NA	NA	NA																							6
72	NA	NA	NA	NA																							2
TOTAL					4	3	2	10	11	7	6	12	6	3	11	8			4		4	1	3	1	3	2	98

time

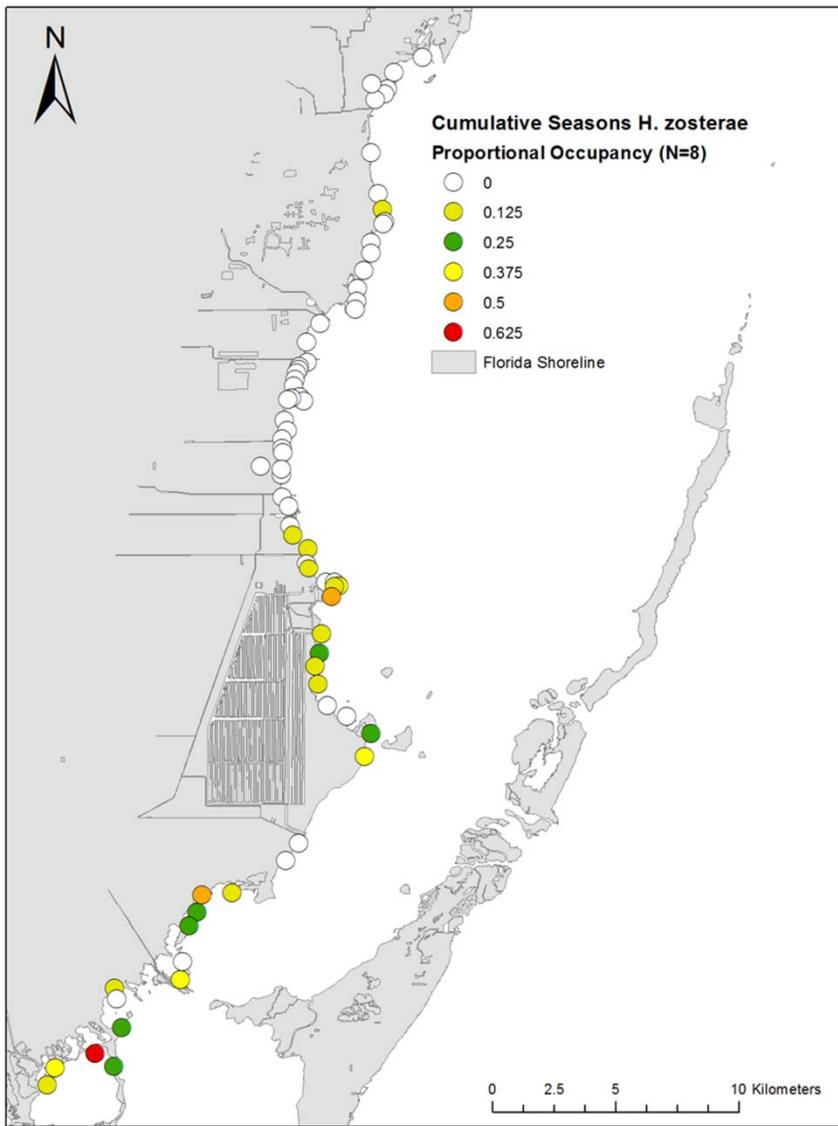
sites

sites	DRY 2005	WET 2005	DRY 2006	WET 2006	DRY 2007	WET 2007	DRY 2008	WET 2008	DRY 2009	WET 2009	DRY 2010	WET 2010	DRY 2011	WET 2011	DRY 2012	WET 2012	DRY 2013	WET 2013	DRY 2014	WET 2014	DRY 2015	WET 2015	DRY 2016	WET 2016	DRY 2017	WET 2017	TOTAL	
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71	NA	NA	NA	NA																							6	
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TOTAL																												98

**72 sites surveyed from 2008–2011**

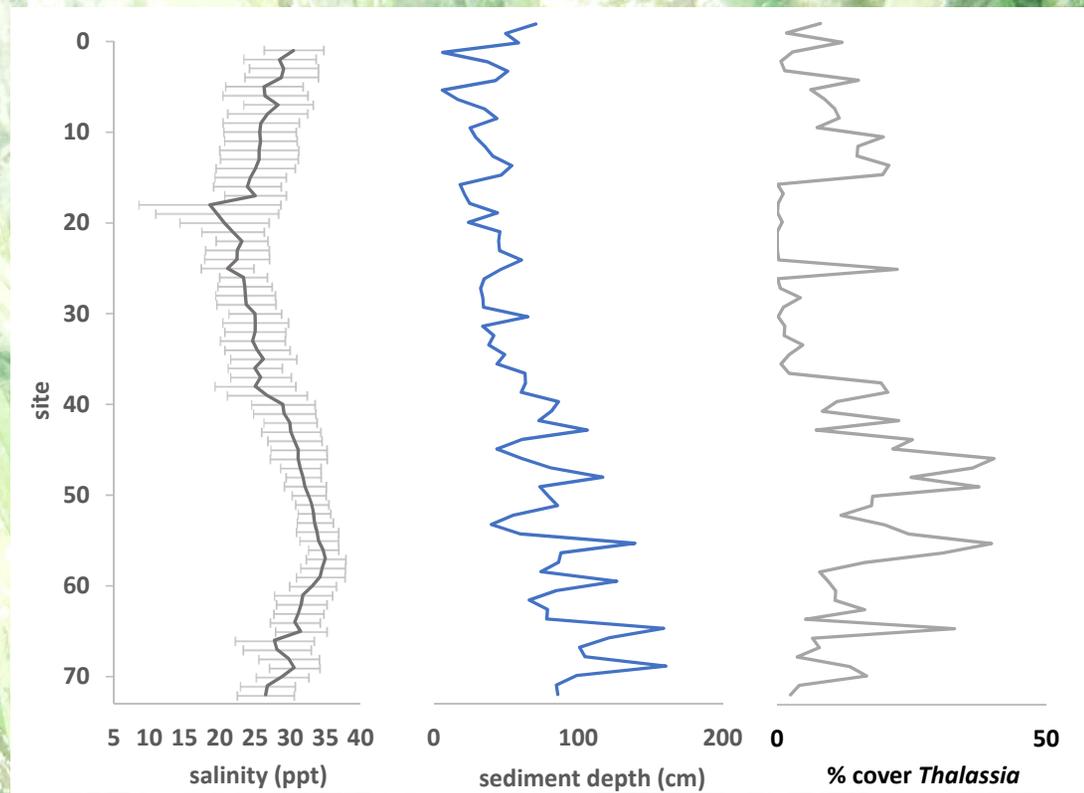
**4 surveys in the wet season**  
**4 surveys in the dry season**

**577 total site observations**  
**66 observed *H. zosteræ***



## Distribution in Biscayne Bay

- Higher frequency of occurrence southern Biscayne Bay
- Higher, less variable salinity, deeper sediment, with high % cover *Thalassia*



# Abiotic predictors of occurrence – Salinity and Sediment Depth

## High salinity, low variation in salinity, and deep sediment predict Dwarf Seahorse occurrence

Salinity logistic regression  $R^2 = 0.413$ ;  $-2 \text{ Log(Likelihood)}$   $\text{Pr} > \text{Chi}^2 = < 0.0001$

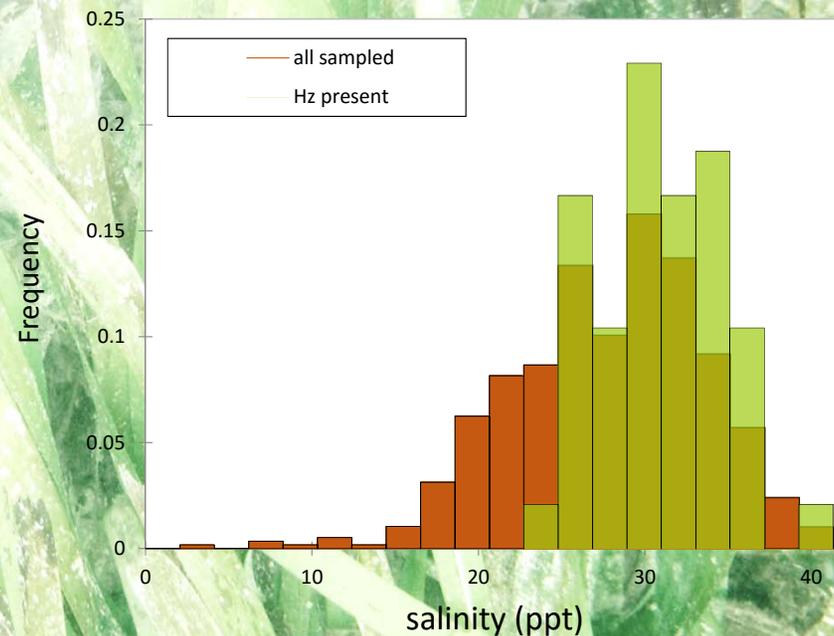
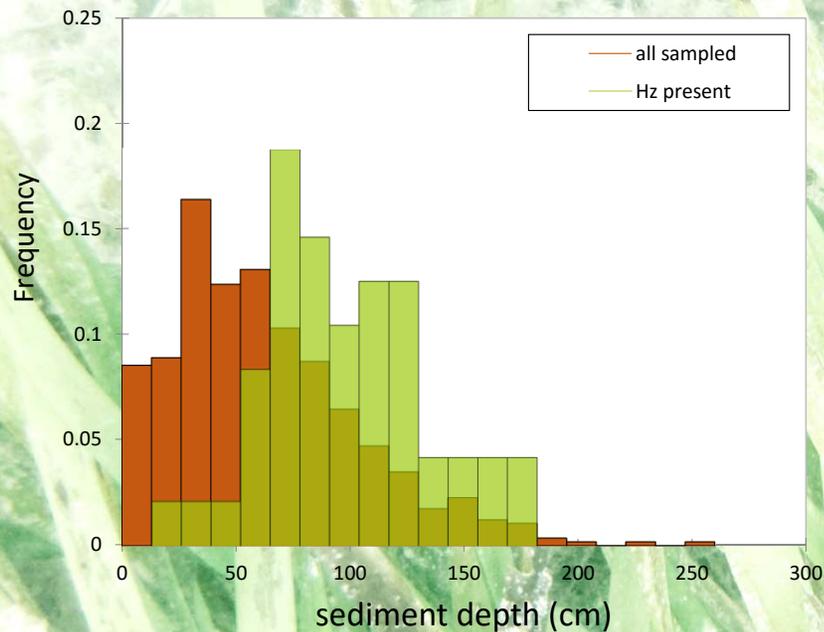
SD salinity logistic regression  $R^2 = 0.37$   $-2 \text{ Log(Likelihood)}$   $\text{Pr} > \text{Chi}^2 = < 0.0001$

Sediment depth (cm) logistic regression  $R^2 = 0.615$   $-2 \text{ Log(Likelihood)}$   $\text{Pr} > \text{Chi}^2 = < 0.0001$

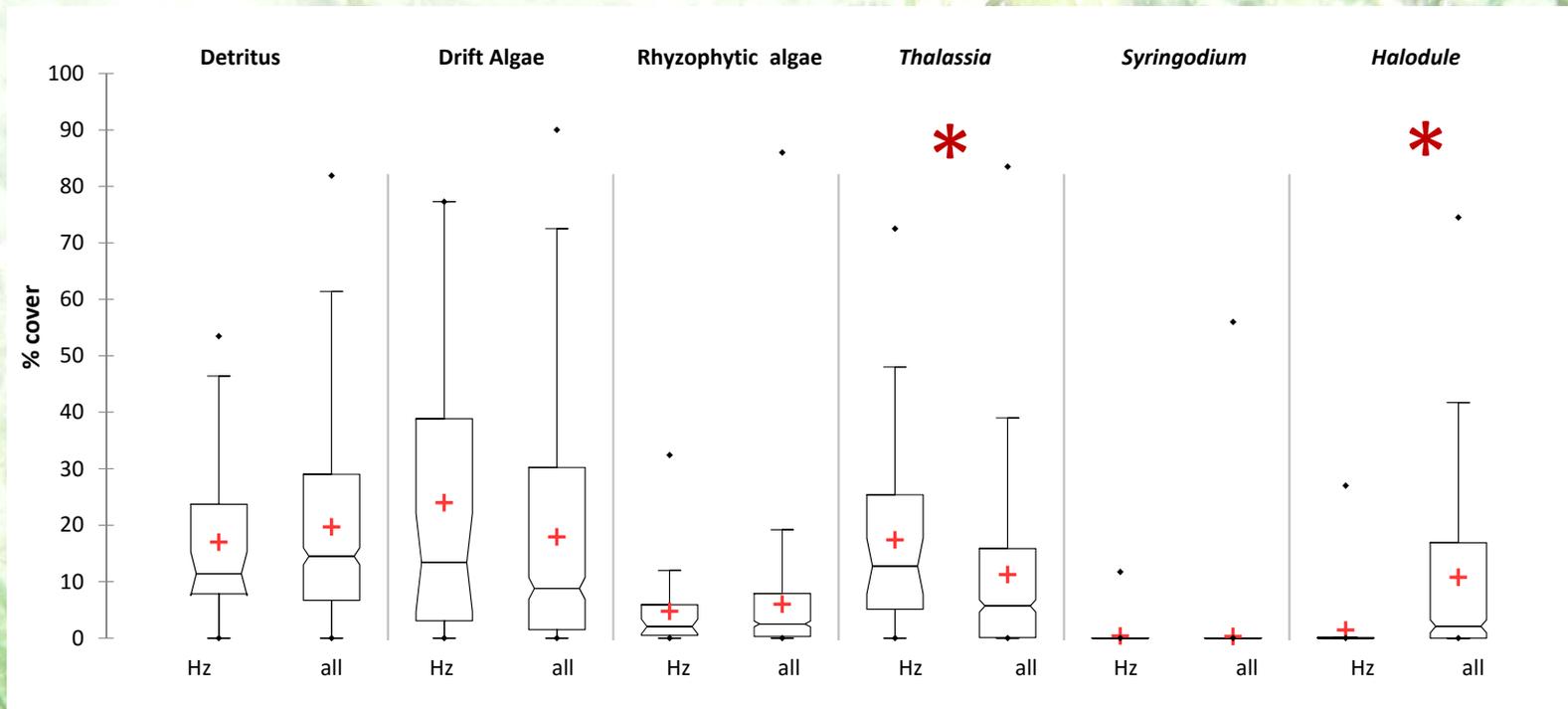
## Southern Biscayne Bay provides higher, less variable salinities AND deeper sediment

-influence of freshwater canal discharge

-relatively sheltered by keys and relatively extensive mangrove coverage

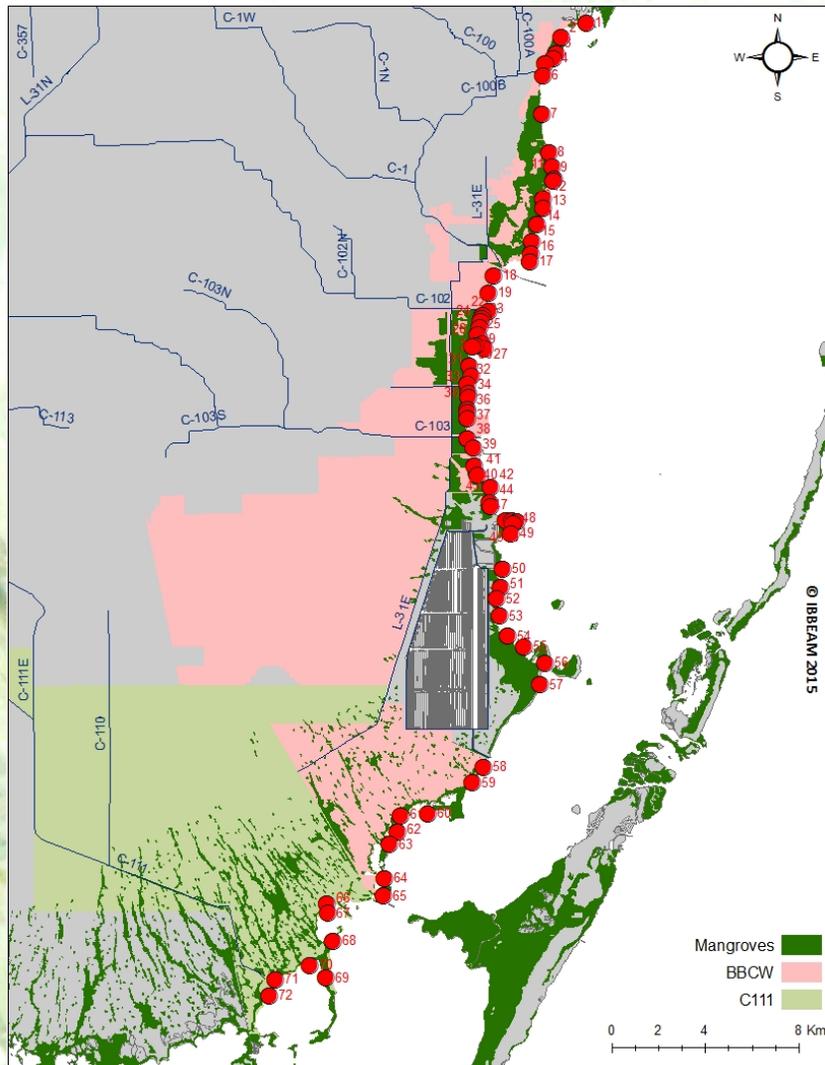


## Site characteristics and biotic predictors of occurrence



Occupied sites characterized by high % cover of Drift Algae ( $24\% \pm 2\%$ ) and *Thalassia* ( $17\% \pm 2\%$ ) which are also characteristic of higher salinities, and low % cover of *Halodule*, associated with variable and low salinity regimes.

\* = distribution of measurements significantly differ (two-sample Kolmogorov-Smirnov tests,  $\alpha=0.5$ ,  $p < 0.0001$ )



## Management implications

Biscayne Bay may be a center of abundance on the Atlantic coast, populations are likely to exhibit limited connectivity to the more robust Gulf populations.

Potential reduction in available habitat in the nearshore region with implementation of CERP projects - Biscayne Bay Coastal Wetlands Project (BBCW) and C-111 South Dade Project

-seeks to establish persistent mesohaline (<20 ppt) conditions

Range contraction may lead to increased vulnerability to stochastic environmental events (i.e. seagrass die-offs due to algae blooms) in Biscayne Bay.

Information should inform management and Status Review