An underwater photograph of a seagrass bed. The water is clear and blue. In the foreground, there are green seagrass blades. In the background, several sea cucumbers are visible, some appearing to be burrowing into the seagrass. The overall scene is a natural, underwater environment.

# Effect of burrowing sea cucumbers, *Holothuria arenicola*, on seagrass beds of Abaco, Bahamas

Liberty Boyd\*, Elizabeth Stoner, Pamela Murata,  
Stephanie Archer, Katherine Comer Santos, Michael  
Hiethaus, and Elizabeth Whitman

# Green Sea Turtle, *Chelonia mydas*



Gary Brennand, National Geographic

# Seagrass Diversity



## Dominant seagrasses species in the Bahamas (Phillips et al., 1982)

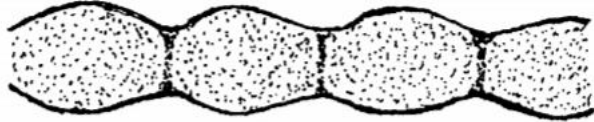
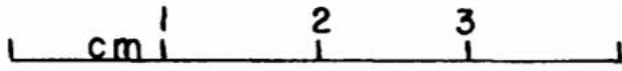
1. *Thalassia testudinum* – turtle grass
2. *Halodule wrightii* – shoal grass
3. *Syringodium filiforme* – manatee grass



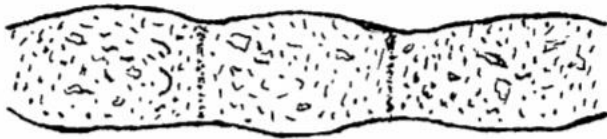


# *Holothuria arenicola* Semper





A *A. agassizi*



B *H. mexicana*



C *H. arenicola*

Figure 4. Diagrams of excretory boluses produced by A, *Actinopyga agassizi* Selenka; B, *Holothuria mexicana* Ludwig; C, *Holothuria arenicola* Semper.



# How is *H. arenicola* effecting seagrass beds in Abaco, Bahamas?

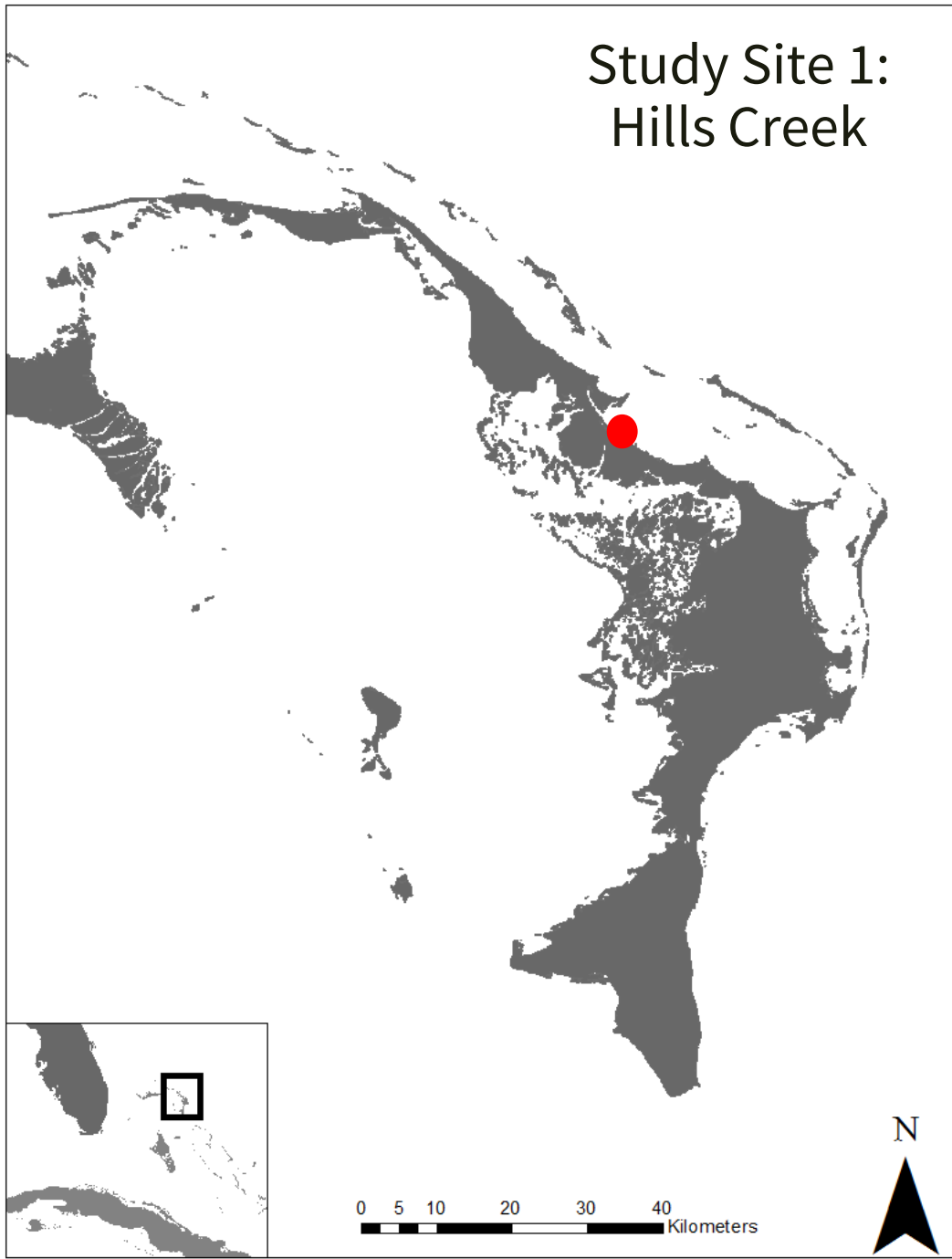
What are the dynamics of *H. arenicola* mounds in seagrass beds?

How does *H. arenicola* effect nutrient availability in the seagrass beds?

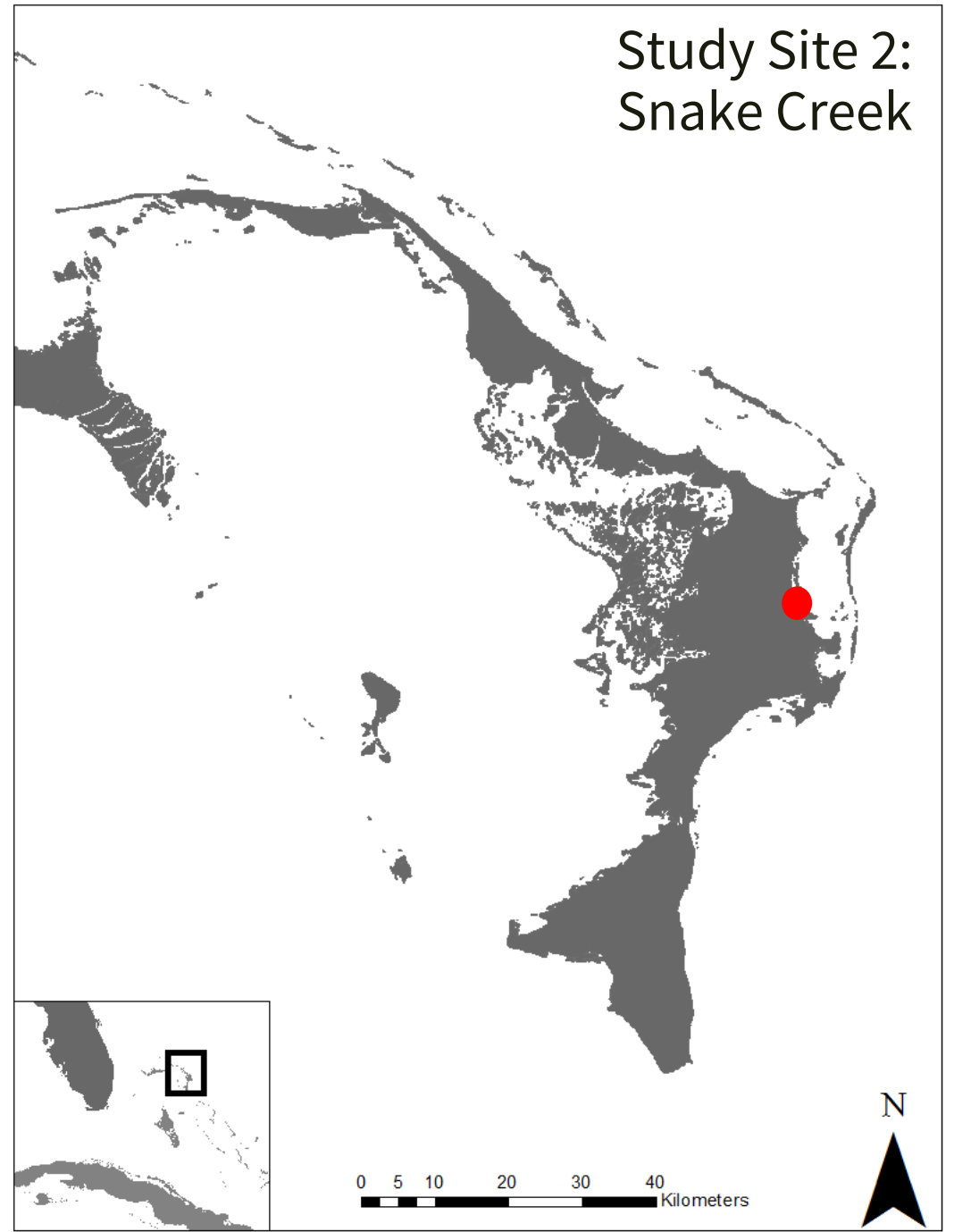
Is sea turtle grazing influenced by the presence of *H. arenicola* mounds?

What is the behavior of *H. arenicola* when exposed from their mounds?

Study Site 1:  
Hills Creek

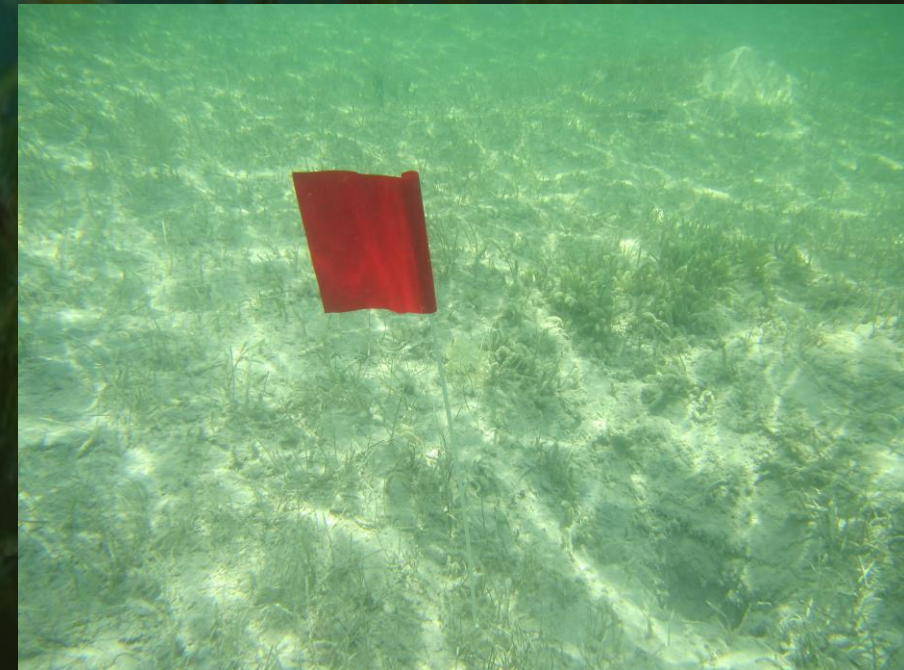


Study Site 2:  
Snake Creek





# Methods- Observational Plots



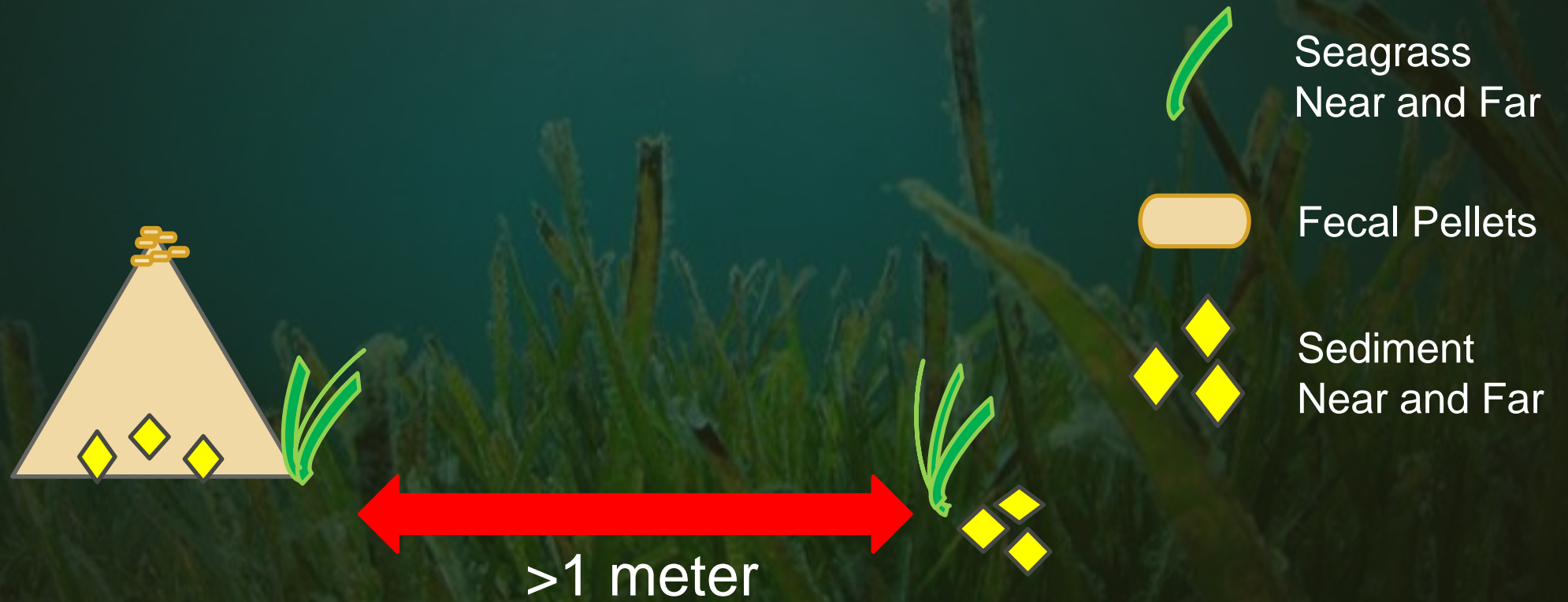
# Study Site 1: Hills Creek



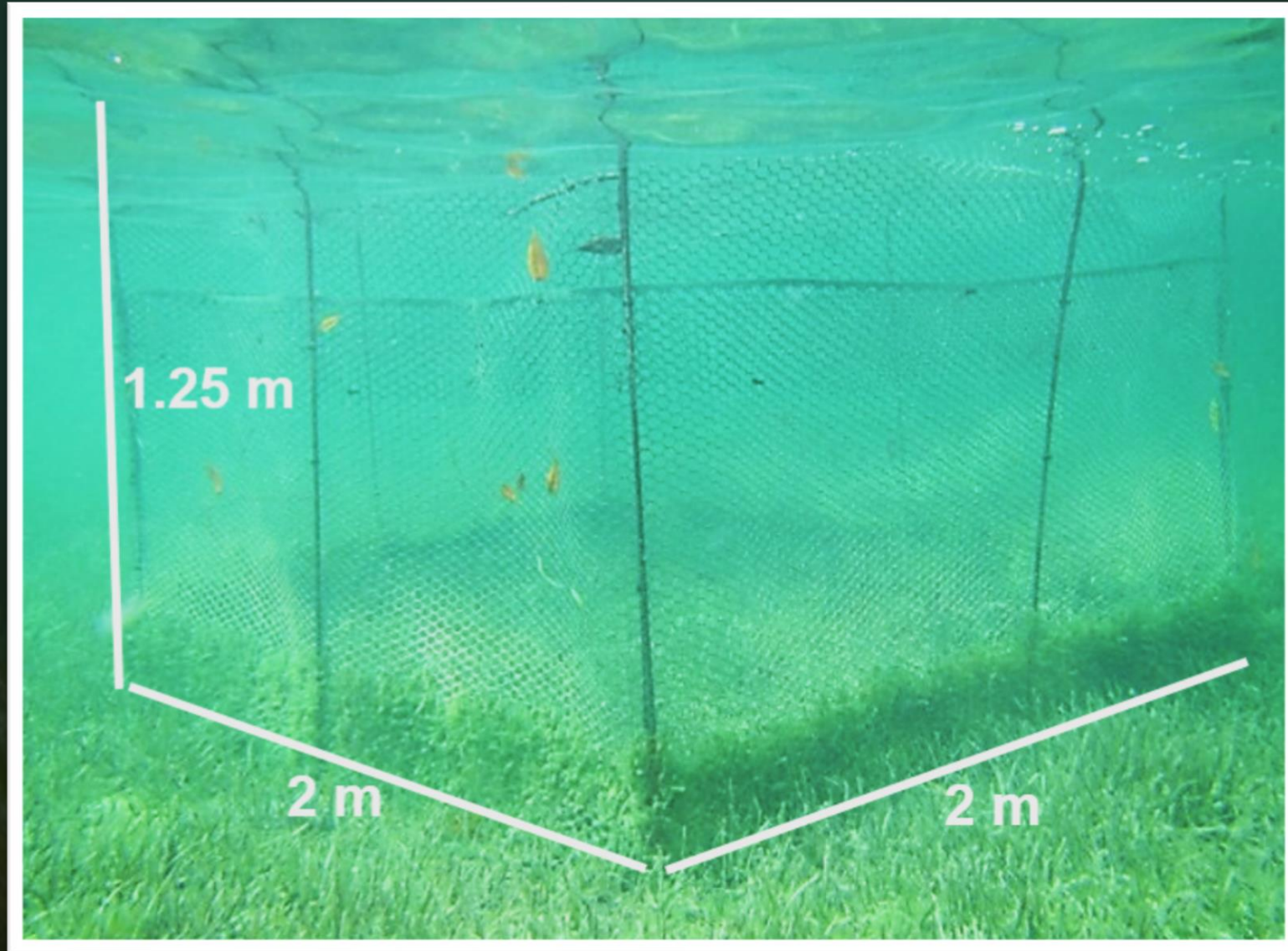
# Study Site 2: Snake Creek



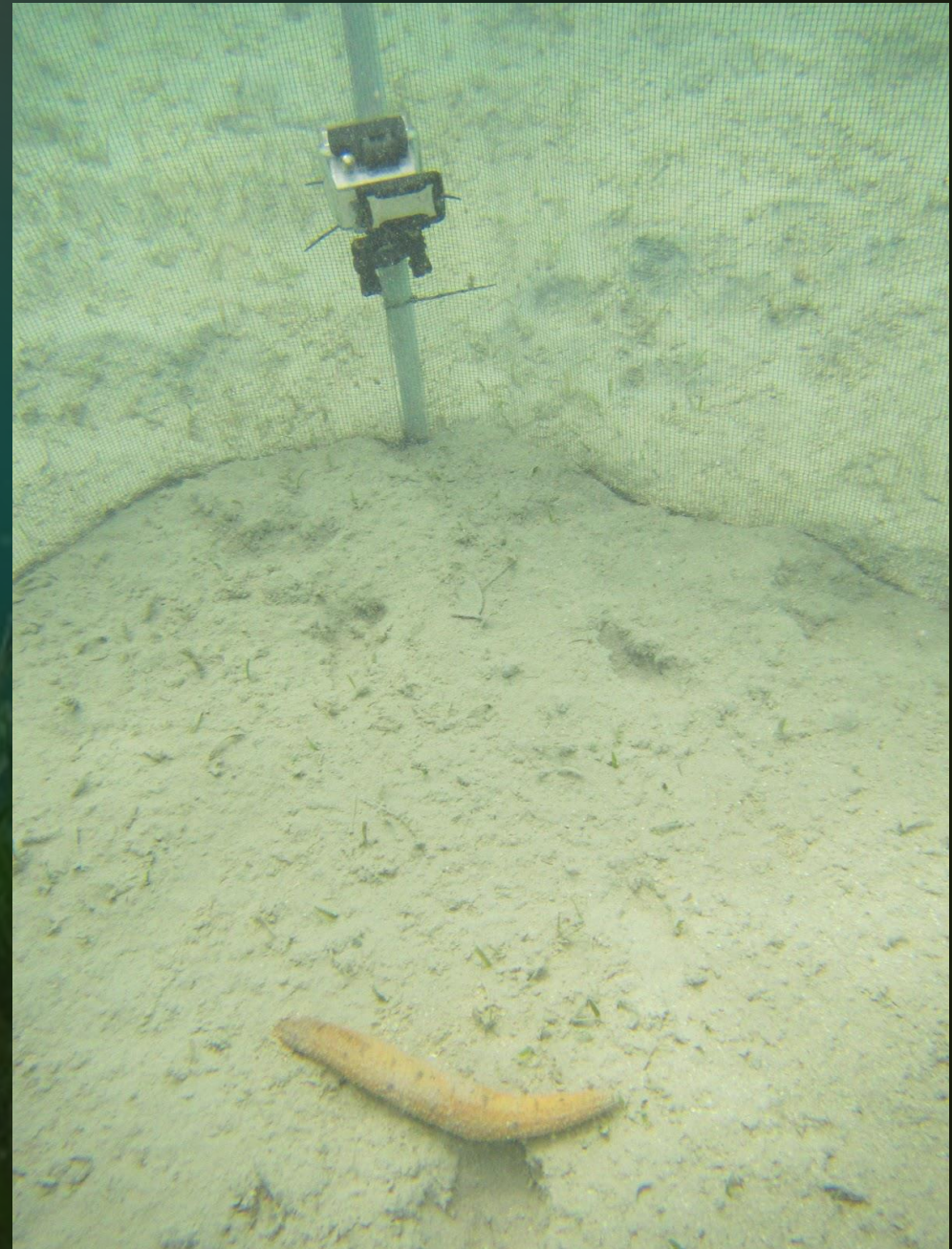
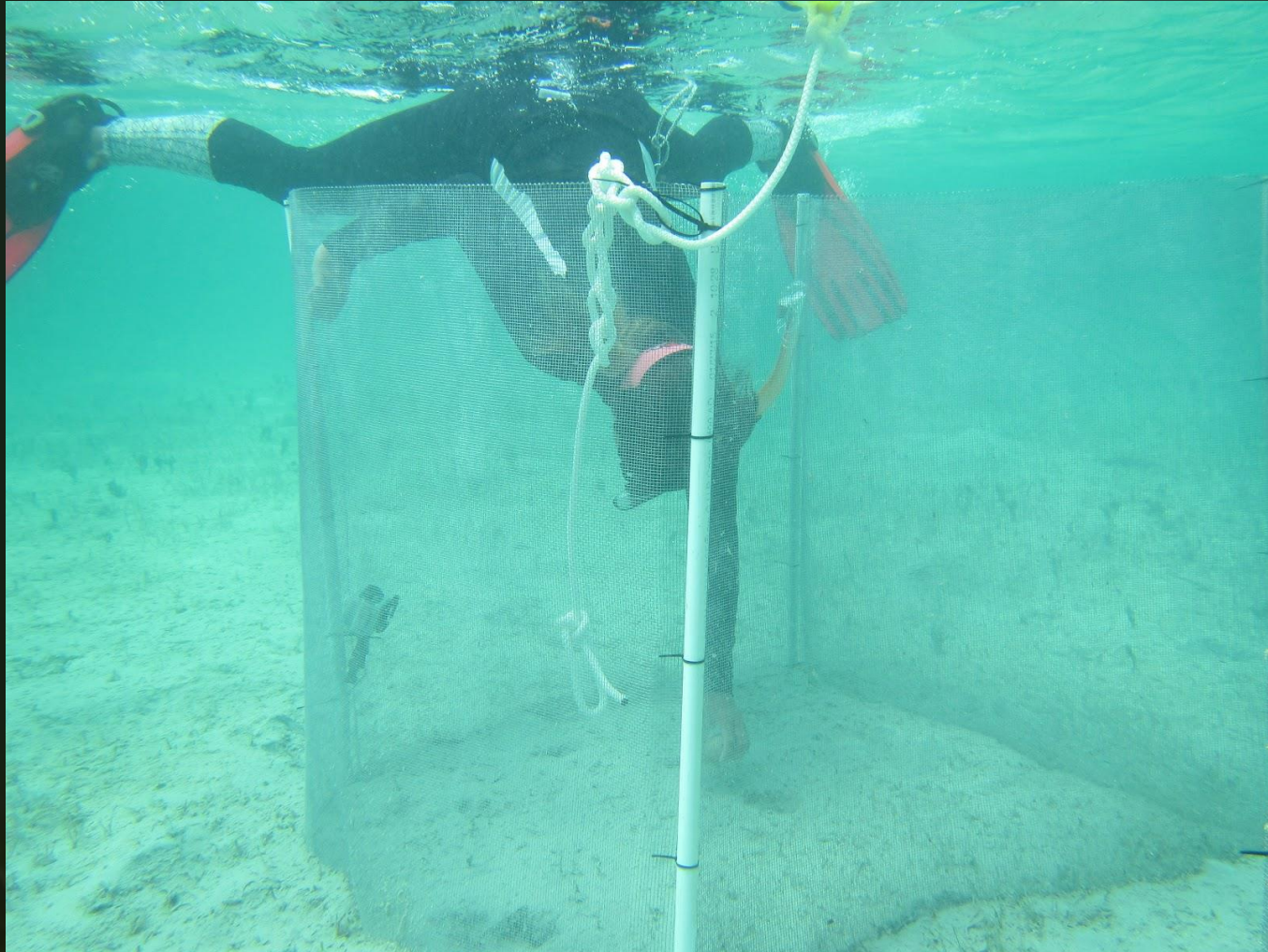
# Methods- Seagrass Sampling



# Methods- Turtle Grazing Exclusion Deceives

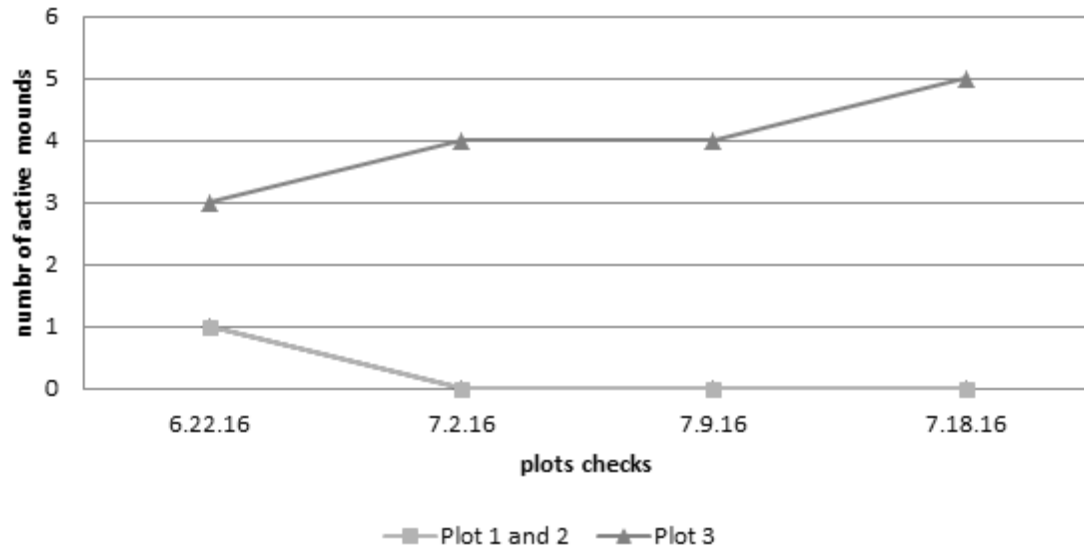


# Methods- GoPro Video

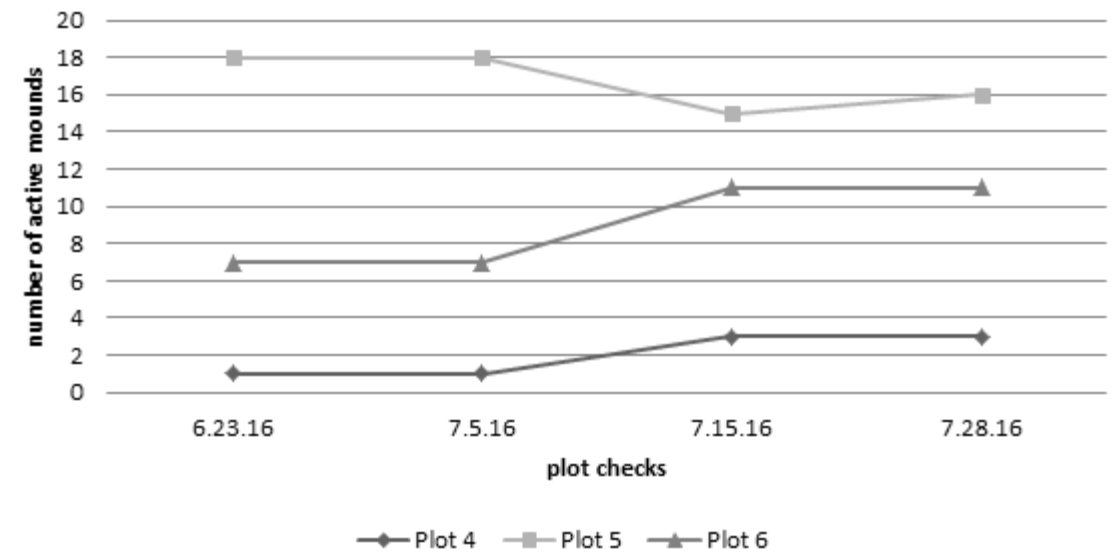


# Results- Observational Plots

## Site 1 number of active mounds per check

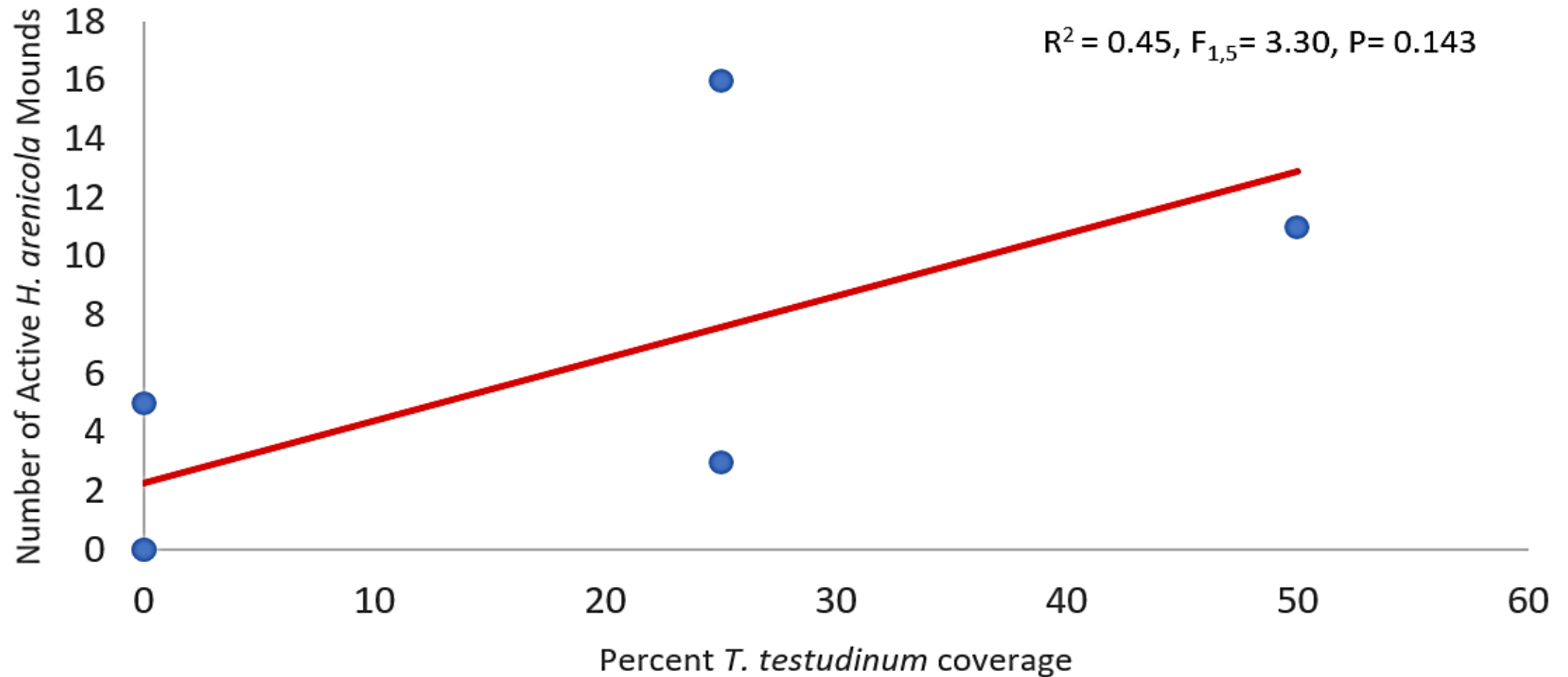


## Site 2 number of active mounds per check



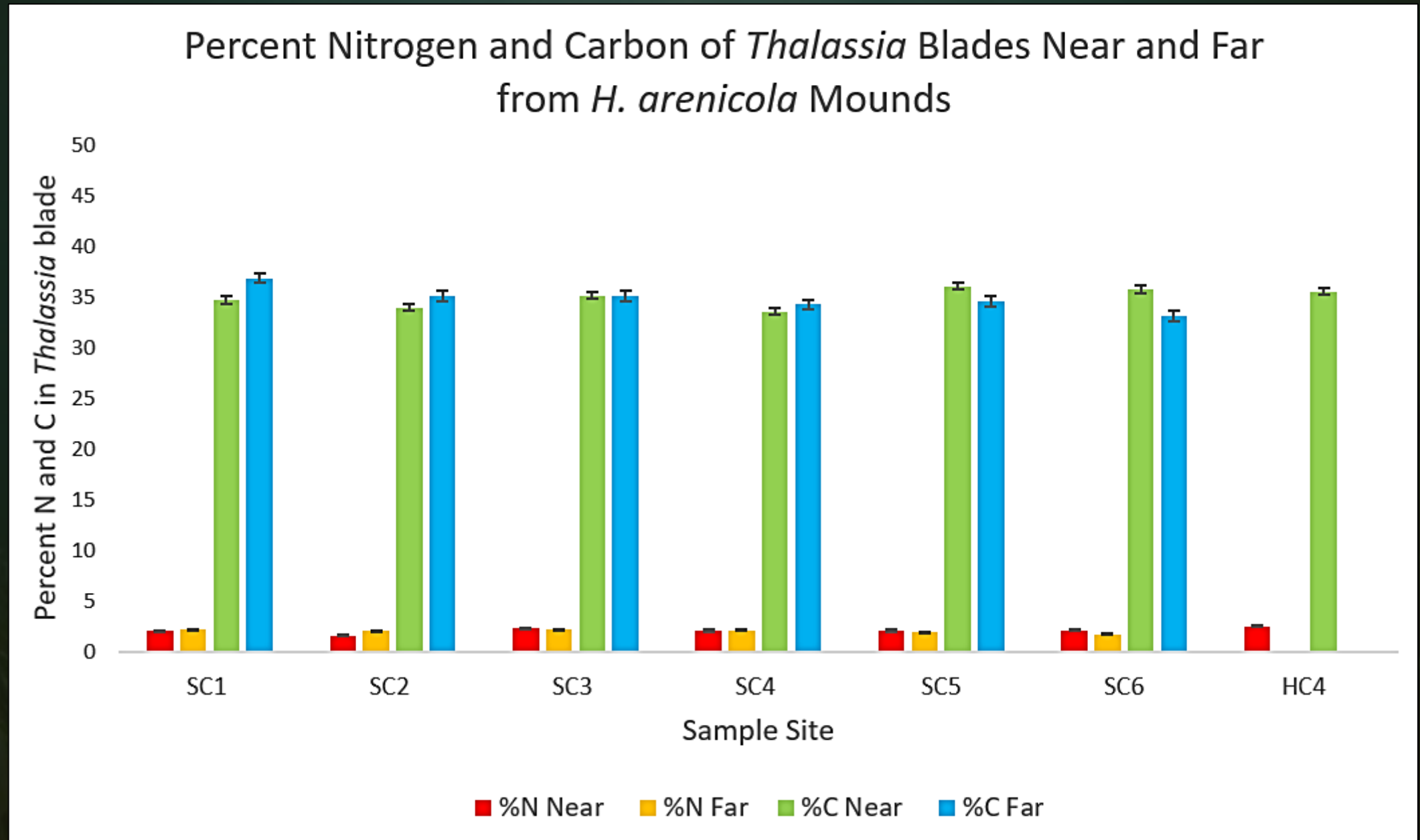
# Results- Observational Plots

Active *H. arenicola* mounds in relation to percent *T. testudinum* coverage





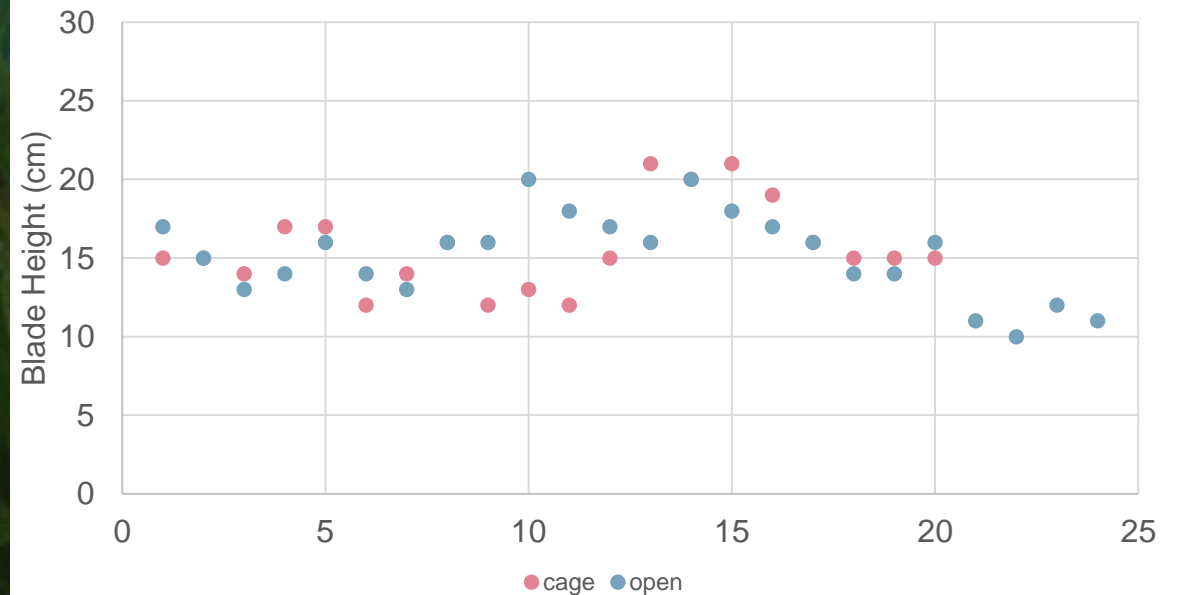
# Results- Nutrient Analysis



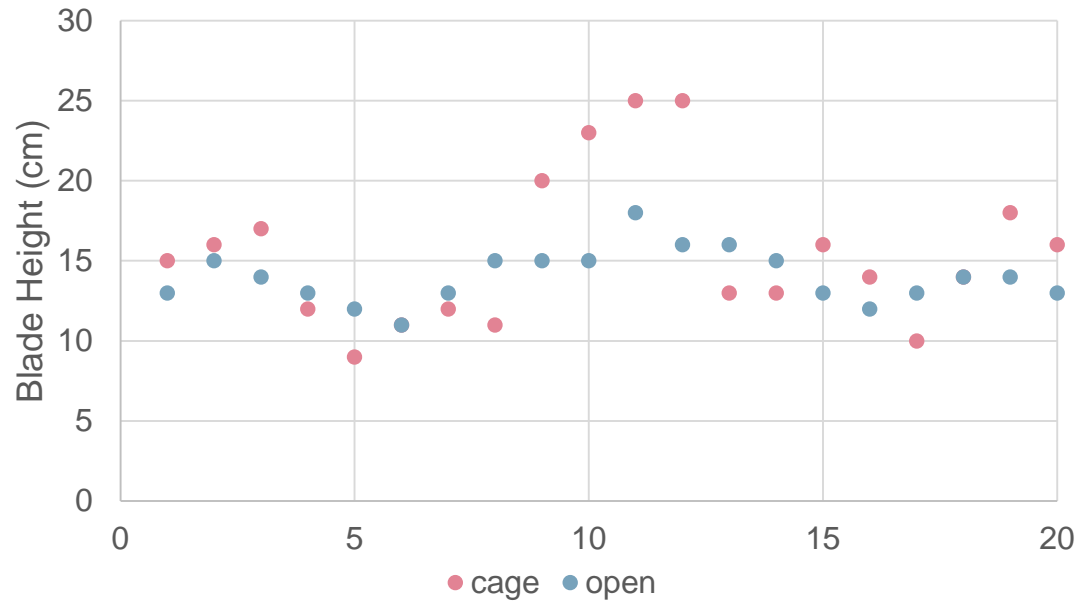
# Results-Turtle grazing activity based on canopy height of *T. testudinum*

Site 2 Snake Creek:  $t=0.65$ ,  $df=42$ ,  $P=0.52$

## Canopy Height in Snake Creek



## Canopy Height in Hills Creek



Site 1 Hills Creek:  $t=1.34$ ;  $df=38$ ,  $P=0.19$

# Results- GoPro Video



# Discussion

- Burrowing sea cucumbers add little to no extra nutrients to seagrass. This could be linked to the microbial community in their guts.
- The species has no significant impact on green sea turtle grazing preferences.
- *H. arenicola* mounds may be a competitor for space for seagrass beds.
- Visual observations in the field leads us to believe there is some alternative relationship between seagrass and burrowing sea cucumbers.

# Discussion



BIS photo/ Gladstone Thurston

In Andros, Bahamas, one Chinese company, SUNCO Wholesale Seafood Ltd., was granted access to harvest over 5,000 sea cucumbers daily.  
(Bahamas B2B, 2010)



David Kirkland/Design Pics/Corbis

# Future Studies

- Test Dissolved Oxygen levels in the sediments to measure the effects of bioturbation in seagrass beds
- Acquire more data on *H. arenicola* mounds and seagrass beds in Abaco
- Extend the study to evaluate *H. arenicola* populations throughout the Caribbean and Gulf of Mexico

# Acknowledgements



**Harriet L. Wilkes Honors College Foundation  
Florida Atlantic University Life Long Learning Society  
Florida Atlantic University Alumni Association  
Ryley Parent  
Laura Thornton  
Maximillian Theo**

