

College of Saint Benedict and Saint John's University

DigitalCommons@CSB/SJU

Celebrating Scholarship and Creativity Day

Undergraduate Research

4-21-2022

Cushion Sea Stars (*Oreaster reticulatus*) have the Ability to Respond to Disturbance

Peyton Kopel

College of Saint Benedict/Saint John's University, pkopel002@csbsju.edu

Thomas Ellis

College of Saint Benedict/Saint John's University, tellis001@csbsju.edu

Follow this and additional works at: https://digitalcommons.csbsju.edu/ur_cseday

Recommended Citation

Kopel, Peyton and Ellis, Thomas, "Cushion Sea Stars (*Oreaster reticulatus*) have the Ability to Respond to Disturbance" (2022). *Celebrating Scholarship and Creativity Day*. 183.

https://digitalcommons.csbsju.edu/ur_cseday/183

This Poster is brought to you for free and open access by DigitalCommons@CSB/SJU. It has been accepted for inclusion in Celebrating Scholarship and Creativity Day by an authorized administrator of DigitalCommons@CSB/SJU. For more information, please contact digitalcommons@csbsju.edu.

Introduction

- 45% of cushion sea stars (*Oreaster reticulatus*, CSS) can be found in seagrass (*Thalassia testudinum*, while 51% occur in coral reef patches mixed with seagrass, and 4.0% are found exclusively in coral reefs (Guzmán & Guevara, 2002) (Figure 1).
- Preferred habitat includes calm, shallow, subtropical waters, with a calcareous sandy bottom (Miranda & Patel, 2011).
- They are omnivores, with a diet consisting of algae, diatoms, crab larvae, and other small organisms (Miranda & Patel, 2011).
- Typical movement patterns consist of an average distance of six meters (19.7 feet) per day (Smith, 1940).
- We hypothesized that there would be a difference in the distance moved among *Oreaster reticulatus* in disturbed and undisturbed environments.
- We predicted that when in disturbed environments, *Oreaster reticulatus* would move a greater distance as compared to undisturbed environments.



Figure 1. Cushion sea stars (*O. reticulatus*). E. Ochoa.

Methods

- CSS were observed March 9 - 11, 2022, in Graham's Harbor, San Salvador, Bahamas at 1100 and 1500 hours. All animals were tracked for one hour.
- Disturbed environment: CSS were moved to a central location (Figure 2).
- Undisturbed environment: CSS were marked in their original location (Figure 3).
- Data analysis was conducted using a t-test.



Figures 2 and 3. In the disturbed environment method, CSS were moved to a central point where measurement began. In the undisturbed method, CSS were marked where found and measured later. Photos: T. Ellis.

Results

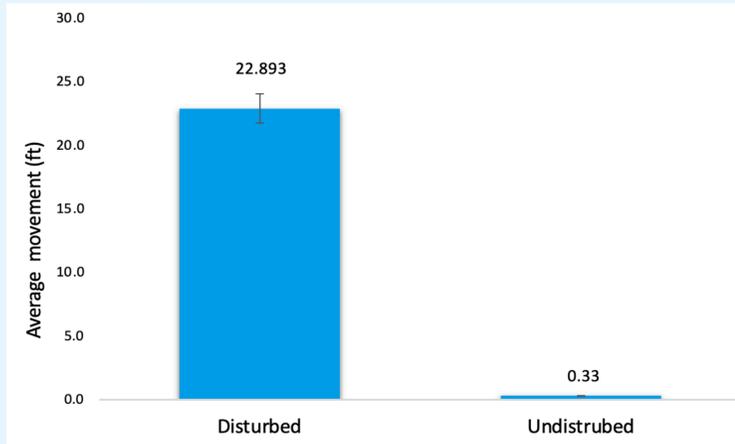


Figure 4. Average movement of *O. reticulatus* in disturbed vs undisturbed environments. Percent error was calculated (n = 3).

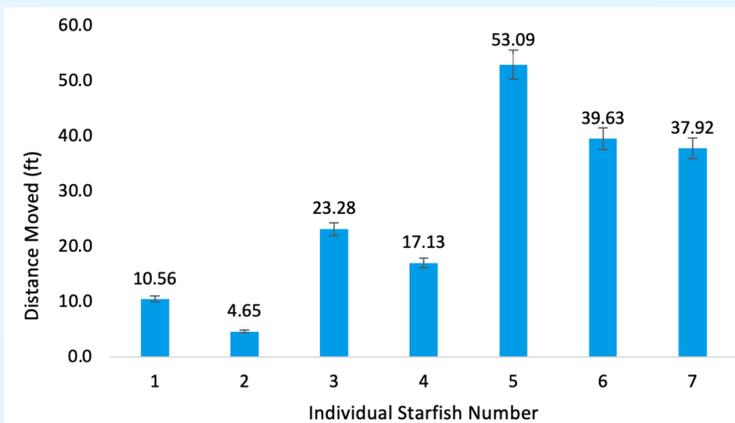


Figure 5. Average movement of *O. reticulatus* between seven individually numbered cushion sea stars in a disturbed environment. Percent error was calculated (n = 3).

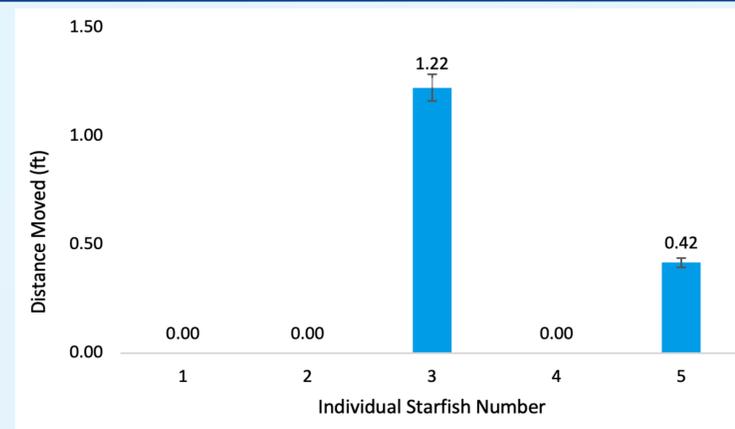


Figure 6. Average movement of *O. reticulatus* between five individually numbered cushion sea stars in an undisturbed environment. Percent error was calculated (n = 3).

Table 1. Analysis results in disturbed/undisturbed environments.

	Disturbed	Undisturbed
Mean	22.893	0.328
Standard Deviation	24.95	0.98
Variance	509.785	0.958
Observations	12.000	15.000
H ₀ Mean Difference	0.000	
df	11.000	
t Stat	3.459	
P(T<=t) one-tail	0.003	
t Critical one-tail	1.796	
P(T<=t) two-tail	0.005	
t Critical two-tail	2.201	

Discussion

- Data analysis results show a statistical difference between the distance moved among cushion sea stars in disturbed and undisturbed environments.
- This supports our hypothesis that there is a difference between the two external sensory inputs.
- A factor that could have disrupted data results was human interference at the testing site, as Graham's Harbor is a frequented snorkeling location.
- Another factor to consider is human error when measuring underwater distances.

Conclusions

- Our hypothesis was supported; the difference between disturbed and undisturbed environments was statistically significant (P(T<=t) two-tail = 0.005).
- In future experiments, a more controlled environment and a more efficient underwater measuring device may be beneficial.
- It would be interesting to investigate directionality and distances moved relative to various ages of the cushion sea stars.

Acknowledgements

We would like to thank the Gerace Research Center and CSBSJU for giving us the opportunity to conduct this research project. An additional thank you to Professor Kristina Timmerman and Dr. Trevor Keyler for organizing the travelling logistics.

References

- Guzmán, H. & Guevara, C. (2002) Annual reproductive cycle, spatial distribution, abundance, and size structure of *Oreaster reticulatus* (Echinodermata: Asteroidea) in Bocas del Toro, Panama. *Marine Biology*. 141(1), 1077-1084. <https://doi.org/10.1007/s00227-002-0898-2>
- Miranda, R. & Patel, S. (2011). *Oreaster reticulatus*. Animal Diversity Web. https://animaldiversity.org/accounts/Oreaster_reticulatus/
- Smith, G. M. F. (1940). Factors limiting distribution and size in the starfish. *Journal of the Fisheries Board of Canada*. 5a(1). <https://doi.org/10.1139/f40-010>