

Distribution of sea urchin density and community structure in different habitats along the northeastern coast of Trinidad

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Context

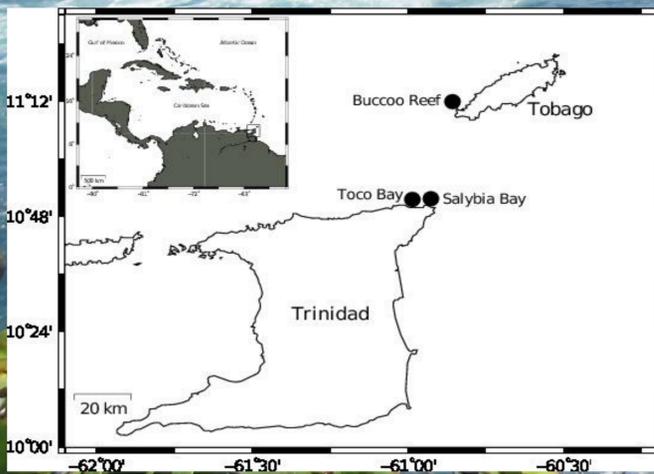
- Pawson (2007) stated that there are 433 echinoderm species located in the Caribbean Sea alone.
- Sea urchins (Echinodermata: Echinoidea) have an integral impact on coral reef communities, specifically related to their effects on algae and bioerosion (Schiel & Foster 1986, Hendler, Miller, Pawson, & Kier 1995).
- Echinometra lucunter* distribution, density, and abundance is likely under-represented due to undersampling (Alvarado, 2011).

Main Objectives

- (1) To assess sea urchin density and color morphotypes (red and black) on reef locations experiencing both high and low wave action.
- (2) To assess sea urchin morphology in different habitats.

Project Background

- The map (below) shows Grande L' Anse (GA), Toco Bay reef and Salybia Bay (SB) reef, Trinidad (located between 10°50.097'N, 60°55.208'W and 10°50.097'N, 60°54.975'W respectively).



Methods

- Random Toss Quadrat Method (1 m²).
- Count every sea urchin within the quadrat (Red vs Black colormorph).
- We used a flattened metal rod to gently pry each sea urchin attached to its hard substrate (Fig. 1).
- We measured the test diameter of randomly selected sea urchins from each quadrat using Vernier calipers (Fig. 1)
- Urchins were weighed with a digital scale.

Sea urchin color morphotypes along the north coast of Trinidad



Fig. 1. Variation in color morphotype of *Echinometra lucunter* and test diameter measurement used at both study sites along the northeastern coast of Trinidad.



Fig. 4. Variation in rocky (low wave action) and open (high wave action) habitat at sites along the northeastern coast of Trinidad.

Results

- Urchins in either habitat at both sites were more likely to have a test diameter ranging from 21-40 mm in length (Figs. 2 a-b).
- sea urchins with the largest test diameters (51-70 mm) were found in areas of low wave action (Figs. 2 a, b).
- Mean test diameter was significantly larger for the red color morphed urchins in low wave action, that is, rocky protected areas versus high wave action, or open areas at SB in 2015 (t-test = 4.41, p<0.05) and 2016 (t-test = 2.25, p<0.05), and for black color morphs in 2016 (t-test = 2.67, p<0.05) (Figs. 3 a, c).
- Mean weight of red morphs in low wave action habitat was significantly heavier than that of red color morphs in open habitat at SB in 2015 (t-test = 4.97, p<0.05) and in 2016 at GA (t-test = 2.17, p<0.05) (Figs. 3 b, d).
- Sea urchin densities were higher for both color morphs at low wave action versus high wave action (Fig. 4).

Conclusions

- Sea urchin densities in this study were similar to that found in other studies (Greenstein, 1993).
- Similar results found from Lewis & Storey (1984) illustrating larger test diameters for urchins at low wave-energy habitats.

References

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Results

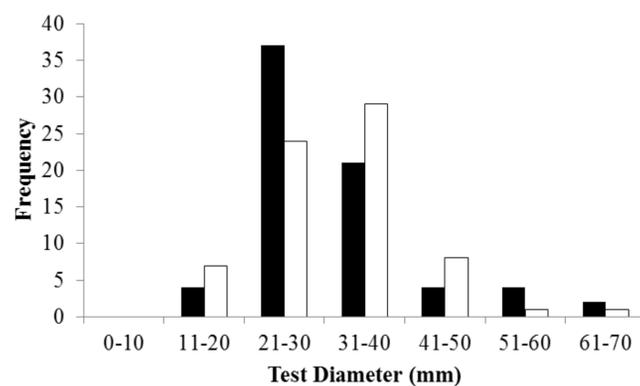


Fig. 2a. Sea urchin frequency at SB and GA for test diameter in June 2015, N = 72 quadrats SB (black bars), N = 70 quadrats GA (white bars).

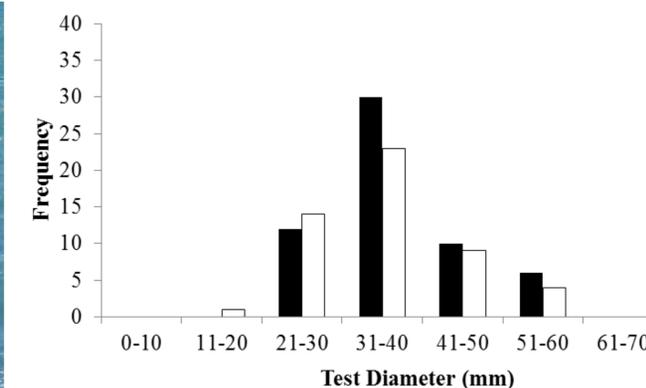


Fig. 2b. Sea urchin frequency at SB and GA for test diameter in June 2016, N = 58 quadrats SB (black bars), N = 51 GA (white bars).

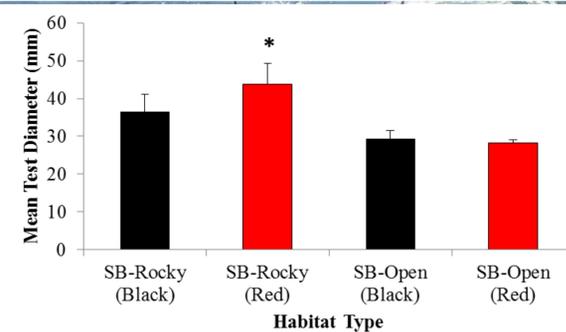


Fig. 3a. Significant differences (t - test, p < 0.05*) for red colormorph SB Rocky versus SB Open mean test diameter in June 2015.

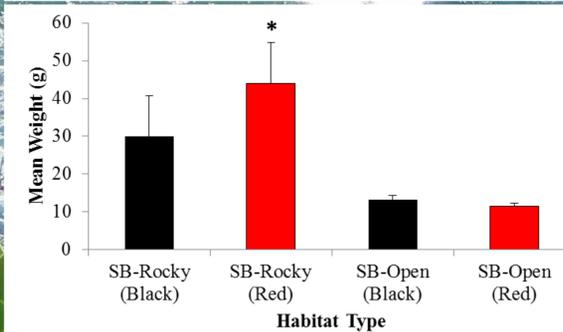


Fig. 3b. Significant differences (t - test, p < 0.05*) in red colormorph SB Rocky versus SB Open mean weight in June 2015.

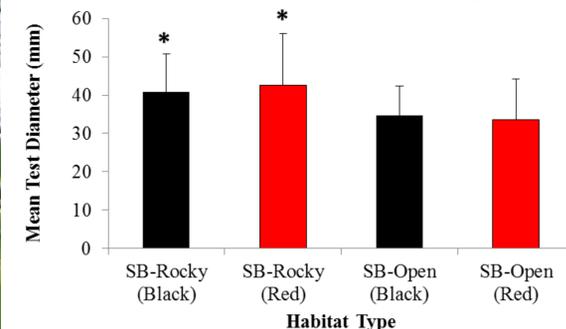


Fig. 3c. Significant differences (t - test, p < 0.05*) in both color morphotypes SB Rocky versus SB Open mean test diameter for both color morphs at SB in June 2016.

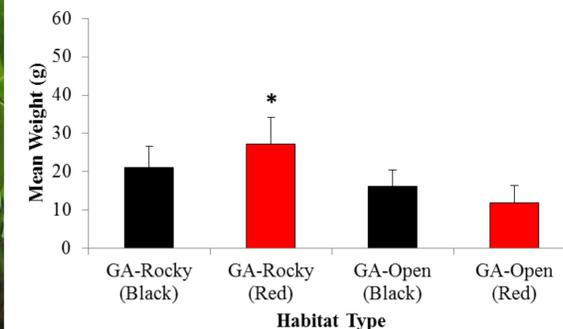


Fig. 3d. Significant differences (t - test, p < 0.05*) in red color morphotype GA Rocky versus GA Open mean weight in 2016. Error bars indicate standard error.