



Relationship between water quality and densities of the sea urchin *Diadema antillarum*

Geraldine Díaz-Ortega, Alex E. Mercado-Molina*

*Department of Biology, University of Puerto Rico. P.O. BOX 70377, San Juan, PR 00936

Email: enidlareg@hotmail.com, amolinapr@gmail.com



Introduction

Diadema antillarum was once the most abundant and important herbivore on the coral reefs of the western Atlantic and Caribbean. It was the keystone herbivore- the grazer that maintained the balance of growth and production between the coral and the algae. The mass mortality of this keystone species is described as the largest known marine mortality which resulted in catastrophic long-term ecological effects. Caribbean wide, *D. antillarum* mortality was greater than 97% (Lessios *et al.* 2001) and as a result, many Caribbean reefs have been dominated by macro-algae thereby smothering corals and inhibiting scleractinian recruitment.

In this study, physical-chemical variables, that according to EPA are necessary to maintain a good water quality, and abundances of the *D. antillarum* were evaluated in three reefs in Puerto Rico. The objective was to assess if there was a significant relationship between water quality and abundances of the sea urchin.

Method

This study was carried out in three sites in the north cost of Puerto Rico, Vega Baja, Luquillo and Escambron (Fig.1). These sites are characterized by shallow waters with a 3-5 m depth and hard bottom. All three sites are exposed to wave action generated by the easterly trade winds.



Figure 1. Study site

The variable tested to assess water quality were alkalinity, NH₃, NH₄, Dissolved Oxygen, and CO₂.

Water sample were taken at weekly basis (for three months) and analyzed using the titration technique. It is a precision dispensing device fitted with compact cartridge in a carefully regulated flow.

Abundances of *D. antillarum* were estimated by counting all individuals within five 20 m² (10 m x 2 m) belt transects placed randomly at 3-5 m in depth. This count was made once every three month.



Figure 2. Water collection and analysis

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Results

Concentrations of all physical-chemical parameters tested differed significantly among sites. In contrast, dissolved oxygen was the only parameter differing significantly among sampling time. To way ANOVA.

Sea Urchin abundances did not differ significantly among different sites but they did differ among time. Two way ANOVA, P>>0.05. There were not significant relationship between sea urchin abundances and the physical-chemical variable tested (Pearson product test. P>> 0.05).

Table 1. Measures of physical-chemical variables in three sites trough time. Numbers represents means values.. (N)= Standard Deviation.

		alkalinity mg/L	ammonia mg/L	ammonium mg/L	carbon dioxide mg/L	dissolved oxygen mg/L
September	Luquillo	190(14.30)	8.83x103	2.07	46(1.63)	10(1.46)
	Escambron	109(17.00)	8.28x103	1.94	67(2.88)	11(0.65)
	Vega Baja	136(21.63)	8.83x103	2.07	60(7.22)	12(1.50)
October	Luquillo	129(16.37)	8.83x103	2.07	51(7.00)	10(0.17)
	Escambron	109(18.02)	8.28x103	1.94	66(3.55)	12(0.62)
	Vega Baja	133(9.04)	8.83x103	2.07	63(1.63)	12(0.10)
November	Luquillo	179(14.00)	8.83x103	2.07	47(2.65)	10(0.60)
	Escambron	123(7.41)	8.28x103	1.94	64(1.00)	13(0.90)
	Vega Baja	140(15.55)	8.83x103	2.07	61(2.52)	13(0.85)

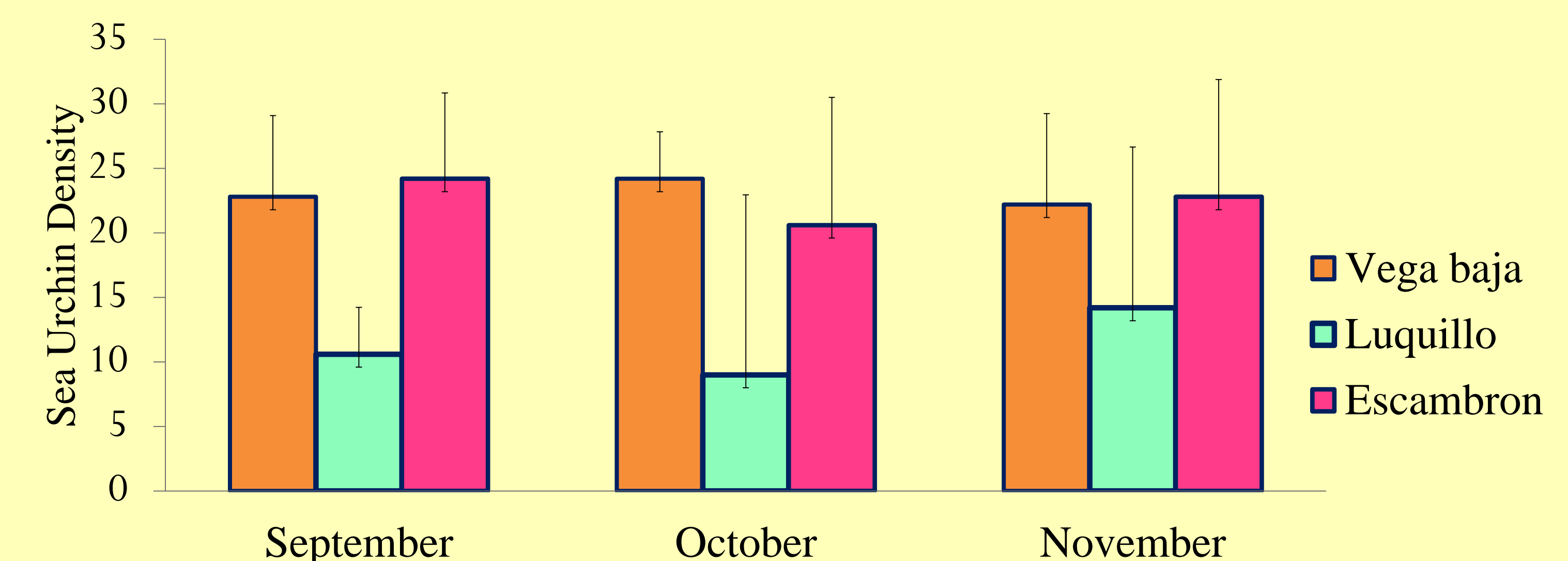


Figure 3. Sea Urchin Density among different during a three month period.

Discussion

Results of this study suggest that differences in concentrations of the parameters measured may not play an important role in *D. antillarum* abundances. Differences in sea urchins abundances may be related to other aspects of spatial and temporal variability such as food availability or recruitment rates (among others). Nevertheless, this study was limited to three months and a long term monitoring program and greater number of study sites may be necessary in order to get a better understanding of the relationship between water quality and *D. antillarum*. Similarly, other water quality parameters such as sedimentation rates and water turbidity may provide valuable information. In order to strengthen this study we are currently. extending the time of study as well as we are carrying out an E.coli bacteria analysis..