

The Population Density of *Diadema antillarum* at Champagne Reef at Scott's Head Soufriere Marine Reserve

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ABSTRACT:

The abundance of the long-spined sea urchin, *Diadema antillarum*, was measured at Champagne Reef at Scott's Head Soufriere Marine Reserve located in Pointe Michel, Dominica. A survey of the reef was taken and several categories of the habitat were considered and measured in one meter square areas along twenty meter transects. The study compared densities on vertical or horizontal substrates and at depths of four meters or six meters deep. Comparison of mean density showed that there was no preference to horizontal or vertical substrates, but that there were more *D. antillarum* at 4m than at 6m deep at Champagne Reef.

INTRODUCTION:

In 1983 there was a mass die-off of the invertebrate *D. antillarum* due to an unknown waterborne pathogen (Press Release, 1999). *D. antillarum* is an herbivore and feeds on algae which invades the coral reefs. They also serve as protectors of the coral because the sharp spines divert predators away. This sudden loss of a keystone herbivore in the coral reefs of the Caribbean caused the loss of more than one organism. Coral reefs around the sea began to disappear and give way to algal growth. Some researchers also correlated the loss of the coral reefs to the overfishing of fishes that eat urchins and algae during 1950 through the 1970's (Press Release, 1999). After the mass die-off of *D. antillarum* it was determined that the population in the Caribbean had decreased to less than 7 percent of what it once was while the seaweed and algal populations jumped from 4 percent to 92 percent by 1993 (Knowlton, 2001). This is known as the "largest known marine mortality which resulted in catastrophic long term ecological effects" (<http://www.diadema.org>). It has taken this nocturnal herbivore over 20 years to reestablish itself and maintain a stable population. Measures are being taken today to try and cultivate *D. antillarum* and corals and reintroduce them in places where they both were once abundant (Press Release, 1999). This study can aid in further research of *D. antillarum* populations at Champagne Reef and in the Caribbean.

METHODS AND MATERIALS:

Transects were measured by counting ten kicks with fins on and measuring the distance. This distance was determined to be 4m. Then nine transects of 20m by 1m were randomly chosen and swum in a wet suit with snorkel gear, and every 4m the urchins were counted in a 1m square area. This gave five readings for each transect. The 1m square area was determined by lowering a 1x1m quadrat tied to a 100ft rope down to the surface of the reef. Data were recorded on an underwater writing tablet and depth was determined by the use of the rope tied to the quadrat that was labeled with a permanent marker. In order to keep the mask from fogging up, baby shampoo was squirted inside the lens and rinsed out.

RESULTS:

Tables 1 and 2 show all of the counts of *D. antillarum* along transects at 4m and 6m, respectively. Table 3 shows the mean densities of *D. antillarum* on horizontal and vertical substrates at each depth.

Table 1: *D. antillarum* Density at 4m Deep on Vertical and Horizontal Substrates

	4 m				
	# Stops	Horizontal	Horizontal Density	Vertical	Vertical Density
Transect 1 5/30	5	15	0.375	3	0.075
Transect 2 5/30	0				
Transect 3 5/30	3	10	0.417		
Transect 1 6/1	5	11	0.275		
Transect 2 6/1	3			20	0.833
Transect 3 6/1	0				
Transect 4 6/1	3			9	0.375
Transect 5 6/1	1	3	0.75		
Transect 6 6/1	5	16	0.4		

Table 2: *D. antillarum* Density at 6m Deep on Vertical and Horizontal Substrates

	6m				
	# Stops	Horizontal	Horizontal Density	Vertical	Vertical Density
Transect 1 5/30	0				
Transect 2 5/30	5	7	0.175	9	0.225
Transect 3 5/30	2	2	0.125		
Transect 1 6/1	0				
Transect 2 6/1	2	0	0	4	0.25
Transect 3 6/1	5	8	0.2	1	0.025
Transect 4 6/1	2	9	0.562		
Transect 5 6/1	4	1	0.031	4	0.125
Transect 6 6/1	0				

Table 3: Mean Density of *D. antillarum* at Champagne Reef National Park

	Mean Density
Horizontal 4m	0.443
Vertical 4m	0.428
Horizontal 6m	0.182
Vertical 6m	0.156

DISCUSSION:

The survey showed that there were more urchins at 4m (standard deviation: 1m) deep than at 6m (standard deviation: 1m) deep at Champagne Reef National Park According to Table 3. Table 1 illustrates that the density at 4m deep on horizontal surfaces is the same as the density on vertical surfaces at the same depth. Table 2 illustrates the same result at 6m. This shows that the substrate angle does not matter but rather the depth.

The long spined sea urchin, *Diadema antillarum* was almost completely wiped out in the Caribbean in 1983. The population has taken over 20 years to recuperate from its devastating disappearance. Champagne Reef National Park in Dominica serves as an example of such a place where *D. antillarum* can be found thriving. According to the data in Table 1, Table 2 and Table 3, there are many more urchins at 4m than at 6m deep. It also appeared that there were no urchins where the surface was covered in algae or sand, or where there were only a few corals. There were also more *D. antillarum* the further away from the shore the site was possibly due to a change in the tides. The further south the site was, in a general term. *D. antillarum* also appeared to be in groups of more than two when seen. Some groups consisted of ten or more in a space less than 2m square.

The data given here can be used in further research on population and distribution of *Diadema antillarum*. Further projects can be done including expanding the depth factor and the exact distribution of the long-spined sea urchin.

WORKS CITED:

<http://www.diadema.org>

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