

**A Continuation of the Assessment of Coral Reef
health in the island of Dominica**
Caitlin Camp, Kathryn Ganter, Thomas McDaniel, and Marie Perez

Abstract:

Champagne Reef and Scott's Head Reef of Dominica were examined in order to determine the health of the coral reefs and compare to the 2014 study. Five transects that were five meters long were made for each reef site and measured the amount of bleached coral, live coral, macroalgae, *Diadema* sea urchins, and sea sponges on the sea floor. Our findings agreed with the Encarnacion et al. (2014) study and found that Scotts Head was a less healthy reef system than Champagne Reef.

Introduction:

Dominica is a small island located in the Lesser Antilles archipelago in the Caribbean Sea. The island is well known for its abundance of extant endemic species and relative lack of human disturbance compared to surrounding islands. The waters around Dominica support several coral reef systems which have experienced varying degrees of coral bleaching (Divine et al. 2006).

Corals survive on symbiotic algae called zooxanthellae that provide nutrients for energy to grow. Corals receive their colors from these algae and coloration of corals is an indication of a productive ecosystem (Roberts 1987). Coral bleaching occurs when there is a change in ocean temperatures and acidification. This environmental stress causes the algae to leave the corals tissues, thus starving the coral and "bleaching" it white. The stress and starvation of the coral makes it susceptible to disease and increasing the risk of mortality.

Encarnacion et al. (2014) conducted a study on the overall health of the Champagne reef and Scott's Head reef in Dominica. Their results indicated that the Champagne Reef was

healthy and Scott's Head Reef was unhealthy based on their measurements of live coral cover, macroalgae cover, and sea urchin numbers.

This study seeks to assess the health of coral reef systems around the Caribbean island of Dominica, compare results with those of the 2014 study, and analyze the changes occurring in the reef systems one year later (Encarnacion et al. 2014).

Method and Materials:

Reef health was examined in two locations. Champagne Reef and Scott's Head, both on the southwest coast of the island, were chosen because of their accessible, extensive coral reef and for comparison to last year's study. Wetsuits were worn for protection against jellyfish stings.

To gather data, we used the PVC pipe quadrat described in the Encarnacion et al. (2014) study. The quadrat was suspended over the reef and moved across a five meter transect which was held across the surface of the water. A picture of the sea floor was taken through the quadrat at each meter marking. Using a Garmin GPSmap76, we recorded the coordinate of each transect taken. The water depth at each transect was measured by a weighted rope that was premeasured to have knots equally spaced one meter apart. We performed transects in this way at five randomly selected locations. A HOBO marine data recorder was attached to a buoy to measure water temperature over time at both sites.

Once all data were collected, the images were analyzed with Adobe Lightroom. Each of the 100 squares of the quadrat were scored for the presence of live coral, bleached coral, macroalgae, and sea sponges. We also counted the number of *Diadema* sea urchins observed in each quadrat area. Counts were summed for all quadrats and then the five quadrat sums were combined for each transect. Overall, this gave us 2,500 transect squares per location sampled. This allowed us to use our data for quantitative measures of reef health.

Results:

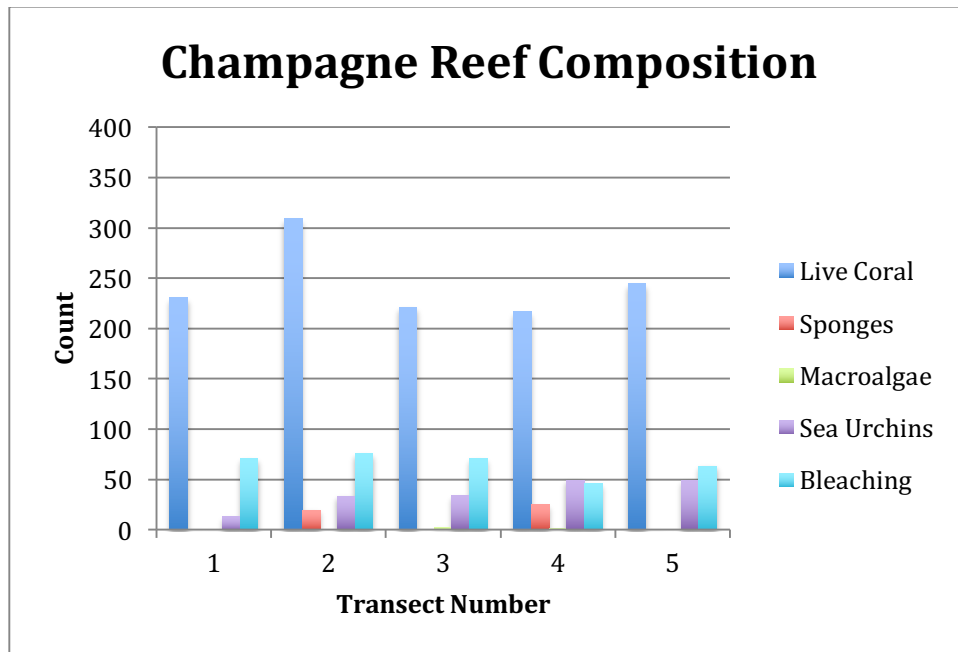


Figure 1: Composition of Champagne Reef Transects

As shown in Figure 1, Champagne reef was observed to have high amounts of live coral in relation to macroalgae, which was barely present, as well as relatively high sea urchin counts.

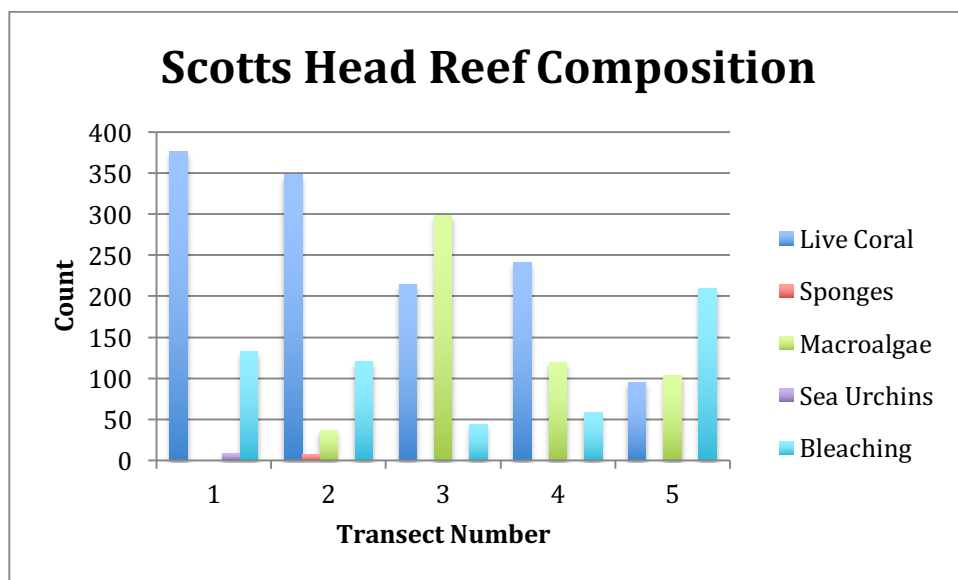


Figure 2: Composition of Scotts Head Reef Transects

Scotts Head reef had very high amounts of macroalgae as well as extremely low sea urchin numbers (Figure 2).

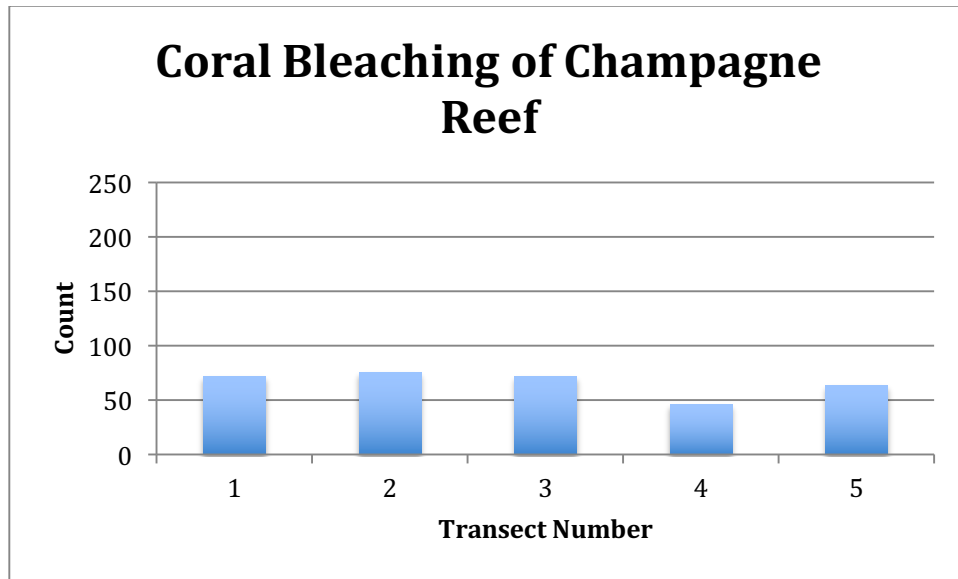


Figure 3: Counts of Champagne Reef Coral Bleaching

Champagne Reef had scattered coral with small bleached parts, but no regions of completely bleached coral. This is apparent in Figure 3, because each transect sampled had similar counts. Overall the reef was healthy, with only 13% of transects sampled containing bleached coral.

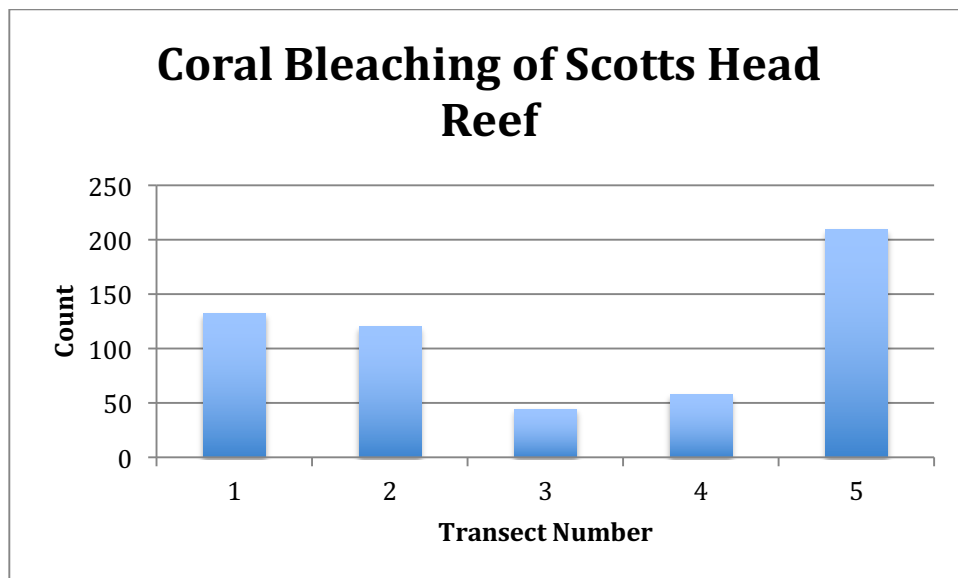


Figure 4: Counts of Scotts Head Reef Coral Bleaching

Scotts Head had areas with large amounts of completely bleached coral. This is reflected in our transect data, because the amount of bleached coral varied greatly depending on the area we sampled. The reef was less healthy than Champagne Reef. 23% of the total transect squares contained bleached coral.

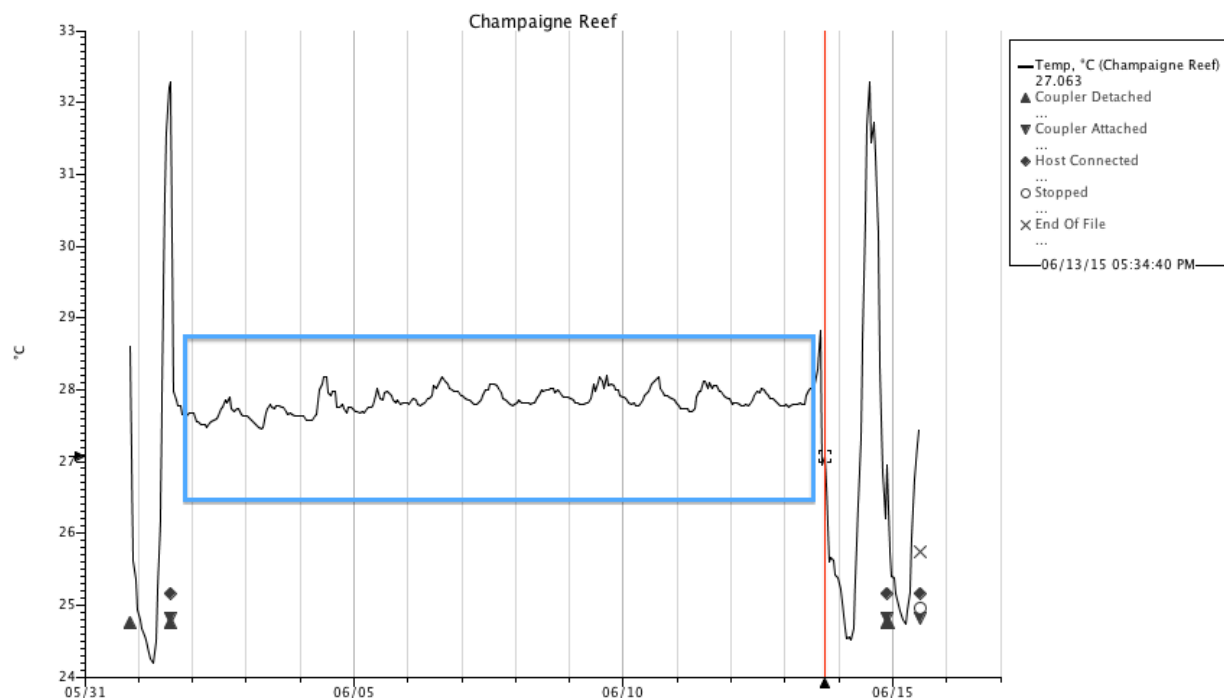


Figure 5: Change in water temperature recorded by HOBO at Champagne Reef

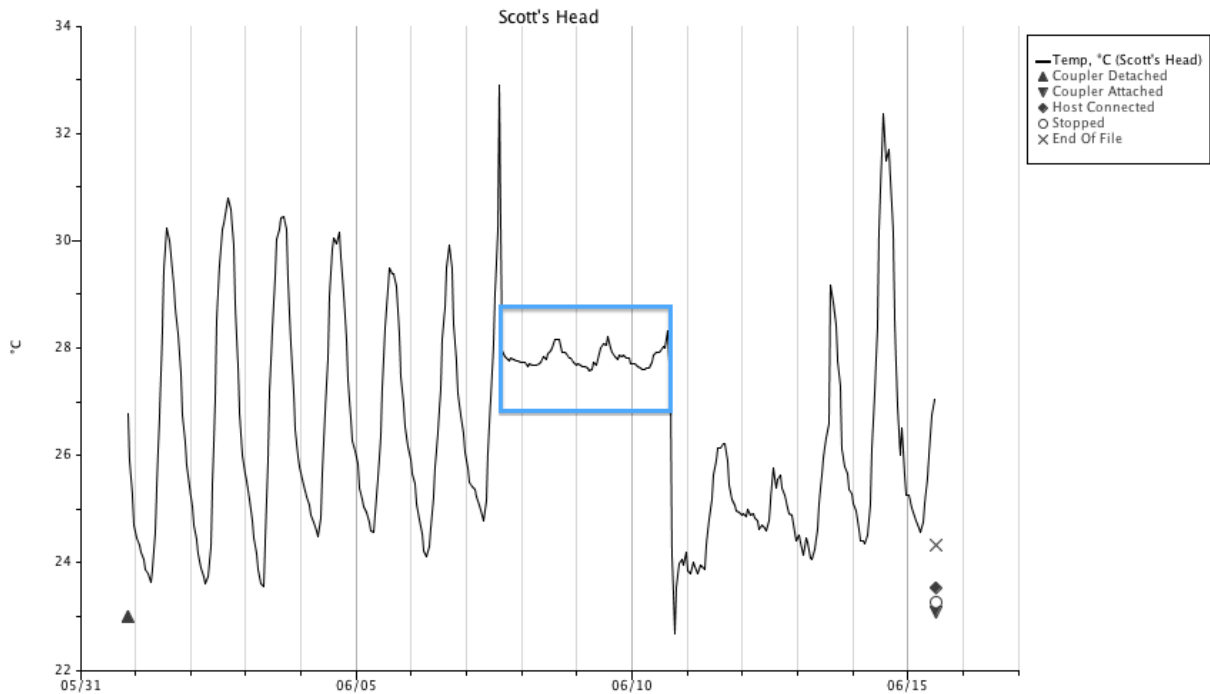


Figure 6: Change in water temperature recorded by HOBO at Scotts Head Reef

The average temperature over the time sampled at Champagne Reef was 27.84°C, compared to Scotts Head at 27.80°C. The blue boxes in Figures 5 and 6 represent the time period in which the HOBOs were in the water.

Discussion:

Overall, the results were consistent with the observations made in the Encarnacion et al. (2014) study. These results suggest that the health of and conditions around the reef have changed little in the last year. Compared to the Encarnacion et al. (2014) study, we added bleached coral and sea sponges as counted variables in order to update the health status of the reefs. We observed that Scotts Head reef exhibited significantly more coral bleaching compared to Champagne reef, supporting the conclusion of Encarnacion et al. (2014) that Scotts Head is an less healthy reef system. Temperature between the reefs does not seem to be related to

differences in reef health, as the recorded difference is insignificant and may be due to the accuracy level of the HOBO devices.

We encountered some issues with keeping the quadrat level over the sea floor in order to get an accurate grid of it, but that was directly affected by the strength of current that day. In addition, due to time, travel and accessibility constraints, our sample size was marginally smaller than that of Encarnacion et al., but not to a degree that would affect our results.

References Cited:

Encarnacion, Diana. Hurd, Sarah. Jones, Neil. Sannwaldt, Jessica. Stehling, Haley. *An Assessment and Comparison of Reef Health in Dominica*. 2014.
http://dominica.tamu.edu/student%20projects/Dominica%20Projects%20pdf%20copy/Encarnacion_Group_2014.pdf.

Divine, Lauren. Campbell, Carolyn. Loughridge. Krause, Travis. *A comparison of brain coral bleaching and water quality at Champagne Bay and Rodney's Rock*. 2006.
http://dominica.tamu.edu/student%20projects/Dominica%20Projects%20pdf%20copy/Divine_Group.pdf

Roberts, Leslie. 1987. *Coral Bleaching Threatens Atlantic Reefs*. Research News: pg.1228.