# **BLACK BAND DISEASE IN BERMUDIAN CORAL REEFS**

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### Abstract

Black band disease results from a bacterium that consumes corals on many Caribbean reefs. This study looked at black band disease (BBD) at two sites in Bermuda, Tobacco Bay and Whalebone Bay, and calculated both the species that BBD was most commonly affecting, and the overall quantity of corals that BBD had infected at each site. By taking video transects of 25 sites, BBD was identified as well as the species of coral it was infecting. This study found that Double Ridged Brain Coral (*Diploria labyrinthiformis*) was the most commonly infected coral species.

Key Words: Black Band Disease, BBD, Phormidium corallyticum, Bermuda, BIOS

### Introduction

*Phormidium corallyticum* is thought to be the cause of black band disease and has become a prevalent issue in the coral reefs of Bermuda by infecting coral reefs and slowly killing off individual corals. It is caused by a pathogenic microbial consortium that forms a horizontally spreading, laminated microbial mat. Black band is unique because the entire mat community spreads across the surface of coral colonies completely degrading coral tissue (Kuta, 2003). This disease characteristically forms a circular or crescent-shaped band of darkly pigmented filaments that separates white, denuded skeleton from living coral tissue. In the disease process, BBD may advance several millimeters per day across a coral's surface, killing an entire colony during one active season or after a repeat infection (Bruckner, 2007). The first disease reported to affect scleractinian corals was originally found off of the on the reefs of Belize and the Florida Keys. Since 1973, black band disease has been reported on reefs throughout the Caribbean basin, the Indo-Pacific (Kuta 1996). The monitoring of black band has become more important with the increase in ocean acidification, which some studies have linked to the rise of disease on many coral reefs (Sockolow, 2009). Because of this growing black band problem, it has become important to determine the species of corals that are being affected its prevalence. Previous work has attempted to look at similar corals as the Bermuda reefs, especially common brain coral (*Diploria strigosa*) and double ridged brain coral (Diploria labyrinthiformis) (Edmunds, 1991; Kuta, 1996). In Bermuda however, it is unclear which species are most heavily affected, and how often the disease jumps from coral to coral, which are questions this research explores.

#### Materials and Methods

*Phormidium corallyctium* is a bacterial infection that consumes corals, characterized by a circular light or white patch of coral surrounded by a thin black band. The disease consumes the coral as it spreads over its surface. While there are many corals that have been infected by BBD, the corals that were infected in this study include: *Diplora strigosa*, the common brain coral; *Diplora labyrinthiformis*, the double-ridged brain coral; *Montastra cavernosa*, the Great Star Coral; and *Gorgonia ventalina*, the purple sea fan.

There were two study sites where data was collected, both of which were in Bermuda on the North side of the island. The first was at Tobacco Bay near the town of St. George, and Whalebone Bay in Ferry Reach Bermuda.

Data for this study were collected by measuring a 50m transect above a randomly selected space above corals in with Tobacco Bay and Whalebone Bay. The sites were not checked for BBD before the dive, but were chosen instead because they contained the corals that were being looked at by this study. A video transect was then taken above that area using a flip cam in an underwater case. These data were then reviewed frame by frame to determine what corals were within that transect, and if they were infected with black band disease. Fifteen transects were taken in Tobacco Bay, and 10 taken in Whalebone Bay, limited by weather conditions and availability of corals.

### **Results and Discussion**

These transects gave quite a bit of data on BBD in Bermudian reefs. Firstly, there were many more healthy corals in Whalebone bay as opposed to Tobacco Bay, and it appears that there were different species of corals affected in these places. While it was common *for Gorgonia ventalina* to have BBD in Tobacco Bay, there were very few cases in Whalebone. Overall there were few infected corals within each transect as shows by the average numbers of infected corals in each transect. This could be due to the sheltered nature of Whalebone, and the vicinity of Tobacco Bay to sewage effluence (Fig 1, Fig 2).

In this study, it also appears that double ridged brain corals (*Diploria labyrinthiformis*) more than any other coral. This could mean that these corals are more susceptible to BBD, or there is another undetermined factor that is causing this increased susceptibility. It also possible that this digression is due to chance.

The result of increased BBD in coral reefs concurs with the knowledge that the bacteria is increasing in Caribbean reefs, which could be caused by an increasingly acidic ocean

and other anthropogenic factors (Edmunds, 1991; Kuta, 1996; Sockolow, 2009). Oceanic acidification weakens corals, making them more susceptible to disease. This research shows that there are corals that are going to be more susceptible to BBD as acidification magnifies, which could be a greater issue for the coral community on the whole.

For any follow up studies, expanding the area of study to other bays would be advisable to get both a larger sample size and a greater understanding of BBD distribution. It would also be interesting to look at these same coral transects over time to determine where BBD was spreading and how quickly it spreads through these bays.



Figure 1. Percent infection of coral species shows the percent infections in both locations of each species out of the total infections at that location. Blue denotes Whalebone Bay while red denotes Tobacco Bay.



Figure 2. Mean infection rate per species. The mean infection rate of each species at each site examined. Blue represents Whalebone Bay and red represents Tobacco Bay. Standard error for Whalebone Bay was 0.01 while standard error for Tobacco Bay was 0.04. CBC stands for common brain coral, DRBC stands for double ridged brain coral, GSC stands for Great star coral, and PSF stands for purple sea fan.

### Acknowledgements

The BIOS sesearch station in Bermuda was utilized, as well as Clark University's lab resources with Deb Robertson and Todd Livdahl.

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