**Evaluating the effects of space and time on sponge and coral communities in the British Virgin Islands**

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**Introduction**

Ecological communities are changing and there has been an increase in rates of biodiversity loss (Staudinger et al., 2013; Stork, 2010). Declines in biodiversity have been associated with higher levels of disturbance that affect community dynamics and species extinction (Svensson et al., 2007). Historically, the intermediate disturbance hypothesis has been used to describe how competition and intermediate natural disturbances, such as hurricanes, maintain high diversity in certain ecosystems such as tropical forests and coral reefs (Connell, 1978). This high diversity response to disturbance assumes coral reef communities can recover, but there are now additional anthropogenic factors that have compromised this ability to recover (Hughes et al., 2017). Coral reef communities are threatened by anthropogenic disturbances that vary on spatial and temporal scales, such as dredging, ocean acidification, sedimentation, overfishing, and persistent high temperatures. Some of these disturbances have been found to effect richness, abundance, and diversity of reef organisms (Habibi, Setiasih, & Sartin, 2007; Nelson et al., 2016; Stubler, Duckworth, & Peterson, 2015; J. L. Wulff, 2006).

Because communities are webs of interactions, the effects of changes due to disturbance can be complicated and unpredictable. Foundation species play important roles in establishing ecosystems and, in several marine ecosystems, have been attributed with maintaining biodiversity (Angelini, Altieri, Silliman, & Bertness, 2018). When ecosystems are threatened by disturbance, it is intuitive to study the impacts of these disturbances on the foundation species. California mussels and seagrasses are examples of foundation species threatened by disturbances (Gaylord et al., 2011; Thomson, Burkholder, & Heithaus, 2015).

With increasing disturbance rates and declining biodiversity, much attention has been given to monitoring coral reefs around the world. Because corals provide the foundation for these ecosystems, many studies use coral diversity as a proxy for overall reef diversity (Darling et al., 2017; Stella, Pratchett, Hutchings, & Jones, 2011). It has also been suggested that sponges may be a coexisting foundational group for coral reefs (Angelini et al., 2018).

Several studies have found that coral diversity is positively correlated with fish diversity (Darling et al., 2017). Relationships between corals and other groups have been studied (Stella et al., 2011). However, there is still a lack of long-term studies of the relationships between coral diversity and diversity of other taxonomic groups. In particular, there has been a call for studies that compare coral diversity and sponge diversity because of their functional similarities, the lack of long-term studies that consider sponges, and the potential for sponges to outcompete corals when disturbance levels are higher (J. Wulff, 2001; J. L. Wulff, 2006).

This study generally investigates spatial and temporal relationships of corals and sponges. More specifically this study will consider:

(1)

-If overall percent cover of coral and overall counts of sponges will follow the same trends over the study period.

(2)

-If overall percent cover of coral and overall counts of sponges will follow the same trends among field sites.

(3)

-If the dominant group of coral will be the same over time.

-If the dominant group of sponge will be the same over time.

-If not, then does the dominant group of coral correlate to the dominant group of sponge over time.

(4)

-If the dominant group of coral will be the same among sites.

-If the dominant group of sponge will be the same among sites.

-If not, then does the dominant group of coral correlate to the dominant group of sponge among sites.

*Things to consider:*

*Taxonomic resolution*

*% cover vs. count of sponges*

*Side note:*

*Why are the percent cover values for the coral dataset sometimes negative?*

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