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MES 501

11.21.2022

Seagrass Lab

***Introduction***

Seagrass communities are important habitats found from the tropics to boreal margins in all the world’s oceans (Duffy, 2006). Organisms from all trophic levels use this habitat, from foraging green sea turtles (Ogden et al., 1983), juvenile reef fish (Olinger et al., 2017). and invertebrates such as conch. This study surveys seagrass beds and monitors changes in Brewer’s Bay, St Thomas, USVI from 2009 to 2022. Number of conch observed was also surveyed. The three main native species found in the Caribbean are *Thalassia*testudinum, *Halodule wrightii*, and *Syringodium filiforme*. These beds have been exposed to a variety of stressors including hurricane Earl in 2010, hurricanes Irma and Maria in 2017 and the invasion of *Halophila stipulacea* first observed in Brewer’s Bay in 2014 (Figure 1). *H. stipulacea* was first reported in the Caribbean in 2002 and first seen in St John USVI in 2012 (Willette et al., 2014). This study monitors percent seagrass cover by species, shoot density, shoot length, and conch density over time in Brewer’s Bay, St Thomas, USVI.

***Results and Discussion***

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Figure 1. Average percent seagrass cover by species in Brewer’s Bay, St Thomas, USVI from 2009 to 2022 ± SEM . Letters represent significant differences between years determined by Fisher’s post hoc test with a Bonferroni correction p<0.05. No error bars or letters for 2009 due to lack of replication.

The average percent seagrass cover from surveys in 2009 was 28.7%, this value falls outside of the 95 percent confidence interval of mean seagrass cover in 2010 (0.7841 to 3.6731 percent cover). This decline in seagrass cover can likely be attributed to Hurricane Earl, which hit St Thomas in August 2010.

Data from 2010 through 2022 did not meet ANOVA assumptions for normality or equal variance, so a Kruskal Wallis one way test was performed (Chi-squared = 88.92, df=12 , p-value= 7.986e -14), followed by post hoc analysis using Fisher’s exact test with a Bonferroni correction p<0.05 (Figure 1). There was a significant decline in percent seagrass cover in 2017, likely attributed to Hurricanes Irma and Maria which hit St Thomas in September 2017.

From 2009 to 2013 *S. filiforme* was the dominant seagrass observed in Brewer’s Bay. A shift in species composition commenced in 2014 when the invader *H. stipulacea* was first observed. In 2014 the dominant species was *H. wrightii*, and from 2014 to 2022 the dominant species was *H. stipulacea.*

Chart, bar chart, histogram

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Mean Shoot Density(±SEM) Per 0.04m^2

Figure 2. Average seagrass shoot density per 0.04m^2 in Brewer’s Bay, St Thomas, USVI from 2009 to 2022 ± SEM. Letters represent significant differences between years determined by Fisher’s post hoc test with a Bonferroni correction p<0.05. No error bars or letters for 2009 due to lack of replication.

The average shoot density from surveys in 2009 was 28.4 shoots per 0.04m^2, this value falls outside of the 95 percent confidence interval of mean shoot density in 2010 (1.005 to 6.194 shoots per m^2). This decline in shoot density can likely be attributed to Hurricane Earl, which hit St Thomas in August 2010.

Data from 2010 through 2022 did not meet ANOVA assumptions for normality or equal variance, a Kruskal Wallis one way test was performed instead (Chi-squared = 69.09, df=12 , p-value= 4.739e-10), followed by post hoc analysis using Fisher’s test with a Bonferroni correction p<0.05 (Figure 2). There was a significant increase of shoot density from 2011 to 2012. There was no significant change in shoot density from 2012 to 2016, this time encompasses the invasion of *H. stipulacea* in 2014. This suggests that the invasion had no immediate effect on shoot density.

There was a significant decline in shoot density in 2017 likely attributed to Hurricanes Irma and Maria which hit St Thomas in September of that year. The dominant seagrass species in 2016 prior to the disturbance was *H. stipulacea.* It would be interesting to perform further analysis to compare the recovery of shoot density before and after the invasion of *H. stipulacea.* Specifically looking at the recovery rates of native dominated beds after 2010 vs *H. stipulacea* dominated beds after 2017. There was a significant decrease in shoot density from 2021 to 2022, the cause of this decrease was not investigated in this study.

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Figure 3. Average shoot length per 50 square meter transect in Brewer’s Bay, St Thomas, USVI from 2009 to 2022 ± SEM. Letters represent significant differences between years determined by Fisher’s post hoc test with a Bonferroni correction. No error bars or letters for 2009 due to lack of replication.

The average shoot length from surveys in 2009 was 56mm, this value falls outside of the 95 percent confidence interval of mean shoot length in 2010 (7.761 to 18.75 mm). This decline in shoot length can likely be attributed to Hurricane Earl, which hit St Thomas in August 2010.

Data from 2010 through 2022 did not meet ANOVA assumptions for normality or equal variance, a Kruskal Wallis one way test was performed (chi-squared = 74.49, df = 12, p-value = 4.587e-11), followed by post hoc analysis using Fisher’s test with a Bonferroni correction p<0.05 (Figure 3). There was no significant change in shoot length from 2012 to 2016, this time encompasses the invasion of *H. stipulacea* in 2014. This suggests that the invasion had no immediate effect on shoot length. There was a significant increase in shoot length in 2012. There was a significant decrease in shoot length in 2017, this was likely due to Hurricanes Irma and Maria.

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Figure 4. Average conch density per 50 square meter transect in Brewer’s Bay, St Thomas, USVI ± SEM from 2010 to 2022. There were no conch observed in 2018, 2019, and 2022.

Average density of Conch in surveyed transects in Brewer’s Bay was consistently below 20 from 2010 to 2022 except for 2015. In 2015 there were a large amount of conch observed.

Works Cited

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