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The Effect of Changes in Tidal Cycle On the Movement of Diatoms in St. Simons Island, GA

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Abstract/Introduction

Most of us are probably unaware that every second breath we take is because of algae. Algae are primary producers and have different sizes, shapes, and functions which are crucial to their survival in aquatic habitats. Some algae are able to travel up and down in the mud and sand in coastal areas and some contribute to the very diverse food chain and habitat stabilization. Those are very diverse habitats with tidal cycles and periods of desiccation. Understanding the organisms living in those habitats remain as an important goal especially when those motile algae come to the surface when the tide is low in order to attain sunlight for photosynthesis. The ability to travel into the moist sand allows for them to survive longer periods of time than the ones that stay on the sand surface or are taken by the tide back to the ocean. In this experiment, the movement distance of algae was documented from the northern region of St. Simons Island, Georgia. Algae community in Georgia was dominated by Nitzschia species (Bacillariophycea) and the movement of algae depended on external temperature and time of sampling.

Materials & Methods

Study Site

FIGURE 1: Map of Georgia, 31.154492, - 81.364489, St. Simons Island, Georgia

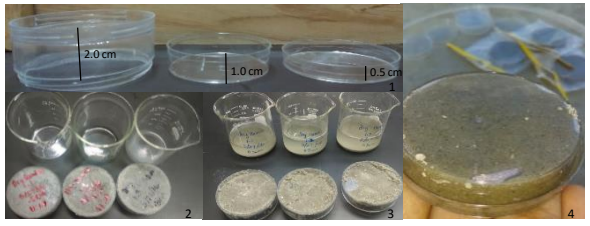

FIGURE 2: 1. Three different petri dishes used for sample collection; 2. Frozen samples prior to the addition of filtered marine water; 3. Samples after the addition of filtered marine water; 4. Collected sample at study site.

Sand samples were collected into three different petri dishes of 2.0 cm, 1.0 cm, and 0.5 cm in height. Starting with low tide, samples were collected three meters away from the water until the high tide reached the three meters mark. A one time collection of three samples with the 0.5 cm petri dish in which formaldehyde was added at the site of collection for preservation. Collected samples were placed in an ice cooler until they were moved into the freezer.

Materials & Methods continued

A minimum of 100 units live counts were assessed for each of the 27 samples under a 400 magnification using Leica CH-9435, a microscope imaging system.

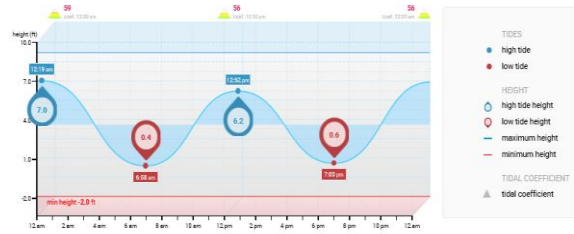

Figure 3: Tide schedule from May 27, 2016; Experiment was from 9:45 am to 11:00 am.

Results

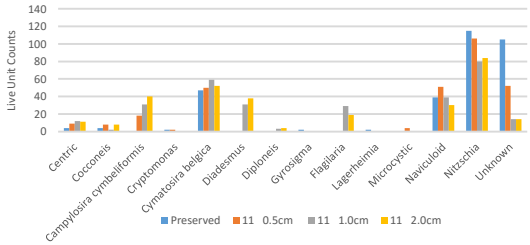

Figure 4: The total genera from May 27, 2016 collection. In all levels of the sand, Nitzschia is the dominant genus. Unknown group is dominated by pennate diatoms. Preserved sample is to find the general

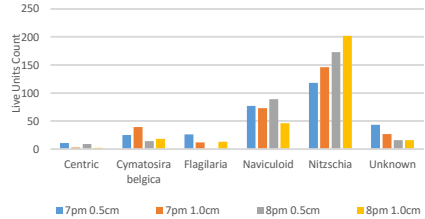

Figure 5: The total genera from June 7, 2016 collection. Different colors represent different time of collection and depth of the petri dish.

- A total of 27 samples were taken, and 13 known taxa were identified to genus in live samples
- Live diatoms dominated the sample with 98.8% and soft algae consisted of 1.2% in the total sample collection
- From the diatom community, 96.1% consisted of live diatoms and 3.9% of dead diatoms
- The Shannon Diversity is established from the known percentage from each site, which explains why the Shannon Diversity is so low even though there are 14 genera present
- The most abundant group is Nitzschia and it is also the most diverse at species level with at least 35 species (Figure 5).
- Movement of algae is determined by an increase or decrease in species in each depth of the sand
- Not all algae have the ability to move due to different morphological features. Motile diatoms in these samples are Nitzschia (42.7%) and Naviculoid (19.6).
- Samples taken in May 27, 2016 have higher diversity in the community (Average of 1.66 Shannon Diversity) than the samples taken in June 7, 2016 (Average of 1.07 Shannon Diversity). (Figure 6 with 13 known genera; Figure 4 with 5 known genera)
- A community that has a Shannon Diversity number between 1.7 to 7 is considered to be an extremely diverse community. The low number in Shannon Diversity is caused by the unknown pennates that are unaccounted for in the equation. Only known genera were used to determine diversity of the community.

Table 1: The percentage of the known genera and unknown genera for May 27, 2016 sample collection

	Known (%)	Unknown (%)
Preserved	68.1	31.9
0.5 cm	82.7	17.3
1.0 cm	95.3	4.7
2.0 cm	95.3	4.7

Table 2: The percentage of the known genera and unknown genera for June 7, 2016 sample collection

	Known (%)	Unknown (%)
7 pm 0.5 cm	85.7	14.3
7 pm 1.0 cm	91.0	9.0
8 pm 0.5 cm	95.0	5.0
8 pm 1.0 cm	93.7	6.3

Figure 6: Shannon Diversity from May 27, 2016 and June 7, 2016. The number between 1.7 and 7 indicates extremely diversity in the community.

Dominant Diatoms

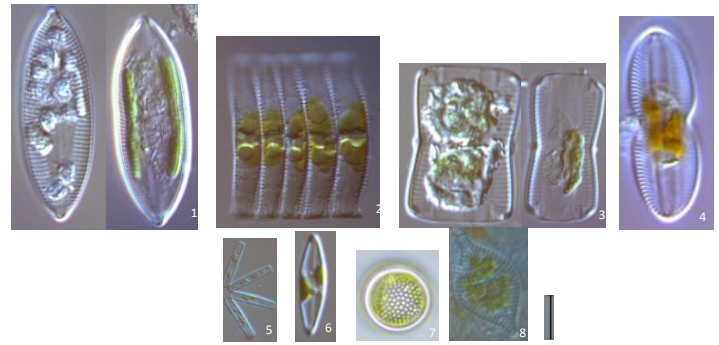

Figure 7: The scale bar represents 10 µm; 1. Naviculoid; 2. *Campylosira cymbeliformis* (Grunow); 3. *Naviculoid retusa* (Brebisson); 4. Diploneis; 5. Flagilaria; 6. Small Naviculoid; 7. Aulacousira ; 8. *Rhaphoneis amphiceros* (Ehrenberg)

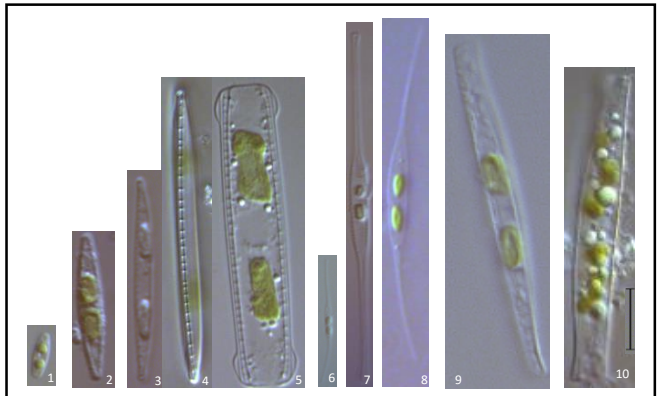

Figure 8: The scale bar represents 10 µm; A plate of Nitzschia group: 1. *Nitzschia* sp 1; 2. *Nitzschia* sp. 2; 3,4. N. plagiogrammopsis, valve view (Ehrenberg); 5. N. plagiogrammopsis, girdle view; 6,8. Nitzschia closterium (Ehrenberg); 7. Nitzschia bartholomei (Grunow); 9. Nitzschia sp 8

Conclusion

Based on the data collected at various conditions, the results concluded that Nitzschia is the most dominate group of algae among the 13 genera that were observed. The diverse community of Nitzschia is shown by the presence of more than 35 species, in which eight of them were identified. Due to the biraphid characteristics of Nitzschia, unlike the other genera, they have the ability to freely move in multiple directions despite the differences in tide movements. In spite of the fact that samples were collected at different temperatures, there was not a significant difference in the abundance level of each genera.

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