Diatom Diversity in Savannah River Oxbows: A Pilot and Exploratory Survey

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Introduction

Diatoms are commonly used as a biological indicators of aquatic ecosystem health because they are fairly easy to identify to species level as compared to other types of algae and they are more sensitive to changes in water chemistries than macroinvertebrates. Therefore, we are assessing diatoms as part of a food web study in four oxbows along the Savannah River. Pollutants and disturbances can influence these primary producers' assemblages which can impact higher trophic levels of life. Gathering baseline data at oxbows along the Savannah River could yield better insight to changes in riverine systems and monitoring higher trophic levels of life on which we depend for natural and economic resources.

Objectives

The Phinizy Center for water Sciences is conducting a fish community survey in four oxbows along the Savannah River. Historically, it is thought that oxbows connected to the river would have similar taxa (e.g., Fish, macroinvertabrates and algae) to the river and each other, and would differ in taxa from those found in disconnected areas. This exploratory pilot study aims to:

1) Identify genera that are present at each site
2) Create a picture key or guide of the diatom species/ genera found at each oxbow
3) Provide evidence for continuing project for long term monitoring in order to answer the question: Are sites with similar regimes (connected vs. disconnected) similar in diatom taxa?

Answering this question will allow a better understanding of impacts on fish populations and a more precise analysis of diatom diversity along the Savannah River.

Methods

- One preliminary sampling event October 2015
- Diatometers placed at all four sites
- Nitric acid and hydrogen peroxide digestion method for diatom cleaning and processing
- Zyrax mounting media for permanent slides
- 200 valves counted for each site

Study Sites

- Four oxbows along the Savannah River in Screven County Georgia
- Created by Army Corps of Engineers for commercial navigation from 1950s-70s by dredging
- Two are connected to the river (Miller and Whirligig); and two are considered disconnected from the river (Conyers and Possum Eddy)

Figure 1: The four oxbow lakes studied in Screven County, Georgia

Figure 1. Contributed by Liam Wolf

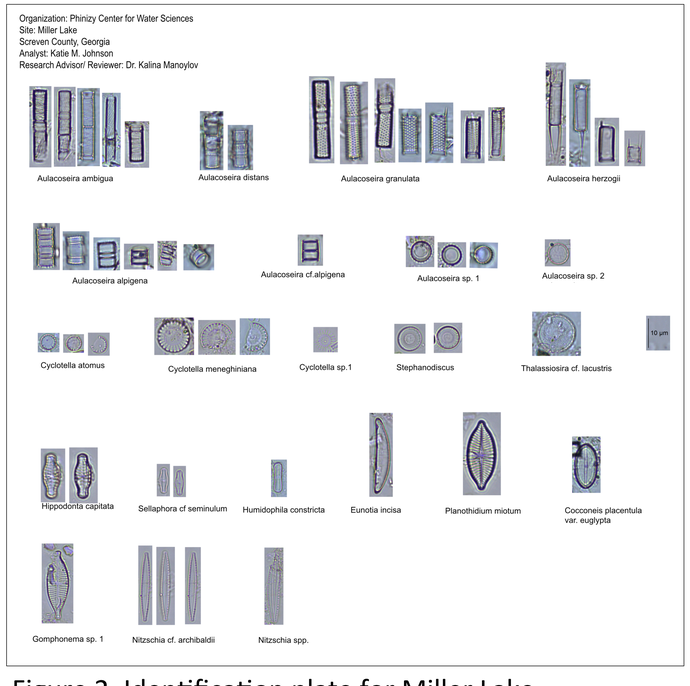


Figure 2. Identification plate for Miller Lake

Results

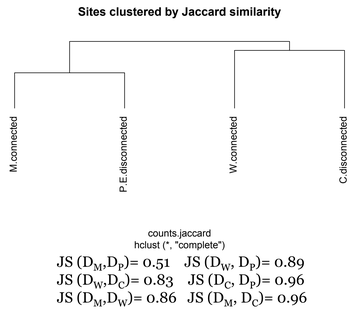


Figure 3. Dendrogram of sites clustered by Jaccard similarity

- Miller Lake (M) (connected) and Possum Eddy (P) (disconnected)based on clustering of Jaccard similarity indices (0.51)

Table 1: Genera richness, diversity, and evenness indices of the Savannah River oxbows October, 2015.

Site	Richness	Shannon	Simpson	Evenness
Miller	12	1.175	0.496	0.473
Whirligig	24	2.613	0.899	0.822
Conyers	15	1.173	0.536	0.433
Possum Eddy	11	1.437	0.634	0.599

- Whirligig is the most species rich of the four sites

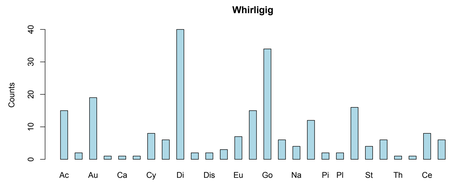
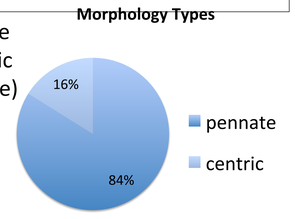


Figure 4. Histogram of genera counts for oxbow Whirligig

- 31 genera were found (5 centric and 26 pennate)



- Miller and Possum Eddy have the highest counts of centric diatoms (202 and 140 respectively)

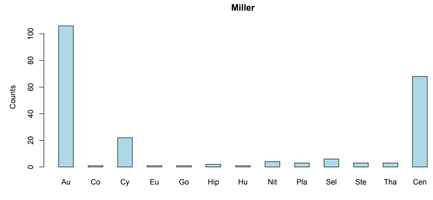


Figure 5. Histogram of genera counts for oxbow Miller

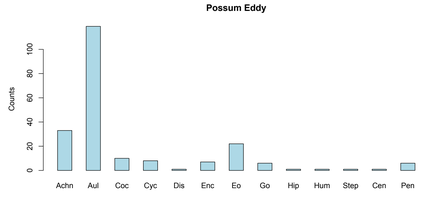


Figure 6. Histogram of genera counts for oxbow Possum Eddy

Table 2: Identified Diatom genera found in Savannah River oxbows October, 2015 and histogram abbreviations.

Achnanthes (Achn)	*Diadesmis (Di)*	*Gomphonema (Go)*	*Sellaphora (Sel)*
Achnanthidium (Ac)	*Diploneis (Dip)*	*Hippodonta (Hip)*	*Staurosira (Sta)*
Aulacoseira (Au/Aul)	*Discostella (Dis)*	*Humidophila (Hum/Hu)*	*Stephanodiscus (Step/Ste)*
Bacillaria (Ba)	*Encyonema (Enc/En)*	*Navicula (Na)*	*Surirella (Sur)*
Caloneis (Cal/Ca)	*Eolimna (Eo)*	*Nitzschia (Nit/Ni)*	*Thalassiosira (Tha)*
Cocconeis (Coc/Co)	*Eunotia (Eu)*	*Nupela (Nu)*	*Tryblionella (Tr)*
Cyclotella (Cyc)	*Fragilaria (Fra)*	*Pinnularia (Pin/Pi)*	*Ulnaria (Ul)*
Cymbella (Cym)	*Frustulia (Fru)*	*Planothidium (Pla)*	Unknown Centric (Cen/Ce)
			Unknown pennate (Pen)

Conclusions

1) Connectivity may not play as large a role as other environmental factors in diatom community dynamics (*e.g.,* depth or surface area). Data from more sampling events would need to be incorporated to fully test hypotheses on connectivity and taxa
2) High number of pennates could be due to sampling methods. Diatometers may select for certain species that can attach themselves to slides (*i.e.,* have a raphe) so future methods could include composite sampling of all habitat types.
3) Understanding more about the primary producers at each site could yield insight into Southeastern riverine systems such as nutrients in aquatic systems that can cause harmful algal blooms.
4) Future sampling events could aid in predictive modelling of independent variables that significantly impact diatom communities and possibly those depending on primary producers for resources.

Acknowledgements

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