Melissa Moreno

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Project proposal

Topic- Algal bloom effects on snook species

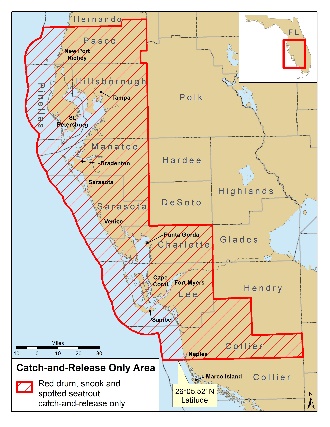
**Rationale:**

Algal blooms (*Karenia brevis*) are dinoflagellates when clustered in large quantities are typically referred to as “red tides”. When algal blooms become massive the clusters release a neurotoxin called brevetoxin (Perryman et al., 2020). Direct exposure to large amounts of brevetoxin can change the sodium- potassium channels of fish, ultimately leading to fish mortality (Kirkpatrick et al., 2004). Algal blooms can also indirectly impact marine fauna by triggering hypoxia (depravation of oxygen) (Landsberg et al., 2009). There are several studies which focus on red tide impacts on human health (Fleming et al., 2005) and tourist economy (where red tides can prevent humans from touring beach front properties). Algal blooms can be triggered by an influx of minerals, salinity and nutrients (DiLeone and Ainsworth, 2019). Florida uses many resources when algal bloom events occurs and kill fish including beach and water cleanup.

Snook are a popular sports game fish which can be up to 48 inches and 36 pounds. Snook are the largest and most common fish caught by anglers. Snook are considered to be a “species of concern” (by FWC) due to over harvesting. There are several research projects in Florida that are concerned with snook habitat protection and snook life cycles. The rationale for this research is to fill a gap in the literature since there is not much information know about the relationship between snook distribution and algal bloom events. Biologically the rationale would be to help stakeholders and decision makers choose more niche areas to protect against snook mortality against red tide events.

**Objectives:**

1. To determine salinity distributions between location of high algal bloom densities.

2. To conduct a spatial analysis on historic and recent algal blooms and compare snook fish distributions between time periods.

**Approach:**

The study area is located near the central west coast of Florida (Figure 1). This area is known to be a popular location to fish for snook. This area is currently in a catch and release season until May 2021. The fishery will reopen on September 1, 2021. Information about snook harvest times has been provided online at myfwc.com.

The algal bloom data comes in a point vector layer and are provided by FWC (<https://geodata.myfwc.com/>). The snook distribution data are provided by OBIS (<https://mapper.obis.org>) and are also in a point vector layer. The approach to conduct this analysis will be to use snook distribution data and compare the data in MaxEnt to the different time periods of historical and recent red tide presence/absence along with sea surface salinity information (provided by <https://resources.marine.copernicus.eu/>). Afterwards, the positive algal bloom points could be used in a snook species distribution model. The positive points might also be analyzed in a hot spot analysis in ArcGIS. Using MaxEnt has been used in many species distribution model analyses and ESRI ArcGIS products have been used extensively in federal and state organizations.

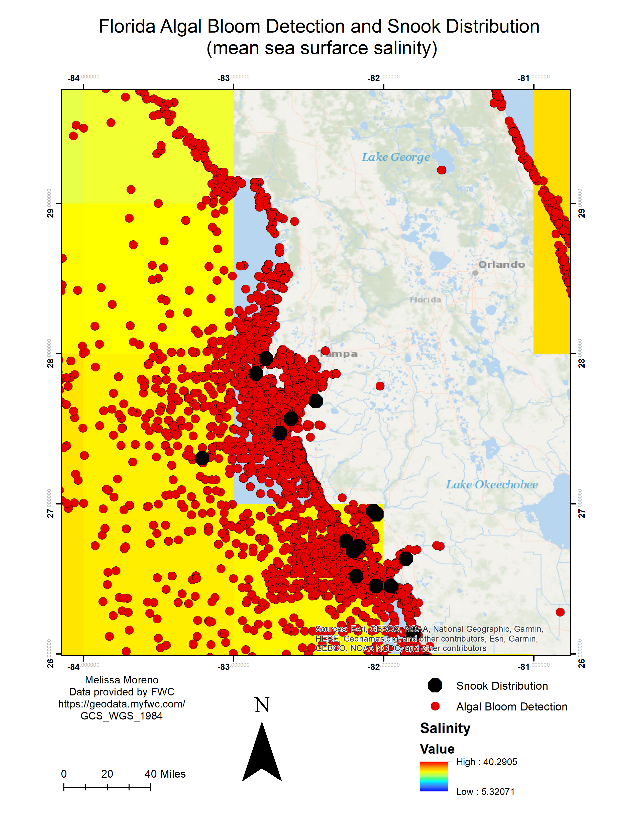
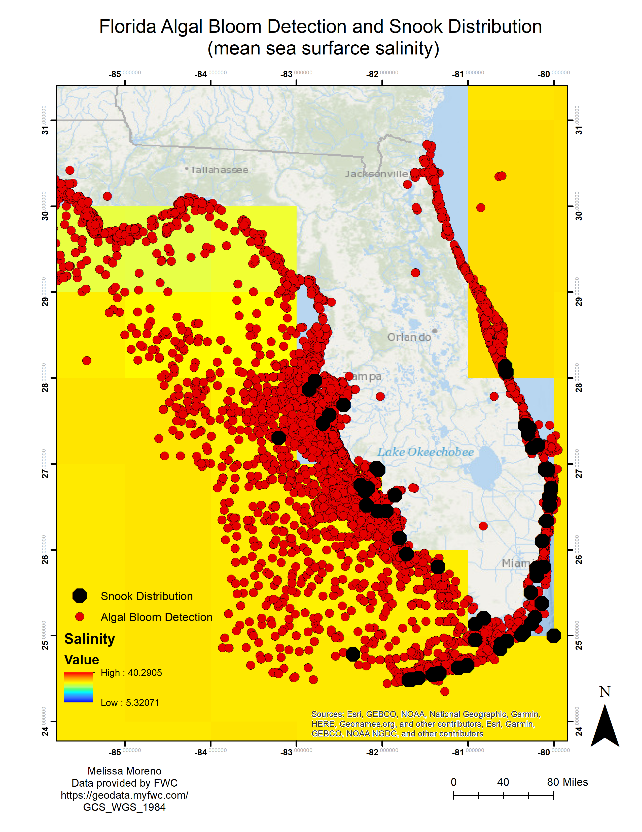
**A) B)**

Figure 1- A) Map of Florida displaying snook distribution and algal bloom detection, B) Zoomed in area of study area (Tampa and Sarasota areas) also displaying snook distribution and algal bloom detection

**Expected Benefits:**

The impacts of this project are to further understand the ecological impacts of red tide events on snook distributions. One expected benefit of this analysis is that it will provide supporting documentation to help state and local officials manage red tide areas affecting snook distribution. In these areas, officials might be able to focus their efforts in reducing red tide events to help fish species reproduce and populate. Another expected benefit of this analysis is that it can be used to help the public understand some of the impacts red tide has not only on humans but also on fish species.

**References:**

Perryman, H. A., Tarnecki, J. H., Grüss, A., Babcock, E. A., Sagarese, S. R., Ainsworth, C. H., & DiLeone, A. M. G. (2020). A revised diet matrix to improve the parameterization of a West Florida Shelf Ecopath model for understanding harmful algal bloom impacts. Ecological Modelling, 416, 108890.

Kirkpatrick, B., Fleming, L. E., Squicciarini, D., Backer, L. C., Clark, R., Abraham, W., ... & Zaias, J. (2004). Literature review of Florida red tide: implications for human health effects. Harmful algae, 3(2), 99-115.

Landsberg, J. H., Flewelling, L. J., & Naar, J. (2009). Karenia brevis red tides, brevetoxins in the food web, and impacts on natural resources: Decadal advancements. Harmful Algae, 8(4), 598-607.

Fleming, L. E., Backer, L. C., & Baden, D. G. (2005). Overview of aerosolized Florida red tide toxins: exposures and effects. Environmental Health Perspectives, 113(5), 618-620.

DiLeone, A. G., & Ainsworth, C. H. (2019). Effects of Karenia brevis harmful algal blooms on fish community structure on the West Florida Shelf. Ecological Modelling, 392, 250-267.

Larkin, S. L., & Adams, C. M. (2007). Harmful algal blooms and coastal business: economic consequences in Florida. Society and Natural Resources, 20(9), 849-859.

**Raster/shapefile links:**

<https://geodata.myfwc.com/datasets/shallow-banks-in-florida-bay-and-florida-keys>

<https://geodata.myfwc.com/datasets/recent-harmful-algal-bloom-hab-events>

<https://geodata.myfwc.com/datasets/rare-and-imperiled-fish/data>

<https://myfwc.com/research/redtide/monitoring/database/>

**FWC snook information:**

<https://myfwc.com/research/saltwater/fish/snook/sketch-common-snook/>

<https://mote.org/research/program/marine-fresh-water-aquaculture/marine-freshwater-aquaculture-current-projects>

<https://myfwc.com/fishing/saltwater/recreational/snook/>