Michael Mahoney

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Effects of the Gulf Hypoxic Zone on brown pelican (*Pelecanus occidentalis*) foraging patterns

The Mississippi River plays a large role in the physiological conditions across Louisiana's wetlands. The river and its contents change the physical environment with its fluctuations in temperature, flow, sediment, and nutrient contents. The Gulf hypoxic zone is an area of oxygen poor water that is greatly influenced by the amount of nutrients from agricultural fertilizer being deposited into the Gulf of Mexico by the Mississippi River. This area of low oxygen may be correlated with lower levels of aquatic life, which may have many indirect impacts on fisheries and coastal animal populations. This past summer I worked as a research assistant for doctoral student Brock Geary studying the foraging patterns of brown pelican (*Pelecanus occidentalis*) populations in the Gulf of Mexico to see how they are influenced by the Gulf Hypoxic Zone.

The brown pelican is a resident fish eating water bird, with local populations feeding almost exclusively on the gulf menhaden (*Brevoortia patronus*) (Shields, 2014). The pelicans nest in colonies on various substrate including grass, forbs, and mangroves. During our field season, the pelicans initiated nest building in late April, and began breeding in the later spring and early summer months (Shields, 2014 and Walter et al. 2013). On the islands, brown pelicans have limited predators, but are highly impacted by various forms of habitat degradation via hurricanes and other chemical contaminants (Walter et al. 2013). We still do not know the extent to which invasive species like nutria (*Myocastor coypu)* and fire ants (*Solenopsis invicta*) impact the pelican nesting colonies. Since the main food sources of these birds are fish from the areas surrounding their colonies, we anticipated the foraging patterns of these birds to be influenced by the theoretical range shift of their prey.

Throughout the summer we visited two different islands that were home to resident brown pelican colonies off the coast of Louisiana. During our trips, we would visit Queen Bess Island, in Barataria Bay, and Raccoon Island in Terrebonne Bay, both of which have been or are currently being restored to prevent erosion to protect and create breeding grounds for wading birds. Both of the islands are important nesting colonies for brown pelicans and other coastal bird species that nest on the island including reddish egrets (*Egretta rufescens*), roseate spoonbills (*Platea ajaja*), and black skimmers (*Rynchops niger*). On the islands, we used GPS telemetry to study the foraging patterns of the pelicans. We caught three pelicans on Queen Bess Island and five on Raccoon Island. Once the small transmitter device was secured to the back of the pelican, GPS and accelerometer data was wirelessly downloaded to our hand held base station on each subsequent colony visit. The tags collected location data every 15 minutes, while the accelerometers ran continuously through the daylight hours, collecting approximately six samples, on all three spatial axes, per second. This information is being be used to calculate the home ranges of these birds, and isolate areas where they spend most of their time. The accelerometer data could also be used to help determine whether the bird was stationary, flying, or diving. The data that came in from the birds was then downloaded at Tulane for analysis.

While we were on the islands, we also conducted other surveys in order to study the island community. During each trip to the island, Brock, another field assistant from Tulane, Marie, and I would conduct nest success surveys in order to monitor multiple nests and the growth of their chicks. Brock would record the number of chicks in each nest and their relative age. We also conducted a fire ant survey in order to

investigate the abundance of fire ants on Raccoon Island. At multiple sites along the dunes, we placed baited test tubes on the ground, waited an hour, and collected all ants found in the tube. This data will be used to make inferences about relative abundance of fire ant colonies on the island. From these data sets we can make inferences about the overall success of the pelican populations on the islands.

Because this study is being conducted over several breeding seasons, results are still forthcoming about how foraging patterns are being influenced by the hypoxic zone. From this opportunity, I learned many valuable skills that I plan to continue to build on. Aside from the useful information I learned about the natural history of these islands, the pelicans, and the other species that inhabited the islands, I gained hands-on experience with many field techniques. Brock was a great mentor, and it was very interesting to learn about how the experimental techniques he was applying to the field would be revisited and analyzed in the lab. This learning experience was a great opportunity for me to be introduced to the unpredictability of being a field researcher; in order to get the best results you have to be hardworking and ready to make changes to the experimental design of the project. I plan to continue to build on the skills I learned from this experience and apply them to new research opportunities. I would like to thank the Sea Grant for allowing me to have this opportunity to form new skills that I will carry throughout my professional career.

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