



Issue 34, Summer 2024

MASGP-24-001-02

Grabbing the Bull by the Fins: Bull Sharks in the northern Gulf of Mexico

Background on the Bull

Hearing the term “bull” as a descriptor for a shark probably conjures up images of a pugnacious and powerful predator. While it’s true that bull sharks (*Carcharhinus leucas*) earned their name from their stocky build and aggressive, predatory talents, there’s a lot more to these sharks than their fearsome reputations. In fact, even though these individuals are responsible for an occasional bite, you’re still far more likely to be [bitten or killed by a New Yorker than a bull shark](#).



A bull shark seizes the opportunity for a free lunch. Source: MSU Marine Fisheries Ecology Program.

Bull sharks are recognizable due to their blunt snout and muscular body. They are dark grey on the top of their body, with a transition to a paler color on the belly. This pattern is known as countershading, and helps them to camouflage and maintain stealth underwater. When viewed from above, the darker grey blends into the murkier waters below. When viewed from below, the lighter belly blends into the sunlit waters at the surface. Mature individuals can grow to 11 feet in length. These sharks are truly cosmopolitan, occupying subtropical and tropical coastal regions across the globe. They are remarkably adaptable, having the greatest freshwater tolerance of all shark species, which are usually completely marine. A golf course in Australia once rebranded to boast of the [bull sharks that lived in their lake for almost 20 years](#). As top predators, they play an important role in regulating the populations of their prey and maintaining the balance of their ecosystems. Because of the connectivity they provide between salt- and freshwater habitats, bull sharks are not only more resilient themselves, but they also increase the resilience of their habitats. The diversity of habitat use by bull sharks supports an exchange of nutrients and provides ecological stability between oceans, bays, and estuaries.

Bull Sharks in the Alabama

Delta

The presence of bull sharks has been confirmed up the Mississippi River as far north as Illinois, but how far have they been detected upriver in Alabama? In 2020, we published a [paper](#) that found bull sharks occupied less-urbanized, riverine habitat up to 120 km (75 mi) upriver during Alabama's dry summer season. In this study, we used eDNA (environmental DNA, i.e., DNA that is released from an animal into the environment) to assess the habitat use of bull sharks at the upper part of Mobile Bay, Alabama, known as the Mobile-Tensaw Delta. Here, freshwater and saltwater mix, creating a highly productive and dynamic habitat for wildlife. Using eDNA techniques in ecology is similar to a forensics team using DNA to place someone at a crime scene. An animal has left behind some physical evidence of its presence in an area, whether that be urine, scales, etc., and scientists are able to trace the DNA from that evidence back to a particular species. While extremely useful in that it can help us detect species without visual confirmation (e.g., catching them on fishing gear), eDNA can only tell us whether a species was present in an area; it does not provide other information, such as sex, size, condition (a measure of well-being based on length and weight), or life stage (mature vs. immature) of the animals. However, other studies have told us that [baby bull sharks abound](#) during warmer months in Mobile Bay, indicating it likely functions as a nursery habitat.

Rock-a-Bye Baby Shark: Bull Sharks Use Nurseries



Profile of a juvenile bull shark. Source: Bryan Huerta

Like many other species, bull sharks use nursery habitat for the birth and growth of their young, which are as small as 1 ft at birth. Nursery habitat is important to bull sharks because it provides protection from larger predators and access to abundant prey, giving these sharks a greater chance of making it to adulthood and reproducing. Because of their freshwater tolerance, bull sharks can occupy coastal freshwater and estuarine habitats, such as rivers, estuaries, bays, and mangroves, for nurseries. Mobile Bay makes a perfect nursery habitat for a young bull shark due to its highly productive waters, which provide ample prey, and the dynamic influx of riverine waters at the northern portion of the bay, allowing them to occupy regions inaccessible to other predatory sharks. With the help of the Alabama Department of Conservation

and Natural Resources (ADCNR), we have been able to uncover how baby bull sharks are occupying the Alabama coast, and how that may be changing with the climate.

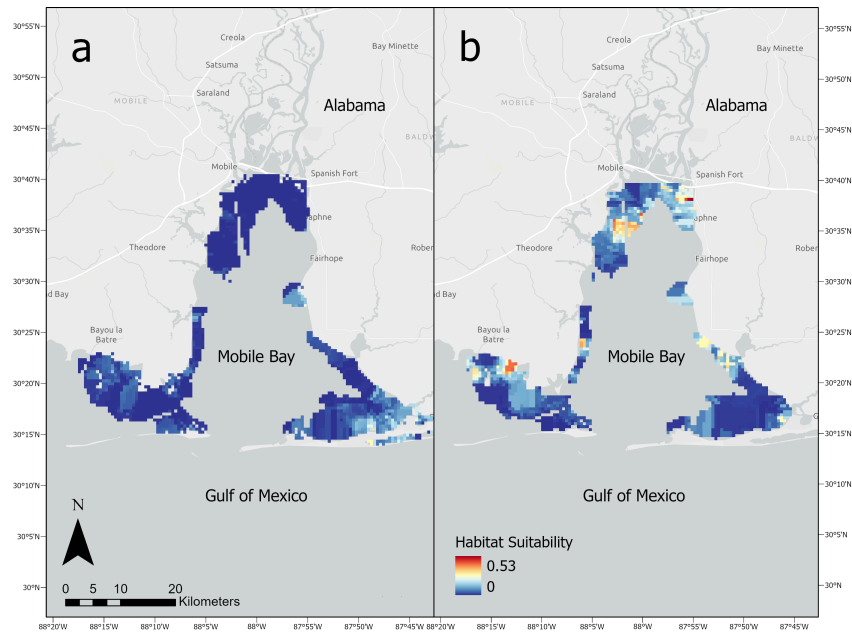
No Bull: Climate Change Affects Bull Sharks

As waters warm around the world, including the Gulf of Mexico, marine species are impacted. We often hear of the consequences, such as coral bleaching, having detrimental effects on tropical marine systems. But is it possible for some species to be better adapted to handle these changes than others and perhaps even thrive?



A member of the ADCNR retrieves a gill net for sampling. Source: ADCNR.

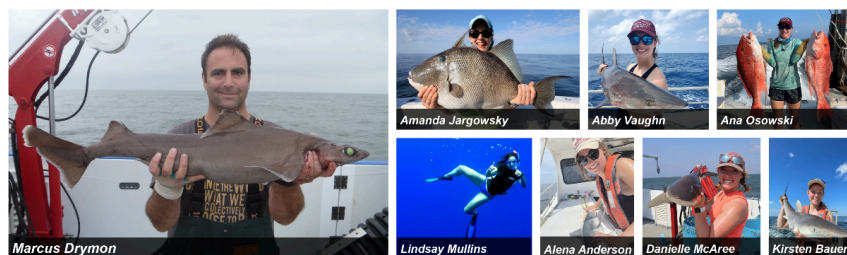
For the last few decades, the ADCNR has been conducting a gill net survey of Alabama's shores. This information, coupled with environmental data, has been useful in tracking trends in fish populations over time. Since 2003, we were able to [identify a five-fold increase in the relative abundance of bull sharks in Mobile Bay and Mississippi Sound](#), which occurred in tandem with waters warming at a rate of 0.05 °C/yr. The relative abundance describes the number of fishes (including sharks) captured per gill net hour fished. When these data were coupled with machine learning modeling (i.e., the use of computer programs that recognize patterns in data), we found warmer waters were the greatest predictor for the presence of a juvenile bull shark over the past 20 years. Further, the warmer the water, the more likely there was to be a juvenile bull shark caught, with no upper threshold to their thermal tolerance identified. This has led to an expansion in their overall suitable habitat. So, while many species are negatively impacted by warming waters, juvenile bull sharks appear to be thriving at the current thermal ranges observed on the Alabama coast.



Habitat suitability for juvenile bull sharks based on mean environmental conditions (i.e., average temperature, salinity, Chlorophyll-a, riverine discharge and dissolved oxygen) from 2003-2005 (a) and 2018-2020 (b). Habitat suitability indicates the probability of catching a juvenile bull shark via gill net at a particular location. Source: Mullins et al. (2024).

Alabama is not the only portion of the Gulf of Mexico coastline to host baby bull sharks in its waters. The bays of Texas also support their own population of bull sharks, and lately, they've been saying "howdy" to more. In fact, they've come to host 8 times the relative abundance of bull sharks compared to 40 years ago! Since waters are remaining warmer for longer, the baby bull sharks are able to spend more time in their nursery habitats, feeding and growing stronger, before heading offshore as coastal waters cool in the winter, a phenomenon known as "overwintering" (Matich et al. in press). This extra time spent in nursery habitats has likely increased their survivorship to adulthood.

Although there are apparent benefits of warmer waters for bull sharks, we also know there are costs. On one hand, warmer waters allow bull sharks to grow faster, but they also place increased demands on the sharks' aerobic metabolism and feeding requirements. Thus, there may be a tipping point where these costs outweigh the benefits for a baby bull shark. Prior to a physiological tipping point, climate change could also come to collect through ecosystem stresses. Warming temperatures have led to a reduction in [other species](#) in the Gulf, which may have rippling effects throughout the ecosystem. Until then, though, we will celebrate the resiliency of these baby bull sharks thus far.



I'm Marcus Drymon, an Associate Extension Professor at Mississippi State University and a Marine Fisheries Specialist at Mississippi-Alabama Sea Grant. Amanda Jargowsky, Abby Vaughn, Ana Osowski, Lindsay Mullins, Alena Anderson, Danielle McAree, Kirsten Bauer, and I are the Marine Fisheries Ecology Lab. We'd love to hear from you! Please reach out to us at marinefisheriesecology@gmail.com



Facebook Website

Copyright © 2024 Mississippi State University Marine Fisheries Ecology, All rights reserved.

Want to change how you receive these emails?
You can [update your preferences](#) or [unsubscribe from this list](#).

