Citizen Science

What is citizen science? Citizen science, also known as community science, involves the collection of data by non-professional researchers. Incorporating information compiled by members of the community and other stakeholders is rapidly becoming a popular strategy for researchers to use for large-scale, ecosystem-level studies. Observations and knowledge collected from people who are familiar with their local environments have been used to document species declines, detect shifts in ecosystem structure, and track marine invasions.

For example, citizen science has been used to combat the invasive red lionfish that have spread into northern Gulf waters over the past decade. A recent citizen science study compared lionfish surveys completed by spearfishers and divers (i.e. citizen science data) with traditional fishery-independent data sources (i.e., scientific surveys). They found that community observations documented the existence of lionfish in the Gulf a couple of *years* earlier than scientific monitoring programs. This study underscores the speed at which valuable information can be obtained from "nontraditional" data resources.

What is the history of citizen science? Citizen science has been used for centuries. Records of bird monitoring citizen science programs in Europe date back to the 1700s, and in 1874, the British government even enlisted the help of prominent amateur astronomers to calculate the distance from Earth to the Sun in a project called the Transit of Venus. Since then, the fields of ornithology and astronomy have taken advantage of citizen science in order to conduct studies that encompass wide geographic expanses and time frames (e.g., studies of migration patterns or planetary movement). Now, fisheries scientists are catching on. In fact, for a recent publication in which we assessed the diet of tiger sharks, we capitalized on citizen science resources generated by amateur ornithologists across the country. To understand the relationship between the tiger sharks (predators) and birds (prey), we used the world's largest biodiversity-related citizen science project: eBird. Without the help of avid birdwatchers around the world, the migratory information that was needed to recognize a unique predator-prey relationship would have been missing.

To read more about the relationship between tiger sharks and songbirds, click HERE.

How does citizen science aid research? Scientific research projects can be limited by a multitude of factors such as time, money, and staff. With the hard work of dedicated citizen scientists, the challenges presented by these

limitations can be alleviated. More specifically, scientists have been able to collect powerful long-term datasets that can encompass information across extensive spatial and temporal scales that otherwise may not have be feasible to study. These data are often necessary for evaluating large-scale environmental processes, such as those associated with climate change.

In summary, citizen science is a valuable, cost-effective way to combine local knowledge with data collected by researchers to improve management and to maximize the success and health of our ecosystems

Citizen Science at MSU:
Tarpon Tagging

Photo by David Hay Jones

Above: Matthew Jargowsky of the Marine Fisheries Ecology lab tags a tarpon with the help of angler advocates

In addition to our tiger shark study, we recently collaborated with citizen scientists to examine habitat use and movement of Atlantic tarpon in the northern Gulf of Mexico. More than 25 anglers provided assistance, both by tagging fish in the field and contributing financial support. The curiosity of the anglers regarding the biology and ecology of the tarpon provided a mutually beneficial experience in which we had the opportunity to share information about the fish with those who are experts in catching them. However, this knowledge transfer was not just a one-way street, as these anglers also provided key insights into tarpon ecology that could only be learned through decades of fishing experience. Given that Atlantic tarpon are designated as Vulnerable by the IUCN, the angler advocates involved in tagging these fish have contributed significantly to research aimed at informing the management necessary to sustain these fish populations.

As these anglers know, tarpon are one of the most difficult fish to catch in the northern Gulf of Mexico. Yet with the help of these angler advocates, we have tagged more than 30 tarpon with SPOT tags since 2018. With their generosity, we were able to work together tagging these fish by actually joining the anglers on their boats as they caught the fish. As we watched the anglers wrangle in the fish, which leapt out of the water with a fight when hooked, the resilience of these fish and the fishermen who love and respect them was palpable.

The outcome of this study included identification of potential feeding and spawning areas, as well as an increased understanding of tarpon movement patterns in the northern Gulf of Mexico. Moreover, it demonstrated the crucial role that angler advocates can play in the conservation of this highly valued, but threatened species. If you would like to read more about this project, please check out the resulting publication HERE.

West-Central Coastal Florida Shark Survey and Mapping

Above: an immature great hammerhead is tagged and measured by CMERA participants.

Our most recent citizen science-based work comes from a collaboration with a group located in Clearwater, Florida known as the Coastal Marine Education and Research Academy (CMERA). Established in 2012, CMERA is a privately run organization whose mission is geared towards providing undergraduate and graduate students with hands-on field experience, while collecting survey data on sharks and rays in the nearshore coastal waters of west-central Florida. Despite the bustling human population in the nearby Pinellas County, their coastal barrier island and seagrass habitats have never undergone a formal shark population analysis, and the data collected by CMERA's student scientists have gone unassessed and unpublished.

Using their summertime capture data, which spans the years 2012-2018, we were able to input and organize shark captures in a Geospatial Information System (GIS). These types of systems allow researchers to manage, analyze, and display spatial data. Once these data were organized, we identified a diverse assemblage of 11 shark species in the area. Importantly, most of the sharks captured were immature individuals. This indicated to us that this area could potentially function as nursery habitat, furthering the need for a baseline population assessment in the area. We also performed a hot spot analysis to identify locations where different species of sharks and immature individuals may be most densely populated. We then applied a statistical model which

allowed us to identify what environmental factors, such as temperature or salinity values, characterized ideal shark habitat.

With this information, we found that shallow, warm, seagrass environments were providing essential habitat for the vast majority of species. Most interestingly, we also found that areas protected as "No Internal Combustion Engine" zones, where motorized boating activity is forbidden, were serving as hot spots for the greatest diversity of sharks, including immature sharks and the protected great hammerhead and scalloped hammerhead. These assessments will provide a baseline reference to evaluate population changes in future studies, and will help guide environmental management decisions in the local area.

To learn more about CMERA and their opportunities, please check out their website HERE.

You as the Citizen Scientist

As community members participating in citizen science, you have the power to influence the scope of ecological research, as well as learn about and help provide solutions to issues that may be occurring in your very own backyard. In addition, citizen science not only benefits research efforts, but can benefit the participants themselves. Participants of citizen science research demonstrate a sense of increased self-efficacy, find an outlet for community and increased social interaction, and receive a chance to gain new skills and knowledge. If you are interested, we strongly encourage you to get involved in a project that matches your unique interests and capabilities!

Wondering how you can contribute to fisheries studies in the Gulf? One of the easiest ways to conduct community science as a local fisherman is through tagging studies. If you ever catch a tagged fish or shark, record as much information as possible and report it to the appropriate entities. For example, if you catch a shark with a red tag near its dorsal fin, chances are it's one of ours. Regardless of your plans to keep or release the animal, make a quick note of your location (the more specific the better), the species you caught, the associated tag number, the estimated length of the animal and any other details you'd like. You can then go to the website listed on the tag (in our case, it's www.msusharktags.com) or call the number listed on the tag to report the fish's information. These data will provide scientists with movement information and even assist us in estimating habitat preferences of local shark and fish species. You can also participate in regional and national angler-based and cooperative tagging programs. On a national level, NOAA Fisheries has resources for anglers and fish enthusiasts to participate in shark, tuna and billfish tagging programs. There are also regional tagging programs that encourage citizens to tag and report fishes in the northern Gulf of Mexico; examples include the TAG Alabama Program with the Coastal Conservation Association in Alabama and the Sport Fish Tag and Release Program with the Gulf Coast Research Laboratory in Mississippi. Getting involved with these local tagging programs is the perfect opportunity to contribute to fisheries research while also enjoying your favorite pastime: fishing.

For additional opportunities with Mississippi State University Extension, including those outside of aquatic efforts, please click HERE.

Readers: We Need Your Help!

Photo by Bryan Huerta

Thank you for supporting MSU Marine Fisheries Ecology by subscribing to our newsletter! We value the opportunity to connect with you, and we'd appreciate your honest critique of our Gulf Coast Fisherman Newsletter content from this past year. Please take our 1-minute, 4-question survey at https://msudafvm.co1.qualtrics.com/jfe/form/SV_9KnAi6J0rNKHqPs for a chance to win a $100 Visa gift card! (Please note – this survey closes on March 15, 2021 at 11:59 PM.)

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