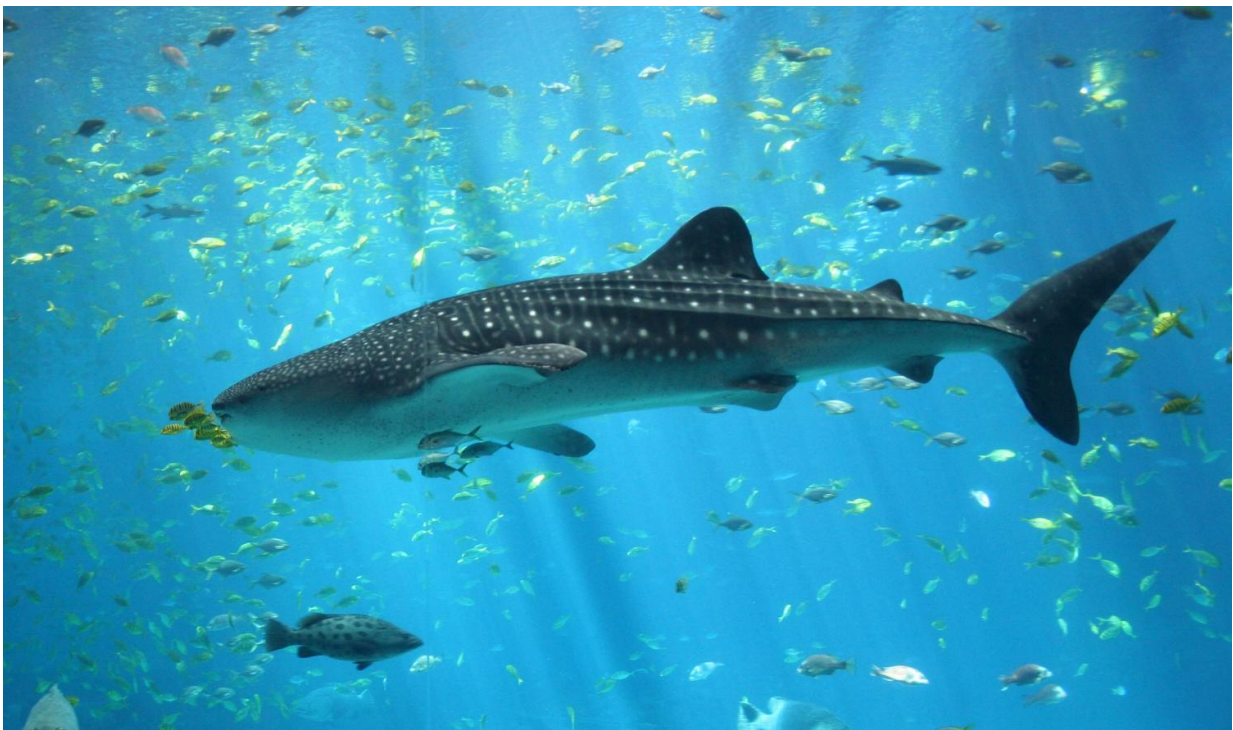


New study, detailing 22-year-long global citizen science project sheds light on enigmatic endangered whale sharks

November 29 2017



Credit: Zac Wolf/Wikipedia

Vital scientific information about whale shark behavior, biology and ecology is being uncovered by an unlikely source - ecotourists and other citizens. Thanks to modern advancements in technology and the burgeoning field of "citizen science," new information about gregarious

and mysterious whale sharks is being revealed in a study slated to publish on November 29 in *BioScience*.

Whale shark habitat spans the globe, making long-term research over wide geographic ranges a difficult challenge for whale shark researchers. To address this challenge, researchers harnessed modern technology, creating an online photo database called Wildbook for Whale Sharks and enlisted the help of ecotourists and citizens across the globe to upload any images of whale [sharks](#) they happened to see or encounter anywhere in the world. Photos of nearly 30,000 encounters representing 6,000 individually-identified sharks across 54 countries over 22 years has given scientists a rich data set to analyze and better understand the nature of this endangered species that has long been misunderstood and understudied.

Through this effort, researchers have now identified 20 whale shark aggregation sites globally, an increase from 13 identified prior to enlisting citizens in this scientific effort.

"This effort is increasing our knowledge of whale shark abundance and geographic range, trends in site fidelity and frequency," explained the study's lead author and Director of ECOCEAN Inc. Dr. Brad Norman. "That information is vital for prioritizing conservation areas for the species."

Analysis of the images provided data on sex-ratio bias, site fidelity and aggregation, hotspot sites, size and migration patterns of the animal—details that improve scientists' understanding of the species and help conservation efforts to protect them and their environment.

"Enlisting citizens to participate in science has helped us uncover several mysteries of the [whale shark](#). We are piecing together a puzzle of both the ecology of this endangered species and the areas that are most

critical to them," said Dr. Alistair Dove, Vice President of Research and Conservation at Georgia Aquarium, a co-author on the study.

The long-term observation project has provided enriched scientific knowledge of the species including:

- Spot patterns in whale sharks are unique and long lasting, and provide a method of individual identification through photographs.
- Some of the most populous hotspots of whale sharks include the Ningaloo Reef in Australia, the Atlantic coast of Mexico, Mozambique and the Philippines. Year-by-year observation of the population in these areas and lack of population in others suggests to researchers how illegal fishing and lack of conservation can impact aggregation.
- There is a strong male bias at the majority of sites, showing an overall 66 percent male population globally.
- For the most part, whale sharks aggregate around the same hotspots from year to year.
- Few individual whale sharks move between countries.

Engaging citizen scientists in photo-identification of whale sharks tells scientists more than the nature of the species, but also identifies an association between ecotourism activities and how they may affect the appearance and return rate of whale sharks. It can also identify how areas of high fidelity are addressing conservation techniques, showing how those techniques may be applied on a larger scale. Finally, a broader analysis of the environmental variables in the aggregation sites can inform the long-term impacts of climate change in the movement of the whale sharks.

The study's authors encourage other directed research programs using [citizen science](#) to dedicate their efforts to photo-identification sampling

at times and locations separate to regular tourism activities to encourage consistency and avoid data gaps.

Provided by Georgia Aquarium

Citation: New study, detailing 22-year-long global citizen science project sheds light on enigmatic endangered whale sharks (2017, November 29) retrieved 2 May 2024 from <https://phys.org/news/2017-11-year-long-global-citizen-science-enigmatic.html>

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