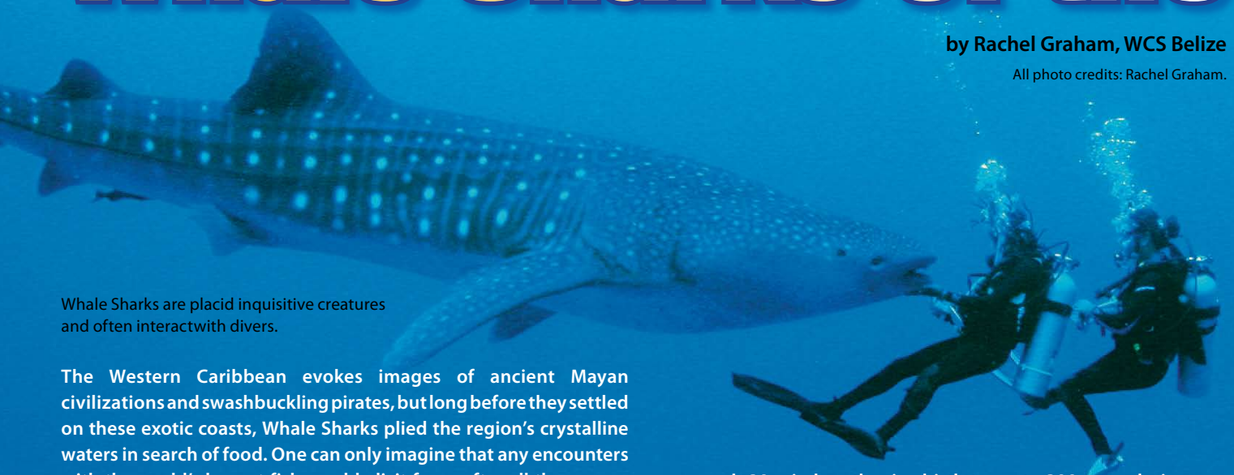
Whale Sharks of the Western Caribbean

by Rachel Graham, WCS Belize

All photo credits: Rachel Graham.



Whale Sharks are placid inquisitive creatures and often interactwith divers.

The Western Caribbean evokes images of ancient Mayan civilizations and swashbuckling pirates, but long before they settled on these exotic coasts, Whale Sharks plied the region's crystalline waters in search of food. One can only imagine that any encounters with the world's largest fish would elicit fear - after all these were the monsters of the sea, waiting to gobble up anyone unfortunate enough to find themselves stranded. Little did these early seafarers know that Whale Sharks are harmless animals that prey on small fish, zooplankton and jelly fish. In fact, little was known about Whale Sharks, their populations, patterns of movement, biology or behaviour until the past decade. Historically, the majority of information on Whale Sharks came from animals washed up on shore, caught in nets or rammed by ships. We now know that they can reach 20m in length, give birth to up to 300 pups during one gestation period, and are capable of navigating across ocean basins in search of food. Whale Sharks are slow growing, long lived animals (potentially reaching up to 100 years of age) and consequently are highly vulnerable to fishing pressure. Due to rapid declines in their numbers where they have been fished, Whale Sharks were listed on the Convention on the International Trade of Endangered Species (CITES) Appendix II (which regulates trade in wildlife products), and are protected by a number of other conventions.

Since the 1990s, coastal and marine tourism has risen dramatically as people seek new adventures. As visitor interest for the thrill of shark encounters increased, reports of Whale Shark sightings poured in from different areas worldwide. It was only a matter of time before Whale Sharks became a focus of marine tourism and conservation globally. This attention led to the identification of several sites where Whale Sharks could be seen predictably, sometimes in the tens or hundreds of animals. Despite increasing sightings and encounters no-one knew the reasons for regular Whale Shark visitations. It was the fishermen of the Western Caribbean who first shared with scientists their seasonal encounters of Whale Sharks at three sites: Mexico's NW corner of the Yucatan, Belize's Gladden Spit, and Utila Island off the mainland coast of Honduras. These sites are located along the world's second largest reef system - the Mesoamerican Reef. Now, almost a decade later, pieces of the Whale Shark mystery are falling into place.

FEEDING ON SPAWN

Much of the initial information on Whale Shark populations and behaviour in the region was gathered in Belize, where work with local fishermen in 1998 revealed the occurrence of Whale Sharks in relation to reef fish spawning aggregations - discrete sites where fish gather to reproduce. Whale Sharks, known locally as "Sapodilla Tom" (after the fisherman (Tom) who first saw them near the Sapodilla Cayes on the Barrier Reef), congregate every March-June and occasionally until October at Gladden Spit. Gladden Spit is important for at least 25 species of reef fish that come together in huge numbers at specific times of the year, usually around the full moon, to reproduce. During a spawning event, female and male fish rise in the water as groups, releasing millions of eggs and sperm. The hundreds of billions of fertilized eggs float to the surface and, due to the oil droplets in each of the eggs, produce a very nutritious meal. Whale Sharks target the clouds of snapper spawn as soon as they are released and, as active feeders, are able to eat while remaining in a stationary and vertical position in the water (as opposed to passive feeding Basking Sharks that need to swim continuously, mouths agape, to capture more dispersed prey).

Whale Shark feeding at the surface.

RESIDENT OR MIGRANT?

After the first underwater encounter with the Whale Sharks at Gladden Spit, we knew we were witnessing something unique. The phenomenon raised a slew of questions from scientists, local fishermen and tour-guides alike. We were curious to know where the Whale Sharks came from and where they went to after the peak spawning time of April and May, or whether they were resident at Gladden Spit and stayed deep. If they travelled away, how far? We knew from other scientists that one Whale Shark traveled across the Pacific Ocean from Baja, Mexico covering almost 13,000km. It was possible that the sharks encountered in Belize were doing the same thing. But were they stopping off at other places along the way and feeding on other spawning aggregations? Were the same sharks coming back to Gladden every year? Moreover, we had no idea how many Whale Sharks visited Belize or even exist in the world. Finally, if we thought that this was an amazing phenomenon then surely others would too and management of the site would be easily put in place. We had our work cut out.

TAGGING

We were able to use a range of different research techniques thanks to funding from the UK Darwin Initiative and the Natural Environmental Research Council. We first started tagging sharks from 1999-2002 to differentiate between individuals encountered. Although we had some excellent results on movements and re-sightings, we found that tags often got fouled with algae, were broken or simply came out. We noted that Ningaloo Reef's Whale Shark research pioneer, Geoff Taylor, used the spot patterns behind the gills and we incorporated this into our photo identification work that focused on the dorsal and lower tail spot patterns. We ultimately abandoned conventional tagging after 2002 in favour of photo ID as it was more reliable and non-invasive. This resulted in identification of at least 106 individuals, several of which were resighted year after year. We estimated sizes by placing a diver or boat next to individuals, and "checking under the hood" for the sex (presence of claspers in males). Most of the sharks that recorded since 1998 at Gladden are juvenile males around 6m in length. Once we knew that the visiting population was rather small and sighted seasonally at Gladden Spit, we needed to know if it was resident but moving to deeper waters outside of spawning events and whether it capable of traveling large distances. The marker tags confirmed movement along the Mesoamerican Reef: two dive groups saw a Whale Shark with our tag north of Cancun, Mexico, over 600 km away from Gladden Spit and another tagged Whale Shark was encountered in Utila! To help us get a more detailed understanding of the Whale Sharks' activities we also tagged some of the Whale Sharks with acoustic or "pinger" tags.

Each pinger emits a different set of sound pulses that helps us differentiate between the sharks. The sound is picked up by underwater receivers stationed at different points along the reef which continually record shark presence and absence. Between 2000 and 2003, 22 sharks fitted with tags and 23 receivers deployed throughout the Belize Barrier Reef, including Gladden Spit told us that the same Whale Sharks returned to Gladden every year and, arriving when fish start to spawn. The receivers also revealed that the sharks often leave after the two-week spawning moon, moving to many other sites along the reef and atolls, only to return for the next spawning moon. So where are the Whale Sharks going during the rest of the year? To try and elucidate this mystery we are using the latest technology: satellite pop-up archival tags.

The pop-up archival satellite tag is an amazing piece of technology. A mini-computer surrounded by dense floating foam with an antenna at one end, the tag records depth, temperature and light levels every minute of the day for as long as it stays on the shark. At a pre-programmed date, the tag detaches itself and floats to the surface. The information is transmitted to a satellite, and sent to us by email. We deployed 11 tags that revealed Whale Sharks dive regularly to 500 m and occasionally beyond 1000 m, and are able to withstand temperatures below 5?C for short periods of time. Their diving behaviour is periodic, with specific dives occurring every 29 days, 24hrs and every 8hrs. Whale Sharks dive deep primarily during the day and outside of the snapper spawning periods. During deep dives they may be seeking food, trying to regulate their temperature, orienting themselves with respect to the seafloor or continental shelves or, also very likely, just taking a little kip! Using smart position only satellite tags (SPOT) (attached to the shark via a lanyard and transmits when floating at the surface), we were able to track directed movements to the two other feeding aggregations along the Mesoamerican Reef in Mexico and Utila. We were therefore able to determine that Whale Sharks are not resident at any one site but that they aggregate primarily to feed. The satellite and acoustic tracking revealed that they possess a migratory corridor along the Mesoamerican reef where they are able to time their movements to reach key feeding sites just as "dinner is served". However, we still do not know the full extent of the migrations, if only a portion of visiting populations move from one site to another or if all animals visit the three feeding sites. There is still no good explanation for why we primarily encounteryoung male sharks - where are the females and large adults? Where are the neonates or recently pupped sharks? How do sharks know to arrive when the food is available and what cues are they using to navigate to these sites? There is still much to learn! Colleagues in Mexico and Utila are currently investigating the structure and size of the visiting populations at their feeding aggregations and expanding the movement studies to determine whether Whale Sharks are moving outside of the Mesoamerican Reef region.

THE FUTURE

From the moment we witnessed the phenomenon at Gladden Spit in 1998, we worked to get the site and its seasonal visitors protected. We developed encounter guidelines and a course to train fishers and local guides as Whale Shark tour guides. In 2000, the Gladden Spit and Silk Cayes Marine Reserve was declared, and in 2003 Whale Sharks were protected nationally, and spawning aggregations protected at key sites along the reef. Tourism has increased dramatically since 2000 but guidelines and regulations now in place enable site managers (NGO Friends of Nature) to protect the Whale Shark and reef fish spawning aggregation site. We are proud to work with local fishermen, tour-guides, local conservation organizations, the Belize government and other researchers to pool our pieces of the puzzle and are finally beginning to see the big picture of the life and ways of our giant ambassador of the seas.

The gentle ambassador of the sea.