Whale sharks of northern Mindanao: hunters to spotters?

Large Marine Vertebrates Research Institute Philippines

Progress Report

by Gonzalo Araujo & Jessica Labaja

This report presents an update for our 2017 whale shark research and conservation work in Talisayan, Misamis Oriental, Philippines. After some unforeseen delays due to security concerns and unfavourable weather, surveys started on March 11th 2017. Since, a total of 30 surveys were conducted along the municipality of Talisayan, extending through Balingoan and into Camiguin Island to the North, covering >120 hours and >1,000 km of effort. So far, we recorded 34 encounters with whale sharks whilst on survey, including 2 individual whale sharks that were previously identified at our Cebu whale shark monitoring site in 2012. The municipality of Talisayan has 395 fishermen registered with the Local Government Unit in 11 coastal barangays (villages). Based on previous local, and international work with small-scale fisheries, we aimed to interview 40% of them (162), to understand their experiences and interactions with whale sharks, and other megafauna catches. Preliminary results are presented herein.

Background

The whale shark *Rhincodon typus* is the world's largest fish, and it inhabits the tropical and warm temperate waters of the world (Rowat & Brooks, 2012). Whale sharks create seasonal aggregations in certain areas, normally linked to primary productivity (e.g. Robinson *et al*., 2013; Motta *et al*., 2010; Rohner *et al*., 2015). This predictability makes them targets to hunters and tourists alike. In the Philippines, targeted fisheries for whale sharks operated in the Bohol Sea area into the late 1990s, with over 100 whale sharks landed seasonally at just two sites (Pamilacan Island, Bohol, and Talisayan in Misamis Oriental; Alava *et al*., 2002). Continued exploitation in the Indo-Pacific region led to the uplisting of the species to 'Endangered' under the IUCN Red List in 2016 given their >50% population decline in the last three generations (Pierce & Norman, 2016).

The northern Mindanao bays present high primary productivity between December and June (Cabrera *et al*., 2011). This was corroborated by semi-structured interviews with local fishermen who confirmed the bloom of sergestid shrimps (spp. unknown) during these months, a whale shark favourite (e.g. Rohner *et al*., 2015; Araujo *et al*., 2016a). The bays are in close proximity to deep waters close to shore, providing unique areas of upwelling, and where pelagic species are seen in relative proximity to the coast. Hunters from Guiwanon, Talisayan, used to travel far and wide across the Bohol Sea in search of whale sharks (Alava *et al*., 2002). Whale sharks were caught in Talisayan, south of Camiguin, and in the Salay area on the west side of the peninsula, though catch per unit effort decreased there over time. Eckert *et al*. (2002) deployed a satellite tag on a whale shark in Salay, and recent tag data revealed movement between Talisayan, Camiguin and Salay by some individuals (Araujo *et al*., *in prep*.). These preliminary results highlight the importance of the area for this endangered species, on at least a seasonal basis.

Little is known about the general marine biodiversity in northern Mindanao. Magsaysay, between Gingoog and Butuan Bays, reportedly hosts whale sharks during the sergestid shrimp season as well as satellite tag data also shows the whale sharks moving through this area (Araujo *et al*., *in prep*.). Malimono in Surigao del Norte is a long straight coastline with occasional small bays adjacent to steep slopes. Whale sharks were sighted along a 25 km stretch of coastline during exploratory surveys in 2016 (Araujo, unpub. data). Similarly, Talisayan has seasonal black skipjack tuna fisheries, fisherfolk of which all reported the occurrence of whale sharks in close proximity to the tuna, even sometimes ending entangled in their nets. A close relationship with the fishermen can help identify whale shark hotspots.

This report presents our preliminary results from our work in northern Mindanao. Meetings were held during the first week of February and Prior Informed Consents (PIC) were signed with the municipal Mayors of Talisayan and Malimono. Due to security constraints (rebel fights in the vicinity), work in Malimono had to be cancelled, and we will therefore focus efforts in Salay area during the second stage of the project, with whom a PIC was also signed. The rainy season continued throughout February, so fieldwork started in early March. The fixed-winged drone arrived in the Philippines in mid-March in an unfortunate semi-broken state. We are currently working to fix it and get it up in the air.

Project Update 2017

Whale Shark surveys

In collaboration with the Local Government Unit of Talisayan, surveys were conducted along the coastline of Talisayan, Misamis Oriental, in search for whale sharks (Fig. 1).

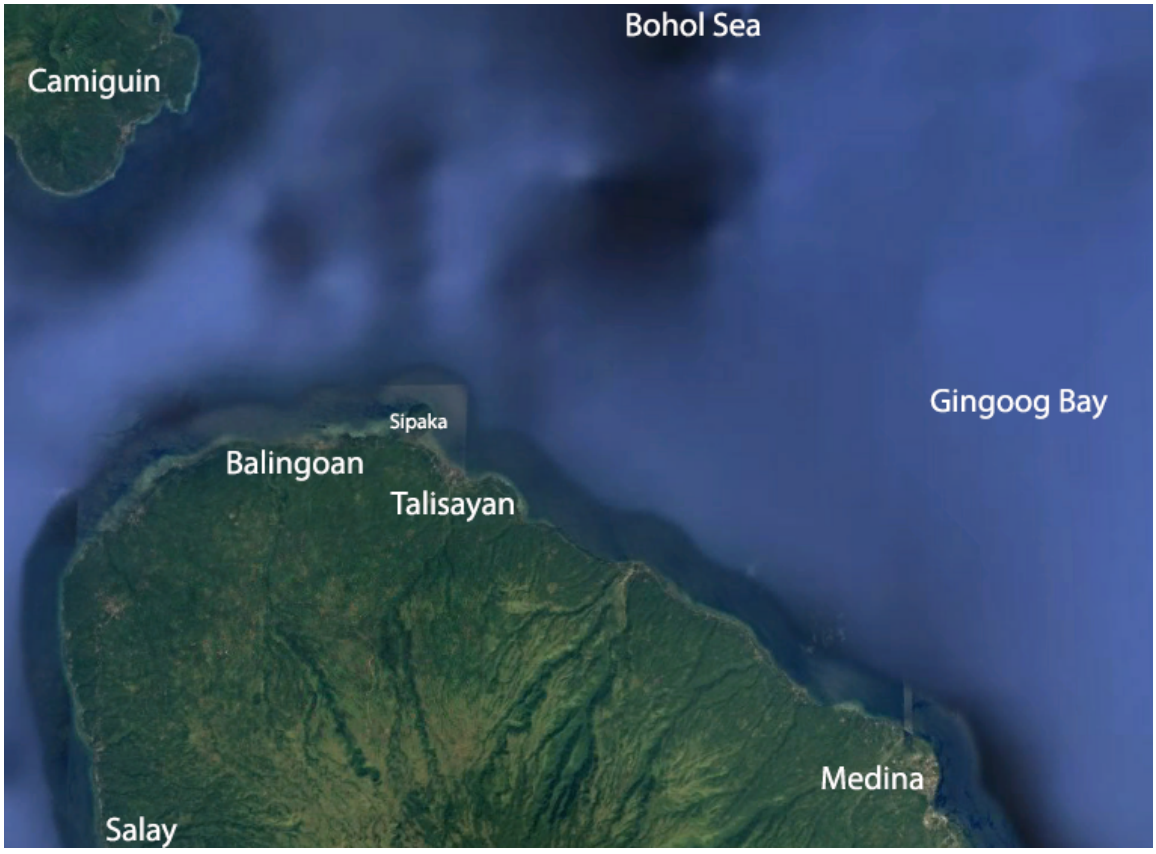

Fig. 1. Map of the study area.

Whale sharks are commonly sighted in association with other fauna (Fig. 2.). To help find the whale sharks, we look for fish boils on the surface. So far, we have seen whale sharks occurring with *Euthynnus affinis* (black skipjack or mackerel tuna), *Katsuwonus pelamis* (skipjack tuna), *Auxis* spp. (likely *A. rochei* and *A. thazard*; bullet mackerel/tuna), and the juvenile version of these species. When sighting a boil of fish, the pumpboat slowly approaches whilst looking for fins breaking the surface. Fisherfolk are normally already at the scene, and they drive with their pumpboats over the boil, trailing a 30 m line with a single or multiple silvery hooks over it. It is unsafe for researchers to get in the water to observe if whale sharks are under the tuna boil and not breaking the surface. We collect a GPS waypoint only when a researcher visually confirms a whale shark sighting.

When safe to enter the water, researchers will take a waypoint, enter the water and approach the left flank of the whale shark. We collect photographic identification (photo-ID) images of the whale shark, and confirm its sex by photographing the presence (male) or absence (female) of claspers. We had a total of 34 whale shark encounters, but only 15 confirmed individual whale sharks due to difficulty of obtaining photo-ID. Whale sharks ranged from 4 to 7 m in total length, with all but 1 confirmed female. Three (3) out of 14 whale sharks had propeller cuts on them. Of the 15 individual whale sharks encountered on survey, 2 were previously sighted in Cebu. This is relevant data, and adds to our understanding of regional movements of whale sharks through the use of photo-ID. Whale sharks were encountered close to shore in the month of March, and further offshore (4 -8 km) in April and May.

Surveys started from Barangay Mintabon during March through to mid-April, and then from Poblacion thereafter. Whale shark sightings were mostly in Talisayan waters, though encounters were recorded in Medina, Balingoan and Camiguin waters (Fig. 1).

Fig. 2. Whale shark feeding in close proximity to the survey boat.

Other megafauna

Whilst on survey, we also recorded encounters with other species. We had a total of 70 encounters with marine mammals, namely spinner dolphins (*Stenella longirostris*), Risso's dolphins (*Grampus griseus),* melon-headed whales (*Peponocephala electra*), Fraser's dolphins (*Lagenodelphis hosei*) and *Kogia* spp. (likely *Kogia sima*). They were mostly encountered 3-8 km from shore, particularly off the Sipaka peninsula (Fig. 1). Billfishes, mobulid rays, turtles and other shark species were also recorded and species identified where and when possible. These data were shared with the Local Government Unit of Talisayan.

Fisherfolk questionnaires

Between March 19th and May 9th we conducted 162 interviews with the fisherfolk of Talisayan. This represented 40% of the registered fishermen on the official ledger, a 2015 initiative by the Bureau of Fisheries and Aquatic Resources (FishR). Semi-structured interviews were based on methods adapted from Whitty (2016) and Moore at al. (2010). The objective of the questionnaires was to gain local knowledge on whale shark-fishermen interactions, seasonality and distribution in the area, as well as understanding their perception on shark, ray and turtle catches over time. Data clean-up and analyses will be completed after the fieldwork is completed.

Barangay	# of fisherfolk	# of interviewees (40%)
Luyong Baybayon	20	8
Poblacion	60	24
San Jose	65	26
Calamcam	20	8
Tagbucbuc	28	11
Putting Balas	38	19
Pampangon	24	10
Pook	25	10
Sta.Ines	45	18
Punta Santiago	38	15
Mandahilag	32	13
Total	**395**	**162**

Table 3. Coastal Barangays of Talisayan and interviewee numbers.

Fig. 3. Research assistant Christine assists with species identification during fisherfolk interviews.

Local Education

In February 10th, we held a talk at an important university in Cagayan de Oro City entitled 'Real Fantastic Beasts and where to find them'. We discussed research techniques for whale sharks, and how the work to be completed in northern Mindanao would help with our understanding of the species, and hence their conservation. Over 30 students attended, some of which have joined us as research assistants for the field work.

On March 28th, we held a lecture on 'Large Marine Vertebrates of the Bohol Sea' at Bukidnon State University – Talisayan Campus. Seventy (70) sophomore students attended the talk, where we shared basic biological and ecological knowledge on the large marine vertebrates that occur in their home waters and the existing threats that continue to endanger these animals.

Month of Ocean

We will host a day of activities centered on marine conservation with the community of Talisayan . We will use a charismatic species, in this case the whale shark, to introduce concepts on marine ecology, biology of marine megafauna, and some of the risks they face today. We will engage the community about the cycle of plastics in the oceans, and conduct a beach cleanup and rubbish segregation. We will conclude with a public screening of a marine-related documentary. We have conducted similar activities in the past in Southern Leyte (with Rufford's support) and have been highly effective and engaging. We hope to achieve similar results.

Preliminary Discussion

Understanding the presence and distribution of whale sharks in a new area is a challenging task. Though the whale shark is the world's largest fish, the habitat in which they live is also vast, with whale sharks from Southern Leyte diving to depths of >1,500 m (Araujo, unpub. data). We conducted 30 surveys with the objective of understanding the whale sharks' distribution in Talisayan. Though we encountered whale sharks throughout the area, the effort was very high for the number of encounters we had (3.5 hrs per WS). It is possible that whale sharks do not aggregate in the coastal waters of Talisayan for a prolonged period of time like in other areas, and hence, the chances of successful encounters are limited. Encounters with cetaceans were more successful (1.73 hrs per encounter). Seasonality of whale sharks can be highly variable (Araujo et al., 2017), and hence, decisions should not be based on a single season. It is possible that there is limited food in the region, or deeper, and hence whale sharks are not sighted as frequently as in previous seasons. At Panaon Island, Southern Leyte, whale sharks were sighted for a small period of time in December 2016, and no longer (Araujo, unpub. data). It is therefore possible, that there are an unusually low number of animals in the region this season.

Whale sharks were encountered in association with other fish species, namely mackerel and the tuna species. Preliminary analyses of the interview data revealed that this is indeed a common occurrence during the tuna and mackerel season (Feb-May). Dissection of the smaller fish species confirmed the presence of sergestid shrimps (spp. unknown, likely *Lucifer* spp.) in their stomachs. The larger species contained sardine-sized fish, possibly in the area feeding on the sergestids also. Most whale shark reports occur in the evening, with fisherfolk complaining that the whale sharks disrupt their fishing activities, many of which lead to a loss or destruction of gear. During our interviews, we asked the fisherfolk to describe how they would avoid such interactions, though these data have yet to be processed.

Whale sharks in the Philippines are known for having a high occurrence of propeller strikes on them. Interestingly, through our surveys in Talisayan, we identified one possible source of such cuts. During skipjack-related species fishing, fisherfolk drive straight over the fish boil, where whale sharks are known to be. Indeed, through our questionnaires with the fisherfolk of Talisayan, many reported having hit, or knowing someone who did hit a whale shark with their boat in the past year. They are aware of the risks of hitting a whale shark, but the value of the catch is important for their livelihood. The majority of fisherfolk suggested slowing down or avoiding the whale shark as a possible solution, but given the difficulty of manoeuvring the local pumpboats, it seems an unlikely solution to the problem. The fish boils are sporadic and distributed over a large area, and it is therefore difficult to implement spatial restrictions also. We will work with the fisherfolk and the LGU once the data analyses are completed, to achieve common ground on the matter.

Next stage

We will move the team to the municipality of Salay, to the west of Talisayan. This site represents an area of high importance for whale sharks based on tagging data (Eckert et al., 2002; Araujo et al., *in prep*.), and our exploratory surveys in 2016. Salay is situated in Macajalar Bay, one of four mega-diverse Bays in northern Mindanao (CI, 2008). We will continue with water-based surveys to understand whale shark distribution, and also continue with fisherfolk questionnaires along the coastal Barangays. There are a total of 725 fisherfolk registered with the LGU of Salay, and for consistency in data collection, we aim to complete 290 interviews. We will continue to process the interview data collected during the first stage of the project, and organise community meetings in Talisayan to present the results, possible

solutions to whale shark conflicts as suggested by them, and conduct a whale shark awareness workshop with the original hunters of Guiwanon.

Acknowledgements

Our work thus far would not have been possible without the assistance of the Municipal Agricultural Office of the Talisayan Local Government Unit. We would like to thank Mayor Rommel Maslog for his support, and for welcoming us into the community. Special thanks are extended to Ligaya Babarin, Milan Balacuit, Lito Semine, Danilo Dalay, Melva Pateño, and Mario Pateño. Our work is supported through The Rufford Foundation's Small Grant 20000-2. We would like to thank our volunteers and research assistants for their tireless work.

References

Araujo, G., Snow, S., So, C.L., Labaja, J., Murray, R., Colucci, A. and Ponzo, A. 2016a. Population structure, residency patterns and movements of whale sharks in Southern Leyte, Philippines: results from dedicated photo-ID and citizen science. Aquatic Conservation: Marine and Freshwater Ecosystems.

Araujo, G., Vivier, F., Labaja, J., Hartley, D., Ponzo, A. 2017. Assessing the impacts of tourism on the world's largest fish Rhincodon typus at Panaon Island, Southern Leyte, Philippines. Aquatic Conservation: Marine and Freshwater Ecosystems, 2762.

Araujo G, Rohner CA, Murray R, Labaja J, Ponzo A, Pierce SJ. *In prep*. Juvenile corridor: movement of whale sharks in the Sulu and Bohol Seas as explored through satellite telemetry. Royal Society Open Science.

Araujo G, Hanf D, Labaja J, Ponzo A. *In prep*. Whale sharks of the Bohol Sea: developmental habitat for juveniles? Journal TBD.

Moore JE, Cox TM, Lewison RL, Read AJ, Bjorkland R, McDonald SL, Crowder LB, Aruna E, Ayissi I, Espeut P, Joynson-Hicks C. An interview-based approach to assess marine mammal and sea turtle captures in artisanal fisheries. Biological Conservation. 2010 Mar 31;143(3):795-805.

Rohner CA, Armstrong AJ, Pierce SJ, Prebble CE, Cagua EF, Cochran JE, Berumen ML, Richardson AJ. 2015. Whale sharks target dense prey patches of sergestid shrimp off Tanzania. Journal of plankton research. Mar 17:fbv010.

Rowat D, Brooks KS, March A, McCarten C, Jouannet D, Riley L, Jeffreys G, Perri M, Vely M, Pardigo B. 2011. Long-term membership of whale sharks (Rhincodon typus) in coastal aggregations in Seychelles and Djibouti. Marine and Freshwater Research 62:621-627.

Whitty TS. Multi-methods approach to characterizing the magnitude, impact, and spatial risk of Irrawaddy dolphin (Orcaella brevirostris) bycatch in small-scale fisheries in Malampaya Sound, Philippines. Marine Mammal Science. 2016 Jul 1;32(3):1022-43.