Project Update: February 2020

Introduction

The juvenile sharks programme's main objective is to explore and understand more about nursery grounds around San Cristóbal Island, Galapagos Marine Reserve.

With the great support of a 2nd Rufford Small Grant, we are focusing our efforts on understanding how the interaction in between human activities, particularly by-catch by local artisanal fisherman, could affect the survivorship of juvenile blacktip sharks (*Carcharhinus limbatus*) on two mangrove lagoons catalogued as putative nursery grounds for this species: Puerto Grande and La Seca (Figure 1).

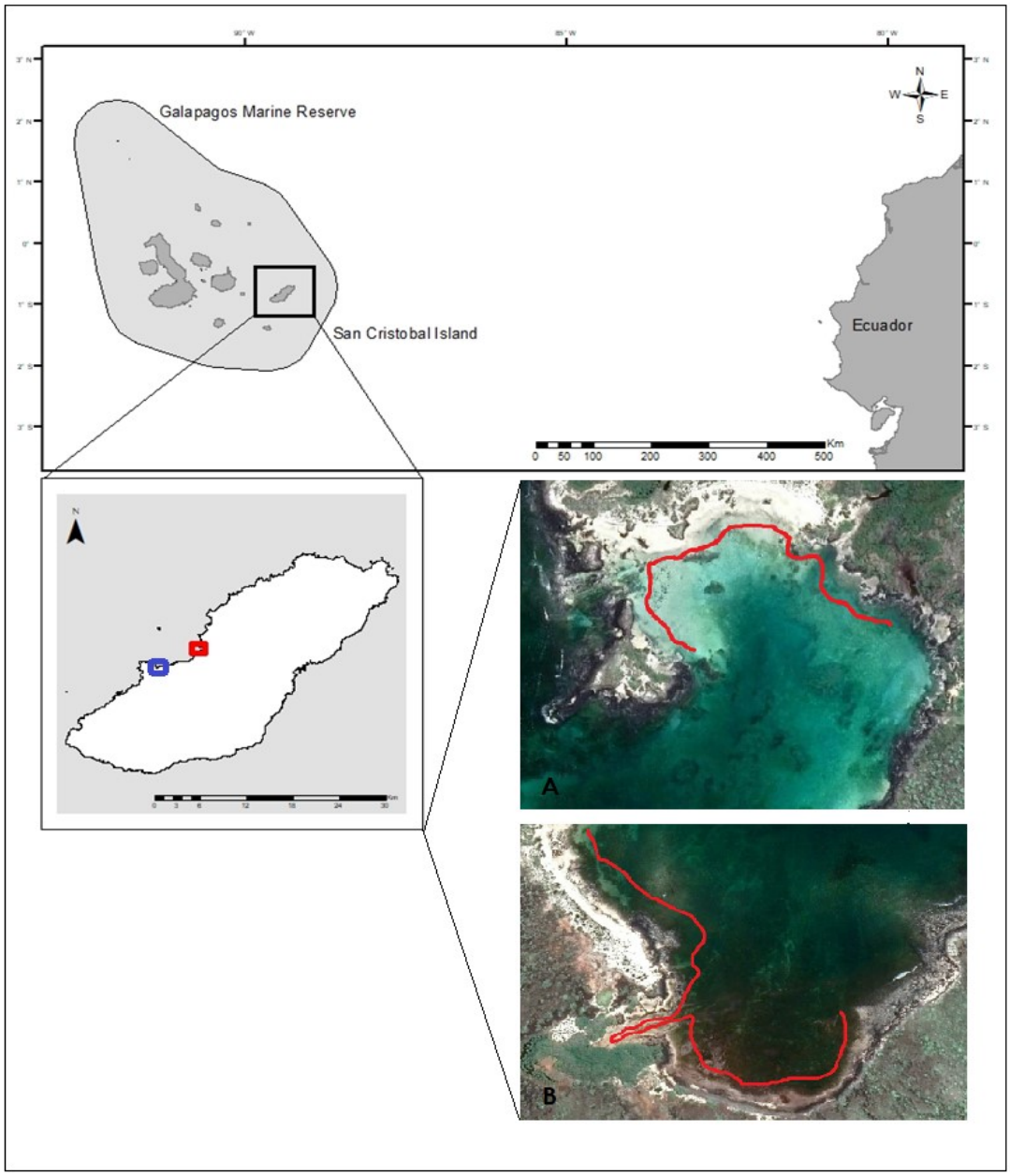


Figure 1. Map showing sampling sites. A. Puerto Grande represented as a red rectangle. B. La Seca, represented as a blue rectangle. The continuous red line represents the sampling area inside each bay.

Activities

1. Capture-mark-recapture

In the first month we were able to sample Puerto Grande and La Seca for 5 days at each site. Using a 100 m long beach seine, individuals were corralled at the beach or inside the mangrove. All individuals were manipulated by using the protocol developed by the Galapagos National Park Directorate (Llerena et al. 2011).

Each individual was blood sampled using a caudal puncture (Figure 2) - no more than 1ml of blood was drawn from each individual. Field meters were used to measure glucose, lactate, and haemoglobin*. Individuals were measured, sexed, and tagged (spaghetti tags) at the base of the first dorsal fin, for later recognition (Figure 3). A little tissue sample from the first dorsal fin was taken for a concurrent study on kinship analysis, and for a future radio isotopes study. Individuals were released alive after approximately 3 minutes.

Figure 2. Blood sampling underneath the caudal fin at La Seca. Figure 3. Shark Team processing a neonate blacktip.

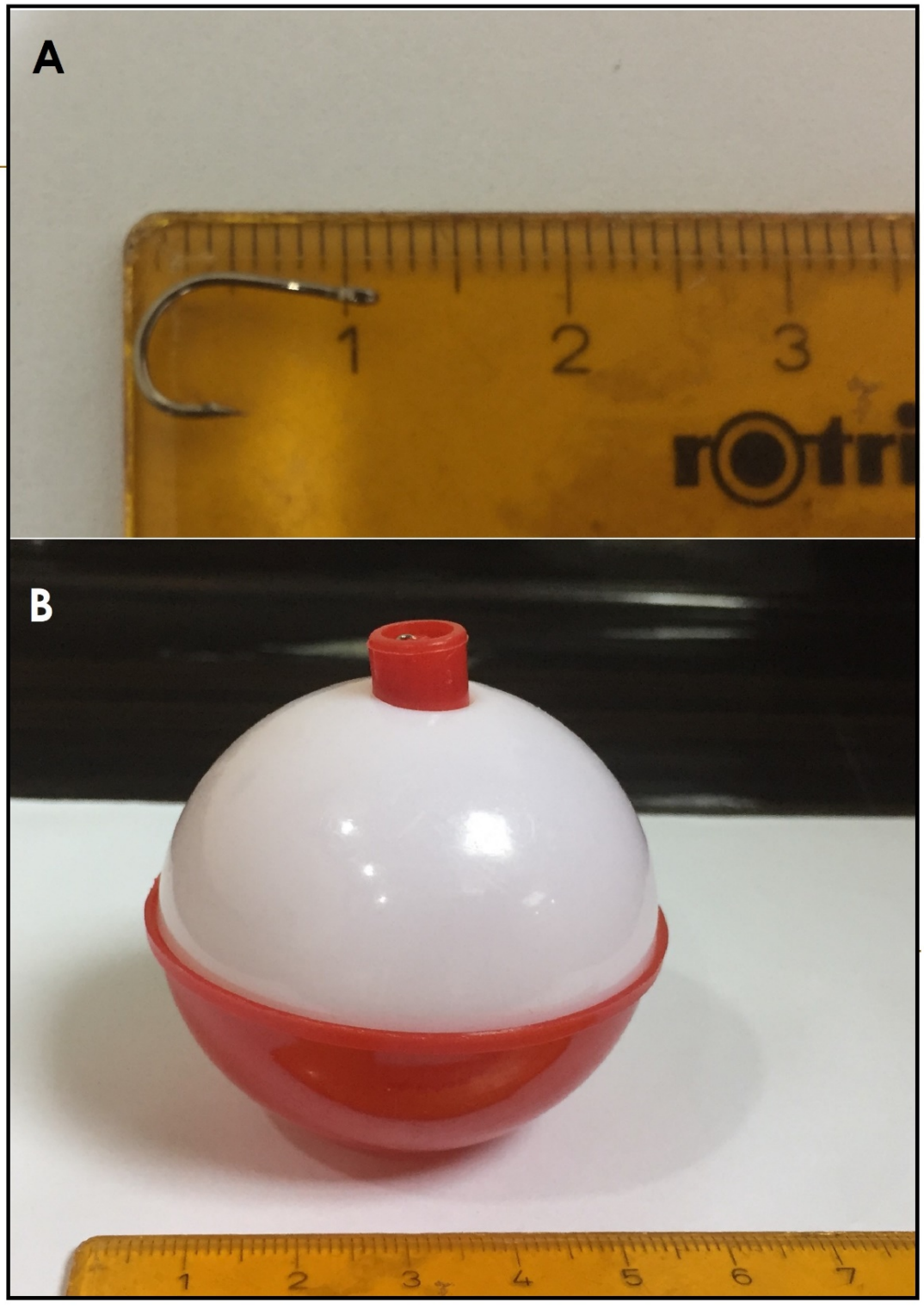
(*) The assessed parameters are important to build a baseline for physiological parameters, so we will be able to compare physiological values obtained after a by-catch encounter.

2. By-catch short-term mortality

To assess how vulnerable blacktip sharks are to by-catch, we carried out 1 day of sampling at each location. A 20 m gillnet was set inside the bay; the net was far from the mangrove zone where abundance is higher to prevent a great number of individuals getting caught.

By the time one shark was caught, the entanglement location was registered. Immediately, the shark was taken from the water and a blood sample was taken by a caudal puncture and, by using in-situ field meters, glucose, lactate, and haemoglobin parameters were measured. Body measurements were also taken to analyse body condition related to stress. After this, a little hook (approximately 1 cm, without barb), tied to a monofilament and attached to a small-light visual float

(approximately 6 cm diameter) (Figure 4), was attached to the shark by inserting the hook on the base of the first dorsal fin. Finally, reflexes were assessed by stimulating different corporal reactions: 1. The bite reflex; 2. The nictitating membrane reflex; 3. The flexibility; and 4. Equilibrium (how upright the shark swam when leaving). The individual was released alive after approximately 3 minutes. After release, each individual was followed up for a period of 15 minutes to assess short-term mortality by evaluating directional, non-directional, or non-swimming behaviour. After the established time, the vessel got close to the visual float and it was recovered, as well as the monofilament and hook, ensuring no damage to the shark.



This image shows the 1cm hook (A) and (B) small visual float that are used when following up sharks.

Preliminary Results

1. Capture-mark-recapture

A total of 67 blacktips were successfully tagged (n=25 at Puerto Grande, n=42 at La Seca). At present, just three individuals have been recaptured (one of them twice). This could be explained by the great abundance during February, the start of the pupping season. Mean total lengths of 63 cm for individuals at Puerto Grande and 68.5 cm for those at La Seca, were registered.

2. By-catch short-term mortality

A total of nine individuals (n=5 at Puerto Grande, n=4 at La Seca) were blood-sampled and assessed for reflexes (media TL= 63.94cm). Just two individuals presented a lack of more than two reflexes, and six of them presented just one impaired reflex from the four assessed. The majority of them did not respond to the nictitating membrane stimuli.

Observations

- During the fieldtrips for capture-mark-recapture study at Puerto Grande, eight neonate hammerhead sharks were corralled inside with blacktips. We processed them with the same methodology but were not able to take blood samples from any of them.
- During the net setting for the by-catch short-term mortality sampling, a team of snorkelers were patrolling the net looking for any entangled sharks. If there was one individual caught, snorkelers registered the entangling location and passed it to the team aboard, where the individual was processed immediately. On the other hand, if more than one shark was caught on the net, the snorkelling team immediately released them alive. Our operational capacity to process sharks is one at any given time, so additional sharks caught in the net need to be released to avoid mortality and did not form part of the sample.

Challenges

- Glucose and haemoglobin were successfully measured but this was not the same with lactate. A technical problem with the lactate field machine did not allow us to assess this parameter. In future, we will buy a brand new lactate machine.
- Given the COVID-19 pandemic, all our fieldtrips during March, April and May were cancelled. At the moment, we are analysing the best way to recover all data lost so far.

Literature Cited

Llerena, Y., Espinoza, E., & Peñaherrera, C. (2011). Manual para el monitoreo y marcaje en tiburones juveniles de las zonas de manglar de la Reserva Marina de Galápagos. Dirección del Parque Nacional Galápagos y la Fundación Charles Darwin. Puerto Ayora, Galápagos, Ecuador.

A 60cm blacktip neonate being measured.

Shark Team ready to start processing a neonate blacktip shark.