



# Cocos Island Dive Expedition

Research Brief

Photo by GP Schmahl

# Background

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Turtle Island Restoration Network (TIRN) and Randall Arauz (formerly of PRETOMA) have been studying and tracking sharks and sea turtles at Cocos Island for almost a decade. In that time, we have seen the threats to the Island's unique biodiversity, in the form of continued illegal fishing, but also an increase in the awareness of the need to protect the marine biodiversity of this World Heritage Site.

**Expedition participants can observe or participate in the following research activities:**

## Retrieve, maintain and re-deploy acoustic receivers

On every expedition, receivers are retrieved and brought to the mothership, where the data is downloaded onto a computer, batteries are replaced if necessary, and they are re-programmed for re-deployment. They are then returned to their stations. Maintenance of the anchor-buoy station (replacement of ropes, cleaning or replacement of buoys) is also done as needed.

## Census sharks and rays

Interested participants are given underwater writing slates and are asked to stop at 5 minute intervals and record all shark and ray species. Data from slates are transferred to a computer after each survey. Slates are cleaned and readied for the next dive.

## Capturing and tagging turtles

Interested participants are trained in the capture and handling of turtles. Turtles are transferred to the mothership for measuring/weighing; to attach acoustic, satellite, and permanent monel tags; to take tissue samples; and photograph before release.

## Individual photo-identification of hammerhead sharks

We are currently working with computer scientists to develop a computer algorithm to be able to identify individual sharks for population studies. We may be using a number of methods in order to gather photographs of the same known individuals for testing. This may involve coordinating several participants to photograph the same shark(s) simultaneously, and may also involve deployment and retrieval of stationary cameras underwater.

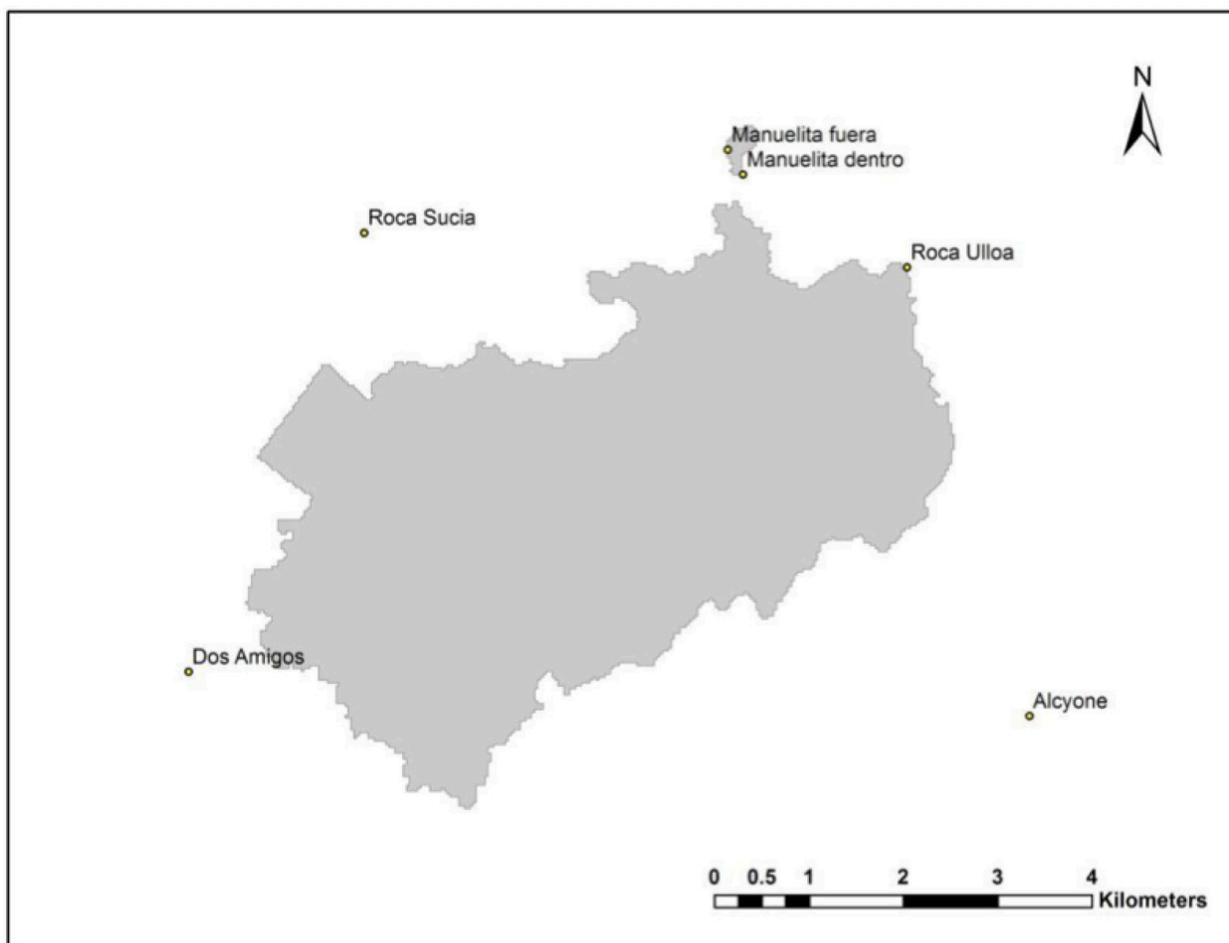
## Photo-documenting species and activities

One of the critical roles participants provide is photo and video-documentation of the expedition. These are extremely helpful in promoting the research and conservation activities of the organization. Please bring your underwater cameras and be willing to share photos with us.

## Tagging sharks

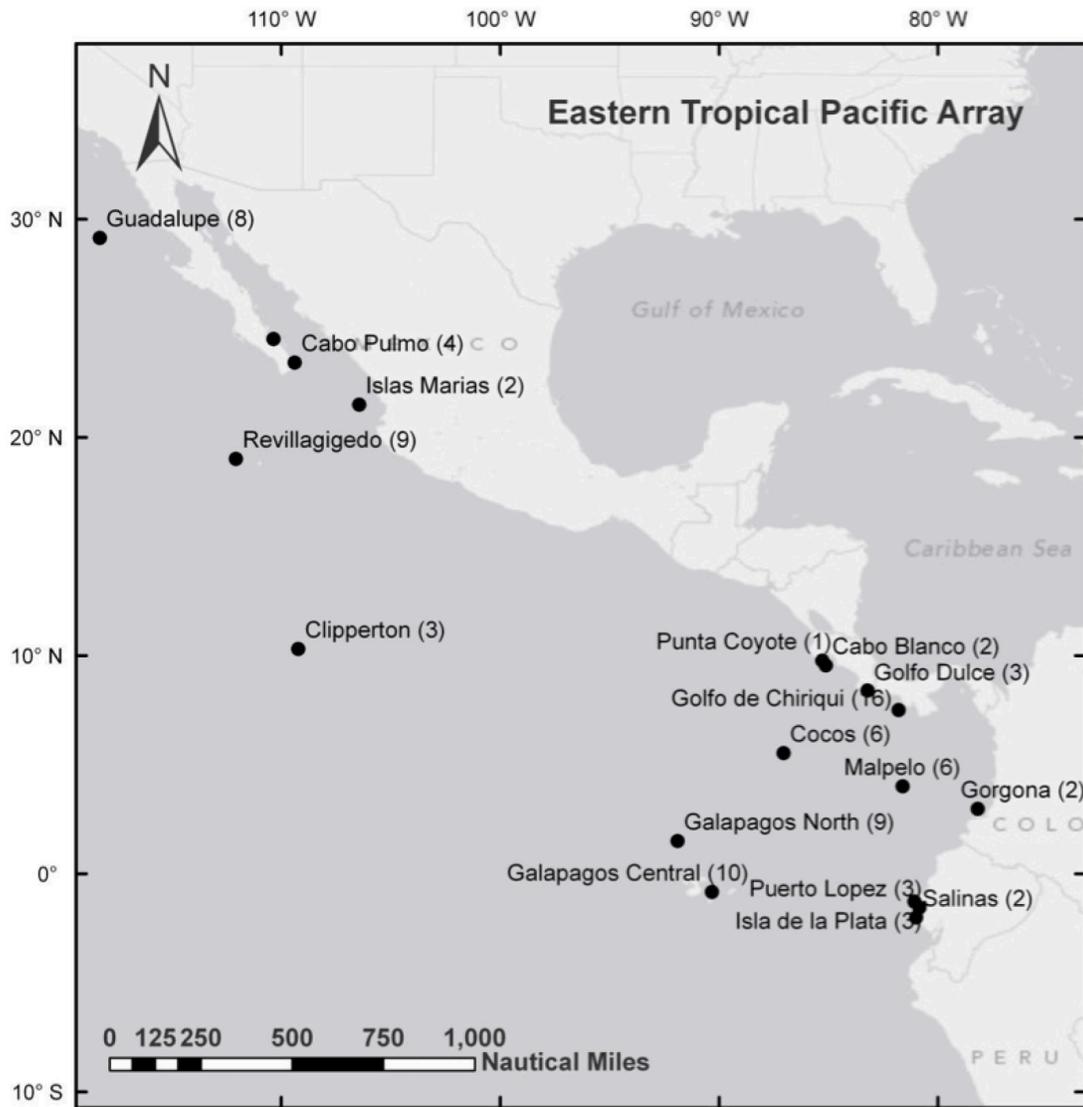
Current regulations of the Cocos Island National Park only allow permitted scientific researchers to tag sharks, but all participants will be able to observe this activity. If you are experienced with the use of pole spears or spear guns, it is sometimes possible to have you added to the permit. Please let us know if you are experienced and interested well in advance of the expedition.

One of the primary research tools of the team is an array of **ultrasonic receivers**, or listening stations, which is deployed around the island (Figure 1). These listening stations consist of an underwater hydrophone, which detects and records the presence of ultrasonic tags when they come within range (usually 100-300 m radius). Over the last few years, the Cocos research team has placed tags on over 140 subjects, including over 100 hammerhead sharks, 16 green turtles, 5 tiger sharks, and an assortment of other species – hawksbill turtles, silvertip, silky and Galapagos sharks. This has resulted in a database of over a million detections. This information will be used to assess the site fidelity and habitat preference of these species, along with their seasonal presence at the island. With this knowledge, we can inform stakeholders and decision makers about the best conservation policies to adopt for these threatened species.



**Figure 1. Receiver Locations around Cocos Island**

In addition, TIRN and Arauz belong to a wider association of researchers based in the region, who are working jointly to understand the long distance migratory movements of sharks and turtles and their connectivity within the Eastern Tropical Pacific. This network, known as Migramar, maintains an array of over 100 underwater receivers, spread over 5 national boundaries and 5000 miles (Figure 2). Sharks or turtles tagged at one site, which migrate to another, can be detected on any receiver. In this way, connectivity of hammerhead sharks has been established between Cocos, Galapagos and Malpelo, and the longest recorded migration of a Galapagos shark, from the Galapagos Islands to Cocos was also established.



**Figure 2. Eastern Tropical Pacific Underwater Receiver Array.**

# Research Objectives

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## A. Shark & Ray Censusing

Underwater surveys can be very useful to establish relative abundance of key species, as well as spatial and temporal variations over time. Participants will be trained on shark and ray identification and be given slates. The methodology is simple. At five minute intervals, a diver stops, records his/her depth and counts all the sharks/rays that can be seen looking in all directions for approximately 30 seconds.

## B. Turtle Tagging

We have tagged green and hawksbill turtles with both acoustic and satellite tags over the last few years.

Diver safety always comes first: If at any point you feel uncomfortable with the situation, **LET GO OF THE TURTLE.**

Turtle safety is also important: If at any point you feel the turtle's wellbeing is in jeopardy, **LET GO OF THE TURTLE.**

When preparing to capture a turtle, realize that a safe capture will take time. Be sure that you are at least 10, and preferably 15 minutes away from your "deco time."

When preparing to capture a turtle, presume that the encounter will require exertion, and you may use air at a rate much faster than you normally would. Ensure you have adequate air – at least ½ of a tank (1500 psi) is recommended to have at the start of a turtle encounter.

Turtle behavior after being captured can be unpredictable. Turtles can attempt to dive deep or bolt for the surface. It is recommended that you start the turtle capture at least 20 feet above your MOD.

If the turtle starts to head deep and you cannot stop it, **LET GO OF THE TURTLE.**

Under no circumstances violate your MOD.

Solo turtle capture is unsafe. While it is unlikely that a turtle will cause you harm directly, they are wild creatures and can be aggressive when they feel threatened. Turtles can exert significant propulsive force, and large turtles can drag a diver wherever the turtle chooses to go. At a minimum you should attempt a turtle capture only if you have a buddy close at hand to assist you if you are injured or incapacitated.

## B. Turtle Tagging

**Experience has shown that the optimal turtle capturing configuration works like this:**

- Diver "A" approaches the turtle and grasps it firmly behind the neck and at the back of the shell. Preferably, Diver A deflates BCD fully before grabbing the turtle, as no further access to the BC inflator will be possible.
- If possible Diver A should try to "aim" the turtle to a safe direction – i.e. not "up" (so a swimming turtle will pull you to the surface), or "down." The turtle will struggle and be hard to contain. Holding the turtle as close to your chest as possible as been shown to frequently help with controlling the turtle.
- The turtle will likely calm down within a minute or so. If not, and/or you do not feel safe or are getting tired, **LET GO OF THE TURTLE.**
- At any point in the process Diver "B" (Diver A's buddy or another diver assisting in the capture, such as a Dive Master, Trip Leader or other qualified diver), should approach Diver A from behind and grab a hold of Diver A's tank valve/regulator in order to help control Diver A's orientation and motion. Diver B should ensure that both Divers' BCD are deflated, dumping all of Diver A's BC air.
- Once the turtle is calm enough, Diver B proceeds to guide all three – turtle, Diver A, and Diver B towards the surface at a slow and safe ascent rate. No faster than 30 ft/min is recommended.
- If possible, Diver B should hold the team at a depth of 15-20 feet for a 3-minute safety stop. Try to stay near the deeper end of this, as the turtle will likely struggle again, once it realizes it is near the surface (say, above 15 ft).
- After a safety stop, proceed slowly towards the surface; again, try to go no faster than 30ft/min. The turtle will likely attempt to bolt for the surface at some point, and once it reaches the surface and gets a breath it will try to dive. Diver A must try to control the turtle's orientation to minimize this outcome.
- Once on the surface, Diver B should quickly fully inflate Diver A's BCD. Then signal to the skiff driver – if the driver has not already seen the divers surface.
- When the skiff approaches both divers should work to help the skiff driver load the turtle into the boat.
- Diver B should signal Diver A each step of the way, giving a hand signal for the next act (going up; safety stop – 3 minutes, 2 minutes, 1 minute; head to the surface). Diver A should respond with a head nod or shake to indicate readiness to proceed.
- It is highly advised that no one get in front of the turtle. A calm turtle will become very agitated if someone appears in front of it. No one should approach to take pictures from the front, and Diver B should make every effort to stay behind Diver A and out of the way and line of sight of the turtle.
- If the surfacing process does NOT go according to plan – the ascent rate is too fast, the safety stop is missed, or some other abnormality occurs, it is NOT recommended to return to depth on scuba gear. You are recommended to board the skiff, drink water to stay hydrated, and monitor yourself (or your buddy) for any signs of DCS. Every skiff has O2 if needed. Breathing the 32% EAN in your tank is probably better than air as well.
- If the surfacing process does go according to plan, it is still recommended that you do not resubmerge to continue the dive. If you feel it was a shallow capture early in the dive, and you want to return to the water, the skiff driver or dive master will not stop you; however such actions are not recommended.

## C. Shark Tagging

Almost 100 hammerhead sharks and a few tiger sharks have been tagged at Cocos since 2005. Our goal on this trip is to place a further 5-10 tags on hammerheads and/or tiger sharks. However, track lengths vary greatly from 0-1022 days. Our goal is to improve the median track length (28.5 days).

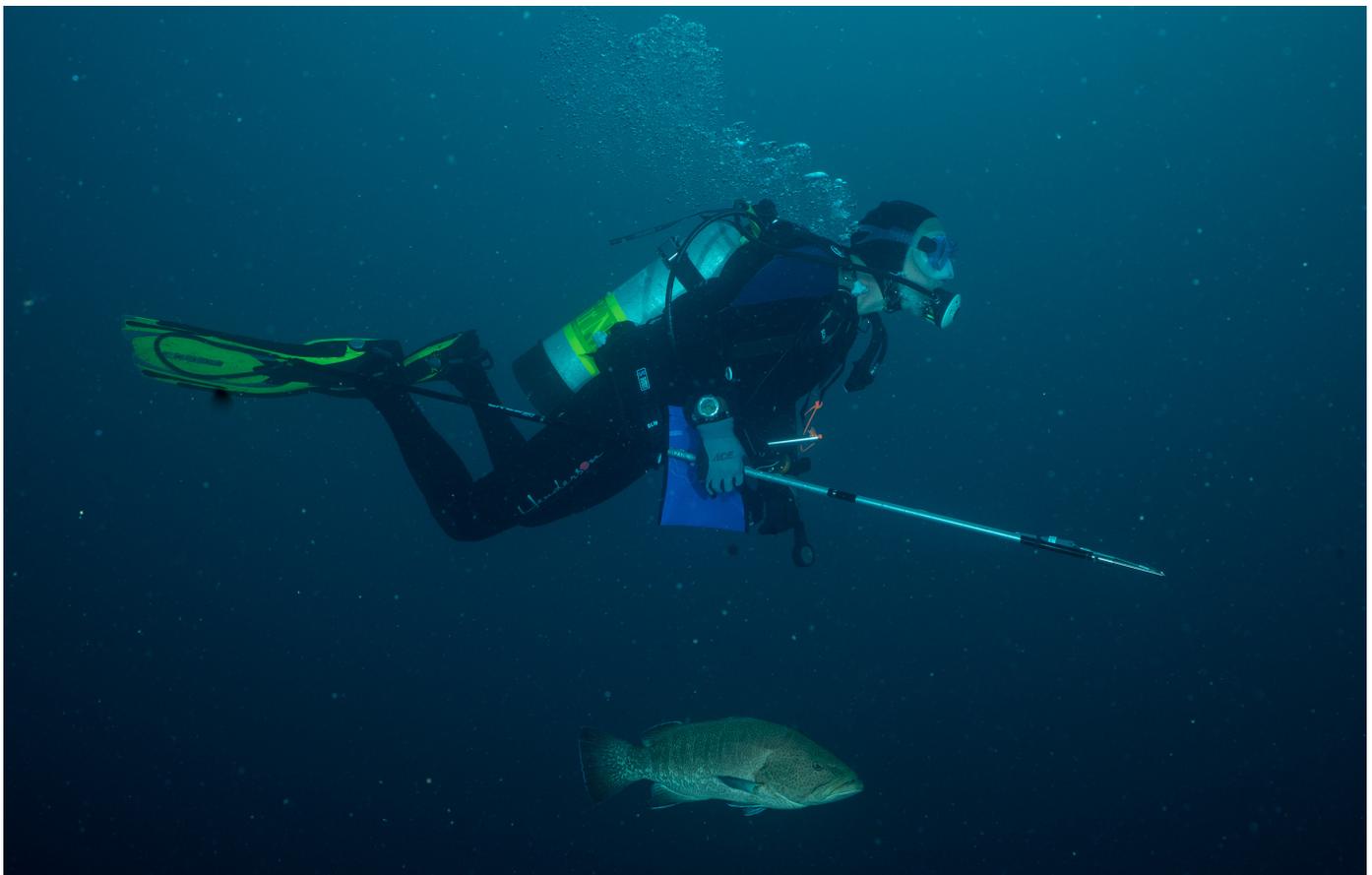
Hammerheads are very shy in comparison with other sharks, and are quick to startle. They do not like the noise generated by scuba equipment. At Malpelo and Galapagos we therefore mainly tag by free diving onto the schools. However, in Cocos this is not always practical.

If tagging on scuba tanks at the cleaning station by Manuelita or Roca Sucia, bear in mind the depth of the sharks – often deeper than 30 m. This limits your time underwater. We have found that stealth is the key here. Stay back among the rocks, above the cleaning station until a group of sharks comes in. Then move down to the edge of the cleaning station and attempt to tag a shark as it comes past.

If using a pole spear, stretch the rubber band to its greatest extent. Only take the shot if you are sure – we want to avoid early tag shedding or unnecessary injury to the sharks. The ideal location for the tag is just at the posterior edge of dorsal fin, a couple of inches slightly to one side. Given that tag shedding is a big problem, we ask that you refrain from tagging unless you are confident of having a good shot. If the shark swerves just before you fire, abort the attempt- there will be plenty of other occasions.

It is not hard to get a tag into a shark, but it IS hard to get it placed correctly so that it does not fall out in a matter of hours or days.

Tiger sharks are not shy of humans and tagging is more straightforward (and more dangerous).





415.663.8590 • [www.seaturtles.org](http://www.seaturtles.org) • [info@seaturtles.org](mailto:info@seaturtles.org)

Photo by GP Schmahl