

Scientific Tourism, Fibropapillomatosis, AND LEARNING TO STAY OUT OF NATURE'S WAY

by MARCELO RENAN SANTOS and YHURI NÓBREGA

Who would you take to a desert island?

It is seven o'clock in the morning, and we are on an old wooden pier in a mangrove swamp on the south coast of Bahia, Brazil. After a night spent on a bus, our group boards two traditional fishing boats heading to Coroa Vermelha Island, a coral reef 13 kilometers offshore. Students of veterinary medicine and biology, journalists, an economist, an architect, a sales representative, and a retiree—we make up quite a diverse team. For some, it is the first time at sea. For us, as sea turtle researchers, it is a perfect opportunity to transmit the message of sea turtle conservation to a special audience in what we hope is a transformative way. Our shared goal is to capture juvenile green turtles for health assessment and blood sampling.

We spend three days together camping on Coroa Vermelha, a tiny atoll with no fresh water and no human structure to provide comfort and shelter. Despite these seeming discomforts, the group is keen to participate in our research effort and to assist in capturing turtles and getting to know them close-up. The participants go through a transformative experience in the marine environment that simultaneously advances our research to understand a little more about green turtle fibropapillomatosis (FP). The entire expedition was funded by the participants in a form of scientific tourism that links research goals with environmental education. And it worked! Not only were our scientific objectives achieved, but our diverse participants now have a greater and more personal connection with the sea and are aware of how and why we need to keep it healthy.

In three scientific tourism expeditions to the island of Coroa Vermelha, we were able to verify the presence of turtles with FP and to evaluate their overall health. Incidence of FP is low on the island in comparison with the Brazilian coast, but it is present in the turtles of Coroa Vermelha and also those in the Abrolhos Archipelago, a marine national park that lies 55 kilometers (34 miles) east of the island. It is there that we made the first report of the disease in 2015 and demonstrated that sea turtles are affected by this insidious disease even far from continental shores. In mainland Brazil, there are reports of FP in green turtles up and down the coast, and the incidence is highest near areas with significant agricultural activity. In contrast, oceanic

islands like the Rocas Atoll (240 kilometers, 150 miles, offshore) and Trindade (1,200 kilometers, 745 miles, offshore) have no reports of FP. Similar disparities have been reported elsewhere in the world.

FP is a type of cancer that affects the skin of turtles, who develop tumors that can reach the size of a melon. In some places, the incidence of tumors in internal organs is common; but in Brazil, this is unusual. Some turtles may have a few small tumors and still be very affected, whereas others with larger tumors appear to be in good condition. Affected turtles suffer debilitating symptoms as tumors rob them of energy and disrupt swimming, feeding, and vision. The large cauliflower-like external tumors are ugly masses and are subject to injury by predators or by contact with stones and corals. They can become gateways for opportunistic infections.

The disease is related to a herpes virus (ChHV5) specific to sea turtles. Although this virus has lived with turtles for hundreds or thousands of years, it has only caused the disease since the 1930s. Perhaps environmental factors that have not yet been well defined, such as pollutants and algal toxins, play a role in the development of the disease. However, its transmissible feature has already been proven and manifests itself through high rates of occurrence in polluted, low-flowing waters where turtle densities are high. During their pelagic phase, hatchlings are far from the apparent sources of the disease, becoming infected later as they grow and return to the coast where they are exposed to environments with FP. The incidence



Members of the Marcos Daniel Institute's scientific tourism expedition in action. © LEONARDO MERÇON

can vary widely between relatively close locations, and this variation is related to the mobility and habitat-use characteristics of juvenile green turtles.

Initially, the worst was feared: the disease would drive green turtles to extinction. But fortunately, green turtle populations have been recovering in various parts of the world despite the threat of FP. Indeed, some turtles do recover from the disease: they become adults without tumors, and they can reproduce and transmit resistance genes to their offspring.

There is still much to discover about FP. Our SWOT-supported group (see *SWOT Report*, vol. XI, p. 44) has collected incidence data in some parts of the Brazilian coast, thereby confirming the epidemiological characteristics of fibropapillomatosis and also verifying that this disease is not alone. Other diseases affect sea turtles. We have observed a high rate of turtles without tumors with low weight and poor body condition on Coroa Vermelha Island. This draws attention to the need for a broader view on the health of green turtles, taking into account that disease manifestations in free-living wildlife reflect

a complex network of ecological interactions between various pathogens, their hosts, and the environment. Fibropapillomatosis is not a monologue character in which green turtles are the stage, but a part of a much more complex drama involving human beings and their interference in the functioning of the planet.

Perhaps the biggest lesson we have learned from FP is that we have to be more aware of the resilience of turtles. Even an evil such as FP has not been able to limit the populations of green turtles from reproducing and continuing their struggle for survival. Humans have not aided the green turtle's recovery from widespread FP infections; if the turtles are recovering, the merit is theirs. Our role in this effort is to understand the phenomena and to apply that knowledge to develop practices that minimize our negative interference in the marine ecosystem. That is the lesson we must take home and ultimately act on. Our daily lives greatly affect the health of the marine ecosystem, but we are not very effective in helping the ecosystem recover. Yet the strength of nature and its ability to reorganize and go its way is tremendous. We should do our human best to stay out of nature's way. ■