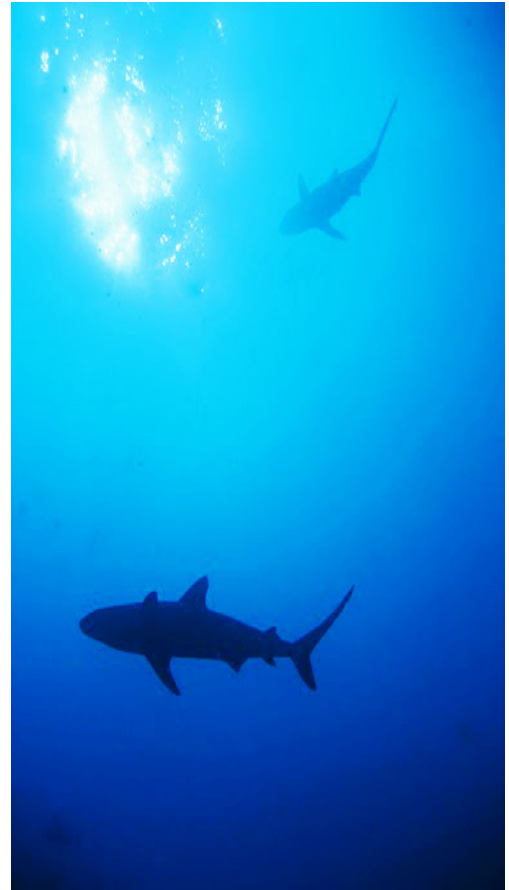


A Predatory Paradox

by *Dalal Al-Abdulrazzak*

In 2007-2008, I was a recipient of a Thomas J. Watson Fellowship, which provides recent college graduates a year of independent, purposeful exploration and travel outside the United States and their home country. Unlike most fellowships, there is no tangible output required, emphasizing that the grant is an investment in a person, rather than a project. Over the course of the year, I traveled to Panama, the Bahamas, New Zealand, Fiji, Palau, the Seychelles and South Africa, to assess how cultural context affects shark conservation. One of my goals was to gather folklore and stories of shark encounters in order to better understand the relationship between humans and sharks. One way I did this was by shadowing shark-diving operations and conducting informal interviews with the operators and tourists. I envisioned an exciting year, full of close calls, startling stories, and electrifying adventures.

However, what I found was much more frightening and dangerous: boredom. Like toddlers in a room full of toys with nothing to do, it's now all too easy for your average tourist to come face-to-face with an apex predator, take some snapshots for proof, and head home. I recall a dive off Dyer Island, South Africa where after a phenomenal encounter with a fifteen-foot great white shark, I was left buzzed and awed, willing to stay underwater until my lips turned blue from the cold in hopes of another glimpse. It has taken me over three hundred dives to see a great white in the wild! However upon surfacing, I was amazed at the somber tone on the boat. On surveying the other divers about their experience I was mainly greeted with comments about the cold water, poor visibility, and seasickness. There was no discernible emotion about having



Grey Reef Sharks. Viti Levu, Fiji.

Photo by D. Al-Abdulrazzak

just survived breathing through a hose in the presence of something with teeth the size of carving knives. The nuances of these great animals and their place on the planet—alongside us—seem entirely lost on most people.

Though western society often sensationalizes sharks in negative ways, other societies admire them, viewing them as symbols for justice and divine ancestral

Continued on page 2 - Sharks

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Sharks - Continued from page 1

power. Sadly, many of the traditional myths and folklore that have long served as a reminder of our place in nature have been lost. In most of the villages I visited, I found that shark encounters have become so rare that many of these stories are not preserved. Elders no longer incorporate sharks into their story-telling traditions. In fact, while spending time with a Kuna family in San Blas, Panama, I was offered a consolation prize for my unfruitful attempts to uncover the myth of *Tio Tiburon*; the matriarch would instead make me a *Mola* (traditional reverse-appliqué cloth panel) of a shark. A week later, I was presented with a *Mola* depicting a creature resembling a cross between a porpoise and sturgeon. I graciously accepted the gift, despite the irony of the situation.

Perhaps it is up to the dive operators, the very people who are putting the last of these wild animals on daily display, to either truly feel the thrill for the first time, or to at least to pretend to feel it.

Too often they shrug their shoulders with cool machismo at how “well-trained” the sharks are, rather than marveling at their restraint. Their promotional line is that no one has ever been bitten,

but of course we all know that it is not true. While in Fiji, I witnessed a shark handler get bitten by a grey reef shark. The handler attempted to continue to feed the sharks, despite the alarming amount of blood seeping out of his wound. After some initial confusion, the show was stopped, and we were frantically herded onto the boat. The injured handler spent the return boat ride in the cabin, away from our sight. There was no debriefing and not a single word was uttered about the incident. I later found out that the handler nearly had his thumb bitten off and needed several stitches.

Although shark-diving encounters have done much to dissipate the “ferocious man-eater” myth that prevails around the world, perhaps it has gone too far. Perhaps, we have taken these magnificent creatures, which for centuries have invoked feelings of wonder and awe, and paraded them around in aquariums and ‘eco-adventure’ tours to the point of dullness. We have demystified the mystical. This is why story-telling is so important. Stories counteract the prevailing nonchalance surrounding alpha predators. They serve to help us rediscover our place in nature and revel in the remarkable intimacy of a rare encounter.



Great White Shark. Dyer Island, South Africa. Photo by D. Al-Abdulrazzak.

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The *Sea Around Us* website may be found at www.seaaroundus.org and contains up-to-date information on the project.



The Sea Around Us project is a scientific collaboration between the University of British Columbia and the Pew Environmental Group. The Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organizations and citizens develop practical solutions to difficult problems. In 2000, with approximately \$4.8 billion in assets, the Trusts committed over \$235 million to 302 nonprofit organizations.



Understanding the role of green turtles in the Caribbean and Hawai'i

by Colette Wabnitz

Following the submission of my doctoral dissertation for external review, I packed my suitcase and boarded a flight to Hawai'i. I was following up on the kind invitation that had been extended to me by George Balazs, Leader of the Marine Turtle Research Program at NOAA, National Marine Fisheries Service (NMFS), to give a presentation at NMFS in Honolulu and visit some of the sites at which he and his team conduct turtle research. The plan specifically included a visit to Kaloko Honokōhau, a National Historical Park located on the Kona coast (west coast of the Big Island) and the focus of one of my dissertation chapters.

At the start of my PhD, I, together with my co-supervisors Drs Karen Bjorndal and Alan Bolten from the University of Florida, submitted a proposal to NMFS to model the potential ecosystem effects a recovering Caribbean green turtle population, in response to their protection throughout the region, would have on seagrass communities. In the Caribbean, green turtles' preferred forage is seagrass, a flowering plant that occurs in shallow coastal environments. My research focus was therefore to be on the likely impacts brought about by the increased grazing activity of a large number of green turtles, and concomitant decline in habitat complexity at the ecosystem level (i.e., reduction in refuge capacity of seagrass for small fish and invertebrates). NMFS offered to financially support the study¹, but asked that my research also

include the investigation of the role of green turtles on reefs in Hawai'i, where, unlike the Caribbean, green turtles primarily forage on algae, and ancillary data demonstrate the population is approaching carrying capacity.

Harvesting of sea turtles for the trade of their meat, oil, shells, and eggs has reduced populations that once numbered in the millions to the brink of extinction. While many countries now have regulations in place to limit this trade, or have banned it altogether, an increasing demand for subsistence and local markets, and a suite of other threats contribute to the continued decline of a number of sea turtle populations. With a few notable exceptions, many populations are considered depleted or declining.

In response to these dramatic declines, scientists and conservation practitioners throughout the world have accelerated their attempts to aid in the recovery of sea turtle populations. Given currently depleted green turtle numbers, their importance and likely impact at historic abundance levels is difficult to imagine (and oft forgotten). To answer the question of whether sea turtle species are central to healthy ecosystem processes, knowledge of their ecology needs to be integrated into the trophic matrix of the system within which they are found. Important aspects to consider are their (a) direct impact as consumers, including their dietary preferences and food consumption rates;

and (b) indirect impact resulting from foraging behaviour (e.g., changes to the structure of their foraging habitat and associated behavioural changes in other species). I addressed (a) focusing on the green turtle aggregation at Kaloko and (b) looking at a seagrass/reef/mangrove system and green turtle population in Puerto Rico and the US Virgin Islands.

Caribbean

Results from a Caribbean ecosystem model (developed using the free software Ecopath with Ecosim – www.ecopath.org) showed that

Harvesting of sea turtles for the trade of their meat, oil, shells, and eggs has reduced populations...



At Kaloko Honokōhau with a green turtle in the foreground.

Continued on page 4 - Turtles

The fact that green turtles feed on non-native algae, including macroalgae, further strengthens their contribution to the promotion of reef resilience...

Turtles - Continued from page 3

recovery of a species whose grazing activity strongly alters habitat structure at the ecosystem level may lead to potentially dramatic changes in species biomass and composition. Findings also demonstrated that by considering multiple predator-prey interactions, *in addition to* the refuge capacity of a primary producer, simulated ecosystem responses are more complex than suggested by simple predator-prey experiments. Results underscored the importance of inter-habitat exchanges (i.e., between reef, mangrove and seagrass) and how recovery of green turtles may potentially affect these linkages and/or the role of individual habitats as nursery areas for a variety of species, including commercially important fish. These findings demonstrate that the recovery plans for sea turtle populations need to be more detailed than merely aiming for a target of species' abundances. Using green turtles as an example, they should explicitly acknowledge the role that green turtles play in structuring seagrass beds, and highlight the need to (i) gain greater understanding of what the implications of this role may have for the 'functioning' of seagrass beds today and into the future, and (ii) perhaps help redefine at what levels green turtle populations may be considered to have made a full recovery.

Hawai'i

Hawai'i represents a unique setting to investigate the role of green turtles as consumers. As noted earlier, these eastern Pacific green turtles feed chiefly on algae rather than seagrass, as in the Caribbean. A turtle fishing ban implemented in the late 1970s has resulted in a dramatic increase in the number of green turtles at foraging areas, with several lines of evidence suggesting that aggregations are reaching carrying capacity.

Results from an Ecopath model developed to represent trophic connections at Kaloko demonstrated that the combined grazing pressure of the different herbivorous groups (i.e., reef fish, sea urchins, and green turtles) matched total algal production. Numerous studies have highlighted the role that large herbivores (e.g., parrotfish in the Caribbean) play in maintaining reef resilience. The results presented here underscore that, at healthy abundance levels, green turtles contribute to the resilience of reefs in the face of disturbance. The fact that green turtles feed on non-native algae, including macroalgae, further strengthens their contribution to the promotion of reef resilience, as herbivorous fish often show a preference for filamentous algae, limiting the ability of



Holding a green turtle in company of one of the students from the Hawai'i Preparatory Academy who regularly help out with turtle tagging campaigns.

macroalgae-dominated reefs to revert to coral dominated states. Green turtles' functional role thus needs to be explicitly included in future studies of reef dynamics.

The Hawai'i model also provided a functional tool for Kaloko managers to make informed decisions about natural resource management in the light of coastal urban expansion plans, while incorporating an ecological perspective. By integrating known information from a wide variety of sources, and helping to organise and track information that would not be possible otherwise, the model also highlighted future research foci. These included the collection of more detailed consumption and diet information for some of the grazers, their spatial distribution on the reef and nutrient input time series data. Such data will increase the model's ability to produce realistic projections, particularly in light of ongoing development, and the desire by park managers to use the model to highlight future management opportunities as well as trade-offs.

Notes

¹Sections of my thesis were also supported by the *Sea Around Us* Project, a scientific cooperation between UBC and the Pew Environment Group, a Mia Tegner Grant, and a Disney Wildlife Conservation Fund grant.

