

Observations On The Defensive And Aggressive Behavior Of The Leatherback Turtle (*Dermochelys coriacea*) At Sea

We report an unusual encounter with an adult leatherback turtle (*Dermochelys coriacea*) off the coastal waters of the Republic of Palau in the western Pacific Ocean on 17 May 1991. We were plying the waters about 1 km south of Ncheangel (Kayangel) Atoll in the channel between the Atoll and Kossol Reef, approximately 8° 1' 30" N; 134° 44' E. The weather was sunny, the northerly wind light, and the ocean calm. Our boat was an open 7 m fiberglass runabout equipped with two 75-hp outboard engines.

At midday we noticed a large animal surfacing several times as we fished about 300 m away. After 5-10 min we motored toward the unidentified creature and found it to be a leatherback turtle interacting with a large (2 m) gray reef shark (*Carcharinus* sp.). The two animals were behaving aggressively, swimming rapidly about one another, with the turtle frequently breaking the surface alongside our boat. We stopped the boat and watched. The turtle swam erratically, repeatedly surfacing and exposing head, carapace, and flippers, often creating a frothy wake of bubbles as it resubmerged. At one point the turtle swam rapidly toward the shark, forcing it to take evasive action by darting away. Although we at first thought that the turtle had possibly been bitten and wounded by the shark, in fact the turtle appeared uninjured with all flippers intact and no blood in the water. After about 5 min the shark swam away and we did not see it again. The turtle, however, maintained an interest in our boat and continued to swim underneath and beside us, acting much as it did in the presence of the shark.

The turtle then began short rushes toward us, solidly ramming the underside of our boat. The turtle typically made shallow dives (5-15 m) in between each surfacing and hitting of the boat. It appeared to be ramming us with the leading edge of its carapace, or the upper part of the carapace itself, as opposed to its head. Although this butting was solid and could have thrown an inattentive person off one's feet, we did not notice any blood in the water or damage to the turtle's carapace. The turtle continued to surface frequently, lifting its head, a fore-flipper, and part of its body out of the water. On at least one occasion it surfaced upside down and swam several meters with its plastron up (Fig. 1). After

5-10 min of this behavior, and after hitting our boat half a dozen times, the turtle appeared to lose interest and began to swim away.

At this point, two members of our crew (C. Cook and N. Idechong) donned masks and snorkels and entered the water, jumping in on opposite sides of the boat. When Cook was 3-4 m from the boat the turtle came immediately and aggressively toward him. The turtle approached with mouth agape, but veered away within the last few meters when Cook made a threatening gesture by spreading his arms. Cook climbed quickly back into the boat, whereupon the turtle shifted attention to Idechong, who had lost sight of Cook and was searching for him at the stern of the boat. As the turtle approached, Idechong swam between the propellers of the two outboard engines. The turtle came from below, mouth open, evidently intent on biting the swimmer. Idechong delivered several kicks to the turtle's head, and the turtle backed off. The turtle did not or was not able to bite the swimmer's foot, and at the first opportunity Idechong climbed back into the boat.

The turtle hit the boat several more times, and then appeared to lose interest, moving farther and farther from us. When the turtle was no longer in sight, we started our engines and motored away. The entire encounter lasted 15-20 min.

The turtle was an adult whose carapace length we estimated to be ca. 1.5 m or more. Leatherbacks with a carapace of this length would be expected to weigh about 450 kg (Anonymous 1975, Van Denburgh 1924). The tail was short and the turtle was probably a female. We took several photographs of the animal as it surfaced around our boat (photos on file at the U.S. Fish and Wildlife Service Honolulu Office). The leatherback is occasionally reported in Micronesia (Pritchard 1977) and is thought to be an uncommon or rare species in Palau and Micronesia. Noah Idechong, who grew up in Palau and spent much time on the water, had seen only one leatherback prior to this encounter.



FIG. 1. Adult leatherback turtle surfacing upside down.

Based on our discussion with others familiar with sea turtles, the behavior of this leatherback was unusual (G. Balazs, T. Fritts, J. Woody, J. Richardson, pers. comm.). However, there are several published accounts of leatherbacks that have acted aggressively in response to humans or sharks (Cropp 1979, Schroeder 1965, Van Denburgh 1922). In one of two encounters described by Schroeder (1965), a large leatherback was observed somersaulting over backwards, making repeated vertical dives, and ultimately attacking Schroeder's boat—behaviors similar to those we observed. Cropp

(1979) detailed an encounter of a leatherback and shark off the coast of Australia. According to Cropp, a great white shark circled under a leatherback which was swimming on its back, wildly thrashing all four flippers, flipping, rolling, and diving on an erratic course. When Cropp maneuvered his boat between the turtle and shark, the turtle continued its tumbling and thrashing on the surface, evidently regarding the boat as another predator. We speculate that the aggressive display of the leatherback toward our boat was the result of its encounter with the shark. The turtle, which was clearly sparring with the shark, evidently considered us to be a threat as well.

Reports of turtles being bitten by sharks are relatively common, and the fact that turtles behave aggressively toward them is expected. However, the behaviors that turtles use to fend off sharks are not well documented. Rudloe (1979) reported that during an attack "turtles can sometimes chase off a shark by fleeing to the surface and beating their flippers, making a thunderous slapping noise that may be too much for the shark's delicate nervous system." Rudloe (1979) also wrote that "Archie Carr has told me about turtles blocking shark attacks by actually folding their flippers together under their plastron, bending their head down, and presenting their carapace as a shield."

Based on our encounter and those of others, adult leatherbacks use several different defensive behaviors when threatened, including ramming, biting, erratic swimming, thrashing on the surface, and swimming upside down on the surface. The survival benefits of ramming, biting, and erratic swimming are self-evident, but the value of swimming upside down and splashing on the surface is perhaps less clear. Swimming upside down on the surface may protect the vulnerable underside of a turtle from attacks lower in the water column. Splashing may deter an attack by a shark, but we can neither corroborate nor refute Rudloe's (1979) statement that the slapping noise made by a turtle is "too much for a shark's nervous system." Although leatherbacks may occasionally be preyed upon by sharks, a large healthy adult can obviously defend itself. Situations where leatherbacks are actually killed by sharks are probably exceptional and may occur mostly when a turtle is already wounded or sick.

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