

## OBSERVATIONS OF SHARKS ATTACKING PORPOISES

(Stenella spp. and Delphinus cf D. delphis)

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## INTRODUCTION

Records of actual observations of shark predation on porpoises are rare. Wood, Caldwell and Caldwell (1970) summarized the most significant observations to date and discussed the evidence that sharks do sometimes prey on porpoises (e.g., crescent-shaped scars on live porpoises and porpoise remains in shark stomachs). They also indicated, however, that it is impossible to determine what proportion of the scarred porpoises suffered the bites when they were young and susceptible to attack and whether the porpoise remains found in shark stomachs were from animals already dead before being eaten. They speculated that healthy, uninjured adult animals are less likely to fall prey to shark attacks than sick, injured or young animals. One of us (Perrin, 1968) has previously reported seeing sharks feeding on porpoises injured during tuna purse seining operations.

During the past several years, we have collectively made seven trips to the eastern tropical Pacific aboard commercial tuna purse seiners. We have also observed five experimental net sets made in local southern California waters by chartered seiners. In the shark-rich eastern Pacific, in association with a fishery in which porpoises are frequently entangled and injured or killed (Perrin, 1970), there are numerous opportunities to observe shark predation on the spotted porpoise, Stenella graffmani, and spinner porpoise, Stenella cf S. longirostris. In the experimental sets in local waters, there were similar opportunities to observe shark predation on white-bellied porpoises (Delphinus cf D. delphis). Although the majority of the observations were of sharks feeding on dead porpoises, several attacks and attempted attacks on living animals were seen. This paper summarizes all observations to date and discusses the threat that sharks pose to these three pelagic odontocetes.

## OBSERVATIONS

The most common kind of incident observed by all of us was sharks feeding on dead porpoises. In the tropical fishing grounds, incidents of this kind occurred at two times: during the actual fishing operations, and at night when the vessel was drifting on an active fishing ground. Of the porpoises that are killed during a net set, only the youngest animals float, presumably because of a higher percentage of blubber in the total body weight. Those that do remain near the surface almost invariably float vertically with the snout out of the water. It was on these dead floating animals that the majority of observed attacks occurred. Although the specific details vary somewhat, the following excerpt from a fishing log describes a fairly typical pattern of attack:

"The body of a juvenile spotter (S. graffmani) was floating approximately 50 meters off the stern. Only the porpoise's beak was projecting from the water. Two sharks of unidentified species, approximately 4 feet in length, circled the body for 10 to 20 seconds at a close range of within 2 feet. One attacked, followed immediately by the other. The body bobbed violently for a few seconds, discolored the water, and then sank from sight." (Field notes of Garvie.)

Although the majority of such incidents occurred outside the pursed net, sharks were often seen inside the net and occasionally constituted part of the catch. In at least one instance, a dead Delphinus was attacked and eviscerated by a 4-foot mako shark (Isurus lamma) inside the net. Although no other instances of sharks biting dead porpoises inside the net were recorded, all of us have seen boated tuna and porpoises that had been mutilated by what could only have been sharks.

We also observed sharks feeding on dead porpoises when the tuna boats were drifting at night in an area rich with fish. Since the decision to drift all night generally follows a successful day of fishing, we were frequently on the deck at this time dissecting porpoise specimens that had been saved from the day's catch. On those occasions, it was not unusual to see sharks cruising the area. As the remains of dissected carcasses were dumped over the side, sharks were seen to move in their direction. One such incident was recorded in detail:

"As we were drifting, several sharks, including a 3-meter hammerhead shark Sphyrna sp., were moving lazily around the boat. I had been dumping remains over the side for half an hour, but not taking time to watch what happened to them. At 2000, when I completed the last dissection and dumped the carcass in the water, I stood at the gunwales to watch. As soon as the carcass hit the water, I saw the hammerhead swim rapidly toward it and rip most of one side of it away before it had been in the water 15 seconds." (Field notes of Leatherwood.)

Although almost all of the feeding observed was on dead animals, four instances of attacks on living Stenella (and at least one unsuccessful attempted attack on a Delphinus) were observed: two on apparently uninjured spotters; one on a live but entangled and struggling spotter; and the last on a live but probably injured spinner.

In the first instance of an attack on an uninjured animal, "a 4.5 foot male, which had been hauled aboard with the fish, was recovered and thrown over the side. Though he was active on the deck and ventilated well, once in the water, he blew only once and began to swim away sluggishly. When he was less than 35 yards off the bow, he was bitten in two by a shark which showed only its dorsal fin, so its size and species were undetermined. The remainder of the porpoise sank through the bloody water and out of sight." (Field notes of Leatherwood.)

In the second instance, "fishermen pulled a live adult female from the brailer and threw her over the side. As she was swimming away, a large shark, with a robust body and a sharply-pointed head, came from deep below the boat and bit the porpoise's midsection. The porpoise sank slowly and was hit several more times by smaller sharks before what was left of her sank out of sight." (Field notes of Leatherwood.)

In neither case did the animals have any apparent injury, although the first may have been suffering from the "capture shock" so often observed in

newly captured pelagic cetaceans. The second was quite active and began moving rapidly away from the boat as soon as she was put over the side. In order to attack her, the shark had to move very quickly on an intercept course.

The third instance involved a porpoise that was "gilled" in the net. "Entrapped near the corkline, the porpoise was thrashing violently. Suddenly, the thrashing stopped and the water became stained with blood. When the net was brought aboard, the porpoise, a juvenile spotter, was pulled on the deck and found to have been eviscerated completely by what looked like three bites from a large shark. The shark must have been inside the net at the time of attack, since the porpoise was entangled from the inside and the net was not torn. There were also some tuna in the net which had been bitten by sharks. Two species of sharks were also brought aboard. One large individual, 7 feet long, with a blunt snout and a rounded, white-tipped dorsal fin, probably Carcharinus longimanus, was the only one that appeared capable of inflicting the bite wounds described." (Field notes of La Grange.)

The other attack on a living but probably injured animal involved a spinner that was entangled in the net. "He was still breathing well when I pulled him from the net pile, tagged him, and put him over the side. Once in the water, he blew twice, all the time drifting towards the bow in the strong current; before he could recover and swim away, he was hit by an 8-foot shark with a black-tipped dorsal fin and killed. Although when I put him in the water he was still able to move both pectoral fins and flukes and had no obvious external injuries, there is an excellent chance that this animal had sustained internal injuries." (Field notes of Leatherwood.)

In addition to these four successful attacks on Stenella, unsuccessful attempted attacks by a mako shark on Delphinus were observed. The shark, trapped inside the closing net with nearly 1000 porpoises, repeatedly chased live adult porpoises for a few yards. In all instances observed, however, the porpoise escaped.

#### DISCUSSION

It was interesting to note that despite the optimum conditions for creating a feeding frenzy (i.e., the abundance of sharks and potential prey both inside the pursed net and around the boat during fishing operations and the discharge of bloody fishing brine from the fish storage wells) no frenzies were observed. In the four cases of attack cited above as well as in the numerous feedings on dead fish and porpoises, the sharks' movements were deliberate. Individual porpoises were apparently being eaten one at a time, and even though several porpoises might be floating close together, the sharks seemed to finish one as a group before starting on another.

None of the feedings on dead porpoises are suprising; neither, perhaps are the few attacks and attempted attacks on living animals in the circumstances of the tuna set. But they do raise the important question as to whether sharks normally pose a significant threat to spinner, spotter porpoise, or white-bellied porpoise or whether they are simply more bold in the atmosphere of confusion or

taking advantage of the accessibility of the porpoises. Several points are relevant. Sharks are frequently found around the tuna boats during sets, sometimes showing up suddenly even though none may have been seen the entire day. Philippe Cousteau (pers. comm., 1967) indicated that in dives under porpoise herds over several years, the divers of the CALYPSO very frequently found tuna and sharks associated with moving porpoise schools. Similarly, on two successive days off Coronado Island, California, small blue sharks and at least two mako sharks were seen swimming with a herd of Delphinus delphis. One 114 cm female porpoise taken during a set on that herd bore healed and partly healed shark scars behind the blowhole, around and below the right eye, on the right side of the melon and on the underside of the jaw (Fig. 1). Though no teeth were found in dissection of the tissue around the scar, the jaws from a 4-foot mako taken during the same set approximately fit the outline of the scar, indicating that a shark of similar size may have inflicted the bites. Of the 85 porpoises from this herd examined in 2 days, this was the only individual that bore a healed shark scar.

Another Delphinus, a 168 cm female captured, radio tagged, and released near San Clemente Island, March 9, 1971, also bore a healed shark scar on the right side of the tail stock. Of over 30 animals captured, tagged, and released to date (Evans, et al., 1972) only this animal bore evidence of a shark bite.

Of all the porpoise specimens examined on the deck during the six separate cruises to the eastern tropical Pacific fishing grounds, none bore scars positively identifiable as shark bites. This observation is consistent with the Caldwell's findings for 11 species of pelagic cetaceans (Wood et al., 1970) and the combined observations tend to support the suggestion that, in the open sea, healthy adult porpoises are highly unlikely to fall prey to shark attacks. Spinner, spotter and white-bellied porpoises are fast swimmers (to at least 14 knots) and could reasonably be expected to out-maneuver most sharks in open water. The absence of scars, however, might also be interpreted to indicate that any attacks that do occur are fatal. The question of the importance of sharks as natural predators of pelagic porpoise remains open and can only be further clarified by extensive observations of the natural interactions of these animals.

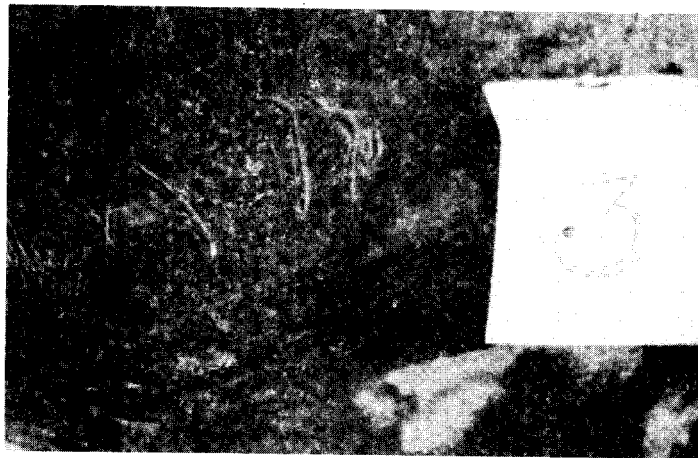


Figure 1. Two views of the head of a 114 cm Delphinus delphis showing healed and partially healed scars attributed to bites by a mako shark.

#### LITERATURE CITED

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