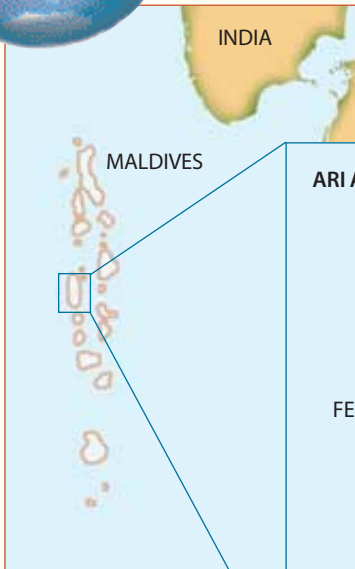
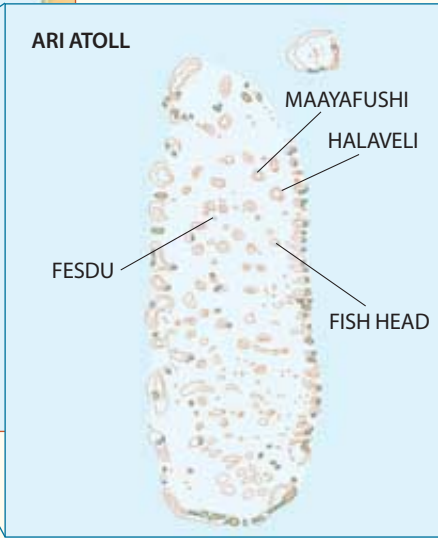


INDIAN OCEAN:

Sharks Mean Business



Throughout the tropics, the future of reef sharks hangs in the balance as the interests of tourism and those of commercial fishing meet head-on by R. Charles Anderson



I am on a wooden motorboat, over a small reef inside Ari Atoll, in the Maldive Islands. It is seven at night. Around me, the warm Indian Ocean is placid, and the lights of half a dozen small resort islands—Maayafushi, Halaveli and Fesdu, among others—glitter in the distance. In a few minutes I'll be in the dark water, scuba diving in the midst of feeding sharks.

being home to about 20 gray reef sharks (*Carcharhinus amblyrhynchos*). Stocky and mean-looking, they are nonetheless dedicated fish eaters, so they thrill divers without really endangering them. When I visited Fish Head last time, however, there was only a solitary shark in residence. Local fishermen had taken all the others. Strands

of fishing line caught on the reef remained as evidence of their visits.

Operators of local dive shops are not happy about the loss. The warm, clear waters, extensive coral reefs and abundant sea life—including sharks—are the main attractions for the tens of thousands of divers who flock to the Maldives every year and form the backbone of the country's major industry: tourism. One estimate puts the annual number of dives made by visiting tourists at more than half a million; each dive costs roughly \$35. From the Maldivian perspective, that is a lot of money—the country's gross domestic product was only \$423 million in 1995.

Apart from tourism, the only industry of any importance is fishing. Maldivian fishers have traditionally targeted tunas such as skipjack and yellowfin using the same live-bait pole-and-line method that their ancestors used 1,000 years ago. This preference for tunas, which are caught out at sea, left the reef-dwelling fish essentially undisturbed—until relatively recently. Over the past 15 to 20 years, East Asian buyers

I am neither as brave nor as foolhardy as that disclosure may suggest. The boat is moored in only eight meters (26 feet) of water, and I will be observing whitetip reef sharks (*Triaenodon obesus*). Inoffensive and fairly small, they are almost as far removed from "Jaws" as a shark can be.

A good shark dive is one of the great wildlife experiences, like a safari in East Africa or a cruise in Antarctic waters. And this particular spot in Ari's lagoon is one of the best shark-watching sites in all of the Maldives, a nation of some 1,200 tiny islands stretching about 1,000 kilometers southwest of the southern tip of India. Unfortunately, though, such places are becoming increasingly scarce.

A few days earlier I had visited Fish Head (Mushimasmingili Thila), another dive site in the same lagoon. Until recently, it was the premier shark dive site in the Maldives,





GRAY REEF SHARKS (above and right), whose numbers are plummeting in the Maldives, are a favorite of diving tourists. A whitetip reef shark (opposite page), whose numbers are also declining, hunts bluestreak fusilier fish (below) on a reef inside Ari Atoll in the early evening.



have encouraged Maldivian fishers to turn to the reefs. Sea cucumbers, groupers, giant clams and reef sharks such as the grays have all taken a hammering. As is true for countless other idyllic islands, two important industries—diving and fishing—are on a collision course in the Maldives.

Dinnertime on the Reef

Such developments are the backdrop for my reef dive in Ari Atoll. After struggling into my scuba gear in the darkness, I duckwalk off the bow and swim down through the cloud of bubbles caused by my entry. Almost immediately my flashlight beam picks up the reef below.

The reef top is a seething mass of fish.

Bluestreak fusilier fish (*Pterocaesio tile*) are milling over the reef and among the rocks, like a living carpet. These fish feed by day, forming great schools above the reef where they peck at incoming plankton. At night the fusiliers sleep in crevices in the reef. Now, just after dusk, they are trying to settle down for the night.

Out of the darkness a shark appears. Then another and another. They are white-tip reef sharks; at about a meter and a half long, they are hardly the efficient killers of popular imagination. Perhaps dazzled by my dive light, they bump into rocks and snap their jaws shut on empty water a full second after startled fusiliers have darted off. Eventually, and right in front of me, one whitetip bites down on a fusilier and with much headshaking makes off with its dinner. The fresh wounds on many other fusiliers attest to recent and frequent near misses. After an hour watching a dozen or



so sharks, I return to the mooring line and slowly ascend to my boat.

Although there's nothing like being next to feeding sharks to pump up the adrenaline, it took bloodless calculations to shed light on the conflict over reef resources. To estimate the value of sharks to the two industries, tourism and fishing, I did a survey of shark diving in the Maldives in 1992 with Hudha Ahmed, my colleague at the Ministry of Fisheries and Agriculture. We found that the money spent by divers on shark dives in the Maldives amounted to some \$2.3 million a year. Some \$670,000 came from dives at Fish Head alone.

We further estimated that for all shark-watching dive sites, the average value of a live gray reef shark was about \$3,300 a year. Because the sharks can live for at least 18 years, and recognizable individuals have been seen at dive sites in the Maldives for many years in a row, the total value of each shark is actually several times higher. In contrast, a dead reef shark has a onetime value (cut up for meat and fins) of about \$32 to a local fisherman. Thus, at dive sites, gray reef sharks are worth at least 100 times more alive than dead.

From an economic point of view, it clear-

ly makes sense to ban shark fishing and leave the sharks as high-earning attractions for visiting divers. That, however, would deprive the fishermen—who gain few direct benefits from tourist income—of even the meager benefit conferred by dead sharks.

As one step toward protecting sharks and other marine life, the Maldivian government designated 15 popular dive sites as Marine Protected Areas in 1995. Eight of the sites, including Fish Head, were major shark-watching dive sites. Unfortunately, there was no means of enforcing the protected status of these areas. During 1995 and 1996, the shark population at Fish Head plummeted, as did the number of divers visiting the site. The loss of revenue is difficult to estimate, but my back-of-the-envelope calculations suggest that it is on the order of \$500,000 a year. All this potential revenue was lost for the sake of about 20 sharks, which probably earned their captors less than \$1,000.

What has occurred at Fish Head has happened at innumerable other locations around the world. The only difference is that I and other divers have monitored the change at Fish Head, and we are trying to do something about it. There is talk of banning shark-fin exports, but such a move would unfairly affect those fishermen who target oceanic sharks, which are more abundant than reef sharks. There is also talk of extending the system of protected areas, but lack of enforcement remains a problem.

The Maldives, moreover, are not the only trouble spot. Shark fisheries are in decline all over the world. Part of the problem is the sharks' biology: they grow slowly, mature late and have small numbers of young. Whitetip reef sharks, for example, mature at about five years and gray reef sharks at seven or eight. Both species give birth to typically two or three offspring at a time—a tiny brood in comparison to the hundreds or thousands of eggs produced by most bony fishes. As a result, shark populations are unusually sensitive to being overfished. Unfortunately, a quarter of the world's population craves shark's fin soup.

In many tropical countries, where shark fishery regulations are difficult to enforce, reef shark populations have dwindled to a small fraction of their original numbers. Even the lure of tourist dollars has not yet stemmed the losses. It is possible that we have already entered the twilight of one of nature's great and stirring spectacles: the sight of sharks feeding in the wild. ■

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