

The Ecological Dangers of Shark Fishing

When thinking about sharks, many people refer more to images of sharks as man-eaters and dangerous predators rather than the important ecological services they provide to their ocean habitats. Thanks to the popularity of the Jaws movie franchise and sensationalist television programs during Discovery Channel's Shark Week, we in the West view sharks as dangerous creatures whose existence could be seen as detrimental to our safety. This has led to the creation of "shark hunting" as a form of extreme sport that American tourists can take part in on vacation to Alaska and Florida. In addition, many fish farmers adopt a top-down system wherein they work to eliminate apex predators from the ecosystem so that other fish types flourish in an unusual manner. Finally, in China and parts of Japan, shark fin soup is a delicacy served at weddings, and other parts of the shark are sold for food, again limiting apex predator populations in an unnatural manner. This wide variety of motives behind shark fishing make it a complex issue that needs many different approaches in order to be solved across the board.

Sharks are what are known as apex predators, meaning they are at the top of the food chain. Although not evident at first sight, there are many benefits to having a flourishing apex predator population. One benefit of a large apex predator population is the process of natural selection in which they take part. Weak and diseased animals are easier prey, so sharks keep prey populations healthy and keep disease well in check. Because apex predators tend to have many species to choose from for food, if one species' population dwindles, the apex predator can help populations persist and ensure that no single species population need be completely consumed. In this way, sharks can directly limit the populations of their prey (1). Another benefit is that they keep mesopredators at bay. Mesopredators, such as rays, are low-level predators that are suppressed thanks to apex predation.

The flourishing of mesopredators has proven to be extremely detrimental to ocean ecosystems, as evidenced in research in the Northern Atlantic. Notably, commercial shellfish populations are actually harmed when sharks are killed and local mesopredators (mostly elasmobranchs) are allowed to dominate. The Census of Marine Life conducted a research study about the effects of shark population shrinkage on lower-level organisms in the trophic chain in the Northwest Atlantic (Appendix A). In the location they studied, there are eleven main species of shark that prey primarily upon mesopredators such as rays as other, smaller sharks. Over the past thirty years, the stocks of these eleven species have been greatly reduced, thanks to human top-down fishing. As a result, "the populations of 12 of the 14 elasmobranch prey species associated with these sharks have increased" (2). A great example from this study can be seen in the interrelationship between cownose rays and scallops in a North Carolina scallop fishery. The cownose population increased almost certainly due to the dwindling shark populations in the area. Cownoses feed primarily upon bivalves (of which scallops are an example), and they seem to have grown to such an extent that they have outpaced the scallops in terms of time needed to replenish, and as a result the scallop population died out almost entirely. If the shark population had not been so decimated by human top-down fishing techniques, this issue would not even have become a problem in the first place. The scallop fishery in question, which was around a century old at the time, has since been forced to close. In addition, bivalves function as water filters, keeping the water relatively clean and otherwise maintaining water quality. As bivalves die out, coastal ecosystems are at extreme risk of degradation, damaging algal blooms, and even dead zones.

This example portrays perfectly the dangers of overfishing of sharks and shark hunting. Sharks indirectly provide many ecosystem services. From the example provided we can see that they keep biodiversity high by making sure no other predator dominates and overfeeds on a third-level population, make sure low-level organisms can persist, and even indirectly keep the ocean clean and viable for all forms of life. As apex predators, they ensure that their ecosystem is in balance – but

humans have now become the top predator of the seas, and the human practice of shark-killing is doing large amounts of damage to the ocean ecosystems, and as a result, our own lives. By killing sharks, we damaged our own profits and food supplies, since our own scallop fisheries died out as collateral. But that mistake is not isolated to the Atlantic Northwest. In the South of the Atlantic Ocean, near Florida, ecosystems are being damaged thanks to the vacation sport of shark-hunting. The same is happening in the Pacific near Alaska. Finally, ocean ecosystems in the Pacific and the Japan and China Seas are threatened due to the popularity of shark fin soup, a dish served at weddings and banquets. It is treated as an ages-old tradition, yet merely dates back around 50 years (3).

Because the issue of shark fishing is extremely complex and multifaceted, it only makes sense that there is no easy one-step solution. Instead, the battle must be fought differently on each front. Since shark fishing is carried out mostly for direct consumption as food in Asia and either for sport or a top-down fishing approach in the United States, different tactics must be taken in each location. In China and Japan, one of the steps ecologists might take is to make strides toward creating a social impetus against consuming shark byproducts. Already, Hong Kong University and the Bank of China are halting the serving of shark fin soup at official banquets and other functions (3), and this is an attitude that would be beneficial for more organizations and people in the region to adopt. In addition to encouraging that attitude, ecologists could work on synthesizing a shark fin substitute to be used in shark fin soup for those who are reluctant to give up tradition (no matter how recently that tradition was installed in actuality), yet willing to acknowledge the damage that shark fishing does to ocean ecosystems and work to counter it. Finally, there are possible measures that Japan and China's governments could take that would be favorable to sharks and the ecosystems they inhabit. A law could be passed banning the purchase or sale of shark byproducts, instituting harsh penalties to be enacted upon anyone caught buying or selling said shark byproducts. Of course, this would require much police enforcement to make sure that a black market doesn't begin to thrive. Although this could anger some fisherman who might feel as if they were cheated out of a profit, these measures would be necessary for the benefit and safety of ocean ecosystems. If efforts are made to inform the fishermen that these measures will actually help lower-level fish populations – that can also be fished for food and profit – to grow, they might see the upsides and change their tune. Even if they aren't initially on board, the fishermen will still reap the benefits of the ecosystem services that a reestablished shark population will inevitably provide.

Ecologists must necessarily take different steps in the United States and Canada, since the motives for shark fishing here are different from those in Asia. In the United States, shark fishing is rooted in part in fear and myth, which has evolved into the bravado-based ego-stroking of vacation shark-hunting. Another, even more common reason for shark fishing, the misguided top-down fishing approach taken in the Northwest of the Atlantic Ocean in both Canada and the United States, also accounts for a large amount of shark fishing. The first step toward addressing the first half of the issue is increased education about sharks' importance in ocean ecosystems as well as the fact that shark killings are much less common than Shark Week sensationalism may have us believe. National Geographic News says “the United States averages just 16 shark attacks each year and slightly less than one shark-attack fatality every two years” (4) - more than twice that amount of people die from lightning strikes on the coast each year. Education about this topic will hopefully have the effect of quelling fears of sharks and dispel the myth of sharks as man eaters that possibly deserve to be killed in some indirect form of retribution. In addition, wide-spread education of fishermen on the damages of top-down fishing and the long-term negative effects on their primary lower-level catch's populations. Last but not least, similar laws to what I proposed for Asia could be implemented. Rather than prohibiting the sale of shark byproducts, however, law-makers could prohibit the killing of sharks for sport and indirect fishing benefits. Coast guards could then be authorized to regulate the coasts and make sure no shark-killing was occurring, and if so the perpetrators would be forced to pay a hefty fee.

Hopefully measures similar to the ones listed above will be instituted around the world

sometime in the near future. While it would be challenging to convince fishermen that their profit lies elsewhere and it would be hard to dislodge the fear the man-eater myths have instilled in many people, it is important that people come to see the truth about sharks and their importance within their ecosystems. Without sharks, our water won't be as clean, there won't be as many species of fish for us to look at when snorkeling, and we will soon run out of certain food sources, such as the scallops over-eaten by the cownose. It is vital that these ecosystem services provided by sharks remain in the oceans in order for both humans and sea-dwelling organisms to enjoy ocean-related life as we know it, whether it is related to recreation, water sanitation, or the food we eat.

Appendix

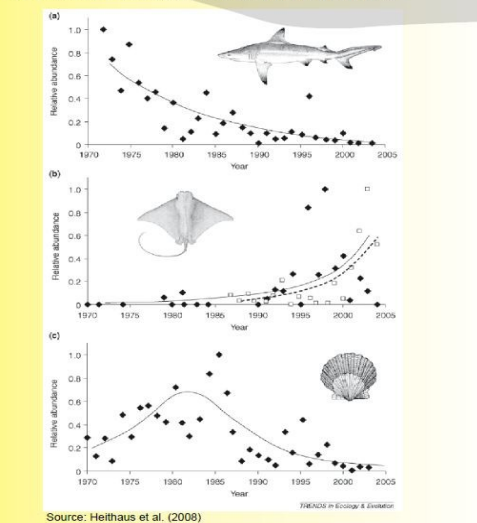
A. Location of the Census of Marine Life shark population study



(http://www.coml.org/discoveries/img/shark_decline_effects_02)

B. Shark effects on mesopredators and bivalves.

Figure 2: As (a) catch rates of large sharks, such as blacktip sharks, declined during research surveys along the east coast of the U.S., (b) cownose rays began to increase, leading to eventual declines in (c) catches of North Carolina bay scallops.⁴⁰



(http://oceana.org/sites/default/files/o/fileadmin/oceana/uploads/Sharks/Predators_as_Prey_FINAL_FINAL.pdf, page 10)

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