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Importance of sharks in ocean ecosystem

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Abstract
Sharks have an important and major role in maintaining the ocean ecosystem and also serving as an indicator of the ocean health. They control the populations of prey species by eliminating the weak and sick animals ensuring the species diversity. Sharks are one of the most important groups of predators of the planet and having over a broad distribution of habitats in every ocean. Sharks play a function of keystone predators and they are important for maintenance and stability of food chain. Shark populations are at threat and have been declining due to overfishing, anthropogenic activities and demand for shark fins. Sharks play an important role in the conservation of coral reefs that facilitates the raising of awareness and financial support for conservation. The large apex predatory sharks that frequent multiple coastal and pelagic ecosystems are at continued risk from exploitation by pelagic longline fisheries and will require important jurisdictional management strategies.

Keywords: sharks, ocean ecosystem, ocean health

Introduction
Sharks play a major role in the ecosystem by maintaining the species below them in the food chain and serving as an indicator of the ocean health. They help remove the sick and the weak as well as keeping the balance with competitors ensuring the species diversity. Sharks have evolved in a tight inter-dependency with the ecosystem. They tend to eat very efficiently eliminating the old, sick and slower fish in a population that they prey upon and keeping that population healthier. Sharks are one of the most speciosa (species-rich) groups of predators of the planet and distributed over a broad range of habitats in every ocean. Globally, Shark populations have been declining over the last century due to large fishing pressures and habitat degradation.

Elasmobranch, particularly sharks comprise one of the most diverse group of predators [1, 2, 3], providing a model for refining predatory roles. Many sharks have been labelled as apex predators, such as bull sharks [4], copper sharks [5] & Caribbean reef sharks [6] and indeed whole shark group is often labelled generically as 'apex', 'top predators' or 'great sharks' [7]. A number of publications have documented a growing concern about the rapid and widespread decline of shark populations [8, 9, 10, 11]. Many shark species are at or near the apex of a food chain or trophic structure that supports them. It is often suggested that the sharks may also function as keystone predators [11, 12] and they are essential for stability and maintaining the food web.

Ecological features
Sharks comprise about half of the total contemporary *chondrichthyans* (492 sharks, 621 bathoids, 46 chimeras, http:// www.catalogueoflife.org), a monophyletic predatory group that originated about 423 million years ago, before any other extant vertebrate predators evolving initially as small coastal consumers then by evolution obtaining larger body sizes, continuous growth, delayed age at maturity and the ability to colonize deeper oceanic waters [13]. The group acquired ecological niches which were previously occupied by now extinct predatory vertebrates [14], and have influenced the diversification and distribution of competitor and prey species [15]. One magnificient example is the extinct Megalodon shark *Carcharodon megalodon*, the largest predatory species recorded, which has caused enormous changes in evolution of its preferred prey, the marine mammals [15]. Chondrichthyes (sharks, rays, skates, and chimaeras) are among the oldest extant vertebrates. They are vital to top-down regulation and maintenance of oceanic ecosystems, and to sustain healthy commercial fisheries and

ecosystem services derived from marine environments [16].
Contemporary sharks are distributed in demersal, coastal and pelagic habitats of ocean [1]. While most species are limited to the continental shelves there is a small number of fully oceanic species such as oceanic, blue, whitetip and mako species; and the larger ones that migrate between coastal and oceanic waters such as silky, hammerhead, tiger, white shark. Sharks are carnivores with body sizes from 0.2 to >20 meter (fishbase.org) and feeding types ranging from filter-feeding (basking, whale shark) to suction crushing (carpet sharks) and effective raptorial mechanisms (white, tiger sharks) [17]. While most larger species (>3 m total length) function as top predators, there is a high diversity of mesopredatory elasmobranchs (typically <1.5 m total length) that are prey to larger sharks. Many sharks are generalists, feeding on a wide variety of prey items. This explains the inter-connectivity of sharks seen in food web models [18], and the likely limited effects on any particular prey species [19].

Importance

Keeping the food web healthy

Many shark species are apex predators and they reside at top the food chain. The sharks control the population of the prey by eliminating the weak, old, slower and sick animals; keeping the population healthier. By removing the sick and the weak, they prevent the spread of disease and outbreaks that can have a devastating effect on the ecosystem. Preying on the weakest individuals also strengthens the gene pool of the prey species. The remaining strong and healthy individuals will give rise to the healthier populations. Sharks groom many populations of marine life to the right size so that those prey species don't cause harm to the ecosystem by crowding or becoming too populous.

Helping to maintain carbon cycle in ocean

Carbon is an important and critical element in the life cycle and the contributor to the global climate change. Sharks help to move and cycle the carbon content in ocean by feeding on the dead matter that accumulates on the sea floor. In addition, research has found that large marine animals such as whales and sharks isolate comparatively large amounts of carbon in their bodies. When they naturally die, they sink to the seafloor and get eaten by scavengers thereby recycling the carbon. But when they are hunted or caught by humans, they are removed from the ocean disrupting the ocean's carbon cycle.

Maintaining the economy

Sharks' control over the species below them in the food chain affects the economy indirectly. A North Carolina study showed that the loss of great sharks increases the population of ray below them and as an outcome the rays ate or eliminated all the bay scallop population thereby forcing the fishery to close. The decline of quahog which is an edible clam with hard shell found along the Atlantic coast; a key ingredient of clam chowder also considered as American classic food is forcing many restaurants to stop serving this dish. This scallop and clam disappearance shows that the elimination of sharks can cause harm to the economy as well as ecosystem.
Sharks are also influencing the economy by ecotourism. Over the last several decades, public fascination for sharks has developed into an increasing ecotourism industry in places like Bahamas, South Africa and the Galapagos Islands. In the Bahamas, a single live reef shark is worth $250,000 as a result of dive tourism but when this same shark is caught by a fisherman, it is valued only $50 (https://eu.oceana.org). Shark diving tourism contributes more than US$17.7 million annually to the national economy in Australia. These activities give rise to local businesses such as boat rental and diving companies and can help in providing job opportunities. So by these things we can say that sharks are worth much more alive than dead.

Keeping seagrasses bed and other vital habitats healthy

Sharks regulate, control and maintain the behaviour of prey species, also prevent them from overgrazing vital habitats. Scientists in Hawaii found that tiger sharks had a positive impact on health of sea grass beds by eliminating the turtle who graze on the seagrass. In tiger shark absence, the turtles graze on the high quality and nutritious seagrass destroying the vital habitat. When tiger sharks are present in that area, turtles however graze on broader area and not on only a single region.

Threats

Sharks are under serious threat all around the globe. It is estimated that upto 70 million sharks are killed by humans annually, due to both commercial and recreational activities. The International Union for Conservation of Nature (IUCN) has classified 17% of more than 1000 species as threatened, according to its 'Red-list' criteria.
By-catch is a serious threat for biodiversity globally, and sharks seems to be particularly vulnerable. About 6.8 million tons of accidentally caught fish and mammals are discarded every year. Being the most frequent threat for sharks, by-catch accounts for 66.9% of shark species that have an unfavourable conservation status according to IUCN.
Finning is another major threat which involves removal of shark fins while rest of the body is discarded into the ocean. It is estimated that 26 to 73 million sharks are killed every year for global shark fin market. Shark fins are used in soups and are one of the world's most precious fishery products. The price of shark fins reached more than US$ 700 per kilogram in 2011, according to the U.S. National Oceanic and Atmospheric Administration (NOAA). It has become pretty clear that international demand for shark fins is the main reason for shark fisheries.
Sharks are also caught for their meat and liver oil, and also their cartilaginous skeletons are also marketed. Meat and fins are used for consumption, cartilage as medical supplement, skins for leather, liver oil for lubricants and a source of vitamin A. Illegal, unreported and unregulated fishing of these species is the reason for putting these species Threatened categories of Red List.
Anthropogenic activities such as pollution, habitat destruction or alteration, damage and loss due to development of coastal areas also accounts for depletion of shark species.
Most sharks are long-living species with slow growth rate, late maturity and have lower reproduction rates. These factors mean that these populations have slower recovery rate than others when depleted. The depletion or even extinction of these top predators in ocean ecosystem will have a catastrophic effect on oceanic ecosystems such as coral reefs and may cause extinction of many other independent species.

Conservation of sharks

Sharks play an important role in the conservation of coral

reefs that facilitates the raising of awareness and financial support for conservation. For example, the recent establishment of shark sanctuary in Palau, Micronesia has increased public awareness on replacement of shark fishing with shark diving has brought commendable socioeconomic and community benefits. Similarly, marine protected areas (MPAs) have been generated in Fiji by agreements between dive tourism operators seeking sharks and traditional stakeholders. Such marine protected areas Such MPAs play an important role in reducing fishing pressure on reef associated sharks. The large apex predatory sharks that frequent multiple coastal and pelagic ecosystems are at continued risk from exploitation by pelagic longline fisheries and will require important jurisdictional management strategies. In the past few decades, global increases in shark fishing and anthropogenic activities have led to a simultaneous decline in shark populations. Since shark restoration to its previous historical baselines might help in restoration of numerous processes of ecosystem. Therefore, conservation efforts should be on reducing fishing pressure on shark populations.

Conclusion

Sharks exhibit high abundance and diversity in natural, unexploited systems. The slight fishing pressure is enough to cause strong population declines in vulnerable species, particularly large sharks. Population declines of large shark species often exceeded one or sometimes two orders of magnitude with some local extinctions. Larger sharks are still seen in some remote or protected areas, particularly in Pacific, and may provide valuable opportunities to gain more information on ecological role of sharks. Yet, reported shark catches are still increasing in most regions due to increase in shark fisheries for supporting shark fin markets.

Sharks have been a relatively stable force in oceans ecosystems over a long evolutionary time and possess a unique set of ecological traits. They are related to bony fishes morphologically and phylogenetically but their life histories may be more comparable to marine mammals specifically their larger size, lower reproduction rate and late maturity. Sharks are highly sensitive to changes in survival, either through fishing or predation. Many large sharks are sole predators of small elasmobranchs and other marine megafauna, and the depletion of these large sharks trigger the increase in these smaller megafaunal species in some regions. Large sharks in particular, with their wide distribution and predatory role can spread their impacts across different ecosystems.

References

1. Compagno LJV. Alternative life-history styles of cartilaginous fishes in time and space. Environ. Biol. Fishes. 1990; 28:33-75.
2. Cortés E. Standardized diet compositions and trophic levels of sharks. ICES J. Mar. Sci. 1999; 56:707-717.
3. White WT, Last PR. A review of the taxonomy of chondrichthyan fishes: a modern perspective. J. Fish. Biol. 2012; 80:901-917.
4. O'Connell MT, Shepherd TD, O'Connell AMU, Myers RA. Long-term declines in two apex predators, bull sharks (*Carcharhinus leucas*) and alligator gar (*Atracto - steus spatula*), in Lake Pontchartrain, an oligohaline estuary in south-eastern Louisiana. Estuaries Coasts. 2007; 30:567-574.
5. Benavides MT, Feldheim KA, Duffy CA, Wintner S. Phylogeography of the copper shark (*Carcharhinus brachyurus*) in the southern hemisphere: implications for the conservation of a coastal apex predator. Mar. Freshw. Res. 2011; 62:861-869.
6. Maljkovic A, Cote IM. Effects of tourism-related provisioning on the trophic signatures and movement patterns of an apex predator, the Caribbean reef shark. Biol. Conserv. 2011; 144:859-865.
7. Ceccarelli D, Ayling T. Role, importance and vulnerability of top predators on the Great Barrier Reef-a review. Great Barrier Reef Marine Park Authority, Townsville. Research Publication 105, 2010.
8. Smith SE, Au DW, Show C. Intrinsic rebound potentials of 26 species of Pacific sharks. Mar. Freshwater. Res. 1998; 49:663-78.
9. Walker TI. Can shark resources be harvested sustainably? A question revisited with a review of shark fisheries. Mar. Freshwater Res. 1998; 49:553-72.
10. Musick JA, editor. Life in the slow lane: ecology and conservation of long-lived marine animals. American Fisheries Society Symposium 23. Bethesda (MD): American Fisheries Society, 1999, 285.
11. Stevens JD, Bonfil R, Dulvy NK, Walker PA. The effects of fishing on sharks, rays and chimaeras (*chondrichthyans*) and implications for marine ecosystems. ICES J. Mar. Sci. 2000; 57:476-94.
12. Hinman K. Ocean roulette: conserving swordfish, sharks and other threatened pelagic fish in long line-infested waters. Leesburg (VA): National Coalition for Marine Conservation, 1998, 52.
13. Grogan ED, Lund R. The Origin and relationships of early chondrichthyes. In: Biology of Sharks and Their Relatives (eds. Carrier JC, Musick JA, Heithaus MR.). CRC press, Boca. Raton. FL, 2004, 3-31.
14. Walker SE, Brett CE. Post-paleozoic patterns in marine predation: was there a Mesozoic and Cenozoic marine predatory revolution? Paleontol. Soc. Pap. 2002; 8:119-194.
15. Lindberg DR, Pyenson ND. Evolutionary patterns in cetacea. Fishing up prey size through deep time. In: Whales, Whaling, and Ocean Ecosystems (eds. Estes JA, De Master DP, Doak DF, Williams TM, Brownell RL.). University of California Press, Los Angeles, 2006, 67-81.
16. Johri S, Solanki J, Cantu V, Fellows S, Edwards R, Moreno I *et al.* 'Genome skimming' with the MinION hand-held sequencer identifies CITES-listed shark species in India's exports market. Scientific reports. 2019; 9:4476.
17. Compagno LJV, Ebert DA, Cowley PD. Distribution of offshore demersal cartilaginous fish (class Chondrichthyans) off the west coast of southern Africa, with notes on their systematics. S Afr. J Mar Sci. 1991; 11:43-139.
18. Bascompte J, Melian CJ, Sala E. Interaction strength combinations and the overfishing of a marine food web. Proc. Natl. Acad. Sci. U.S.A. 2005; 102:5443-5447.
19. Ellis JK, Musick JA. Ontogenetic changes in the diet of the sandbar shark, *Carcharhinus plumbeus*, in lower Chesapeake Bay and Virginia (USA) coastal waters. Environ. Biol. Fish. 2007; 80:51-60.