

Status and Needs of Shark Conservation

Subjects: Biodiversity Conservation

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The expanding shark fin market has resulted in intensive global shark fishing. With 90% of teleost fish stocks over-exploited, sharks have become the most lucrative target. As predators, they have high ecological value, are sensitive to fishing pressure, and are in decline, but the secretive nature of the fin trade and difficulties obtaining relevant data, obscure their true status. In consumer countries, shark fin is a luxury item and rich consumers pay high prices with little interest in sustainability or legal trade. Thus, market demand will continue to fuel the hunt for sharks and those accessible to fishing fleets are increasingly endangered. Current legal protections are not working, as exemplified by the case of the shortfin mako shark. Claims that sharks can be sustainably fished under these circumstances are misguided. To avert a catastrophic collapse across the planet's aquatic ecosystems, sharks and their habitats must be given effective protection.

Keywords: biodiversity conservation ; sharks ; sustainable shark fishing ; shark fin trade ; fisheries ; shark fisheries ; sustainable use

1. Introduction

Shark conservation has been the subject of numerous reports over many years, with arguments for and against action to limit the fishery, without consensus.

The growing market for shark fin soup has resulted in intensive global shark fishing, but most of the catch is neither recorded nor managed ^{[1][2][3][4][5][6]}. Sharks have poor reproductive capacity ^[7] and their numbers are plummeting ^{[8][9]}. With some 90% of teleost fish stocks seriously depleted ^[10], sharks have become the most lucrative target and are now hunted by fisheries globally ^{[3][11][12][13][14][15][16][17][18][19][20]}.

Jurisdictional issues and the difficulty of obtaining data have long obscured understanding of sharks' diversity and numbers ^{[21][22]}. Ranging far from land and migrating across oceans, outside countries' Exclusive Economic Zones (EEZs), their status is difficult for assessment by Regional Fisheries Management Organizations (RFMOs), who have placed higher priority on species with greater economic importance. Shark management has been low priority, poor, or entirely lacking ^{[3][21][22][23][24]}.

Shark fin is a luxury item generating little interest in sustainability or legal trade ^[25]. Rich consumers pay high prices while the will, oversight, and enforcement resources necessary to manage the trade are absent. Market demand fuels the intensive fishery, exacerbating the problem ^{[25][26][27]}.

Although it has been suggested that shark fishing could be made sustainable ^{[28][29][30]}, trends indicate that this is not the case. Increasingly, shark and ray species are found to be endangered and without intervention the situation will decline. To avert collapse across the planet's diverse aquatic ecosystems, sharks and their habitats must be given effective protection ^{[8][9]}.

2. Industrial Fishing

With approximately 2.9 million motorized fishing vessels, the footprint of industrial fishing exceeds other forms of food production ^{[31][32][33][34][35][36][37][38][39]}, yet wild fisheries provide only 1.2% of human food calories ^[31].

Sharks were always a substantial by-catch ^{[45][40]}, generally discarded as trash while fisheries statistics record only landed catches ^{[41][42][43][44][45][46][47]}. By 2003, the ocean had lost ~90% of its predators, 80% within the first 15 years of industrial exploitation ^{[7][17]}. Now, only ~6% remain of the number present in 1950; ~3% in the tropics ^[9].

3. Ecological Consequences

In pristine, unfished regions, sharks are abundant and diverse ^[40]. An ancient line, they are deeply woven into aquatic ecosystems ^{[50][51][52]}. More than seven decades of industrial shark removal ^{[37][38][39][40][41][42][43][44][45][46][47][48][49]} has resulted in a large-scale ecological disruption in terms of the size of individuals, the relative abundance of species, and the community biomass ^{[17][21][40][43][53][54][55][56][57][58][59][60][61][62][63][64][65][66]}, which is not taken into account by RFMOs ^[53]. But media hype has blocked shark conservation efforts ^{[67][68][69][70][71][72][73][74][75][76][77][78]}.

4. Uncertainties

Global studies have emphasized the problems inherent in assessing the status of sharks ^{[1][2][3][4][13][26][79]}. For a shark fishery to be sustainable, it must be possible to determine shark fishing mortality and maximum sustainable yield (MSY). However, these are usually not known or are extremely uncertain ^{[4][5][20][41][80][81][82]}. The Hong Kong market, studied between 1999 and 2001 ^{[1][2]}, showed that shark mortality was four times what had been reported to the Food and Agriculture Organization of the United Nations (FAO) ^[1].

Illegal, unreported, and unregulated (IUU) fishing takes about 20% of the global catch, and as much as 50% in some fisheries ^[83]. The political will to address it is lacking ^{[84][85]}, compliance with regulations is poor, and many vessels intentionally violate laws on the virtually unmonitored high seas ^{[84][85]}, with little fear of prosecution.

The secretive market for squalene is also a prominent cause of shark mortality ^[86] and shark meat and oil are used in everything from make-up to dogfood ^[87].

The high diversity of shark species in the Hong Kong shark fin market indicates the likelihood that species more sensitive to fishing pressure are being replaced by others as they are depleted ^{[6][13][21][23][40][88][89][90][91]}.

5. Conservation Measures

Regulations to protect and manage sharks ^[92] have been ineffective in stopping their decline ^{[6][9][23][25][93][94]}. CITES listings are opposed by shark hunting nations because of the high commercial value of fins ^[4]. An Appendix II CITES listing only requires a "Non-detrimental" finding to export fins from listed species, so fins can be stockpiled until one can be arranged, thus undermining the intended protection ^[95]. Shark hunting nations avoid granting protection to endangered sharks by claiming that they are not wildlife but species of commercial interest ^{[30][96]}. Thus, Appendix II listings fail to provide effective protection ^{[16][93][94][97][98]}.

Finning bans were thought to be a viable means to reduce mortality ^{[11][99]} but they did not improve the availability of data on numbers and species caught. Several jurisdictions introduced 'fins naturally attached' (FNA) regulations, now considered the only way to guarantee that finning did not occur ^{[100][101][102][103]}, and for numbers, species, and sizes to be accurately reported. Other jurisdictions became shark sanctuaries ^{[104][105]}. But there is no FNA policy for vast regions of the high seas, where finning bans remain the only 'control'. In spite of very high mortality, RFMOs see shark management as prohibitively costly ^[4], and oppose adopting FNA policy. Fisheries Certification Standards have been established, but have come into question ^{[106][107][108]}.

6. Shark Meat

Finning bans and FNA policies have diverted attention from the unsustainability of shark catches. The trend is towards less detaching of the fins ^[99], while a surplus of low-value meat has been forced onto world markets ^{[11][13][26]}. The shark fin market drives the market for meat ^{[109][110]}. However, sharks are long-lived top and middle predators and their meat has high levels of accumulated toxins ^{[111][112][113][114][115][116]}.

7. Sustainability

Illegal shark fishing exceeds what is alleged to be sustainable ^[25], yet it is proposed ^[28] that commercial shark fishing become sustainable, considering the case of the spiny dogfish in the USA to be a model ^{[28][117]}. However most shark species are impossible to catch selectively ^[118], so others will be caught as by-catch, including protected, endangered species ^{[9][41]}. Dogfish meat has been sold as a replacement for depleted fish such as cod ^{[119][120][121][122][123][124][125]}, despite the danger to human health ^{[114][121]}, while the fins are sent to Asia ^[117]. But using sharks as a replacement for depleted fish stocks is not a viable solution ^{[10][39]}, for not only are sharks high on the food chain and of incalculable

ecological importance, but shark productivity is low. The boom and bust pattern of spiny dogfish exploitation is typical of targeted elasmobranch fisheries and indicative of poor management. In spite of claims to the contrary, its history suggests that it is not sustainable, and that it will not remain productive for long ^{[29][42][109][125][126][127]}.

7.1. Shark Fin Trade Sustainability

It is also claimed ^[28] that mako and blue shark fisheries in the North and South Atlantic Ocean, and the blue shark fishery in the North Pacific Ocean, are among the 8.7% of supposedly sustainable shark fisheries, despite being unmanaged, part of the global commons, and serving the fin trade.

ICCAT is responsible for the longline fisheries that catch most of the pelagic shark species ^[41] in the Northwest Atlantic. It represents 52 contracting nations and groups that between them fish more than 127 million hooks each year in the North Atlantic. Tuna, swordfish, and billfish are the priority; sharks are of lesser concern. Member nations provide fisheries data of variable quality, but major fishing nations that are not party to ICCAT also work the area; they provide no shark catch data whatsoever.

How any shark species could be managed sustainably under these conditions has not been explained. It is impossible to manage the global commons ^[128].

7.2. Shortfin Mako

Shortfin mako shark catches reported to ICCAT in the North and South Atlantic show steady decline ^{[17][40][129][130][131][132][133][134][135][136][137]}. For three years now, landings from the South Atlantic have exceeded those from the North. The species was assessed ^[22] in 2000 as 'Near Threatened', 'Vulnerable' in 2009, and in 2019 as 'Endangered' worldwide ^[135], with decreasing populations, while no conservation actions were taken.

An ICCAT-recommended retention ban ^[134] for 2019 was blocked by the USA and the EU ^[20], who put short-term fishing interests first. Their failure to respect the RFMO's scientific recommendations violated UNFSA and UNCLOS regulations, which establish a clear duty to protect not only target species but also bycatch, as well as to refrain from actions which cause damage to the marine environment and threatened species. A duty to cooperate with other states in the conservation of living resources was also violated. This is particularly noteworthy given that both the EU and the USA have taken on the role of policing the rest of the world in terms of IUU fishing ^[14]. The USA and the EU were therefore operating at some legal risk, i.e., of being challenged for violating their own laws and perpetrating IUU fishing ^[14].

In November, 2021, a retention ban was finally agreed upon and a management plan is to be launched, with the goal of achieving MSY by 2070 with a probability of between 60 and 70% ^[132].

7.3. Blue Shark

Blue sharks supply most of the fins in Asian markets ^{[2][6][138]} and are at high risk ^{[80][139][140]}. With 90% of fish stocks overfished ^[10], they are caught in increasing numbers for their previously low-valued meat ^[13]. They were already being taken at rates exceeding the maximum sustainable yield (MSY) between October 1999 and March 2001 ^[11] and catches have declined at 5% per year ^[97] since ^[41]. Most caught in the Atlantic are juveniles ^[20], a sign of over-exploitation. In the North Atlantic some 3 million (~100,000 t) have been estimated to be discarded each year ^[41] and landings are declining.

The fins in Asian markets coming from the North Atlantic greatly exceed the reported catch ^[141], indicating substantial unreported finning. The actual mortality is estimated to be four times that reported ^[11] and may be much greater ^{[13][142][143]}. MSY, which is estimated from landings, is not applicable to a largely discarded species ^{[41][144]}, as calculated ^[28].

8. Fishing Economics

The global fishing industry receives ~US\$35.4 billion in subsidies ^[145]. The only profitable fleets are the longliners and purse-seiners targetting the highest-valued prey: tuna and sharks ^[146]. High seas fishing would be transformed if subsidies were halted.

Global studies ^{[10][147]} indicate that overfishing results in a ~US\$83 billion loss annually. Stock recovery through reduced fishing effort, and restoration of habitats are recommended to solve the crisis ^{[147][148][149][150]}. Fishing subsidies that formerly encouraged overfishing could be used to ease the social transition ^{[8][10][39][147]}.

9. Fisheries Management

9.1 Impossibility of Global Sustainability

The USA fishing industry proposed the Sustainable Shark Fisheries and Trade Act (SSFTA) ^[151] as a “practical solution” that would allow American fishermen to continue to profit from the fin trade. It requires that countries importing shark products into the United States have management policies comparable to those under the Magnuson Stevens Act ^[152] ^[153]. However, it has never been suggested how all 1107 chondrichthyan species (as well as all other fish species) could be sustainably managed globally.

The problems would include:

- how to determine an MSY for every shark fishery in the world
- how to determine the baseline
- how management plans will be implemented
- how they will be funded
- how they will be enforced
- how RFMOs could be made to agree to base quotas and rules

Massive data collection projects would need to be organized, standardized, implemented, monitored, and funded globally. When laws are in place, development and funding of management plans would be needed, including staffing, training, scientific advice, and purchase of equipment. Expenses, reaching 14% of the value of landings ^[10], would be borne by the public, while fishers receive the benefits ^{[10][153]}.

This would need to be maintained long-term. However, neither the necessary funds, nor an international organization that could create such a network, exist. Every country would need to keep politics, financial self-interest, corruption, and criminality, out of the process.

The USA and EU refusals to follow ICCAT's recommendations for an immediate retention ban on shortfin mako in the North Atlantic in 2019 ^[20] illustrates the willingness of states to ignore laws in the absence of a higher authority, as well as the difficulty of protecting high-valued animals ^{[25][86][154][155]}.

The involvement of fisheries worldwide and the participation of criminal networks in a trade driven by high prices and rich customers, contrasted with the extreme, ongoing depletion of the animals supplying the fins ^{[6][25]}, makes the hunt for sharks for the shark fin trade not only unsustainable but a severe threat to the health of the world's aquatic ecosystems ^[8].

9.2. Sustainable Use

CITES was founded to limit industry destruction of biodiversity. The Convention uses biocentric values for ‘sustainable use’ ^{[156][157]} in which biodiversity is considered to have an intrinsic value that must be preserved in a state of health ^[156]. However, ‘sustainable use’ is often given a more anthropocentric set of values, in which human use has greater importance ^[157]. The fishing industry views itself as the sole legitimate user, and in effect the owner, of living marine resources and takes an anthropocentric position based on the concept of MSY without regard for ecosystem effects ^[158] ^{[159][160][161]}.

As can be seen in fisheries' practice, ‘sustainable use’ is not being defended against ‘unsustainable use’ but against the effective protection of sharks ^{[9][28][29][30]}. Sustainable use advocates fail to state when it would be time to stop using the ‘resource’. The IUCN defines this as “deliberate misuse of the terminology of sustainable use” to justify the benefits to humans ^[157].

9.3. Instinct vs Science

Due to its financial interests, the fishing industry has pillaged the ocean without concern for wastage and harm ^{[14][15][20][29]} ^{[39][40][53][161][162][163][164][165][166][167]}, in spite of international agreements to the contrary. It has been ‘scientifically’ argued that fishermen should treat fish as they wish because they are predators and part of the food chain ^[168], but our civilization prides itself on using reason, rather than instinct, in its decision-making. However, the fishing industry is in the same position as any other predator that is eliminating its prey ^{[168][169][170][171][172][173][174]}. With the human population as overgrown as it is, it has been known for decades that the moment would come in which no wild prey could sustain us ^{[39][169]}.

The capacity is to recognize the difference between instinctual drive and reasoned thought, yet reason (i.e., science) is often rejected in negotiations. Territorial interests supervene and limit international cooperation ^{[170][172]}, which affects the management of globally-important species. Such barriers must be overcome, otherwise the current pattern of species depletion, extinction, and the unravelling of the planet's ecosystems will continue and accelerate, eventually to the severe detriment of humanity ^{[8][171][172]}.

That one soup recipe could have had such a serious effect on the status of as many species as are represented by the class of Chondrichthyes is a telling indictment of the priorities of humanity.

10. Conclusions

A global catastrophe of elasmobranch loss through unmanageable and unsustainable shark fishing is documented throughout the cited literature. All sharks, manta rays, devil rays, rhino rays, and chimaeras, as well as their parts, require immediate protection from international trade through a CITES Appendix I listing ^{[175][176][177]}. Sharks must be treated as protected wildlife internationally, not as a 'resource' of commercial interest. A binding international treaty to protect sharks, as well as threatened biodiversity in general, should be the immediate goal ^[172].

In addition:

- Shark fin trade bans should be adopted ^[178].
- Drastic reduction in fishing effort is required to permit damaged ecosystems to recover ^{[10][39]}.
- Honest labelling of seafood products is required for transparency and traceability.
- Fishing subsidies need to end. The money could go to help fishermen switch occupations, and to police the shores and reefs they once fished ^{[10][39][179][180]}.
- Deep sea fishing should be permanently banned ^[33].
- Bycatch must be avoided ^{[181][182][183][184][185]}.
- At least 30% of the ocean should be set aside to recover as MPAs ^{[186][187][188][189]}.
- Implementation of a comprehensive monitoring and surveillance system should be a priority for all RFMOs ^{[190][191]}.
- RFMOs should be required to respect human rights, to address slavery, as well as unsafe and inhumane working conditions, to keep track of stocks through stock assessments by species and geographic region, update them regularly, and mandate catch limits. Landings should be monitored, and species-specific records kept.
- IUU fishing should be addressed globally ^[84].
- Cultural change with respect to shark fin soup in China ^[25] and elsewhere needs to be strengthened.

Fishing methods need transforming such that bycatch of non-target species is completely avoided. The reduction in fishing efficiency and the increased costs mean that consumers will have to pay higher prices to eat fish, reflecting the true value of such wild prey. Fishers should be able to sell their catch at a fair price to make a living while neither overfishing nor damaging the environment.

A global shift towards selective, non-destructive fishing methods is necessary for the remaining aquatic biodiversity to survive beyond this century ^{[184][185]}.

The sixth global mass extinction has been brought about by human activities ^[192] and marine biodiversity loss results from decades of over-exploitation ^[193]. There must be a shift away from the attitude that human expansion lies above all other concerns, towards management of the biosphere in the interests of sustainability, not only of sharks, but to permit our civilization to remain in good health. Domination by industry must end if aquatic ecosystems are to be saved from collapse ^{[8][172]}.

History has taught us that no wild animal can withstand targeted industrial-scale hunting long term—not whales, not sea turtles, not fish, and certainly not sharks. When consumption stops, the trade stops.

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