

# Threatened, Endangered and Vulnerable Aquatic Organisms with Special Reference to Elasmobranchs

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## Highlight Points

- ▶ The improper interventions of human beings in nature are pushing several of the aquatic species in the ecosystem to the brink of extinction.
- ▶ According to IUCN, hundreds of marine species across the world come under the categories of endangered and critically endangered species.
- ▶ The unprecedented unnatural extinction of aquatic organisms not only endangered the functioning of the ecosystem but also affected the ecological issues to a large extent.
- ▶ This article throws light on threatened aquatic organisms with special emphasis on Elasmobranchs, their status according to IUCN Red list and suggestions for conservation.

Aquatic species are those organisms that live wholly or mostly in or on the water (fresh, brackish or salt). These birds, mammals, fish, reptiles, amphibians, invertebrates and plants depend on aquatic environments for food, shelter, protection from predators, and other requirements of life. The oceans are home to a large percentage of Earth's biodiversity, occupying 70 percent of its surface and, when volume is considered, an even larger percentage of habitable space. About 75% of earth surface is covered by water, where 97% of water are salt water, 2% of water are from glaciers, and only 1% of water is available as freshwater (IUCN, 2018).

Ecosystem is comprised of interdependent animals and plants which constitute a complex web of life. This variety of life on earth, the biodiversity that features numerous interactions among the species, is most vital to the existence of our planet and, particularly, of humanity. Thus, indeed the extinction of a single species may affect the whole biological system pertaining to life and living things (Shamseer, 2019). Unfortunately, the improper interventions of human beings in nature are pushing several of the species in the ecosystem to the brink of extinction. The unprecedented unnatural extinction of these species has not only the endangered functioning of the ecosystem but also affected the ecological issues to a large extent.

From unknown creatures to Charismatic megafauna, these disappearances in the ecosystem happen frequently. On land, animals like Orangutan (Chimpanzee, Monkey, Gorilla, etc.) Black Rhinos, Amur Leopard and Giant Pandas are some of the most critically endangered species in the world. Similarly, many marine species including marine mammals, sea turtles and salmonids are also on the edge of extinction as climate change and overfishing become a major threat to their existence (Shamseer, 2019). According to the International Union for Conservation of Nature (IUCN), hundreds of marine species across the world come under the categories of endangered and critically endangered species. IUCN, at regular intervals, determines the status of species considering the probability of their extinction, from least concern to extinct. The IUCN Red List of Threatened Species is the world's most comprehensive information source on the global conservation status of animal, fungi and plant species. By evaluating the extinction risk of thousands of species, it is a powerful tool to inform and catalyze action for biodiversity conservation. It also influences the policy changes that are critical to protecting the natural resources and processes that humans rely on.

### Threatened & recognizable categories

Species are classified by the IUCN Red List into nine groups, specified through criteria such as rate of decline, population size, area of geographic distribution, and degree of population and distribution fragmentation. They are Extinct (EX), Extinct in the wild (EW), Critically Endangered (CE), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD) and Not Evaluated (NE). According to IUCN, Threatened embraces the categories of Critically Endangered, Endangered and Vulnerable. CR is a particularly and extremely critical state. Population of less than 250 mature individuals & 80% reduction in population size over 10 years & 3 generations are considered as critically endangered. EN species are organisms (animals or plants) that are at risk of becoming extinct. Population of less than 2,500 mature individuals & 50% reduction in population size over 10 years & 3 generations are considered as endangered. VU are organisms that are at high risk of endangerment in the wild. Population having less than 10,000 mature individuals & 20% reduction in population size over 10 years & 3 generations are considered as vulnerable.

### List of different environment and wildlife protection acts and conventions

- i. Endangered Species Act, 1973: The Endangered Species Act (ESA) was enacted by Congress in 1973. Under the ESA, the federal government has the responsibility to protect endangered species (species that are likely to become extinct throughout all or a large portion of their range), threatened species (species that are likely to become endangered in the near future) and critical habitat (areas vital to the survival of endangered or threatened species).
- ii. Wildlife Protection Act, 1972: The Wildlife Protection Act (WPA) was enacted on 9th September 1972. Main purpose of the act was to protect the wild flora and fauna.
- iii. Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES): CITES is an international agreement between governments. It was opened for signature in 1973 and entered into force on 1st July 1975. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.
- iv. International Union for Conservation of Nature (IUCN): IUCN was established in 1948. It is an international organization working in the field of nature conservation and sustainable use of natural resources. It is involved in data gathering and analysis, research, field projects, advocacy, and education. IUCN's mission is to influence, encourage and assist societies throughout the world to conserve nature and to ensure that any use of natural resources is equitable and ecologically sustainable.
- v. Convention on Biological Diversity (CBD): CBD was opened for signature in 1992 and entered into force on 29th December 1993. Main goal of CBD is conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from genetic resources.

vi. Environment Protection Act (EPA): EPA was passed in March 1986 and came into force on 19th November 1986. Main aim of EPA is to provide for the protection and improvement of environment and for matters connected therewith.

vii. International Whaling Commission (IWC): It is an international body set up by the terms of the International Convention for the Regulation of Whaling (ICRW), which was signed in Washington, D.C., United States, on 2 December 1946. Main aim of IWC is to provide for the proper conservation of whale stocks and thus make possible the orderly development of the whaling industry.

### Lack of Protections

Cartilaginous fish are particularly vulnerable to overfishing because they typically grow slowly and produce few young. Many species are increasingly targeted due to new markets for meat & gills, and high demand for shark fin soup. Finning is banned in roughly 70 countries & by regional fishery bodies, but most enforcement standards are lenient. Regional fishery bodies & wildlife treaties offer international safeguards for a small fraction of shark & ray species. Most countries still do not accurately monitor and/or limit shark, ray, and/or chimaera catches. Rays are generally subject to as much (if not more) fishing than sharks under fewer, less stringent protections (Dulvy et al., 2014). Chimaeras have fewer limits than do sharks or rays, but there are fewer species which are not as heavily fished.

**Table 1. Number of species evaluated in relation to the overall number of described species, and numbers of threatened species by major group of organisms**

Group	Estimated no. of described species	No. of species evaluated by 2019	% of described species evaluated by 2019	No. of Threatened species by 2019
<b>Vertebrates</b>				
Mammals	5801	5801	100%	1220
Birds	11126	11126	100%	1492
Reptiles	10793	7541	70%	1367
Amphibians	8043	6771	84%	2157
Fishes	34200	18449	54%	2494
<b>Subtotal</b>	<b>69963</b>	<b>49688</b>	<b>71%</b>	<b>8730</b>
<b>Invertebrates</b>				
Corals	2175	864	40%	237
Mollusks	80325	8728	11%	2231
Crustaceans	47000	3181	7%	733

(Source: IUCN Red List Version 2019 – 2)

**Table 2. Extinction risk and conservation of the world's sharks and rays**

**a) Most & least Threatened families of sharks, rays & chimaeras (Cartilaginous fishes)**

Most Threatened families	
No.	Families
1.	Sawfishes (Pristidae)
2.	Angel sharks (Squatinidae)
3.	Wedgefishes (Rhynchobatidae)
4.	Sleeper rays (Narkidae)
5.	Whiptail stingrays (Dasyatidae)
6.	Guitarfishes (Rhinobatidae)
7.	Thresher sharks (Alopiidae)
Least Threatened families	
8.	Lantern sharks (Etmopteridae)
9.	Cat sharks (Scyliorhinidae)
10.	Softnose guitarfish (Arhynchobatidae)
11.	Softnose chimaeras (Chimaeridae)
12.	Kitefin sharks (Dalatiidae)

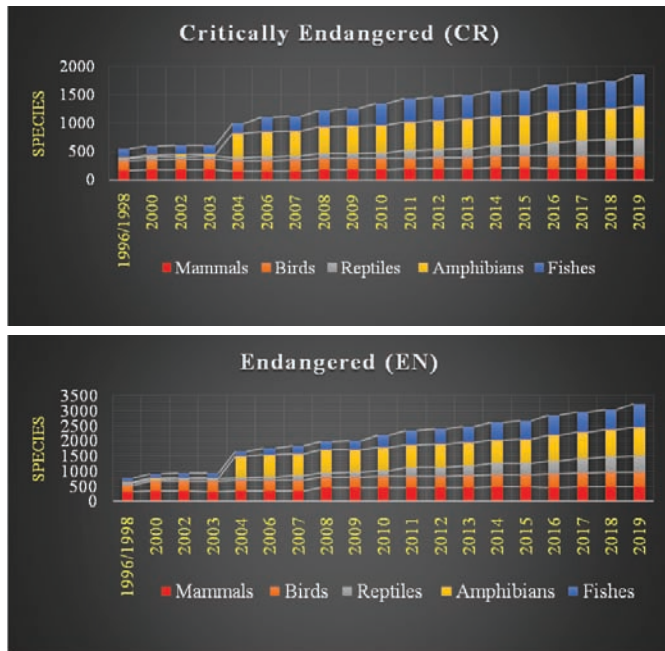
(Source: Dulvy et al., 2014)

**b) Sharks and rays species changing IUCN Red List status (2018-2019)**

Scientific name	Common name	IUCN Red List (2018) category	IUCN Red List (2019) category
Bathyrāja smithii	Softnose Guitarfish	DD	LC
Bathyrāja tunae	Cristina's Guitarfish	DD	LC
Carcharhinus dussumieri	Whitecheek Shark	NT	EN
Centrophorus seychellorum	Seychelles Gulper Shark	DD	LC
Cephaloscyllium albipinnum	Whitefin Swellshark	NT	CR
Chlamydoselachus africana	Southern African Frilled Shark	DD	LC
Euprotomicroides zantedeschia	Taillight Shark	DD	LC
Glaucostegus cemiculus	Blackchin Guitarfish	EN	CR
Glaucostegus granulatus	Sharpnose Guitarfish	VU	CR
Glaucostegus halavi	Halavi Guitarfish	VU	CR
Glaucostegus obtusus	Widenose Guitarfish	VU	CR
Glaucostegus thouin	Clubnose Guitarfish	VU	CR

Scientific name	Common name	IUCN Red List (2018) category	IUCN Red List (2019) category
Glaucostegus typus	Giant Guitarfish	VU	CR
Isurus oxyrinchus	Shortfin Mako	VU	EN
Isurus paucus	Longfin Mako	VU	EN
Narcine bancroftii	Caribbean Numbfish	CR	LC
Odontaspis noronha	Bigeye Sand Tiger	DD	LC
Pseudocarcharias kamoharai	Crocodile Shark	NT	LC
Rhina ancylostoma	Bowmouth Guitarfish	VU	CR
Rhynchobatus australiae	Bottlenose Wedgefish	VU	CR
Rhynchobatus cooki	Clown Wedgefish	VU	CR
Rhynchobatus djiddensis	Whitespotted Wedgefish	VU	CR
Rhynchobatus laevis	Smoothnose Wedgefish	VU	CR
Rhynchobatus luebberti	African Wedgefish	EN	CR
Rhynchobatus springeri	Broadnose Wedgefish	VU	CR
Squalus albifrons	Eastern Highfin Spurdog	DD	LC
Squalus chloroculus	Greeneye Spurdog	NT	EN
Squalus crassispinus	Fatspine Spurdog	DD	LC
Squalus nasutus	Western Longnose Spurdog	DD	NT
Squalus notocaudatus	Bartail Spurdog	DD	LC
Squatina africana	African Angelshark	DD	NT
Squatina argentina	Argentine Angelshark	EN	CR
Squatina dumeril	Atlantic Angelshark	DD	LC
Squatina occulta	Hidden Angelshark	EN	CR
Trygonoptera galba	Yellow Shovelnose Stingaree	DD	LC
Trygonoptera imitata	Eastern Shovelnose Stingaree	NT	LC
Trygonoptera testacea	Common Stingaree	LC	NT

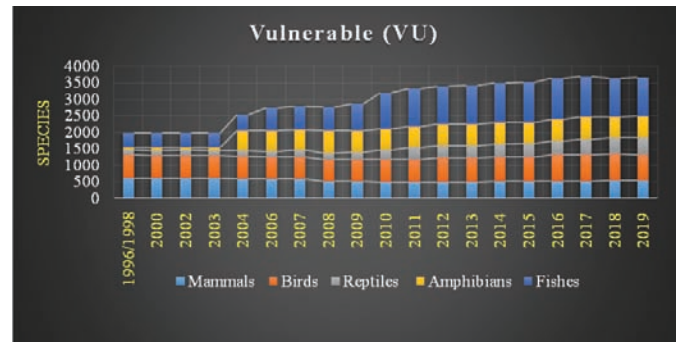
(Source: IUCN Red List Version 2019 – 2)



**Fig. 1. Changes in numbers of species in the threatened categories (CR, EN, VU) from 1996 to 2019 for the major taxonomic groups on the Red List**

#### Conservation strategies

Promptly & accurately report species-specific cartilaginous fish catches to proper authorities. Implement all existing scientific advice regarding cartilaginous fish & their



habitats. Develop/implement national & regional plans of action pursuant to the International Plan of Action for Sharks. Set cartilaginous fish catch limits based on scientific advice and the precautionary approach. Fully protect shark & ray species that are at high risk such as those deemed critically endangered and endangered. Improve monitoring and enforcement in fisheries taking cartilaginous fishes (including by ending at-sea fin removal). Regularly assess the health of cartilaginous fish populations & effects of new factors. Promote research toward minimizing incidental catch & discard mortality. Employ the tools associated with wildlife treaties to complement fisheries management, and facilitate cooperation among countries to conserve shared population

*\*References can be provided on request.*

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# Need of Diligent Knowledge on Transforming Biofloc Technology to the Indian Aquaculture Farmers

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#### Introduction

One of the first references in the popular scientific literature to what now is referred to as “biofloc” by the aquaculture community might be traced to a short piece entitled “ Food Bubble” that appeared in the Nov, 1964 issue of the scientific American Magazine. One of the first applications of biofloc technology for aquaculture was in the early 1970’s at the IFREMER-COP (French Research Institute for Exploitation of the Sea, Oceanic Centre of the Pacific Research Facility in Tahiti (Emerenciano et al., 2013). This ground-breaking work

remains the base for the development of this innovative technology in aquaculture. Interest in biofloc continued to spread all over the world rapidly. Biofloc Technology in outdoor ponds and tanks and indoor raceways and tanks continues to advance as a result of the work of a number of research teams and commercial groups.

The rapid expansion of the useful biofloc technology, fuelled by private entrepreneurs demand for an appropriate Policy and Authorities/Approval bodies to unlock aquaculture’s potential for supporting sustainable and resilient food