

## Large marine species, the keystone for marine ecosystems

### The role of large predators in the balance of ecosystems

The Principality of Monaco was recently the world's first independent State to make the commitment to strive for the protection of bluefin tuna. HSH Prince Albert II has become the symbol of the fight for the preservation of this species. Unfortunately, bluefin tuna, which belongs to the group of great marine predators (cf. *Appendix 1*), is not alone in this category to join the ranks of seriously endangered species.

Super-predators or great predators have an essential role within ecosystems in terms of population dynamics. They contribute to regulating, controlling and stabilising the populations of the species on which they prey. Their own population dynamics is directly affected by that of their prey (feedback loop). Through natural selection, by eliminating the weakest animals first, those that are stricken by disease, parasites, malformations, even cadavers, etc, they have an essential sanitary role. Beyond prey/predator balance, so-called inter-species relations are such that disruption of balance in one population can jeopardise the existence of another species with which it did not seem to have any ties at first. Thus, the extinction of one species can lead to the disappearance of many others and destabilise the entire ecosystems.<sup>1</sup>

Generally speaking, this phenomenon of co-extinction highlights the importance of the complex relationships within ecosystems. Thus, one extinction can trigger the disappearance of many species and destabilise entire ecosystems. This is the case for example of "keystone" species whose importance is such that their disappearance alone brings about profound changes in the ecosystem.

In the marine environment, the impact of the disappearance of a single "keystone" species can be felt even more than on land, since the areas of distribution are much more extensive: thousands of kilometres at sea, compared to tens of kilometres on continents. Consequently, an event occurring in one place can affect species several thousand kilometres away, in particular via sea currents.

While certain species may suffer from the disappearance of others, some may gain from this (cf. *Appendix 2*). From the human standpoint and that of ecosystems, however, it is impossible to foresee the consequences of the imbalance of such complex ocean ecosystems. The effects of such disorganisation are unpredictable, particularly since Man is also a player in the process through overexploitation, with alarming consequences.

### Remarks on shark populations

Among the great marine predators and keystone species, populations of large sharks are also declining all over the world. For a half century, fisheries have tracked down great marine predators - sharks, bluefin tuna, marlin, cod, groupers, swordfish - with unprecedented perseverance and intensity. Before then, these large species dominated fauna made up of small fishes (like sardines and anchovies) which struggled to survive despite their renewal rates. Sharks were omnipresent in coral reefs, cod in coastal ecosystems in the northwest Atlantic. The abundance of these large predators was then two to ten times, even up to a hundred times more than now. The situation is overwhelming: today's oceans are virtually empty of predators. The effects of such overfishing can be observed in the trophic interactions in many global ecosystems and disruption of their functioning. This is the case, for example, in the Mediterranean Sea, where statistics and recent studies shows that blue shark or shortfin mako shark populations have dropped by over 90%. All over the world, scientists observe the same phenomenon and consider that several species are seriously endangered. The main threats

---

<sup>1</sup> According to an article published in 2004 in *Science*, at least 6,300 species "co-threatened" with extinction should be added to the IUCN red list, which also includes 15,000 species of higher organisms.

are from overfishing and degradation of sharks' habitat. The first global study published in June 2009 by the IUCN (International Union for Conservation of Nature) Shark Specialist Group reveals that 32% of the 64 species of ocean sharks and rays are on the verge of extinction. This situation is all the more alarming because of these predators' key role in the balance of marine ecosystems. It is important to take action rapidly and mobilise all global players to strive for the conservation of sharks and all great predators.

## The vulnerability of great predators

### A specific biological cycle

As a general rule, the biological cycles of large predators make them vulnerable to the effects of outside threat, like fishing. In particular, they mature late, have long gestation periods and give birth to a limited number of young at a time. Survival of these species depends on the ability for large adult individuals to live long enough to be able to reproduce several times and ensure renewal of the population.

### The impact of fisheries and increasing "bycatch"

At present, several million sharks are killed every year to supply the market for shark fins and shark flesh, which is also very popular (*cf. Appendix 3*). Formerly treated as simple "bycatch", oceanic sharks are increasingly targeted by new markets for the consumption of shark flesh and the growing demand for their precious fins for famous Asian delicacies, like shark fin soup. At present, Europe supplies one-third of the Asian market in Hong Kong. Indiscriminate techniques are used in deep-sea fishing, like trawling, which captures species that are not targeted, including sharks (up to 40% of the catch).

### Shark finning

When sharks are caught, they are immediately stripped of their fins and thrown back into the sea, sometimes still alive. This practice is known as "finning". Although there are laws banning this in most international waters, lack of supervision and resources to enforce them hinders their effectiveness. Some countries still grant dispensations for their vessels to pursue this illegal practice. A European Action Plan was adopted in April 2009 to control shark fishing and establish sustainable exploitation. French Polynesia decided on a total ban on finning in 2004. Costa Rica forbids the unloading of sharks without their fins. The United States has banned this practice in the Pacific and will soon extend the ban to the Atlantic.

## What can be done?

Governments must invest more in research on great predators to understand the evolution of populations, assess the impact of human activities and global change, define and implement appropriate protection, conservation and management measures (fishing quotas, limiting fishing areas and periods, use of more selective techniques, ban on trade of certain species).

Only international cooperation can achieve concrete results because of the absence of borders in the areas occupied by these great predators, the globalisation of fishing resources on the scale of the Planet and the financial stakes linked to these activities.

The actions that can be developed in the relatively short term with a broad consensus between states could include:

- ✓ Supporting and promoting recommendations for the listing of new endangered species in CITES Appendices.
- ✓ Systematising "sustainable fishing" labels to raise awareness among distributors and consumers, and orient markets through legislation.
- ✓ Promoting an effective system for controlling "shark finning" on an international scale.

## Recent actions

### Great predators listed in CITES Appendices

Regulations exist for international trade in some species of great marine predators. The Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known as CITES or the Washington Convention, is an international agreement between States. Its purpose is to make certain the international trade in specimens of wild plants and animals does not jeopardise the survival of their species.

The species of great marine predators listed in the CITES appendices include **whale shark** *Rhincodon typus*, **great white shark** *Carcharodon carcharias* and **basking shark** *Cetorhinus maximus*, some populations of **saltwater crocodile** *Crocodylus porosus*, **cetaceans**, **polar bear** *Ursus arctos* and **sea turtles**.

Appendices I, II and III of the Convention are lists of species benefiting from different degrees or types of protection in the face of overexploitation. The species in Appendix I are those most endangered of all plant and animal species.

This Convention is regularly updated. On the basis of well-argued scientific studies, some species may be included in the Appendices of the Convention during the Conference of the Parties (CoP) with international delegates from each country meeting every two years.

The case of two shark species, **spiny dogfish** *Squalus acanthias* and **shortfin mako shark** *Lamna nasus*, will be examined at the next Conference in March 2010. On 24 September 2009, the European Commission and member states decided to support Germany's proposal to place both species on the CITES list. Spiny dogfish, caught mainly for its flesh, is exported all over the world to satisfy European demand for fish & chips and smoked fish fillets. Fisheries generally catch pregnant females, which severely jeopardises populations. Shortfin mako shark flesh is popular in Europe and its fins are exported to Asia for shark fin soup.

### Bluefin tuna: the Monegasque initiative

In the summer of 2009, CITES (UN Convention on International Trade in Endangered Species of Wild Fauna and Flora) announced Monaco's decision to have Atlantic bluefin tuna (*Thunnus thynnus*) listed in Appendix I of the Convention on most endangered species the most in need of protection. France and Italy support this proposal<sup>2</sup> which places the European Commission in a good position to have this initiative validated. Some states would prefer a listing in Appendix II to enable some fishermen, especially those using non-destructive methods, to continue fishing.<sup>3</sup>

Although consumers and restaurateurs have recently taken measures to protect the species, especially in France where great Chefs have agreed to stop serving bluefin tuna (unlike Monaco, where it has been banned for two years), political indecision prevailed throughout the month of January, in particular in France where the decision to support the initiative came quite late.

After several months of hesitation, and after Italy expressed its support for Appendix I, on 3 February 2010 France finally joined the European countries in favour of banning international trade in bluefin tuna, recommending that the species be listed in Appendix I of CITES, whose 175 member countries should meet in Doha from 13 to 25 March. France specified certain conditions, requesting an eighteen-month waiting period, until September 2011, before this ban comes into effect. Although it is unanimously recognised that small-scale fishing could be preserved and compensatory measures be set up for industrial fishing, this decision satisfied no one.

---

<sup>2</sup> In certain conditions for France

<sup>3</sup> In France, small-scale tuna fishing (pole-and-line and lining) involves 200 vessels, 700 jobs, 10% of the fishing quota, while tuna seiners represent 28 (subsidised) ships, 300 jobs and 90% of the quota. Illegal fishing, a problem of authority for the ICCAT (International Commission for the Conservation of Atlantic Tunas)...

The Mediterranean tuna fishermen's union declared they were "in a state of shock" while Greenpeace accused France of "keeping up appearances" by claiming to want to save the species, but not immediately. Japan, the largest consumer of bluefin tuna, although it is scheduled to host the International Conference on Biodiversity in October, has done its utmost to keep Atlantic bluefin tuna off Appendix I of CITES. Such a decision, which would mean a moratorium on its trade, is very unpopular in this country and could have serious economic repercussions.

The two European Commissioners in charge of the Environment and Fishing have taken positions favourable to this listing, a proposal to be submitted shortly to member States. Considerable debate is underway in several States.

28 February 2010

## Appendices

### [Appendix 1 - What is a great marine predator?](#)

Great marine predators or super-predators are predators, which, when they reach adulthood, are at the highest level of the pyramid of the marine dietary network. As a general rule, they are mainly prey only to Man, and exceptionally to other super-predators. Such great predators exist among fishes, birds, mammals and reptiles. Among marine animals, they include killer whales and polar bears for mammals; bluefin tuna, great white shark, manta ray, cod, marlin and shortfin mako shark for fish; albatross and sea eagle for birds and the saltwater crocodile for reptiles.

### [Appendix 2 – Examples of the cascade effect](#)

Despite protection measures implemented for several years, the number of otters, especially on the west coast of Alaska, dropped suddenly. This collapse seems to be linked to the change in diet of killer whales that began hunting sea otters, after the two species had shared the same waters peacefully for a long time. In fact, killer whales fed on young whales whose numbers fell suddenly; they then turned to seals, whose population was already endangered because of overexploitation by Man of the fish species that formed their diet... The disappearance of otters has other consequences. Their favourite prey, sea urchins, are proliferating, eating algae and causing an imbalance in populations of herbivores and their predators (cascade effect in the disappearance of many fishes and crustaceans). This implies an economic problem for Man who exploits certain species...

For cod, the collapse in populations along the coast of Nova Scotia (Canada) at the end of the 1980s led, through various direct and indirect effects, to complete upheaval of the marine trophic network, causing massive unemployment among fishermen. At the same time, the disappearance of cod enabled their prey (small pelagic fishes and crustaceans) to thrive, resulting in the reconversion of fishermen - until the next trophic break.

The somewhat different example of starfish, not truly a super-predator in our meaning here, demonstrated that the disappearance of one species could affect biodiversity: researchers removed starfish from certain tidal balancing areas in California. Mussels, their prey, began proliferating and colonising rocks in the area, causing the disappearance of certain species of crustaceans and algae that no longer had enough space or food. The result was a shift from fifteen species in the presence of starfish to a system with eight species, which proves that starfish maintain local biodiversity.

### Appendix 3 - We also eat shark... sometimes unknowingly!

In our northern regions, shark flesh is found in a large number of derivative food products, including pet food. Shortfin mako shark and spiny dogfish are served as “fish & chips”, very popular in the UK.

The name *saumonette*, popular in school cafeterias, covers several shark species: spiny dogfish *Squalus acanthias*, gulper shark *Centrophorus granulosus*, kitefin shark *Dalatias licha*, small-spotted catshark *Scyliorhinus canicula* and nursehound *Scyliorhinus stellaris*, etc, all on the endangered list on the verge of extinction or vulnerable by the IUCN (International Union for Conservation of Nature)...