WWF

REPORT

2018

WILDLIFE IN A WARMING WORLD

FOCUS: Mediterranean

WILDLIFE IN A WARMING WORLD

FOCUS: The Mediterranean

The Mediterranean is among the global Priority Places most exposed to climate change; natural variability will almost certainly be challenged, making the Mediterranean a climate impact hot spot. Higher temperatures in the future will put stress upon natural and human systems, especially during the summer months, even if average global temperature rises are kept to 2°C above pre-industrial levels.

The average projected change in precipitation from all models indicates that all seasons will be increasingly dry. The combination of higher temperatures and reduced precipitation means that soil moisture will decrease and drought conditions will be more likely, with increasing risk of forest fires and impacts on ecosystems, agriculture and people. Given that the Mediterranean hosts more than 300 million visitors each year, these conditions will put enormous strain on the resources of this unique region. On the marine side, sea surface temperatures in the future are very likely to exceed those historically experienced.

From our report, it is clear that Mediterranean biodiversity is vulnerable to rising temperatures as a result of climate change: if the increase is limited to 2°C, almost 30% of most species groups are at risk, and more than a third of all plants. If temperatures rise beyond that limit the situation becomes bleaker still: under currently pledged emissions reduction levels more than half of all plant species and a third to a half of other species groups are projected to disappear. At 'business as usual' levels, on average around half of the region’s biodiversity will be lost. Mammals and birds can adapt to some degree if they are able to disperse – but this is a major challenge in a region where habitats have already suffered significant degradation and fragmentation.

A number of key species that are particularly susceptible to the effects of climate change are present in the Mediterranean. This report summarizes some of the expected impacts on these populations under the projected climate scenarios.

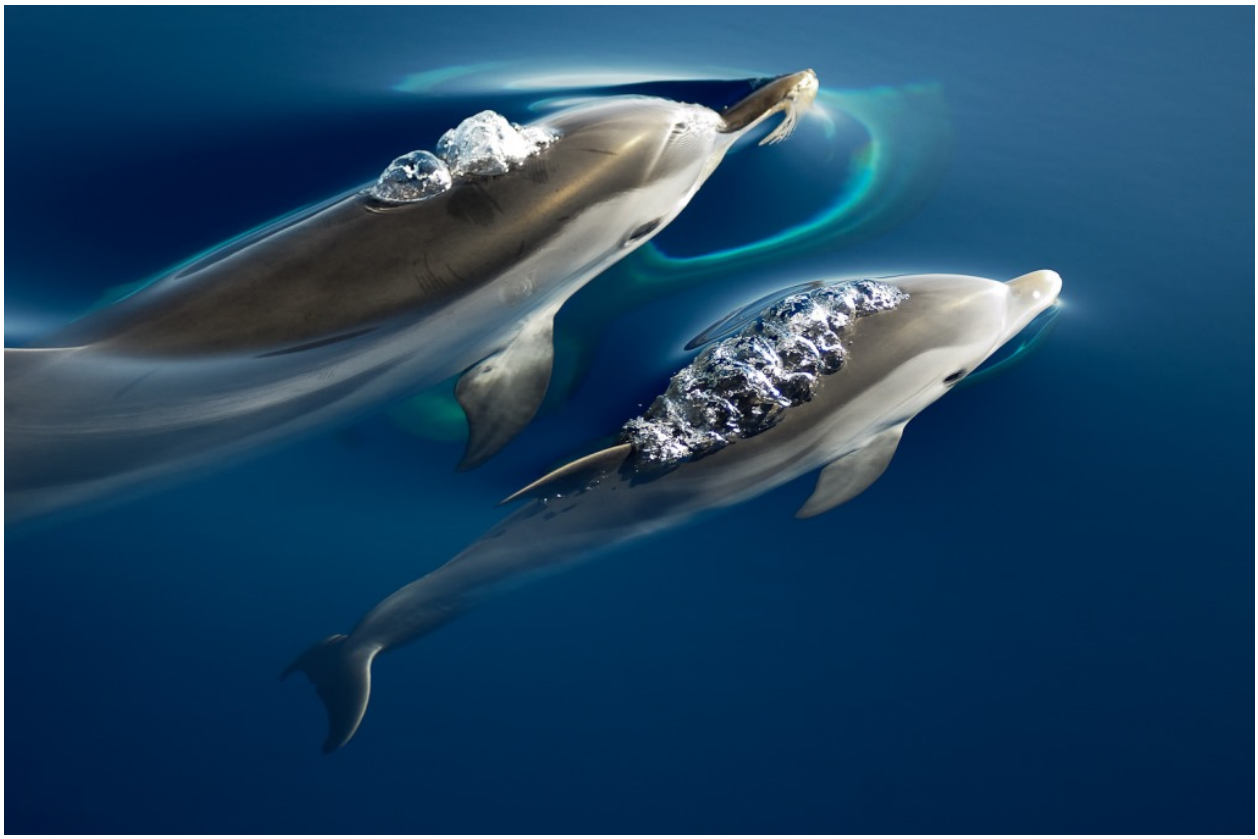
Cover picture: Pilot whales (Globicephala melas). © WWF/Frédéric Bassemayousse

Loggerhead turtle (Caretta caretta). © Michel Gunther / WWF

Marine Turtles

The Mediterranean is important for three species of marine turtle: the leatherback, green and loggerhead. They are seriously threatened by climate change, especially in feeding and breeding grounds. Breeding could be affected in two ways. First, the temperature of the sand where turtles lay their eggs is a factor in the sex of the turtles that hatch. Typically, males come from eggs in the lower, cooler part of the nest: increased temperatures may result only in female hatchlings or, above a certain point, in none surviving at all. While female turtles may change nest depth in response, it isn't known whether this will be enough to compensate for the warming sand. Second, climate change brings rising sea levels, higher tides and more extreme weather events. These can alter or destroy turtle nesting sites, which are already rare and fragile, and could lead to local extinctions where breeding is no longer viable.

Other factors: Sea turtle populations are already impacted by a range of anthropogenic activities, such as fisheries bycatch, coastal development, pollution and habitat degradation.



Striped dolphin (Stenella coeruleoalba).© WWF/Frédéric Bassemayousse

Cetaceans

Cetaceans are water-dwelling mammals that include whales, dolphins and porpoises, occupying diverse habitats from the open seas to coastal waters. In the Mediterranean Sea eight species can be regularly found: fin whale (*Balaenoptera physalus*), sperm whale (*Physeter macrocephalus*), Cuvier's beaked whale (*Ziphius cavirostris*), Risso's dolphin (*Grampus griseus*), short beaked common dolphin (*Delphinus delphis*), striped dolphin (*Stenella coeruleoalba*), bottlenose dolphin (*Tursiops truncatus*) and pilot whale (*Globicephala melas*).

Sea surface temperatures strongly affect many cetaceans, that respond to warming water temperatures by shifting their ranges. The distributions of striped dolphin (*Senella coeruleoalba*), fin whale (*Balaenoptera physalus*) and sperm whale (*Physeter macrocephalus*) are highly associated with sea surface temperatures in the Ligurian Sea. Cetaceans are also strongly influenced by environmental conditions and distribution of their prey. Patterns of seawater temperature and salinity affect the distribution of the Mediterranean fin whale's only prey species, the northern krill (*Meganyctiphanes norvegica*), which is currently situated at the northern limit of its ecological tolerance; krill is likely to be negatively impacted by climate change, reducing in turn the prey availability for the Mediterranean fin whale.

History suggests that marine cetaceans have had the ability to adapt to environmental change, but it is unclear whether they will respond quickly enough to current climate change, for instance by shifting the timing of their arrival at feeding grounds. However, substantial modification would be required to allow the whales to maintain this pace of change.

Other factors: The slow rate of reproduction, low abundance and isolation of populations raise concerns for the maintenance of genetic diversity. Other recognised threats to cetaceans include habitat degradation, and entanglement in fishing gear (as bycatch), ship strikes, pollution (chemical and acoustic), and oil and gas development. Ship strikes injure and kill cetaceans and,

with a rise in marine traffic with ships of increasing size and speed, this threat will only increase. Contaminants such as Polychlorinated biphenyls (PCBs) and organochlorine (OC) pesticides, both now banned or restricted, are known to be toxic to marine mammals, affecting reproduction and the early developmental stages of life, causing tumours and suppressing the immune response. Moreover, noise pollution, such as underwater seismic surveys to locate oil and gas, boat activity and military exercises using underwater sonar, threatens cetaceans that rely on sound to communicate, navigate and forage.

Atlantic bluefin tuna (Thunnus thynnus). © Brian J. Skerry /National geographic stock /WWF

Tuna

Tunas are a group of saltwater finfish represented by 15 species, five of which can be found in the Mediterranean (albacore *Thunnus alalunga*, Atlantic bluefin tuna *Thunnus thynnus*, bullet tuna *Auxis rochei* , little tunny *Euthynnus alletteratus*, Atlantic bonito *Sarda sarda*). They are all commercially fished. Tuna are likely to be strongly affected by changing temperatures within their environment. Water temperature changes have physiological consequences on tuna, impacting cardiac function, spawning activity, egg hatching and larval growth, and swimming abilities. Skipjack tuna (*Katshwonus pelamis*) are predicted to respond to future warming by expanding adult and larval habitat, whereas Atlantic bluefin tuna will be more likely to exploit their highly developed migratory abilities to adapt to climate change, although the extent of the habitat suitable to them is predicted to decrease.

Other factors: Tuna are commercially important, thus catch limits and management measures of the stocks are essential to avoid the depletion of populations, especially for the most valuable species.

Blue shark (Prionace glauca). © naturepl.com/ Franco Banfi/ WWF

Sharks and Rays

Sharks and rays are cartilaginous fish with more than 70 species in the Mediterranean, more than 50% of which are considered threatened by IUCN.

Sharks are considered vulnerable to climate impacts, since fluctuations in climate can disrupt community structure by affecting growth, reproduction and survival, causing changes in abundance, shifts in distributions and local extinctions. Such sensitivity is favoured by many species that show large size and low fecundity, and the production of few, relatively large and developed young. These extreme life histories result in very low population growth rates for some species, rendering them intrinsically sensitive to any form of disturbance.

Climate change will not only affect sharks and rays physiologically, but is also likely to affect prey and habitat distributions with further consequences on their vulnerability.

For instance, two pelagic shark species (blue shark *Prionace glauca* and mako shark *Isurus oxyrinchus*) are likely to be affected by changes in temperature gradients that mediate habitat shifts and prey availability, in turn influencing the sharks' distributions. Several highly migratory species of pelagic shark migrate to exploit seasonal variations in productivity and 'hot spots', but climate change could significantly alter the timing and magnitude of these seasonal patterns. Shark and ray species distributed across a range of temperatures could be less vulnerable than those restricted to a narrow temperature ranges.

Other factors: Sharks and rays are threatened by over-harvesting, habitat degradation and pollution. In particular, shark and ray catches provide the growing global market for their meat, fins, cartilage, skin, oil, teeth, and jaws, thus over-harvesting and illegal, unreported and unregulated fishing are of particular concern.

© Lastampa.it /creative commons

Sturgeons

Sturgeon (*Acipenseriformes*) populations have experienced global declines over the past century, with local extinctions occurring in some species. All sturgeons spawn in rivers of the northern hemisphere. According to IUCN, sturgeons are more critically endangered, than any other group of species.

Sturgeons can be potamodromous, anadromous, or display more complex migration patterns, depending on species and populations. Many sturgeons spawn in freshwater and migrate long distances between different life-cycle habitats for feeding, growing, spawning and overwintering. Sturgeon are sensitive to changes in environmental salinity and temperature, which influence their physiological functioning. The range limits of the endangered European sturgeon (*Acipenser sturio*) have been strongly influenced by climate change that reduced suitable habitat space. Adriatic sturgeon (*Acipenser naccarii*) have been shown to become acclimatised to changes in salinity, but given that the range of temperatures and salinities are likely to expand under climate change, this could challenge the overall fitness of populations. As temperatures in rivers rise and the frequency of extreme temperature events increase, the risk of further population losses is heightened. Sturgeon prey type and abundance are also likely to be affected by future climate change.

Other factors: Overexploitation of sturgeon stemming from illegal, unreported and unregulated fishing and improper fishing and fishery management (since sturgeon meat and especially their caviar are very valuable products), along with habitat loss and water pollution, have severely depleted sturgeon populations globally. Population declines have also been linked to the building of dams, which has resulted in the modification of habitat and further blocked migration.

© Lastampa.it /creative commons

Sea Cucumbers

Sea cucumbers (*Holothuroidea sp*.) are a group of echinoderms that are distributed across the world's oceans, including the Mediterranean.

Increasing sea temperatures, ocean acidification and rise in frequency of extreme temperature events may decrease their survival by modifying their developmental rates, influencing timing of gonad development, spawning and food availability. Low salinity caused by rainstorms has been observed to cause mass mortality events among aestivating sea cucumbers.

Other factors: Sea cucumbers are commonly believed to have aphrodisiac and curative properties in some cultures. Such beliefs could foster their Illegal fishing or overexploitation, which can lead to localised depletions.

© Michel Gunther/WWF

Tortoises and Freshwater Turtles

Around 50% of tortoises and freshwater turtles are listed as threatened on the IUCN Red List, with habitat loss and overexploitation cited as major factors in these declines.

Changes in environmental conditions, particularly temperature range, will impact the extent and distribution of many turtles and tortoises as well as potentially causing localised decreases in abundance and species richness.

Increasing drought frequency as a result of future climate change is expected to present the greatest challenge for tortoises, negatively impacting their metabolic and reproductive rates.

A study that investigated the effects of climate change on the population dynamics of the long-lived Mediterranean Hermann's tortoise (*Testudo hermanni*) showed that rainfall in the winter is a major driver of juvenile survival, thus a shift to a more arid climate would negatively affect population persistence, enhancing juvenile mortality and decreasing recruitment. Hermann's tortoise has low dispersal capacity, which hinders its capacity to disperse to newly suitable habitat space. Hermann's tortoise, like other tortoise and turtle species, is sensitive to low levels of recruitment, which could reduce these species' ability to adapt to changes in the environment.

Turtles and tortoises have temperature-dependent sex determination, i.e. the temperature under which the eggs are incubated determines the gender of the hatchlings, thus climate change may skew the offspring sex ratio as incubation temperatures increase, although females have an innate maternal ability to align their nest site with environmental conditions, which influences survival and quality of their offspring.

Moreover, species with long generation times such as tortoise are less able to quickly evolve genetically and low genetic diversity may be affecting some tortoise species.

Other factors: Decreased water quality as a result of habitat degradation and pollution is another major threat to turtles. Overexploitation of tortoises for pet trade can result in population decline, whereas the introduction of alien species has also depleted native or endemic lake species, with some turtles on the brink of extinction due to these invasive species.ost of native or endemic lake species, with some turtles on the brink of extinction due to these invasive species.

WWF MEDITERRANEAN MARINE INITIATIVE

Prepared by WWF Mediterranean Marine Initiative

Front cover: © WWF/Frédéric Bassemayousse

The designation of geographical entities in this report, and the presentation of the material, do not imply the expression of any opinion whatsoever on the part of WWF concerning the legal status of any country, territory, or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Published in 2018 by WWF-World Wide Fund for Nature (Formerly World Wildlife Fund), Rome, Italy.

wwf.panda.org
mediterranean.panda.org
ocean.panda.org

WWF

Why we are here

To stop the degration of the planet's natural environment and to build a future in which humans live in harmony with nature.

mediterranean.panda.org