Dear students,

In this unit, you will be looking at the current loss of biodiversity, its causes and its impacts. The **introductory text** as well as the first video should give you an overview.

The project "The Blue Planet" deals with the threats that many organisms on this planet are exposed to.

Environmental organizations such as the WWF say that the greatest extinction of species since the end of the dinosaur age is imminent and that one million species could become extinct in the next few decades. Already now 150 species per day disappear forever from our planet (FAZ 2020).

It is intended to provide exemplary insight into the special situation of creatures at sea and on land whose existence is acutely threatened or endangered. In the project, the causes of the precarious situation will be analyzed in detail and globally. In the further course, you will also deal with the broader consequences of the extinction scenario, and possible solution strategies and options for action will be identified.

What is the current situation?

The threat to species is by no means limited to polar bears or seals, whose habitat is shrinking due to the melting of the Arctic ice, or the Big Five in Africa (elephant, rhinoceros buffalo, lion, leopard), but also affects many species close to us, which often go unnoticed by us.

According to the report of the European Parliament (IUCN 2021), in 2015 and 2019 respectively, living organisms in freshwater were particularly endangered in Europe. The species of mussels and snails are affected by 59%, freshwater fish by 43%, amphibians by 23% and reptiles by 20%. According to Zeit Online (2020) or the Red List, the situation of many mammals in Germany has deteriorated in the last 15 years, one third of the mammal species are endangered in their population. This concerns, among others, brown hares, polecats, field hamsters, garden dormice, Bechstein's bats and harbor porpoises. A negative trend was found for half of the species studied.

Plant species are also threatened with extinction. For example, 58% of the endemic (native) tree species in Europe are endangered. One of the best-known examples of this is probably the spruce.

Recently, insect mortality has become more prominent in public awareness. According to Baranov et al. (2020: 1), the insect population in Germany has declined by up to 80% in recent decades. Certainly, it is pleasant not to be plagued by mosquitoes in summer anymore or less, but behind this lies a major ecological problem.

On the one hand, insects represent important links in the food chain, both as eggs, in the larval stage (e.g. mosquitoes), as food for freshwater organisms (fish), but also for amphibians and reptiles or birds and bats in all stages of development.

Perhaps you have noticed that there are fewer and fewer swifts in our country in the summer, because they feed exclusively on flying insects.

Insects are essential for most plants, except for wind-pollinated species. Without insects, there is little or no pollination and thus reduced fruiting.

According to the above-mentioned report by the European Parliament, one of 10 European bee and butterfly species is threatened with extinction (Heinrich Böll Foundation 2020), and half of the 561 wild bee species are declining in population. Serious effects on agriculture and thus on human nutrition are to be expected (Tagesschau24 2020). A harvest decline of up to 90% for various types of fruit and vegetables is feared.

Author: Brigitte Suchanek, 2021

The situation in the world's oceans is also threatening. According to Nunez (2019), marine animal populations are dwindling faster than animals on land because most animals under the sea are cold-blooded and not very temperature-tolerant, and therefore have difficulty adapting to higher water temperatures. In addition, the acidification of the world's oceans due to the increasing CO2 input has a negative effect on many animals and plants. The death of warm water corals is certainly well known. But all species of sea turtles are also threatened in their populations, as are numerous fish species such as sharks.

Although as early as 2010, the United Nations called for a return to healthier and more diverse flora and fauna in 2020, and this was reinforced in the 2030 Agenda in the Sustainable Development Goals (SDGs 14 and 15), the 2020 UN report concludes that all 20 species conservation goals have been missed (Convention on Biological Diversity 2020; Niranjan 2020).

What are the causes of this threatening situation? (T3)

1. Climate change

Global warming, which scientists have been warning about for decades, has developed a new dynamic in recent years. For living organisms, it means increased adaptation stress, especially to heat and drought.

Organisms that are bounded to their location, such as trees, are particularly affected here, as they often receive too little water in their locations and dry out (e.g. spruce forests).

Due to climate change, the climate zones in the northern hemisphere are shifting more and more to the north, which in part leads to the migration of previously native species, as their tolerance range has shifted, resulting in ecological niches for previously alien species.

In our latitudes, global warming is causing the seasons to shift. Spring starts earlier and winter starts later.

Although individual species benefit from this, for example by being able to breed twice, others have major problems as a result. This affects migratory birds in particular, which cannot adapt quickly enough in their migratory behavior to the strong early spring. For example, it can be difficult for individual species to feed their young birds because the caterpillars that serve as food have already pupated.

In the marine habitat, ocean warming is leading to the death of temperature-sensitive corals and thus to the destruction of species-rich habitats on coral reefs.

Thus, it is clear that climate change is an important factor in species decline.

In 2015, the countries that took part in the Paris climate conference committed themselves to taking measures to limit global warming to 1.5°C if possible, although this will be extremely difficult.

2. Displacement of native species

Climate change also favors the increase of alien species, so-called neobiota, so that problems can arise for native species as a result. One speaks then of **invasive species**. Well-known examples are the raccoon, which was released at Lake Edersee in the 1930s and has rapidly multiplied and spread, so that there are now about 500,000 raccoons in Germany, the bullfrog, which displaces native frogs, and the American squirrel (gray), which is more competitive than the reddish native squirrel.

Invasive species spread particularly rapidly in waterways due to international shipping, traveling either in ballast water that is drained as needed or attached to the hull of the ship.

“Invaders” of concern to human health are organisms that can transmit disease, such as e.g. the Asian tiger mosquito (potential carrier of Zika) (German Center for Infection Research eVoJ), of which there are now stable populations in the Rhine Graben or allergy-causing plants such. B. Ambrosia. It is also feared that the advance of the Anopheles mosquito to the north (Mückenatlas 2018) could lead to the spread of malaria in (southern) Europe again.

3. Industrial agriculture and soil sealing

A major role is played by (industrial) agriculture and the sealing of soils through the development of traffic routes, residential areas and industrial estates. (Umweltbundesamt 2022).

4. Destruction of habitats

This can be seen most dramatically in the destruction of the tropical rainforest, the most biodiverse habitat, especially in the Amazon, but also in Central Africa and Southeast Asia. For more information, click here: (Wieland 2021).

5. Hunting

Big game was often hunted to adorn themselves with a trophy. Nowadays, the commercial exploitation of individual body parts plays a greater role (elephant tusks as ivory, rhino horn in traditional Chinese medicine, etc.).

Industrial fishing is leading to massive overfishing in many seas and thus to the endangerment of numerous species. The cause is also the change in consumer behavior. Fish is increasingly valued as a "healthy", high-protein and low-fat food. In addition, region-specific preferences (e.g. shark fin soup) are leading to massive endangerment of individual species.

But tourists also contribute to the endangerment of species, for example by buying turtle shells as souvenirs. (Wieland 2021; BMU 2020)

6. Environmental pollution

A detailed account of the influence of environmental pollution - in this case on living organisms in water can be found here (Oehlmann 2020).

Currently, mainly insecticides and pesticides are the problem for many species. The best known is probably the agent glyphosate, also known as "Round Up" because of its pervasive effect on all wild weeds, so-called "weeds" (BUND o.J.; Umweltbundesamt 2021; Wieland 2021).

7. Light pollution

Due to the increasing illumination of the night sky, the population of insects is massively threatened. This has far-reaching consequences for the pollination performance of insects and thus also for human nutrition (NABU Stuttgart o.J.).

Presumably, the orientation of migratory birds is also affected (LBV o.J.).

Author: Brigitte Suchanek, 2021

But in this project you will also learn ways and possibilities how to protect species and their habitat and what you can do against climate change.

Here, the problems and areas of work that you will be dealing with could only be touched upon. You will have diverse and multilingual material at your disposal.

Look forward to exciting research!

Author: Brigitte Suchanek, 2021

Dear students,

the project "The Blue Planet" deals with the **threats**, to which many **organisms** on this **planet** are exposed.

What is the current situation?

The **threat from species** by no means only affects polar bears or seals, whose habitat is shrinking more and more due to the melting of the Arctic ice, or the Big Five in Africa (elephant, rhinoceros, buffalo, lion and leopard), but also many species in our vicinity, often unnoticed by us .

According to the report of the European Parliament (IUCN 2021), in 2015 and 2019 respectively, living beings in freshwater **were particularly endangered in Europe**, 59% of mussel and snail species and 40% that of freshwater fish, but also 23% of amphibian species or 20% of reptile species. In addition, **one third** of the mammal species are endangered in their population , e.g. the brown hare or the field hamster.

The situation in the **oceans** is also **threatening**. All species of sea turtles are threatened in their populations and numerous fish species such as sharks as well.

Plants are also threatened with extinction, such as 58% of the tree species native to Europe, the best-known example probably being the spruce.

Recently, insect mortality has become more prominent in the public consciousness. Here the situation is particularly dramatic, the amount of insects has decreased by up to 80% in the last decades.

This in turn is a major problem, as many animals feed on insects, whether in the water from the eggs or larvae such as many fish or bats and birds, so their numbers are also declining sharply.

But we humans also depend on the "services" of insects. We would be able to harvest much less fruit and vegetables if bees, wasps, butterflies, etc. could no longer adequately pollinate the flowers.

Additional difficulties are often caused by newly introduced species such as the raccoon or aquatic animals such as the red swamp crayfish, which is increasingly making life difficult for native crayfish. In addition, diseases can be transmitted in this way that previously did not occur at all or hardly at all in our country, such as tick-borne meningitis (TBE).

The invasion of alien species is favored by global warming. As a result of climate change, the climate zones in the northern hemisphere are shifting more and more to the north, which in some cases leads to the migration of previously native species, creating ecological niches for previously alien species.

In our latitudes, global warming is leading to a shift in the seasons, with spring starting earlier and winter later. This causes problems for migratory birds in particular, such as the cuckoo, if their host birds have already bred earlier.

It is thus clear that climate change is an important factor in the decline of species - but it is by no means the only one, for example (industrial) agriculture plays a major role. It is therefore important to limit global warming as quickly as possible.

You will have the opportunity to engage with many of these topics in a variety of ways.

There are texts, pictures, videos and graphics. We wish you a lot of fun and exciting research.

Author: Brigitte Suchanek, 2021

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