



Why is (bio)diversity so important?

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The concept of biodiversity was highlighted at the Rio Conference in 1992 and is defined as the biological diversity of all living organisms on Earth and at all levels, from genes to ecosystems. Biodiversity can be observed/studied at three levels: ecological diversity (ecosystems), specific diversity (species) and genetic diversity (genes).

Biodiversity is the basis for the functioning of all ecosystems on Earth. These ecosystems provide a large number of services such as climate regulation, cleaning of drinking water, air purification, pollination of crops, soil fertilisation and providing of medicines (Brondizio, E.S. et al., 2019). High biodiversity keeps ecosystems healthy and helps humans stay healthy as well (One Health concept). Biodiversity is also an essential part of the solution to climate change and is therefore good for the economy: at least 40 percent of the world's economy is derived from biological resources.

When we impact biodiversity through all sorts of human actions, we ultimately damage ecosystems, and therefore all ecosystem services. Damaged ecosystems are more fragile and they have limited capacity to cope with extreme events. We need to maintain well-balanced and healthy ecosystems, which protect us against unforeseen disasters, the emergence of new diseases and often offer us solutions to the most urgent and complex challenges.

It's all about balance! All living organisms are interdependent on each other for their survival. In other words, every species on Earth contributes in some way to the functioning of the overall ecosystem. If one species disappears, this role is no longer assured and the overall functioning of the ecosystem is disrupted, sometimes with dramatic repercussions. There are many examples of loss of diversity. Take the case of insects, which are the most diverse group of organisms, with several million species. Everyone complains about the nasty mosquitoes that carry pathogens, or the voracious caterpillars that ravage maize crops, etc., but actually only 1% of insects are crop pests, whereas insects provide many services, such as pollinating crops, recycling organic matter, controlling other pests and balancing food chains. Estimates of the loss of insect species range from 50% to 75%, which is considerable (Jactel H. et al., 2020). The main causes of the extinction of these insect species are the destruction of their habitat, the massive use of pesticides (insecticides), climate change and invasive species. For example, the disappearance of some insect species can have a very significant impact on pollination and plant growth and therefore on crop yields. In addition, the disappearance of insect species leads to a decline in their predators: many bird and bat species are affected, just as fish species are affected by the disappearance of aquatic insects. Conversely, if certain species of dragonflies (which feed on aquatic mosquito larvae) disappear because of poor water quality (pollution), then mosquito populations will flourish!



Let's dive into the sea... the ocean is responsible for 50% of primary production on Earth, sustaining our food system. However, rising nutrient loads coupled with climate change, each resulting from human activities, are increasing oxygen consumption by changing ocean biogeochemistry (Breitbart D. et al., 2018; Gattuso J.P. et al, 2021). Deoxygenation of coastal sites will affect biodiversity and food webs and may result in ecosystem collapses, which ultimately will affect food security and livelihoods of the people who depend on it.

The diversity of organisms in seawater is huge and we are only starting to understand the biotic interactions among grazers, primary producers, viruses, and symbionts (mainly parasitic). In every millilitre of seawater, there are 10 to 100 billion microorganisms and viruses. While the major role of these organisms in biogeochemical processes is well known, the interactions between species and the role of viruses are less documented and remain to be discovered. As part of the Tara Oceans project, the associations and interactions among planktonic organisms was studied and provided a resource to support further research on ocean food webs (Lima-Mendez G et al., 2015). The role of viruses and parasites is often beneficial to the ecosystem. For example, unicellular parasites can multiply rapidly to control blooms of toxic dinoflagellates that are a threat to marine ecosystems, and thus help maintain a healthy ecosystem (Chambouvet A. et al., 2008). The functioning of oceanic microbial communities is comparable to that of microbial communities in the human digestive system. Thus, these examples illustrate perfectly that each species is important to preserve. We should not only focus on emblematic or patrimonial species (e.g. whales), but every link in the chain counts (preserving krill, the plankton that whales feed on).

Similarly, actions to conserve *Posidonia oceanica*, a marine plant endemic to the Mediterranean sea, are useful if they do not damage adjacent habitats: the development of anchoring systems outside the sea grass beds, which act as a nursery for many animal species, is of great interest, but these anchoring systems have also to be installed outside the adjacent soft-sediment habitats, which are certainly less emblematic, but whose ecological role is just as crucial! The sand habitats serve as a refuge for a rich and exceptional fauna. These soft-sediment ecosystems are indispensable because the organisms that they host are themselves linked to the trophic chain of larger predators (fishes and marine vertebrates).

And because we are inclined to better protect what we know well, the first action must be education, if possible from a young age. We must explain the importance of maintaining the diversity of organisms and promote the conservation of all species, from the seahorse to the jellyfish!

Finally, the importance of diversity must also be found at the level of institutions and organisations: promoting diversity in terms of gender, culture and origin is a way of resolving the main challenges and therefore of moving the collective forward!

A bit like the moral of La Fontaine's fable "The Lion and the Rat", which says that you always need someone smaller (or different) than you. 😊

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