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# Biodiversity, Climate and Society: Where are We Going and How Fast?

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## Opinion

When talking about environment, about ecology, we mainly talk about changes: climate change, collapse of biodiversity-according to Pierre Henry Gouyon-, worsening of land degradation and desertification<sup>2</sup>... But there have always been changes. It is true, we are not going to dispute this fact: Concerning the climate, there have been successions of periods of glaciation and warming (medieval climatic optimum from the 10<sup>th</sup> century until the 14<sup>th</sup>). Concerning biodiversity we talk about the 6<sup>th</sup> great extinction period, which means that there were 5 before. Some people conclude that our planet is constantly evolving and that these current (dynamic) evolutions are in no way linked to anthropic activities or only to a small extent. According to them, humans, like the rest of the living world, must simply adapt to these changes, as they have always done for billions of years, with varying degrees of success: some species disappearing (the dinosaurs, the dodo<sup>3</sup>...), others mutating, others having adaptive capacities thanks to a natural selection based on a possible "genetic progress" due to the maintenance of a great genetic diversity. Other species

can finally appear due to new pedoclimatic conditions (the australopithecines appeared 4 million years ago, the current human -homo sapiens-sapiens-appeared only 200. 000 years ago). But what is change after all? It is both a question of speed and amplitude of change, whether it is climate change, the collapse of biodiversity, etc. But what is the capacity of ecosystems, particularly those that are now entropized, to adapt to these changes?

- a. is it to try to mitigate the effects at the global and local levels?
- b. and on the other hand, is it to adapt 'locally' to the local effects of global change?

However, the capacity for local adaptation depends precisely on the speed and amplitude of change. No one is equal in the face of change, in the short term some may win, and others lose, but what will happen in the long term? To summarize, is the speed and magnitude of global change and its local effects compatible with the speed and magnitude of local adaptive capacity and their future global consequences? This is the real question, because we are no longer dealing with probabilities and uncertainties; we are entering the era of ambiguity management. This question, which could not be more complex, needs to be refined because when talking about the trophic chain: Westerners put large predators, including humans, at

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<sup>2</sup>Thus, as Pierre Henry Gouyon (2018) says: "This system dynamic has entered what is called a collapse dynamic. For the moment, it is more a demographic collapse than a collapse in terms of the number of species. In other words, when we say "70% of insects have disappeared in Europe over the last ten decades, in reality it's 70% of the biomass, not the species". But if this continues, indeed species will collapse." Oral contribution of Pierre Henry Gouyon to a working group on biodiversity and firms in the NGO OREE. Paris, France.

<sup>3</sup>At this stage of the presentation, is the dodo a good example? Well, no, because if the dodo has disappeared it is because of overexploitation by humans and not in a "natural" way. This point is worth pondering.

the top of the trophic chain-I eat and I am eaten- the production of energy is the result of this sequence; concerning indigenous populations (Amerindians, etc.) large predators are at the bottom

of the trophic chain because if they are present, it means that the rest of the trophic chain is in good condition (Figure 1).



**Figure 1:** Trophic chain.

Furthermore, the living world cannot be reduced to eating and being eaten. There are interactions between the different elements of life that are necessary for the production of energy but also for the proper functioning of nature. Thus, let us not underestimate scenes of “mutualism” that illustrate the importance of cooperation and interdependence between the various elements of an ecosystem. Each organism lives better with than without the others. For example, shrimps (the cleaner wrasse -Labroids dimidiates-) are de-worming a giant moray eel (*Gymnothorax javanicus*). Note that the moray eel refrains from devouring its commensals (Figure 2). Another example of mutualism by Damien Derelle [1], he said in 2012: “by improving the mineral and water nutrition of plants,

mycorrhizal fungi improve the growth and development of plant species. This improvement is achieved through optimal colonization of the roots by the fungus, which develops a large exchange surface (increase in the proportion of arbuscular) in the roots. A plant is likely to have an impact on the fungi through the litter deposited on the soil or through the root exudates excreted into the soil [2]. This results in a better development of mycorrhizal fungi in the soil, allowing them to exploit a larger volume than the roots alone would do, as well as an increased root colonization. This results in action-feedback loops between the fungus and the plant with reciprocal effects<sup>4</sup>.”



**Figure 2:** *Gymnothorax javanicus*.

<sup>4</sup><https://www.jardinsdefrance.org/effets-des-associations-de-plantes-sur-la-symbiose-mycorhizienne-et-reponse-specifique-des-plantes-a-la-mycorhization/>

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