Clear Language for Ecosystem Management in the Anthropocene: A Reply to Bridgewater and Hemming

In a comment on our recent article (Heger et al. 2019), Bridgewater and Hemming (2020) call for putting the umbrella concept "ecological novelty" into a policy context. They suggest linking ecological novelty to the "nature-based solution" paradigm and comment that "Global policy discussions around the 'New Deal for nature' seem to only embrace traditional conservation paradigms, leaving ecological novelty in a policy vacuum" (Bridgewater and Hemming 2020). We agree with Bridgewater and Hemming (2020) that political frameworks need new ways of expressing at which forms of "nature" conservation actions should aim, and we also share their opinion that the umbrella concept of "ecological novelty" can be helpful here. For instance, in the recently published *Zero Draft for a Post-2020 Global Biodiversity Framework* (CBD 2020), "recovery of natural ecosystems" is formulated as one of the main aims for the Convention on Biological Diversity member states for the following 20 years; however, what the term "natural ecosystems" means in the Anthropocene remains an open question.

As we detail in Heger and colleagues (2019), "ecological novelty" can be used to describe and quantify the degree to which an environment differs from reference conditions. We believe that a scientific assessment of the ecological novelty of current as well as of projected future states and functions of study systems can provide a solid basis for management decisions in the Anthropocene. There is an array of options for how to implement nature-based solutions, and it is essential to make informed decisions matching local contexts. For example, reforestation has been suggested as a powerful means to sequester carbon dioxide (CO_2). Depending on how this measure is implemented, the outcome may be a highly novel system optimized for fast growth and high sequestration rates (thus increasing these ecosystem services), but using trees that have not been present in the area before with the potential to negatively affect native biodiversity; or a slow-growing forest that is similar to a historic reference—lending additional benefit for biodiversity conservation, but possibly being less efficient concerning fast sequestration of CO_2.

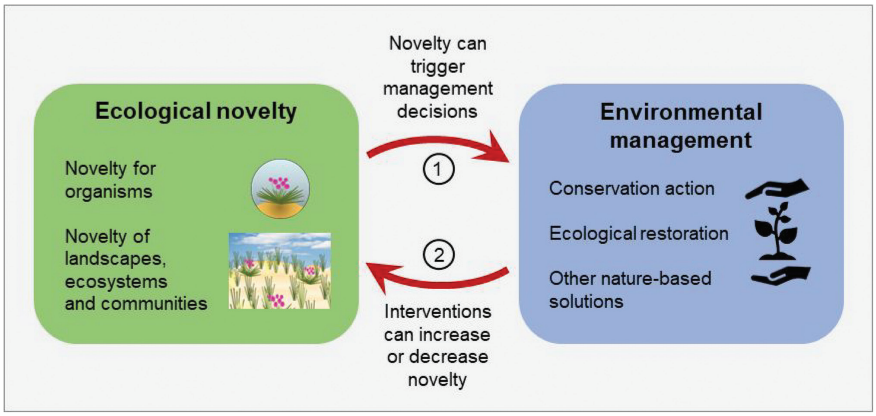

Figure 1. The umbrella concept "ecological novelty" allows the description of current states of ecosystems, as well as projected outcomes of management measures and other human interventions. The concept could therefore be used to clarify what is meant by "nature," and which state of nature is tolerated or aimed for with policy regulations and management measures.

The "ecological novelty" framework can help to enhance clear communication and allow for openly discussing pros and cons of such measures. Different aspects of novelty that already occupy major sectors of environmental policy, such as biological invasions, genetically modified organisms or habitat degradation, can be brought together under one umbrella concept to provide an integrated analysis of ecosystems. Based on an assessment of ecological novelty of the study system compared to reference conditions, it can be discussed whether management measures should be taken (arrow 1 in figure 1), for example in order to reduce novelty, and planned interventions can be evaluated in the light of their projected outcomes (arrow 2 in figure 1).

Future research should aim at developing methods for quantifying the novelty of a system and for predicting the consequences of novelty for ecosystem functioning, evolution, and biodiversity conservation. These scientific descriptions and assessments can then form the basis for a productive search for local consensus on whether or not ecological novelty can be tolerated, prior to action as well as in outcomes of interventions.

Implementing the concept of ecological novelty in environmental policy could therefore allow for more explicit discussions about the aims of nature conservation in the Anthropocene. Using a common concept and speaking the same language will be useful in such discussions, particularly because opinions usually are highly context dependent. For example, the course of discussions about management aims will be different if the focal system is a city (e.g., Planchuelo et al. 2019) versus a nature reserve.

Since the Rio Declaration (UNCED 1992), international environmental policy does no longer aim for conservation of pristine nature only. This is reasonable, as in the face of the ongoing biodiversity crisis there is an urgent need to discuss and implement nature conservation actions as broadly and diversely as possible. We hope the concept of ecological novelty can enhance such discussions and help reach local consensus on conservation actions.

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