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What is biodiversity, how can it be quantified and prioritised and what does that mean for Austrian national parks?

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Summary

The term 'biodiversity' has become ubiquitous in conservation science – finding a project report or proposal within the field not using it will be next to impossible. However, like many terms in conservation ecology, 'biodiversity' has developed into an all-encompassing buzzword. Without a universally agreed definition and delineation, quantification, comparison and prioritisation of biodiversity interventions is difficult or impossible.

For quantitative assessments, biodiversity is sometimes reduced to species numbers, sometimes circumscribed with various biodiversity indicators, i.e. environmental variables that are more or less related to some biodiversity aspects. Neither way has led to a unified quantity that can be used to compare and to rank interventions.
Important components of such an operationalisation of biodiversity are Red Lists of Threatened Species. Red Lists are indispensable in identifying biodiversity elements with a high risk of being lost and thus are essential building blocks in the quantification of biodiversity changes and biodiversity prioritisation.

Based on a method originally developed by Bieringer and Wanninger for the province of Lower Austria, we illustrate with an example from Kalkalpen National Park how species of national importance can be identified and conservation priorities can be derived (ZULKA et al. 2017). The method uses Red List categories (quantified as extinction probabilities per unit time) and regional responsibility (quantified as percentage of species range in the target area) and combines them into a conservation priority score. Species or habitat types can then be ranked according to these scores.

Among Austrian endemic animal species living in National Park Kalkalpen, we obtained highest conservation priority scores for the groundwater snail *Bythiospeum nocki*, the cave beetle *Arctaphaenops muellneri*, the leaf beetle *Oreina plagiata commutata*, die ground beetles *Leistus austriacus* and *Pterostichus lineatopunctatus* and the caddisfly *Rhyacophila producta*.

However, the method is not restricted to assess conservation priorities. Using the responsibility score, we found that an enlargement of National Park Kalkalpen by integrating Haller Mauern, Warscheneck and Totes Gebirge would triple its average responsibility for Austrian endemic species (4.0%). In this respect, an enlarged National Park Kalkalpen would even overtake National Park Gesäuse (2.3%), one of the endemic species hot spots in Austria.

In a similar attempt to make biodiversity impacts accessible to life cycle assessment (LCA) of products and processes, the potential effect of any intervention impinging on biodiversity can be quantified. Basically, three components need to be assessed:
1. the probability that a population is affected by the intervention,
2. the gravity of the effect, judged by the Red List category of the species and
3. the direction and impact on a single population.

Summed across all species in the intervention region, a characterization factor (CF) for the intervention can be obtained.

This quantification method can be adjusted to account for other practical problems, e. g. in environmental impact assessment or monitoring. In particular, it can be applied for conservation problems in Austrian national parks. We provide an example of biodiversity quantification for assessing the success of habitat restoration measures in the National Park Gesäuse (ZULKA 2013).

Quantification of biodiversity has been sometimes met with scepticism owing to its tendencies towards reductionism and over-reliance on simple numbers for complex problems. We discuss data requirements, the chances and opportunities, but also the risks and pitfalls of such quantification approaches.

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