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Biology, Uses and Conservation

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Description

The conservation issues of Hungary well exemplify the problems of other post-socialist countries in CEE. Contrary to previous prioritisation studies, we did not simply ask experts to provide their opinions on knowledge gaps. Instead, we used possible future statements from the Environmental Foresight – Hungary 2050 report to highlight likely future environmental and conservation problems and ask the experts to define research questions addressing these future statements.

Here we aimed (i) to harmonise research priorities with a previous assessment of environmental horizon scanning produced by experts from a wide range of disciplines, (ii) to identify research topics in the field of conservation biology that are relevant to filling the most important knowledge gaps, (iii) to group the topics into clusters of research areas that can serve as inputs to research funding agencies for developing programs and grant calls to enhance the relevance of research in current and future conservation biology, and (iv) to investigate the political context of conservation issues in implementation. We believe that our prioritisation can help the science–policy discussion, and in the long run will eventually contribute to healthy and well-functioning ecosystems.

Conservation Biology

Conservation biology is designed to identify pressing environmental problems and to solve them. This review evaluates the relative effort of conservation biology in problem-based and solution-based research, and tests whether or not this has changed in the past decades for five major drivers of biodiversity loss, i.e. habitat loss and fragmentation, overexploitation, biological invasion, pollution, and climate change. By randomly sampling papers from four decades of the conservation literature (1980–2019), we estimated the frequency of solution-based research related to the five biodiversity loss drivers. We also estimated how the ratio of the words ‘problem’ and ‘solution’ has changed over time, as a proxy for discourse bias. We found that a quarter of the scientific papers on conservation constitute solution-based research, while three-quarters were classified as problem-based. Temporal analyses showed that the proportion of solution-based papers increased along the four decades, from 0.18 to 0.30, mostly due to research on effects of habitat loss and fragmentation, and overexploitation. The solution-to-problem word ratio increased steadily, from almost zero in the 1980s to 0.60 in 2019. Significant increases occurred for all drivers of biodiversity loss, indicating an important temporal change in conservation discourse and concerns. We propose that, in order to be more effective against the biodiversity crisis, conservation science should expand the solution-based agenda by active changes in graduate education, research choice, research funding priority, editorial emphasis, and media coverage that can produce desired impacts on conservation practice, public perception, and environmental policies.

The conservation biology literature can be clearly classified in one of two main lines of research: problem-based or solution-based studies. Roughly speaking, problem-based studies aim to understand the main anthropogenic drivers associated with biodiversity loss and decline. In contrast, solution-based studies are directly designed to propose, evaluate, and implement solutions to environmental problems. This classification raises an important question: how much of the information provided by conservation science is dedicated to solution- or problem-based research? Also, since conservation biology has become a complex field, studying several biodiversity loss drivers, such as habitat loss and fragmentation, biological invasion, overexploitation, pollution, and climate change, it is necessary to understand how the relative effort in solution problem based research differs among drivers. Furthermore, since the field of conservation biology has matured in the past decades, it is also important to understand how the field is changing through time.

Basis and Accomplishments

Conservation biology has contributed to the understanding of the main problems causing the global biodiversity crisis and has provided tools to solve them. The basis and accomplishments of this broad research area has been repeatedly reviewed. Recently, it has been argued that more drastic transformative changes will be necessary to halt the biodiversity crisis and to

insure human well-being. Although it is now clear that limited progress will be made without deep technological, economic and social changes, the expanding breadth and depth of the crises add extra pressure on conservation biology, making its future priorities to be questioned once more. In fact, there is a growing feeling that conservation biology needs a more positive agenda to improve its influence towards conservation practitioners, decision makers, and the general public. Here, we argue that conservation biology should enhance its solution-based research agenda. Problem-based research is widespread in the conservation biology literature. Problem-based research on habitat loss and fragmentation focuses on characterizing how different features of altered landscapes, such as habitat amount, fragment size and isolation, edge effects, matrix permeability, and landscape-scale processes affect biodiversity. Overexploitation has a long history on solution-based research as hunting and fishing pre-dated the origin of modern humans as resource-based activities, being practiced for subsistence, commerce, leisure, ritual or religion, protection of herds and people, and damage control. Overexploitation leads to a strong research-tradition to guide management worldwide. Multiple techniques and market-based conservation tools were developed to counteract overexploitation.

The main solution themes include the analysis of habitat management, predator control, restocking, and establishment of no-take areas, quotas, protection of vulnerable development stages, and the development of models to estimate stocks in order to regulate harvests, effort and trade.

This includes, for instance, systematic strategies to reduce the dispersal of potentially invasive species by transport, trade, and travel, measures to avoid naturalization once the species are introduced, eradication tools on islands or other well-defined areas, and mitigation of their impact on native populations, communities, and ecosystems. Applied research includes screening of transported materials, quarantine, biological, mechanical or chemical control, and modifications in land use. Solution-based research on biological invasion also investigates the engagement of relevant stakeholders and long-term political commitment.