frontiers | Frontiers in Ecology and Evolution

TYPE Editorial
PUBLISHED 23 August 2022
DOI 10.3389/fevo.2022.1015457

OPEN ACCESS

EDITED AND REVIEWED BY
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SPECIALTY SECTION
This article was submitted to Conservation and Restoration Ecology, a section of the journal Frontiers in Ecology and Evolution

RECEIVED 09 August 2022
ACCEPTED 11 August 2022
PUBLISHED 23 August 2022

CITATION
Gonçalves-Souza T, Alves RRN, Albuquerque UP and Júnior WSF (2022) Editorial: Integrating traditional ecological knowledge into ecology, evolution, and conservation. *Front. Ecol. Evol.* 10:1015457. doi: 10.3389/fevo.2022.1015457

Editorial: Integrating traditional ecological knowledge into ecology, evolution, and conservation

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KEYWORDS

traditional ecological knowledge (TEK), ethnobiology, biodiversity, indigenous communities, conservation biology

Editorial on the Research Topic
Integrating traditional ecological knowledge into ecology, evolution, and conservation

Ecology and evolution are the core disciplines that investigate the processes that generate and maintain biodiversity in space and time. The theoretical and applied studies produced in these two disciplines represent pivotal information to set conservation biology priorities. Because humans represent one of the main factors contributing to land-use changes in world ecosystems, it is essential to include them in theoretical and applied studies. However, most of the current literature in ecology, evolution, and conservation (hereafter called "biodiversity disciplines") uses the variable "human" basically as the negative driver causing biodiversity loss. On the one hand, by including humans as the source of biodiversity loss, this literature provides relevant information to be broadly used in biodiversity management and conservation. On the other hand, disregarding that local populations depend on biodiversity for a living could hamper our ability to produce socially inclusive theories. In fact, recently the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services has argued that the traditional ecological knowledge is a missing component in applied sciences and in the decision-making process (see also IPBES, 2018; Jack et al., 2020; Albuquerque et al., 2021). This has raised two pertinent issues for promoting a program that incorporates local knowledge into biodiversity disciplines: (1) How can the fields of ethnobiology and biodiversity be integrated to better understand how landscapes, animals, and

plants have been used and domesticated? (2) How can policies and conservation efforts be influenced by the ethnobiological evidence to help maintain biodiversity? In this Research Topic, several researchers looked into various facets of ethnobiology that might open up novel directions for explicitly merging biodiversity disciplines and traditional ecological knowledge. It contains 12 papers that address these issues in a variety of social-ecological systems.

One set of papers examined the patterns and processes involved in the use and domestication of landscapes, animals, and plants. Understanding how local populations' management and selection of resources can result in domestication is a long-standing concern of ethnobiology. In effect, for the conservation and sustainable use of biodiversity, it is essential to comprehend the multidimensional framework within which interactions between people and biodiversity have evolved. Tobes et al. investigate the ichthyological knowledge (with focus in ethnotaxonomy) of indigenous Kichwa people from the Ecuadorian Amazon showing that Kichwa classification is multidimensional and considers attributes like skin and scales, fishbones and spines, meat quality, body shape, diet, and salience. Ethnotaxonomic knowledge can provide important information about the stocks of economically and culturally important species, and makes it possible to elaborate workable monitoring plans involving fishing communities. The extent of human activities spans different spatial and temporal scales. The research by Ferreira et al. compiles information from a systematic review of small-scale populations' management practices in South American savannas. This is one of the first studies focused on the important dry forest formations of South America. The authors find evidence of different methods of biodiversity management, such as building niches that may result in the domestication of landscapes. The study of Ojeda-Linares et al. was performed in Mesoamerica, which is especially fruitful in studies focused on local ecological knowledge about plants to meet nutritional needs. What most calls attention in this paper is the union of this approach and genomic techniques to understand these processes in fermented beverages traditionally prepared in Mexico. The authors concluded that the traditional practices of preparing these beverages affect microbial diversity, suggesting an important discussion about food security and self-sufficiency. Analyzing local knowledge of plant use can be helpful in determining how phytosanitary issues impact food security. To better understand the impact of sociocultural and agricultural practices on the occurrence of cassava bacterial blight, Pérez et al. conducted interviews with Colombian farmers. The significance of this work lies in its assessment of the potential effects of land use, phytosanitary control, and fertilizer use on the prevalence of bacteria blight in cassava and on local populations. Santos et al. investigated the environmental and social factors that drive the consumption and preferences for meat as a source of protein for indigenous populations. The authors demonstrated that deforestation, urbanization and father's occupation determine how young students consume wildlife meat which also has implications to food security.

In another group of studies, ethnobiological information is expressly used to make decisions about management and conservation strategies for biodiversity. Zarazúa-Carbajal et al. analyzed the coexistence and use of fauna by the Mexicatl (Nahua) people in Central Mexico showing that local people recognized a hundred of animal items associated to 18 use categories and three types of damage (crop loss, predation of domestic animals, and damages to health). This information is essential for establishing management plans directed toward sustainable use of wildlife. An important aspect is linked to people's perception of agroforestry systems and the motivations that lead them to carry out management actions that maintain native vegetation in agricultural areas. This is addressed in the article by Rendón-Sandoval et al. that investigates the motivations of peasants from three human groups to maintain native vegetation of Tropical Dry Forest in their agroforestry systems in Cuicatlán, Oaxaca, Mexico. The authors highlight that the motivators indicated by people involved the contributions of these areas through material, regulatory and non-material services, which favor fundamental human needs linked to subsistence, identity and protection. As a result, it reveals that conservation actions for these environments must take into account the historical interactions with human groups, in addition to their perceptions and motivations for maintaining management actions that favor biodiversity. Another aspect of traditional ecological knowledge that can guide conservation decisions is determining the spatial and temporal distribution of threatened or economically relevant species. Jesus et al. offer some guidance on how to use data from interviews with octopus fishers to identify species distribution and comprehend potential fishing pressure that could have an impact on them. The authors used the knowledge of fishers to show a wide range of information that can aid in conservation decisions, including: (i) behavioral traits that aid in differentiating between co-occurring species, (ii) spatial distribution and fishing patterns, (iii) social factors affecting fishing success, and (iv) use of octopus fishing as a secondary source of income indicating a potential weak pressure on octopus populations. Quirino-Amador et al. explicitly integrated the ecological and scientific knowledge from fishers, divers, and reef scientists to investigate temporal changes in reef landscapes. They highlighted that the complementarity of information among different stakeholders enables a better understanding of how human behavior impacts and perceives changes in natural ecosystems, which could be essential to manage reef environments, particularly those without baseline data. In a similar way, Pereyra et al. used an interdisciplinary approach combining stable isotopes analysis and fisher's knowledge to understand trophic relationships of amazonian fishes. The authors find that the two sources of

knowledge were able to predict the trophic position of six fish species. Importantly, by using the local knowledge this study provided reliable information about trophic ecology of endangered species which can help fisheries management and species conservation.

The local ecological knowledge can also be valuable to track the impact of environmental changes on human health and to understand the adaptive strategies developed by them to survive in a changing environment. Magalhães et al. explored this issue and asked how do people from different human groups perceive and develop adaptive strategies to deal with diseases caused by extreme climate change? The results showed that the perceived incidence of diseases was the factor that positively explained the frequency of adaptive strategies adopted by people. This suggests that public policy efforts should be directed toward certain groups of diseases with higher incidence to favor the health of human groups in extreme climatic events. The events may also affect water availability for people, which can have social, economical and political impacts on traditional populations. For example, Fowler studied the ways water is made and unmade on Sumba Island when subjected to tensions between local indigenous populations and off-island policies. Studies of this nature are important for the equitable and sustainable management of water, the protection of water quality, and the conservation of freshwater biota.

As concluding remarks, the 12 papers in this Research Topic shed light on the great potential of including local ecological knowledge into biodiversity disciplines to help improve conservation decision and policy (see, e.g., Gurney et al., 2019; Gelcich et al., 2019; Barbosa-Filho et al., 2020). In addition, this Research Topic provides insights that we hope will stimulate further research bringing together several academic fields concerned with biodiversity conservation and human well-being.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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