ETHNOBIOLOGY LETTERS

Perspectives

Directions In Brazilian Ethnobiology

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Abstract This manuscript examines the prevailing trends within the field of ethnobiology in Brazil and highlights its departure from the traditional dichotomy that partitions ethnobiological inquiry into utilitarian and cognitive perspectives. Instead of an extensive review of the diverse perspectives within the Brazilian ethnobiological landscape, this article primarily highlights the author's specific viewpoint. As such, this paper outlines some of the orientations and inventive trajectories within the field, emphasizing their origin within the rich academic legacy of Brazil.

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(Un)Defining the Brazilian Ethnobiology

In 2013, we sought to characterize the trends in ethnobiology in Latin America to understand the state of the field (see Albuquerque et al. 2013). We attributed the observed growth in the field to various factors, including the rich biological and cultural diversity and the scientific landscape in some nations. Since then, it has become clear that ethnobiological research in Latin America has already moved away from the classic dichotomy that divides ethnobiological research into utilitarian and cognitive approaches (e.g., Prado and Murieta 2015). Instead, the scenario outlined at that time showed the apparent dominance of research categorized as ethnobotanical, which persists today. Furthermore, Brazilian authors publish more papers on ethnobotany than any other approach, focusing on medicinal plants (Gonzalez-Rivadeneira et al. 2018; Pathak and Bharati 2020; Phumthum 2020; Ritter et al. 2015). In Brazil, researchers who do not necessarily identify as ethnobiologists have made notable contributions to understanding the interaction between people and biota (e.g., Sena et al. 2022). However, mapping this research can be challenging.

In Brazil, I am particularly critical of two types of studies that undermine the logic or motivation of scientific/academic research. First, studies aim to obtain a comprehensive list of species, whether plants or animals, for a particular region or ethnic group. Although these studies may have some local importance, they contribute little, scientifically, to adding new knowledge in the field or creating ruptures in the structures of knowledge that elevate us to new levels. Another type of study is justified by calculating ethnobiological indices. Unfortunately, such indices have multiplied over time and have been increasingly incorporated into different studies entirely uncritically. For example, the renowned use value index proposed by Phillips and Gentry (1993) was aimed at testing hypotheses in ethnobotany (Albuquerque 2009). Since then, few studies have used the proposal as conceived (Ramos et al. 2012) and ended up reproducing the technique in various studies to introduce something quantitative to the study.

I would like to argue that Brazilian ethnobiology is a field of theoretical and epistemological disputes that can generate a rich debate and vibrant advances for the area if our community overcomes tendencies to negate one approach in favor of another and instead accepts that we have a complex and multifaceted interdisciplinary field of knowledge. This

acceptance can enrich discussion and progress in the field (Ludwig and El-Hani 2020).

Controversies

Villagómez-Reséndiz (2020) made a recent effort to understand how ethnobiological research is configured in North and Latin America beyond a historical perspective centered on classification into stages/phases and the utilitarian/cognitive dichotomy. Our aim in discussing the work of Villagómez-Reséndiz is not to provide a direct response to their specific critique. Instead, we intended to contextualize their perspective in the broader framework of contemporary trends in ethnobiology scholarship, with a particular emphasis on the Brazilian context. We will now summarize Villagómez-Reséndiz's (2020) ideas, which classified Brazilian ethnobiology into two main branches: evolutionary ethnobiology and ethnoecology. Both branches prioritize biological perspectives in their understanding of ethnobiology but differ in their interpretation of Traditional Ecological Knowledge (TEK) and their approach to cultural issues. Ethnoecology aims to create an integrated approach between human and natural sciences, considering social-ecological factors and focusing on historical and synchronic accounts of plants and animals.

On the other hand, evolutionary ethnobiology concentrates on ethnomedicine, ethnobotany, and ethnozoology, emphasizing plants' economic and medicinal value and relying on an evolutionary perspective. However, Villagómez-Reséndiz (2020) argues that evolutionary ethnobiology typically needs more resources to address cultural issues and conduct more comprehensive ethnographic research. Its focus on TEK in biodiversity management adopts a quantitative approach that overlooks broader cultural and political dimensions of TEK in the co-production of knowledge (Villagómez-Reséndiz 2020).

Villagómez-Reséndiz's (2020) analysis ignores nuances that ethnobiological research has achieved in Brazil and its classification effort is unfortunately misguided. In Brazil, different understandings of the area coexist. For example, we still tend to distinguish ethnoecology from ethnobiology inconsistently. The Brazilian ethnoecological tradition encompasses different authors who structure different schools, from ethnoecology based on assumptions in human ecology, which had Alpina Begossi (1958–2023) as its leading exponent, to comprehensive ethnoecology proposed by José Geraldo Wanderley Marques to ethnoecology centered on discussions about peasant farming by Victor Toledo. In my reading, over the last few decades, only ethnoecology, practiced by Alpina Begossi, seems to reinvent itself in the Brazilian scenario (e.g., Nunes et al. 2019; Silvano et al. 2023). Today, I argue that we should reserve the term ethnobiology for any study focused on the relationship between our species and different life forms at different spatial and temporal scales. For us, Victor Toledo's work influenced the treatment of ethnoecology as a synonym for political ethnobiology (see Albuquerque et al. 2024). However, different approaches still coexist in Brazil.

Villagómez-Reséndiz (2020) adds to this argument that there is an ongoing debate about the relationship between TEK and biological and anthropological research in North and Latin America. For him, ethnobiology encompasses various approaches to studying TEK, but there is a growing trend toward prioritizing a biological perspective in ethnobiological research. In his view, this emphasis on biological factors often results from the limited use of ethnographic methods. It can lead to a lack of critical examination of ecology's cultural and political dimensions. I had the recent opportunity (Albuquerque 2022a, b) to criticize this perspective as reductionist and ignoring the interdisciplinary character of ethnobiology (see McAlvay et al. 2021). I am not arguing against anthropology and ethnography, but rather against the claim that ethnobiology cannot be conducted without anthropology and ethnography. In my view, the lack of a more anthropological approach in Brazilian ethnobiology, or the limited use of ethnographic methods, is also due to the lack of interest of researchers trained in these traditions in ethnobiological studies, although there are notable exceptions (e.g., Prado et al. 2020, 2022; Shepard Jr. and Daly 2022). Indeed, one of the reviewers of this article pointed out that Brazil may not have had a strong tradition of incorporating more anthropology into ethnobiology due to a limited engagement of Brazilian anthropology with the field.

I argue that Villagómez-Reséndiz (2020) incorrectly labels all research conducted in Brazil that identifies with any of the subdisciplines of ethnobiology, such as ethnobotany, ethnozoology, and ethnomycology, which may follow different theoretical or epistemological orientations, as evolutionary ethnobiology. On the other hand, evolutionary ethnobiology is a recently systematized

field that assumes evolutionary theory as the main theoretical background to understand the relationship between humans and nature (Ferreira Júnior et al. 2022).

Directions and Innovative Approaches

Over the past years, ethnobiology research has made significant progress in Brazil, leading to novel perspectives and opportunities to understand the interplay between humans and biodiversity. While I will discuss some of these advances, it is essential to highlight that research in Brazil is broader than these approaches. Brazilian ethnobiology has certainly been reinventing itself, either by following global trends in research in the area or by generating innovations for the field. Brazilian scholars have made significant investments in advancing the educational aspects of ethnobiology, resulting in the production of numerous textbooks (Albuquerque et al. 2014, 2015, 2017, 2019a; Alves and Albuquerque 2018) and the establishment of scientific journals (*Ethnobiology and Conservation* and *Ethnoscientia*). Regarding the journals established in Brazil, they have become part of the network of sister journals published worldwide, thus expanding the possibilities for diverse research and epistemological orientations. Over time, they have been gradually gaining more international prominence (see Stepp 2023).

Notably, Brazil is the home of Latin America's first graduate program in Ethnobiology and Nature Conservation, founded in 2011. Moreover, Brazilian academics have played a pivotal role in establishing and developing various subfields and approaches within ethnobiology, including Evolutionary Ethnobiology, the intersection of ethnobiology and education, and the integration of ethnobiology with philosophy.

The emphasis placed by Brazil on educational initiatives, the creation of specialized programs, and the active involvement of scholars in diverse branches of ethnobiology underscores the country's distinctive contributions and advancements within the field. By fostering a nurturing academic environment and encouraging interdisciplinary collaborations, Brazil has cultivated a vibrant and thriving ethnobiological community that transcends the mere adoption of global trends. This distinctive state of Brazilian ethnobiology exemplifies the nation's dedication to pushing the field's boundaries and promoting innovative approaches (see Albuquerque et al. 2020a).

In this perspective, science is considered a fundamental tool for understanding and preserving TEK but is not seen as an end. On the contrary, political ethnobiology values integrate science with social, ethical, and political values, recognizing the importance of cultural, environmental, and political dimensions involved in the phenomena studied. Political ethnobiology, in contrast, differs from naïve social activism, which often lacks connection with the realities of traditional communities and fails to contribute to effective practices. This approach needs to be updated and more effective in dealing with the complexity of the phenomena studied by ethnobiology.

For example, Renck et al. (2023a) suggests that including Indigenous People and Local Communities (IPLC) in fisheries policy can enhance the accuracy of environmental policies and promote sustainable fishing practices by providing valuable information on marine species' behavior and migration patterns and the ecological connections between different species. Additionally, including epistemic diversity in environmental policy challenges methodology, politics, and ethics, leading to concrete proposals to benefit both people and nature (Renck et al. 2023b).

One area that has gained traction in ethnobiology research in Brazil is the link with education (see Baptista and Araújo 2019; Baptista and El Hani 2009; Oliveira et al. 2020; Sotero et al. 2020; van Luijk et al. 2021). Scholars have emphasized the value of TEK and cultural diversity for helping to build a multicultural and inclusive education. Combining ethnobiology and education can foster critical awareness of environmental and social issues. According to Robles-Piñeros et al. (2020), the introduction of formal schooling in many contexts of the "Global South" raises concerns about the simultaneous introduction of hierarchies between knowledge systems that present academic knowledge (AK) as authoritative, while marginalizing local knowledge and practices of knowledge transmission. According to them, this can create tensions between TEK and AK in communities. By investigating biology education as a "trading zone" between knowledge systems, it is possible to analyze how partial overlaps become negotiated in educational practices in rural Brazil and provide the basis for educational interventions that foster intercultural dialogue.

Another critical area of research has been the integration of AK and TEK (El-Hani et al. 2022) to support biodiversity and biocultural conservation and sustainable use (e.g., Assis Magalhães et al. 2022; Braga-Pereira et al. 2022; Sena et al. 2022). This approach involves recognizing and valuing local communities and traditional peoples' knowledge and practices concerning biodiversity and integrating it with scientific knowledge and practices to develop conservation strategies that acknowledge their contributions (Albuquerque et al. 2021).

A crucial component of ethnobiology research in Brazil has been a critical reflection on research methods, including the discussion and analysis of different methodologies used (e.g., Chaves et al. 2019; Jacob et al. 2021; Lyra-Neves et al. 2015; Meireles et al. 2021; Silva et al. 2022). This reflection has led to the development of new approaches that consider the complexity and diversity of knowledge systems and practices of local communities and traditional peoples, as well as scientific questions.

Gender (Silva et al. 2019; Zank et al. 2021) and decoloniality (Martinelli and Euzébio 2022) have also emerged as important topics in ethnobiology research in Brazil. Researchers are exploring how gender issues affect knowledge, research practice, and relationships between researchers and research institutions. For example, Silva et al. (2019) propose a comprehensive strategy to tackle gender bias in ethnobiological research. They advise various measures, such as facilitating the participation of women in scientific gatherings, initiating mentorship programs for female researchers and students, and integrating gender issues into research projects. Moreover, the authors recommend that journals implement policies to support gender equity in authorship and editorial boards. Finally, they stress the significance of spreading awareness about gender bias and its repercussions on scientific research by conducting educational initiatives, such as workshops and seminars.

Historical ethnobiology is another growing field of research in Brazil that examines the historical interactions between human societies and the natural world, focusing on using and managing natural resources (e.g., Medeiros 2020; Medeiros and Alves 2020). This area provides valuable insights into contemporary environmental and cultural issues and can inform efforts to promote sustainable and equitable use of natural resources. I cannot overlook, also, the studies of historical ecology initiated in Brazil, to the best of my knowledge, by Balée (2013), which have provided strong evidence of Indigenous peoples' management of our landscapes throughout the years. This management has led to the domestication of landscapes and individual species, challenging the notion of environments being untouched or free from human influence (e.g., Clement et al. 2015; Levis et al. 2018; Lombardo et al. 2022).

Brazilian researchers have also developed innovative conceptual frameworks, emphasizing the dynamic and interactive relationships between humans and their environment and the several factors that shape these relationships. An exciting example involves the recent formalization of the evolutionary ethnobiology approach. Brazilian researchers systematized ecological and evolutionary scenarios to investigate the dynamic relationships between people-biota in different social-ecological systems (Ferreira Júnior et al. 2022). In addition, we have proposed a conceptual synthesis that aims to enhance the integration of research programs in ethnobiology (Albuquerque et al. 2020a). The framework explicitly considers the three general processes that can underlie the relationships between humans and nature in social-ecological systems: cognitive processing, cultural transmission, and biocultural evolution. By demonstrating the interactions between these processes across different spatial and temporal scales, the framework can help address the complex dynamics in social-ecological systems. This integrative potential is significant in ethnobiology as it combines applied and basic research, enabling reflexivity about the structure of local knowledge in negotiations related to issues such as biodiversity conservation or food security. Instead of viewing applied and basic research as competing for attention, the proposed framework illustrates how they can complement each other to better understand the negotiation of practices.

Brazilian researchers have also produced formal theories originating from ethnobiological research and the accumulation of diverse sources of evidence (Albuquerque et al. 2019b). The social-ecological theory of maximization, for example, integrates the evolutionary relationships between plants or other living resources and humans, providing a theoretical framework for the selection and use of biota from an evolutionary perspective. Furthermore, the theory

draws on various hypotheses and evidence from previous ethnobiological studies, such as the apparency hypothesis, hypothesis of non-random selection of plants, hypothesis of diversification, climatic seasonality hypothesis, and the utilitarian redundancy model (see Gaoue et al. 2017).

The challenges posed by contemporary political and economic issues have profoundly impacted ethnobiological research in Brazil, prompting the field to reinvent itself. There has been a growing development of political ethnobiology in the Brazilian context, characterized by an approach that combines the appreciation of science with the defense of political and ethical commitments with Indigenous People and Local Communities (IPLC). This movement has been particularly strengthened through the pioneering work of ethnobiologist Darrell Posey (see López Garcés and Robert 2012; Golan et al. 2019), who emphasized the importance of TEK and community engagement in his research (see Albuquerque 2022b).

For example, the recent substantial expansion of political ethnobiology in contemporary Brazil can be inherently linked to the political context. Brazil's distinctive social and environmental dynamics, characterized by political polarization during the President Bolsonaro administration, an upsurge in anti-science populism (see Lasco 2020), critical concerns regarding deforestation, contentious debates encompassing land utilization and conservation (see Levis et al. 2020), and violence against IPLC and primarily Indigenous communities, as well as the ongoing deliberations surrounding the future and structure of FUNAI (National Foundation for Indigenous People) (e.g., Congretel and Pinton 2020; Welch 2022), have collectively forged a fertile backdrop for the evolution and significance of political ethnobiology in the nation.

During the Bolsonaro administration, the political landscape has experienced heightened divisions and polarization, with policies and discourse perceived as undermining environmental safeguarding and Indigenous rights. This contentious milieu has instigated the emergence of political ethnobiology as a response to the challenges encountered by IPLC and their knowledge systems about the environment. By actively addressing the predicaments posed by deforestation, land disputes, and the unsustainable exploitation of natural resources, political ethnobiologists in Brazil have endeavored to bridge the gap between scholarly research and activism, advocating for more efficacious approaches firmly rooted in a profound comprehension of IPLC and their interconnectedness with the environment.

Additionally, the ascendancy of anti-science populism (see Taylor 2021) and the erosion of trust in scientific expertise have amplified political ethnobiology's pertinence. The IPLC's knowledge systems have been undervalued and disregarded, as anti-environmental agendas frequently dismiss the significance of indigenous perspectives. In this context, political ethnobiology assumes a pivotal role in amplifying the voices and knowledge of IPLC, underscoring their invaluable contributions to environmental conservation and sustainable practices.

The nation's extensive biodiversity and culturally rich heritage face jeopardy due to deforestation and the unsustainable exploitation of natural resources. Political ethnobiologists recognize the urgency of addressing these challenges and advocate for inclusive and participatory approaches integrating TEK systems into conservation endeavors.

Furthermore, I can consider several significant aspects based on reflections (Albuquerque et al. 2019c) for the field of ethnobotany. Considering this work, it is necessary to identify the key characteristics that also define ethnobiological research in Brazil:

- One crucial issue is understanding better biota-based knowledge systems (BBKS), which involves developing new theoretical and methodological research proposals integrating insights from various disciplines. It highlights the importance of understanding BBKS as complex systems encompassing not only biota but also people and their cultural practices. Ferreira Júnior (2020) argues that we need to advance in building common research agendas and invest in better training in theory and methodology of science to advance ethnobiology.
- Another issue is how to improve our understanding of biota-human interactions at a biological and cultural level (e.g., Liporacci et al. 2017), studying biota uses and biota meanings and values (e.g., Jacob et al. 2023; Souza et al. 2022), including in urban ecosystems (Albuquerque et al. 2023).
- The potential role of TEK in contemporary conservation strategies must be addressed (e.g.,

Conde et al. 2020). Recognizing TEK as a valuable source of information for conservation efforts is crucial, and strategies incorporating local knowledge and practices must be developed (e.g., Alves et al. 2022; Bastos et al. 2022).

- Promoting sustainable use and management of biota resources must be addressed and is critical, in light of increasing threats, such as climate change (Ladio 2017), habitat loss, and overexploitation. It requires the development of strategies that balance human needs with ecological sustainability.
- Improving our understanding of medicinal biota requires attention (Albuquerque et al. 2020b). Integrating approaches, such as ethnopharmacology, phytochemistry, and clinical trials, are crucial to comprehensively understanding medicinal biota's chemical composition, pharmacological properties, and cultural significance.
- The social and economic dimensions of BBKS also need to be addressed. For example, issues, such as power relations, gender roles, and market dynamics, must be studied in addition to biota uses to understand better the contexts in which they occur.
- Lastly, improving our understanding of biota domestication and crop evolution is a critical issue that requires the study of genetic, ecological, and cultural dimensions of both crop species and their wild relatives and other biota utilized by humans (e.g., Reis et al. 2018; Wagner et al. 2022).

These advancements demonstrate Brazilian researchers' creativity and intellectual rigor in ethnobiology. By developing new frameworks and challenging traditional approaches, they contribute to a more comprehensive and inclusive understanding of the complex relationships between humans and their environment, with the potential to inform policies and practices that promote sustainability and equity in Brazil and beyond.

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