

Chapter 1

Evolutionary Ethnobiology

**Ulysses Paulino Albuquerque, Patrícia Muniz de Medeiros,
and Alejandro Casas**

A number of concepts and views about ethnobiology can be found in a vast literature produced during the last decades. A newcomer scholar in the field often feels trapped in a maze of concepts and assumptions that generate more questions than explanations. This is commonplace for a discipline that is growing, defining its nature, and assessing its interests, research methods, and connections with other scientific areas overlapping questions and fields of interest. No science constructs and matures without continually questioning its own bases and premises looking for its own identity. In addition, some research fields have more than one identity, and this is the case of Ethnobiology. This field convenes and joins researchers with various theoretical and epistemological backgrounds. The complexity of ethnobiological problems require the working together of a high diversity of perspectives, methods and viewpoints for approaching theoretical questions and applied perspectives in common.

This text is a modified version of Albuquerque and Medeiros (2013).

U.P. Albuquerque (✉)

Laboratory of Applied and Theoretical Ethnobiology, Biology Department,
Universidade Federal Rural de Pernambuco, Rua Dom Manoel de Medeiros, s/n,
Dois Irmãos, Recife, Pernambuco 52171-900, Brazil
e-mail: upa@db.ufrpe.br

P.M. de Medeiros

Ethnobiology and Human Ecology Group, Center of Biological and Health Sciences,
Universidade Federal do Oeste da Bahia, Estrada para o Barroco, s/n,
Morada Nobre, Barreiras, Bahia 47805-100, Brazil

A. Casas

Instituto de Investigaciones en Ecosistemas y Sustentabilidad (IIES),
Universidad Nacional Autónoma de México, Campus Morelia,
Antigua Carretera a Pátzcuaro 8711, Col. San José de la Huerta,
Morelia, Michoacán 58190, Mexico
e-mail: acasas@cieco.unam.mx

Anderson (2011:1) defines ethnobiology as “the study of the biological knowledge about certain groups of plants and animals and their interrelationships.” In order to approaching the interrelationships, it is necessary an ecological perspective. Hurrell and Albuquerque (2012) stated that ethnobotany can also be understood as a part of ecology.¹ The same can be said to ethnobiology; and also it is possible to say that ecology may be part of ethnobiology. At the end of the day both definitions visualize that ecosystems and ecological problems cannot be understood without influence of humans, and similarly, human cultural and social problems cannot be understood without considering ecosystems and ecological interactions. In fact, nowadays making reference to social-ecological problems is an explicit recognition of this intimate interaction (Berkes and Folke 1998; Folke 2004; Walker et al. 2004). Ethnobiology is eminently a social-ecological science, concerned with interrelationships between people and their biological resources (plants, animals, and other organisms). It deals with interaction between the different biotic components and frequently also with abiotic components of ecosystems and their dynamic relationships occurring in time and space.

It is not unusual for us to consider the relationships between people and biological resources from an ecological perspective. The conventional ecological science (the modern ecological research) insufficiently considers human aspects as topics of theoretical interest. The classic notion of ecology, dissociated from human beings, may constitute a source of bias, given that humans interfere directly in ecological and evolutionary processes. Similarly, sociological or anthropological approaches decontextualized of ecological systems and interactions do not allow a holistic comprehension of the real problems. According to Fritjof Capra (2004), the contemporary environmental crisis is the crisis of a conception of environment dissociating nature from society. Therefore, the synthetic approach of social and ecological issues is not only a theoretical challenge, but also an applied necessity. As social-ecological science, ethnobiology may make important contributions in this direction.

Ethnobiology has been predominantly focused on the utilitarian role of plants and animals (Toledo and Alarcón-Cháires 2012). The most common approach in ethnobiology today is to focus on lists of useful plants and animals, which leaves out attempts to understand the complex relationships between people and biological resources but fails to identify patterns in the use of such resources. This approach belongs to the history of ethnobiology (strongly influenced by an economic and perhaps taxonomic perspective because of the preoccupation with the listing of organisms). It is an important step of Ethnobiological research because it records knowledge that may otherwise soon be lost by communities and because it aids in the search for “new products”. This approach on the other hand is insufficient to for the theoretical foundations of ethnobiology, that are indispensable for any scientific field. Although concerns and descriptions of utilitarian aspects are undoubtedly part of ethnobiology, these topics and approaches do not define the body of a science. Constructing a social-ecological science like ethnobiology requires much more theory and methods.

¹More specifically, the authors discuss a biocultural ecology to account for the human dimension in the traditional ecological approach.

The broad concept of ethnobiology presented above does not fully meet the current need for including concepts of ecology and evolution in ethnobiology. Although some researchers advocate that it is redundant to address ecology and evolution in ethnobiology, we doubt whether these researchers are using these perspectives in their work at all. On the one hand, these concepts are used extensively as theoretical scenarios for interpreting and guiding research (as in the case of plant management and domestication studies; see, for instance, Casas et al. (2007)). On the other hand, they appear to be completely forgotten in many studies. Johns (1990) presents interesting ideas and approaches, from an ecological and evolutionary perspective, for understanding the use of medicinal plants and food by humans. Unfortunately, very few researchers consider this perspective in their investigations. Even so, Johns (1990) strongly influenced the construction of a theoretical scenario accounting for an evolutionary view on health and disease (see Fabrega Jr 1997).

What may then justify this lack of ecology and evolution in ethnobiology studies, especially in countries where the science is practically performed by professionals from the natural sciences? We are not arguing for the exclusion of the humanities and social sciences, given that humans are a cultural species. Belonging to a cultural species does not eliminate our biological-evolutionary trajectory. Our social behavior is also a product of biological evolution, and our cognitive, social and cultural components were primarily responsible for our dominance over most other species. What we are and how we act are influenced by a biological-cultural complex. Ecological and human cultural processes influence to each other and delineate crucial aspects of nature of humans and humanized nature. It is not our intention to rekindle here the debate about human behavior, i.e., whether our choices and tendencies are biologically determined or whether they are the result of the culture in which we find ourselves. We have already outgrown this debate by accepting that, in the case of our species, ecological and human cultural processes are strongly linked in an evolutionary trajectory. We will not advance in our understanding of the relationships between people and nature by ignoring either the animal (biological-ecological) nature of humans or the natural context of human culture. We consider it is possible to substantially advance in constructing ethnobiological science by drinking at the fountains of different areas that have been busy understanding human beings from an ecological and evolutionary perspective.

The ecological approach seeks to account for the current aspects that explain the relationship between people and nature, considering the interrelationships that people establish with different natural resources and ecosystems in space and time. This approach asks how people behave in different environments and how they deal with diversity, in addition to asking what determines the properties of social-ecological systems. The evolutionary approach also studies current behaviors, but with the intent of trying to unravel which pressures have shaped us, i.e., how and why certain traits or characteristics emerged.

Thus, we have a challenge ahead of us: to define the field of ethnobiology that seeks to combine ecology and evolution in understanding how people from different cultures cope with (influencing and being influenced by) the natural resources in different environments given the ecological, evolutionary, and cultural pressures to

which our species is subject. It is important to point out that the evolutionary branch of ethnobiology may consider two aspects of evolution: the biological evolution and the cultural evolution. Although they may follow similar trajectories, the first one requires genetic and/or epigenetic changes while the second can be performed in a single generation, by means of environment-influenced behavioral changes. Thus, we call evolutionary ethnobiology the branch of ethnobiology that studies the evolutionary histories of human behavioral patterns and human understanding about biological resources (about both cognition and behavior), considering the historical and contemporary aspects that influence these behaviors at both the individual and societal levels.² An ethnobiology that adopts this perspective will routinely address concepts such as adaptation, adaptability, evolutionary trends of traits, and phylogeny.

The first two basic premises are clear³: (a) that human behavior, variable between pairs of the same group and related to the use of natural resources, evolves by means of the selection of traits that confer adaptive advantages; and (b) that large behavioral variability should be inherited, not necessarily on a genetic basis, but primarily by cultural transmission. In a single human population, distinct individuals may have different strategies for dealing with natural resources and different ways of interacting with other members of the same population that influence their decisions and their behavior. Our understanding of the relationship between people and natural resources can very much benefit from the incorporation of all concepts built over the years in other areas and from methodological approaches that assess the role of an individual and the influence of different social-environmental contexts in structuring our ecological understanding.

Ecological and evolutionary perspectives are undoubtedly important theoretical issues for making ethnobiology a holistic science. Evolutionary ethnobiology accounts for social, cultural, ecological, and evolutionary issues derived from the interactions between humans and biotic components of ecosystems. An evolutionary ethnoecological perspective allows including the modelling of ground, water, and other abiotic elements. With this perspective, throughout this book we review the ecological and evolutionary consequences of interactions between humans and nature. As discussed in Chap. 4 by Casas et al. (2015), evolutionary ethnobotany is a research approach that combines different perspectives from a broad spectrum of disciplines. Its general purpose is analyzing the evolutionary processes derived from interactions between humans and plants, animals, fungi and a broad spectrum of microorganisms, which may have consequences on: (1) organisms

²This perspective makes sense in light of Niche Construction Theory, which is still neglected and not well known. All living beings (including humans), through their activities and decisions, modify their own niches and those of other organisms. In altering niches, organisms would also be altering natural selective pressures (see Odling-Smee et al. 2003).

³These premises are inspired by the fundamental ideas of behavioral ecology (see Jeanne 1998). However, in behavioral ecology, a behavior is considered adaptive when it generates a positive impact on the fitness of its descendants. It is difficult, but not impossible, to measure such an impact when we work through the issues of interest in ethnobiology.

interacting with humans, (2) humans themselves, their culture and societies, and (3) ecosystems and landscapes. This perspective indicates that evolutionary ethnobiological questions are eminently social-ecological complex problems and their understanding therefore requires interdisciplinary research approaches.

Examining the interrelationships between people and nature and considering the forces that helped shape this complex relationship will help us undoubtedly to moving forward in building theories in ethnobiology.

Acknowledgements This work was supported by funding from the Pernambuco State Foundation for Science and Technology (FACEPE—APQ—1264-2.05/10) and the National Council of Technological and Scientific Development (CNPq—Proc. 471989/2012-6).

References

- Albuquerque UP, Medeiros P (2013) What is evolutionary ethnobiology? *Ethnobia Conserv* 2:6
- Anderson EN (2011) Ethnobiology: overview of a growing field. In: Anderson EN, Pearsall D, Hunn E, Turner N (eds) *Ethnobiology*. Wiley-Blackwell, Hoboken, NJ
- Berkes F, Folke C (1998) Linking social and ecological systems: management practices and social mechanisms for building resilience. Cambridge University Press, Cambridge
- Capra F (2004) *The hidden connections: a science for sustainable living*. Anchor Books-Random House, New York
- Casas A, Otero-Arnaiz A, Pérez-Negrón E, Valiente-Banuet A (2007) In situ management and domestication of plants in Mesoamerica. *Ann Bot* 100:1101–1115
- Casas A, Parra F, Rangel S, Guillén S, Blancas J, Figueredo CJ (2015) Evolutionary ecology and ethnobotany. In: Albuquerque UP et al (eds) *Evolutionary ethnobotany (This book)*. Springer, Amsterdam
- Fábrega H Jr (1997) *Evolution of sickness and healing*. University of California Press, Berkeley
- Folke C (2004) Traditional knowledge in social–ecological systems. *Ecol Soc* 9(3):7
- Hurrell J, Albuquerque UP (2012) Is ethnobotany an ecological science? *Ethnobia Conserv* 1:4
- Jeanne RL (1998) Behavioral ecology – investigating the adaptive value of behavior. In: Dodson S et al (eds) *Ecology*. Oxford University Press, New York
- Johns T (1990) *With bitter herbs they shall eat it: chemical ecology and the origins of human diet and medicine*. University of Arizona Press, Tucson
- Odling-Smee FJ, Laland KN, Feldman MW (2003) *Niche construction – the neglected process in evolution*. Princeton University Press, Oxford
- Toledo V, Alarcón-Cháires P (2012) La etnoecología hoy: panorama, avances, desafíos. *Etnoecologica* 9(1):1–16
- Walker B, Holling CS, Carpenter SR, Kinzig A (2004) Resilience, adaptability and transformability in social–ecological systems. *Ecol Soc* 9(2):5