ETHNOBIOLOGY AND CONSERVATION

OPINION

Ethnobiology and Conservation, 15:23 (12 October 2026)
doi:10.15451/ec2026-10-15-23-1-10
ISSN 2238-4782 ethnobioconservation.com

Old uses, new species: the hidden effects of taxonomic change on ethnobiological knowledge

Rômulo Romeu Nóbrega Alves[1,2*], Anna Karolina Martins Borges[2] and Ulysses Paulino Albuquerque[2,3]

ABSTRACT

Much of the ethnobiological knowledge produced by research is documented and synthesized under scientific names, yet species boundaries can change long after records are produced. When a historically broadly circumscribed species is later split, earlier information on use, hunting, trade, management, or other human relationships may no longer contain enough evidence to determine which currently recognized species was involved. We introduce taxonomic erosion of ethnobiological knowledge as the loss of contemporary taxonomic resolution or assignability of previously documented ethnobiological records following changes in taxonomic circumscription. We distinguish this process from nomenclatural change, misidentification, and what has been termed erosion of local ecological knowledge, which concerns the knowledge held by people rather than its scientific documentation. Its occurrence depends jointly on the nature of taxonomic change and on the evidence preserved with each record, including voucher specimens, diagnostic images, biological material, provenance, and other verifiable documentation. We also introduce the complementary concept of taxonomic recovery of ethnobiological knowledge, which occurs when preserved evidence allows historical records to be reconnected to currently recognized taxa. Newly described or newly delimited species may also possess histories of human relationships that long predate their scientific recognition. We argue that taxonomic traceability should be treated as a core component of ethnobiological documentation, databases, and syntheses. The taxonomic resolution assigned to a record should never exceed that supported by the preserved evidence.

Keywords: Ethnobiology; local knowledge; species delimitation; taxonomic erosion; taxonomic recovery; taxonomic traceability; taxonomy.

1 Universidade Estadual da Paraíba, Campus V, João Pessoa, Paraíba, Brazil.

2 Programa de Pós-Graduação em Etnobiologia e Conservação da Natureza, Universidade Federal Rural de Pernambuco, Recife, PE, Brazil.

3 Laboratório de Ecologia e Evolução de Sistemas Socioecológicos (LEA), Departamento de Botânica, Universidade Federal de Pernambuco, Recife, Pernambuco, Brazil.

* Corresponding author ✉. E-mail address: RRNA (romulo_nobrega@yahoo.com.br), AKMB (karolm26@hotmail.com), UPA (ulysses.albuquerque@ufpe.br)

SIGNIFICANCE STATEMENT

Taxonomic revisions can reveal previously hidden biodiversity while simultaneously making older ethnobiological records difficult or impossible to assign to the newly recognized taxa. We conceptualize this overlooked problem as taxonomic erosion of ethnobiological knowledge and distinguish it from nomenclatural changes, identification errors, and erosion of local knowledge. We also introduce taxonomic recovery to describe cases in which preserved evidence allows historical records to be reassigned after taxonomic change. The framework links taxonomy, ethnobiological documentation, databases, trade records, and conservation assessments through a single principle, the preservation of the evidence that connects each record to the organism documented. This perspective provides a practical basis for updating historical knowledge without creating false species-level precision.

INTRODUCTION

Ethnobiological knowledge is produced at the interface between people, organisms, and systems of classification. Human societies recognize, name, and organize plants and animals through local classificatory systems that may correspond to scientific taxa in different ways (Berlin 1992; Berlin et al. 1973; Hunn 1977). A local name may correspond to one scientific species, encompass several species, or distinguish entities within what scientific taxonomy treats as a single species (Otieno et al. 2015, Reis et al. 2026). Among medicinal plants traded in public markets of northeastern Brazil, for example, each vernacular name corresponded, on average, to 2.78 scientific species (Cavalcanti and Albuquerque 2013). Scientific documentation therefore adds a crucial step, in which local names and practices are associated with taxonomic entities whose supporting evidence should remain verifiable (Bye 1986; Łuczaj 2010).

Throughout this article, we use "ethnobiological knowledge" to refer to the body of information on human relationships with organisms that has been documented through ethnobiological research, that is, records of names, uses, practices, and interactions as published, stored, and synthesized under scientific names. We do not use the term to designate the local, traditional, or Indigenous knowledge held by the communities with whom such research is conducted, which exists independently of scientific documentation and is organized according to its own classificatory systems. The processes described here affect the scientific documentation of human-organism relationships, not the knowledge held by people themselves.

Once published, statements such as "this plant is medicinal," "this animal is hunted," or "this species is traded" may circulate for decades through articles, reviews, databases, and conservation assessments linked to a scientific name. That link is not necessarily permanent because taxonomy changes not only names but also the boundaries of the biological entities to which those names refer. Consider a study that correctly documents medicinal use of a historically broadly circumscribed species A. Decades later, A is split into A1, A2, and A3. The revision increases knowledge of biodiversity but raises the question of which of those species was actually registered, a question that updating the name alone cannot answer.

Sometimes the answer can be reconstructed. A voucher can be re-examined, a photograph may retain diagnostic characters, preserved tissue may permit molecular analysis, or sufficiently precise provenance may constrain the record to a single currently recognized species. In other cases, only the historical scientific name, a vernacular name, or a broad locality survives. The ethnobiological relationship persists, and the original identification may have been entirely correct under the taxonomy then available, so what has been lost is taxonomic resolution.

We call this process taxonomic erosion of ethnobiological knowledge and define it as the loss of contemporary taxonomic resolution or assignability of a previously documented ethnobiological record following a subsequent change in the taxonomic circumscription of the entity to which the record was originally assigned. Taxonomic erosion occurs when later species boundaries create distinctions that the preserved evidence cannot resolve, and it is fully compatible with a correct original identification. It should therefore be distinguished from synonymy, spelling errors, simple nomenclatural updating, vernacular ambiguity, or misidentification. These processes may nonetheless compound the problem, since a record that preserves only a vernacular name already encompassing several species (Cavalcanti and Albuquerque 2013) becomes even less assignable if one of those species is later split.

Taxonomic erosion is also distinct from erosion of local ecological or traditional knowledge, which concerns loss, fragmentation, or disrupted transmission of the knowledge held by local and traditional communities themselves (Benz et al. 2000; Manduzai et al. 2026; Zent 2001). The notion of knowledge erosion is itself contested in ethnobiology: changes often interpreted as loss, such as the incorporation of exotic species into local pharmacopoeias, may instead reflect people's own choices and the dynamic, adaptive char-

acter of local knowledge systems (Albuquerque 2006). Our use of "erosion" therefore refers exclusively to the loss of taxonomic resolution in documented records and makes no claim about the vitality or decline of local knowledge. In taxonomic erosion, both local knowledge and its scientific documentation may persist; what is lost is the species-level assignability of the documented record. Here, we examine the conditions under which taxonomic change preserves, erodes, or enables recovery of ethnobiological knowledge, discuss the implications for research and conservation, and propose taxonomic traceability as a practical framework for preserving the interpretability of ethnobiological records through future taxonomic change.

Not every taxonomic change produces erosion

The effect of taxonomic change depends on both the nature of the change and the evidence preserved with the record. A change of name or generic combination may fragment retrieval without making the biological record ambiguous. The tegu now known as *Salvator merianae*, for example, was widely documented in Brazilian ethnozoology as *Tupinambis merianae* (Alves et al. 2012a,b). A systematic revision resurrected *Salvator* from the synonymy of *Tupinambis* (Harvey et al. 2012), and subsequent ethnobiological studies adopted *Salvator merianae* (Alves et al. 2019; Borges et al. 2023), while the older records remain attributable to the same biological species (Figure 1A).

Crotalus durissus provides a complementary example of temporary nomenclatural instability (Figure 1B). Hoser (2009) proposed the combination *Caudisona durissa*, which was subsequently adopted in part of the Brazilian literature, including ethnozoological studies documenting medicinal use and other human interactions with rattlesnakes. Wüster and Bérnils (2011) challenged this classification and recommended retaining *Crotalus durissus*. The nomenclatural transition was not immediate, however, and both combinations continued to occur in the Brazilian literature. In 2012, for example, an ethnobiological review adopted *Caudisona durissa* (Alves et al. 2012a), whereas a zoological catalogue of hunted reptiles from the Brazilian semiarid region used *Crotalus durissus* (Alves et al. 2012b). Thus, records concerning the same biological species became distributed across publications under different scientific names, illustrating nomenclatural fragmentation rather than taxonomic erosion.

The situation changes when a revision alters species circumscription. The complex historically called *Mazama americana* illustrates the problem (Figure 1C). Molecular and cytogenetic studies revealed strong divergence among morphologically similar populations (Abril et al. 2010; Cifuentes-Rincón et al. 2020; Duarte et al. 2008), and *Mazama rufa* was subsequently revalidated through integrated morphological, cytogenetic, and molecular evidence (Peres et al. 2021). A historical record identified as *M. americana* sensu lato can be reassigned if a voucher, sequence, diagnostic image, or other preserved evidence identifies one current species. When such evidence is absent, however, a hunting or use record should not be automatically assigned to *M. americana* sensu stricto, the taxon that retained the historical name, or to *M. rufa*. It should remain at the historical level supported by the evidence, with uncertainty made explicit.

Such cases reflect the normal course of taxonomic progress, since taxonomy is expected to change as new evidence modifies species boundaries and reveals previously hidden diversity (Meyer et al. 2026). The important asymmetry is that taxonomic resolution can increase while the resolution of older ethnobiological records decreases. Taxonomic progress reveals erosion when earlier documentation cannot follow the new circumscription.

What makes an ethnobiological record taxonomically traceable?

We define taxonomic traceability as the capacity of an ethnobiological record to be reassessed against later taxonomic circumscriptions. This capacity depends largely on the evidence preserved at the time of documentation. A scientific name records an identification made within a particular taxonomic context, but the name alone may not provide the information needed to reassess that identification when species boundaries change. Taxonomic traceability therefore depends on the possibility of returning to the evidence associated with a record and reinterpreting it in light of current knowledge. Voucher specimens are particularly valuable in this respect because they allow identifications to be verified and, when necessary, revised (Bye 1986; Huber 1998; Turney et al. 2015). In ethnopharmacology, this principle has been formalized in community-wide best-practice guidelines that require botanical documentation through voucher specimens deposited in accessible herbaria (Heinrich et al. 2018), and an assessment of more than 400 articles in two leading journals found that over a third of the scientific plant names cited were incorrect in some respect (Rivera et al. 2014). In ethnobotany, Łuczaj (2010) emphasized the importance of explicitly evaluating the credibility of plant identifications according to the evidence available in historical sources. Importantly, the value of a voucher lies in preserving the possibility of subsequent verification or correction, since its existence does not

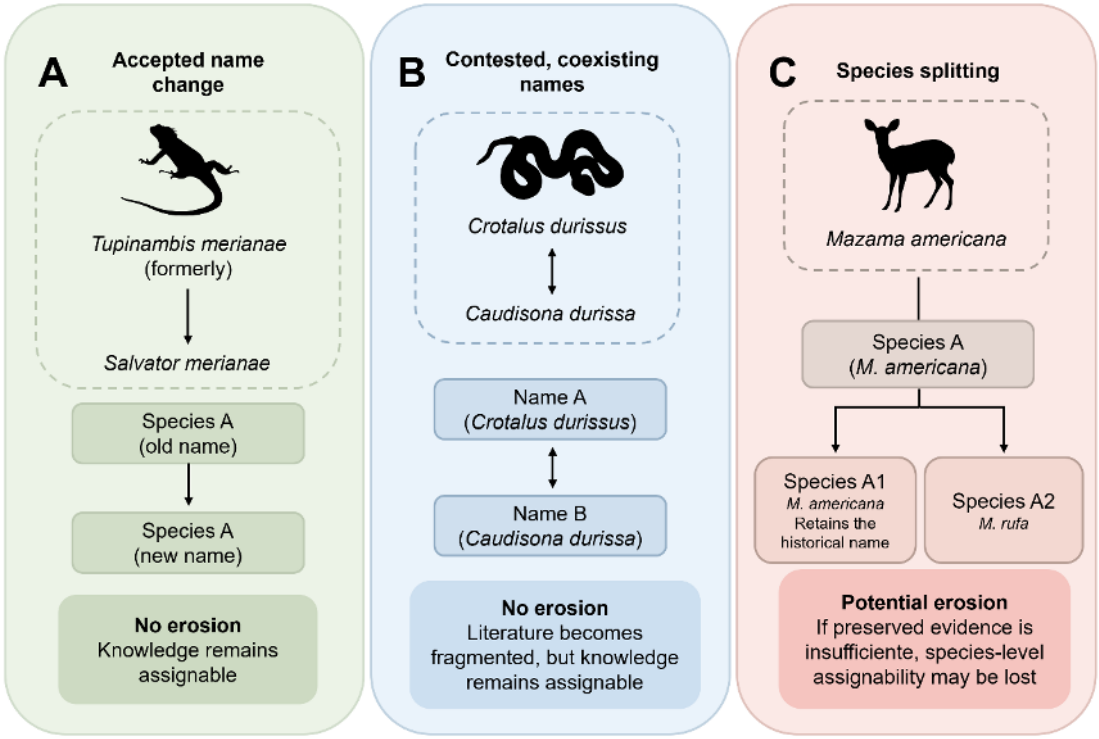

Figure 1. Alternative outcomes of taxonomic change for ethnobiological records. (A) An accepted change in name or generic combination preserves assignability to the same biological species. (B) Nomenclatural instability, in which competing names coexist in the literature, may fragment the literature without producing taxonomic erosion. (C) Species splitting may result in taxonomic erosion when preserved evidence is insufficient to assign historical records to the newly recognized species.

guarantee that the original identification was correct. In the Polish ethnobotanical collections examined by Łuczaj (2010), about 10% of voucher specimens had originally been misidentified, most of them within the correct genus.

Each form of evidence has limits as a basis for taxonomic traceability, since a voucher may lack characters needed to distinguish species recognized only later; a photograph may or may not show diagnostic features; stored tissue may permit analyses unavailable when the study was conducted; and precise locality can be decisive for allopatric taxa but uninformative for sympatric ones. Alternative forms of evidence have been proposed precisely because conventional vouchers are not always feasible; in ethnozoology, for instance, sound recordings have been advocated as vouchers for birds, whose preparation as museum specimens requires specialized skills (Alves and Souto 2010; Hunn 1992). The relevant property is therefore the capacity of the evidence to support future reassessment, whatever its type.

This challenge is particularly evident in markets and trade chains, where organisms often reach researchers as roots, bark, powders, meat, skins, bones, shells, or other processed products (Alves et al. 2013; Kool et al. 2012; Veldman et al. 2020). Processing can remove diagnostic morphology, while commercial or vernacular categories may encompass multiple scientific species. In Recife (Brazil), for instance, *Myracrodruon urundeuva* and *Schinus terebinthifolius* are traded under the same name, "aroeira," and used interchangeably because the plant parts sold do not allow the two species to be distinguished (Cavalcanti and Albuquerque 2013). Brazilian products sold as "cação" have likewise been shown by DNA barcoding to represent different shark species (Almerón-Souza et al. 2018), and molecular approaches have been used to trace the taxonomic origin of aquatic wildlife products used and traded in Brazil (Siciliano et al. 2023). In samples of the Amazonian medicinal plant locally known as Piri-Piri, DNA barcoding revealed that one of 19 samples declared as *Cyperus articulatus* was actually *C. surinamensis*; importantly, barcode markers differed in their ability to discriminate among *Cyperus* species (Mezzasalma et al. 2017). Although these cases involve identification rather than taxonomic change, they show that molecular meth-

ods can recover taxonomic information from processed or otherwise difficult-to-identify material. Such methods nonetheless leave part of the uncertainty unresolved. Their resolution depends on the markers used, sequence quality, reference libraries, and the taxonomy itself. In seized seahorse and pipefish products, DNA barcoding identified pipefish as *Syngnathoides biaculeatus*, whereas most seahorses could not be resolved to species because sequences fell within an unresolved *Hippocampus kuda–H. fuscus* complex (Serite et al. 2021). Molecular evidence cannot provide species-level certainty when the reference taxonomy does not support it.

Taxonomic traceability should therefore be understood as a property of the entire chain of evidence associated with a record, rather than of the scientific name alone. Ideally, an ethnobiological record should preserve the vernacular or local name, the taxon as originally published, the original reference, the type of use or interaction, the part or product involved, the date and locality or origin, and the voucher or other evidence supporting the identification. When a record is reassessed following taxonomic change, its taxonomic history, the current taxon or taxa compatible with the preserved evidence, the basis for reassignment, and the confidence of that reassignment should also be documented.

Consequences for ethnobiological knowledge and conservation

Taxonomic erosion changes the taxonomic level at which a documented relationship can be defended, while the relationship itself remains on record. If historical species A is split into A1, A2, and A3, assigning all old records to A1 merely because A1 retains the original name can artificially give A1 a history accumulated across populations now distributed among several species. Conversely, A2 and A3 may appear to lack histories of use even when their populations were hunted, traded, or used for decades under the former circumscription. Absence of knowledge must therefore be distinguished from existing knowledge whose contemporary species-level attribution cannot be resolved.

The effect can propagate when individual records are aggregated in reviews, databases, and comparative analyses. Large-scale ethnobiological syntheses commonly use species as units for integrating use, ecology, phylogeny, trade, and conservation status (Alves et al. 2021; Soares et al. 2025, Souto et al. 2026). Regional syntheses that cross-reference vernacular names recorded in dozens of local surveys with currently accepted scientific names (e.g., Cavalcanti and Albuquerque 2013) illustrate both the value of this approach and its dependence on the stability of the circumscriptions to which those names are linked. Taxonomic name harmonization is essential for combining biodiversity data produced under different nomenclatures because it reconciles synonyms and nomenclatural variants (Grenié et al. 2023), yet it cannot reconstruct information that was never recorded at a resolution sufficient to distinguish descendant taxa. If historical records cannot be redistributed after a split, derived estimates of how many species are used, which species are most heavily exploited, and how human use relates to ecological or evolutionary traits may also be affected.

The same issue matters for conservation information. After a split, a newly delimited species may occupy a much smaller range than the formerly recognized entity while exploitation records remain attached to the historical name. Without discriminating evidence, it is inappropriate either to assign all historical pressure to the species retaining that name or to assume that all descendant taxa experienced equivalent pressure. The taxonomic history of each record should therefore accompany use and trade records whenever such information informs conservation assessment.

A potential case of future taxonomic erosion is provided by the spiny turtle, *Heosemys spinosa*, a terrestrial turtle distributed across Southeast Asia, from the Thai-Malay Peninsula to the Greater Sunda Islands and the southern Philippines. The species is subject to substantial human exploitation, including illegal collection for food and traditional medicine markets, particularly in China, and for the international pet trade. Genetic and phenotypic analyses of specimens originating from a large wildlife seizure, the pet trade, and museum collections revealed concordant variation suggesting that *H. spinosa*, as currently recognized, may contain additional cryptic taxa (Spinks et al. 2012). If future taxonomic studies recognize more than one species within *H. spinosa*, historical records referring only to that name may not contain sufficient evidence to determine which of the newly recognized taxa was actually exploited. Such records would then provide a clear example of taxonomic erosion, in which the history of exploitation would remain documented while part of its species-level attribution could be lost.

Taxonomic traceability and continuity of ethnobiological knowledge

If future revisions can alter the interpretation of records produced today, the task is to create records capable of surviving change rather than to seek artificial taxonomic stability. The focus must shift from the scientific name as an endpoint to the chain of evidence connecting that name to the organism documented. Record lineage is central, because one should be able to

reconstruct the path from the original ethnobiological observation, through the evidence supporting identification, to its contemporary taxonomic interpretation (Figure 2).

Nomenclatural updating and taxonomic reassignment are different operations. A one-to-one name change can be updated while retaining the original name for traceability. After a split or redefinition, replacing the historical name with one current species is a biological claim that requires evidence. Reassessment should therefore ask which currently recognized taxa are compatible with the preserved evidence. If one species is supported, reassignment can be unequivocal; if one is more likely but alternatives cannot be excluded, confidence should remain qualified; if several species remain compatible, all should remain possible; and if the evidence cannot improve on the historical identification, the record should remain at that level. As a general rule, the taxonomic resolution assigned to a record should never exceed that supported by the preserved evidence.

Preserved evidence can also produce the opposite outcome. We define taxonomic recovery of ethnobiological knowledge as the restoration of contemporary assignability of a historical record by re-evaluating preserved evidence under a later taxonomic circumscription. Two records originally published as species A may therefore have different fates after A is split: one remains attributable only to the historical complex, whereas a voucher, image, tissue sample, or diagnostic provenance allows the other to be reassigned securely to A2. Erosion and recovery are thus alternative outcomes of taxonomic change, mediated by the evidence that survives.

A particularly important implication for ethnobiology is that the history of relationships between people and a species is independent of, and often much older than, its scientific recognition. Organisms may have been recognized, used, hunted, collected, managed, or traded long before science describes them as distinct species. The Lao giant flying squirrel *Biswamoyopterus laoensis* was described from a specimen encountered in a food market in Laos, where flying squirrels were sold as bushmeat (Sanamxay et al. 2013). Its scientific description was new, whereas the human relationship with the organism may have been much older.

An even stronger situation occurs when local knowledge preserves biological distinctions that have not yet been formalized by scientific taxonomy. A remarkable example comes from the southern Western Ghats of India, where Indigenous Irula and Malasar communities recognized distinctions among grasses classified scientifically within *Tripogon*. Their knowledge drew attention to plants that were locally differentiated despite their similarity under the available scientific classification. Taxonomic work supported the recognition of one of these entities as a distinct species, *Tripogon cope*, on morphometric grounds, and subsequent ethnobotanical genomics work further illustrated how local classifications can guide investigation of such biological distinctions (Newmaster and Ragupathy 2010; Newmaster et al. 2008). In this case, local knowledge went beyond documenting a human relationship with a species before its formal scientific recognition and preserved a biological distinction that scientific taxonomy had not yet adequately represented.

The cases of *Biswamoyopterus laoensis* and *Tripogon cope* therefore reveal two different ways in which ethnobiological histories can precede taxonomic recognition. In the former, an organism was already embedded in human exploitation before being formally described as a species; in the latter, local knowledge distinguished biological entities before their differentiation was fully incorporated into scientific taxonomy. Together, these cases show that a species can be new to science without being new to people, and that the human-organism relationships associated with a newly recognized species may be much older than its scientific documentation.

Taxonomy changes; the evidence must remain

Taxonomic erosion reveals a paradox, in that taxonomic revisions can increase our knowledge of biodiversity by recognizing previously hidden diversity while simultaneously reducing the resolution with which accumulated information can be assigned to the newly recognized species. We may therefore know biological diversity better while having less securely attributable knowledge about the individual histories of some of its components. Taxonomic progress leaves the documented relationships intact and exposes that part of it was produced under species boundaries that no longer correspond to current ones.

This outcome can be avoided when records preserve evidence capable of following later changes in taxonomic circumscription, in which case ethnobiological knowledge can retain continuity or be taxonomically recovered. When the available evidence cannot distinguish among current taxa, the record remains valid but should be kept at the taxonomic level that can be defended. Reviews, databases, and new field studies should therefore preserve the taxon as originally published, provenance, and evidence supporting identification, together with any subsequent reassignment and its justification. For previously published records, we propose taxonomic reassessment of ethnobiological

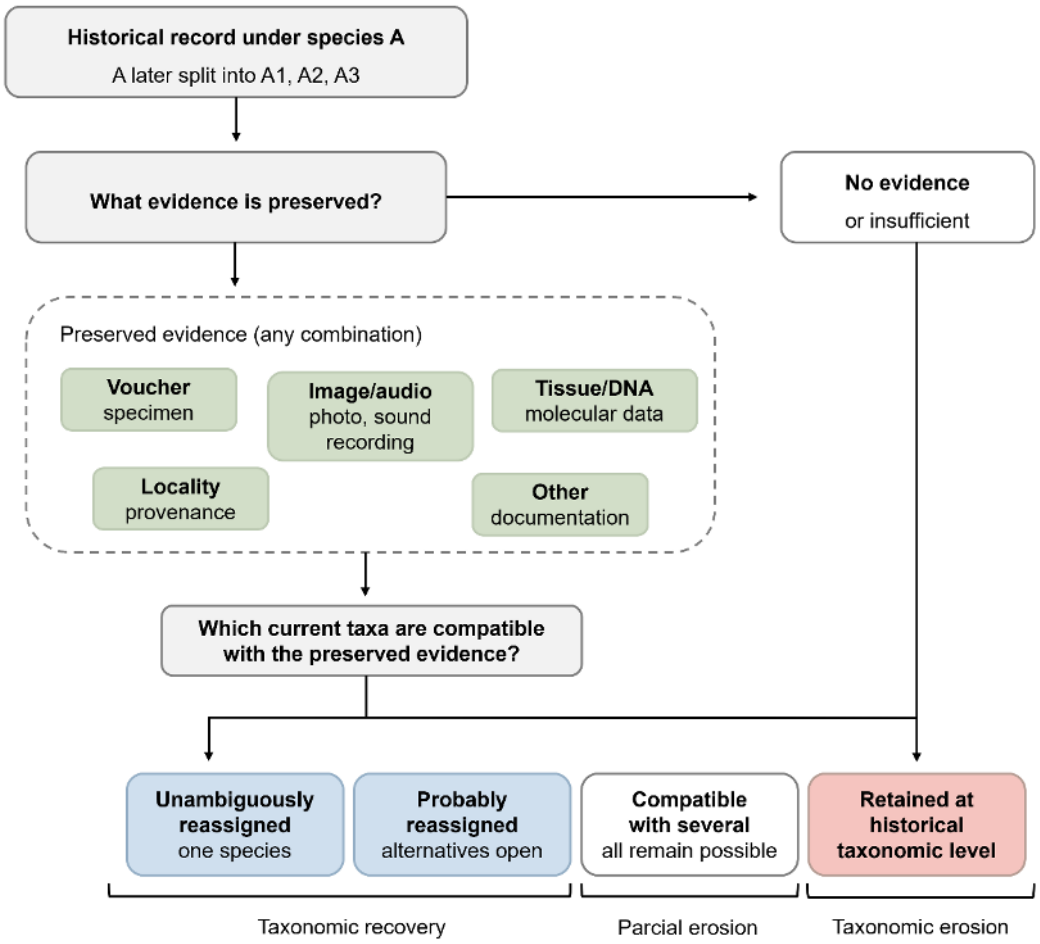

Figure 2. A framework for taxonomic traceability and reassignment of historical ethnobiological records. After a species is split, preserved evidence determines which currently recognized taxa remain compatible with a record. Records can be unambiguously or probably reassigned (taxonomic recovery), remain compatible with several taxa (partial taxonomic erosion), or be retained at the historical taxonomic level, which is also the outcome when no evidence is preserved (taxonomic erosion). The resolution assigned to a record should never exceed that supported by the evidence. Unresolved records can be reassessed as new evidence or methods become available.

records as a formal and citable practice in which historical records are re-evaluated against current taxonomy and classified according to the strength of the available evidence as unambiguously reassigned, probably reassigned, compatible with multiple current taxa, or retained at the historical taxonomic level (Figure 2). Such reassessments could be published as dedicated contributions or incorporated into databases and syntheses, providing a transparent mechanism for updating ethnobiological knowledge without creating unsupported taxonomic precision. Ethnobiological journals could also facilitate this process by providing space for substantial taxonomic reassessments of previously published records as publishable contributions, particularly when reassignment changes the species-level interpretation of historical use, trade, management, or other human-organism relationships.

When a historically broad species is split, the knowledge accumulated within its former boundaries does not split automatically with it. Some records may be reassigned confidently or probably to one of the resulting species, others may remain compatible with several, and still others may remain attributable only to the historical taxonomic concept. Preserved evidence may also allow unresolved records to be reassessed and taxonomically recovered as knowledge and analytical tools improve. Recognizing these different outcomes prevents changes in biodiversity clas-

sification from being confused with changes in the documented history of relationships between people and organisms. Preserving the evidence that connects each record to the organism documented is what allows ethnobiological knowledge to remain traceable and, when necessary, to be reassigned and taxonomically recovered as species boundaries change.

CONFLICT OF INTEREST

The authors serve as editors of Ethnobiology and Conservation and declare no other conflicts of interest.

CONTRIBUTION STATEMENT

Conceived the presented idea: RRNA.
Wrote the original draft: RRNA.
Reviewed and edited the manuscript: RRNA, AKMB, UPA.
Approved the final version of the manuscript: RRNA, AKMB, UPA.

DISCLOSURE OF AI USE

During the preparation of this manuscript, the authors used ChatGPT (OpenAI) to assist with literature searches and organization, development and refinement of the conceptual framework, and the development of figures. Claude (Anthropic) was also used to assist with language editing and revision of the English text. All literature sources, scientific interpretations, conceptual decisions, figures, and manuscript content were reviewed and validated by the authors, who take full responsibility for the final content of the publication.

REFERENCES

Abril VV, Carnelossi EAG, González S, Duarte JMB (2010) **Elucidating the evolution of the red brocket deer *Mazama americana* complex (Artiodactyla; Cervidae)**. *Cytogenetic and Genome Research* 128:177-187. doi: 10.1159/000298819.

Albuquerque UP (2006) **Re-examining hypotheses concerning the use and knowledge of medicinal plants: a study in the Caatinga vegetation of NE Brazil.** *Journal of Ethnobiology and Ethnomedicine* 2:30. doi: 10.1186/1746-4269-2-30.

Almerón-Souza F, Sperb C, Castilho CL, Figueiredo PICC, Gonçalves LT, Machado R, Oliveira LR, Valiati VH, Fagundes NJR (2018) **Molecular identification of shark meat from local markets in Southern Brazil based on DNA barcoding: evidence for mislabeling and trade of endangered species**. *Frontiers in Genetics* 9:138. doi: 10.3389/fgene.2018.00138.

Alves RRN, Souto WMS (2010) **Desafios e dificuldades associadas às pesquisas etnozoológicas no Brasil.** In: Alves RRN, Souto WMS, Mourão JS (eds) *A Etnozoologia no Brasil: importância, status atual e perspectivas*. 1st ed. NUPEEA, Recife, PE, Brazil, pp. 57-65.

Alves RRN, Vieira KS, Santana GG, Vieira WLS, Almeida WO, Souto WMS, Montenegro PFGP, Pezzuti JCB (2012a) **A review on human attitudes towards reptiles in Brazil**. *Environmental Monitoring and Assessment* 184:6877-6901. doi: 10.1007/s10661-011-2465-0.

Alves RRN, Pereira Filho GA, Vieira KS, Souto WMS, Mendonça LET, Montenegro PFGP, Almeida WO, Vieira WLS (2012b) **A zoological catalogue of hunted reptiles in the semiarid region of Brazil**. *Journal of Ethnobiology and Ethnomedicine* 8:27. doi: 10.1186/1746-4269-8-27.

Alves RRN, Rosa IL, Albuquerque UP, Cunningham AB (2013) **Medicine from the wild: an overview of the use and trade of animal products in traditional medicines**. In: Alves RRN, Rosa IL (eds) *Animals in Traditional Folk Medicine: Implications for Conservation*. Springer, Berlin, Germany, pp. 25-42. doi: 10.1007/978-3-642-29026-8_3.

Alves RRN, Araújo BMC, Policarpo IS, Pereira HM, Borges AKM, Vieira WLS, Vasconcellos A (2019) **Keeping reptiles as pets in Brazil: Ethnozoological and conservation aspects**. *Journal for Nature Conservation* 49:9-21. doi: 10.1016/j.jnc.2019.02.002.

Alves RRN, Borges AKM, Barboza RRD, Souto WMS, Gonçalves-Souza T, Provete DB, Albuquerque UP (2021) **A global analysis of ecological and evolutionary drivers of the use of wild mammals in traditional medicine**. *Mammal Review* 51:293-306. doi: 10.1111/mam.12233.

Benz BF, Cevallos J, Santana F, Rosales J, Graf S (2000) **Losing knowledge about plant use in the Sierra de Manantlán Biosphere Reserve, Mexico**. *Economic Botany* 54:183-191. doi: 10.1007/BF02907821.

Berlin B (1992) **Ethnobiological Classification: Principles of Categorization of Plants and Animals in Traditional Societies**. Princeton University Press, Princeton, USA.

Berlin B, Breedlove DE, Raven PH (1973) **General**

principles of classification and nomenclature in folk biology. *American Anthropologist* 75:214-242. doi: 10.1525/aa.1973.75.1.02a00140.

Borges AKM, Ribeiro BDP, Alves RRN (2023) **Hunting, capture, and wildlife use by communities in a semi-arid region of Northeastern Brazil.** *Human Dimensions of Wildlife* 28:187-197. doi: 10.1080/10871209.2021.2018738.

Bye RA Jr (1986) **Voucher specimens in ethnobiological studies and publications**. *Journal of Ethnobiology* 6:1-8.

Cavalcanti DR, Albuquerque UP (2013) **The "hidden diversity" of medicinal plants in northeastern Brazil: diagnosis and prospects for conservation and biological prospecting.** *Evidence-Based Complementary and Alternative Medicine* 2013:102714. doi: 10.1155/2013/102714.

Cifuentes-Rincón A, Morales-Donoso JA, Sandoval EDP, Tomazella IM, Mantellatto AMB, de Thoisy B, Duarte JMB (2020) **Designation of a neotype for *Mazama americana* (Artiodactyla, Cervidae) reveals a cryptic new complex of brocket deer species**. *ZooKeys* 958:143-164. doi: 10.3897/zookeys.958.50300.

Duarte JMB, González S, Maldonado JE (2008) **The surprising evolutionary history of South American deer**. *Molecular Phylogenetics and Evolution* 49:17-22. doi: 10.1016/j.ympev.2008.07.009.

Grenié M, Berti E, Carvajal-Quintero J, Dädlow GML, Sagouis A, Winter M (2023) **Harmonizing taxon names in biodiversity data: a review of tools, databases and best practices**. *Methods in Ecology and Evolution* 14:12-25. doi: 10.1111/2041-210X.13802.

Harvey MB, Ugueto GN, Gutberlet RL Jr (2012) **Review of Teiid morphology with a revised taxonomy and phylogeny of the Teiidae (Lepidosauria: Squamata)**. *Zootaxa* 3459:1-156. doi: 10.11646/zootaxa.3459.1.1.

Heinrich M, Lardos A, Leonti M, Weckerle C, Willcox M, Applequist W, Ladio A, Lin Long C, Mukherjee P, Stafford G (2018) **Best practice in research: consensus statement on ethnopharmacological field studies – ConSEFS.** *Journal of Ethnopharmacology* 211:329-339. doi: 10.1016/j.jep.2017.08.015.

Hoser R (2009) **A reclassification of the rattlesnakes; species formerly exclusively referred to the genera *Crotalus* and *Sistrurus***. *Australasian Journal of Herpetology* 6:1-21.

Huber JT (1998) **The importance of voucher specimens, with practical guidelines for preserving specimens of the major invertebrate phyla for identification**. *Journal of Natural History* 32:367-385. doi: 10.1080/00222939800770191.

Hunn ES (1977) **Tzeltal Folk Zoology: The Classification of Discontinuities in Nature**. Academic Press, New York, USA.

Hunn ES (1992) **The use of sound recordings as voucher specimens and stimulus materials in ethnozoological research.** *Journal of Ethnobiology* 12:187-198.

Kool A, de Boer HJ, Krüger Å, Rydberg A, Abbad A, Björk L, Martin G (2012) **Molecular identification of commercialized medicinal plants in Southern Morocco**. *PLoS ONE* 7:e39459. doi: 10.1371/journal.pone.0039459.

Łuczaj ŁJ (2010) **Plant identification credibility in ethnobotany: a closer look at Polish ethnographic studies**. *Journal of Ethnobiology and Ethnomedicine* 6:36. doi: 10.1186/1746-4269-6-36.

Manduzai AK, Karimi AG, Pieroni A (2026) **Back-and-forth moribund ethnobotany: erosion and fragmentation of Local Ecological Knowledge among Afghan returnees in contemporary Afghanistan and perspectives for an ethnobiology of the refugees**. *Journal of Ethnobiology and Ethnomedicine*. doi: 10.1186/s13002-026-00960-y.

Meyer L, Ladle RJ, Trad RJ, Frazão A, Frateles L, Lessa T, Pinto RB, Freitas TMS, Tessarolo G, Guedes JJM, Castro-Souza RA, Medeiros H, Jardim L, Neves DRM, Rosado BHP, Lohmann LG, Hortal J, Diniz-Filho JAF, Stropp J (2026) **Taxonomic uncertainty: causes, consequences, and metrics**. *Trends in Ecology & Evolution* 41:299-308. doi: 10.1016/j.tree.2025.12.006.

Mezzasalma V, Bruni I, Fontana D, Galimberti A, Magoni C, Labra M (2017) **A DNA barcoding approach for identifying species in Amazonian traditional medicine: The case of Piri-Piri.** *Plant Gene* 9:1-5. doi: 10.1016/j.plgene.2016.11.001.

Newmaster SG, Ragupathy S (2010) **Ethnobotany genomics - discovery and innovation in a new era of exploratory research**. *Journal of Ethnobiology and Ethnomedicine* 6:2. doi: 10.1186/1746-4269-6-2.

Newmaster SG, Balasubramaniam V, Murugesan M, Ragupathy S (2008) ***Tripogon cope* (Poaceae: Chloridoideae), a new species supported by morphometric analysis and a synopsis of *Tripogon* in India**. *Systematic Botany* 33:695-701. doi: 10.1600/036364408786500253.

Otieno J, Abihudi S, Veldman S, Nahashon M, van

Andel T, de Boer HJ (2015) **Vernacular dominance in folk taxonomy: a case study of ethnospecies in medicinal plant trade in Tanzania**. *Journal of Ethnobiology and Ethnomedicine* 11:10. doi: 10.1186/1746-4269-11-10.

Peres PHF, Luduvério DJ, Bernegossi AM, Galindo DJ, Nascimento GB, Oliveira ML, Sandoval EDP, Vozdova M, Kubickova S, Cernohorska H, Duarte JMB (2021) **Revalidation of *Mazama rufa* (Illiger 1815) (Artiodactyla: Cervidae) as a distinct species out of the complex *Mazama americana* (Erxleben 1777)**. *Frontiers in Genetics* 12:742870. doi: 10.3389/fgene.2021.742870.

Reis MMT, Liebl ARS, Ribeiro MWS, Santos ANA, Ladislau DS, Aride PHR, Oliveira AT (2026) **Ethnoichthyological knowledge of commercial fishermen of edible fish in the city of Barcelos, middle Rio Negro, Amazonas.** *Ethnobiology and Conservation*, 15:1-26. doi: 10.15451/ec2026-09-15-14-1-26.

Rivera D, Allkin R, Obón C, Alcaraz F, Verpoorte R, Heinrich M (2014) **What is in a name? The need for accurate scientific nomenclature for plants.** *Journal of Ethnopharmacology* 152:393-402. doi: 10.1016/j.jep.2013.12.022.

Sanamxay D, Douangboubpha B, Bumrungsri S, Xayavong S, Xayaphet V, Satasook C, Bates PJJ (2013) **Rediscovery of *Biswamoyopterus* (Mammalia: Rodentia: Sciuridae: Pteromyini) in Asia, with the description of a new species from Lao PDR**. *Zootaxa* 3686:471-481. doi: 10.11646/zootaxa.3686.4.5.

Serite CP, Ntshudisane OK, Swart E, Simbine L, Jaime GLM, Teske PR (2021) **Limitations of DNA barcoding in determining the origin of smuggled seahorses and pipefishes**. *Forensic Science International: Animals and Environments* 1:100006. doi: 10.1016/j.fsiae.2021.100006.

Siciliano S, Viana MC, Bonvicino CR, Ruenes GF, Donato ALDS, Emin-Lima R, Attademo FLN, Luna FO, Valiati VH, Oliveira LR, Costa AF (2023) **Giving names to the characters: identifying, tracing and estimating the multiple use of aquatic wildlife in Brazil.** In: Galetti PM Jr (ed) *Conservation Genetics in the Neotropics*. Springer, Cham, Switzerland, pp. 325-349.

Soares H, Barboza RRD, Feijó A, Provete DB, Alves RRN (2025) **Worldwide patterns of wild mammal trade are driven by species ecology, evolutionary relatedness, and socio-political variables: inferences from the TRAFFIC bulletin**. *Ethnobiology and Conservation* 14:1-17. doi: 10.15451/ec2025-07-14.25-1-17.

Souto WMS, Santos EPO, Silva JAA, Menezes IS, Alves RRN, Silva AB (2026) **Far Beyond Bushmeat: A Review of the Hunting and Uses of Neotropical Columbids.** *Ethnobiology and Conservation*, 15: 1-17 doi: 10.15451/ec2026-07-15-15-1-17.

Spinks PQ, Thomson RC, Hughes B, Moxley B, Brown R, Diesmos A, Shaffer HB (2012) **Cryptic variation and the tragedy of unrecognized taxa: the case of international trade in the spiny turtle *Heosemys spinosa* (Testudines: Geoemydidae)**. *Zoological Journal of the Linnean Society* 164:811-824. doi: 10.1111/j.1096-3642.2011.00788.x.

Turney S, Cameron ER, Cloutier CA, Buddle CM (2015) **Non-repeatable science: assessing the frequency of voucher specimen deposition reveals that most arthropod research cannot be verified**. *PeerJ* 3:e1168. doi: 10.7717/peerj.1168.

Veldman S, Ju Y, Otieno JN, Abihudi S, Posthouwer C, Gravendeel B, van Andel TR, de Boer HJ (2020) **DNA barcoding augments conventional methods for identification of medicinal plant species traded at Tanzanian markets**. *Journal of Ethnopharmacology* 250:112495. doi: 10.1016/j.jep.2019.112495.

Wüster W, Bérnils RS (2011) **On the generic classification of the rattlesnakes, with special reference to the Neotropical *Crotalus durissus* complex (Squamata: Viperidae)**. *Zoologia* 28:417-419. doi: 10.1590/S1984-46702011000400001.

Zent S (2001) **Acculturation and ethnobotanical knowledge loss among the Piaroa of Venezuela: demonstration of a quantitative method for the empirical study of traditional ecological knowledge change**. In: Maffi L (ed) *On Biocultural Diversity: Linking Language, Knowledge, and the Environment*. Smithsonian Institution Press, Washington, DC, USA, pp. 190-211.

Received: 08 October 2026
Accepted: 10 October 2026
Published: 14 October 2026