



# Ethnozoological insights from Nepal: Vertebrate diversity in ethnomedicine

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(Received: 24 October 2025; Revised: 10 December 2025; Accepted: 23 December 2025)

## Abstract

This study provides a review of the ethnozoological knowledge and zootherapeutic practices among the diverse ethnic communities of Nepal, noting the cultural, medicinal, conservation significance of animal-based remedies. Traditional healing systems across Nepal rely on fauna and their derivatives hence forming an important component of indigenous healthcare. Relevant literature was reviewed using PubMed, Scopus, ScienceDirect, ResearchGate and Google Scholar using key terms like “Ethno-zoological study”, “medicinal animal”, “traditional medicine”, “traditional medicine practitioner”, “Nepal”. From a total of 100 articles, 27 articles representing 20 ethnic groups were selected. In total, 97 species of vertebrates belonging to 48 families and 29 orders were identified for treating 85 distinct ailments, most associated with musculoskeletal, digestive, and reproductive disorders. The species *Canis aureus*, *Columba livia*, and *Axis axis* were most frequently cited, with meat, fat, and bile being the predominant animal parts utilized. Notably, 28 species were classified as globally threatened, highlighting the tension between traditional medicine and biodiversity conservation. This review aims to highlight Nepal's rich bio-cultural diversity and the role of zotherapy in primary healthcare, while identifying critical knowledge gaps in underrepresented ethnic groups. Interdisciplinary approaches involving ethnobiology, pharmacology, toxicology and conservation science are needed to validate therapeutic claims and ensure public health safety and promote sustainable management of faunal resources.

**Keywords:** Biodiversity conservation, ethnozoology, indigenous knowledge, traditional medicine, zotherapy

## Introduction

Humans have been using animals and their products for various purposes like food, medicines, clothes and other services since prehistoric era (de Melo et al., 2014; Hussain & Tynsong, 2021). Studying the interactions and relationships between humans and animals is known as ethnozoology (Lema et al., 2025). The study encompasses studying of animal use, species diversity, ethno-taxonomy, and animal conservation within the framework of the culture and traditions of involved local community (Audina et al., 2015; Román et al., 2023; Solís & Casas, 2019). Therefore, ethnozoological studies are very important for understanding the complex connections between people and animals, and its impact on environmental sustainability and the protection of natural resources (Setyawan et al., 2024).

Indigenous people possess vast array of natural remedies using traditional medicine derived from wild plants and animals (Alves & Alves, 2011). Such medicine encompasses a comprehensive knowledge base, skills, and practices rooted in the theoretical frameworks, cultural beliefs, and experiences, and is used to prevent, diagnose, improve, or treat ailments whether explicable or not (Kandari et al., 2015). This knowledge is primarily based on local resources and expertise, offering a vital alternative in developing countries having limited access to pharmaceuticals (Acharya et al., 2025; Mutula et al., 2025). According to the World Health Organization (WHO, 1993), around 70-80% of the world's rural population relies on primary health care on traditional medicine.

Animals and their derived products play crucial roles in numerous traditional therapies, and their evidence can be traced since historic era (Acharya et al., 2025). The treatment of human ailments with traditional medicines derived from animal products is termed as Zoo-therapy (Alves & Alves, 2011; Timothy et al., 2018). Animals not only contribute to tradition but also to modern medicines and therapies (Acharya et al., 2025; Mengistu et al., 2024). Out of 252 chemicals selected as essential by the World Health Organization (WHO), 11.1% are derived from plants and 8.7% from animals (Dedeke et al., 2006). In recent times, the application of zotherapy has been considered primary option among many other known therapeutic practices in the world (Kendie et al., 2018). Zoo-therapy is being increasingly recognized for its potential contribution in understanding and addressing ecological challenges including complex issues of conservation in modern research (Brook & McLachlan, 2008; Mekonen et al., 2017; Mutula et al., 2025). Zoo-therapy is intertwined with sociocultural and religious beliefs making it necessary to be understood by those involved in modern conservation efforts (Alves & Alves, 2011). The use of animal medicine in across cultures shows the need for interdisciplinary ethnozoological research to inform biodiversity conservation (Hailemariam & Mekonen, 2021).

Nepal is a small country rich in bio-cultural diversity with 142 ethnicities (CBS, 2021) having intimate interrelationship with number of unique assemblages of fauna (Gurung, 2021; Shrestha & Bajracharya, 2023). Much of the historical and contemporary indigenous knowledge of numerous ethnic groups around the world

is in vanishing state due to modernization, cultural shifts, and the loss of oral traditions, so is in case of Nepal (Acharya et al., 2025). While numerous ethnobotanical studies have documented plant-based remedies, research on animal-derived medicines, study on zootherapeutic practices remains comparatively limited and underrepresented (Acharya et al., 2025; Hussain & Tynsong, 2021; Quave et al., 2010). To address this gap, this review aims to document the diversity of species used in ethnomedicines, examine cultural and conservation implications of zootherapeutic practices and identify research gaps for future interdisciplinary studies.

### Materials and Methods

The publications were searched using PubMed, Scopus, ResearchGate, Google Scholar and ScienceDirect to collect the required information on ethnozoology and associated traditional therapeutic knowledge of Nepal. Articles were carried out without regard to time restrictions and were searched using key terms such as “Ethno-zoological study,” “animal products,” “fauna,” “medicinal animal,” “traditional medicine,” “ethno-medicine,” “animal-based remedies,” “traditional medicine practitioner,” and “Nepal” used separately and in combination using Boolean operators “OR” or “AND”. Additionally, manual Google searches and

reference list screening were conducted to find other relevant articles.

All papers were screened in accordance with the PRISMA 2020 guidelines. Studies that were published in peer-reviewed journals or academic theses accessible online, and that focused on vertebrate species used for human medicinal purposes in Nepal, were included. Only studies that provided clear information on the animal species, parts used, and ailments treated were considered eligible. Studies that were conducted outside Nepal, focused exclusively on ethnobotany or invertebrates, or described veterinary and livestock treatments were excluded. Likewise, studies lacking defined objectives, methods, or usable data on zootherapeutic applications were not included in the final analysis.

A total of 100 articles were initially retrieved (Google Scholar = 50; Scopus = 20; PubMed = 15; ResearchGate = 10; ScienceDirect = 5). After removing duplicates (n = 6) and applying the inclusion/exclusion criteria, 27 studies representing 20 indigenous and local ethnic groups were selected for review. The study identification and selection process is summarized in Fig. 1.

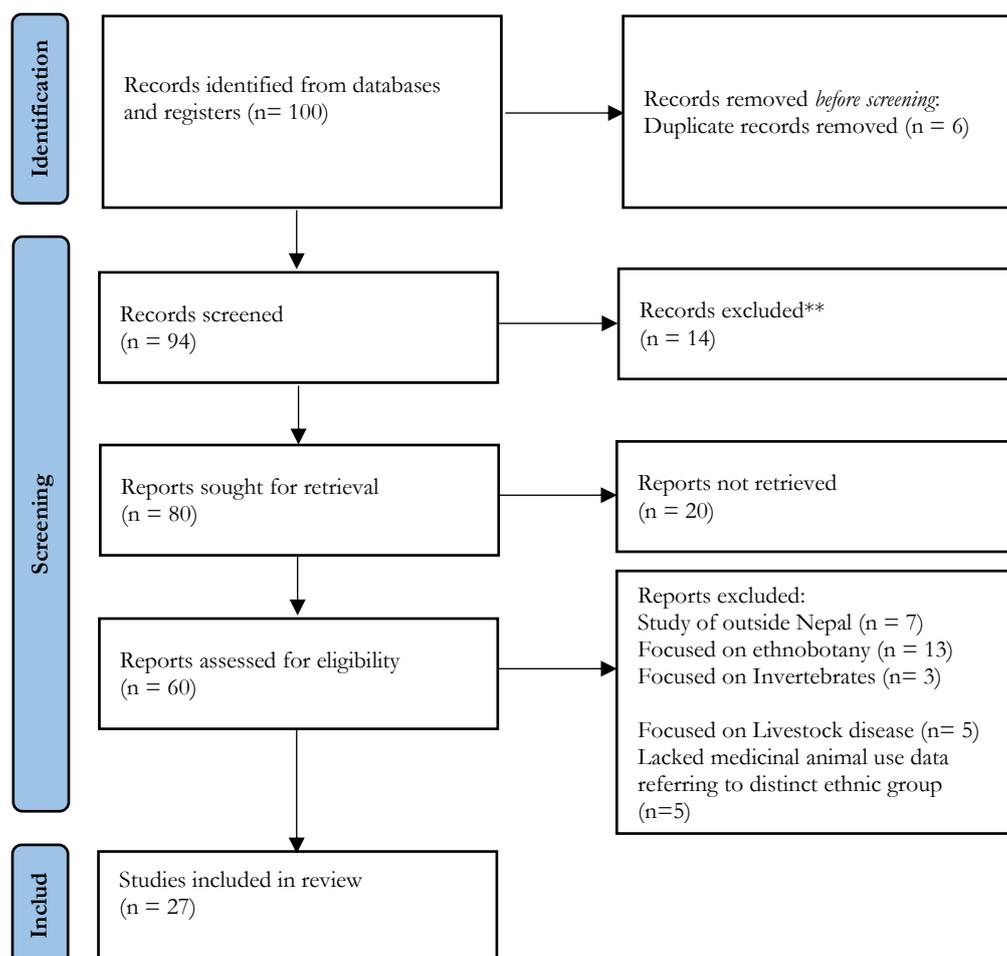


Figure 1. PRISMA flowchart of study selection and inclusion process

For each eligible study, key data like species name, taxonomic classification, IUCN status, animal part used, ailment treated, and associated ethnic group were extracted and enlisted in Microsoft Excel spreadsheet and descriptive analysis were performed using Pivot table to summarize proportion of species by taxonomic class (Aves, Mammalia, Reptilia, Pisces, Amphibia), frequency of ailments treated and commonly used animal parts, number of threatened species by IUCN category; and distribution of species use across ethnic groups. Relative frequencies and percentages were calculated to visualize trends, and results were illustrated using bar charts and pie charts, generated in Excel. No meta-analysis was conducted because of the narrative and heterogeneous nature of available data.

## Results and Discussion

### Species Used According to Class

A total of 97 species belonging to 48 families and 29 orders were recorded for their ethno-medicinal use across Nepal. Among these, Aves (31.9%) were the most represented, followed by Mammalia (25.8%), Reptilia (21.6%), Pisces (16.5%), and Amphibia (3.1%). The most quoted avian species were *Columba livia*, *Passer domesticus*, and *Vanellus indicus*, whereas *Canis aureus*, *Lepus nigricollis*, and *Rhinoceros unicornis* were the most cited mammals. Similarly Reptilian record was dominated by

Chelonian species. These were found to be mostly used by ethnic groups like Tharu, Magar, Badi, and Balami groups, residing in lowland regions where reptiles are abundant. *Monopterusuchia*, *Anguilla bengalensis*, and *Tor putitora* were most cited Pisces and only three species of amphibian i.e *Hoplobatrachus tigerinus*, *Nanorana liebigii*, and *Nanorana polunini* were quoted across the literature. The comparative use trend among all the classes of vertebrate is shown in Figs. 2 and 3.

The predominance of Aves and mammals is consistent with the studies of India, Latin America and Ethiopia, where high diversity of species has been linked with primary health care practices among indigenous communities (Acharya et al., 2025; Alves & Alves, 2011; Hussain & Tynsong, 2021; Mengistu et al., 2024; Vijayakumar et al., 2015). This can be attributed to ecological abundance, ease of identification and symbolic roles in cultural belief system. The most commonly treated ailments like arthritis, rheumatism, fractures, asthma, tuberculosis, pneumonia, diarrhea, dysentery, gastritis etc. also align with the global trend in ethnozoological practices (Acharya et al., 2025; Alves & Alves, 2011; Hussain & Tynsong, 2021; Mengistu et al., 2024; Vijayakumar et al., 2015).

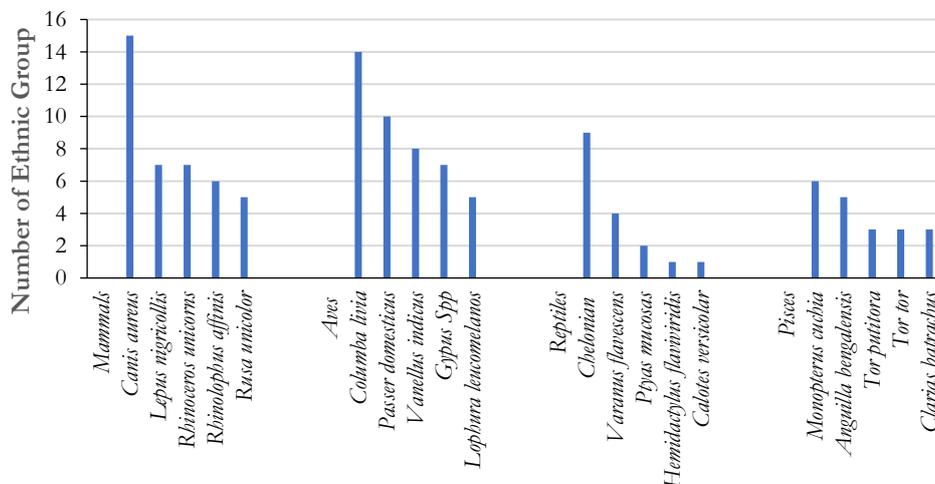


Figure 2. Representation of the most used species from each class in ethnomedicine

### Species and Ailment Distribution

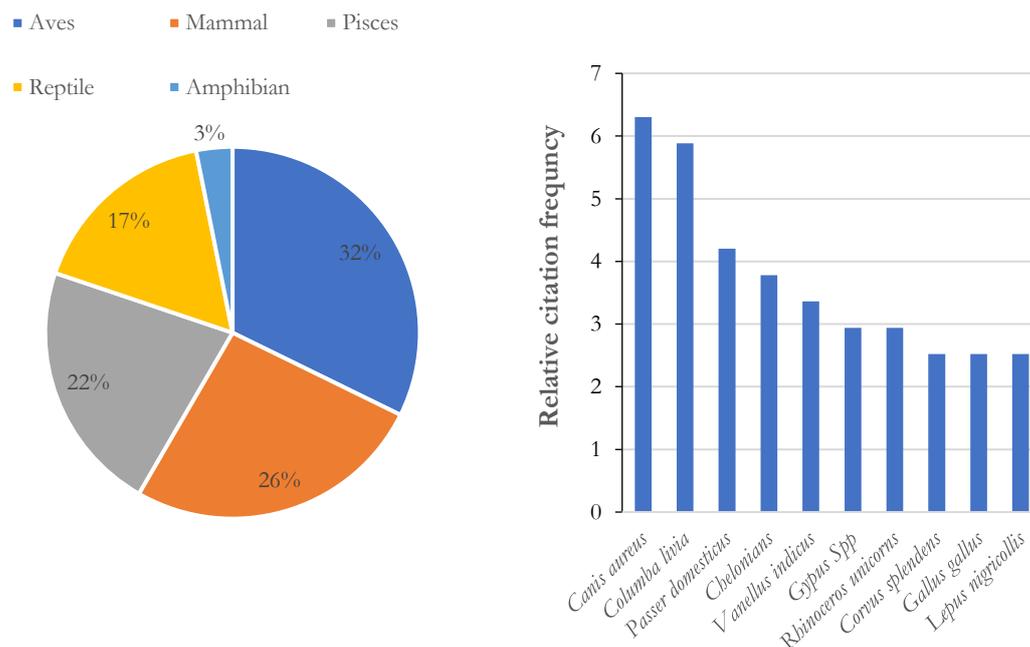
The documented species were found to be used in the treatment of 85 unique ailments mostly of Musculoskeletal (16%), digestive (12%) and reproductive category (11%) (Figure 4) which supports the global ethnozoological pattern where chronic and high-incidence health issues are addressed using animal-derived remedies valued for their perceived efficacy and symbolic potency (Adhikari et al., 2020; Vijayakumar et al., 2015). *Canis aureus*, Chelonian, *Axis axis* and *Columbia livia* were the most versatile species, treating greatest number of ailments (Figure 5). Birds and mammals are easily available, identifiable and deeply embedded in local

belief systems symbolizing healing, purity, and strength (Alves & Alves, 2011; Lohani, 2012). These same species appear frequently in traditional pharmacopeias of South Asia, Africa, and Latin America for analogous uses, indicating cross-cultural convergence in medicinal traditions (de Melo et al., 2014; Khadka & Yadav, 2018; Quave et al., 2010).

Similarly, *Canis aureus*, *Columbia livia*, and *Passer domesticus* were used by the largest number of ethnicities as shown in Figure 2. The overlap in species use among several ethnic groups might have resulted from possible knowledge exchange between geographically proximate

populations. Such cultural diffusion has been observed in other South Asian and Latin American regions, where neighboring communities share common faunal resources for medicinal purposes (Alves & Alves, 2011; Hussain & Tynsong, 2021). The fact that different ethnic groups use the same animals for similar health problems reflects a pattern of shared or convergent knowledge, which indicates that these remedies may be effective (Alves & Alves, 2011). Studies from places as far apart as Brazil, Ethiopia, and Mexico show similar overlaps in the use of certain animals for medicine (Román et al.,

2023; Solís & Casas, 2019). However, the predominance of mammals and birds in this pharmacopeia raises conservation concerns, as many of these species face ecological pressures and legal protection (Lema et al., 2025; Mekonen et al., 2017; WHO, 2023). Hence, while the convergence of *Canis aureus*, *Axis axis*, and *Columba livia* across diverse cultures reinforces their potential pharmacological relevance, sustainable integration of traditional zotherapy with modern conservation and biomedical validation frameworks remains essential for preserving both cultural knowledge and biodiversity.



**Figure 3.** Comparative representation of vertebrate species used in ethnomedicine;

### Ethnic Group Utilization

Medicinal animal use was recorded among 20 ethnic groups of Nepal. The Tharu, followed by the Magar and Jirel, used the highest number of species (Fig. 6), whereas the Badi, Brahmin, Tharu, and Tamang groups reported the largest number of ailments treated. The extensive use of fauna by Tharu and Magar communities reflects their close interaction with forest ecosystems and dependence on natural resources for primary healthcare (Gurung, 2021; Lohani, 2012).

Lowland ethnic groups, such as the Tharu, Badi, and Magar, rely heavily on surrounding wetlands, river systems, and tropical forests, which offer abundant access to fish, reptiles, and birds. In contrast, highland communities like the Tamang, Lapcha, and Tangebeton inhabit colder, mountainous regions with lower faunal diversity and instead depend on fewer but symbolically significant species, often used in spiritual or ritual healing (Acharya et al., 2025; Gurung, 2021). For example, Himalayan groups attribute sacred powers to *Moschus chrysogaster* (musk deer) and *Panthera uncia* (snow leopard),

using them symbolically rather than for consumption (Shrestha & Bajracharya, 2023).

This geographical variation illustrates how ecological availability, livelihood, and faith traditions shape species use across Nepal. Smaller groups such as the Lapcha and Tangebeton reported the use of fewer animal species, likely due to isolation and underrepresentation in ethnobiological studies. Expanding research in such communities is vital for documenting Nepal's full range of traditional knowledge.

### Animal Parts Used in Remedies

Meat, fat and bile were mostly used parts in treatment of variety of ailment categories (Fig. 7). Eggs, blood and bones were frequently used for respiratory and musculoskeletal disorders. Skin, Secretions and whole animals were less common and applied in treatment of wounds, burns and skin related ailments. Animal parts used in traditional systems such as bile, fat and musk are documented to have bioactive compounds in biomedical studies, revealing their potential pharmacological relevance (Liu et al., 2021; Luo et al 2025). In contrast,

species like bats and rodents, used in traditional medicines are reported to pose significant zoonotic risks (Banerjee et al., 2019; Rahman et al., 2020). The predominance of meat, fat and bile in contrast to the rare

use of secretions suggests that traditional practices often rely on consumptive uses of animals, possessing significant implication on species survival. This is more concerning when threatened species are involved.

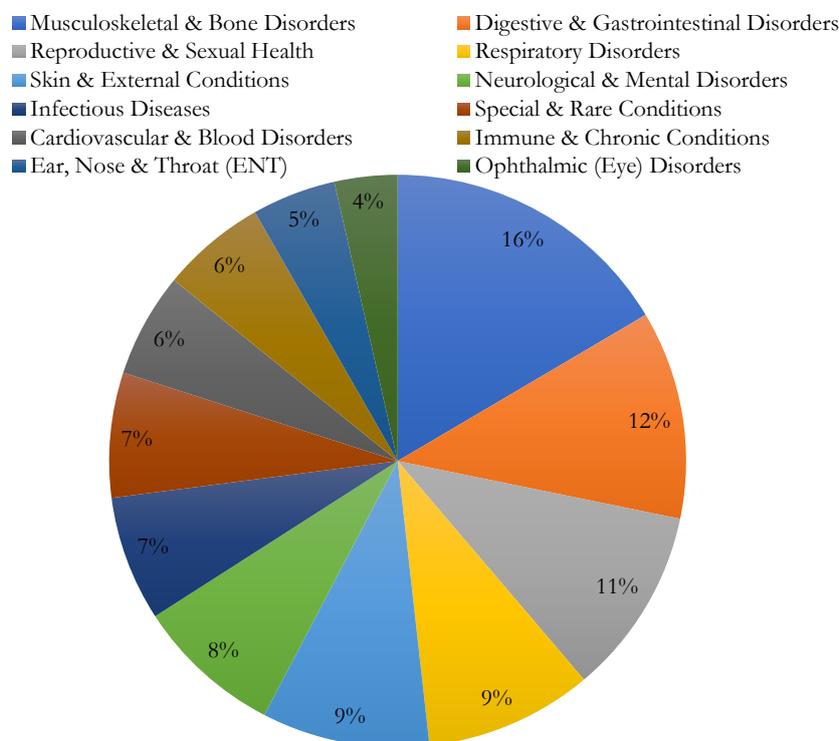


Figure 4. Percentage distribution of ailment categories treated using treated using vertebrates.

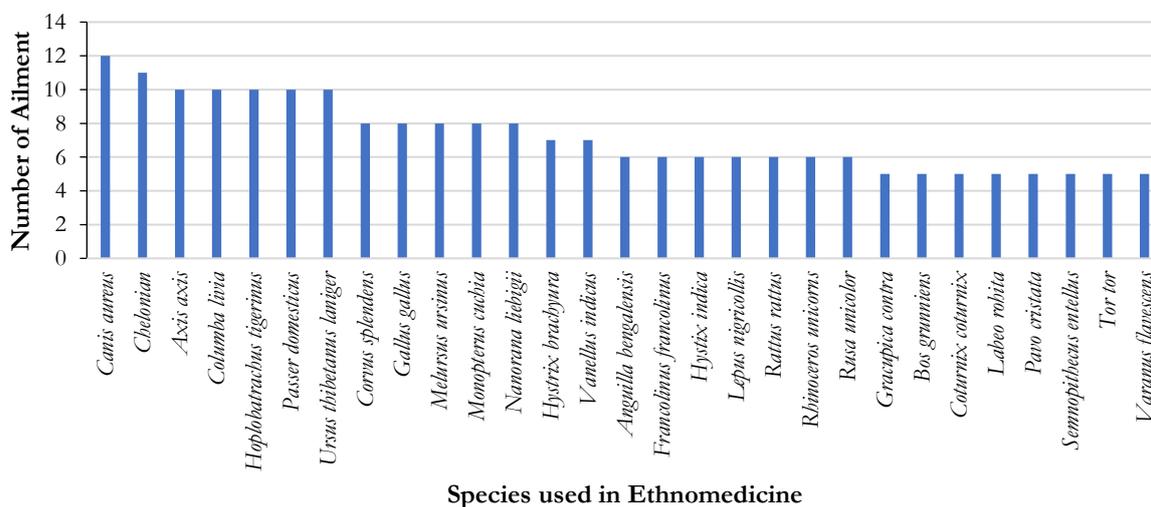


Figure 5. Number of ailments cured by using the species

### Threatened Species

Of the 97 recorded species, most species are least concerned as shown on Figure 8. Notably, 28 species were classified as globally threatened as shown in Table

1. One species of class Pisces, *Tor tor* of order Cypriniformes and family Cyprinidae was found to be data deficient.

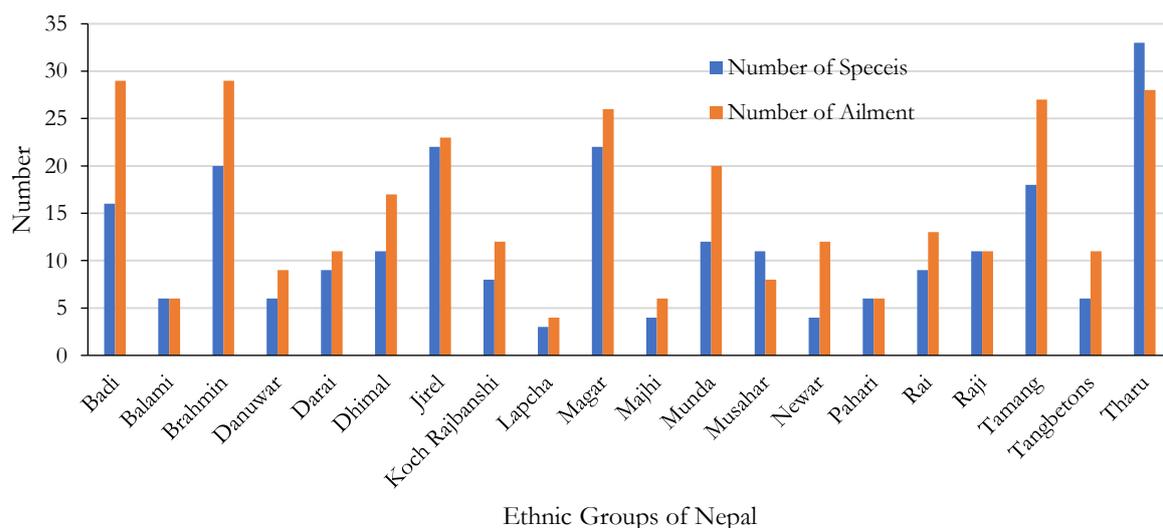


Figure 6. Representation of species used, and ailment treated by different ethnic groups

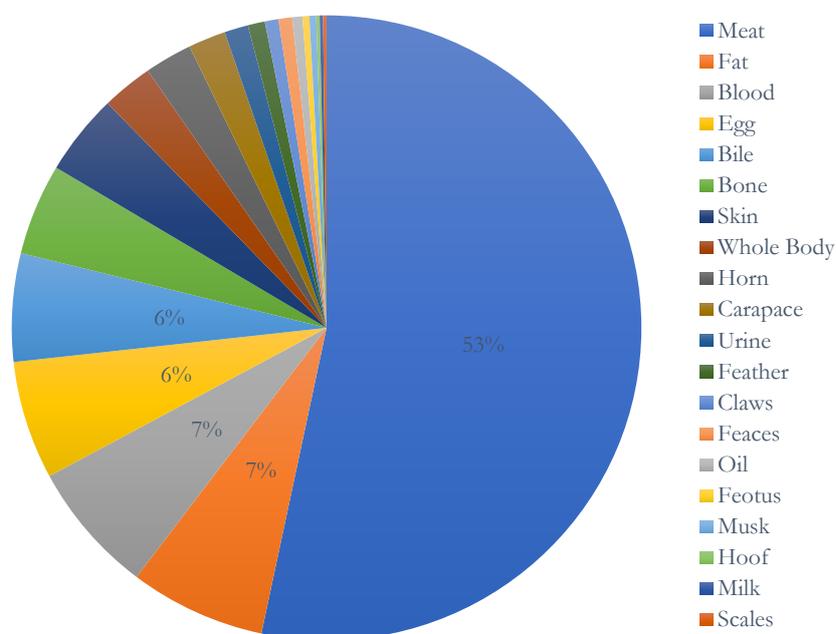


Figure 7: Parts used in remedies of different ailments

Table 1. Threatened species used in Ethnomedicine

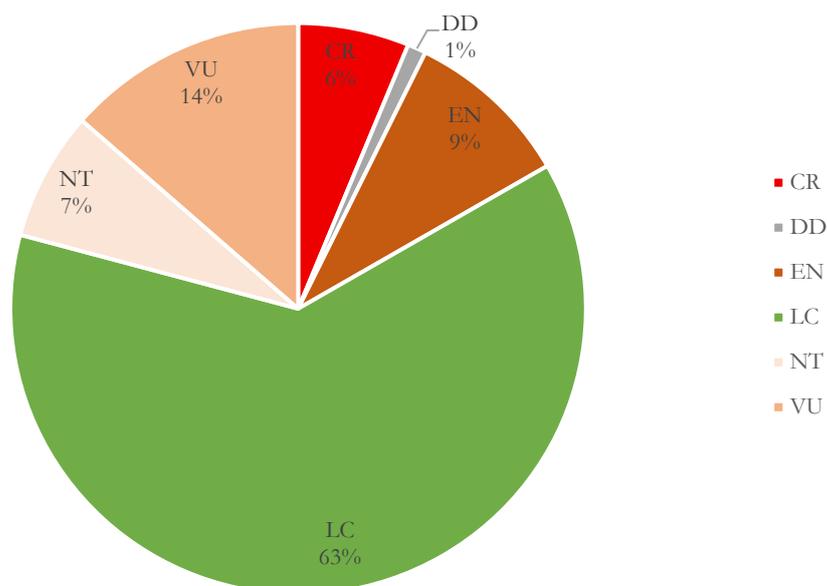
Threat Category (IUCN)	No. of Species	Species (Scientific Name)
Critically Endangered (CR)	6	<i>Indotestudo elongata</i> , <i>Batagur kachuga</i> , <i>Nilssonina nigricans</i> , <i>Gyps bengalensis</i> , <i>Gyps tenuirostris</i> , <i>Manis pentadactyla</i>
Endangered (EN)	9	<i>Melanocheilus tricarinata</i> , <i>Geoclemys hamiltonii</i> , <i>Batagur dbongoka</i> , <i>Chitra indica</i> , <i>Elephas maximus</i> , <i>Moschus chrysogaster</i> , <i>Tor putitora</i> , <i>Varanus flavescens</i>
Vulnerable (VU)	14	<i>Melursus ursinus</i> , <i>Mus musculus</i> , <i>Rhinoceros unicornis</i> , <i>Rucervus duvaucelii</i> , <i>Rusa unicolor</i> , <i>Ursus tibetanus</i> , <i>Wallago attu</i> , <i>Schizothorax richardsonii</i> , <i>Schizothorax plagiostomus</i> , <i>Nilssonina burum</i> , <i>Nilssonina gangetica</i> , <i>Morenia petersi</i> , <i>Amyda ornata</i> , <i>Hardella thurjii</i>

It is essential to integrate molecular, pharmacological, and toxicological analyses with ethnobiological knowledge is essential to verify the efficacy and safety of animal-derived remedies used in traditional medicine.

Advanced methods such as compound isolation, bioassays, and metabolomic profiling can help identify active constituents and validate traditional claims, supporting both drug discovery and the mitigation of

health risks from untested formulations (Liu et al., 2021; Luo et al., 2025). The zootherapeutic knowledge of more than 120 ethnic communities in Nepal remains undocumented, creating a significant data gap in understanding the full extent of biocultural diversity. Therefore, future research should focus on these understudied and remote groups, adopting interdisciplinary approaches that combine ethnobiology, pharmacology, toxicology, and conservation science. The frequent use of threatened species further

underscores the need for community-based conservation strategies that align with indigenous livelihoods and promote sustainable resource use. Integrating these efforts within the One Health framework, recognizing the interdependence of human, animal, and ecosystem health, provides a balanced pathway to preserve both traditional knowledge and biodiversity and guides ethical biomedical innovation in Nepal.



**Figure 8.** Composition of species according to IUCN status

## Conclusions

This review presents a total of 97 vertebrate species used by 20 ethnic groups in Nepal to treat 85 ailments, testifying to the profound roots of zootherapeutic knowledge in the rich biocultural landscape of the country. The fact that Aves and mammals are dominant, besides a frequent use of meat, fat, and bile, expresses both ecological availability and deep cultural connections between people and wildlife. However, the use of 28 globally threatened species has serious conservation, ethical, and health implications. Unregulated harvesting of endangered fauna can accelerate biodiversity loss and disrupt ecosystems while potentially creating a conduit for zoonotic disease transmission. Many traditional remedies also remain untested scientifically, which intends to point out the urgent requirement for biological and pharmacological detailed research to ascertain safety, efficacy, and active principles. A holistic approach of One Health is hence called for a method that extends the circle of documentation to the marginal and least-studied areas, promotes interdisciplinary research, and develops sustainable use through community awareness and the facilitation of substitutes for the threatened species. Combining traditional knowledge with scientific validation and conservation policy offers a protection strategy for endangered

wildlife, preservation of unique oral and cultural heritages in Nepal, and encouragement for developing ethical evidence-based biomedical innovations serving both local and global health.

**Authors contributions:** Conceptualization, methodology, data curation, original draft preparation, KR; Writing—review and editing, KD; Writing—review and editing, AK and Writing—review, editing and supervision, DG. All authors have read and agreed to the final version of the manuscript.

**Conflicts of Interest:** The author declares no conflicts of interest.

**Data Availability Statement:** The data that support the findings of this study are available from the corresponding author upon reasonable request.

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