



Ethnozoological Use of Reptiles by the Adi and Galo Tribes of Arunachal Pradesh

Omeneyi Pertin¹, Sompha Wangsu², Katynam Panor³, Nending Muni⁴

¹Research Scholar

²Research Scholar

³Research Scholar

⁴Assistant Professor

^{1,2,3 & 4}Dept. of Zoology, Himalayan University, Jullong, Itanagar, Arunachal Pradesh

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Abstract

Reptiles constitute an important component of traditional food systems and ethnomedicinal practices among many indigenous communities worldwide. In Northeast India, particularly Arunachal Pradesh, traditional knowledge regarding reptile utilization remains insufficiently documented despite the region's rich biodiversity and cultural diversity. The present study investigated the utilization of reptiles as food resources and traditional medicine among the Adi and Galo tribes of Arunachal Pradesh and assessed local awareness regarding health risks and reptile conservation. A cross-sectional mixed-method survey was conducted in Parbuk village of Lower Dibang Valley District and Aalo of West Siang District. Data were collected from 120 respondents using structured questionnaires, interviews, and direct community interactions. Statistical analyses included descriptive statistics, reliability testing, correlation analysis, Kaiser–Meyer–Olkin (KMO) testing, Bartlett's Test of Sphericity, and Exploratory Factor Analysis. The overall reliability coefficient of the questionnaire was acceptable (Cronbach's $\alpha = 0.781$), while KMO (0.684) and Bartlett's Test ($p < 0.05$) confirmed data suitability for factor analysis. Approximately 85% of respondents reported consuming reptile meat, with monitor lizards representing the most preferred species (69.01%). Wild hunting remained the principal source of reptile acquisition (94.23%). Ethnomedicinal practices were primarily documented among the Adi tribe, who reported the use of monitor lizard fat, gall bladder, and tail ash for treating allergies, hyperglycemia, and ear infections, respectively. Correlation analysis demonstrated a significant positive relationship between motivational-cultural factors and health-related perceptions ($r = 0.940$, $p < 0.05$). Although respondents possessed moderate awareness regarding hygiene and conservation issues, knowledge of reptile-associated zoonotic diseases remained limited. The study highlights the continued importance of reptiles within indigenous food and

¹Corresponding Author

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medicinal systems while emphasizing the need for conservation education and sustainable utilization strategies to ensure long-term biodiversity protection.

Keywords: Arunachal Pradesh, Conservation awareness, Ethnozoology, Indigenous knowledge, Reptile Consumption, Traditional Medicine

Introduction

Human societies have relied upon wildlife resources for subsistence, medicine, cultural practices, and spiritual purposes throughout history. Among vertebrate groups, reptiles have occupied an important position in traditional food systems and medicinal practices across many regions of Asia, Africa, and South America. Reptiles such as snakes, turtles, tortoises, crocodilians, and monitor lizards are widely consumed as alternative sources of animal protein and are frequently incorporated into traditional healthcare systems (Alves et al. 2008). Previous studies indicate that reptiles provide substantial nutritional benefits owing to their high protein content, low fat concentration, and presence of essential amino acids necessary for human health.

Beyond their nutritional value, reptiles are deeply embedded within traditional medicinal systems. Various body parts, including fats, skin, bones, bile, and internal organs, are used to treat ailments ranging from inflammation and skin diseases to respiratory disorders and rheumatic conditions (Mahawar & Jaroli, 2006; Mukherjee et al. 2017; Mishra et al, 2020; Getachew et al. 2022). Such practices are particularly common among indigenous communities where traditional ecological knowledge remains closely connected to local biodiversity.

India possesses remarkable reptilian diversity and supports numerous indigenous cultures that maintain long-standing relationships with wildlife resources. Northeast India, recognized as part of the Indo-Burma biodiversity hotspot, contains exceptional biological richness and cultural heterogeneity (Chatterjee et al. 2006). Within this region, Arunachal Pradesh harbors extensive forest ecosystems and more than one hundred documented reptile species in Indo-Burma, creating opportunities for diverse human–reptile interactions (Chandra et al. 2018). At the same time, the ongoing use of reptiles raises important conservation considerations. Growing demand, habitat degradation, and environmental pressures may place stress on wild reptile populations. Since reptiles play significant roles in maintaining ecological balance, their decline can have broader impacts on ecosystem stability (Valencia-Aguilar et al. 2013). The use of reptiles in India is regulated under the Wildlife (Protection) Act, 1972, as amended by the Wildlife (Protection) Amendment Act, 2002. Many reptile species, including monitor lizards, turtles and pythons, are protected under different schedules of the act (Government of India, 1972; Government of India, 2002).

Several studies have documented wildlife utilization among indigenous communities in Northeast India. However, most investigations have focused either on food consumption

or medicinal use separately (Chakravorty et al. 2011; Singh et al. 2023; Hussain & Tynsong, 2021). Limited attention has been directed toward understanding the integrated role of reptiles as both dietary and medicinal resources while simultaneously evaluating community perceptions regarding health risks and conservation concerns. Furthermore, few field-based studies have specifically examined reptile utilization among the Adi and Galo tribes of Arunachal Pradesh.

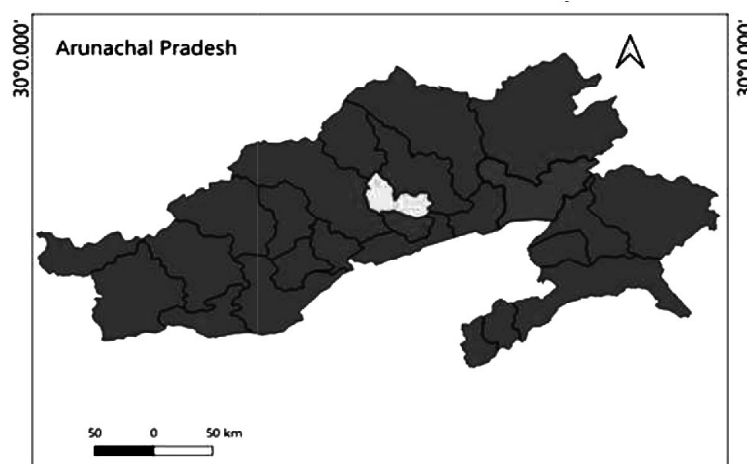
Understanding indigenous wildlife utilization practices is increasingly important because modernization, changing lifestyles, conservation regulations, and habitat degradation are transforming traditional relationships between communities and biodiversity. Documentation of indigenous knowledge not only contributes to ethnobiological research but also provides insights relevant to conservation planning, public health awareness, and sustainable resource management.

Therefore, the present study investigates reptile utilization practices among the Adi and Galo tribes of Arunachal Pradesh with particular emphasis on food consumption patterns, traditional medicinal applications, awareness of health risks, and conservation perceptions.

MATERIALS AND METHODS

Study Area

The study was conducted in two locations representing the traditional territories of the Adi and Galo tribes of Arunachal Pradesh. Parbuk village in Lower Dibang Valley District represents a predominantly Adi settlement situated between 27°30'N to 28°38'N latitude and 95°15'E to 96°30'E longitude. Aalo, located in West Siang District, approximately between 27°02'N to 29°05'N latitude and 94°05'E to 95°15'E represents a major settlement inhabited primarily by members of the Galo tribe. Both study sites lie within tropical and subtropical forest landscapes and maintain strong cultural traditions and continue to exhibit varying degrees of dependence on natural resources and forest ecosystems.



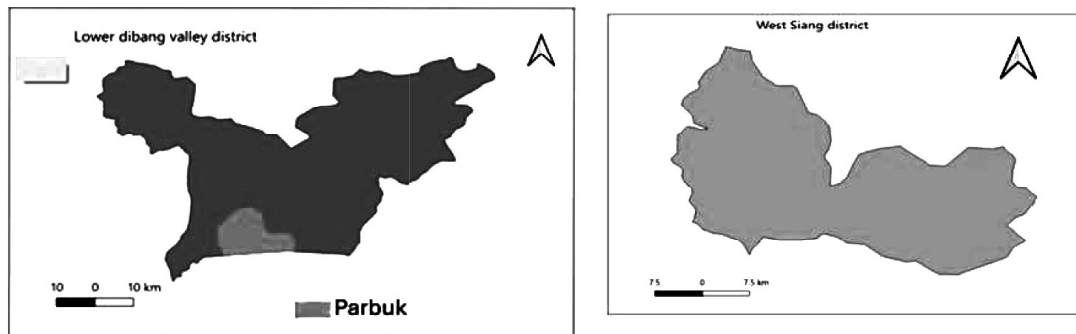


Figure 1: Study area map

Research Design

An empirical cross-sectional research design incorporating both quantitative and qualitative approaches was employed. The mixed-method framework facilitated comprehensive documentation of reptile utilization practices while enabling statistical evaluation of respondent perceptions and knowledge systems.

Data Collection

Data collection was undertaken for the period of five months from January to May 2026 through structured questionnaires, interviews, and direct interaction with knowledgeable community members, including elders, hunters, and traditional practitioners. A total of 120 respondents participated in the study, comprising 60 individuals from each of the two tribal communities. The questionnaire included sections addressing demographic characteristics, reptile consumption patterns, medicinal utilization, motivational and cultural factors, health awareness, and conservation perceptions. Reptile species reported by participants were identified based on respondent's recognition of standard photographic references and later verified using the field guide by Das & Das, 2017. As the present study was based on an ethnozoological survey, no reptile specimens were collected or directly observed in the field. Whenever uncertainty arose regarding species identity, the record was cross-checked through repeated interviews with experienced hunters, village elders, or traditional knowledge holders until a consensus identification was reached.

Statistical Analysis

Data were analyzed using Microsoft Excel and IBM SPSS Statistics Version 25. Descriptive statistics were applied to summarize respondent characteristics and utilization patterns. Questionnaire reliability was evaluated using Cronbach's Alpha coefficients. Validity assessment involved Kaiser-Meyer-Olkin (KMO) testing and Bartlett's Test of Sphericity. Exploratory Factor Analysis was performed to identify latent dimensions within survey responses. Correlation analysis examined relationships among motivational, cultural, and health-related variables.

RESULTS

Reliability and Validity Assessment

Reliability analysis indicated acceptable internal consistency of the survey instrument. The overall questionnaire yielded a Cronbach's Alpha value of 0.781, while individual constructs demonstrated moderate to good reliability (Table 1). Conservation and Legal Awareness exhibited the highest reliability coefficient ($\alpha = 0.803$), followed by Knowledge and Health Concern ($\alpha = 0.696$) and Motivation and Cultural Factors ($\alpha = 0.571$).

Table 1: Cronbach's Alpha Reliability Test.

Construct	No. of items	Cronbach's Alpha	Interpretation
Motivation and Cultural Factors (MCF)	5	0.571	Moderate reliability
Knowledge and Health Concern (KHC)	5	0.696	Acceptable Reliability
Conservation and Legal Awareness (CLA)	6	0.803	Good reliability
Overall Questionnaire	16	0.781	Acceptable to Good Reliability

Validity testing demonstrated the dataset's suitability for multivariate analysis. The KMO measure of sampling adequacy was 0.684, while Bartlett's Test of Sphericity was highly significant ($\chi^2 = 277.304$, $p < 0.05$), confirming adequate interrelationships among variables (Table 2)

Table 2: KMO and Bartlett's Test.

Measure	Value
KMO Measure of Sampling Adequacy	0.684
Bartlett's Test (χ^2)	277.304
Degrees of Freedom (df)	120
Significance (Sig.)	<0.05

Demographic Characteristics

Male respondents constituted a greater proportion of participants in both tribal groups, reflecting the traditional involvement of men in hunting and wildlife procurement activities (Figure 2). The largest age category comprised individuals between 21 and 30 years, representing 44 of the total 120 respondents (Figure 3). Older participants generally demonstrated greater familiarity with traditional reptile-related knowledge than younger generations.

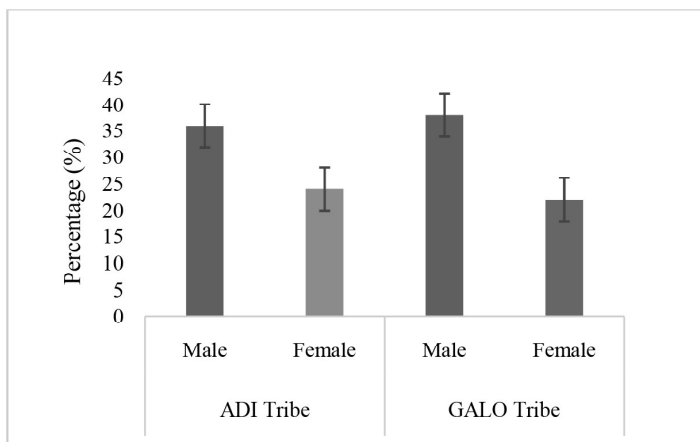


Figure 2: Gender distribution of respondents

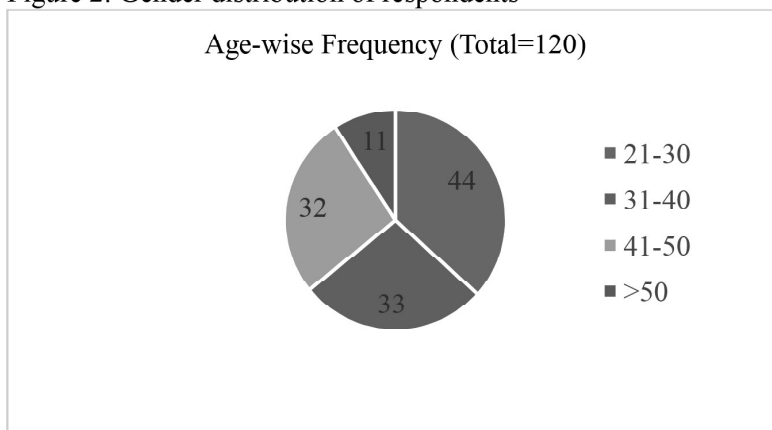


Figure3: Age-wise Distribution of Respondents

Reptiles as Food Resources

The majority of respondents (85%) reported consuming reptile meat, confirming its continued importance within local dietary traditions. Consumption rates were slightly higher among the Galo tribe (90%) than among the Adi tribe (80%).

Table 3 depicts the distribution of reptile species consumed by the respondents. The results indicate that monitor lizards constituted the most commonly consumed reptile, with 98 respondents (69.01%) reporting their consumption. This was followed by tortoises, which were consumed by 17 respondents (11.97%). The consumption of snakes and turtles was reported by 13 (9.15%) and 12 (8.45%) respondents, respectively. Only 2 respondents (1.41%) reported consuming reptiles categorized as “others,” making this the least represented group.

Participants identified various reptile species as food resources during the survey. Monitor lizards emerged as the dominant species consumed, accounting for 69.01% of reported

consumption records. Tortoises (11.97%), snakes (9.15%), and turtles (8.45%) were consumed less frequently. Four most commonly consumed species were documented during the study, as given in Table 4.

Table 3: Distribution of reptile consumption among the informants.

Type of Reptile Consumed	Frequency	Percentage (%)
Snake	13	9.15
Monitor Lizard	98	69.01
Turtle	12	8.45
Tortoise	17	11.97
Others	2	1.41



Table 4: Reptile species identified in the Study Area

Sl. No	Common Name	Scientific Name	IUCN Red List status (2025)	Vernacular names
1	Water Monitor Lizard	<i>Varanus salvator</i>	Near Threatened	Sarkot (in Adi dialect) Horkek (in Galo dialect)
2	Softshell Turtle	<i>Nilssoniasp.</i>	Endangered	Rangkop (in Adi dialect) Rakop (in Galo dialect)
3	Assam Roofed Turtle	<i>Pangshurasyhetensis</i>	Critically Endangered	(Softshell Turtle and Assam Roofed Turtle share the same vernacular names)
4	Burmese Rock Python	<i>Python bivittatus</i>	Vulnerable	Birem (in Adi dialect) Behrom (in Galo dialect)

Wild hunting represented the principal source of reptile meat acquisition, accounting for 94.23% of responses, whereas market purchases and commercial sources contributed minimally (Figure 4). Traditional hunting methods, including the use of hunting dogs, remained common among participants.

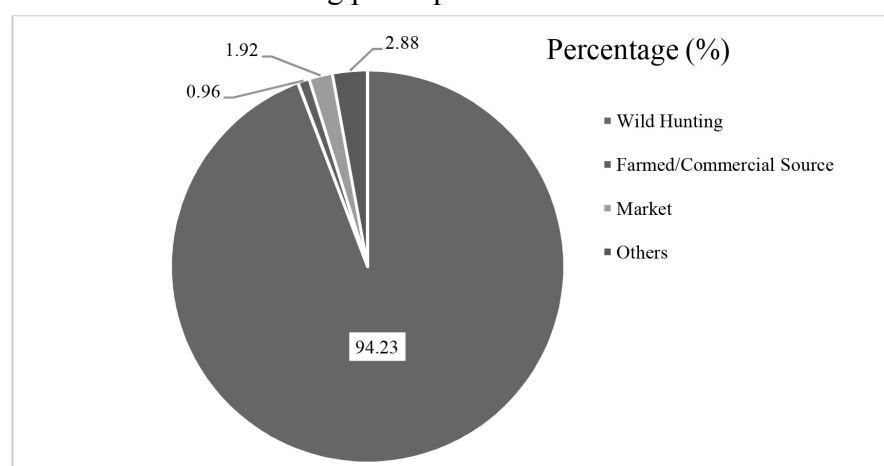


Figure 4: Sources of reptile meat among local community

Traditional Medicinal Applications

Ethnomedicinal utilization differed substantially between tribal groups, as shown in (Table 5). The Adi tribe reported several medicinal applications involving monitor lizards. Rendered fat was applied externally to alleviate allergies; smoked gall bladders were consumed in small quantities for perceived regulation of blood sugar levels; and ash derived from burned tail tips was applied to relieve ear infections. In contrast, the Galo tribe reported no specific medicinal treatments involving reptile body parts, although reptile meat was generally regarded as nutritious and health-promoting.

Table 5: Reptile-based traditional medicinal practices among the Adi and Galo Tribes according to the survey.

Tribe	Species	Body parts used	Method of preparation	Mode of use	Believed health benefits
Adi	Monitor lizard	Fats	The extracted fats were rendered without adding any additional ingredients	Applied externally	Believed to provide relief from allergies
Adi	Monitor lizard	Gall bladder	Smoke dried	Ingested in small portions at a time	Believed to reduce sugar levels
Adi	Monitor lizard	Tail tip	Burned to ashes	Ashes applied externally	Believed to provide relief from ear infections
Galo	Various edible reptile species	Meat	Roasting and frying	Ingested	Considered highly nutritious and health-promoting

Awareness of Health Risks Associated with Reptile Consumption

Participants demonstrated moderate awareness regarding hygiene and safe preparation practices. Knowledge of illnesses resulting from improper handling and preparation of reptile meat was generally moderate to high. Traditional knowledge and community experience played a significant role in shaping perceptions of food safety and preparation practices. To minimize potential health risks, respondents commonly reported removing the skin and intestines before cooking, a practice believed to reduce contamination and the transmission of reptile-borne pathogens. However, awareness of scientifically documented zoonotic and food-borne diseases associated with reptiles was relatively limited. Many participants were unfamiliar with specific health hazards linked to reptile consumption and relied primarily on inherited customs and traditional beliefs rather than modern medical knowledge when evaluating the safety of reptile meat.

Awareness of Reptile Conservation and Sustainable Utilization

Apart from health-related knowledge, respondents demonstrated a reasonable level of awareness regarding reptile conservation and sustainable use. A substantial proportion of participants recognized that excessive hunting and consumption could lead to declines in reptile populations and negatively impact local biodiversity. Some respondents were also aware that certain reptile species are protected under wildlife conservation laws. These findings indicate that conservation awareness exists within the community, although the extent of knowledge varies among individuals.

Correlation between Reptile Consumption and Knowledge/Health Concerns

The correlation analysis between Reptile Consumption and Knowledge/Health Concerns revealed a strong positive relationship between Motivation and Cultural Factors (MCF) and Knowledge and Health Concerns factors (KHC) ($r = 0.940$, $p < 0.05$) (Table 6). This finding suggests that the utilization of reptiles as food and traditional medicine among the Adi and Galo tribes is closely associated with respondents' knowledge, perceptions, and health-related awareness. The significant relationship further highlights the continued cultural importance of reptiles in the traditional practices of these indigenous communities.

Table 6: Correlation analysis of factors influencing reptile utilization practices.

Variables	Pearson Correlation (r)	Significance (p-value)
MCF ↔ KHC	0.940	< 0.05

DISCUSSION

The present study demonstrates that reptiles continue to play a significant role in the traditional lifestyle and cultural practices of the Adi and Galo tribes of Arunachal Pradesh. The persistence of reptile utilization for food, medicine, and cultural purposes reflects the close relationship between indigenous communities and their surrounding natural environment. Similar observations have been reported from several regions of Northeast India, where wildlife remains an integral component of traditional livelihoods and healthcare systems (Chakravorty et al. 2011; Chinlapianga et al. 2013; Hussain & Tynsong, 2021). Studies conducted across indigenous societies worldwide have likewise shown that reptiles constitute an important component of traditional ethnobiological knowledge and cultural identity (Alves & Rosa, 2007; Alves et al. 2012).

The findings indicate that traditional knowledge regarding reptile use is primarily concentrated among individuals actively involved in hunting and forest-based activities. This pattern agrees with the observations of Jugli et al. (2020), who reported that elderly and experienced tribal members possessed substantially greater knowledge of wildlife resources than younger generations. Similar trends have been documented globally, where traditional ecological knowledge is often maintained by elders and specialized resource users (Sherry & Myers, 2002). Such knowledge represents an important cultural asset that

contributes to biodiversity management and sustainable resource utilization. However, rapid socio-economic development, modernization, formal education systems, and changing occupational patterns may contribute to the gradual erosion of indigenous ecological knowledge (Maffi, 2005; Reyes-García et al. 2013).

Several reptile species were reported as food resources during the survey, with the water monitor lizard being identified as the most preferred species for both dietary and medicinal purposes. Similar findings have been reported among indigenous communities of Northeast India and Southeast Asia, where monitor lizards are widely hunted because of their large body size, high meat yield, and perceived medicinal value (Chinlampaing et al. 2013; Bennett, 1995). Alves et al. (2008) also documented extensive medicinal and nutritional use of reptiles in traditional communities, highlighting their importance in ethnomedicine across tropical regions. The preference for water monitor lizards observed in the present study may therefore reflect both practical and cultural considerations.

Respondents, particularly among the Galo tribe, regarded reptile meat as highly nutritious and beneficial for maintaining physical health. This perception is supported by several scientific investigations that have identified reptile meat as a valuable source of high-quality protein, essential amino acids, and micronutrients (Hoffman, 2008; Ramos et al. 2020). Studies on reptile-based diets have demonstrated that reptile meat can contribute significantly to food security in rural communities where alternative animal protein sources are limited (John & Jones 2024). Furthermore, Klemens and Thorbjarnarson (1995) emphasized the historical importance of reptiles as a source of nutrition in many traditional societies.

The study further revealed that wild hunting remains the principal source of reptile meat among respondents, indicating continued dependence on nearby forest ecosystems for subsistence needs. Comparable findings have been reported in various tropical regions where bushmeat and wildlife harvesting remain important sources of food and income (Akani et al. 1998; Fa et al. 2002). In Northeast India, wild animal hunting has historically been closely linked to cultural traditions, food preferences, and local economic conditions (Aiyadurai et al. 2010). The frequent use of hunting dogs observed during the survey further suggests the persistence of customary hunting practices that have been transmitted through generations.

Differences in reptile utilization between the Adi and Galo communities emphasize the influence of cultural beliefs, social norms, and inherited traditional knowledge on wildlife use. Similar observations have been reported by Chinlampaing et al. (2013), who noted considerable variation in animal use among indigenous groups depending on cultural traditions and local customs. Ethnozoological studies conducted in different regions of Asia, Africa, and Latin America have similarly demonstrated that cultural values strongly influence the selection, utilization, and conservation of wildlife resources (Alves & Souto, 2015). Such cultural diversity contributes significantly to the variability observed in wildlife exploitation patterns among indigenous societies.

Although respondents generally practiced hygienic methods, including removing the skin and intestines before cooking reptile meat, medicinal preparations involved rendering the fat, smoking the gall bladder and burning the tail tip of the monitor lizard prior to their respective uses, awareness regarding reptile-associated zoonotic diseases was found to be moderate. This finding is consistent with Warwick et al. (2001), who highlighted the public health risks associated with handling and consumption of reptiles, including the potential transmission of bacterial pathogens such as *Salmonella* spp. and other zoonotic agents. Karesh et al. (2005) similarly emphasized that increasing human interaction with wildlife may elevate the risk of disease emergence and transmission. Consequently, awareness programs promoting safe handling, processing, and cooking practices could contribute to reducing potential health risks while respecting traditional dietary customs.

The nutritional significance of reptile meat identified in this study is further supported by archaeological and anthropological evidence demonstrating the long-standing role of reptiles in human diets. Sianto et al. (2012) documented the consumption of reptiles by prehistoric human populations, suggesting that reptiles have served as a food resource throughout human evolutionary history. Likewise, Alves et al. (2012) argued that wildlife-derived foods continue to provide important nutritional benefits for many traditional societies, particularly in regions where access to domestic livestock products is limited.

From a conservation perspective, the present findings raise concerns regarding the sustainability of current harvesting practices. Reptiles perform essential ecological functions, including regulation of prey populations, nutrient cycling, and maintenance of ecosystem balance (Valencia-Aguilar et al. 2013). Excessive hunting pressure, combined with habitat degradation and environmental changes, may negatively affect reptile populations and associated ecosystem processes. Similar concerns have been expressed by Böhm et al. (2013), whose global assessment revealed that nearly one-fifth of reptile species face elevated extinction risks due to multiple anthropogenic pressures. Furthermore, Laland Nadim (2021) emphasized that unmanaged exploitation of reptiles can contribute to population declines, particularly for large-bodied species that are preferentially targeted by hunters.

The findings of the study should also be considered from the legal context of Wildlife (Protection) Act, 1972. Under Wildlife (Protection) Act, 1972, as amended by the Wildlife (Protection) Amendment Act, 2002 all the reptile species identified in this study receive legal protection. Unauthorized hunting or trade of these species are prohibited (Government of India, 1972; Government of India, 2002).

Therefore, the continued dependence on wild reptile populations necessitates the implementation of sustainable management strategies that balance community needs with biodiversity conservation. Community-based conservation approaches, incorporation of indigenous knowledge into resource management, and strengthened awareness regarding wildlife regulations may contribute to long-term sustainability (Berkes, 2012). In addition, the development of sustainable farming or captive-breeding programs for selected edible

reptile species could potentially reduce hunting pressure on natural populations while simultaneously enhancing food security and livelihood opportunities for local communities (Mattioli et al. 2006). Such integrated approaches would support both conservation objectives and the socio-cultural practices of indigenous communities.

Conclusion

The present study highlights the continued importance of reptiles in the socio-cultural and subsistence practices of the Adi and Galo tribes of Arunachal Pradesh. Reptiles are utilized not only as a source of food but also for medicinal purposes, reflecting the deep-rooted traditional knowledge and cultural beliefs associated with wildlife use among these indigenous communities. The findings demonstrate that knowledge regarding reptile utilization is largely retained by individuals actively involved in hunting and forest-related activities, indicating that traditional ecological knowledge continues to be transmitted across generations, although it may face challenges from modernization and changing lifestyles.

Among the reptile species recorded, the water monitor lizard emerged as the most preferred species for both consumption and traditional medicinal use, emphasizing its cultural and nutritional significance within the communities. The study also revealed that wild hunting remains the primary means of obtaining reptile resources, underscoring the continued dependence of local people on surrounding forest ecosystems. Differences observed between the Adi and Galo communities further illustrate the influence of cultural traditions, local beliefs, and inherited knowledge on patterns of wildlife utilization.

Although respondents generally practiced hygienic methods of meat preparation, awareness regarding reptile-associated zoonotic diseases was found to be moderate, indicating the need for improved public health education while respecting traditional customs. At the same time, the perceived nutritional value of reptile meat suggests that reptiles continue to contribute to local food security and dietary diversity.

From a conservation perspective, sustained reliance on wild reptile populations may pose challenges to biodiversity conservation if harvesting remains unmanaged. Therefore, conservation efforts should integrate indigenous knowledge systems with scientifically informed management approaches to ensure the sustainable use of reptile resources. Community participation, awareness programs, habitat protection, and the promotion of sustainable harvesting practices are essential for balancing traditional livelihoods with biodiversity conservation. Furthermore, the exploration of regulated captive breeding or sustainable farming of selected edible reptile species may help reduce pressure on wild populations while supporting local nutritional and economic needs. However, such initiatives must be implemented within the legal framework of Wildlife (Protection) Act, 1972 as amended in 2002. The present investigation did not find any evidence on community-led management or regulated captive breeding programmes within the Adi and Galo tribes.

Overall, the study contributes to the understanding of human–reptile interactions in Arunachal Pradesh and emphasizes the need to preserve both reptile diversity and the

valuable traditional knowledge associated with its use. Future research focusing on the nutritional composition of reptile meat, traditional medicinal applications, population status of exploited species, and sustainable utilization practices would further strengthen conservation and management strategies in the region.

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