# Perception of local tribes towards herpetofauna in remote Darjeeling hills, Eastern Himalaya

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Hazra P, Chhetri K, Chhetri U, et al. Perception of local tribes towards herpetofauna in remote Darjeeling hills, Eastern Himalaya. AGBIR. 2025;41(5):1-8.

Herpetofauna is among the most hated group in the animal kingdom by human beings. Although few animals enjoy some aspect of preservation due to religious and cultural values in their habitat than most of the others in this group. They are mostly not economically harmful but rather beneficial in controlling pests and play many important ecological roles. Many folklores, ideas, perceptions, and values play a very important role in the human relationship with animals, besides scientific approaches. We designed a study of human perception of herpetofauna focusing on

# INTRODUCTION

lacksquare here are many animal species, whether endangered or not, are appreciated by humans. Although aesthetic reasons are not scientifically accepted when carrying out conservation measures, the fact remains that aesthetics greatly influences the support given by the public and various decision-making bodies to the preservation of many species [1]. It is easier to justify the conservation of more aesthetically pleasant species than less appreciated species [2]. In this regard, species like the giant panda (Ailuropoda melanoleuca) and dolphins are often used as symbols by famous organizations or environmental protection agencies and are called "flagship species". They are considered as ambassadors for conservation and their protection contributes to the preservation of other organisms in their ecosystems [3,4]. Among different types of organisms human preferences have influenced the provision of conservation resources toward large charismatic species and what is largely considered by the public to be more attractive and colorful vertebrate groups [5,6]. Many birds, mammals, and fishes have been more appreciated and protected because they are more socially accepted than reptiles, amphibians, and invertebrates; however, there are exceptions for example, although bats are mammals, they are regarded as like reptiles or invertebrates. The wolf (Canis lupus) is another exception to this rule and many factors affecting wildlife conservation [7,8]. The wolf's image (e.g., as a bloodthirsty, demonic, man-eating animal) has been influenced by negative values, folklore, and mythologies and it has been perceived as a threat to regional pastoralist economies in Portugal. The conflict between the wolf and man is created by fear and competition for food, leading to persecution and deliberate extermination of wolves [9]. The perception that a particular animal is dangerous and aggressive to humans, like the Iberian wolf, has led to other similar situations for other large carnivores all over the world, as documented in other studies [10-13].

Even though herpetofauna is not responsible for major economic losses and most are harmless, they are feared and persecuted. In fact, many reptiles are quite useful for human beings, not only as food, medicines and raw materials but also in terms of ecological equilibrium and pest control. Despite this usefulness, many animals are seen as dangerous and are persecuted by humans. For example, the gecko is seen as a poisonous and differences in attitude according to age, gender, and educational qualification. Respondents were asked to rate the animals according to fear, tolerance, disgust, and ecological role. The result shows significant variations of attitude between males and females toward tolerance of herpetofauna as well as awareness of their ecological or environmental benefits. Different age groups and educational qualifications also exhibited significant variations in conceptions and misconceptions towards herpetofauna regarding their existence near or within human habitats, their ecological role, etc.

Keywords: People's perception; Herpetofauna; Education; Awareness; Conservation

evil animal despite its ecological importance and role in preventing mosquito plagues and is therefore persecuted. It was also shown that most people disdain creatures that represent little threat to humans these are connected to animal phobias, cultural issues and emotional reactions [14-16]. The human fear of reptiles could be a result of the ancient conditions in which the first mammals evolved. In addition to that, these fears may even be an evolutionary heritage. The high level of fear towards snakes and other animals among humans and other primates suggests that this fear is the result of ancient evolutionary history, and may explained by genetic variability why not all individuals harbor these phobias.

The causes of human attitudes towards animals have various natures and the existence of many myths, stories, and misconceptions (some of them resulting from the direct interpretation of local folklore) may be largely responsible for many of this persecution. The human's perception of threat or potential harm is one of the main reasons for disliking animals, and the outlook of the animals rather than actual bio-ecological importance is also the most important reason for the preference for certain types of animals. All those folklore, ideas, perceptions, and values are a very important part of the human relationship with animals (besides "scientific" approaches) and can be considered as a part of the human relationship with animals, or "ethnozoology". According to Alves et al., ethnozoology is "the variety of interactions (both past and present) that human cultures maintain with animals" and this type of study "has its roots as deep within the past as the first relationships between humans and other animals". Although dealing with a very vast and important area, all the types of human relations with animals, these studies are still not very common worldwide, except in Brazil, where many studies have already been done. In this regard, ethnoherpetological studies are even less common worldwide. There are few studies on the topic, and existing ones are mainly concentrated in Africa, South America and Asia. Studies presenting situations in which this type of knowledge has a negative impact on conservation are few, and almost none have ever established a clear link between the presence of folklore, negative values, and preferences, and persecution and anti-conservation attitudes towards reptiles. Only a few studies have been dedicated to understanding peoples' attitudes toward reptiles and amphibians [17-20].

This work is intended to be an early contribution to clarify the situation in Eastern Himalaya, West Bengal, India. The objectives of the study were the

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Received: 26-June-2023, Manuscript No. AGBIR-23-103827; Editor assigned: 29-June-2023, PreQC No. AGBIR-23-103827 (PQ); Reviewed: 12-July-2023, QC No. AGBIR-23-103827; Revised: 02-September-2025, Manuscript No. AGBIR-23-103827 (R); Published: 09-September-2025, DOI: 10.37532/0970-1907.25.41(5).1-8

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documentation of misconceptions about herpetofauna among local people adjacent to a national park, rich in herpetofauna diversity, and the overall perceptions and beliefs of the local tribes in this regard. It shows significant variations of attitude between males and females toward tolerance of herpetofauna as well as awareness of the ecological or environmental benefits of the herpetofauna. Different age groups and educational qualifications also exhibited significant variations in conceptions and misconceptions towards herpetofauna regarding their existence near or within human habitats, their ecological role, etc. Thus, the general objective of this study is to analyze human perception, values, and folklore related to herpetofauna and to insight into their problem and maintenance.

# MATERIALS AND METHODS

# Study area

The study was conducted at four villages; namely Ladam Khasmal, Reshop, Kolakham and Samalbung adjacent to Neora Valley National Park from 1<sup>st</sup> April to 31<sup>st</sup> October in the year 2022. The geographical locations, number of people who participated in the questionary survey, and altitude of the study areas are summarized in Table 1 and Figure 1. A catalog with 29 herpetofauna species commonly found in the study area is given in Table 2.



#### TABLE 1

Geographical distribution and the number of participants of the study area

S. no	Name of the village	Number of individuals	Latitude (°N)	Longitude (ºE)	Altitude (m)
1	Ladam khashmahal	25	27°07'14"	88°39'48"	1250
2	Rishop	21	27°06'10"	88°39'06"	2591
3	Kollakham	49	27°05'51"	88°40'22"	1981
4	Samalbong	27	27°03'20"	88°40'07"	2000

## TABLE 2

List of herpetofauna commonly encountered in the study area

Reptiles	Group	Species represented	Common Name	IUCN conservation status in India
	Snakes	Ovophis monticola	Mountain Pit viper	LC
		Trimeresurus albolabris	Green Pit viper	LC
		Psammodynastes pulverulentus	Mock viper	NE
		Pseudoenodon macrops	Large eyed false cobra	LC
		Lycodo fasciatus	Banded wolf snake	LC
		Pareas monticola	Assam snail eater	LC
		Ptyas mucosa	Indian rat snake	NT
		Bungarus niger	Greater black krait	NE
		Rhabdophis subminitus	Red necked keelback	LC
		Trachischium guentheri	Worm eating snake	LC

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	Lizard	Japalura variegate	Variegated mountain	LC
		Asymblepharus sikimmensis	lizard Sikkim Ground Skink	LC
		Calotes versicolor	Common garden lizard	LC
	Gecko	Cyrtodactylus khaiensis	Khasi hill bent toed gecko	NE
		Hemidactylus platyurus	Flat tailed house gecko	LC
	Skink	Asymblepharus sikkimensis	Sikkim ground skink	LC
		Eutopis Sp.	Grass skink	LC
Amphibians	Caecilian	Ichthyophis sikkimensis	Sikkimese Caecilian	DD
	Toad	Duttaphrynus melanostictus	Common toad	LC
		Duttaphrynus himalayanus	Himalayan toad	LC
	Frog	Polypedates leucomystax	Common tree frog	LC
		Amolops sp.	Cascade frog	NT
		Amolops gerbillus Philautus	Gerbil's stream frog	LC
		sp.	Bubble nest frog	DD
		Therloderma sp.	Shrub frog	LC
		Megophyrus sp.	Horned frog	LC
		Nanorana Sp. Raorchestes	Paa frog	LC
		annandalii Hoplobatracus	Annandale's bush frog	LC
		crassus	Jerdon's bull frog	LC

# Estimation of public attitude towards herpetofauna

A total of 122 villagers (77 male and 45 female) from the four villages adjacent to Neora valley national park, were selected for the questionnaire survey due to their dependency on adjacent forest areas. The minimum age of the participant taken was 15 and the maximum of 85 years. People were asked about their knowledge of the herpetofauna species found in their area and how frequently they have been interacting with them. The questionnaire survey was based on information regarding their attitude and perception of local herpetofauna. Out of the 29 herpetofauna species commonly found in the study areas, the five most common species from each class of reptilia (mountain pit viper (Ovophis monticola), green pit viper (Trimeresurus albolabris), common garden lizard (Calotes versicolor), flat tailed house gecko (Hemidactylus platyurus), and variegated mountain lizard (Japalura variegate) and amphibia (common toad (Duttaphrynus melanostictus), Himalayan toad (Duttaphrynus himalayanus), bubble nest frog (Philautus sp.), Annandale's bush frog (Roarchestes annandalii), common tree frog (Polypedates leucomystax)) were chosen to prepare the questionnaire survey sheet. The people participating in the survey were shown color photographs of the animals to determine their attitudes and perceptions toward the animals.

# TABLE 3

The outcome of respondents of different genders in the study area

# Data analysis

The data were analyzed by using SPSS, version 20. Pearson *Chisquare* tests were employed to assess the relationships among variables.

#### **RESULTS AND DISCUSSION**

The variations in public attitudes towards different herpetofauna were summarized in Tables 3-5. The attitude towards herpetofauna greatly varies among different gender (Table 3), educational qualifications, and age groups. There are significant variations in attitude between males and females toward killing herpetofauna ( $\chi^2$ =11.78, df=2, P=0.005); actions taken after the first encounter ( $\chi^2$ =55.34, df=7, P<0.001); Ecological benefits of herpetofauna ( $\chi^2$ =9.52, df=4, P=0.049); perception about attacked by those animals after encountering ( $\chi^2$ =10.17, df=2, P=0.006); Ugliness of the animals ( $\chi^2$ =16.09, df=3, P=0.001); and frightened by those species ( $\chi^2$ =10.49, df=2, P=0.005).

P					
	Male	Female	X <sup>2</sup>	df	Р

If you encounter, will	No, for both	45	39			
you kill h	Yes, for reptile	30	6	11.78	2	0.005
	Yes, for both	2	0			
What will be your first	Kill the reptile	28	3			
action after encounter?	Kill both	1	0			
	Run away for reptile	1	15			
	Run away for both	1	0	55.34	7	<0.001
	Call someone to kill reptile	0	10			
	Remove reptile	23	5			
	Remove amphibian	1	0			
	Remove both	22	12			
Do you believe this	No, for both	18	13			
species is beneficial for the ecosystem?	Yes, for reptile (Scientific)	0	3			
	Yes, for both (Scientific)	21	6	9.52	4	0.049
	Yes, for reptile (Ethical)	14	5			
	Yes, for both (Ethical)	24	18			
Do you think it will attack	No, for both	54	19			
Int? you encounter	Yes, for reptile	23	25	10.17	2	0.006
	Yes, for both	0	1			
Do you find this animal	No, for both	42	10			
ugiy?	Yes, for reptile	20	12	16.09	3	0.001
	Yes, for amphibian	6	9			
	Yes, for both	9	14			
Are you afraid of this N species? Y	No, for both	8	0			
	Yes, for reptile	64	34	10.49	2	0.005
	Yes, for both	5	10			

In different age groups (Table 4), significant variations in attitude towards the herpetofauna were reflected in the poisonousness of the animals ( $\chi^2$ =26.35, df=12, P=0.01); ecological benefits of herpetofauna ( $\chi^2$ =58.4, df=24, P<0.001); benefits for human being ( $\chi^2$ =55.59, df=24, P<0.001);

ugliness of the animals ( $\chi^{2}$ =31.94, df=18, P=0.022); frightened by those species ( $\chi^{2}$ =23.96, df=12, P=0.021); and change in population dynamics of the herpetofauna due to anthropogenic interferences ( $\chi^{2}$ =40.57, df=18, P=0.002).

TABLE 4
The outcome of respondents of different age groups (years) in the study area

		15-20	21-30	31-40	41-50	51-60	61-70	71-80	<b>X</b> <sup>2</sup>	df	Р
Do you think it is poisonous or not?	No, for both	1	2	0	0	0	0	0			
	Yes, for reptile	8	16	8	21	10	5	2	26.35	12	0.01
	Yes, for both	5	15	18	2	6	1	2			
Do you believe this species is beneficial	No, for both	7	5	1	9	5	2	2			

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for the ecosystem?	Yes, for reptile (Scientific)	1	1	1	0	0	0	0			
	Yes, for both (Scientific)	3	16	7	1	0	0	0	58.4	24	<0.001
	Yes, for reptile (Ethical)	3	8	4	1	3	0	0			
	Yes, for both (Ethical)	0	3	13	12	8	4	2			
Do you believe this	No, for both	7	6	1	9	5	2	2			
species is beneficial for the bumans?	Yes, for reptile (Scientific)	0	1	1	0	0	0	0			
numans:	Yes, for both (Scientific)	4	16	7	1	0	0	0	55.59	24	<0.001
	Yes, for reptile (Ethical)	3	7	4	1	3	0	0			
	Yes, for both (Ethical)	0	3	13	12	8	4	2			
Do you find	No, for both	10	18	5	10	4	3	2			
ugly?	Yes, for reptile	1	4	13	5	5	3	1	31.94	18	0.022
	Yes, for amphibian	2	5	0	3	4	0	1			
	Yes, for both	1	6	8	5	3	0	0			
Are you afraid of this	No, for both	1	1	2	1	0	1	2			
species?	Yes, for reptile	12	26	24	17	14	5	1	23.96	12	0.021
	Yes, for both	1	6	0	5	2	0	1			
Do you think due to	No, for both	5	8	17	19	11	4	4			
human interference their	Yes, for reptile	2	3	2	3	0	2	0	40.57	18	0.002
population is decreasing?	Yes, for amphibian	0	1	0	0	0	0	0			
200. Subing :	Yes, for both	7	21	7	1	5	0	0			

There are also significant variations in people's perceptions of herpetofauna with their educational qualifications (Table 5). These include eradication of species ( $\chi^{2}=24.29$ , df=12, P=0.019); actions taken after the first encounter ( $\chi^{2}=67.9$ , df=42, P=0.007); ecological benefits of herpetofauna ( $\chi^{2}=147.56$ , df=24, P<0.001); benefits for human being ( $\chi^{2}=144.43$ , df=24, P<0.001);

perception about attacked by those animals after encountering ( $\chi^{2=22.46}$ , df=12, P=0.003); frightened by those species ( $\chi^{2=22.9}$ , df=12, P=0.029); and change in population dynamics of the herpetofauna due to anthropogenic interferences ( $\chi^{2}$  =112.73, df=18, P<0.001).

# TABLE 5

The outcome of respondents of different education levels in the study area

	Illiterate	Primary	Premetric	Metric	Post-metric	Graduate	Post- graduation	X <sup>2</sup>	df	Ρ
No, for both	8	8	6	6	11	7	1			

Do you think you	Yes, for reptile	16	18	8	3	2	0	0	24.29	12	0.019
should eradicate this species	Yes, for both	6	7	4	5	3	3	0			
from your locality?	Kill the reptile	8	14	7	1	0	1	0			
	Kill both	0	0	1	0	0	0	0			
	Run away for reptile	6	3	1	3	2	1	0			
	Run away for both	0	0	0	1	0	0	0			
What will be your first action after	Call someone to kill reptile	4	6	0	0	0	0	0	67.9	42	0.007
encounter	Remove reptile	5	4	5	7	4	2	1			
	Remove amphibian	0	0	1	0	0	0	0			
	Remove both	7	6	3	2	10	6	0			
	No, for both	12	8	1	5	5	0	0			
Do you believe this species is	Yes, for reptile (Scientific)	0	0	0	2	0	1	0			
beneficial for the ecosystem?	Yes, for both (Scientific)	0	0	2	6	11	7	1	147.56	24	<0.001
	Yes, for reptile (Ethical)	2	1	13	1	0	2	0			
	Yes, for both (Ethical)	16	24	2	0	0	0	0			
	No, for both	12	8	1	5	5	1	0			
Do you believe this species is	Yes, for reptile (Scientific)	0	0	0	1	0	1	0			
beneficial for the humans?	Yes, for both (Scientific)	0	0	2	7	11	7	1	144,43	24	<0.001
	Yes, for reptile (Ethical)	2	1	13	1	0	1	0			
	Yes, for both (Ethical)	16	24	2	0	0	0	0			
Do you	No, for both	16	10	14	11	13	8	1			
attack you if	Yes, for reptile	14	23	3	3	3	2	0	29.46	12	0.003
encounter it?	Yes, for both	0	0	1	0	0	0	0			
Are you	No, for both	0	3	2	1	0	1	1			
afraid of this species?	Yes, for reptile	27	27	12	10	15	8	0	22.9	12	0.029

	Yes, for both	3	3	4	3	1	1	0			
Do you think due to	No, for both	26	29	6	7	0	0	0			
human interference their	Yes, for reptile	0	3	7	1	0	0	1	112.73	18	<0.001
population is decreasing?	Yes, for amphibian	0	0	0	0	0	1	0			
	Yes, for both	4	1	5	6	16	9	0			

What people feel and believe about nature determines their attitudes toward it. The results suggest that the human persecution and negative attitudes towards herpetofauna can be explained by the presence of folklore and negative values and those socio-demographic variables also affect the presence of these ideas and values. Similar wrong perceptions about bats and spiders also exist resulting from the interpretation of common folklore, also showed a significant relationship with negative values. Also, the results of some authors indicated a preference for other animals to the detriment of herpetofauna, even anticipating that the support dedicated to their preservation would be less than that provided to other animals. More recently it has been also shown that snakes and "wugs", a taxon that includes invertebrates like snails, and crabs, and vertebrates as lizards and turtles, were the least appreciated animals when compared to other taxons such as mammals such, birds, or fishes. As the emotional responses to animals comprise an important dimension in the retention and articulation of ethnobiological information. It can be concluded that these wrong perceptions, resulting from folklore, can clearly influence the attitudes people have toward these animals. However, it must be considered that not all the wrong perceptions about amphibians and reptiles result directly from folklore, such, as it was already referred, evolutionary responses, or lack of information, which can lead people to think these animals as dangerous, lethal, or aggressive. Reptiles were more misinterpreted than amphibians, and, in fact, amphibians showed a lower negative attitude than reptiles. The greatest threats to reptiles and amphibians are due to habitat destruction, pollution, climate change and competition with alien species but it is also known that the complex relationship between humans and these animals, consisting of their direct persecution, capture, and killing, poses a serious and real threat. Among many other threats, the greatest threat to reptiles in the Mediterranean basin is habitat destruction and alteration, which affect not only endangered species but also species that are not yet threatened, followed by over-exploitation of animals, pollution, and invasive species.

Our results clearly show that attitude towards herpetofauna significantly varies with gender, age, and educational qualifications. Religious views usually do not promote beliefs in superstitions among those tribes. Although male people are more aggressive toward killing and eradicating those animals than females while females are more afraid of those animals and chose to stay away. Females are also significantly more aware (both ethically and scientifically) of the ecological or environmental importance and conservation of the species. Among different age groups people from 21 years to 50 years are more positive toward ecological and human benefits from herpetofauna as well as anthropogenic pressure on the natural habitats leading to declining of those species. But those age groups are also significantly more prone to misconception regarding venomous and nonvenomous, ugliness, and danger from those animals. Academically higher qualified people are also significantly less prone to show direct threats towards killing, eradication, and removal of species. Those people also give significant positive attitudes toward herpetofauna regarding ecological and human benefits from them as well as anthropogenic pressure on the natural habitats leading to the decline of those species. And irrespective of gender, age, and educational qualifications there is a significantly high level of intolerance towards reptiles than amphibians; like fear, killing, eradication, and removal of reptilian species.

Lack of education and awareness about the importance of the ecological and economic role of herpetofauna are responsible for grooming many

misconceptions and negative thoughts toward these animal groups. While less educated people in the survey often ruled out the importance of herpetofauna on the other hand, people with higher academic qualifications have some minimum awareness of herpetofauna and the importance of conservation in the study area, and according to their opinion, wild animals have the right to roam freely in nature as humans do. Individual interests in wildlife education played a role in creating positive attitudes toward them. So, proper education and awareness programs are the best solution to create an environment in which both humans and herpetofauna can co-exist.

#### CONCLUSION

People's perception of herpetofauna has great importance in their conservation both inside and outside of the protected areas. But lack of education and awareness about the importance of the ecological and economic role of herpetofauna are responsible for developing many misconceptions and negative thoughts toward these animal groups. Hence, this work intends to highlight and clarify the situation. Proper education from the primary school level as well as different awareness programs especially in the areas where people's interaction with herpetofauna is frequent can give fruitful results in terms of conservation and co-existence.

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