



Distribution and natural history notes on the herpetofauna of Ladakh, India

The Himalayas is the highest and youngest mountain range in the world. It provides unique habitat characteristics and is home to a unique assemblage of flora and fauna. There is very little information on the herpetofauna and their ecology in the trans-Himalayan region of Ladakh. Ladakh, located in an area of rain shadow, is characterized by extreme weather, climate, and terrain and relatively lower species richness. The region's elevation ranges from 2,700 m to over 7,000 m a.s.l. (Dawa *et al.* 2000) and the annual precipitation is ~90–110 mm (Srivastava *et al.* 2009) while the temperature ranges from -30 °C in winters to 30 °C in the summers.

Previous authors have identified two subregions: Ladakh Mountains and Tibetan Plateau (Kumar *et al.* 2017). Most of the region is treeless (Hartmann 1983, Kachroo *et al.* 1977), hence it is also known as a cold desert (Negi 2002) or 'high-altitude desert-steppe' (Humbert-Droz & Dawa 2004, Dvorský *et al.* 2011). The herpetological diversity and richness of Ladakh is similar to that of the neighboring region of Gilgit-Baltistan (Ficetola *et al.* 2010), with which it shares geographical, topographic, and climatic characteristics. Recent herpetofaunal observations from Ladakh have been published by Sahi & Duda (1986), Verma & Sahi (1995), and Sahi *et al.* (1996). In 1999, a herpetofaunal survey was conducted in Ladakh where five species of reptiles and one species of amphibian were recorded (Vijaykumar *et al.* 2001; Fig. 1). Vasudevan *et al.* (2002) claim that amphibians in Ladakh's Kargil region have declined since 1978 compared to other vertebrates. Unlike other parts of India and adjacent regions of Tibet, Baltistan and Central Asia, Ladakh hosts a relatively lower diversity of reptilian and amphibian species. A herpetofaunal checklist dedicated to the Ladakh region has so far not been formally prepared or

maintained. In an effort to fill this knowledge gap, a rapid herpetofaunal assessment survey was conducted during March–September 2019. The survey formed a part of a larger ecological study in the region by the Department of Wildlife Protection, Leh, UT Ladakh.



Figure 1. The single amphibian species recorded from Ladakh, *Bufotes latastii*

Two of us conducted a visual encounter survey of 61 sites along the course of the Indus River in Leh and Kargil Districts, Nubra Valley and Changthang Plateau in the Trans Himalayan region of Ladakh (Fig. 2). The sites were selected randomly based on habitat types, and accessibility from roads and villages, which are generally located near natural water sources. Six major habitat types (Fig. 3) were identified for this survey: (1) rocky outcrops, (2) riparian, (3) rocky or sandy plains, (4) agricultural lands (5) sand dunes and (6) meadow/grasslands. A total of 220 hours were spent surveying 150 km (~6 km/day) of randomized trails. The surveys were conducted during 0800–1700 hr. Night surveys near streams and rivers were carried out to document amphibians and nocturnal species.

Based on the data (species richness and abundance), the Shannon Wiener diversity index (H') was calculated using Microsoft Excel and SPSS software. We recorded 400 individuals (389 reptiles and 11 amphibians; Table 1) of six species belonging to two orders and five families (Figs. 1, 4). Diversity was higher in Kargil ($H'1.36$) and lower in Changthang.

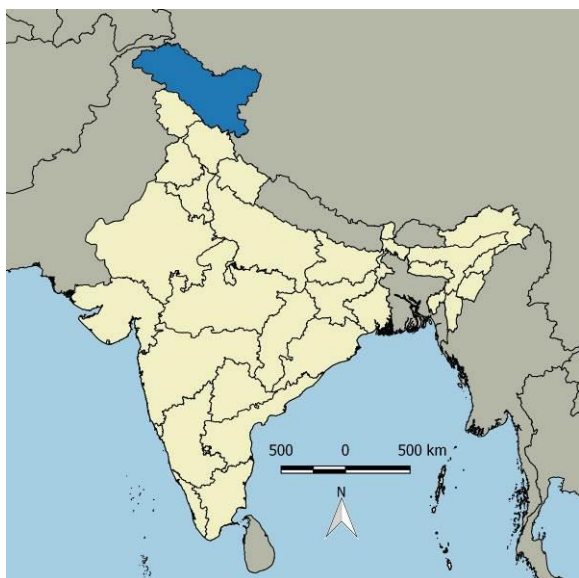


Figure 2. India map showing the Ladakh region

Sahi *et al.*, (1996) reported the presence of *Cyrtodactylus montinum*, *C. lawderanus*, *Scincella himalayana*, *Elaphe hodgsoni* and *Ptyas mucosus* in their checklist for Jammu and Kashmir. However, none of those species have been reported from Ladakh in the survey conducted by WII and USFWS in 1999–2000 or

by us in 2019. While *Gloydius himalayanus* is reported from the Lesser Himalayas (Sahi & Koul 2020), it has not been recorded in Ladakh during previous or current surveys. In general, the sites surveyed seem to have a limited but healthy diversity of herpetofauna.

Ladakh is a famous tourist destination and tourist movement is highest during the summer months. This increases risks for herpetofauna as they are commonly run over by vehicles. Off-roading by tourist vehicles is a major threat to the habitats. Apart from this, rapid changes to habitats in terms of unplanned developments, sand and rock mining etc. are other potential threats. In fact, mining is a serious threat for herpetofauna populations as it irreversibly alters the habitat by uplifting soil and rock. During our survey, herpetofauna were absent or observed in significantly lower numbers (0–3 individuals) around mining sites.

This survey strongly supports the need for a long-term study on various ecological aspects of herpetofauna of the region to understand the presence of ectotherms in cold ecosystems and to develop a viable conservation policy in Ladakh.

Table 1. Checklist and the summary of herpetofauna recorded during this study; RO: rocky outcrops, R: riparian, RP: rocky plains, SP: sandy plains, AL: agricultural lands, SD: sand dunes, M/G: meadow/grasslands; whether the habitat is within the transition zone between rocky and plain (TRP) = Yes/No.

Family	Species ^{IUCN Status} (number of individuals)	elevation (m)	Habitat						TRP	
			RO	R	RP	SP	AL	SD		M/G
Bufonidae	<i>Bufo laticaudatus</i> ^{LC} (n=11)	3,100–3,200		×				×		No
	<i>Paralaudakia himalayana</i> (n=175)	2,789–3,945	×		×			×		Yes
Agamidae	<i>Phrynocephalus theobaldi</i> ^{LC} (n=121)	3,085–5,100			×	×			×	Yes
	<i>Altiphylax stoliczkae</i> ^{LC} (n=78)	3,000–4,026	×		×	×				Yes
Scincidae	<i>Ablepharus ladacensis</i> (n=14)	3,485–3,950	×	×				×	×	No
Colubridae	<i>Platyceps ladacensis</i> (n=1)	3,100		×						Yes

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