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NOTES ON GEOGRAPHIC DISTRIBUTION

First record of the genus *Elaphe* Fitzinger in Wagler, 1833 (Squamata, Colubridae) in Pakistan

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Abstract. We report the first records of the Himalayan Ratsnake, *Elaphe hodgsonii* (Günther, 1860), from Pakistan, which are the first confirmed occurrences of the genus in the country. Several observations from May–June 2025 allowed us to document the species from Khyber Pakhtunkhwa Province and Azad Jammu and Kashmir Region, extending the known range westward from India. One juvenile specimen was deposited in the Pakistan Museum of Natural History (PMNH 5164). These findings confirm earlier published predictions and highlight the Himalaya as a transitional biogeographic zone, while underscoring the need for further surveys and phylogeographic studies.

Key words. Colubridae, dispersal corridors, distribution limits, new record, South Asia

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Introduction

The genus *Elaphe* Fitzinger in Wagler, 1833 (Squamata, Colubridae) currently comprises 18 species of non-venomous snakes distributed across the Palearctic and Oriental zoogeographic realms (Jablonski et al. 2023), but with the highest diversity occurring in Asia. The taxonomy of these snakes has long been debated, leading to the proposal of several genera that were later revised further through molecular-taxonomic evaluations. Among these, the genus *Orthriophis* Utiger, Helfenberger, Schätti, Schmidt, Ruf & Ziswiler, 2002 was established to accommodate a group of East and Southeast Asian ratsnakes which differ morphologically and genetically from the typical Palearctic *Elaphe* species (e.g. Helfenberger 2001; Utiger et al. 2002). However, more recent phylogenomic studies and subsequent taxonomic recommendations have supported a broader concept of *Elaphe*, treating *Orthriophis* as a junior synonym due to its position inside a group including other Old World ratsnakes (Chen et al. 2017). Consequently, species such as *Elaphe taeniura* Cope, 1861 and *E. moellendorffi* (Boettger, 1886), which represent basal lineages within *Elaphe*, are now generally retained within the genus, reflecting their close evolutionary affinities.

Elaphe hodgsonii (Günther, 1860) was found to be closely related to other Asian ratsnakes, forming a group together with *E. cantoris* (Boulenger, 1894) and *E. moellendorffi* (Utiger et al. 2002; Chen et al. 2017), all species associated with mountainous regions of South and Southeast Asia. *Elaphe hodgsonii* primarily inhabits the lower montane and foothill forest zones (moist deciduous, moist oak, and dry coniferous forests) of the Himalayan region, at elevations between ~830 and 3200 m (Nanhoe and Ouboter 1987; Schulz 1996; Das 2002; Singh and Joshi 2018). However, the type locality is reported as "Tsomoriri, Ladak, Tibet" (Kramer 1977), at approximately 4,600 m a.s.l. (32.907°N, 78.311°E) with the lectotype BMNH 1946.1.6.15 (adult female; leg. M.V. Schlagintweit). This elevation and the high-altitude cold-desert habitat in a rain shadow (Changthang Plateau) are not suitable for the species, which raises questions about the origin of the lectotype and the accuracy of the type locality as given by Günther (1860) and Kramer (1977). The species is in the literature reported from northern and northeastern India (Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Assam, Meghalaya), Nepal and from Bhutan and China (Sahi and Duda 1985; Schulz 1996; Singh and Joshi 2018; Che et al.

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2020; Wangyal et al. 2020; Messenger 2021) However, particularly in the eastern part of the range, the presence of the species requires further clarification (see dubious record from the Garo Hills; Wall 1924). Schulz (1996) also suggested that the species likely occurred in northeastern Pakistan which comprises some of the foothills of the western Himalaya. However, to date, no confirmed records exist within the current political boundaries of Pakistan, near the disputed territories of Indian Kashmir (Sahi and Duda 1985; Schulz 1996).

Elaphe hodgsonii is a very elusive species, and little is known about its natural history in the wild (Schulz 1996). As of 30 June 2025, only 53 observations are available on the iNaturalist platform. Its secretive habits (living in dense vegetation) combined with its cryptic coloration likely contribute to the general scarcity of records. The species may therefore have simply been overlooked through its range. Here, we present the first confirmed records of *E. hodgsonii* from Pakistan, supported by a museum voucher specimen and photographic evidence, together with additional information on its occurrence and habitat, extending the known range of the species several dozen kilometers westward.

Methods

An opportunistic field visit was conducted between 2 May and 2 July 2025 in the Himalayan regions of Pakistan (northeastern Khyber Pakhtunkhwa Province and the Pakistan-administered region of Azad Jammu and Kashmir), primarily for the purpose of nature exploration and landscape observations. Specimens were documented through a combination of direct field observation and reports by residents. Photographs were taken using smartphone cameras under natural light. Coordinates and elevation data were recorded using a GPS receiver and Google Earth. The datum used for recording geographic coordinates is WGS84. To visualize the range of the species, an updated range map (Figure 1)

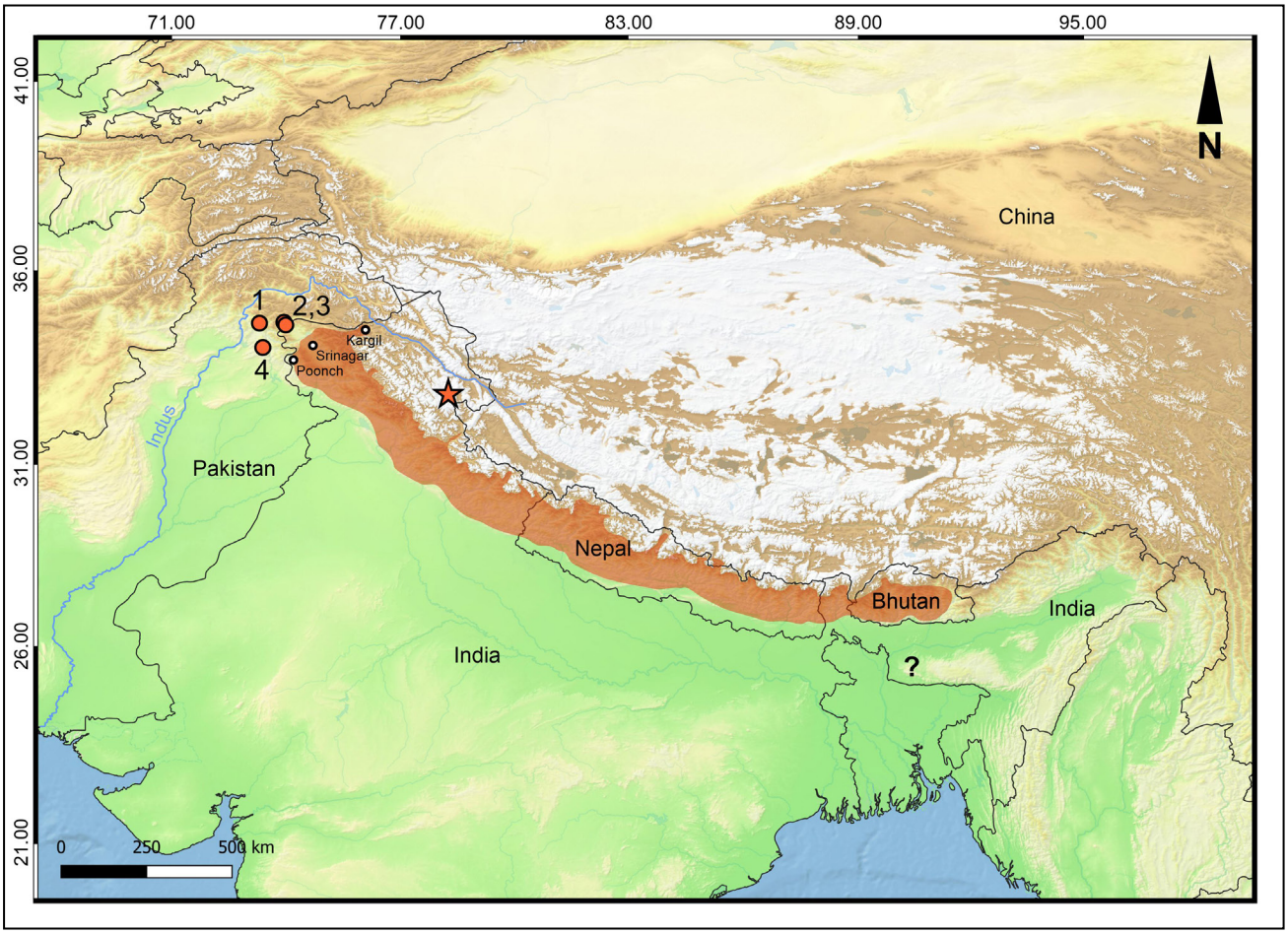

Figure 1. Map showing the distribution of *Elaphe hodgsonii* across the Himalayan region. The orange polygon represents the modified range based on data from Sahi and Duda (1985), Schulz (1996), Singh and Joshi (2018), Che et al. (2020), Wangyal et al. (2020), and Messenger (2021). Newly confirmed localities in Pakistan are shown as orange circles and numbered as follows: 1 – Sundhi, Baffa Pakhal, Mansehra, Khyber Pakhtunkhwa Province; 2 – Nagdar, Neelum Valley, Azad Jammu and Kashmir Region; 3 – Nagdar Kanari, Neelum, Azad Jammu and Kashmir Region; 4 – Khanspur Road, Ayubia, Abbottabad, Khyber Pakhtunkhwa Province. The labeled cities on the Indian-administered side of Kashmir (Kargil, Srinagar, Poonch) represent areas of the westernmost occurrence records previously summarised by Schulz (1996). The star represents the position of the species type locality, "Tsomoriri, Ladak, Tibet" (Kramer 1977). The question mark indicates a dubious record from the Garo Hills (Wall 1924).

was created using QGIS v. 3.44 (2025; https://qgis.org/), based on data and information from Schulz (1996), Singh and Joshi (2018), Che et al. (2020), Wangyal et al. (2020), and Messenger (2021). Identifications were made visually based on external morphological characters sensu Schulz (1996). No specimens were directly collected in the field, but one dead specimen provided by a local resident was deposited in the Pakistan Museum of Natural History (PMNH). Observations were conducted with voluntary cooperation of residents.

Results

Order Squamata
Family Colubridae
Genus *Elaphe* Fitzinger in Wagler, 1833

***Elaphe hodgsonii* (Günther, 1860)**
Figures 2,3

New records. PAKISTAN — **Khyber Pakhtunkhwa Province** • Mansehra District, Sundhi, Baffa Pakhal;

Figure 2. Documented specimens and habitats of *Elaphe hodgsonii* in northern Pakistan. **A.** Adult specimen from Sundhi, Khyber Pakhtunkhwa Province; inset: close-up of the head. **B.** Montane forest in the same locality. **C.** Road-killed specimen from Nagdar Kanari, Azad Jammu and Kashmir Region. **D.** Natural habitat at the Nagdar Kanari locality. **E.** Adult female killed at the same locality as in C,D. **F.** Head detail and ventral side of the same specimen as in E. **G.** Juvenile specimen killed on Khanspur Road, Khyber Pakhtunkhwa Province; inset: head detail. **H.** Ventral side of the same specimen.

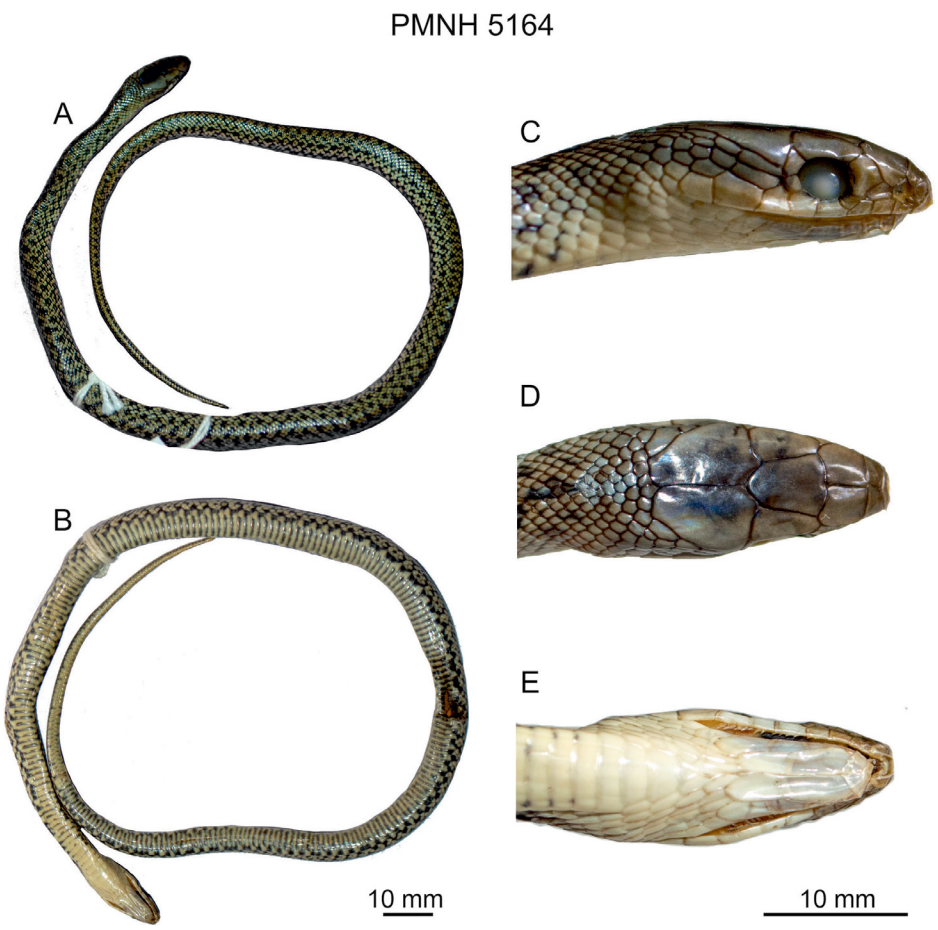

Figure 3. Preserved juvenile specimen of *Elaphe hodgsonii* (PMNH 5164) from Nagdar Kanari, Neelum, Azad Jammu and Kashmir Region, Pakistan in the collection of the Pakistani Museum of Natural History, Islamabad. **A.** Dorsal view. **B.** Ventral view. **C–F.** Lateral, dorsal and ventral view on the head.

34.6512°N, 73.3103°E; alt. 2994 m; 7.V.2025; Mudassar Basri obs.; montane coniferous forest [*Abies pindrow*, *Picea smithiana, Pinus wallichiana*, *Cedrus deodara*] with steep grassy slopes, boulders, and freshwater sources; handled by locals and showing external damage; 1 individual, alive, not collected • Abbottabad District, Khanspur Road, Ayubia; 34.0283°N, 73.4055°E; alt. 2372 m; 15.VI.2025; anonymous local resident obs.; temperate montane zone with mixed natural and semi-managed vegetation [*Prunus domestica*, *P. persica*, *Malus domestica*, *Ziziphus* spp.], and native broadleaf and coniferous trees; 1 juvenile, dead, reportedly killed by a dog or humans shortly before observation, not collected — **Azad Jammu and Kashmir Region** • Neelum District, Neelum Valley, Nagdar Kanari; 34.6752°N, 73.9510° E; alt. 1863 m; 1.VI.2025 and 2.VII.2025; Saqib Maqsood Meer obs.; temperate montane zone [*Juglans regia*, *Prunus domestica*, *Ficus carica*, *Morus alba*, *M. nigra*], and dense herbaceous cover [*Artemisia* spp., *Bergenia ciliata*, *Taraxacum officinale*], intermixed with cultivated plants [*Capsicum annuum*, *Cucumis sativus*, *Rosa* spp.]; perennial spring nearby; 2 individuals, sex of first unknown, second ♀, both dead, killed shortly before observation, not collected • Neelum District, Neelum Valley, Nagdar Kanari; 34.6778°N, 73.8864°E; alt. 2700 m; 19.VI.2025; Tahir Mehmood leg.; temperate montane vegetation with intermixed natural and cultivated plants; 1 juvenile, PMNH 5164, preserved in ethanol.

Identification. This species is the only representative of the genus *Elaphe* in the western Himalayan region and cannot be confused with any other native snakes. It is a medium-sized to large snake characterized by an elongated head, with a distinctly yellowish snout and labial shields (see Schulz 1996 for detailed diagnosis). The specimen observed alive at Sundhi, Baffa Pakhal exhibited the following meristic characters: mid-dorsals 23, subcaudals 81 (paired), ventrals 233, two scales covering the cloacal opening. The collected specimen from Neelum Valley (PMNH 5164) is characterized by the following measurements (mm) and meristic data: snout–vent length 255 mm; tail length 70 mm; head length 15 mm; head height 6 mm; head width 6 mm; preoculars 2; postoculars 2; temporals 3/3; posterior temporals 3/3; supralabials 8/8; infralabials 9/9; preventrals 2; ventrals 235; dorsals 24/23/19 (forebody/midbody/hind body); subcaudals 79 (paired); two scales cover the cloacal opening. All counts are within the variation reported for the species (ventrals 228–247, subcaudals 72–92, dorsal scale rows 23–21–19; Kramer 1977; Schulz 1996), thus confirming the identification.

Discussion

The expected occurrence of *Elaphe hodgsonii* in Pakistan, previously predicted by Schulz (1996) but not confirmed until now, has been verified. The species' range is thus extended westward by approximately 70–100 km in a straight line. Geographically close localities are present, according to Sahi and Duda (1985) and Schulz (1996), in the disputed territories of Jammu and Kashmir in India, i.e. in the vicinity of Kashmir Valley near Srinagar, and near Kargil and Poonch, close to the Line of Control with Pakistan (Figure 1; Schulz 1996: map14). The new data for the species underscore Pakistan's significance as a biogeographic crossroads between Central and Southeast Asia, and as one of the key regions for understanding the evolution of Eurasian herpetofauna (e.g. Khan 2006; Jablonski et al. 2024).

The complex distribution patterns and high diversity of amphibians and reptiles in this region are largely shaped by major mountain systems and river valleys, which provide unique environment and have historically facilitated speciation and dispersions. *Elaphe hodgsonii* is not the only taxon of Oriental or Sino-Japanese origin (see Holt et al. 2013) recorded from Pakistan. For Himalayan-associated taxa in the area, the Siwalik Range (Himalayan foothills) serves as an important corridor, enabling many species to reach the westernmost limits of the Himalaya under Pakistani administration, bordering the Indus River Valley. Comparable distribution patterns are seen in genera such as *Cyrtodactylus* Gray, 1827 (Gekkonidae), *Japalura* Gray, 1853 (Agamidae), or *Herpetoreas* Günther, 1860 (Natricidae), which are primarily distributed in East or Southeast Asia but extend westward into Pakistan along the Himalayan foothills. A similar pattern was recently demonstrated in *Eublepharis* Gray, 1827 (Eublepharidae), where the discovery of a distinct lineage associated with the Himalayan foothills ("sp. Himalaya"; Agarwal et al. 2022) indicates historical expansions through montane corridors by cryptic, previously unrecognized populations of the genus. These examples highlight that only a combination of field research, DNA analyses, and morphological confirmation can reveal the biogeographic signals embedded in these taxa and clarify their evolutionary trajectories. In this context, assessing the genetic diversity of *E. hodgsonii* across the Himalaya would provide valuable insights into the species' evolutionary history.

The occurrence of *E. hodgsonii* in Pakistan also suggests the potential presence of other reptile taxa not yet confirmed from the westernmost Himalaya but whose distribution patterns make their occurrence plausible. One such example is the genus *Dopasia* Gray, 1853, a secretive group of lizards whose westernmost Himalayan record is from Mashobra, Himachal Pradesh, India (Smith 1935; 31.128°N, 77.228°E), approximately 450 km east of the Pakistani records of *E. hodgsonii*. The possible presence of *Ophiophagus* Günther, 1864, in the extreme western Himalaya and eastern Pakistan also remains unresolved. The previously claimed record from Pakistan proved to be a false record; the supporting photograph was traced to China, and the paper was subsequently retracted (see Kaiser 2025). Nevertheless, species distribution models (Amat and Escoriza 2022) predict suitable habitat in the western Himalayan region, which is partly consistent with the earlier but still questionable report by Smith (1943) from "near Lahore", Punjab, Pakistan.

Recent discoveries have confirmed the presence of other Oriental-associated reptile species long suspected to occur in Pakistan (see Murray 1884). The colubrid *Coelognathus helena* (Daudin, 1803) was confirmed from the country's eastern part (Ullah et al. 2022). Formerly included in *Elaphe* (e.g. Schulz 1996), this species is now placed, together with *Gonyosoma* Wagler, 1828, outside the traditional ratsnake clade (Chen et al. 2017). Our report therefore represents the first confirmed record of a true ratsnakes in Pakistan. Nevertheless, the sub-Himalayan corridor remains still poorly explored due to difficult terrain and complex socio-political conditions in Kashmir and adjacent border regions and thus constitutes a promising yet understudied area for understanding the westernmost distribution and evolutionary history of Himalayan reptiles.

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Additional information

Conflict of interest
The authors declare that no competing interests exist.

Ethical statement
No ethical statement is reported.

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Data availability
All data that support the findings of this study are available in the main text.

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