

Snakes of South Asia

Discovering Hidden Diversity; Conserving a Changing Legacy



Editors

Indraneil Das, Anslem de Silva, Kanishka D.B. Ukuwela
Nimal D. Rathnayake & Suranjan Karunarathna

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Middle row: *Trimerodytes percarinatus*, *Tropidolaemus laticinctus*, *Tropidolaemus subannulatus*;

Bottom row: *Herpetoreas pealii* & *Python molurus*.

Back cover species: *Ahaetulla nasuta* & *Dendrelaphis effrenis*.

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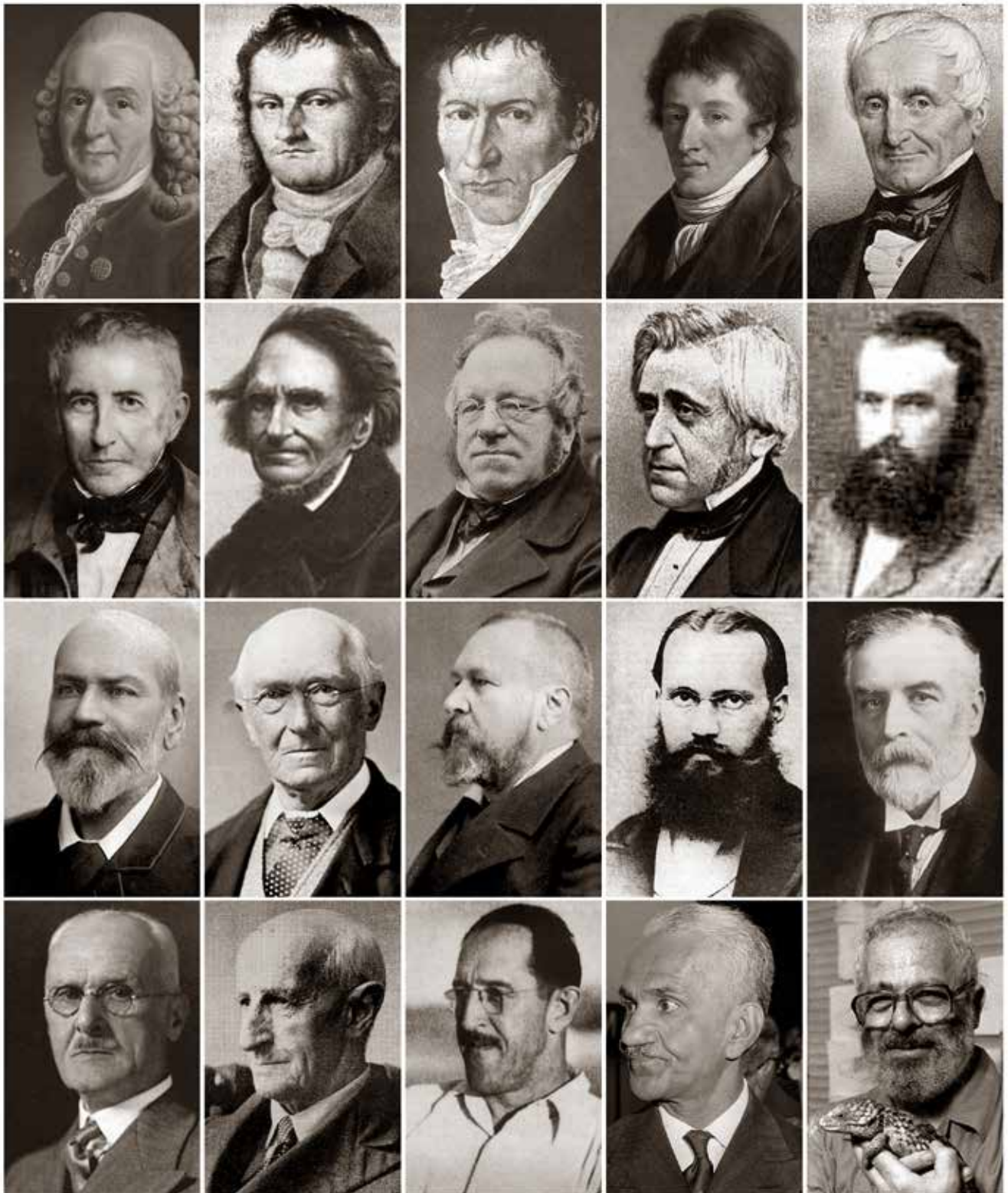
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This book is dedicated to the following pioneering herpetologists who have made significant contributions to the advancement of South Asian snake taxonomy.



Names are listed from left to right arrange in chronological order: **Row 1** – Carl von Linné (1707–1778), Johann Gottlob Schneider (1750–1822), Blasius Merrem (1761–1824), Jean Léopold Nicolas Frédéric Baron Cuvier (1769–1832), André Marie Constant Duméril (1774–1860); **Row 2** – Friedrich Boie (1789–1870), Giorgio Jan (1791–1866), John Edward Gray (1800–1875), Auguste Henri André Duméril (1812–1870), William Theobald (1829–1908); **Row 3** – Richard Henry Beddome (1830–1911), Albert Carl Ludwig Gotthilf Günther (1830–1914), Friedrich Fritz Müller (1834–1895), Ferdinand Stoliczka (1838–1874), George Albert Boulenger (1858–1937); **Row 4** – Wall Frank (1868–1950), Malcolm Arthur Smith (1875–1958), Edward Harrison Taylor (1889–1978), Paulus Edward Pieris Deraniyagala (1900–1976), Carl Gans (1923–2009) respectively (Image courtesy: Kraig Adler photo library).

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Foreword by

Alan H. Savitzky



Commemorating the 1st World Congress on Snakes
(1–4 October 2026, Kandy, Sri Lanka)

Amphibia & Reptile Research Organization of Sri Lanka, Gampola, Sri Lanka

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**Indraneil Das, Anslem de Silva,
Kanishka D.B. Ukuwela, Nimal D. Rathnayake
& Suranjan Karunarathna**
(Editors)

18 September, 2026

Foreword

Southern Asia is a rich laboratory for ophidian evolutionary experimentation. With over 4,200 species, the Serpentes comprise the largest major lineage among the more than 12,200 species of Squamata (Uetz *et al.*, 2026). Although the date of the divergence between snakes and their closest lizard relatives remains uncertain, molecular and fossil-calibrated studies point to an origin in the Jurassic (e.g., Zheng & Wiens, 2016; Harrington & Reeder, 2017). By the Late Cretaceous, a rich diversity of archaic snake taxa had evolved (Head *et al.*, 2022), and the early branching of living lineages is believed to have occurred (Burbrink *et al.*, 2020). This dating means that in the time since snakes arose, the Indian landmass collided with southern Asia, crustal torsion formed much of what is now Malaysia and Indonesia, and the sea level changes of the Pleistocene repeatedly isolated and reconnected the islands of Sundaland and Wallacea. For a lineage with the morphological and ecological malleability of the Serpentes, these historical events presented countless opportunities for vicariance, dispersal, and invasion of new environments. As befits a region of such geological complexity, the species richness of snakes, like that of many other groups, has been greatly under-appreciated until recently. As the Introduction to this volume notes (Das, 2026), both new explorations and new methods, especially molecular phylogenetics, have revealed extensive cryptic diversity, including deeply divided lineages within what have historically been considered widespread species.

Although the major branches of the ophidian evolutionary tree have been greatly clarified in recent years, persistent differences in authors' approaches to ranking those lineages within the Linnean hierarchy -- that is, whether major groups of snakes are recognized as families, subfamilies, or tribes -- make direct comparisons of diversity among those branches difficult. Regardless of one's taxonomic preferences, however, no other region of the globe is as rich in family-group taxa as southern and south-eastern Asia, especially those groups nestled among the basal branches of the Alethinophidia. The surprising distinctiveness of some long-recognized lineages has led to their elevation to familial status, such as the Pareidae and Homalopsidae. Others have only been discovered relatively recently, such as the bizarre Xenophidiidae of Malaysia (Günther & Manthey, 1995), which molecular studies have identi-

fied as the sister family of the remarkable bolyeriid snakes of the Mascarene Islands (Zaher & Smith, 2020). Even among some long-established families and genera, recent studies have identified rampant paraphyly, leading to wholesale reassignment of species among existing or newly described genera, as in the Homalopsidae and the Natricinae.

The sheer magnitude of the snake fauna of southern and south-eastern Asia is staggering. The large and climatically complex nation of India hosts 366 species in 16 families (Das *et al.*, 2026). Sri Lanka, where the 1st World Congress on Snakes has been held, harbors about one-quarter as many species on only 2% as much land area (Pyrón *et al.*, 2013). Owing in part to its extraordinary archipelagic nature, as well as its inclusion of species-rich and faunistically distinct West Papua in the east, Indonesia holds nearly the same number of species as India (374, also in 16 families; Amarasinghe *et al.*, 2026), on almost 40% less land area. An even more impressive comparison can be made between Indonesia and Brazil, both of which are equatorial countries. The 412 species of snakes occurring in Brazil (Nogueira *et al.*, 2019), a country nearly 4.5 times larger than Indonesia, represents only 10% more species. Even discounting the remarkable 9% of Indonesian species that belong to the two independent marine lineages of Elapidae, the comparison for terrestrial species alone remains impressive.

With respect to ecological diversity, the south Asian snake fauna is rich not only in marine elapids, the Laticaudinae and Hydrophiini, but also in many freshwater and coastal taxa, including the Homalopsidae, Acrochordidae, and numerous aquatic Natricinae. Arboreal species also abound in the region, notably among the Colubrinae, including iconic genera such as *Ahaetulla*, *Chrysopelea*, and *Boiga*, as well as many of south Asia's pitvipers (Crotalinae). Fossorial and semifossorial taxa include entire families, such as the Uropeltidae, Anomochilidae, and likely the Xenophidiidae, whose mode of life remains a mystery, as well as the erycine boas and the megadiverse genus *Calamaria* and other colubrid taxa.

Finally, in addition to revealing the remarkable diversity of south Asian snakes, this important volume reflects the endemic expertise of herpetologists from throughout the region. Leading researchers from each of the included countries have contributed not

only their taxonomic knowledge but also their rich field experience to this comprehensive work. Publication of Snakes of South Asia is a fitting way to celebrate the convening of the 1st World Congress on Snakes in Kandy, Sri Lanka, setting a bar against which future progress on our knowledge of Asian snakes will surely be measured.

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Alan H. Savitzky
 Department of Biology
 Utah State University
 Logan, Utah,
 USA
 (E-mail: savitzky@usu.edu)

13 August, 2026

Message from the Congress Chair

It is with immense pride and pleasure that I welcome you to the 1st World Congress on Snakes (WCS 2026) and present this commemorative publication. The convening of the world's first international congress dedicated exclusively to snakes marks a historic milestone in the advancement of ophiology, herpetology, and global snake conservation. Sri Lanka, with its exceptional snake diversity and long-standing contributions to herpetological research, is honoured to host this landmark event in the beautiful World Heritage City of Kandy.

This volume reflects the spirit of scientific collaboration that forms the foundation of WCS 2026. Bringing together contributions from leading researchers across South Asia, it provides updated country checklists, summarizes the current state of knowledge on snake diversity, examines conservation priorities, and identifies important research gaps that require future attention. It is my sincere belief that this publication will become an important reference work for scientists, conservation practitioners, wildlife managers, educators, students, and policy-makers, while promoting greater regional and international cooperation.

The conservation of snakes has never been more important. Snake populations worldwide face increas-

ing threats from habitat loss, climate change, persecution from ignorance, illegal wildlife trade, and emerging environmental challenges. At the same time, snakes continue to play vital ecological roles and hold immense scientific, medical, and cultural significance. Addressing these challenges requires strong partnerships, sound science, and a shared commitment that extends beyond national boundaries.

I extend my heartfelt appreciation to the editors, contributing authors, reviewers, sponsors, and members of the organizing committees whose dedication and hard work made both this publication and the 1st World Congress on Snakes possible. I hope this volume will inspire new discoveries, strengthen international collaboration, and contribute meaningfully to the conservation of the world's remarkable snake diversity for generations to come.

Anslem de Silva

Congress Chairperson

1st World Congress on Snakes (WCS 2026)

Kandy, Sri Lanka

(E-mail: kalds@sltnet.lk)

18 September, 2026

Chapters by Country

(In Alphabetical Order)

(Including the Country reports of Indonesia, Timor-Leste, and Snake-Bite Envenomation in South Asia)



South Asian Snake Diversity: The Golden Age of Discovery is Not Yet Over!

Indraneil Das

*Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak,
94300 Kota Samarahan, Sarawak, Malaysia (E-mail: idas@unimas.my)*

"Salutations to the serpents who dwell upon the earth, those in the atmosphere, and those in the sky. Salutations to the serpents whose venom is sharp, who dwell in the trees, and who rest in the roots of trees. Salutations to the serpents who dwell in the rays of the sun, and those who have made their homes in the waters".

These lines are from the Taittiriya Samhita (Part 4.2.8.3), a sacred Sanskrit text, and part of the Yajurveda, composed circa 3,500 years ago.

The most ancient peopled, as well as biologically diverse landscape of the world may well be southern Asia. Traditionally, the area comprises only the Indian Subcontinent, while at other times, it refers to all of subtropical and tropical Asia, delineated by the Indus basin to the west, across the southern flanks of the Himalayan range and the land to its south, eastwards into Indo-China, Indo-Malaya, across the insular regions of Sundaland, stopping at the Strait of Lombok. This, then, is the rough interpretation in this work, a collection of essays by prominent scholars for each country, with notable omissions (such as Indo-China and northern Indo-Malaya), for constraints of time in producing this work.

The faunas for a majority of individual nations have been summarised in scholarly papers and books, such as field guides; other resources are available in the form of online databases, citizen science portals and even on private blogs and websites. The cumulative human knowledge on south Asia's snake fauna is thus substantial, as well as dynamic, making discoveries and reviews outdated faster than ever before. The speed at which knowledge is acquired and transmitted has also aided the recognition, and sometimes action on conservation issues faster than in the past.

This introductory chapter argues that the golden age of species discovery is not over yet, as emphasized

by the discoveries made in the past decade, including a number of novel taxa.

Let's commence with just one spectacular example from near deep time. Debajit Datta and Sunil Bajpai, palaeontologists from the Indian Institute of Technology Roorkee, recently described an immense serpent that they allocated to the family Madtsoiidae from the Middle Eocene rocks of Kutch, in western India. Named *Vasuki indicus*, its body length was estimated between 10.9–15.2 m, the upper limit making it the largest snake that ever lived. While its diet remain unknown, cooccurring early catfishes, turtles, crocodiles, and cetaceans, may have been on its menu (Datta & Bajpai, 2025). The generic name of this incredible animal is appropriately after the mythical king of the Nagas in Hindu mythology.

Onwards to the present, one would be challenged to choose a representative amongst the many serpentine novelties, and accordingly, we choose novel genera and families from the region that illustrate particular points and/or have been covered by the media.

Where delimitation of presumed common species results in more species

Mallick *et al.* (2020) examined three species of *Ahaetulla* considered 'familiar', a widespread, 'town-and-country' species (*A. nasuta*), and two (*A. pulverulenta* and *A. dispar*) endemic to the Western Ghats, that long, near uninterrupted mountain range that runs along the west coast of India. The first group yielded as many as six lineages, the name-bearing species (*nasuta*) itself restricted to the wet zone of central and south-western Sri Lanka. Figure 1A, shows a member of the group from the dry zone of Peninsular India (*oxyrhyncha*, an 1825 name). Revived from obscurity was *isabellina* (a 1910 name). Three new species were described, with allopatric distribution- *malabarica* (southern Western Ghats);

farnsworthi (central Western Ghats); and *borealis* (northern Western Ghats). The paper describes two additional species, of the *pulverulenta* (*travancorica*) and *dispar* (*sahyadrensis*) complexes.

Close look at a small group of restricted range species, using multiple approaches, result in numerous mountain top endemics

Evan Quah, my colleague and friend from our sister institution in Sabah (the Institute of Tropical Biodiversity and Conservation, Universiti Malaysia Sabah) devoted himself, with support of his colleagues, to an interesting group of largely montane species, the so-called Slug-eating snakes. In south-east Asia, three genera have now been reported, the most species rich being *Asthenodipsas* (Figure 1B). Again, careful comparisons of museum specimens, coupled with new material greatly enhanced our knowledge of these species, effectively doubling the fauna. In Quah *et al.* (2019, 2020, 2021) are descriptions of four new species (*borneensis*, *ingeri*, *jamilinaisi*, and *stuebingi*), of which at least three are mountain-top specialists, considered together, reduce the known range of the respective species groups they were formerly allocated to.

And when such species are iconic, taxonomic revision can change conservation status

No doubt the most charismatic (in the public eye) of all venomous snakes is the largest, the king cobra, genus *Ophiophagus* (Rattlesnakes and Mambas may come a distant second and third!). My own place of birth is at the type locality of its type species (*hannah*); in my teens and twenties, working in the range of a second species (*kaalinga*; see Figure 1F); getting married within the range of the third (*salvatana*); and finally, spending nearly three decades within the distributional range of the fourth (*bungarus*). As members of the complex are rare, as well as hard to collect and transport, few specimens exist in any single museum, and the study required visits to dozens of systematics collections, across Asia, in Europe, and North America. The pandemic lockdown gave the opportunity for ‘quiet time’ to work with a talented team, and the monographic revision was finally published, to the surprise of many (Das *et al.*, 2024). In this work, two new species (*kaalinga* and *salvatana*) were described, and an obscure name (*bungarus*) revived from synonymy. Consequently, once a widespread species

(as *Ophiophagus hannah* sensu lato), member species were shown to have significantly smaller ranges. The descriptions of the two species, endemic to the Western Ghats of India (maximum 160,000 km²), and Luzon in the Philippines (110,000 km²) make it critical to reassess these populations vis-à-vis the IUCN Red Listing criteria.

Vicariance evolution of a Miocene lineage

Three unidentifiable colubrid snakes, collected from Gujarat, the Indian State whose rocks yielded *Vasuki*, the giant Eocene serpent, formed the basis for the establishment of a new genus, *Wallaceophis* and species, *Wallaceophis gujaratensis* Mirza *et al.*, 2016 (Figure 1C). Named after the celebrated explorer and naturalist, Alfred Russel Wallace (1823–1913), molecular data reveal it as a member of a clade of Old World Racers, and was recovered as a sister taxon to *Lytorhynchus*, the so-called ‘Awl-headed Snakes’, whose distribution centre around North Africa and the Middle East, with species entering the our limits only in the extreme west. Molecular clock employed by these authors suggest that the split between the two genera took place in the early Miocene, circa 17.1 MYA, a period when the Indian plate had fused with the Asian one. Nonetheless, a Trans-oceanic dispersal was suggested, given the insular history of origin of the Saurashtra region, now a peninsula, and hence, an example of the vicariance hypothesis.

When evolutionary tales of convergence emerge from new phylogenies

For over a century, the xenodermid genus *Stoliczka*, with just two named species, had a curious distribution: north-eastern India (*khasiensis*) and over 3,000 km to the south, on the island of Borneo (*borneensis*). A third species was described in 2021, close to the type locality of the former species. Various scenarios have been evoked to interpret the enormous disjunction (glacial refugia, undersampled intervening regions), till closer comparison, using morphology plus molecules by Deepak *et al.* (2021) demonstrated an altogether different relationship. Here, the Bornean taxon (Figure 1E) is demonstrated to be related to another south-east Asian species (*Xenodermus javanicus*), and consequently, transferred to a monotypic genus *Paraxenodermus*. The sole species, *P. borneensis* is restricted to montane forests of northern Borneo (Sabah and Sarawak).



Figure 1. (A) *Ahaetulla oxyrhyncha*, Vadanemmeli, Tamil Nadu, India, 1998, (B) *Asthenodipsas borneensis*, Kubah National Park, Sarawak, Malaysia, 2010, (C) *Wallaceophis gujaratensis*, Halol, Gujarat, India, (D) *Gloydus himalayanus*, Sangla Valley, Himachal Pradesh, India, 1996, (E) *Paraxenodermus borneensis*, Crocker Range National Park, Sabah, Malaysia, 2001, (F) *Ophiophagus kaalinga*, Vanjikadavu, Kerala, India, 1998. Left, Romulus Whitaker, right, the author (Photos: A, B, D, E - Indraneil Das; C - Raju Vyas; F - Shekar Dattatri).

Cross-boundary collaboration, resulting in story of evolution through isolation

For over a century, *Gloydius himalayanus* or the Himalayan Pit Viper (Figure 1D) was considered an exceptionally widespread species, with a distribution stretching pan-Himalayas, and even known from adjacent regions. Two new species of the *Gloydius himalayanus* complex (*lipipengi* and *swild*) were recently reported from the Tibetan Plateau (Shi *et al.*, 2021), to the north-west of the distribution of the group. The region to the south of this massif had remained unstudied for over a century, except for the description of *G. chambensis* Kuttala *et al.*, 2022. Using morphological (including study of relevant type specimens), distributional, ecological, and molecular data from multiple countries, Jablonski *et al.* (2026) described five well-supported lineages, resulting in the description of three species of the genus, from the Hindu Kush of north-western Pakistan (*hindukushensis*), the Hazara region of north-eastern Pakistan (*hazarensis*), and the Himalaya of western and central Nepal (*nepalensis*). The work reemphasizes the importance of integrative research, value of old systematic collections, as well as international collaboration in approaching problems of undocumented cryptic species within widespread species groups.

Summary

The case studies presented above are representative and tell different stories on themes relevant to biodiversity explorations in our time. These, and the many papers to be presented at the 1st World Congress of Snakes, join the substantial body of scientific literature for the region, and will be a reminder that our knowledge of the snake fauna of South Asia is a work in progress, and much will be learnt on its origins and diversity in the decades to come.

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