



Snakes of Urban Delhi, India: An Updated Annotated Checklist with Eight New Geographical Records

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Delhi, the second most populated city in the world, nevertheless has about 22% green cover (Hama et al. 2020; Maitra and Jyethi 2020) comprised of urban trees, public parks, private gardens, lawns, urban forests, wetlands, and urban streams (Bolund and Hunhammer 1999; Bretzel et al. 2016). Certain types of human structures and land use configurations also can attract animals, particularly herpetofauna. Examples include abandoned buildings or building sites, landfills, and garbage dumps.

Snakes (particularly in Delhi) and other herpetofauna have received little attention as research subjects. Instead, during human-animal encounters, snakes often face anthropological threats (Gibbons et al. 2000) that include habitat destruction, scarcity of prey, pollution, road mortality, or persecution just for being snakes (Lewis et al. 2010). Existing conservation strategies tend to focus on birds and mammals, while invertebrates and smaller and less conspicuous vertebrates are overlooked (Doherty et al. 2020).

We conducted 376 field surveys from January 2016 to October 2020 with three main objectives: (1) To collect baseline historical information and compare it with current snake diversity in Delhi; (2) to create a new inventory of snakes; and (3) to identify threats faced by snakes in selected localities within representative habitats in Delhi. Herein we provide a summary of the five-year-long assessment of snakes in urban Delhi and provide an updated checklist of species.

Materials and Methods

We surveyed areas within the ~1,482 km² and eleven administrative districts of the Union Territory of Delhi (Fig. 1) (28.24–28.53°N, 76.50–77.20°E; avg. elev. 216 m asl). Delhi, surrounded by the Himalayan Mountains to the north, the central hot peninsular region to the south, a hilly region to the east, and the Great Indian Desert to the west, has a semi-arid climate (Sahay 2018; Yadav and Sharma 2018). Total average rainfall in Delhi is 611.8 mm/year (Masood and Ahmad 2020) with most falling during the monsoon

season. Two prominent geographic features of Delhi are the Yamuna River and the Delhi Ridge. Natural vegetation is northern tropical thorn forest (Champion and Seth 1968).

We conducted active searches in parks, forests, private gardens, farms, vacant plots, and areas surrounding lakes and other bodies of water. We gathered data from visual encounter surveys, pitfall traps, opportunistic encounters, nocturnal road cruising, and roadkills (Campbell and Christman 1982; Heyer et al. 1994; Sutherland 1996). Species encountered were photographed in the field and subsequently identified to species by consulting keys in the taxonomic literature (e.g., Whitaker and Captain 2008) and online databases. Threat assessments for each species were gleaned from the IUCN Red



Fig. 1. Map of Delhi, India, showing its eleven districts.

Table 1. Checklist of snakes recorded in Delhi, India, during this study. Those marked with an asterisk (*) are new records for the territory. Abbreviations: IUCN/WPA = IUCN Red List status (NE: Not Evaluated, LC: Least Concern) and Wild Life (Protection) Act, 1972 schedule; Relative Abundance (C: common, UC: uncommon, R: rare); Habitat (T: Terrestrial, F: Fossorial, Ar: Arboreal, SAr: Semi-arboreal, Aq: Aquatic).

Species	IUCN/ WPA	Relative Abundance	Habitat	Source
Colubridae				
Banded Racer, <i>Argyrogena fasciolata</i> (Shaw 1802)	NE/IV	R	T	Hussain 1997
Common Catsnake, <i>Boiga trigonata</i> (Schneider 1802)*	LC/IV	UC	SAr	Current Report
Common Trinketsnake, <i>Coelognathus helena</i> (Daudin 1803)*	NE/IV	R	T	Current Report
Common Bronze-backed Treesnake, <i>Dendrelaphis tristis</i> (Daudin 1803)*	NE/IV	R	Ar	Current Report
Common Wolfsnake, <i>Lycodon aulicus</i> (Linnaeus 1758)	NE/IV	C	T	Hussain 1997
Barred Wolfsnake, <i>Lycodon striatus</i> (Shaw 1802)*	NE/IV	C	T	Current Report
Common Kukri, <i>Oligodon arnensis</i> (Shaw 1802)*	NE/IV	C	T	Current Report
Streaked Kukri, <i>Oligodon taeniolatus</i> (Jerdon 1853)*	LC/IV	C	T	Current Report
Glossy-bellied Racer, <i>Platyceps ventromaculatus</i> (Gray 1834)	NE/IV	R	T	Narayanan and Satyanarayan 2012
Oriental Ratsnake, <i>Ptyas mucosa</i> (Linnaeus, 1758)	NE/II	C	T	Hussain 1997
Black-headed Royal Snake, <i>Spalerosophis atriceps</i> (Fischer 1885)	NE/IV	UC	T	Hussain 1997
Elapidae				
Spectacled Cobra, <i>Naja naja</i> (Linnaeus 1758)	LC/II	C	T	Hussain 1997
Common Krait, <i>Bungarus caeruleus</i> (Schneider 1801)	NE/IV	C	T	Hussain 1997
Erycidae				
Common Sandboa, <i>Eryx conicus</i> (Schneider 1801)*	NE/IV	UC	T	Current Report
Red Sandboa, <i>Eryx johnii</i> (Russell 1801)	NE/IV	UC	T	Hussain 1997
Homalopsidae				
Siebold's Smooth Watersnake, <i>Ferania sieboldii</i> (Schlegel 1837)	LC/IV	R	SAq	Hussain 1997
Natricidae				
Buff-striped Keelback, <i>Amphiesma stotatum</i> (Linnaeus 1758)	NE/IV	UC	T	Prasad et al. 2018
Checkered Keelback, <i>Fowlea piscator</i> (Schneider 1799)	NE/II	C	SAq	Hussain 1997
Psammophiidae				
Leith's Sandsnake, <i>Psammophis leithii</i> (Günther 1869)	NE/IV	R	T	Hussain 1997
Pythonidae				
Indian Rock Python, <i>Python molurus</i> (Linnaeus 1758)	NE/I	UC	T	Hussain 1997
Typhlopidae				
Brahminy Blindsnake, <i>Indotyphlops braminus</i> (Daudin 1803)	NE/IV	C	F	Hussain 1997
Viperidae				
Russell's Viper, <i>Daboia russelii</i> (Shaw and Nodder 1797)	NE/II	R	T	Hussain 1997
Saw-scaled Viper, <i>Echis carinatus</i> (Schneider 1801)*	NE/IV	UC	T	Current Report

List (IUCN 2020) and from the Indian Wildlife (Protection) Act (1972). Nomenclature corresponds to Aengals et al. (2018) and Uetz et al. (2020). We determined abundance based on sighting frequencies (Walmiki et al. 2012).

Results

During the study period, we recorded a total of 329 snakes in 23 species and nine families (Table 1) from Delhi. The most species were in the family Colubridae (11) followed by the families Elapidae, Erycidae, Natricidae, and Viperidae, each with two species, and the families Homalopsidae, Psammophidae, Pythonidae, and Typhlopidae, which were represented by single species. Based on frequencies of encounters, of the 23 snake species found, nine were common, eight were uncommon, and six were rarely recorded during the study.

Species Accounts

COLUBRIDAE

Banded Racer, *Argyrogena fasciolata* (Shaw 1802) (Fig. 2A). One dead individual (TL 510 mm) was found on the road near Swarna Jayanti Park in November 2018.

Common Catsnake, *Boiga trigonata* (Schneider 1802) (Fig. 2B). One adult (TL approx. 750 mm) was observed during the evening in South West Delhi (Rajokri Protected Forest) in February 2016 while climbing a Neem Tree (*Azadirachta indica*) 2.2 m above the ground.

Common Trinketsnake, *Coelognathus helena* (Daudin 1803) (Fig. 3A). A road-killed juvenile (TL 620 mm) was observed in South Delhi (Chattarpur DLF Farms) in October 2019.

Common Bronze-backed Treesnake, *Dendrelaphis tristis* (Daudin 1803) (Fig. 3B). One active individual (TL approx. 1,220 mm) was observed on a Cluster Fig (*Ficus racemosa*) in South West



Fig. 2. Species of snakes observed in Dehli, India, during this study: (A) Banded Racer (*Argyrogena fasciolata*). Photograph by D.P. Shrivastava. (B) Common Catsnake (*Boiga trigonata*). Photograph by Vishal Varma.



Fig. 3. Species of snakes observed in Dehli, India, during this study (cont.): (A) Common Trinket Snake (*Coelognathus helena helena*). (B) Common Bronze-backed Treesnake (*Dendrelaphis tristis*). (C) Common Wolfsnake (*Lycodon aulicus*). Photographs by Gaurav Barhadiya.

Delhi (Chhawla Area near the Najafgarh drain) in January 2017.
Common Wolfsnake, *Lycodon aulicus* (Linnaeus 1758) (Fig. 3C). Two individuals were recorded in the South West Delhi District (Border Security Force, Chawla Campus) inside a residential area in July 2017. One live individual was observed crossing a road in North West Delhi (Rithala) in April 2018, another climbing wall crevices in East Delhi (Mayur Vihar) in August 2020. This species is generally active at night although difficult to identify due to its similarity with the Common Krait (*Bungarus caeruleus*).

Barred Wolfsnake, *Lycodon striatus* (Shaw 1802) (Fig. 4A). One individual (TL 304 mm) was recorded in the afternoon near the walking trail in South Delhi (Sanjay Van, Hauz Khas) during August 2019 and another (TL 365 mm) in South West Delhi (Aya Nagar Forest) in October 2018.

Common Kukri, *Oligodon arnensis* (Shaw 1802) (Fig. 4B). One active individual (TL 490 mm) was recorded in North Delhi (Buddha Jayanti Park) near the nursery area and another (TL 580 mm) in East Delhi (Trilokpuri) near Sanjay Lake in a degraded plantation.

Streaked Kukri, *Oligodon taeniolatus* (Jerdon 1853) (Fig. 4C). One hatchling (TL 152 mm) was recorded in South Delhi (Deer Park, Hauz Khas) in grass during February 2018 and one juvenile (274 mm) in South West Delhi (Ghitorni Forest) in September 2020 while crossing a concrete road.

Glossy-bellied Racer, *Platyceps ventromaculatus* (Gray 1834) (Fig. 5A). The record of this species is based on Narayanan and Satyanarayan (2012), who recorded two live (1 male, 1 female) sub-adults in West Delhi District (Punjabi Basti and Anand Parbhat).

Oriental Ratsnake, *Ptyas mucosa* (Linnaeus, 1758) (Fig. 5B). Two individuals (TL 1584 mm and 1678 mm) were observed in South West Delhi (Ayanagar Region) in July 2016 and three juveniles in the Chhawla Region in October 2017. Live individuals were recorded at the Delhi University campus in August 2016 in Buddha Jayanti Park.

Black-headed Royal Snake, *Spalerosophis atriceps* (Fischer 1885) (Fig. 5C). The first snake (TL 1220 mm) was recorded in Northwest Delhi (Punjab Khor) in May 2016 on a Chamror Tree (*Ehretia laevis*) and another in South Delhi

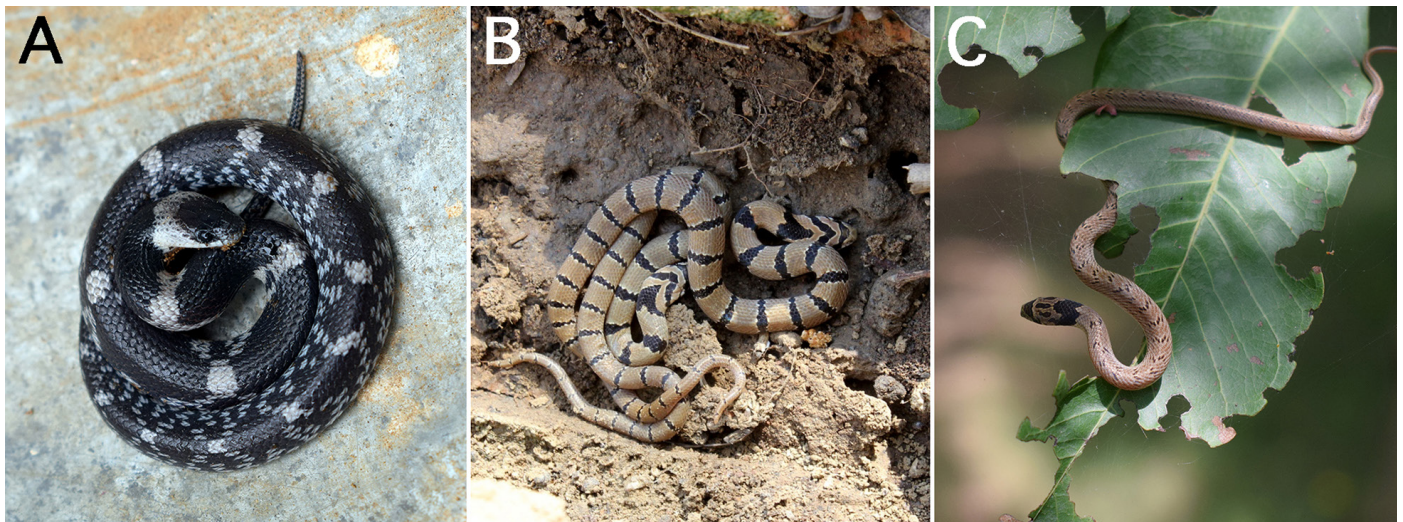


Fig. 4. Species of snakes observed in Dehli, India, during this study (cont.): (A) Barred Wolfsnake (*Lycodon striatus*). Photograph by Gaurav Barhadiya. (B) Common Kukri (*Oligodon arnensis*). Photograph by D.P. Shrivastava. (C) Streaked Kukri (*Oligodon taeniolatus fasciatus*). Photograph by Gaurav Barhadiya.



Fig. 5. Species of snakes observed in Dehli, India, during this study (cont.): (A) Glossy-bellied Racer (*Platyceps ventromaculatus*). Photograph by Vishal Varma. (B) Oriental Ratsnake (*Ptyas mucosa*). Photograph by Gaurav Barhadiya. (C) Black-headed Royal Snake (*Spalerosophis atriceps*). Photograph by Gaurav Barhadiya.

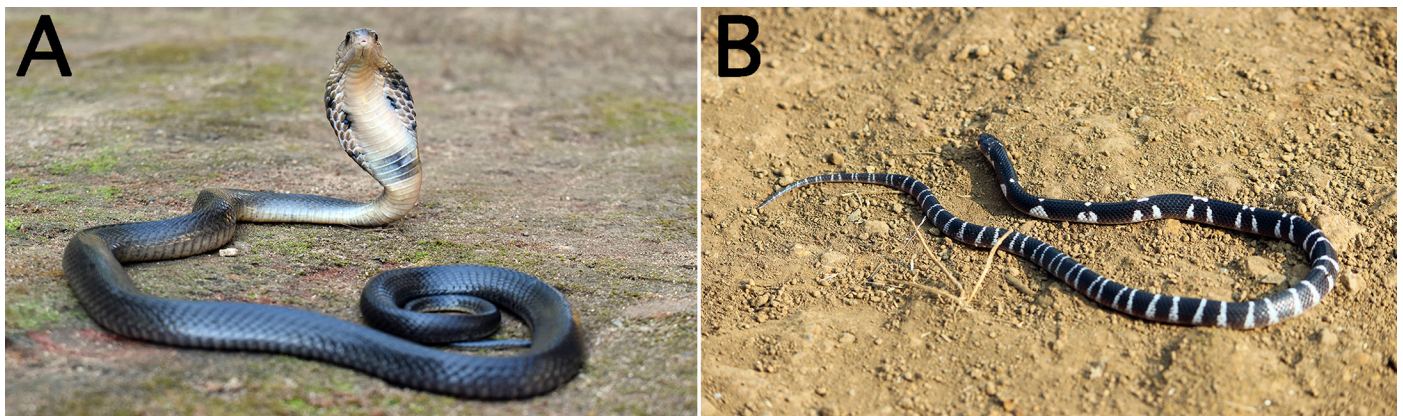


Fig. 6. Species of snakes observed in Dehli, India, during this study (cont.): (A) Spectacled Cobra (*Naja naja*). (B) Common Krait (*Bungarus caeruleus*). Photographs by Gaurav Barhadiya.

(Jawahar Lal Nehru University campus near Hauz Khas) in a pile of leaf litter in September 2019.

ELAPIDAE

Spectacled Cobra, *Naja naja* (Linnaeus 1758) (Fig. 6A). The first individual (TL 1,220 mm) was found in South West Delhi District (Ayanagar) in July 2016, hidden in a garbage heap. Individuals also were recorded from South Delhi (Chattarpur) and West Delhi (Peera Garhi) in July 2019.

Common Krait, *Bungarus caeruleus* (Schneider 1801) (Fig. 6B). One dead individual (TL 1,370 mm) killed by laborers near a construction site was recorded in South West Delhi (Dwarka Sector 21) in April 2018 and another large snake (TL 1,520 mm) was recorded in South Delhi (Sainik Farms) while crossing a road at night in August 2018.

ERYCIDAE

Common Sandboa, *Eryx conicus* (Schneider 1801) (Fig. 7A). The first individual (TL 940 mm) was observed in North West District (Kanjhawala) while crossing an agriculture trail and a second individual (TL 620 mm) was found in New Delhi District (Vasant-Vihar Region) in an urban park while foraging under the dried leaves.

Red Sandboa, *Eryx johnii* (Russell 1801) (Fig. 7B). One individual (TL 670 mm) was observed near the bus stop of Punjab Khor, Kanjhawala in North West Delhi District in June 2016; the area is surrounded by agricultural fields. Another individual (TL 730 mm) was entangled in plastic mesh in a private garden of South Delhi District (Asola Wildlife Sanctuary) in September 2019.

HOMALOPSIDAE

Siebold’s Smooth Watersnake, *Ferania sieboldii* (Schlegel 1837) (Fig. 8A). Records of this species are based on reports from the Delhi Development Authority in 2016. The team recorded a few individuals from North Delhi District (Yamuna Biodiversity Park, Wazirabad), which lies on the western bank of the River Yamuna, and is the only locality in Delhi where this species has been recorded (Srivastava et al. 2020).

NATRICIDAE

Buff-striped Keelback, *Amphiesma stolatum* (Linnaeus 1758) (Fig. 8B). In the evening, one individual (TL approx. 400 mm) was observed crossing a road in North Delhi District (Kamla Nehru Ridge) and another in South Delhi District (Lodhi Gardens) in September 2020.



Fig. 7. Species of snakes observed in Dehli, India, during this study (cont.): (A) Common Sandboa (*Eryx conicus*). (B) Red Sandboa (*Eryx johnii*). Photographs by Gaurav Barhadiya.



Fig. 8. Species of snakes observed in Dehli, India, during this study (cont.): (A) Seibold's Smooth Watersnake (*Feranias seiboldii*). Photograph by D.P. Shrivastava. (B) Buff-striped Keelback (*Amphiesma stolatum*). (C) Checkered Keelback (*Fowlea piscator*). Photograph by Gaurav Barhadiya.

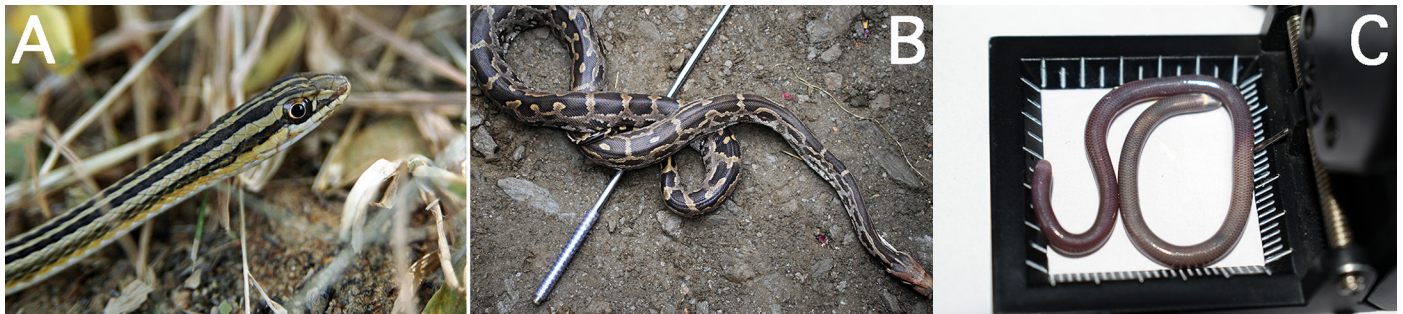


Fig. 9. Species of snakes observed in Dehli, India, during this study (cont.): (A) Leith's Sandsnake (*Psammophis leithii*). Photograph courtesy of the Biodiversity Documentation Centre, Aravalli Biodiversity Park, New Delhi, India. (B) Indian Rock Python (*Python molurus*). Photograph by Gaurav Barhadiya. (C) Brahminy Blindsnake (*Indotyphlops braminus*). Photograph by Gaurav Barhadiya.

Checkered Keelback, *Fowlea piscator* (Schneider 1799) (Fig. 8C). One adult (TL approx. 600 mm) was recorded in East Delhi (Mayur Vihar near Sanjay Lake) in September 2019. A few individuals were recorded from Ayanagar and Vasant Vihar in 2019 and 2020.

PSAMMOPHIIDAE

Leith's Sandsnake, *Psammophis leithii* (Günther 1869) (Fig. 9A). A record of this species is based on the Delhi Development Authority Report in 2016, which reported a live snake in New Delhi District (Aravalli Biodiversity Park, Vasant Vihar). This area, which follows a ridge, is characterized by tropical thorn and broadleaf deciduous forests, which support much of the herpetofauna of Delhi.

PYTHONIDAE

Indian Rock Python, *Python molurus* (Linnaeus 1758) (Fig. 9B). The first juvenile (TL 730 mm) was seen in South Delhi District (Mehrauli Region) in January 2017; it had entered a marketplace through the drainage network. Another individual (TL 1,920 mm) was recorded near the bank of the Yamuna River in the North West Delhi District (Alipur Region) in June 2019.

TYPHLOPIDAE

Brahminy Blindsnake, *Indotyphlops braminus* (Daudin 1803) (Fig. 9C). Individuals (TL 90–120 mm) were recorded from the South West Delhi (Chhawla) area during heavy rain in August 2016 and from Ayanagar at a construction site in October 2019.

VIPERIDAE

Russel's Viper, *Daboia russelii* (Shaw and Nodder 1797). This record is based on Husain (1997); however, we did not encounter a single individual of this species despite active searches in suitable habitat nor did we hear about any encounters from local residents. The occurrence of Russel's Viper in Delhi remains questionable.

Saw-scaled Viper, *Echis carinatus* (Schneider 1801) (Fig. 10). The first individual (TL approx. 320 mm) was active in South West Delhi (Ayanagar Forests) below a Kair (*Capparis decidua*) bush in February 2016. A juvenile (TL approx. 200 mm) was recorded in South West Delhi (Fatehpur Village) in



Fig. 10. Species of snakes observed in Dehli, India, during this study (cont.): Saw-scaled Viper (*Echis carinatus*). Photograph by Gaurav Barhadiya.

dry rocky habitat while crossing under dry leaves of a Golden Shower Tree (*Cassia fistula*) in November 2016.

Discussion

The results of our surveys are intended to serve as baseline information on snake diversity in Delhi. Because snakes play significant roles in ecosystems as well as acting as important ecological indicators (Janani et al. 2016), management plans for any particular region are necessary for conserving biodiversity at local and landscape levels (Pawar et al. 2007). We identified persecution of snakes, roadkills, habitat loss, and habitat fragmentation as major threats to snakes in urban Delhi. Also, the fact that many species were infrequently encountered points to a need for conservation action and long-term monitoring. This could be facilitated through special awareness programs for urban residents, especially youth, to encourage conservation and coexistence with snakes in the city.

Rapid urbanization has a dramatic impact on animal populations, including snakes. Future urban planning must preserve the green spaces that not only sustain the remaining urban biodiversity but also supply oxygen, sequester carbon, reduce the severity of heat waves, and provide space for urban dwellers to stay connected with nature.

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