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

**Fig. 2.** Species of snakes observed in Delhi, 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 Delhi, India, during this study (cont.): (A) Common Trinket Snake (*Coelognathus helena helena*). (B) Common Bronze-backed Treessnake (*Dendrelaphis tristis*). (C) Common Wolfsnake (*Lycodon aulicus*). Photographs by Gaurav Barhadiya.
Delhi (Chhawla Area near the Najafgarh drain) in January 2017. **Common Wolfspine, 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 Wolfspine, 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.
(Jawaharlal 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.
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 (Aravali 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.

**TYPOLOPIDAE**

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...
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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Literature Cited

Aengals, R., V.M.S. Kumar, M.J. Palot, and S.R. Ganesh. 2018. A Checklist of Reptiles of India. Version 3.0. <www.zsi.gov.in>.

Bolund, P. and S. Hunhammer. 1999. Ecosystem services in urban areas. Ecological Economics 29: 293–301. http://dx.doi.org/10.1016/S0921-8009(99)00013-0.

Bretzel, F., F. Vannucchi, D. Romano, F. Malorgio, S. Benvenuti, and B. Pezzarossa. 2016. First resighting since the 1940s of Siebold’s Watersnake, Ferania sieboldii (Gray, 1834) (Squamata: Serpentes: Colubridae): New locality record in Delhi National Capital Region (NCR), India. Check List 8: 1356. https://doi.org/10.15560/8.6.1356.

Narayanan, A. and K. Satyanarayan. 2012. Glossy-bellied racer snake Platyceps ventromanilatus (Gray, 1834) (Squamata: Serpentes: Colubridae): New locality record in Delhi National Capital Region (NCR), India. Check List 8: 1356. https://doi.org/10.15560/8.6.1356.

Pawar, S., M.S. Koo, C. Kelley, M.F. Ahmed, S. Chaudhuri, and S. Sarkar. 2007. Conservation assessment and prioritization of areas in northeast India: Priorities for amphibians and reptiles. Biological Conservation 136: 346–361. DOI: 10.1016/j.biocon.2006.12.012.

Pessa, V.K., A. Verma, and G. Shahabuddin. 2018. An annotated checklist of the herpetofauna of the Rashtrapati Bhawan Estates, New Delhi, India. Journal of Threatened Taxa 10: 11295–11302. https://doi.org/10.1109/jott.2353.10.2.1129511302.

Sahay, S. 2018. Urban adaptation to climate sensitive health effect: Evaluation of coping strategies for dengue in Delhi, India. Sustainable Cities and Society 37: 178–188. https://doi.org/10.1016/j.scs.2017.11.017.

Srivastava, D.P., S. Gautam, M. Singh, U. Sirohi, D. Mukherjee, and F.A. Khudsar. 2020. First resighting since the 1940s of Siebold’s Watersnake, Ferania sieboldii (Schlegel 1837), in Delhi, India. Reptiles & Amphibians 27: 525–527.

Sutherland W.J. 1996. Ecological Census Techniques. Cambridge University Press, New York, New York, USA.

Uete, P., P. Freed, and J. Hoisek. 2020. The Reptile Database. <http://www.reptildatabase.org>.

Vasadaven, K., A. Kumar, and R. Chellam. 2006. Species turnover: the case of stream rainforests in the Western Ghat, southern India. Biodiversity & Conservation 15: 3515–3525. https://doi.org/10.1007/s10531-004-3101-x.

Vikram S. and H.S. Banyal. 2013. Study of herpetofauna of Khajjiar Lake of Chamunda District, Himachal Pradesh, India. International Journal of Plant, Animal and Environmental Science 2013: 8 pp.

Wallach, V., K.L. Williams, and J. Bouyndy. 2014. Snakes of the World: A Catalogue of Living and Extinct Species. CRC Press, Boca Raton, Florida, USA.

Whitaker, R. and A. Captain. 2008. Snakes of India. The Field Guide. Draco Books, Chennai, India.

Yadav, N. and C. Sharma. 2018. Spatial variations of intra-city urban heat island in megacity Delhi. Sustainable Cities and Society 37: 298–306. https://doi.org/10.1016/j.scs.2017.11.026.