



Ophidian diversity and distribution in a peri-urban area of western Ahmedabad, Gujarat, India

Green spaces and biodiversity in urban and peri-urban settings are known to show positive effects on human health and well-being through their ecosystem services (Aerts et al. 2018). However, the reptilian diversity in such landscapes does not always gain the desired attention (Brum et al. 2023), and their ecological roles are often undermined (de Miranda 2017). Ophidians (snakes) have fascinated people since time immemorial and hold significant cultural values. Globally, studies on snakes in urban settings have focused on understanding their diversity, anthropogenic impacts, and human-snake conflict (Brum et al. 2023). In India, some snakes are termed “medically important”, and given the religious and cultural ethos, understanding their diversity and distribution is key to sustaining these values that promote coexistence of all life forms. The state of Gujarat holds a valuable diversity of reptilian fauna (Vyas 2007).

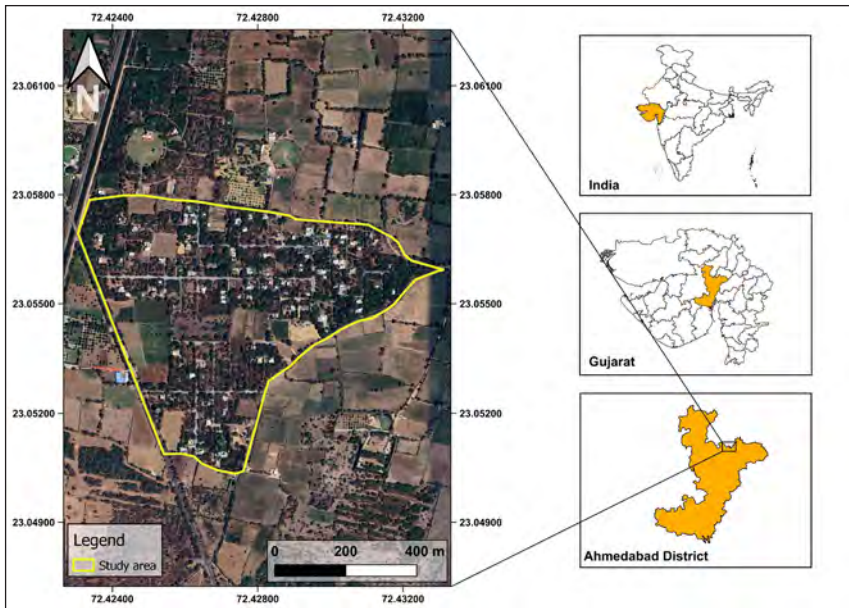
The snake diversity has been well documented across different landscapes in the state (Patel & Vyas 2019). However, a limited number of these

studies were carried out in urban or peri-urban areas (Vyas 1987; Urfi 2005; Vyas 2013; Shroff 2016).

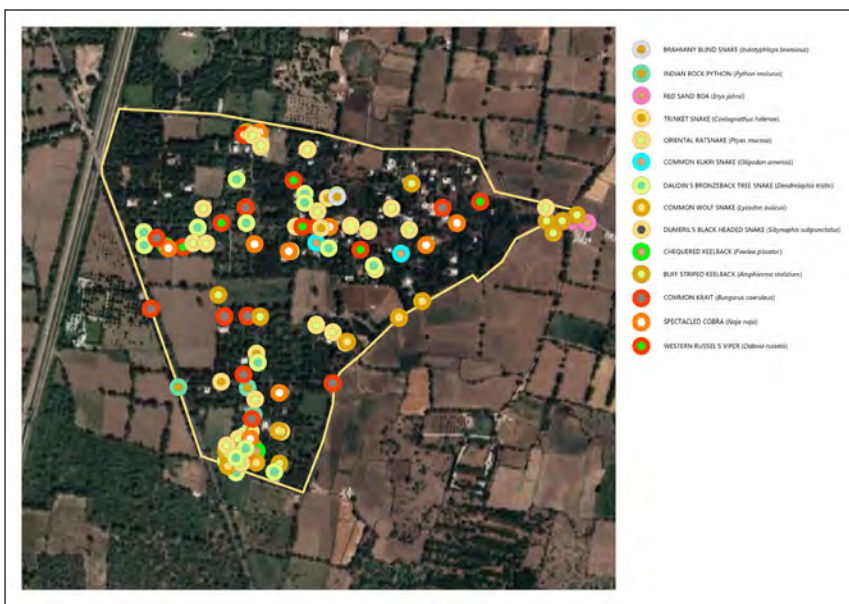
We attempted to document the diversity and distribution of snakes in a residential society called Suramya-3 (23.0557 N, 72.4272 E) encompassing an area of 84 acres (0.3 km²) in the peri-urban western Ahmedabad. The number of residents and constructions have been limited, but the rate of constructions and inhabitants is now rising. This study was carried out to preliminarily understand the species occurrence, and subsequently sensitize the residents towards conserving these species. Surrounded by fields, and in proximity to important waterbodies, viz., Thol Bird Sanctuary, Palodia lake, and Narmada Canal, Suramya-3 boasts of diverse flora including grasses, herbs, shrubs, and trees like *Prosopis cineraria*, *Cassia fistula*, *Azadirachta indica*, *Syzygium cumini*, *Acacia nilotica*, *Holoptelea integrifolia*, *Albizia lebbek*, *Cassia javanica*, *Salvadora persica* to name a few. Vertebrate fauna includes 12 species of mammals, about



Snake species observed in the study area: A—*Python molurus* | B—*Ptyas mucosa* | C—*Oligodon arnensis* | D—*Dendrelaphis tristis* | E—*Lycodon aulicus* | F—*Sibynophis subpunctatus* | G—*Coelognathus helenae* | H—*Amphiesma stolatum* | I—*Bungarus caeruleus* | J—*Naja naja* | K—*Daboia russelii*. © Rishit Shroff.



Map showing the location of the study area.



Map showing the locations of all snake species recorded during the study period in the study area.

100 bird species (both resident and migrant), approximately 20 species of reptiles that include turtles, lizards, skinks, and snakes, and commonly observed three frog species. The climate is typically dry tropical with four seasons-

summer (March–June) with an average maximum temperature of 41° C, monsoon (July–September) with an average annual rainfall of 800mm, dry post-monsoon (October–November), and winter (December–February)

with an average minimum temperature of 15°C (Shroff 2016).

The data were collected between June 2022 and June 2024 opportunistically through direct sightings while walking/driving, rescue calls, and images and observations obtained from fellow residents in the society. The first author is an authorized snake rescuer in Ahmedabad recognized by the state forest department, and is well versed in identifying and handling snakes for over two decades. The species identity was confirmed using Whitaker & Captain (2008). Data on the date, GPS location, time, species, length/size of the snake were recorded. Since most of the data was based on direct sightings, the length of the snakes to the nearest approximation (in metres) was ascertained in relation to the width of the road, and/or other objects in proximity. The age class (adult, sub-adult, or juvenile) was determined by the approximate length of the snake. The time of the sighting was further categorized into morning (0600–1200 h), afternoon (1200–1600 h), evening (1600–2000 h),



Table 1. Details of season-wise observations of snake species at Suramya-3 (June 2022–June 2024).

	Snake Species	Family	No. of sightings									Total observations	
			2022				2023				2024		
			W	S	M	PM	W	S	M	PM	W		S
1	Brahminy Blind Snake <i>Indotyphlops braminus</i> (Daudin, 1803)	Typhlopidae										1	1
2	Indian Rock Python <i>Python molurus</i> (Linnaeus, 1758)	Pythonidae			3								3
3	Red Sand Boa <i>Eryx johnii</i> (Russell, 1801)	Boidae			1	2							3
4	Trinket Snake <i>Coelognathus helenae</i> (Daudin, 1803)	Colubridae			4			1			1		6
5	Oriental Ratsnake <i>Ptyas mucosa</i> (Linnaeus, 1758)	Colubridae			11	3		7	5	6		4	36
6	Common Kukri Snake <i>Oligodon arnensis</i> (Shaw, 1802)	Colubridae				1		1		1			3
7	Daudin’s Bronzeback <i>Dendrelaphis tristis</i> (Daudin, 1803)	Colubridae		1	3	1		5	7	1		3	21
8	Common Wolf Snake <i>Lycodon aulicus</i> (Linnaeus, 1758)	Colubridae			1	1		1	4			1	8
9	Dumeril’s Black-headed Snake <i>Sibynophis subpunctatus</i> (Duméril, Bibron & Duméril, 1854)	Colubridae			1								1
10	Chequered Keelback <i>Fowlea piscator</i> (Schneider, 1799)	Natricidae			1			1					2
11	Buff Striped Keelback <i>Amphiesma stolatum</i> (Linnaeus, 1758)	Natricidae	1		4	3	1	2	5	1			17
12	Common Krait <i>Bungarus caeruleus</i> (Schneider, 1801)	Elapidae		1	2	2	1		7				13
13	Spectacled Cobra <i>Naja naja</i> (Linnaeus, 1758)	Elapidae		1	1		1	4	4	2		1	14
14	Western Russel’s Viper <i>Daboia russelii</i> (Shaw & Nodder, 1797)	Viperidae		1		3	1	1		1		2	9
	Total of snakes encountered		1	4	32	16	4	23	32	12	1	12	137

W- Winter, S- Summer, M- Monsoon, PM- Post-monsoon

and night (2000–0600 h). Images were taken whenever possible. The distribution maps were created using CAD version: ARES STANDARD

2023 with Google Earth satellite imagery (Image © 2024 Airbus) as the base layer. Based on 137 independent sighting records,



Table 2. Details of the time periods and age class of snakes observed at Suramya-3 (June 2022–June 2024).

	Snake Species	Venomous/ non-venomous	No. of sightings						
			Time period				Age class		
			Morning	Afternoon	Evening	Night	Adult	Sub-adult	Juvenile
1	Brahminy Blind Snake <i>Indotyphlops braminus</i>	Non-venomous	1				1		
2	Indian Rock Python <i>Python molurus</i>	Non-venomous				3			3
3	Red Sand Boa <i>Eryx johnii</i>	Non-venomous	2			1	3		
4	Trinket Snake <i>Coelognathus helenae</i>	Non-venomous	2		3	1	5		1
5	Oriental Ratsnake <i>Ptyas mucosa</i>	Non-venomous	22	7	7		30	3	3
6	Common Kukri Snake <i>Oligodon arnensis</i>	Non-venomous	1		1	1	2	1	
7	Daudin’s Bronzeback <i>Dendrelaphis tristis</i>	Non-venomous	10	8	2	1	21		
8	Common Wolf Snake <i>Lycodon aulicus</i>	Non-venomous	1	1	3	3	5	3	
9	Dumeril’s Black-headed Snake <i>Sibynophis subpunctatus</i>	Non-venomous	1						1
10	Chequered Keelback <i>Fowlea piscator</i>	Non-venomous				2	2		
11	Buff Striped Keelback <i>Amphiesma stolatum</i>	Non-venomous	5	7	4	1	15		2
12	Common Krait <i>Bungarus caeruleus</i>	Venomous	2		3	8	9	4	
13	Spectacled Cobra <i>Naja naja</i>	Venomous	6		7	1	8	6	
14	Western Russel’s Viper <i>Daboia russelii</i>	Venomous	4	1	2	2	8	1	
	Total number of snakes encountered		57	24	32	24	109	18	10

a total of 14 species belonging to 14 genera and seven families were observed. The Oriental Rat Snake *Ptyas mucosa* was the most frequently encountered species, with the least number of observations of Brahminy Blind Snake *Indotyphlops braminus*, and Dumeril’s Black-headed Snake *Sibynophis subpunctatus*. The majority (46.71%) observations were recorded during the monsoon months which

is in consonance with previous studies in Ahmedabad (Urfi 2005; Shroff 2016), and mostly during the morning hours (41.60%). Adult snakes contributed to about 80% of the observations, while sub-adults and juveniles constituted the rest. Among all the observations, a miniscule proportion (5.83%) of snakes were recorded within built premises, with the rest being observed outdoors.



The most commonly observed Oriental Ratsnake *P. mucosa* showed a wide spread distribution pattern in the study area, as was the case with the Daudin's Bronzeback *Dendrelaphis tristis*, Common Krait *Bungarus caeruleus*, and Spectacled Cobra *Naja naja*. The Indian Rock Python *Python molurus*, and Red Sand Boa *Eryx johnii* exhibited a highly restricted distribution pattern. Trinket Snake *Coelognathus helenae*, Common Kukri Snake *Oligodon arnensis*, and Buff Striped Keelback *Amphiesma stolatum* showed a patchy occurrence. Western Russel's Viper *Daboia russelii* was recorded only in the northern region of the study area. Common Wolf Snake *Lycodon aulicus* depicted occurrence at the agricultural interface along the borders of the society. Checkered Keelback *Fowlea piscator* was recorded at two locations which were ~200, and ~500 m away from the closest water body, the Narmada canal, and over a kilometre away from Palodia lake. Out of the two occasions, one was during the monsoon, which may have allowed formation of water-logged areas in the society. Single observations each for the Brahminy Blind Snake *I. braminus*, and Dumeril's Black-headed Snake *S. subpunctatus* were recorded. All the species were mostly observed in habitats described in previously published literature (Whitaker & Captain 2008).

The present study shows that the snakes in the study area represent seven out of the 11 families of snakes in Gujarat, and constitute 14 of the recorded 67 species (Patel & Vyas 2019). The main caveat of the study was the method with which the data were collected, this combined with the low detection probability

could mean that the presence of these 14 species in other locations, and other probable species may have gone unnoticed. For instance, a Common Cat Snake *Boiga trigonata* was observed recently in the premises in July 2024. The study however does generate a baseline for future monitoring. It elucidates patterns of seasonal occurrence and distribution which can help in conserving these species in this peri-urban area. One of the shortcomings of the study is the lack of exact explanations behind the distribution pattern. Further systematic observations on species abundance and distribution, as well as monitoring of microhabitat parameters are crucial to understand space use. This understanding can largely assist in contemplating species' requirements and movement patterns so as to benefit their conservation and avoid potential conflict. The study area remains exemplary in terms of human-wildlife coexistence chiefly owing to the limited resident human population. The first author remains involved in rescue operations and in generating awareness for snakes in the study area. The basic understanding of snake identification, biology, and myth busting continue to remain crucial for their conservation and this information are being disbursed among the residents. If snake conservation is to succeed in the study area, such activities are vital given the ever-increasing pressure on wildlife due to human settlements.

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