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Urban college campuses as safer refuge for wildlife perceived as dangerous: A case study on snakes in Madras Christian College, Chennai, India

S. Janani[1], S.R. Ganesh[2*]

[1] Department of Zoology, Madras Christian College, Chennai – 600 045, Tamil Nadu, India
[2] Kalinga Foundation, Guddekeri, Agumbe, Shivamogga district – 577 411, Karnataka, India
*Corresponding author: email: snakeranglerr@gmail.com

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Abstract

We surveyed for snakes in a historic, old, educational institution having a large and well-vegetated campus. From a three-year survey (2016-18), spanning 288 field days, covering 1152 hours of fieldwork, a total of 132 snake sightings representing 23 species were obtained. This also includes medically important venomous snakes (*Naja, Bungarus, Daboia, Echis*), as well as snakes that are very rarely if ever encountered or reported from the Greater Chennai and its environs (*Dryocalamus, Coelognathus, Platyceps, Eryx, Calliophis*). A total of 12 kinds of microhabitats including terrestrial, semi-fossorial, arboreal and aquatic settings within three habitat types including green-spaces/vegetation, farmlands and built-up areas were found to be occupied by snakes. The fact that this study reports the highest species richness of snakes from any study in Chennai (23, vs. 19 in literature) highlights the constant long-term stability of green-spaces that enable the continued survival of snakes in this campus, surrounded by an inhospitable urban sprawl.

Key words: Compound, single tons, doubletons, habitat types, microhabitats, wolf snakes

1. Introduction

Snakes are widely worshipped in India (Nair, 2017) as well as dreaded and often killed by people out of fear of snakebites (Chinnasamy et al., 2014; Williams et al., 2017). This often leads to widespread human-snake conflict situations that sadly result in loss of lives on both sides. To avoid this, extensive awareness drives are the need of the hour in Tamil Nadu (Samuel et al., 2020). This problem is especially aggravated when cities expand into the wild or vegetated habitats and the urban sprawl encroaches more and more in natural green belts, destroying them and ousting their animal inhabitants. Thus, snakes are often seen in or near human habitations in Tamil Nadu, especially in its capital city Chennai (Daniels, 2001). To

cater to the needs of Chennai people for keeping snakes at bay, by rescuing and relocating them elsewhere, Govt. and allied private sectors are available (Janani et al., 2016a, b).

Yet there is no guarantee that snakes are always reported to authorities and that no one engages in self-indulgence by harming the snakes as well as unnecessarily putting their life at risk of self-induced retaliatory bites. The Greater Chennai and its environs are home to over two dozen snake species, including highly venomous ones (Murthy, 1977). Some studies on the snakes of Chennai exist (Kalaiarasan & Kanakasabai, 1999; Subramanaian, 2001, 2002; Ganesh et al., 2005; Ganesh & Asokan, 2010; Tsetan & Ramanibai, 2011; Aengals, 2015; Janani et al., 2016a, b, 2019). A study on widespread Indian venomous snakes across a habitat disturbance gradient, elsewhere in Tamil Nadu, reported their presence even in humanised township areas (Janani & Ganesh, 2022). Agasint this backdrop, the present study examines snake diversity within a centuries-old educational institution campus in Chennai city.

2. Materials and methods

Study Area

The Madras Christian College (12.921°N 80.121°E, 30 m asl; Figure 1) or MCC for short, is a higher education institution founded in 1837, in Tambaram, a suburb of Chennai city, in southeastern India. It now covers an area of about 365 ha or 1.48 sq. km (Caleb, 2020). The college campus has remnant patches of native scrub jungles, farmlands, grasslands and water bodies. The natural climax vegetation here is termed as 'tropical dry evergreen scrub' which is a remnant of the tropical dry evergreen forest along the Coromandel Coast. Soil type is alluvial to partly lateritic and diurnal air temperature ranges around 20°C–40°C. Four seasons namely post-monsoon (Jan.-Feb.), summer (March-May), Pre-monsoon (June-Sep.) and monsoon (Oct.-Dec.) prevail. The average annual rainfall is 130 cm, with maximum precipitation during December in North-East monsoon. Accounts on the flora and fauna of this campus are available in Lal & Livingstone (1978), Amirthalingam (2005), Sanjeevaraj (2011) and Caleb (2020). Our visual surveys were only within the college campus and never out of the campus limits. Snakes were not physically restrained for the study as they are legally protected wildlife.

Figure 1. Map of the study area – Madras Christian College (MCC), Chennai, India rendered from Google Earth

Methodology

Fieldwork was conducted for three years, from January 2016 to December 2018 using three methods (Dorcas & Wilson, 2009) namely: 1) diurnal time-constrained visual searching (Crump and Scott, 1999; Ribiero-Junior et al., 2008), 2) cover board/ artificial refuge checking (Halliday & Bloumin-Demer, 2015) and 3) road cruising (Enge & Wood, 2002). We evaluated our findings in three different habitat types a) Scrub jungle b) agricultural lands and c) buildings and built-up environs. A total of 1152 person-hours of survey effort was spent. In each survey, 2 people were involved and the surveys were done twice a week, covering 288 field days during the study period. All three sampling techniques were employed at the same sites to ensure effective comparisons. Road cruising was carried out by walking and/or slowly driving (two-wheeler <25 kmph) along motorable tar and mud roads within the Madras Christian College, totalling up to 4 km in all. Identification of snakes was done using standard guides (Daniel, 2002; Daniels, 2001; Whitaker and Captain, 2004; Ganesh, 2015). For each survey, habitat type, date, time, weather condition and microhabitat were noted in the field. A list of species and their detectability estimate and relative abundance measures were calculated from the data thus collected. The species accumulation curve for the survey input vs. output was plotted to assess the sampling efficiency of this study.

3. Results

In all, a total of 132 sightings of snakes belonging to 23 species were recorded (Figure 2, 3). This includes some rare snakes with very few sightings. Singleton species were *Calliophis melanurus, Platyceps plinii, Coelognathus helena* and *Dryocalamus nympha*. Doubleton species were *Echis carinatus* and *Lycodon fasciolatus*. All 23 species were detected by live sightings and none was recorded only based on skin shed sloughs or dead animals. By almost the end of 2nd year of the survey > 95% of the snakes had been sighted, with the last year fetching the remaining few, the rarest of the snake species in the study area.

When compared field sampling-wise (Table 1), most of the snakes both in terms of species (n=23; 100%) and sightings (n=95; 72%) were those sampled by visual surveys. Whereas, cover board checking (11 sp., 48%; 18 sightings, 13%) and road cruising (11 sp., 48%; 19 sightings, 14%) surveys faired rather low, though equally so, for sampling snakes during the study. Notably, all the singleton and doubleton species (n=5; 22%) were only recorded during visual surveys and not by the other two methods.

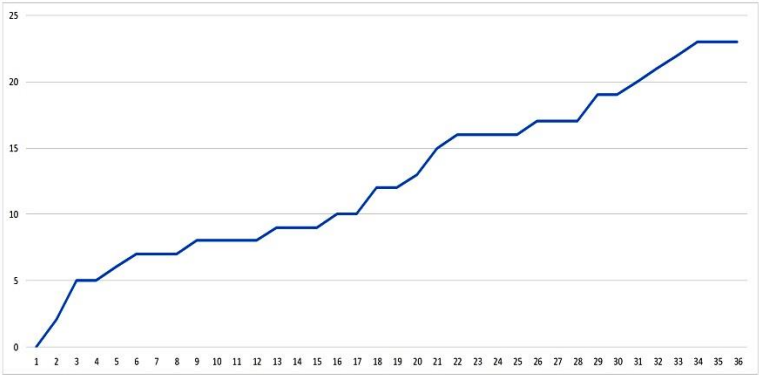

Figure 2. Species accumulation curve of snakes sighed in MCC campus during the study, plotting the number of months of survey (x-axis) against the number of snake species (y-axis)

Table 1: Snake sightings as per survey type, their encounter rates (Enc. Rate) and relative abundances (Rel. Ab. in %)

Snake Species	Cover	Road	Visual	Total	Enc. Rate	Rel. Ab. %
Lycodon striatus	3	1	9	13	1.13	9.8%
Indotyphlops braminus	1	1	9	11	0.95	8.3%
Fowlea piscator	0	0	10	10	0.87	7.6%
Dendrelaphis tristis	1	3	6	10	0.87	7.6%
Oligodon taeniolatus	1	2	6	9	0.78	6.8%
Ptyas mucosa	1	3	5	9	0.78	6.8%
Ahaetulla oxyrhynca	0	2	7	9	0.78	6.8%
Lycodon aulicus	4	2	3	9	0.78	6.8%
Naja naja	2	1	5	8	0.69	6.1%
Oligodon arnensis	0	2	6	8	0.69	6.1%
Bungarus caeruleus	0	1	4	5	0.43	3.8%
Daboia russelii	1	0	4	5	0.43	3.8%
Atretium schistosum	2	1	2	5	0.43	3.8%
Eryx conicus	0	0	4	4	0.35	3.0%
Boiga trigonata	0	0	3	3	0.26	2.3%
Eryx johnii	1	0	2	3	0.26	2.3%
Amphiesma stolatum	1	0	2	3	0.26	2.3%
Lycodon fasciolatus	0	0	2	2	0.17	1.5%
Echis carinatus	0	0	2	2	0.17	1.5%
Coelognathus helena	0	0	1	1	0.09	0.8%
Dryocalamus nympha	0	0	1	1	0.09	0.8%
Calliophis melanurus	0	0	1	1	0.09	0.8%
Platyceps plinii	0	0	1	1	0.09	0.8%
Total	18	19	95	132	11.46	100.0%

When compared according to their spatio-temporal patterns (Table 2), most snakes were seen in vegetation belts, both as regards species (n=20; 87%) and sightings (n=70; 53%), compared to either farmland (14 sp., 61%; 29 sightings, 22%) or buildings (17 sp., 74%; 33 sightings, 25%). Regarding the singleton and doubleton species, such species were detected in vegetation belts and buildings, but not in farmlands.

As regards their seasonal break-up, the frequency of snake sightings during monsoon season both in terms of species (n=17; 74%) and sightings (n=37; 28%) was comparable to that in post-monsoon, both in terms of species (n=18; 78%) and sightings (n=35; 26%). Snakes seen during pre-monsoon were comparatively lower in terms of species (n=14; 61%) and

sightings (n=33; 25%). Those seen during summer were not low as regards species (n=18; 78%) but were so, as regards their total frequency of sightings (n=27; 20%).

There was discordance concerning the number of snake species recorded and the total number of sightings of snakes recorded, as per season. If calculated based on species, the lowest detections were in pre-monsoon (17 spp.), but when calculated as per total sightings, the lowest detections were in summer (27 sightings).

Table 2. Spatio-temporal breakup of snake sightings in MCC campus during 2016-18. Farm – farmlands, Build – buildings, Veg – vegetation belts, Mon – monsoon, PoM – post-monsoon, PrM – pre-monsoon, Sum – summer.

Snake species	Farm	Build	Veg	Mon	PoM	PrM	Sum	Total
Lycodon striatus	2	2	9	6	1	4	2	13
Indotyphlops braminus	5	2	4	3	3	4	1	11
Fowlea piscator	5	3	2	3	2	4	1	10
Dendrelaphis tristis	1	3	6	1	4	3	2	10
Oligodon taeniolatus	1	3	5	2	3	3	1	9
Ptyas mucosa	3	1	5	3	2	2	2	9
Ahaetulla oxyrhynca	2	1	6	3	3	2	1	9
Lycodon aulicus	0	2	7	2	1	3	3	9
Naja naja	1	4	3	2	2	1	3	8
Oligodon arnensis	1	1	6	1	3	3	1	8
Bungarus caeruleus	1	4	0	1	3	1	0	5
Daboia russelii	2	0	3	2	0	1	2	5
Atretium schistosum	2	1	2	3	1	0	1	5
Eryx conicus	0	1	3	1	1	1	1	4
Boiga trigonata	0	0	3	0	0	1	2	3
Eryx johnii	1	1	1	1	1	0	1	3
Amphiesma stolatum	2	0	1	1	1	0	1	3
Lycodon fasciolatus	0	2	0	0	2	0	0	2
Echis carinatus	0	1	1	2	0	0	0	2
Coelognathus helena	0	0	1	0	1	0	0	1
Dryocalamus nympha	0	0	1	0	0	0	1	1
Calliophis melanurus	0	1	0	0	1	0	0	1
Platyceps plinii	0	0	1	0	0	0	1	1
Grand Total	29	33	70	37	35	33	27	132

A similar pattern was noted when quantifying snake occupancies of microhabitats season-wise (Table 3). Monsoon had the highest snake detections (n=37; 28%), followed by post-

monsoon (n=35; 26%), then pre-monsoon (n=33; 25%) and lastly summer (n=27; 20%). Species-wise split was not attempted in this case due to inherent/intrinsic differences among the many snake species, such as primarily terrestrial, aquatic, arboreal and fossorial forms.

Overall, 12 different kinds of microhabitats were associated with direct sightings of snakes. Among them, the most occupied microhabitat was fallen logs (n=21; 16%), followed by leaf litter and trees (n=16; 12%) each. Next came bare ground and water bodies (n=12; 9%) each, as well as plants /bushes (n=11; 8%) with comparable sighting frequencies. Appallingly, an equal prevalence of dead snakes sighted as roadkills on roads exists (n=11; 8%). Next, termite mounds and rock piles & crevices have comparable sightings (n=7-8; 5-6%). Lastly, the two kinds of roads, viz., mud roads and tar roads each have equal counts (n=4; 3%). The total count of live snakes seen on mud roads and tar roads (n=4+4) equals that of roadkill snakes (n=8).

Table 3: Seasonal dynamics of resource state utilisation patterns by snakes in MCC campus

Resource state	Monsoon	Post-monsoon	Pre-monsoon	Summer	Total
Cover objects	4	3	0	3	10
Leaf litter	4	4	4	4	16
Bare ground	2	4	3	3	12
Plant & bushes	3	3	4	1	11
Road kills	2	3	4	2	11
Mud road	1	3	0	0	4
Rock piles & crevices	2	2	1	2	7
Tar road	0	1	1	2	4
Termite mound	3	0	4	1	8
Trees	4	6	4	2	16
Under log	6	4	5	6	21
Water bodies	6	2	3	1	12
Grand Total	**37**	**35**	**33**	**27**	**132**

4. Discussion

In a previously published account on MCC fauna, Sanjeevaraj (1968) reported 18 snake species on the campus, whereas we recorded 23 species. Yet some snakes then reported in 1968, were not recorded by us, like the python (but see Karthy et al., 2022). Our perusal of the literature reveals that a few studies on snakes in Chennai give quantitative data for snake species sighted, including our past works (Ganesh et al., 2005; Janani et al., 2016a,b). But in many respects these studies often differed in their data collection protocols, sampling methods, survey input and manpower, thereby restricting a meaningful comparison of the ensuing results. This precludes us from elaborately comparing the sighting frequencies and abundances of snake species in this work vs. those published earlier.

Applying generalisations, the following may be deduced from comparing ours with multi-year studies that report numbers of snakes in their studies. About 488-1198 snakes were rescued per year from Greater Chennai (Janani et al., 2016a). But this is a study on snake rescues and not on wild sightings, as in our case. However, a study in a peri-urban lake reported 547 snake sightings in 5 years or 109/per year in Korattur Lake (Ganesh et al., 2005).

A study in Nadukuppam village farmlands revealed 151 sightings in a year (Krishnakumar et al., 2023). Ours was 132 in 3 years, i.e. 44 /year, which is much lower compared to previous studies. Likewise, a six-year (2007-12) study of roadkills in a Chennai suburb revealed 7 snake species representing 85 roadkills in all, and 8-20 roadkills per year (Aengals, 2015). It is higher than the 3-4 roadkills per year that we report herein.

Figure 3. a. *Dryocalamus nympha*, b. *Fowlea piscator*, c. *Amphiesma stolatum*, d. *Echis carinatus*, e. *Dendrelaphis tristis*, f. *Ptyas mucosa*, g. *Eryx johnii*, h. *Indotyphlops braminus*, i. snake shed skin, j. likely microhabitat.

Anyhow, concerning snake species richness reported in the many studies from Chennai and its environs (Kalaiarasan & Kanakasabai, 1999; Subramanian, 2001, 2002; Ganesh et al., 2005; Tsetan & Ramanibhai, 2011; Janani et al., 2016a, b) comparisons can be very easily made. These values are quite comparable and are elaborated here (also see Krishnakumar et al., 2023). A total of 19 species was reported by Kalaiarasan & Kanakasabai (1999) who studied snakes in Peri-urban and semi-rural areas bordering Chennai city. This is so far the highest species richness of snakes reported from in and around Chennai, by a study. But some studies report snake species not recorded by us, of both doubtful (Karthy et al., 2022; *Python*) and certain (Kautilya & Bodkha, 2014; *Grypotyphlops*) nature.

A compilation of 6 years (2010-15) data on snake rescues in Greater Chennai, primarily led by the Tamil Nadu Forest Dept. sometimes in tandem with the Fire & Rescue Dept. and like-minded private associate bodies, reports 16 snake species. Another similar study on snake rescues, of a short duration of two months Nov.-Dec. 2015 during the Chennai floods in Greater Chennai revealed 10 snake species. Both long-term (5 years; 2001-05) and short-term (< 1 year, in 2010) studies on certain wetlands in or near Chennai report 12-13 snake

species (also see Subramanian, 2001). Understandably, studies of much lower duration, report a much lower richness value of just 5 snake species (Subramanian, 2002). This stresses the need for longer duration studies to fully sample snakes in situ.

Moving away from Chennai on to much farther (> 100 km) ecologically similar areas reveals the following scenario. Studies on a college campus in Mayiladuthurai revealed 13-15 snake species (Kannan et al., 1994; Ganesh & Chandramouli, 2007; Nath et al., 2012). A three-year study on Oustheri–a lake near Pondicherry, revealed 14 species (Alexander & Jayakumar, 2014). But a mere 1-year study in rural farmlands (Nadukuppam) near the same Pondicherry, revealed 22 snake species (Krishnakumar et al., 2023). Closest among the farther study sites, in Kalpakkam Nuclear Plant, a long-term (4 years) study revealed 17 snake species (Ramesh et al., 2013). Again, rapid surveys (1 month) revealed only 5 snakes in the distant yet similar Rameswaram (Ravichandran & Siliwal, 2010).

Most studies conducted near townships and cities like Chennai and Pondicherry were either in wetlands (Subramanian, 2001, 2002; Ganesh et al., 2005; Tsetan & Ramanibhai, 2011; Alexander & Jayakumar, 2014) or closed private compounds of a rather stable nature, such as educational (Kannan et al., 1994; Ganesh & Chandramouli, 2007; Nath et al., 2012; this work) or industrial institutions (Ramesh et al., 2013). These areas are stable because it is impractical for these lands to be brought under increased building constructions for housing purposes. This study further emphasises the importance of physical structural stability as the single most overriding factor responsible for the continuing maintenance of rather constant vegetation belts over long timescales that have permitted the persistence of snake populations.

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Conflict of interests

The authors declare that they have no competing interests.

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