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Hissing for rescue: Mapping the human-snake niche in Coimbatore through a snake rescue analytical approach

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This study examines the patterns and trends of snake rescues in North Coimbatore, Tamil Nadu, India, over 35 months (2022–2024) to analyse snake ecology and develop human–snake conflict mitigation measures. A total of 2318 snakes representing 17 species were recorded, including 980 venomous and 1338 non-venomous individuals. The Indian rat snake (*Ptyas mucosa*) was the most frequently rescued species, followed by the Indian cobra (*Naja naja*), the Russell's viper (*Daboia russelii*), and the common wolf snake (*Lycodon aulicus*). Key parameters such as refugia type, refugia temperature, and rescue timing were documented by Wildlife and Nature Conservation Trust (WNCT) snake rescuers. Analysis revealed that seasonal fluctuations significantly influenced both rescue frequency and refugia use. Among identified refugia, debris piles were the most utilised, followed by indoor rooms, open spaces, and storage areas or machinery. Snake rescues peaked during the summer months and were most frequent in the afternoon hours. Spatial mapping identified high human–snake conflict zones, underscoring the need for targeted conservation strategies and improved conflict mitigation measures in these high-risk areas.

Key words: human–wildlife conflict; refugia occurrence; seasonal shift; snake ecology and conservation; snake rescues.

Snakes are among the most misunderstood and feared animals worldwide (Isbell, 2006). The Indian subcontinent, covering approximately 4.4 million km^2, lies at the convergence of two major biogeographic realms: the Palaearctic and the Oriental. This unique positioning contributes to its rich biodiversity, with high endemism. India is home to around 700 reptile species, 52% of which are snakes, encompassing 98 genera and 361 species across 18 families (Das & Das, 2017; Ramesh & Nehru, 2019). Of these, 73 species are venomous, including 40 species from the family *Elapidae* and 33 from *Viperidae*. The increasing overlap between human populations and wildlife habitats has intensified human–snake encounters, a critical issue in conservation and wildlife management. Factors like habitat loss, degradation, and urban encroachment lead to more frequent interactions between

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humans and snakes (DICKMAN, 2010; RAMESH & NEHRU, 2019). While global reptile populations face threats from habitat degradation and land conversion (GIBBONS *et al.,* 2000), some snake species have resisted the urban invasion of natural landscapes.

Snakes play a crucial role in the ecosystem, serving as key predators and biological controllers within the food web while also acting as prey for various predators (LATIFI, 1991; MOHAMMED & YOUSIF, 2019). Poor waste management, which attract preys such as rodents, has led to a rise in snake encounters in human-dominated areas, increasing risks for both people and snakes (MCKINNEY, 2008; BARVE *et al.,* 2013; ROSHNATH, 2019). Suburban areas consist of a mix of housing structures, gardens, permanent water sources, and human-provided food resources, which can support abundant prey populations, including frogs (ERNST *et al.,* 2011; LIU *et al.,* 2021) and rodents (FENG & HIMSWORTH, 2013), thereby benefiting their predators (LETTOOF *et al.,* 2023). This has led to frequent encounters, often ending in snakes being killed when spotted. Intentional killing is a major factor contributing to the decline of snake populations (BARUAH & SENGUPTA, 1998). The abundance of prey species such as rodents, amphibians, and poultry near human settlements and agricultural areas can attract snakes, increasing the likelihood of human–snake interactions. The World Health Organisation (WHO) has classified snakebites as a "Neglected Tropical Disease" (CHIPPAUX, 2017; GUTIÉRREZ, 2021; MARTÍN *et al.,* 2021; MARTINEZ *et al.,* 2024). Every year, snakebites kill between 81 000 and 138 000 people and cause long-lasting disabilities in another 400 000 people; the burden of snakebite death and disability is greater than any other neglected tropical disease (LANCET, 2019). Understanding the distribution of venomous snakes and their impact on health systems, human populations, and the snakebite burden on people at national, regional, and global levels is important for effective reduction and mitigation of snakebite (WHO, 2017).

Limited research exists on the effects of human disturbances on reptiles, particularly snakes, in urban environment (CARRASCO-HARRIS *et al.,* 2020; BARHADIYA, 2024). When conducted, most studies focus on protected areas such as national parks or wildlife sanctuaries, overlooking much of the urban landscape (FRANÇA & FRANÇA, 2019). In India, some studies have examined snake assemblages in urban settings (PURKAYASTHA *et al.,* 2011; PRASAD *et al.,* 2018; ROSHNATH, 2019; KALKI *et al.,* 2021; JIGAR *et al.,* 2022), but published works primarily list species present rather than exploring their distribution or ecology within these areas (BARHADIYA *et al.,* 2024). Understanding how animal ecology, life history, and landscape characteristics influence the persistence and success of snakes in urban environments is essential for conservation efforts, urban planning, and reducing human–wildlife conflicts (GIBBONS *et al.,* 2000; LETTOOF, 2023).

The objective of this study is to investigate the spatiotemporal patterns and ecological drivers of snake rescues in North Coimbatore over three years. Specifically, the study aims to (i) examine seasonal and diel (time of day) variations in rescues of venomous and non-venomous snakes, (ii) assess the association between snake species and refugia types across seasons, (iii) identify spatial hotspots of snake rescues through heat mapping, and (iv) evaluate the influence of temperature on rescue occurrences. By integrating ecological and human–wildlife interaction perspectives, the study seeks to provide insights into the dynamics of snake rescues across urban rural landscape.

Materials and Methods

Study area

North Coimbatore (Fig. 1) is situated in the southern Indian state of Tamil Nadu at approximately 11.04732°N, 76.90817°E. The study area experiences a semi-arid climate due to its location in the rain shadow of the Western Ghats. This city, also known as the "Manchester of South India" for its thriving textile industry and economic significance, has a population of over 1.8 million people (Thyagarajan *et al.*, 2021; Deepikavani & Thilakam, 2023). It lies at an average elevation of 411 m (1348 feet) and forms part of the biodiversity-rich Nilgiris Biosphere Reserve. Coimbatore receives an average annual rainfall of 952 mm, with 77% of this precipitation occurring between June and November. The mean monthly temperature averages around 25°C, with January recording the lowest temperatures at 18°C and April peaking at 35°C.

Coimbatore has undergone significant anthropogenic changes, with urban areas expanding by 94.5 km² over 11 years, resulting in substantial losses of agricultural land and vegetation (Prabu & Dar, 2018). Rapid urbanisation and environmental degradation pose major challenges, straining natural resources and increasing pollution. Land-use changes, particularly the conversion of agricultural land into urban spaces, have impacted biodiversity and water resources. Additionally, waste management and water conservation have become critical concerns as the population continues to grow (Noufal *et al.*, 2020; Ntagisanimana *et al.*, 2021; Thyagarajan *et al.*, 2021; Deepikavani & Thilakam, 2023; Balachandran & Muruganandham, 2024).

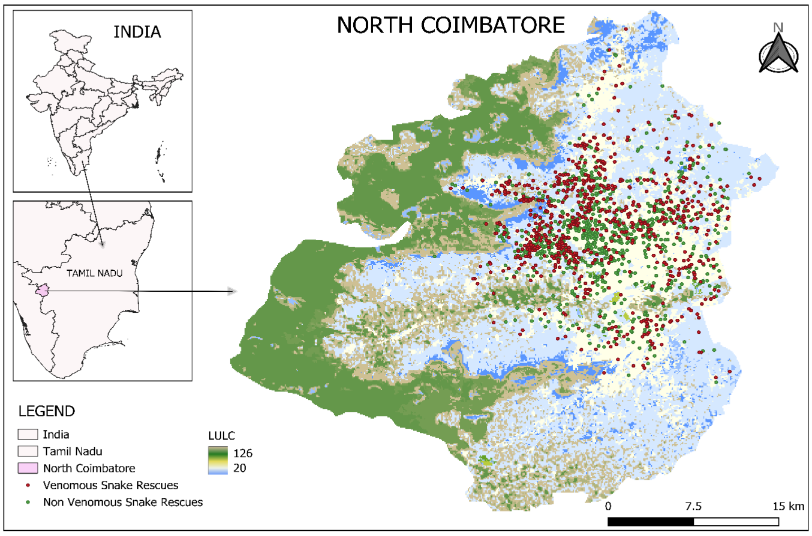

Figure 1: Location of the study area within Catalonia (small inset) and distribution of ponds inside and outside the protected area.

Data collection

The snake rescue data, recorded by rescuers from the Wildlife and Nature Conservation Trust (WNCT), was curated and systematically organised to create a comprehensive and reliable dataset for this study. The rescues were carried out following rescue calls received through an official advertised phone number. The phone numbers of rescuers were associated with the Forest Department and were also disseminated through awareness programs conducted in schools, colleges, workplaces, and other public gatherings. The team consisted of 10 rescuers who were properly trained and equipped with snake rescue kits to minimise physical contact with the animals. Following each successful snake rescue, the GPS coordinates, the specific refugium from which the snake was retrieved, the date and time of the rescue, along with the minimum and maximum temperature of the day obtained from the Indian Meteorological Department (https://city.imd.gov.in/citywx/responsive), were systematically recorded into an Excel spreadsheet. Snake rescues were categorised seasonally as follows: summer (March–June), monsoon (June–September), and winter (November–February). The refugia were classified into 10 types (Table 1). A day was divided into four time periods: morning (6:00–12:00), afternoon (12:00–16:00), evening (16:00–20:00), and night (20:00–6:00). The land use and land cover (LULC) map of Coimbatore was derived from the ESA WorldCover 2021 dataset (ESA/WorldCover/v200) at 10 m spatial resolution using Google Earth Engine (GORELICK *et al.*, 2017). Additional spatial data on water bodies and watercourses were obtained from the Geofabrik OpenStreetMap (OSM) database.

Table 1: Breakdown of the habitats from which snakes were rescued.

No.	Refugia	Definition
1	Animal enclosure	Space that is enclosed for keeping animals inside
2	Debris	Remnant of wood and other objects piled together that is already destroyed
3	Entrapment	Snake capture sites, including plastic nets and both natural and artificial refuges
4	Floral vegetation	Gardens and spaces with stray or overgrown plants
5	Indoor rooms	Inside the house
6	Open spaces	Ground, road, park, and outdoors
7	Pipes and holes	Grain, pipe, PVC, plumbing
8	Storage and machines	Shoe stands, sheds, washing machines, and equipment
9	Vehicles	Cars, bike bags, travel bags, and vehicles
10	Water sources	Tanks, meters, and drums

Rescue operations were not standardised by fixing working hours, as recue calls were received and attended 24 hours a day. The response to each call depended on the availability of rescuers, which was coordinated within the team according to the urgency of the situation. Rescues were typically carried out by the rescuer closest to the reported location; if unavailable, another team member attended the rescue. Despite the lack of temporal standardisation, rescue records were pooled and categorised into diel periods such as morning, afternoon, and evening as defined above. The diel was taken as a category based on temperature as a primary factor, relying on thermal heterogeneity. As this was not a designed survey but an operational response to unpredictable events, standardisation focused on receiving calls, attending rescue, collecting data, providing awareness and releasing the rescued snake within one hour of capture in the closest forested habitat.

Statistical analysis

We assessed seasonal variation in snake species occurrence across three survey seasons: summer, monsoon, and winter. Each observation was coded by species identity and season of detection. A contingency table of species counts by season was constructed to examine patterns in rescue frequency. Pearson's chi-squared test was employed to determine whether the distribution of counts differed significantly across seasons (χ^2, degrees of freedom, *p*-value). To ensure test validity, expected frequencies were evaluated to minimise potential loss of statistical power due to sparse cells. Where low counts occurred, standardised Pearson residuals ($r > 1.96$) were calculated to identify significant deviations from expected values, indicating over- or under-representation of particular species in specific seasons. When applicable, *post hoc* pairwise comparisons with Bonferroni correction were applied to control for Type I error in multiple testing scenarios. Additionally, Cochran Mantel Haenszel tests were employed to assess interaction effects between categorical variables, such as season and snake type, across stratified refugia categories. These combined approaches enabled robust detection of seasonal and habitat-specific trends in snake rescue patterns. Data entry was performed using Microsoft Excel (2016), and spatial mapping was conducted in QGIS (version 3.40.2) to ensure geographic accuracy and visual clarity. All statistical analyses were performed in R version 4.4.0 (R CORE TEAM, 2024).

RESULTS

Over 35 months, a total of 2318 snakes belonging to 17 species were rescued, comprising 980 venomous and 1338 non-venomous snakes. The rescue frequency averaged ~4.12 per day. The Indian rat snake (*Ptyas mucosa*) was the most frequently rescued species with 856 rescues, followed by the Indian cobra (*Naja naja*) with 678, Russell's viper (*Daboia russelii*) with 251, and the common wolf snake (*Lycodon aulicus*) with 239 rescues (Table 2). Rescues were highest in summer for both venomous and non-venomous snakes, followed by monsoon and winter (Fig. 2), though the seasonal distribution did not differ significantly between snake types ($\chi^2 = 3.09$, df = 2, $p = 0.214$). Time of day significantly influenced rescue patterns ($\chi^2 = 53.43$, df = 3, $p < 0.001$), with venomous snakes rescued most frequently in the afternoon (n = 278), followed by evening (n = 269), morning (n = 195), and night (n = 238); non-venomous snakes showed a similar but distinct pattern, peaking in the afternoon (n = 482), followed by evening (n = 295), morning (n = 359), and night (n = 202). Among venomous species (Fig. 3), *Naja naja* had the most rescues in summer (n = 337), decreasing in monsoon (n = 236) and winter (n = 133), with significant seasonal variation ($\chi^2 = 88.42$, df = 2, $p < 0.001$) driven by elevated summer occurrences (standardised residual = 8.12). *Daboia russelii* peaked in winter (n = 94), with lower rescues in monsoon (n = 80) and summer (n = 76), though not significantly different across seasons ($\chi^2 = 2.14$, df = 2, $p = 0.342$). *Bungarus caeruleus*

Table 2: Total number of rescues performed by WNCT for each species over 35 months.

Family	Scientific name	Common name	n	%	IUCN	Indian WPA
Colubridae	*Ahaetulla oxyrhyncha* (Bell, 1825)	Indian vine snake	47	2.03	LC	-
	Boiga forsteni (Duméril, Bibron & Duméril, 1854)	Forsten's cat snake	3	0.13	LC	IV
	Coelognathus helena (Daudin, 1803)	Trinket snake	28	1.21	LC	IV
	Dendrelaphis tristis (Daudin, 1803)	Common bronzeback tree snake	101	4.36	LC	IV
	Lycodon aulicus (Linnaeus, 1758)	Common wolf snake	232	10.01	LC	IV
	Oligodon taeniolatus (Jerdon, 1853)	Streaked kukri snake	28	1.21	LC	IV
	Ptyas mucosa (Linnaeus, 1758)	Oriental rat snake	836	36.07	LC	II
	Sibynophis subpunctatus (Duméril, Bibron & Duméril, 1854)	Jerdon's many-toothed snake	2	0.09	LC	IV
Elapidae	*Bungarus caeruleus* (Schneider, 1801)	Common krait	19	0.82	LC	IV
	Naja naja (Linnaeus, 1758)	Spectacled cobra	706	30.46	LC	II
Erycidae	*Eryx conicus* (Schneider, 1801)	Common sand boa	2	0.09	NT	IV
	Eryx johnii (Russell, 1801)	Red sand boa	14	0.60	NT	IV
Natricidae	*Fowlea piscator* (Schneider, 1799)	Checkered keelback	28	1.21	LC	II
Pythonidae	*Python molurus* (Linnaeus, 1758)	Indian rock python	15	0.65	NT	I
Typhlopidae	*Indotyphlops braminus* (Daudin, 1803)	Brahminy blind snake	2	0.09	LC	IV
Viperidae	*Daboia russelii* (Shaw & Nodder, 1797)	Russell's viper	250	10.79	LC	II
	Echis carinatus (Schneider, 1801)	Saw-scaled viper	5	0.22	LC	IV

rescues remained consistently low across seasons (monsoon: n = 10, summer: n = 4, winter: n = 5; $\chi^2 = 3.26$, df = 2, $p = 0.196$), while *Echis carinatus* was rescued equally in summer and monsoon (n = 2 each) and once in winter ($\chi^2 = 0.40$, df = 2, $p = 0.819$). Among non-venomous snakes, *Ptyas mucosa* had the highest rescues, peaking in summer (n = 331), followed by monsoon (n = 284) and winter (n = 221), with significant seasonal variation ($\chi^2 = 21.86$, df = 2, $p < 0.001$) and elevated summer occurrences (residual = 3.84). *Lycodon aulicus* also had the highest rescues in summer (n = 97),

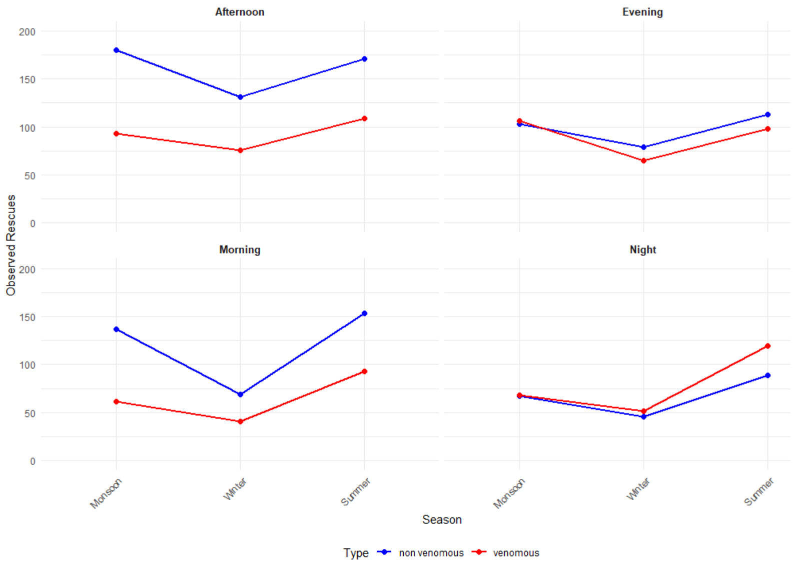

Figure 2: Number of snake rescues by season, time of the day, and type.

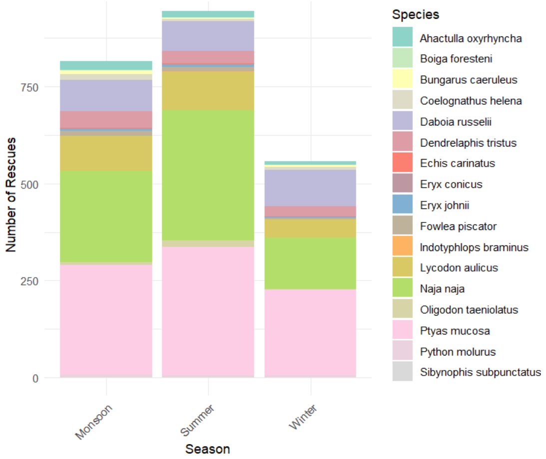

Figure 3: Seasonal distribution of snake rescues by species.

with a slight decline in monsoon (n = 89) and winter (n = 46; $\chi^2 = 19.46$, df = 2, $p < 0.001$; summer residual = 2.74). Overall, most species showed peak rescues in summer, except *Daboia russelii*, which peaked in winter, and a few species with relatively stable numbers across seasons.

Analysis of refugia where the snakes were found (Fig. 4a and b) revealed significant differences between venomous and non-venomous snakes ($\chi^2 = 45.28$, df = 9, $p < 0.001$), with venomous snakes most frequently rescued from artificial constructions such as debris (n = 203) and indoor rooms (n = 222; Table 1), followed by open spaces (n = 167) and entrapment (n = 18; residual = 4.98). Non-venomous snakes were also primarily rescued from debris (n = 270), indoor rooms (n = 382; residual = 3.20), and storage (n = 162). Seasonal variation in refugia occurrence (Fig. 4c and d) showed a significant interaction between season and snake type (Cochran-Mantel-Haenszel $\chi^2 = 101.59$, df = 18, $p < 0.001$). During summer, non-venomous snakes favoured debris (n = 129) and indoor

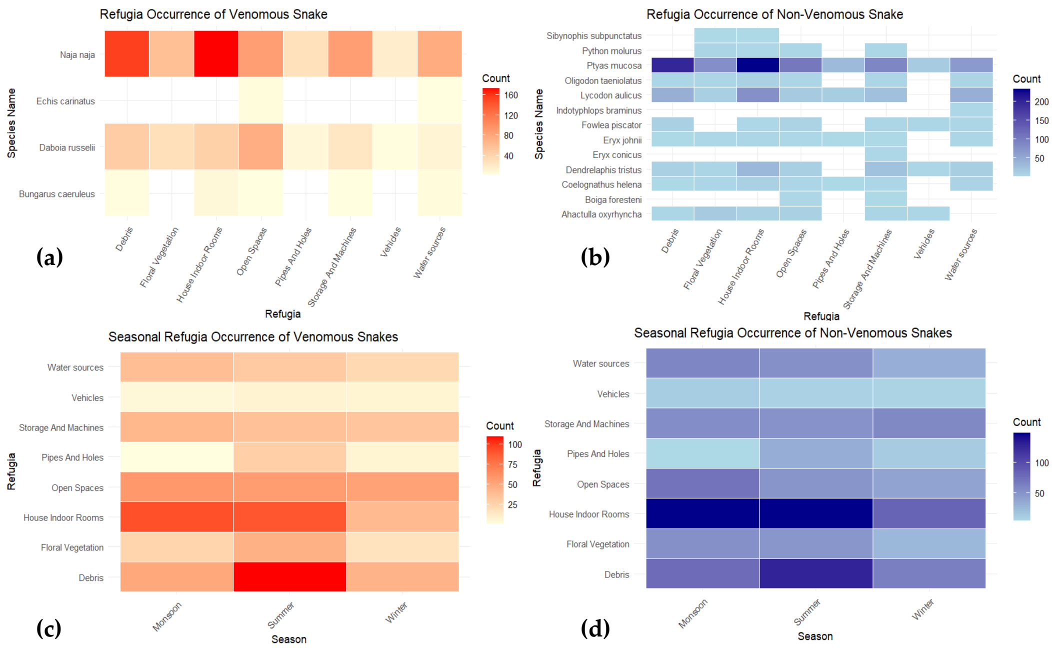

Figure 4: Refugia occurrence and refugia seasonal patterns for both venomous and non-venomous snakes.

rooms (n = 149), while in winter, indoor rooms became dominant (n = 84; refugia by type in summer: $\chi^2 = 19.33$, df = 9, $p = 0.023$; in winter: $\chi^2 = 21.16$, df = 9, $p = 0.012$). Similarly, venomous snakes were most found in debris (n = 109) and indoor rooms (n = 90) during summer, in indoor rooms (n = 92) during monsoon (refugia by type in monsoon: $\chi^2 = 17.96$, df = 9, $p = 0.036$), and in debris (n = 44) and open spaces (n = 53) during winter.

The analysis between temperature and snake rescues (Fig. 5) showed a distinct thermal optimum, with the highest rescue frequencies concentrated between 27–30°C. Within this range, rescues peaked at 28°C (291 individuals: 180 non-venomous, 111 venomous), followed by 30°C (252 individuals: 139 non-venomous, 113 venomous), 27°C (240 individuals: 154 non-venomous, 86 venomous), and 29.5°C (202 individuals: 125 non-venomous, 77 venomous). Rescue numbers declined markedly outside this window, with fewer than 50 individuals recorded below 25°C and above 32°C. The temperature distributions of non-venomous (n = 1338) and venomous (n = 980) snake rescues differed significantly ($\chi^2 = 8.401$, df = 2, $p = 0.015$). Non-venomous rescues occurred at slightly lower mean temperatures (28.8°C) than venomous (29.0°C), with the primary divergence at > 32°C, where venomous rescues exceeded expectations (standardised residual = +2.1) and non-venomous fell short (-1.8).

The heat map analysis (Fig. 6) revealed distinct distribution patterns of venomous and non-venomous snakes, highlighting high-risk areas for human–snake conflict in North Coimbatore. The highest incidences of venomous snake rescues were recorded in Appanayakanpalayam (region 1), Velandhipalayam (region 2), Navavar Piruvu (region 3), Nanjundapuram (region 4), and Subramanipalayam (region 5), while non-venomous snakes were most frequently rescued from Vadavalli (region 1), Kaverinagar (region 2), Thudiyalur (region 3), Velandhipalayam (region 4), and Athipalayam Pirivu (region 5). The analysis revealed a distinct distribution pattern for venomous snakes, recording a total area of 4516 km², with 37 km² classified as high-risk (38–48 occurrences), 419 km² as moderate-risk (19–38 occurrences),

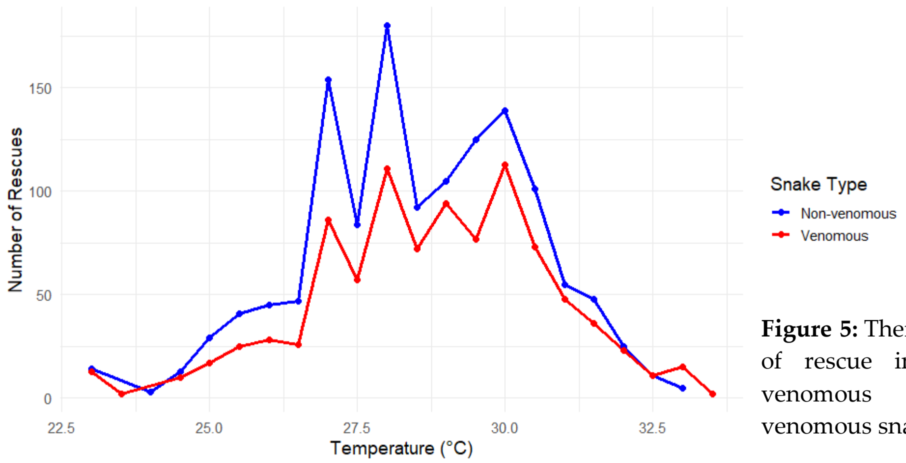

Figure 5: Thermal pattern of rescue instances in venomous and non-venomous snakes.

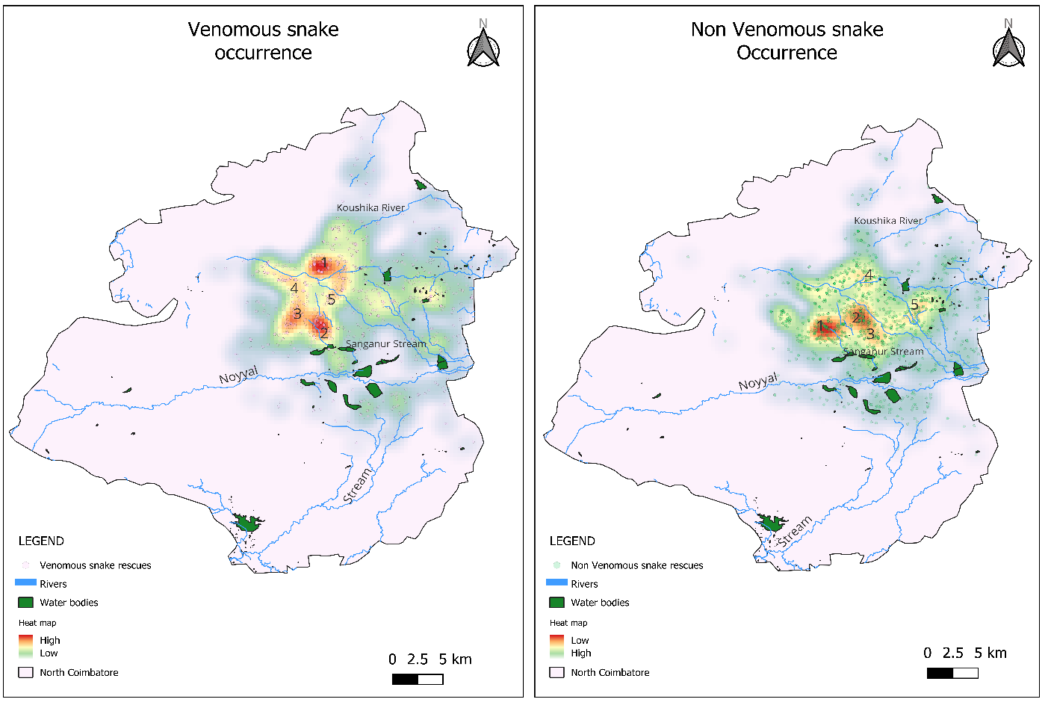

Figure 6: Heat map of snake rescue distribution highlighting high-risk areas of human–snake conflict separately for venomous and non-venomous snakes in North Coimbatore.

and 4060 km² as low-risk (0–19 occurrences). In comparison, non-venomous snakes were recorded across a slightly larger area of 4622 km², with 40 km² in high-occurrence zones (59–75 occurrences), 413 km² in moderate-occurrence zones (30–59 occurrences), and 4169 km² in low-occurrence zones (0–30 occurrences). These findings indicate that venomous snakes have smaller but more concentrated high-risk zones, whereas non-venomous snakes exhibit a broader distribution across the region.

DISCUSSION

This study summarises the snake rescue work done in an urban environment in southern India for 35 months. The study identified the most frequently rescued species, including both venomous and non-venomous species, which were the Indian rat snake, followed by the Indian cobra, Russel's viper and common wolf snake. Rescues peaked during summer and in the afternoon, aligning with snakes' ectothermic behaviour and their dependence on external heat for thermoregulation and activity. Afternoons provide optimal warmth and higher human presence, increasing sightings. At night, snakes retreat to shelters, leading to fewer rescues. This aligns with known ecological patterns of cold-blooded animals (PARMESAN, 2007; DEUTSCH *et al.*, 2008; TODD *et al.*, 2011; BUCKLEY *et al.*, 2012; RUGIERO *et al.*, 2013; ESKEW & TODD, 2017; JESUS *et al.*, 2023). Importantly, this rescue data reflects human–snake encounters rather than the total activity of snakes. Seasonally, summer had the highest number of rescues, though no significant difference was observed between venomous and non-venomous snakes overall. Hot conditions likely push snakes beyond their thermal comfort zone, driving them to seek cooler refuges in human settlements such as trash piles and sheltered spaces, which also offer safety and food. Cobras and rat snakes showed the largest increases during summer, with wolf snakes also showing significant rises. Less common species such as saw-scaled vipers, kraits, vine snakes, and cat snakes displayed similar patterns, reflecting their need for protective shelter during hot conditions. Refugia preferences varied significantly by species and season: in winter, non-venomous snakes mostly sheltered indoors (84), whereas venomous snakes were found more in open areas. These patterns align with earlier Indian studies (NANDE & DESHMUKH, 2007; JAGADEESH *et al.*, 2015), suggesting urban microhabitats function as thermal refuges. Winter rescues were generally lower, as snakes require external warmth for movement. Russell's vipers were an exception, showing higher winter activity (94 rescues), possibly due to their tendency to remain in cooler open areas. Kraits and saw-scaled vipers showed consistent rescue numbers across seasons, likely due to their nocturnal habits that reduce daytime encounters. A temperature rescue analysis indicated a peak in activity around 28°C, with fewer rescues at extreme temperatures, supporting the idea that thermal stress drives snakes to seek shelter and increases human encounters (DEUTSCH *et al.*, 2008; BUCKLEY *et al.*, 2012).

Using rescue data and heat map analysis in QGIS, we identified key hotspot areas for snake rescues. These areas provide favourable conditions for both venomous and non-venomous snakes, offering abundant shelter, prey, and proximity to critical water bodies such as the Noyal River, Koushika Stream, and Sanganur Stream. Additionally, regions near lakes such as Krishnapathi, Selvampathy, Perur, Singanallur, and Ukkadam serve as ideal snake habitats due to their rich (prey) biodiversity and ecological features. The city is home to 22 lakes, largely fed by the Noyal River, which function as storage and percolation tanks. Unfortunately, the city's open drainage and sewer systems lead untreated waste directly into these lakes and the Noyal River (MATHEW *et al.*, 2002; MATHEW *et al.*, 2003; PRUSTY *et al.*, 2006; NISHADH *et al.*, 2008). This alarming situation not only threatens water quality but also jeopardises the ecological balance of these habitats.

Rapid urbanisation near critical snake habitats has increased human–snake conflicts, as snakes venture into human-dominated areas. Coupled with fear and misunderstanding, this encroachment threatens snake populations, making conservation efforts essential to prevent further declines. Interestingly, the rescue hotspots show significant overlap, suggesting shared habitat preferences among venomous and non-venomous snake species. These findings highlight the importance of these regions as ecological zones supporting diverse snake populations. Protecting these water bodies and surrounding habitats is crucial, not only for sustaining snake populations but also for maintaining overall ecological health.

The habitat of *E. carinatus* spans diverse environments, including sand, rocky terrain, silty soil, and scrublands (LATIFI, 1991). It is also commonly found in areas such as flat rocks and brush piles (PHELPS, 2010). This species has been recorded in three primary habitat types: semi-desert regions, rainforests, scrub forests, mixed, dry, and moist deciduous forests, and grasslands (http://indiansnakes.org; KHAIRE, 2014; MUKHERJEE, 2021). However, most *E. carinatus* rescues have occurred in open spaces near water sources, which is a concerning trend. Indian pythons (*P. molurus*) are primarily found in tropical regions, including mangroves, scrub jungles in arid areas, major rainforests, and grasslands. They inhabit a variety of natural environments such as rainforests, river valleys or riparian zones, wooded areas with sufficient hiding places, scrublands, grassy marshes, and rocky or semi-rocky hills. These snakes generally prefer major biomes and are often recorded in areas with ample resources and shelter (BHUPATHY & VIJAYAN, 1989; BABAR *et al.,* 2019). However, *P. molurus* have also been rescued from artificial habitats such as floral vegetation, open spaces, storage areas, machinery, building premises, and even toilets. The presence of individuals in artificial habitats poses a significant threat to their survival, as it deviates from their natural ecosystems described above. The Indian rat snake (*P. mucosa*) is an effective predator with a broad diet that includes rodents, birds, eggs, amphibians, insects, and even other snakes. This versatile diet helps it play a crucial role in controlling pest populations, particularly rodents, which is essential for maintaining ecological balance (SAMSON *et al.,* 2023). Even young individuals contribute by feeding on insects, further enhancing pest control in agricultural and natural environments (MARTIN, 2024). Similarly, the common wolf snake (*L. aulicus*) primarily preys on geckos and skinks (WHITAKER & CAPTAIN, 2004).

Much of the existing literature on snakes in India focuses on their status, distribution, and taxonomy (MURTHY, 1990; DAS, 2003; DAS, 2010). Understanding how an animal navigates and uses its environment is crucial for addressing ecological, behavioural, and conservation-related questions. This is particularly significant for snakes, as their movement patterns and habitat usage over time are closely linked to their life history traits (BRONIKOWSKI, 2000; LUISELLI, 2006). Wildlife rescue data is crucial for understanding conservation issues and broader ecological impacts. The seasonality of snake rescues provides valuable insights into their activity patterns within the district, essential for developing strategies to mitigate human–snake conflicts (ROSHNATH, 2017). Snakes are equally important in maintaining ecological balance, as they serve as dominant predators in some ecosystems and crucial prey in others (MORENO-RUEDA & PIZZARO, 2007; SPERRY *et al.,* 2008), and they are among the faunal groups most adversely affected by anthropogenic development (GIBBONS *et al.,* 2000; ROSHNATH, 2017). The WHO estimates that 81 000 – 138 000 people die annually from snakebites worldwide, with three times that number surviving but suffering from amputations and permanent disabilities (WHO, 2019). According to a community-based survey, "The Million Death Study" published in 2011, India alone loses between 40 000 and 50 000 lives annually to venomous snakebites (MOHAPATRA *et al.,* 2011). The four widely distributed venomous snakes, Indian cobra (*N. naja*), Russell's viper (*D. russelii*), saw-scaled viper (*E. carinatus*), and common krait (*B. caeruleus*), collectively known as the "big four", are responsible for most snakebite incidents and fatalities (MOHAPATRA *et al.,* 2011). The major challenges in managing snakebite-related health hazards include a lack of understanding of snake biology, inadequate treatment protocols, scarcity of antivenom, geographical variation in venom across regions, and widespread misconceptions and lack of public awareness (SAIKUMARI *et al.,* 2015). The research by MARTINEZ *et al.* (2024) suggests that by 2070, India may face increased vulnerability to snakebites, potentially impacting both public health and veterinary health. This forecast highlights the need for proactive measures to address the growing risk and prepare for future challenges in snakebite management.

In response to the increasing number of rescues and the need for public education, the WNCT team conducts 50 awareness programs annually. These programs aim to educate the public about snakes, their behaviours, and proper handling practices. The lack of public knowledge often leads to preventable snakebite incidents, making these awareness initiatives crucial. Volunteers play a vital role in this effort, not only assisting the community but also recording and monitoring the types of snakes commonly found in human settlements. Their contributions are essential for improving public safety and promoting coexistence with these important reptiles.

We are planning to study snake population dynamics using capture and recapture methods while raising awareness about safe snake release practices. Addressing snake–human conflicts will require collaboration across departments and improving waste management in Coimbatore. We also insist on creating a real-time monitoring Android application specifically to record snake rescues, similar to other citizen science portals, to better understand human–snake interactions. This initiative, being implemented on a large scale, can reduce snake–human conflict.

The team WNCT has shown the power of combining research, awareness, and action in Coimbatore. Collaboration between ecologists and wildlife rescuers has been key to their success. Through snake rescues, they have conserved snake populations, reduced human–wildlife conflict, and preserved the ecological balance. Their efforts in educating communities have helped people coexist peacefully with snakes, reduce fear, and promote safe handling practices. This holistic approach not only protects snakes but also fosters long-term conservation and deeper public understanding of wildlife. WNCT's success in Coimbatore offers a model that can be replicated in other regions facing similar challenges.

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