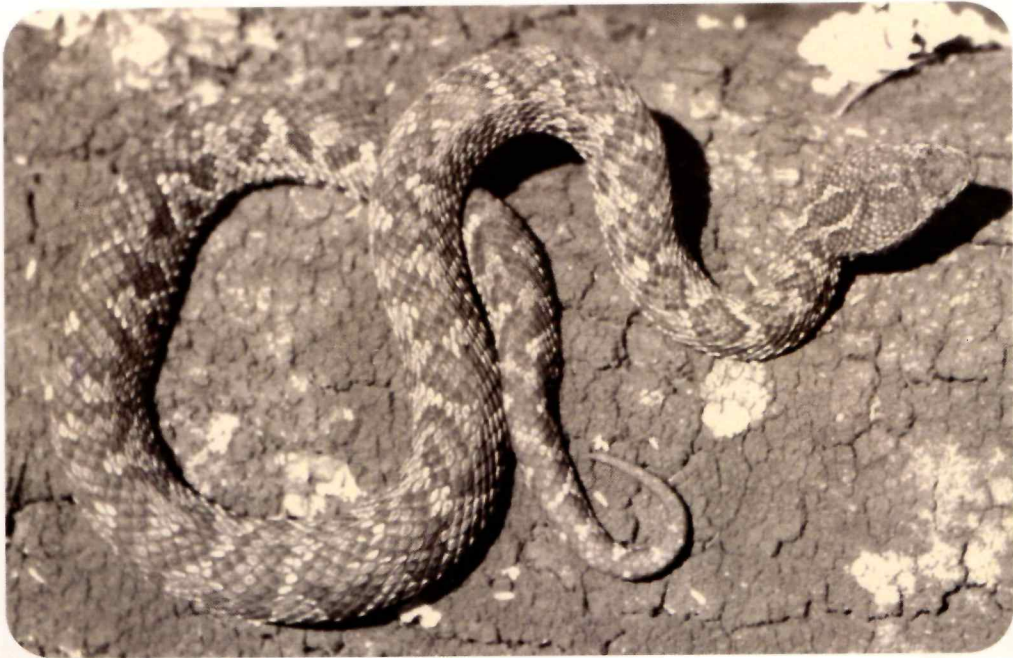


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Cover

Horse-shoe pitviper (*Trimeresurus strigatus*) : a venomous snake, found in high-elevation shola grassland zones of upper Nilgiris; endemic to the Western Ghats. Also see page 10.

Photo: P.Kannan & P.Santhosh Kumar

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Cover
Horseshoe crab (Limulus spp.) is a primitive, make fossil is high-valued, that contains most of copper. It is endemic to the Western Ghats. Also see page 10.
Photo: P. K. Suresh & Senthil Kumar



STATUS OF MUGGER CROCODILES (*CROCODYLUS PALUSTRIS*) IN RIVER MOYAR, SOUTHERN INDIA

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Abstract

Status of Mugger crocodiles (*Crocodylus palustris*) was studied in the river Moyar between 2014 and 2016. In total, 98 positive sites (scat and basking sites) were observed in which 28 Muggers were encountered directly in the 102 km river stretch during entire study period. The relative abundance of muggers per kilometers was 0.44, 0.51 and 0.41 during post-monsoon, winter and summer period. The population abundance of the muggers was 46, 52 and 42 during post-monsoon, winter and summer period respectively. The distribution of mugger signs were positively correlated with width and depth of the river and negatively correlated with river substrate such as shallowness, mesquite invasion and steep-slopesites. In all, no burrows were observed along the river banks. No instances of human-crocodile conflicts and domestic animal casualties were observed. Perhaps, various types of threats to Mugger habitat were noticed including 'Mesquite' invasion, pesticide agriculture run-off mixing and dynamite fishing activities. Muggers in Moyar River are protected but, due to illegal fishing practice in some part of the river, fish abundance drastically declining and it could lead human-wildlife conflict in future. The present study suggest further ecological research to propose strategies to conserve the mugger population and the river Moyar ecosystem.

Key words: Mugger crocodiles; Status; river Moyar; Western Ghats; conservation

Introduction

The Marsh crocodile or Mugger (*Crocodylus palustris*) is one of the common, widely spread and most adaptable crocodylian species in India (De Silva & Lenin 2010). They are amphibious in nature, occupying a variety of habitats including hill streams, manmade reservoirs, seasonal tanks, large rivers, small pools, irrigation channels and also urban drainages & sewage puddles (Vyas, 2010, 2013). This species is a threatened reptile in India and legally protected under Schedule I in the India's 'Wildlife (Protection) Act 1972' and categorized as 'Vulnerable' under the assessment criteria of IUCN for threaten species (Choudhary & De Silva 2013). In the late 1970s, the mugger population was depleted from its entire distribution range due to illegal hunting, unrestricted fishing and habitat loss which brought muggers to the edge of extinction (Whitaker 1987, Bustard 1999). But now, the mugger population persisted due to the legal protection and the success of ex-situ programmes and release practices (De Silva & Lenin 2010). Mugger is known to inhabit many of the large fresh water bodies in India (Vijaykumar *et al.* 1999; Vyas, 2008; Vyas, 2010). However, river Moyar is one among the potential mugger habitat in southern part of the Western Ghats, which supports sizable mugger population.

Materials and Methods

Study area

Moyar is a well-known perennial river in the Western Ghats that flows through many protected areas viz., Mudumalai Tiger Reserve (MTR), Sathyamangalam Tiger Reserve (STR) and Nilgiri North & South Divisions (NND; NSD) (11.56 N' and 76.93 E' ~431m asl) (**Fig. 1**). Upper gorges of the river receives more than 5000mm rainfall and lower/down river area receives about 824 mm rainfall annually and average temperature in this region varies from 25 - 38°C in the lower elevations and 14 - 30°C in higher elevations. Further, the elevation of the river area varies from 250m asl (in downstream areas) to 2050 m asl (in upstream areas) (Puyravaud & Davidar 2013). The landscape supports one of the largest Tiger (*Panthera tigris*), Leopard (*Panthera pardus*), Elephant (*Elephas maximus*), Otters (*Lutagale perspicillata*; *Anoxyx cinerea*) and Gyps Vulture populations. Moyar is a key livelihood source for more than a million people and thousands of hectares of agricultural lands (Puyravaud & Davidar 2013). However, this river ecosystem

faces many threats such as agriculture runoff mixing, hydroelectric projects, fishing activities, pesticide and motor oil spilling in the river water (Puyravaud & Davidar 2013). In spite of these threats, mesquite (*Prosopis juliflora*) continue to invade the river gorges catastrophically impacting native biodiversity.

Assessing distribution and status of muggers

The field survey was conducted by foot along the 102 km stretch of Moyar and its tributaries, using landmarks, the entire river was surveyed in three seasons post-monsoon, winter and summer, only inaccessible area were left-out to avoid accidents during the survey (Vyas 2008, 2009). The survey consist of two to three observers to assess the status and distribution pattern of muggers. Whenever we encountered the mugger (direct and indirect [scats, burrows/basking site]) its location marked using Geographical Positioning System (Garmin 80). Observations were made along the river from the eastern part (248 m asl) to western part (2054 m asl). The presence of crocodiles in each seasons was mapped based on sightings as well as indirect fecal evidence of mugger using QGIS software. Crocodiles were categorized into size classes- >1.5m as adults, <1.5m as sub adult (Vyas 2013). Direct sightings and photographic evidences (DSLR camera) were used for demographic classification (Vyas 2012).

Assessing the habitat correlation

We laid 1.2 km river transacts in which, 100 m X 15 m plots were laid at the distance of every 400m to assess habitat parameters). In each plot habitat parameters such as type of substrate (hard sand, loose sand, rock, stone and gravel, canopy cover, vegetation cover and leaf litter (measured as percentage cover of the plot) were assessed (Anoop and Hussain, 2004). 'Hard sand' are defined as fine-textured, tightly packed sand, while 'loose sand' as coarse and loosely packed. Any boulder are classified as rock, stones and gravels (small-sized stones roughly under 10mm in diameter) (Bonesi and Macdonald 2004). Pearson's correlation test was performed to understand the relationship between habitat traits with mugger signs distribution.

Results

The 102 km river Moyar was surveyed in three seasons yielded a total of 98 positive signs/scats were recorded and 28 muggers were directly sighted. The relative abundance was not showing any significance either positive or negative in all three seasons (0.44 ± 0.18 individuals / km [post monsoon] and 0.51 ± 0.27

individuals / km [winter] and 0.41 ± 0.11 individuals / km [summer]) respectively (**Table. 1**). However, the habitat use by muggers were similar in all three seasons. Loose sand and rocky sites (51.72 ± 2.79 and 48.25 ± 1.89 ; $p > 0.825$) were highly occupied by muggers where the canopy cover was less than 40% (**Table. 2**). Among different age groups adults (41%) followed by sub adults (29%), juveniles (5%), yearlings and those of unknown age group (25%) were observed respectively. The seasonal occurrence of mugger crocodiles in river Moyar was shown in **Figure. 1**. Mugger occupancy was positively correlated with rocky, loose soil and less canopy cover sites. However, it was negatively correlated with shallow river depth, narrow river width and Mesquite (*Prosopis*) invaded sites in river Moyar (**Table. 2**). Year-wise comparison of the relative abundance of crocodiles was shown in **Fig. 2**.

The survey results that the distribution of mugger crocodiles were high in downriver areas and low in the upriver areas. Perhaps, no cases of any human-crocodile conflicts and cattle predations were observed during the survey. However, the entire river was facing unrestricted fishing pressure mostly anglers, cast nets were used by fishermen. Sadly, fishermen infrequently using dynamites for fishing in river Moyar region. In addition, agricultural pesticide runoff and laundry waste water mixing into the river are polluting the river and its biodiversity.

Discussion

This study explored the population and distribution mapping of crocodiles, identified the habitat preference and threats associated in the Moyar River. The only crocodilian known to inhabit the river was *C. palustris*. In this study, the numbers of adults that were seen, is easily comparable to the sub-adults because the movement and other activities of the sub-adult muggers was not limited as most of the time they were basking on the rocks or sandy sites (Whitaker and Whitaker 1984). The highest numbers of mugger signs and direct sightings (fourteen) were found in the winter, which is the breeding season and hence peak activity period for this species in south India (Whitaker & Whitaker 1984). Crocodile preferred certain sites, along the river course with varying depth and fast moving meanders, similar to observations of Goit & Basnet (2011).

In winter and summer most sightings were in the sand bank, no grass cover and rock formations were found in middle of the river as compared to other habitats. Most of the muggers were found performing either basking or gaping. But, in Koshi River they preferred mainly sand bank, high grass cover and river channels as their habitat in winter and spring (Goit & Basnet 2011). According to Whitaker (1987),



gaping has significance in the thermoregulation. It may also perhaps be a way to get rid of oral infections, pathogens and parasites as small birds would come to pick off such animals from the mouth of crocodiles. Downstream movement of crocodiles during the monsoon and summer period has also been reported from the Koshi River to the Ganges River in India (Biswas 1970). However, similar movement pattern were observed in downriver areas during summer further, they moved towards upriver during the post-monsoon season in river Moyar.

However, anthropogenic pressures such as unrestricted fishing activities, pesticide agricultural runoff mixing into the mugger habitat were observed during the surveys. In spite, in river Moyar muggers live in very close proximity to the humans with sizable populations in the region. It is difficult to ascertain that they would not pose any problem to local people, who regularly share the river habitat with the muggers. Although, the Moyar region has legal protection, one of the reasons for the low level of conflict may be that the local people here are indigenous tribes who have always lived with wildlife, including muggers. Their existence has been positively accepted by people mainly because of the fact that there have been no human casualties and cattle attacks in this region. But, incidence of a few attacks could possibly lead to the rise in negative attitudes about muggers in future.

Thus, most of the muggers were sighted sporadically during the census period. Initiation of systematic monitoring programme look into ecological parameters like movement patterns, territoriality, interspecific relationship with sympatric species, prey selection, breeding success and conflicts will be crucial to conserve the *Crocodylus palustris* in river Moyar ecosystem.

Acknowledgement

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Figure 1. Map showing the season-wise distribution of Muggers signs and sighting in the river Moyar, Western Ghats

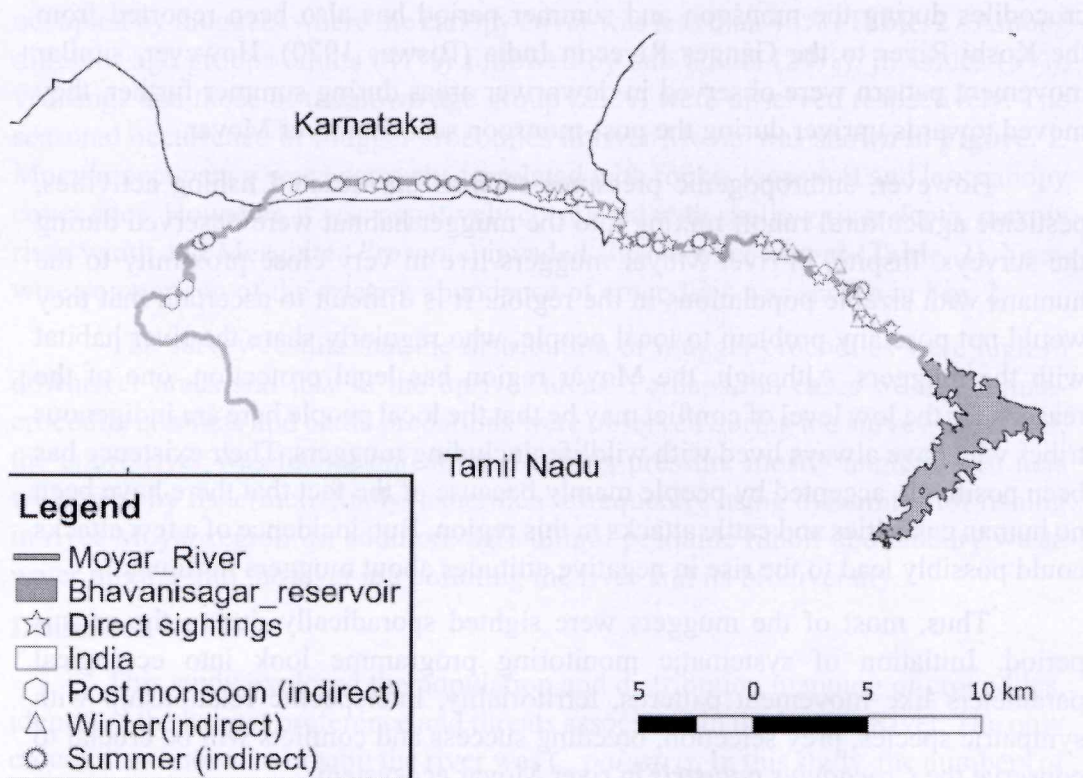


Table 1. Relative abundance of Muggers/ kilometer in different seasons in river Moyar during 2014 - 2016.

	Post-monsoon	Winter	Summer
Relative abundance	0.44	0.51	0.41
Standard Error	0.08	0.27	0.11

Figure 2. Year-wise comparison of relative abundance/ kilometer of the muggers in river Moyar.

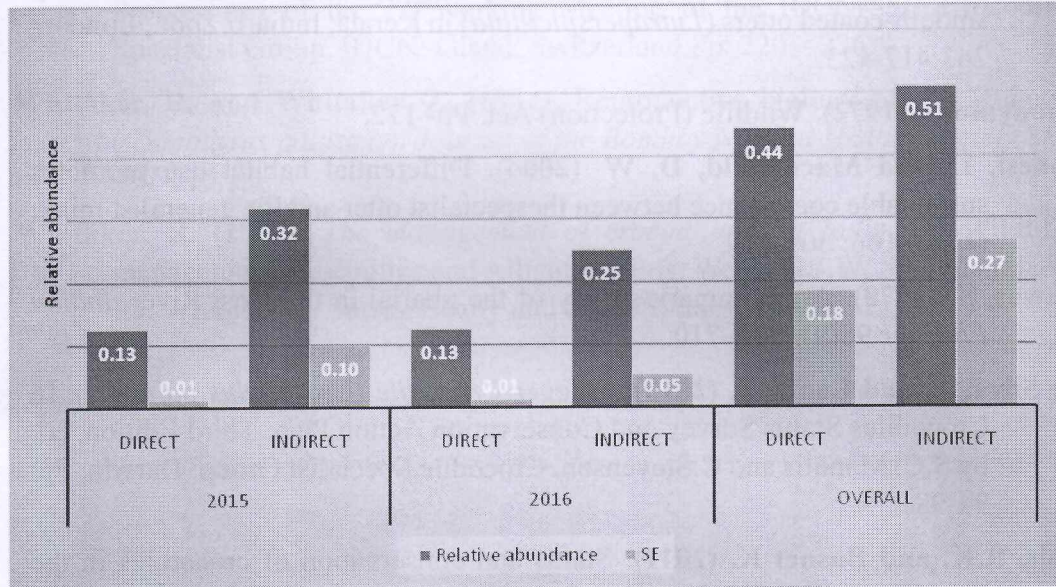


Table 2. Summary of the significant results of the χ^2 analysis using cross-tabulation and Pearson's correlation tests for habitat relationship with mugger signs distribution in river Moyar.

Habitat type	Grid cell Neighborhood	χ^2	Type of association	Significance (P)
Rocky	20 x 20	0.38	+	0.825
Loose sand	%	0.34	+	0.068
Mesquite sites	20 x 20	-0.37	-	0.075
Canopy cover	%	-0.53	-	0.038
River depth	Meters	0.43	+	0.671

A significant χ^2 value indicates that there was a significant association between the presence or absence of signs and that habitat type. A positive association of mugger sign activity with a particular habitat types are indicated by a plus sign and a negative association by a minus sign in the table.



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SOME ENDEMIC SNAKES OF UPPER NILGIRIS, TAMIL NADU – AN OVERVIEW

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Introduction

Snakes play very important roles in many ecosystems, serving as both predators and prey for a large number of animals (Greene, 1997). Many species of Indian snakes chiefly feed on vermin like rats and other agricultural pests (Whitaker and Captain, 2004). They are ectotherms and thus can allocate more energy to growth and reproduction than comparably-sized endotherms (Pough, 1980; Godley, 1980). Over 3000 species of snakes have been described worldwide thus far and more are being discovered. Snakes mostly live in tropical and sub tropical countries. Of around 280 species of snakes known from India, only 25 are common and widespread in India. The remaining species are more or less confined to some of the bio-geographical regions (Vijayaraghavan and Ganesh, 2011). Among the recorded reptiles, four species are listed in schedule I and six species are listed in Schedule II of the Wildlife (Protection) Act, 1972.

Nilgiris

Nilgiri Biosphere Reserve (NBR), formed under the aegis of the Man and Biosphere Reserve Programme of the Ministry of Environment and Forests, Government of India, is India's first Biosphere Reserve. Nilgiris means 'Blue mountains' in the native dialects (Tamil, Malayalam and Kannada) and it bears the distinction of being the only hill district in Tamil Nadu State. Total area of the Nilgiri Biosphere Reserve is 5,520 Sq.km encompassing parts of Tamilnadu (2537.6 Sq.km), Kerala (1455 Sq.km) and Karnataka (1527.4 Sq.km). Nilgiris represents the northern most limit of the Western Ghats segment in Tamil Nadu and is part of the Nilgiri Biosphere Reserve. The Nilgiris occupies a total area of 2542.49 Sq Kms (11^o, 12' and 11^o,43' north and 76^o,14 and 77^o,1' east) with Kerala on the west, Karnataka on the north and Coimbatore district of Tamil Nadu on the east and south. This district derives its charm from its natural setting, at the junction

of Western and Eastern Ghats. Average monthly rainfall of the district is 94.29 mm, mean maximum average temperature is 96^o C and mean relative humidity is between 75.8 and 76.9%. Natural vegetation in this district is varied and diverse, harbouring many rare, endemic, endangered and threatened species of flora and fauna (Saravanakumar *et al.*, 1993).

Some Endemic Snakes Distributed in Nilgiris, Tamil Nadu

1. *Plectrurus perrotetii* (Perrotet's shield tail)

Description: Non venomous. Burrowing, grows up to 44 cm, body covered with smooth scales, have small eye, short blunt tail ends in two small points. Brown or dark purplish brown over all. Under side of tail orange in colour. Young snakes often have a red or yellow lines on topside of the tail. Muscles of the trunk is well developed for digging their way in to the soil with the snout. While handling, they do not bite but will twine themselves round the fingers, may defecate and poke with tail tip.

Distribution: Endemic to the Western Ghats. Inhabit the mountains of Nilgiris even at very high altitudes. Live under stones, logs and mostly buried in the earth.

2. *Xylophis perroteti* (Striped narrow headed snake)

Description: Non venomous. Grows up to 60 cm. Body cylindrical with smooth scales, tapering head, small eye, olive coloured with whitish stripes, indistinct dull yellow colour sometime present, lip scales black and yellow or brown coloured. Oval pupil. Short tail. Feed on earth worms. Diurnal, inhabits under stone, leaf litter and burrows in thickly vegetated areas. We can also see this snake near cultivation, burrows and near human habitations. Young ones seen during July and August.

Distribution: Fossorial snake, endemic to the Western Ghats. Distributed in upper Nilgiris.

3. *Ahaetulla perroteti* (Bronze headed vine snake)

Description : Mildly venomous. Grows up to 60 cm. It is a high altitude grass land species. Have pointed and projecting snout, without any dermal appendage as in common vine snake. Dorsal side bright green in colour, ventral side yellowish or pale green in colour.

Distribution: Endemic to the Western Ghats. This species is common on the grassy hills and montane shola grass lands of upper Nilgiris.

Pit vipers

They are small to medium-sized, slow moving, nocturnal snakes. The name is derived from the heat sensitive pit located between each nostril and the eye. The Western Ghats is home to a highly distinctive group of these snakes. Six species of pit vipers have been reported from the Western Ghats; they are hump nosed pit viper, *Hypnale hypnale*, large scaled pit viper *Trimeresurus macrolepis*, Malabar pit viper *Trimeresurus malabaricus*, horse-shoe pit viper *Protobothrops strigatus*, bamboo pit viper *Trimeresurus gramineus* and Hutton's pit viper *Tropidolaemus huttoni*. Pit vipers feed on frogs, lizards, rodents and birds. The venom is not as toxic as venom of true vipers, but all strike fast and some species have caused human fatalities. Pit vipers are ovo-viviparous. Many pit vipers are terrestrial, while a few are highly arboreal. They are sedentary in nature. They are fairly slender bodied with prehensile tail. The presence of a pair of heat sensitive pits enables the pit vipers to accurately locate warm blooded prey. Most vipers are typically patterned; they rely on camouflage to blend with their surroundings an essential feature of a sit-and wait ambusher, allowing the prey to come within the striking range. Most vipers have vertically elliptical cat like pupils that maximize the use of available light in low light jungle or nocturnal conditions.

4. *Trimeresurus strigatus* (Horse shoe pit viper)

Description : Venomous. Uncommon. Endemic to the Western Ghats. Grows upto 40 cm. Triangular head; broader than the neck. Heat sensitive pits present between eye and nostril. Slightly prehensile and short tail. Dorsal side brown or grayish brown with dark edged brown spots with zig zag stripe. Smaller spots present on sides of the body. A horse-shoe shaped pale brown, yellowish or white mark present on the neck. Ventral side whitish or yellowish marked with brown colour. Nocturnal, mostly terrestrial. Feed on small mice, frogs and smaller snakes. Give birth to live young ones.

Distribution: Endemic to the Western Ghats. Distributed in upper parts of Nilgiris.



Discussion

The Nilgiris is the most forested district of the state and signifies an important stretch of the Western Ghats and is the meeting point of the Western and the Eastern Ghats and are home to many rare, endangered and endemic species of herpetofauna (Srinivasulu *et al.*, 2008). There are about 67 species of snake are reported in this hill, among these 27 species are endemic to the Western Ghats (Kannan, 2014). Due to the occupation of plainsmen and the British during the past century has undergone considerable changes in Nilgiri landscapes. The fast pace of change was ushered by a development of large stretch of plantations such as tea, coffee and wattle (Nixon, 2015). Consequently, over 80% of the Southern Montane wet temperate forests (Shola and Grassland) of Upper Nilgiris have been lost since 1850 (Saravanakumar *et al.*, 1993). This level of habitat loss and fragmentation are a major threat to biodiversity hotspot (Wilson, 1992).

Furthermore the Nilgiri hills is an important tourist center of South India; which attracts a large number of tourists from other parts of the state and country. Thus a large number of hotels, clubs, resorts, gardens and roads have appeared rapidly and as a result, traffic density was high throughout the year, as a result extreme level of pollution are increased and the result was affecting the entire ecosystem of Nilgiris. Among the wildlife facing threats in Nilgiris, as with so many of our snakes are facing hard time because of habitat loss, developments, extreme pollution cause for increasing of temperature, which affects snakes drastically, particularly the burrowers which have taken millions of years to become specially adapted to this way of life (Whitaker and Captain, 2004). Human induced changes in landscape level and habitats which are continuing unabated realized and predicted impacts on ecology and evolutionary processes in biodiversity (Saunders *et al.*, 1991). Snakes are usually having a low capacity to respond to habitat alteration (Filippi and Luiselli, 2000). Snakes and other reptiles are one of the best group of animals to study the patterns of distribution of biological diversity because of their distribution in various habitats and climatic conditions and high degree of variation in resource use. Surveys should be undertaken to find out the status, distribution pattern, biology and habitat ecology of rare and endemic species of snakes and other reptiles in Nilgiris.

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A RAPID ASSESSMENT OF THE STATUS OF COMMON LIZARDS IN CHENNAI AND KANCHEEPURAM DISTRICT, TAMIL NADU

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Abstract.-With its rapid urbanization Chennai City is unable to pay much concern to its natural environment. Scrublands are common natural resources that have considerable conservation value as they support many species of medicinal plants, ground birds, small mammals and reptiles. Lizards are key components of ecological communities. There is considerable pressure in India on lizard habitats adjoining cities. Five places with varying degrees of urbanization were selected for a rapid assessment on the presence of lizards. The places that were selected are TholkappiaR Poonga, Guindy National park, Pallikaranai marsh in Chennai and Mambakkam and Venkatapuram in Kancheepuram district.

Key words: Rapid assessment, Lizards, Chennai, Restoration.

Introduction

Lizards form one of largest herpetofaunal groups in India,. The general distribution and biology of Indian reptiles is well documented (Das, 2002; Daniel, 2002; Smith, 1935). Over 230 species of lizards have been recorded so far from India and many more are being discovered and described frequently (Aengals *et al*, 2018). In and around Chennai, many species of lizards are getting depleted due to conversion of scrub lands to real estate development. It was observed that there are still several undisturbed lizard habitats that are rich in biological diversity in the adjoining Kancheepuram district near Chennai city. They are polluted by the improper management of urban sewage that is dumped directly into the water bodies. These rivers have lost some of the biodiversity which has lead to local extinction of some common Indian lizards. Some areas were restored from pollution which has led to ecological restoration such as Tholkappiar poonga. These areas provide habitat for the Garden lizard (*C. versicolor*) that thrives in large numbers.

The present study involved a rapid assessment of lizard species in selected habitats in Chennai and adjoining Kancheepuram district.

Methodology

Five places were chosen for study which had varying densities of lizards in Chennai and Kancheepuram district. Mambakkam ($12^{\circ} 49' 24''$ N, $80^{\circ} 09' 52.5''$ E) and Venkatapuram ($12^{\circ} 46' 21.9''$ N, $79^{\circ} 58' 4.8''$ E) are located in Kancheepuram district and are locally known as reserve forests. There is one disturbed site in Chennai that is the Pallikaranai marsh ($12^{\circ} 56' 53.7''$ N, $80^{\circ} 12' 36.5''$ E). Tholkappiar poonga ($13^{\circ} 01' 15.2''$ N, $80^{\circ} 15' 53.2''$ E) is a restored site and Guindy National park is a protected area ($13^{\circ} 04' 04''$ N, $80^{\circ} 14' 54''$ E) each of which is located in Chennai city. For the Rapid assessment survey, lizard sampling was done in the mornings with an Irula tribal field assistant and the species recorded noted down. Surveys were done in the month of February for five days in 2013. Each habitat was surveyed after the monsoon rains. The study habitats were selected basically on the varying degrees of lizard diversity. The study area was randomly searched for the presence of lizards. Geographic location was recorded by GPS reading with an instrument. Lizard populations were classified as Common (++++) with greater than 40 lizards in a habitat, as abundant (+++) with 30 - 40 lizards, Occasional (++) with 10-30 lizards, Rare (+) with less than 10 lizards and absent (-) with no lizards.

Result

Garden lizard (*Calotes versicolor*), Fanthroated lizard (*Sitanaponticeriana*), Grass skink (*Eutropis carinata*), Bark gecko (*Hemidactylus leschnaulti*), Rock gecko (*Hemidactylus reticulatus*), Snake skink (*Lygosoma punctata*), Common Monitor (*Varanus bengalensis*) were the species recorded.

Common Garden lizard (*Calotes versicolor*). An arboreal diurnal lizard of gardens, hedges, sedges and forest. An agile climber it moves with speed and dexterity when required, It feeds on insects especially ants forming a major part of the diet. During the breeding season the males develop a brick red colouration hence the common name blood sucker. In Pallikaranai marsh, restoration for protection of biodiversity by planting of saplings on either side of a bypass road that divides the wetland has provided shelter for large population of these lizards. It could be considered as 'Common category' in the marsh. In the other habitats such as Mambakkam, Venkatapuram and Tholkappiar poonga it could be classified



as 'Occasional.' In Guindy National park it could not be sighted at all. This could be due to limited time spent in sampling.

Fan throated lizard (*Sitana ponticeriana*). It is a habitat specialist surviving in open scrubland reserve forests of Mambakkam, venkatapuram and Guindy National park. They could be categorized as 'Common' in these habitats, Fan throated lizard is an agile lizard taking to bipedal motion when required. In the mornings they emerge out to bask on top of the Dwary bush (*Canthiam coromandelicum*). Males have a gular appendage that turns to various shades of blue during the breeding season. It is absent in Tholkappiar poonga and Pallikaranai marsh mainly due to habitat change.

Garden skink (*Eutropis carinata*) is almost a commensal of man surviving in semi urban areas as well as forest. Primarily a ground dweller found searching for prey in the forest floor. Sometimes it enters houses when searching for prey. It was not recorded in all habitats but was recorded in the category 'Occasional' in Tholkappia poonga and the category 'Rare' in Guindy National park

Bark gecko (*Hemidactylus leschnauli*) is a common gecko found in the Indian peninsula. As the name suggests its structure merges with the coloration of the bark which is its habitat, It is classified in the category 'Occasional' in Thokkapia poonga and not in the other areas. This variation in densities is due to change in habitats in the study areas.

Reticulated gecko (*Hemidctylus reticulatus*) As the name suggests it is associated with rocks. It was placed in the category 'Rare' due to its limited sighting, It was recorded only in Mambakkam.

Snake skink (*Lygosoma punctatum*) It is an elongated snake like skink with feeble five toed limbs. The Juveniles color is red in the tail. General color is brown above with each scale ending in a black spot. It was recorded in Guindy National Park and Tholkappia poonga. In Guindy National park it was categorized as 'Rare' and in Tholkappia poonga it was categorized as 'Occasional'

Common Indian Monitor (*Varanus bengalensis*) This is a diurnal lizard though more active in mornings and evenings. Adults are grey above with yellowish white underside, They can run fast and are also good climbers They are carnivorous

and can eat anything that they can overcome. They are considered as 'Rare' in Tholkappia poonga and 'Abundant' in Guindy National Park.

Discussion

It could be observed from the results that lizards could be found in all habitats but in varying densities. As *C. versicolor* was present in all the five habitats our findings confirm it to be a resilient species. Its presence in large numbers in Pallikaraanai marsh could lead to the fact that social forestry is providing habitat for these lizards. *S. ponticeriana* is a common species of ground lizard of the scrubland ecosystem. As they are poikilothermic they have to emerge for basking in the morning. They aren't found in areas with water bodies. They were found in large numbers in the scrublands of Mambakkam indicating a healthy ecosystem.. Lizard species diversity recorded besides *C. versicolor* include Common grass skink (*E. carinata*) Bark gecko (*H. leschnaultii*), Reticulated gecko (*H. reticulatus*) and Snake skink (*L. punctatum*). Lizards could be considered as important indicators of urbanization.

The present study reveals the need for protection of lizards both in the protected areas and unprotected areas. When there is protection the number of species will increase leading to an increase in diversity.

Table 1: Status of some lizards in Kancheepuram district and its adjoining Chennai (Common- +++, Abundant -+++, Occasional-++, Rare -+, Absent--)

Species recorded	Kancheepuram district		Chennai city		
	Mambakkam	Venkatapuram	Pallikaranai	Adyar poonga	GNP
<i>Calotes versicolor</i>	++	++	++++	++	-
<i>Sitana ponticeriana</i>	++++	++++	-	-	++++
<i>Eutropis carinata</i>	-	-	-	++	+
<i>Hemidactylus leschnaultii</i>	-	-	-	++	-
<i>Hemidactylus reticulatus</i>	+	-	-	-	-
<i>Lygosoma punctatum</i>	-	-	-	++	+
<i>Varanus bengalensis</i>	-	-	-	+	+++



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**OCCURRENCE OF THE SLENDER DAY GECKO
CNEMASPIS GRACILIS (BEDDOME, 1870)
IN KOZHIKODE DISTRICT, KERALA**

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The genus *Cnemaspis* Strauch, 1887, is the second most species rich genus in the family Gekkonidae and is represented by 25 species in India (Aengals *et al.*, 2018). Palot (2015) reported the occurrence of 11 species of *Cnemaspis* from the State of Kerala, namely: Beddome's Day Gecko *Cnemaspis beddomei* (Theobald, 1876), Indian Day Gecko *Cnemaspis indica* Gray, 1846, Kottiyur Day Gecko *Cnemaspis kottiyooensis* Cyriac & Umesh, 2014, Coastal Day Gecko *Cnemaspis littoralis* (Jerdon, 1854), Mountain Day Gecko, *Cnemaspis monticola* Manamendra-Arachchi, Batuwita & Pethiyagoda, 2007, Sispara Day Gecko, *Cnemaspis sisparensis* (Theobald, 1876), Slender Day Gecko, *Cnemaspis gracilis* (Beddome, 1870), Nilgiri Day Gecko *Cnemaspis nilagirica* Manamendra-Arachchi, Batuwita & Pethiyagoda, 2007, Wayanad Day Gecko, *Cnemaspis wynadensis* (Beddome, 1870), Ponnudi Day Gecko, *Cnemaspis nairi* Inger, Marx & Koshy, 1984 and the Ornate Day Gecko *Cnemaspis ornata* (Beddome, 1870).

Among the day geckoes, the Slender Day Gecko or Graceful Day Gecko *Cnemaspis gracilis* (Beddome, 1870) is one of the most beautiful day geckoes of the southern Western Ghats. The species was originally described from the Palakkad region of Kerala and is known from the hilly regions of Tamil Nadu (Nilgiri foothills, Sirumalai, Sivagiri, Yelagiri, and near Bhavani River in Ooty) (Srinivasulu *et al.*, 2014). The taxonomic status of these populations is unresolved. It is found mostly in and around dry and moist deciduous forests, but also occurs near human habitations such as in the crevices of buildings, tree trunks and boulders nearby. In Kerala, this species is known from a few places in Palakkad district (Chittur, Pudunagaram, Dhoni hills, Chulannur Peafowl Sanctuary), Chinnar Wildlife Sanctuary and Marayoor hills of Idukki district (Rajkumar, 2013; Palot, 2015). This species is also considered as species complex, due to variation in colouration, scale pattern and body proportions (Smith, 1943; Manamendra-Arachchi *et al.*, 2007).

In March 2018, while conducting herpetofaunal surveys at Chevayur (11 ° 15.56'N 75 ° 49.40'E) area of Kozhikode district, we came across a few individuals of *Cnemaspis gracilis* from a homestead area (Fig.1). The locality is about 5 km east of Kozhikode city and located on a laterite hillock, about an altitude of 80ft. The identification is made as per the current concept of *C. gracilis* (see Srinivasulu *et al.*, 2014) and is based on its slender body and the golden fringed beautiful scales, for which it is named. The species is active during day time and rests within the crevices in the building or on the stacked wood materials nearby. The species is crepuscular, as many as 4-5 individuals were observed foraging on the walls and nearby area of the building during early morning and evening. They have the habit of drinking water droplets, splashed on the wall while watering the garden plants, during summer months.

The current record forms a recent report for the species from the Kozhikode district, north of the Palakkad gap in the Western Ghats. Earlier, the species is known only from places near Palakkad gap. The present locality is approximately 150km away from the type locality of the species, Palakkad area, hence noteworthy to report.

The only other Day Gecko (*Cnemaspis*) species reported from the Kozhikode city and environs is the Coastal Day Gecko *Cnemaspis littoralis* (Jerdon, 1854), which is normally found on the trunks of large trees or coconut palms near human settlements. Range-wide population systematics of this species complex is needed to decipher the hidden diversity within.

Acknowledgments

The authors are grateful to Dr. Kailash Chandra, Director, Zoological Survey of India, Kolkata and Dr. P.M. Sureshan, Officer-in-Charge, Zoological Survey of India, Western Ghat Regional Centre, Kozhikode for facilities and encouragements. We are also thankful to the Principal, St. Joseph's College (Autonomous), Devagiri, Kozhikode for the constant support and encouragement.

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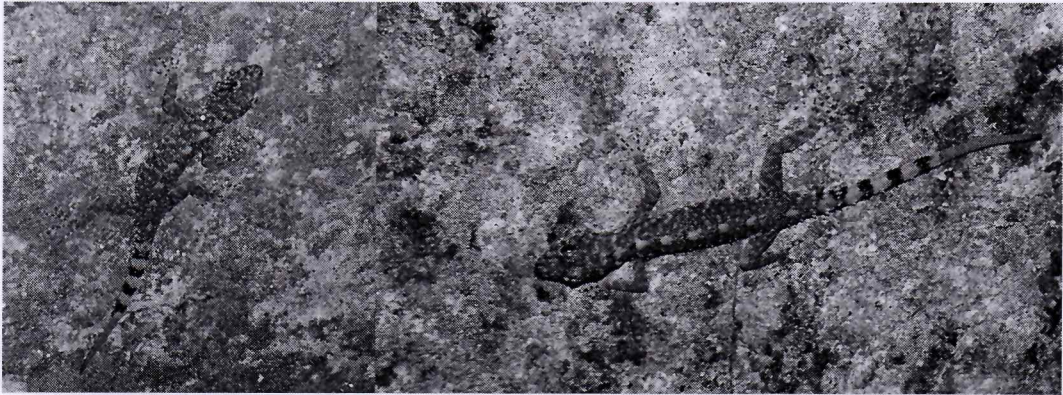


Fig. 1. Slender Day Gecko *Cnemaspis gracilis* (Beddome, 1870)

SURGICAL MANAGEMENT OF LACERATED WOUND IN A SPECTACLED COBRA (*NAJA NAJA*) – A CASE REPORT

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Abstract: An adult male Spectacled cobra was rescued by People for Animals (PfA) Wildlife Hospital with an extensive lacerated wound in the ventral aspect of the mid - body segment. Owing to the behaviour of snakes and their habitat, the wound was extremely contaminated. After thorough irrigation of the wound and mild debridement, the wound repair was done surgically under general anaesthesia using Ketamine and Xylazine. To hasten the recovery, the snake was provided with external warmth using artificial sources like heat emitter and UV-B lamp. Enrofloxacin and Meloxicam were also administered post - operatively. Wound healing progressed without any complications and the snake was released back into a suitable habitat after 15 days.

Introduction

The goal of wound management is to convert a contaminated wound into a clean wound that can be closed. In addition, because of the wide variety of unique physiological and anatomical characteristics among snakes, chelonians, and lizards, different techniques maybe necessary for different reptiles. The field of reptile surgery is continuously evolving and novel surgical techniques have been reported in recent years. These innovative procedures often reduce the invasiveness of conventional interventions or provide insightful solutions to common disorders. Given the caseous nature of reptilian purulent exudates, basic cleaning and irrigation is seldom insufficient, and surgical debridement usually is necessary. Sharp dissection is used to remove all adherent necrotic and infected tissue. Although slow, the ability of reptiles to recover from extensive traumatic wounds is remarkable given that the wound is thoroughly decontaminated.

Case History & Observation

An injured adult Spectacled cobra was brought to People for Animals (PfA) Wildlife Hospital. Physical examination under tube restraint revealed that the snake had an extensive lacerated wound on the ventral aspect of its mid - body segment (Fig.1) resulting in significant contamination. The cause of the wound was unknown but the contaminants included mud and sand along with a minor level of tissue debris. However, no purulent material or discharge was observed in the wound. The wound was flushed with normal saline, cleaned with povidone iodine liquid, D mag® spray was applied to the wound and Meloxicam s/c (0.5 mg/kg IM; (Mette *et al*) was given. Since the laceration was extensive, surgical wound repair was scheduled the next day.

Treatment & Management

Induction of anaesthesia was achieved using a combination of Ketamine (Benett RA 1996; Bouts and Gasthus 2002) and Xylazine at the rate of 30 mg/kg and 4 mg/kg respectively given intramuscularly to the dorsal apaxial muscle at the cranial one-third body segment (Fig.2) The wound was rinsed with 10% povidone iodine solution after 5 minutes of anaesthesia, and closed using simple continuous suture pattern with PGA size 3-0 (Fig.3). 5 doses of Enrofloxacin 10mg/kg (Waxman, 2014) every alternate day in the span of 10 days along with Meloxicam 0.5 mg/kg IM (Mette *et al.*) for 3 consecutive days were administered parenterally to mitigate post - operative infection and pain in the snake. Himax (Fig.5) was used to dress the wound, with the dressing being changed every alternate day for 10 post - operative days. After 15 post – operative days in captivity, the snake was released into the wild. This report describes the successful wound repair under general anaesthesia in a Spectacled cobra.

Acknowledgement

The authors thank all the Rescuers at PfA Wildlife Hospital for their expertise in handling venomous snakes; Samhita Kashyab for all the clinical photographs taken during the surgical procedure; and Dr. Vigneshwari, MVSC Scholar and Trishna V. S., writer and intern at PfA for editing and effective articulation of this case findings.



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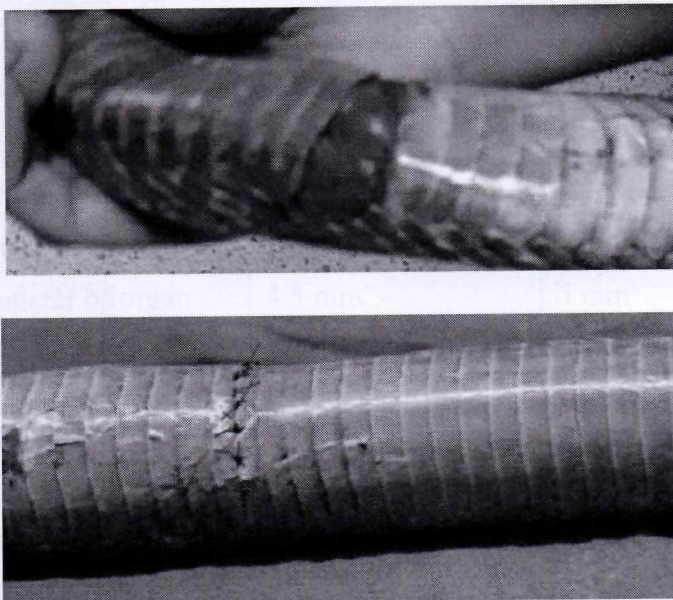


Fig.1. Wound of the cobra before (top) and after (above) medical intervention

**NOTES ON MALE GENITALIA OF
CALOTES VERSICOLOR AND
*CHAMAELEO ZEYLANICUS***

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Information on hemipenal morphology among Indian reptiles is very scarce. Some older treatises on the subject such as Smith (1935, 1943) provide brief notes on the organs for certain species. More recent books on the subject (see Das, 2002; Daniel, 2002) still have not shed light on the subject. Barring such short texts, dedicated works on Indian reptiles genitalia is still wanting. My sightings of two roadkill lizards provide me an opportunity to observe and study their genitalia. Therefore, I here provide my observations on the organs, observed in Rajasthan.

On July 24, 2004, while patrolling on Panarwa-Kotra road inside the Phulwari-ki-nal Wildlife Sanctuary, I found a dead Common Garden Lizard *Calotes versicolor* and dead Indian Chameleon *Chamaelo zeylanicus*, both trampled on the road at a distance of 1.0 km near Patharpadi check-post of the sanctuary. Both were adults and still many parts of their body were in good condition including genital organs. By applying a bit pressure, I manage to bring out the hemipenises of both the dead lizards. I carefully observed their male genital organs to note the differences between both the species.

My observations are listed in table below :

Table 1 : Comparison of male genital organs of *Calotes versicolor* and *Chamaeleo zeylanicus*.

S. No.	Parameter	<i>Calotes versicolor</i>	<i>Chamaeleo zeylanicus</i>
1	Length of organ	11 mm	12 mm
2	Diameter of organ	4.5 mm	5 mm
3	Color of organ	Whitish	Reddish
4	Tip of organ	Conical and split	Blunt

The table indicates that structure of male genital organs is different in these arboreal colour changing lizards. This is totally understandable as they belong to different families – Agamidae and Chameleontidae respectively. The tips of hemi-penises in both the species are quite different in structure and appearance. Though these two species are widespread and often encountered, information is available on genital organs of these two lizards have not been adequately dealt with in existing literature (Das, 2002; Daniel, 2002; Smith, 1935; Tikader & Sharma, 1985). Therefore the present information is worth recording.

Acknowledgements

Author is very thankful to staff of Phulwari-ki-nal Wildlife Sanctuary to help during the present study. I also thank local Bhil tribals to share local names of both the lizards.

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S. No.	Parameter	<i>Crotalus viridis</i>	<i>Crotalus tigris</i>
1	Length of organ	11 mm	12 mm
2	Diameter of organ	4.5 mm	2 mm
3	Color of organ	Whitish	Reddish
4	Tip of organ	Conical and sharp	Blunt

The table indicates that the genital organs of these two species are different in their external colour, shape and size. The tip of the organ is also different as they belong to different families – Agamidae and Chamaeleonidae respectively. The tip of the organ is conical and sharp in *Crotalus viridis* and blunt in *Crotalus tigris*. Though these two species are widespread and often encountered, information is available on genital organs of these two lizards has not been adequately dealt with in existing literature (Dutta, 2007; Tikader, 2007; Sharma, 1977; Tikader & Sharma, 1985). Therefore the present study is a first attempt to record the genital characters of these two species.

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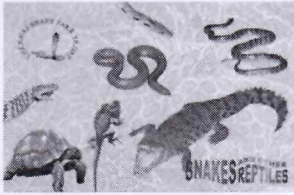
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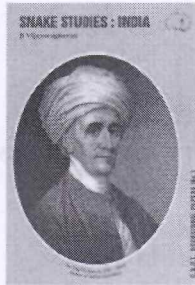
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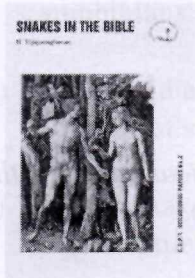
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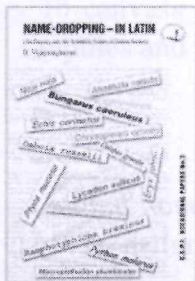
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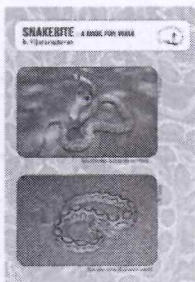
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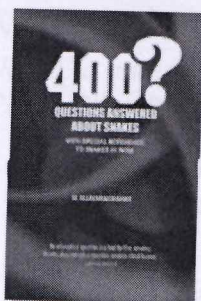
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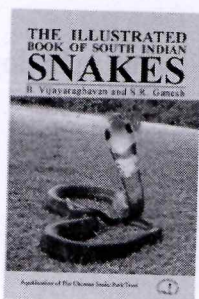


5. *Snakebite: A Book for India* (English) (2008),
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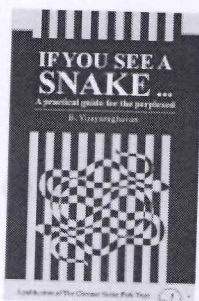


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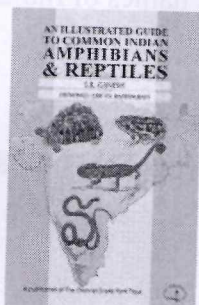
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- i) To maintain and display a captive collection of snakes and other reptiles as a means of eliciting public interest in them and prompting the public to empathize with them.
- ii) To promote knowledge among the public on reptiles and amphibians and dispel the widespread erroneous beliefs about snakes in particular and, to this end, conduct awareness programmes targeting school children primarily and bring out low-priced publications with technical, semi-technical and popular contents on reptiles and amphibians.
- iii) To aid and assist research on reptiles and amphibians including the conduct of surveys to assess their status and distribution.
- iv) To undertake captive breeding of endangered species of snakes and other reptiles.
- v) To canvass public support for the protection and conservation of reptiles and amphibians.

* * * * *

FORM IV

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