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**Cover**

**Iridescent snake (*Blythia reticulata*)**

Non-venomous. North-east Indian hill States. Found under fallen logs and decaying vegetation. Grows to about 1.5 feet. Feeds on earth worms. Lays about 6 eggs.

**Photo: D.N. Harit**

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## A STUDY ON PIT VIPERS OF THE WESTERN GHATS, TAMIL NADU, INDIA

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**Abstract:** Distribution of and microhabitat usage by pit vipers were studied during May 2005 and 2007 in Siruvani forest, Nilgiri Biosphere Reserve and Indira Gandhi Wildlife Sanctuary in the Western Ghats of Tamil Nadu. Surveys were conducted from 0600 to 1200 hrs and from 1500 to 1900 hrs. Two methods namely visual encounter survey and quadrat sampling were used for data collection. Various localities and different habitats were surveyed during the present investigation. On locating a pit viper, the parameters like species, area, forest types, altitude, and location of the snakes were collected. Four species of pit vipers namely hump-nosed pit viper (*Hypnale hypnale*), Malabar pit viper (*Trimeresurus malabaricus*), large-scaled pit viper (*T. macrolepis*), and bamboo pit viper (*T. gramineus*) were recorded during the course of the investigation.

**Key words:** Pit vipers, Western Ghats, endemic, microhabitat, altitude.

### Introduction

Pit vipers evolved in Asia and spread across the Berring Strait into the Americas. Fifty species of pit vipers have been reported in tropical Asia and occupy most terrestrial habitats except deserts (O'Shea, 2005). Pit vipers are small to medium-sized, slow moving, nocturnal/diurnal snakes. All pit vipers have thermal receptors located on the side of the face between the eye and nostril. These heat-sensitive organs play an important role in the detection and capture of endothermic prey. They can detect temperature differences as slight as 0.003° C. Pit vipers mainly feed on frogs, lizards, rodents and birds. The venom is not as toxic as true viper venom. All pit vipers strike fast and some species like the hump-nosed pit viper *Hypnale hypnale* seem to be quite toxic and bites may cause considerable swelling and pain (Whitaker and Captain, 2004). Most pit vipers are ovo-viviparous. Pit vipers

in India are found mostly in the forest areas and plantations. Of the twenty species occurring in India, nine are common in their ranges. Many vipers are terrestrial and some are arboreal, being found on the ground or on low bushes. They feed on frogs, small rodents and lizards. They are sedentary in nature with fairly slender bodies and prehensile tails. Most vipers are cryptically patterned; they rely on camouflage to blend with their surroundings and are sit-and-wait ambush predators, allowing the prey to come within strike range. Most vipers have vertically elliptical cat-like pupils that maximize the use of available light in the low-light jungle or nocturnal conditions.

In India, there are twenty species of pit vipers mainly in the Himalayas, Northeast India, Andaman and Nicobar Islands and in the Western and Eastern Ghats (Whitaker and Captain, 2004), of which fifteen belong to the genus *Trimeresurus*, two to *Protobothrops*, one each to *Gloydius*, *Hypnale* and *Ovophis* all in family Viperidae. The Western Ghats of India is considered as one of the 25-biodiversity hotspots in the world (Myers *et al.*, 2000) and is home to a highly distinctive reptile fauna. Among the 500 species of reptiles known from India, 167 (33.4%) occur in the Western Ghats, of which 96 (59%) species of reptiles are endemic to this region (Das, 1997).

The mountain range of the Western Ghats (22°-8°N) extends approximately 1500 km along the western coast of the Indian peninsula. The area of this mountain range is about 1,00,000 sq km which extends from the river Tapti, Gujarat in the north to the tip of the peninsula. It encompasses a gradient of altitude (200-2500 m), temperature (3-45°C) and rainfall (500-5000 mm). The precipitation gradient is accompanied by a change in vegetation from scrub to dry deciduous to moist deciduous to semi evergreen and wet evergreen forests. At higher elevations (above 2000 m), the rain forest is replaced by grasslands and stunted tropical montane forest. Climate in the Western Ghats varies with altitudinal gradation and distance from the equator. The climate is humid and tropical in the lower reaches tempered by the proximity to the sea. Elevations of 1,500 m (4,921 ft) and above in the north and 2,000 m (6,562 ft) and above in the south have a more temperate climate. There are six species of pit vipers in the Western Ghats, of which five are endemic (Whitaker & Captain, 2004). They are the hump-nosed pit viper *Hypnale hypnale*, (Merrem, 1820), large-scaled pit viper *Trimeresurus macrolepis* Beddome, 1862, Malabar pit viper *T. malabaricus* (Jerdon, 1854), Horse-shoe pit viper *T. strigatus* Gray, 1842, Bamboo pit viper *T. gramineus* (Shaw, 1802) and Hutton's pit viper

*Tropidolaemus huttoni* (Smith, 1949). The Huttons pit viper ranks as one of the very rare Asian pit viper and it has been described by (Hutton, 1949 & Smith 1949), and it was re-described again a decade back by David & Vogel (1998). Even though pit vipers are distributed throughout this hill range, available studies are mainly on the taxonomy and systematics of Asian pit viper (Malhotra and Thorpe, 2004 and Vogel *et al.* 2007), their occurrence, (Whitaker, 1969; Inger *et al.* 1986, Kannan and Venkatraman, 1998; Ishwar *et al.* 2001, Kannan, 2005), breeding (Kannan and Bhupathy, 1996) resource – utilization patterns (Ganesh *et al.*, 2010; Sawant *et al.*, 2010 a,b) and husbandry practices (Kannan *et al.* 2007). Information on spatial distribution pattern and microhabitat usage of pit viper is scanty. This paper describes the distribution pattern and micro habitat use of pit vipers in Tamil Nadu part of the Western Ghats.

## **Methodology**

### **Visual Encounter Surveys (VES)**

This method tends to detect pit vipers in an area or habitat (Champell and Christman, 1982), recording all visible animals on the surface (Corn and Bury 1990). While walking, we scanned the vegetation, path, and other possible places for pit vipers. Often, the field workers searched the leaf litter, as leaf litter species emerge when slightly disturbed, which allowed them to be recorded. Small rocks and dead logs were turned over. Searches were also made all along the streams running in the study areas. All specimens of interest encountered were caught and morphometric data such as snout to vent and tail lengths were measured. Ecological information gathered included sex, colour variations, height from ground upon sighting, microhabitat, presence of ecto-parasites, threats (presence of potential predators, habitat change etc.). Species were identified using Whitaker and Captain (2004).

### **Quadrat Sampling (25 m x 25 m)**

In each selected habitat type (Shrub, dry and moist deciduous, riverine forests, tropical mixed evergreen forests and montane shola grassland), a minimum of 5 randomly selected quadrats of 25 x 25 m was sampled. The fieldworkers systematically searched the quadrats walking parallel on paths across the area, where all snakes observed were recorded. In addition, leaf litter was turned over. Tree roots, buttresses and holes were also searched using torch light.

## Results

On 19<sup>th</sup> May 2005, while conducting survey in the deciduous and riverine forest of the Siruvani, foot hills lie between 10°56' and 10°58' N and 76°42' and 76°44' E), we located a pit viper, which was lying on the ground in a flat coil with only the head upward and it was identified as hump-nosed pit viper *Hypnale hypnale* (Merrem, 1820) based on the description by Whitaker and Captain (2004). It was an adult female with a snout-vent length of 40 cm, tail length, 6 cm. The snake was basking on the root of a fallen tree (Table 1). The area was wet as there was a stream close by. Other species of reptiles such as the garden lizard *Calotes versicolor*; Roux's Forest Lizard *Calotes rouxii* and Keeld Grass Skink *Eutropis carinata* were recorded in the same locality.

The semi-evergreen and evergreen forests in upper Siruvani were surveyed on 20<sup>th</sup> May 2005, three Malabar pit vipers *Trimeresurus malabaricus* (Jerdon, 1854), were seen during one day search. Two of them were found on a twig 5 ft from the ground, close to a stream which was surrounded by rocky boulders. The ambient temperature was very low and the surrounding area was wet. These were males and their snout vent lengths were 45 and 48 cm, tail length were 13 and 13.5 cm head length were 3 cm and head width were 2.5 cm respectively. Another pit viper was also encountered on a tree branch in a slightly open forest at an altitude of 1200 m above sea level in the upper Siruvani. It was a female. Its snout vent length was 90 cm and tail length was 13cm. It was resting and highly camouflaged in the environment by its coloration.

The other associated reptilian fauna were the Western Ghats flying lizard *Draco dussumieri*, large scaled forest lizard *Calotes grandisquamis*, keeled grass skink *Eutropis carinata*, Indian day gecko *Cnemaspis* sp. and sloughed skin of king cobra *Ophiophagus hannah*. Vegetation of the area was Southern Tropical Evergreen forests.

On 21.5.2005 and 22.5.2005, study was conducted in and around Valparai situated in Indira Gandhi Wildlife Sanctuary (10° 00-30' N 76° 48'–77° 30 'E). Searches were made in the rain forest fragments surrounded largely by tea estates. These fragments range in area from less than 1 ha to about 2,500 ha, and occur in an altitudinal range of 700 m to 1600 m. Searches were also made all along the streams around Valparai area. But we could not find any pit vipers.



Searches were made in Akkamalai and Andiparai areas. Edges of streams, tea and coffee estates were also surveyed thoroughly but we could not see any pit vipers. But these areas were largely disturbed by tea estates activities. Pesticide usage, cattle grazing and anthropogenic pressure were high because of tea estates and its allied activities. During 1995, while collecting data on Agamid lizards in the same locality, a Malabar pit viper was recorded and the snake was resting on the thick leaf litter. The natural vegetation of the area has been classified as wet-evergreen forest (Pascal, 1998).

Field work was done at Grass hills areas on 29.5.07. It is a part of Indira Gandhi Wildlife Sanctuary & National Park. Grass hills is a picturesque spot at a height of nearly 2400m MSL, with cool climate. While surveying the area we sighted a snake, which was coiling on a twig of a small tree 1 m above ground at the edge of evergreen forest adjacent to grasslands. The area was very wet and the ambient temperature was below 20°C. The snake was inactive due to cool weather and the sky was cloudy and it was drizzling. The snake was identified as large scaled pit viper *Trimeresurus macrolepis* based on the description by Whitaker and Captain (2004). The associated reptile fauna recorded in the locality were the endemic Gunther's vine snake *Ahaetulla dispar* which was seen on open grassland, Elliot's forest lizard *Calotes ellioti* and a skink *Eutropis* sp. while doing agamid lizard survey. During 1995 at Grass hills, a bamboo pit viper (*T.gramineus*) was seen basking on the bushes near evergreen forest.

On 31 May 2007, searches were made in Karian shola evergreen forest at Top Slip. The moist deciduous and evergreen forest patches near Karian shola were thoroughly searched during day time but we could not see any pit viper. Later we began the work late in the evening at Karian shola evergreen forest. At around 9.30 pm we heard slight movement along the leaf litter and when we focused the particular point we noticed a hump-nosed pit viper *Hypnale hypnale*. It was an adult female, slightly black in color, active on the surface, possibly searching for prey on the buttresses. Its snout-vent length was 43 cm, tail length 6.5 cm head length and width 3 and 2.5 cm respectively and weighed 200 g.

Table 1. Pit vipers located during the study period.

Protected Area	Altitude (m)	Species	Forest type	Micro habitat
Lower Siruvani, Nilgiri Biosphere Reserve	650	<i>Trimeresurus malabaricus</i>	Moist deciduous	Coiled on a twig
Lower Siruvani, Nilgiri Biosphere Reserve	800	<i>Hypnale hypnale</i>	Dry deciduous	Under root of a tree
Upper Siruvani, Nilgiri Biosphere Reserve	800	<i>Trimeresurus malabaricus</i>	Moist deciduous	Coiled on a twig
Pudhuthottam, Valparai, Indira Gandhi Wildlife Sanctuary	1070	Pit viper not sighted	Evergreen forest	-
Valparai, Indira Gandhi Wildlife Sanctuary	1600	Pit viper not sighted	Semi evergreen	-
Akkamalai, Indira Gandhi Wildlife Sanctuary	1300	<i>Trimeresurus macrolepis</i>	Evergreen	Coiled on a twig of a small herb
Grass hills, Indira Gandhi Wildlife Sanctuary	1800	<i>Trimeresurus gramineus</i>	Grass land	Arboreal
Akkamalai, Indira Gandhi Wildlife Sanctuary	1200	<i>Trimeresurus malabaricus</i>	Evergreen	leaf litter
Topslip, Indira Gandhi Wildlife Sanctuary	500	<i>Hypnale hypnale</i>	Evergreen	On buttresses

## Discussion

In general, our observation confirms Ganesh *et al.* (2010) that pit vipers are found more in undisturbed forests than in tea, coffee and cardamom plantations. This is the converse of what has been reported by some others (e.g. Aengals, 1995; Whitaker & Captain, 2008). Snakes in the wild tend to be highly secretive. Therefore, field workers may have few opportunities to observe pit vipers in the wild and this may account for the conflicting observations as mentioned above. While analyzing the micro habitat preference of pit vipers, the hump-nosed pit viper was found to use logs and tree base and leaf litter as micro habitats. The Malabar pit viper used rock as a base near stream and tree branch on certain occasions. The large-scaled and bamboo pit viper were mostly arboreal and prefer open areas along the boundary of the evergreen forest near grassland. These were consistent with literature (Sawant *et al.* 2010 a & b, Ganesh *et al.* 2010)

Forest fragmentation coupled with pesticide use in tea and coffee estates and anthropogenic pressure on the existing fragments may be the reason for not sighting pit vipers in the fragmented rain forests in Valparai areas. The greatest threat to snakes is habitat destruction, which results in the physical elimination of both animals and their ecosystem and the fragmentation of remaining populations which are subject to reduced population size and the resulting potential loss of genetic diversity (Wilcox and Murphy, 1985). Loss and fragmentation of tropical rainforests has set the stage for high depletion as remnant fragments undergo further fragmentation and degraded forests shed species more rapidly (Brooks *et al.* 1999). Typically, species are more likely to disappear from small fragments, and, particularly, the endemic, resident and habitat specialist species are more likely to disappear than others (Fagan *et al.* 1999; Laurance *et al.* 2002).

Formerly, searchers in Valparai plantation yielded many species of reptiles including pit vipers (Aengals, 1995). But the present work could not. The reasons may be that forestry practices such as intensive site preparation and single species management may also adversely impact snakes, particularly the pit vipers, since they are slow-moving and not able to alter their habitats suddenly. Snakes have always aroused intense fear in people and workers in tea estates wantonly kill pit vipers they encounter in tea estates during the course of their routine field activities. Because of the use of various biocides in modern agriculture, the local population of the reptiles may suffer declines of unknown magnitude and duration. Since pit vipers feed on lizards, frogs and small birds (Whitaker and Captain, 2004) pesticide



accumulation in their prey base and subsequent transfer to the pit vipers through the food chain is also of great concern (Goldberg, 1975).

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## COMMUNITY STRUCTURE OF REPTILES OF SOUTH-EAST COAST OF INDIA

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**Abstract:** We examined the structure of reptile community using belt transect, quadrat, time constrained and night survey methods in the south-east coast of India across *Casuarina equisetifolia*, *Spinifex littoreus*, *Prosopis juliflora*, Mangrove and Beach habitat patches from January 2012 to March 2012. A total of seven species of reptiles belonging to six families were recorded. These habitat types were found to harbour an equal quantum of species, but in varying abundances. Marine species like sea snakes and sea turtles were not recorded in inland tracts. House gecko (*Hemidactylus frenatus*) was dominant in *Casuarina*, sand skink (*Eutropis bibronii*) was observed mostly in *Spinifex*, while garden lizard (*Calotes versicolor*) was observed in *Prosopis*. Both belt transect and quadrat methods were found appropriate to study the reptile community in these habitat types. A long term study would through more light on other aspects of herpetofaunal ecology of this region.

**Key words:** herpetofauna, abundance, Tamil Nadu, Pondicherry, mangrove

### Introduction

Herpetofauna has remained underutilized model animals when it comes to assessing animal community structures when compared to other terrestrial vertebrate groups. In India, some studies about herpetofaunal community exists (Inger *et al.*, 1987; Ishwar *et al.*, 2001; Vasudevan *et al.*, 2001; Vijayakumar *et al.*, 2006; Bhupathy & Nixon, 2011; Bhupathy *et al.*, 2012). These studies were those pertaining to the herpetofaunal community of the Western Ghats hill range. Herpetofauna of the coastal plains have been comparatively poorly studied. Nonetheless, some of the major studies in this region include Ganesh & Chandramouli (2007), Kannan *et al.*, (1994) and Kalaiarasan & Kanakasabai (1999). These apart, Ganesh & Chandramouli (2010; 2011) concentrated not on community structure, but on taxonomy, thereby



leaving us with very meager information on herpetological communities of Indian coastal plains.

Particularly, information on reptiles of India's mangroves is inadequately known for several reasons including poor expected species richness, unsuitability of the habitat to implement some of the standardized sampling techniques, lack of research interest in coastal herpetofauna, among others. In this work, we aim to document the reptiles in selected habitats of east coast of southern India, estimate their density, understand relationships between vegetation type and reptile community patterns, evaluate the relative efficiencies of belt transect and quadrat methods and finally, suggest management recommendations for the conservation of reptiles in the coastal areas. The present study work will fill up this lacuna and provide some baseline information on India's coastal reptile communities.

### Study Area

The present investigation was conducted in five locations of Nagapattinam District (Tamil Nadu) and Karaikal (Pondicherry) which includes Pazhayar (11°21'04.53"N & 79°49'57.44"E, elevation 0 m ASL), Thirumullaivasal (11°14'57.98"N & 79°50'42.02"E, elevation 2 m ASL) and Tharangambadi (11°01'28.37"N & 79°51'21.36"E & elevation 2 m ASL) Karaikal (10°54'32.52"N & 79°51'12.49"E, elevation 3 m ASL), Neravy (10°54'07.00"N & 79°51'07.91"E, elevation 2 m ASL). Here five distinct habitat types *viz.*, *Casuarina equisetifolia*, *Spinifex littoreus*, *Prosopis juliflora*, mangrove and beach were identified. Average annual rainfall is about 1260 mm, with 68 % in October-December, during the northeast monsoon. Mean ambient air temperature ranges from 16-38° C.

### Materials and Methods

Data collection was carried out between January 2012 and March 2012. Sightings were obtained using four different methods—belt or strip transect of 100 X 6 m dimension (n=1) (Vijayakumar *et al.*, 2006), quadrat of 10 X 10 m dimension (n=6) (Campbell and Christman, 1982), time-constrained survey (Vogt and Hine, 1982) and night survey. Belt transect and quadrat method were employed in *Casuarina*, *Prosopis* and *Spinifex* for intensive reptile survey. Time constrained method was employed in beach and mangrove habitats. Night survey was carried out occasionally in the mangroves and on the beach. The number of species and individuals were counted by intensively observing all prospective microhabitats such as fallen and decaying log, tree bark, leaf-litter, under stone, rock crevices, in

tree holes and on trees, shrubs and on herbs. The entire study area was classified into five different types of habitat namely *Casuarina equisetifolia*, *Spinifex littoreus*, *Prosopis juliflora*, mangrove and beach. When the target animals were encountered they were photographed for identification. Identification was done based on external morphology by referring field guides (Smith, 1935, 1943; Whitaker and Captain, 2008).

## Results

A total of 131 individuals of seven species (one unidentified) belonging to six families (Agamidae, Gekkonidae, Scincidae, Colubridae, Hydrophiidae and Cheloniidae) were recorded (Appendix 1). The following accounts give information on the distribution patterns of reptile abundance and habitat – use across the many sampled regions throughout the study period.

With regard to the many vegetation types, the reptile abundances were categorized as follows: In *Casuarina* plantation the house gecko (*Hemidactylus frenatus*) was recorded with a maximum value of  $0.20 \pm 0.98/\text{ha. belt}$ ;  $0.40 \pm 0.07/\text{ha. quadrat}$ , followed by sand skink (*Eurtopis bibronii*)  $0.60 \pm 0.26/\text{ha.}$  and  $0.10 \pm 0.02/\text{ha}$  and garden lizard (*Calotes versicolor*)  $0.20 \pm 0.09/\text{ha.}$  and  $0.07 \pm 0.01/\text{ha.}$  In *Prosopis juliflora* our result reveals that among the three species of reptiles, garden lizard ( $0.33 \pm 0.19/\text{ha.}$  and  $0.16 \pm 0.04/\text{ha.}$ ) was the most dominant, closely followed by the sand skink ( $0.33 \pm 0.19/\text{ha.}$ ) and then by the striped keelback ( $0.06 \pm 0.01/\text{ha.}$ ); in *Spinifex littoreus* two species of reptiles viz., sand skink and garden lizard were observed. The results reveal a higher number of sand skinks ( $3.00 \pm 1.50/\text{ha. belt}$ ;  $0.87 \pm 0.18/\text{ha. quadrat}$ ) in this habitat compared to garden lizard ( $0.75 \pm 0.38 \text{ belt}$ ;  $0.21 \pm 0.04 \text{ quadrat}$ ; Table 1; Figure 1). In mangroves and beaches, these sampling techniques could not be implemented.

The present study revealed that the reptile species could use different habitats for their survival as foraging habitats and also the reptile species density would vary according to the locality of the habitats. As regards the microhabitat preferences, there was a significant variation between the reptiles and among the floristic variables (viz., GBH, perch height and perching height) studied in both the methods used in all the habitats ( $P < 0.05$ ).

Very few studies on Indian herpetofauna directly compare the relative effectiveness of multiple methods adopted in the same work. In our study we have evaluated the relative efficiency of belt transect and quadrat methods in order to

identify which should be considered more appropriate for herpetofauna in a coastal area. In accordance with the General Linear Model (GLM) there was no significant difference between the reptile population and among the methods (belt and quadrat method) ( $P>0.05$ ), which implies that the population of reptiles did not show any associations between the methods adopted. So, belt or quadrat method can be used to survey the reptile community in coastal plains area.

The maximum extent of all possible areas were searched for reptiles in the mangroves and on the beach. In total, 12 hours of time-constrained and night survey were done. This yielded a finding of 6 individuals of snake in a short duration. All the six individuals could not be restrained for examination: their identities could not be ascertained. Survey on the beach yielded 1 individual of Annulated sea snake (*Hydrophis cyanocinctus*) and 23 dead Olive ridley turtle (*Lepidochelys olivacea*) from the selected area (Table 2).

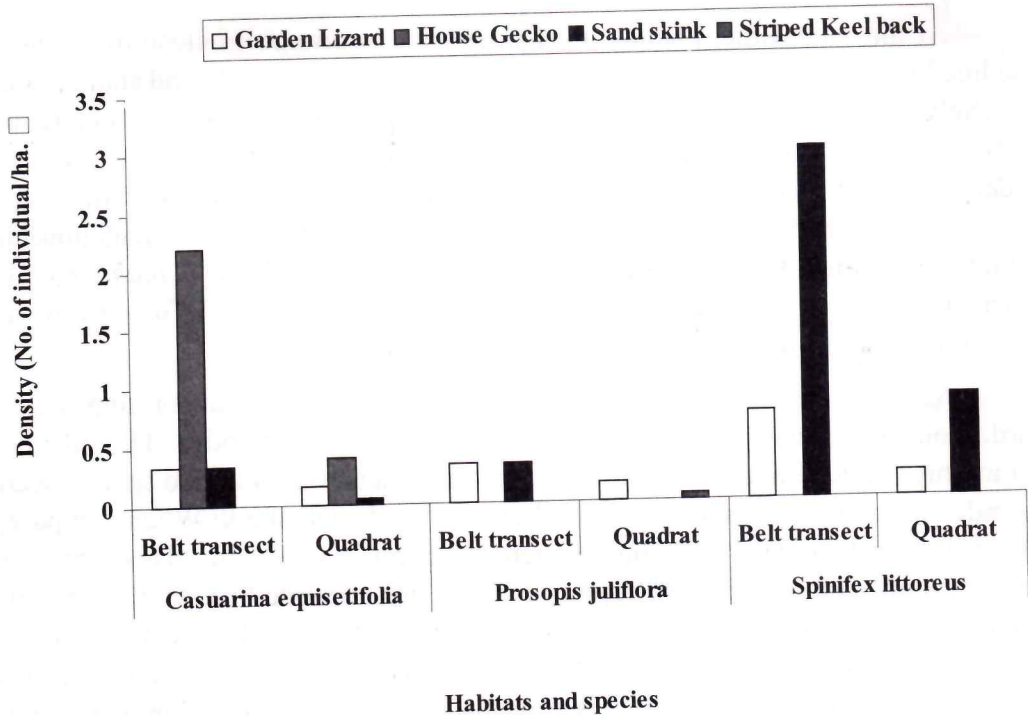
**Table 1.** Population of reptiles per hectare in the various vegetation types

Species	Belt Transect Mean $\pm$ SE	Quadrat Mean $\pm$ SE
<i>Casuarina equisetifolia</i>		
Garden lizard	0.20 $\pm$ 0.09 (N=5)	0.07 $\pm$ 0.01 (N=30)
House gecko	2.20 $\pm$ 0.98 (N=5)	0.40 $\pm$ 0.07 (N=30)
Sand skink	0.60 $\pm$ 0.26 (N=5)	0.10 $\pm$ 0.02 (N=30)
<i>Prosopis juliflora</i>		
Garden lizard	0.33 $\pm$ 0.19 (N=4)	0.16 $\pm$ 0.04 (N=18)
Sand skink	0.33 $\pm$ 0.19 (N=4)	0 (N=18)
Striped keel back	0 (N=4)	0.06 $\pm$ 0.01 (N=18)
<i>Spinifex littoreus</i>		
Garden lizard	0.75 $\pm$ 0.38 (N=4)	0.21 $\pm$ 0.04 (N=24)
Sand skink	3.00 $\pm$ 1.50 (N=4)	0.87 $\pm$ 0.18 (N=24)

Table 2. Reptile abundance in mangrove and beach habitat

Habitat	Effort (minutes/observer)	Species Richness	Abundance	Species
Beach	330	2	24	<i>Lepidochelys olivacea</i> - 23 <i>Hydrophis cyanocinctus</i> -1
Mangrove	720	1	6	Unidentified snake-6

Figure. 1. Density of reptiles in different habitats found by belt transect and quadrat methods





## Discussion

In *Casuarina* plantation, comparatively low species richness was observed and that too only lizards. Among lizards, House gecko was highly utilizing the *Casuarina* plantation. This may be because of the availability of many microhabitats such as peeled bark and prey species namely spider (spider was sighted under the bark of *Casuarina*) and dragon flies were sighted in the same habitat as well. On many occasions during the survey, wings of dragon flies were observed under the tree barks where geckos live. According to Csurhes and Markular (2009) house gecko is a generalists predator and it will feed on any insect. Similarly, a study in Burma showed seven orders of insects (Hymenoptera, Coleoptera, Lepidoptera, Orthoptera, Diptera, Hemiptera and Zygoptera as well as spiders (Arachnida) in the stomach content of house gecko (Tyler 1960). Present observation is also similar to the earlier studies by Tyler (1960) and Wilson (2006).

At the same time, plantation of *Casuarina equisetifolia* close to the high tide line lead to the habitat loss for coastal fauna such as sea turtle and shore crabs, etc, (Selvam, 2006). *Casuarina* plantation is believed to have negative impact on nesting beaches and nesting (Pandav, 2005). Incubation temperature for the nest under the shade of *Casuarina* plants was lower than natural area (Schmelz and Mezich, 1988). However, the plantation of *Casuarina* protects the neighbouring habitats and human settlements from adverse effects of cyclones, *Tsunami*, etc.. In order to avoid negative effect on the sea shore crab and sea turtle, *Casuarinas* can be planted a few hundred meters away from the high tide line.

*Spinifex littoreus* belongs to a grass family with stolon-forming stems, hard, stout, many-noded, rooting and copious branching at nodes. This plant is commonly called 'Ravana's moustache'. In this vegetation, only two species were recorded and, that too, lizards viz., garden lizard and sand skink. When compared to garden lizard, the sand skink highly preferred *Spinifex* vegetation. This species of grass generally grows in sandy beaches close to the high tide line. Moreover, sand skinks are generally adapted to live in such a habitat. According to Hora (1926-27), the sand skink was never reported more than a few yards from the seashore. Observation made in present study is almost similar to the observation reported by Hora (1926-27).

*Prosopis juliflora* is a shrub or small tree native to Mexico, South America and the Caribbean. It has become established as a weed in Asia. In Tamil language it is known as *velikkathan*. Here, three species of reptile were sighted which include

two lizards (garden lizard and sand skink) and one snake (striped keelback). When compared to sand skink, the garden lizard was significantly utilising *Prosopis juliflora*. Garden lizard was commonly found among the undergrowth in open habitats. It roosts on the branch of trees during night hours. *Prosopis juliflora* provides suitable microhabitat for roosting. Hence garden lizard was high in this vegetation.

#### Appendix 1. Checklist of reptiles sighted in the study area

Sl.No	Common name	Scientific name	IUCN Status
1	Garden lizard	<i>Calotes versicolor</i>	Not Evaluated
2	House gecko	<i>Hemidactylus frenatus</i>	Not Assessed
3	Sand skink	<i>Eutropis bibronii</i>	Data deficient
4	Striped keelback	<i>Amphiesma stolatum</i>	Not Evaluated
5	Annulated sea snake	<i>Hydrophis cyanocinctus</i>	Least Concern
6	Olive ridley turtle	<i>Lepidochelys olivacea</i>	Vulnerable
7	Snake	Unidentified	-

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## RECORD OF IRIDESCENT SNAKE *BLYTHIA RETICULATA* (BLYTH, 1854) FROM MIZORAM, NORTH EAST INDIA

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The iridescent snake *Blythia reticulata* is a comparatively small snake measuring about two feet in length. Within India, this species has been reported from Assam, Arunachal Pradesh to Manipur and Myanmar (Das, 2008; Gharpurey, 2006; Sharma, 2003; Whitaker & Captain, 2008). Smith (1943) stated its distribution range as Assam, Burma, (Chin Hills and Lushai Hills). The rich biodiversity of North East India has not been explored much so far. Mizoram, one of the North Eastern Hill states of India lies between 21°57' to 24°30' – N latitude and 92°15' to 93°26' – E longitude. It is surrounded by the International boundary of Myanmar in the east, in the west by Bangladesh and on the northern side it is surrounded by Manipur, Assam and Tripura states of India. Ramanujam and Harit have reported the ophidian fauna of the state for the first time. There is also some other literature available on the snakes of this region in Harit (2008 & 2010) and Mathew (2007). But in none of these literatures is there a mention of the occurrence of *Blythia reticulata* in Mizoram. Mathew (2007) has also not included this snake in the *Fauna of Mizoram-Reptilia*.

On 11<sup>th</sup> June 2012, around 08.00 Hrs, a snake was found killed on the road side on way to the Government College at Champhai District of Mizoram, North East India. It was picked up for identification, (Fig.1). The snake seemed to be killed recently. Total length was found to be 49.5 cm, including tail length of 6.5 cm. Body scalation was in 13(near neck):13(mid body):13(before tail) rows, ventrals-133, subcaudals-28 pairs, anal-2, supralabials – 5, with 3<sup>rd</sup> and 4<sup>th</sup> touching eye, post ocular-1, loreals and preocular were absent. Scales smooth. Head not broader than neck. Tail short with pointed tip. Colouration was black gray and shining almost throughout the dorsal side. Belly scales light in colour with further lighter margins. The specimen has been deposited in the museum of Department of Zoology, Government Champhai College, Mizoram.

Based on the literature available ((Das, 2008; Gharpurey, 2006; Sharma, 2003; Smith, 1943; Whitaker & Captain, 2008), it was identified as *Blythia reticulata* (Blyth, 1854). This seems to be the first record of its occurrence and range extension to Mizoram state, North East India.



**Fig.1.** Dorsal and ventral views of the Mizoram specimen of the *Blythia reticulata*

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**FIRST RECORD OF INDIAN SLENDER GECKO  
*HEMIPHYLLODACTYLUS AURANTIACUS* (BEDDOME, 1870)  
IN YELAGIRI HILLS, TAMIL NADU**

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The Indian slender gecko *Hemiphyllodactylus aurantiacus* (Beddome, 1870) is a small, insect-eating, night-active species of endemic gekkonid lizard distributed in the mountain ranges of southern India (Bauer & Das, 1999). It is one of the many poorly known, mountain-dwelling gekkonid lizards of India (Sharma, 2002). This species was first described from Shevaroy Hills (Southern Eastern Ghats) which lies in the Salem district of Tamil Nadu by Lt. Col. Richard Henry Beddome in the year 1870. Later on, this species was reported from other hills in the Western Ghats such as Anaimalais and Nilgiris (Smith, 1935). Subsequently, it was also reported from other areas of the Southern part of the Eastern Ghats such as Kolli Hills in Namakkal district of Tamil Nadu and Bangalore and Bannerghatta Hills in Karnataka (Daniels, 1994). The species were found even on buildings in the Kolli hills (Daniels & Kumar, 1998). Most recently, this species was reported from Araku Valley (Chettri & Bhupathy, 2010) and also from many hills in the Eastern Ghats of Andhra Pradesh (Javed *et al.*, 2010).

In this article, the author provides the observations on the first sighting of the Indian slender gecko *Hemiphyllodactylus aurantiacus* (Beddome, 1870) in Yelagiri Hills of the Tamil Nadu part of Eastern Ghats. It is situated in Vellur district, in the northeastern part of Tamil Nadu. It is a rather isolated spur of the Southern Eastern Ghats lying near other such ranges such as Javadhu Hills. While the foothills are covered with dry scrub type of habitat, higher up the vegetation type changes to mixed and moist deciduous forests. The area where this lizard was located, i.e. Mangalam, a small village, is at the base of the Swamimalai hills. Here the climate is cool and moist and the vegetation is green and dense, in contrast to the lower reaches and the plains.



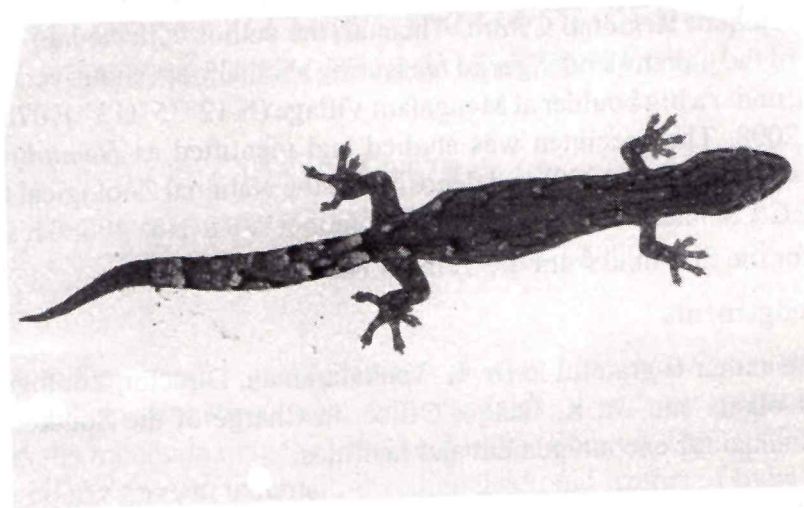
During the faunal inventory survey conducted by the Zoological Survey of India, Southern Regional Centre, Chennai, the author collected an adult female specimen of the Indian slender gecko measuring about 33mm snout-vent and 27 mm tail length, under a big boulder at Mangalam Village (N 12°35' 113" E 078°39' 748' ') on 12.06.2008. The specimen was studied and identified as *Hemiphyllodactylus aurantiacus* (Beddome, 1870) and deposited in the National Zoological Collections of ZSI/SRC/Chennai bearing registration number VRL No. 406. This species is reported for the first time from the Yelagiri Hills.

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Indian slender gecko from Yelagiri hills. Photo: G. Sankaran, ZSI/SRC/Chennai.



## OBSERVATIONS ON FEEDING BEHAVIOUR OF A WILD KING COBRA *OPHIOPHAGUS HANNAH* IN THE WESTERN GHATS

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The king cobra *Ophiophagus hannah* (Cantor, 1836) is a large-growing (5.5. m), diurnal, active-foraging, snake-eating, oviparous, elapid snake found in the dense jungles of south and southeast Asia (Whitaker, 1978; Das, 2002; Daniel, 2002; Whitaker & Captain, 2004). Much has been published about the natural history of this magnificent snake. A large part of the literature, however, is on captive specimens (Agard, 1924; Evans, 1902; Gowrishankar & Whitaker, 2009; Scott, 2002; Whitaker *et al.*, 2003), except a few recent ones on wild snakes (Bhaisare *et al.*, 2010; Bhattacharya & Mithra, 2005; Whitaker *et al.*, 2011). In this article, I report my observations on the feeding behaviour of a wild king cobra, seen in the Western Ghats that was observed to feed on an adult Indian rat snake (*Ptyas mucosa*), which is the king cobra's staple prey species in this part of India (Bhaisare *et al.*, 2010; Whitaker *et al.*, 2003, 2011).

The observations took place in the Parambikulam Tiger Reserve (10°23' N latitude 76°42' E longitude; 300-1438 m asl) in the Palghat district of Kerala. On 12<sup>th</sup> June 2010, in the southwestern monsoon season, by around 13:00 hrs., a wild adult king cobra was observed actively hunting a rat snake on the forest floor. The surrounding habitat was tropical moist deciduous and semi-evergreen forests. From visual estimation, the king cobra would have measured about 12 ft in length and the rat snake about 6 ft in length. Both these are the reported average sizes for these two species (Das, 2002; Daniel, 2002; Whitaker, 1978; Whitaker & Captain, 2004).

First the king cobra cornered the rat snake around a bush and then bit it near its tail / hind body. After some eight minutes, it bit the rat snake in its midbody and then again near the neck, after seven minutes. When the cobra bit the rat snake it held often chewing several times, envenomating the snake. Every time the king

cobra bit the rat snake, the cobra would twist the rat snake dorsoventrally and would chew repeatedly along its dorsal, lateral and ventral parts.

The rat snake reacted by a few strikes, targeted mainly at the cobra's head and neck regions. The rat snake bit the cobra twice near its neck, just behind the head. The rat snake was then seemingly paralysed by the cobra's venom. After about 25 min., the rat snake made no movements ie. no twitching of the body or tongue-flicking or other localized body movements.

After 13 minutes from the rat snake's immobilisation, the cobra started eating the rat snake. The cobra held the rat snake by its head and started ingesting the rat snake slowly. The cobra took 11 minutes to ingest completely the immobilized rat snake.

The entire feeding episode from the cobra's cornering the rat snake to its complete ingestion took 44 minutes. By about 13:50 hrs, the king cobra had completed eating the rat snake.



A wild king cobra feeding on a rat snake in Parambikulam Tiger Reserve, Kerala

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## RANDOM HARVEST

### *Marachékka*

The common bronzeback tree snake (*Dendrelaphis tristis*) is a non-venomous arboreal snake found in most of peninsular India. It inhabits bushes, small trees, palmyra etc. The female lays eggs in tree-holes and rotting vegetation. A colourful superstition widespread in parts of south India is that this snake, called *komberimooken* (or *komberimurken*) in the vernacular is highly venomous, and so vicious and spiteful that when it bites someone it will climb a tree and maintain a vigil to ensure that the person is truly dead and his body burnt, and it will climb down from the tree only when it sees the smoke rising from the funeral pyre.

It is, perhaps, the same snake that is known as *marachékka* in Malayalam. The belief in parts of Kerala is that the *marachékka* is a highly venomous dweller in tree-holes. (Hence the name?) When a person is bitten by this snake, the native physician tries to cure the victim by incantations and herbal medicine. The victim shows signs of recovery only to relapse soon into his previous state. The cycle of impending recovery and relapse gets repeated over and over again until the victim finally succumbs to the venom. The snake then hangs from the branch of the tree in which it dwells, and, only after it sees the smoke from the pyre does it rest content and withdraws into its hollow.

\* \* \* \*

### Rare lizard rediscovered after 135 years

Jeypore ground gecko (*Geckoella jeyporensis*) is a little-known endemic gekkonid lizard known only from its original description in 1877 by Col. Richard Henry Beddome who procured one specimen from the Pattinge Hill, a hill range in the Eastern Ghats of Andhra Pradesh. In 2010-11 a team of researchers comprising of Ishan Agarwal and A.D. Roy from the Centre for Ecological Sciences, Bangalore, Varad Giri of the Bombay Natural History Society, Mumbai and Dr. Aaron M. Bauer from the Villanova University, U.S.A, rediscovered this species from two hill ranges – Galikonda, Vishakapatnam district, Andhra Pradesh and Deomali, Koraput district, Orissa. The scientists published their findings in *HAMADRYAD* in June 2012. The paper reports for the first time, the lizard's life colouration, other morphological details and natural history such as habitat associations. The two specimens, both males, are now deposited as voucher specimens in the Centre for



Ecological Sciences and the Bombay Natural History Society. The first specimen was found under a stone during daytime, while the second was sighted at night on a tree trunk. The researchers decided not to give precise details of the location “in order to provide some protection from commercial collecting for this attractive species.”

\* \* \* \*

### Getting high on snake venom

The State Wildlife Wing of Maharashtra has uncovered an illicit snake venom trade. On 12<sup>th</sup> September 2012, 12 snake catchers, all college students, were caught red-handed with 8 ml of cobra venom and 4 live spectacled cobras (*Naja naja*) – Schedule – II species under the Indian Wildlife (Protection) Act, 1972. The cobra also features in Appendix II of CITES, *Convention of International Trade in Endangered Species*. The venom collected was allegedly used illegally as “intoxicants”.

– Source: *Traffic Post* Nov.2012.

\* \* \* \*

### Reticulated python is *Python reticulatus* once again

The reticulated python was first scientifically named as *Boa reticulata* by Schneider in 1801. It was later allocated to the genus *Python* Daudin, 1803 by Fitzinger in 1826 and the scientific name has since then been *Python reticulatus*. This name has remained stable for over a century, till in 2004 Raymond Hoser – whom Wikipedia describes as “a self-described Australian herpetologist, snake-catcher and author (b.1962)” coined, for this species, a new generic name *Broghammerus*, after a German herpetologist Stefan Broghammer. The scientific name of the species thus became *Broghammerus reticulatus*. The work of Hoser has been criticised by Wuster *et al.* “*Taxonomic contributions in the “amateur” literature: comments on recent descriptions of new genera and species by Raymond Hoser*”, for basing nomenclatural acts and taxonomic decisions on unsubstantiated “evidences” such as aberrant colouration, clinal / intraspecific variation, lack of proper typification and absence of a list of examined comparative material and so on. Notwithstanding this, Rowlings *et al.*, in their paper titled “Python phylogenetics:inference from morphology and mitochondrial DNA” through genetic and morphological analyses



reinstated Hoser's name *Broghammerus*, but with substantial evidence. For those who are unfamiliar with procedures in zoological nomenclature, it is necessary to mention here that zoological names work more by the "principle of priority" than in terms of scientific rigour and accuracy alone. Hence, although Rowlings *et al.*, must be credited for properly delimiting the new genus to a group of Asutralasian pythons, they are forced to retain Hoser's name- combination *Broghammerus reticulatus*. Dr. Indraneil Das, in his book "A field guide to the reptiles of southeast Asia" used Hoser's new genus name, in the sense of Rowlings *et al.* However, Romulus Whitaker, whilst reviewing the book, criticized the usage of *Broghammerus* and stated that reticulated python must still be called *Python reticulatus* even though this has not had unequivocal response from fellow scientists. To put an end to the continued erroneous usage of *Broghammerus* [and many other such "new names" and "new taxa"], Kaiser *et al.* 2013 in their paper titled "Best Practices: In the 21st century, taxonomic decisions in herpetology are acceptable only when supported by a body of evidence and published via peer-review" commented on Hoser's own private publications of taxonomic and nomenclatural actions and advised scientists to follow alternative usages of genuine available names in place of Hoser's names. Going by their recommendation, the reticulated python thus once again becomes *Python reticulatus*, after an unwanted and convoluted spate of "research". It is hoped that *Python reticulatus* for this species, will find general favour at least from now on.

\* \* \* \*

### Do Scientists have a sense of humour?

Kaiser *et al.* mention in the course of the paper quoted in the previous extract that the great taxonomist Linnaeus named a plant as *Siegesbeckia* after a certain Johann Georg Siegesbeck, who was Linnaeus's "contemporary and a very vocal critic." The plant is a weed!

\* \* \* \*

### Two new snakes from the Eastern Ghats

Two new species of snakes have been described from the Eastern Ghats, a hill range in eastern peninsular India, extending from Orissa to Tamilnadu. Gower's shieldtail snake *Rhinophis goweri* was described from Bodamalai hills of Tamilnadu. This snake is named after Dr. David Gower of the Natural History Museum in London, in appreciation of his outstanding work on shieldtail snakes.



The discovery was reported in the *Russian Journal of Herpetology* by R. Aengals of the Zoological Survey of India and S.R.Ganesh of the Chennai Snake Park. It is a small, 1 foot long, non-venomous, burrowing snake that belongs to family Uropeltidae, unique to peninsular India and Srilanka. The snake has a dull brown body and the tail is orange-red underneath.

The yellow-green cat snake *Boiga flaviviridis* was described based on specimens from the Eastern Ghats (Udayagiri in Andhra Pradesh and Kaigal in Karnataka) and the Eastern coastal plains (Berhampur in Orissa and Sriharikota in Andhra Pradesh). This species was so named because of its peculiar yellowish green colouration, *flavus* meaning yellow and *viridis* meaning green in Latin. This mildly-venomous, rear-fanged tree snake grows to about 1 m and is slender in build with a triangular head and large beady eyes. This discovery was reported in *Zootaxa* by Gernot Vogel from Germany and S.R.Ganesh of the Chennai Snake Park.

These recent new descriptions further emphasize the fact that dry forests that typically prevail in the Eastern Ghats are still largely under-explored and are wrongly thought to be poor in species richness, particularly when compared to the Western Ghats. Further studies are needed to better document the full biodiversity of the Eastern Ghats.

\* \* \* \*

### **Studies on Western Ghats tree frogs, including new descriptions**

Recently two scientific articles published in *Zootaxa* have reported new studies on Western Ghats tree frogs. The first one by Dr. S.D. Biju and his students from the Delhi University report elaborate nesting behaviours, colour changes from juvenile to adulthood and discuss geographic ranges and morphology of four endemic species of Western Ghats tree frogs belonging to the genus *Rhacophorus* – popularly called the flying or gliding frog because of their dermal appendages using which they glide. The species studied are: *Rhacophorus malabaricus*, *R. calcadensis*, *R. lateralis* and *R. pseudomalabaricus*. The study concluded that “ontogenetic colour change” and polyandry are commonly occurring but hitherto undocumented in Western Ghats *Rhacophorus*.

The second paper by Robin Abraham and others from Kerala in collaboration with Dr. Alexander Pyron of George Washington Univ., U.S.A has reported two new genera of tree frogs from the Western Ghats. The first new genus *Beddomixalus* was erected for the recently described new species – *Polypedates bijui* from high



elevation forests of Anaimalais and High Ranges. The genus name is an honour to Col. Richard Henry Beddome, a British Army officer of the erstwhile Madras Presidency who was a famed natural historian who had studied Western Ghats amphibians too. The second new taxa (new genus and new species) was named *Mercurana myristicaplaustris*. The genus was named after a famous UK singer who lived in the Western Ghats and the species name is after the *Myristica* swamps of southern Kerala, the sole habitat of the new species.

These new findings highlight cryptic diversity of Western Ghats indicating both our lack of knowledge of species richness as well as unknown life histories of described species.

\* \* \* \*

### **'Snake root' in Australia and India**

In *Snakes Alive! Snake Experts and Antidote Sellers of Australia* (1986), the author John Cann narrates a belief in Australia that if a snake and an 'iguana' (goanna or monitor lizard) fight and the goanna gets bitten, it scampers off for a mouthful of a native plant (*Lobelia purpurascens*) before it returns to fight the next round. This is a small herb found in eastern Australia, now named *Pratia purpurascens*, which bears the common name 'white root'.

There is a similar belief in India that the mongoose, the well-known enemy of snakes, is immune to snakebite and it gets its immunity by eating the root, rather, the bulb of a plant which, for this reason, is named 'mongoose plant' or 'Indian snake root' in English, *Ophiorrhiza mangos* in Latin, *sarpāri* (snake's enemy) in Sanskrit and *keeri poontu* (mongoose root) in Tamil. It is believed that the mongoose, when it sees a snake and decides to make short work of it, goes in search of this plant and, after eating the bulb, returns to put up a good fight and kills the snake.

Both the Australian and the Indian herbs have a reputation for being antidotes to snakebite in humans even though this doesn't seem to have any scientific basis.

\* \* \* \*

### **The unlegendary smallness of being**

The most venomous snake of India is a comparatively small snake: the common krait (*Bungarus caeruleus*) whose average length is three feet. The Indian snake whose bite is more often fatal than that of others is again a comparatively small one – the saw-scaled viper (*Echis carinatus*), generally reaching not more



than one-and-a-half feet. But, in legend and fable, if a snake has to live up to its reputation of being deadly, it has to be a gigantic one and, preferably, many-headed. Thus we have *Vrtra*, *Kāliya*, *Vāsuki* and so on.

\* \* \* \*

### **Croc head scales are formed by physical cracking**

In *SCIENCE* dt. 29<sup>th</sup> Nov. 2012, Milinkovitch and others report that unlike normal reptilian scales that are formed as individual units of the skin, the head scales in crocodiles form from extraneous reasons. The scientists have discovered that, unlike other skin appendages such as scales, feathers and hairs the head, particularly face and jaw scales of crocodiles are not normal keratinized epidermal units. While these aforesaid structures are genetically controlled developmental elements that are produced by a process called “reaction-diffusion mechanism (RDM)”, the head scales of crocodiles, unlike their own body scales, form out of “physical self-organizing stochastic process distinct from RDMs: cracking of the developing skin in a stress field”. The authors further go on to state that the underlying causal mechanisms for this process are the mechanical stress in this region that is generated by a very fast growth of embryonic facial and jaw skeleton coupled with the high degree of keratinisation of this region.

\* \* \* \*

### **A snake's unintended selective predation**

A 2011 study by the University of Florida suggests that rat snakes once thought to threaten the endangered red-cockaded woodpecker may actually benefit the birds.

Katie Sieving and John Kappes found that rat snakes help the birds by eating species that commonly steal the endangered woodpecker's nest-cavities. The red-cockaded woodpeckers “nest in cavities they create in living pine trees and naturally protect themselves from rat snakes by pecking around the cavity and causing sap to flow”. A marauding snake gets stuck in the sap and, before it robs the nest, falls off the tree. The snake may then divert its attention to non-sticky cavities of other woodpeckers like the more common red-bellied woodpeckers which compete with the endangered red-cockaded woodpeckers.

Source : Katie Sieving [chucao@ufl.edu](mailto:chucao@ufl.edu)

\* \* \* \*

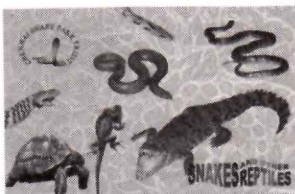


### **The Gordian knot**

Some shieldtail snakes, particularly the pied-belly shieldtail (*Melanophidium punctatum*) are known for their habit, when picked up, of coiling their hindbody tightly around one's finger. In the *Herpetofauna of Knuckles Range* (Knuckles is a hill range in central Srilanka), Suraj Goonewardene *et al.* refer to a belief in the Knuckles that a shieldtail snake will "tie a knot around your fingers and it will never again untie". What happens next has not been mentioned.

– B. Vijayaraghavan

## Our Publications



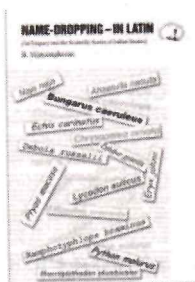
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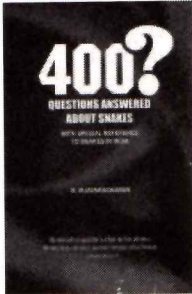
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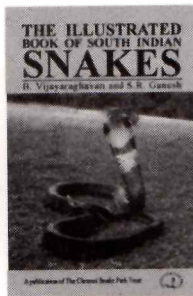
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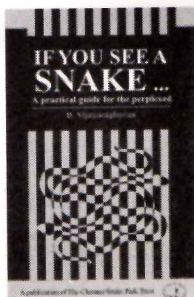
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- iv) To undertake captive breeding of endangered species of snakes and other reptiles.
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