

## Habitat preference of pit vipers along the western ghats (Goa)

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The state of Goa is located along the central-west coast of India, lying between latitude 14°51' to 15°48' N and longitude 73°41' to 74° 20' E. There are three main physical divisions viz. the mountainous region of the Sahyadris in the East, the middle level plateaus in the centre and the low-lying river basins with coastal plains. The portion of the Western Ghats lying in Goa (The Sahyadris) has an area of about 600 sq.Km. and an average elevation of 600 meters. The important vegetation of the range include tropical wet evergreen forests, tropical moist deciduous forests, tropical dry deciduous forests, scrub jungles, montanne sub-tropical forests and wet grasslands. Due to its mountainous character, often characterized by steep slopes that make part of it relatively inaccessible, the range has remained undisturbed for much of human history. Partly for this reason and also because of the unique ecosystem it represents, the Western Ghats today are acknowledged to be one of the 'hotspots' of biological diversity and endemism in the world. Six species of pit vipers have been reported from Western Ghats[1]. These pit vipers, except *T. gramineus*, are endemic to Western Ghats. Most of them become very active in the evening; during day they remain coiled on a branch [2]. *H. hypnale* is both terrestrial and arboreal in its habit often ascending low bushes in the forest [3].

Pit-vipers belong to the family Viperidae and sub-family Crotalinae. Three species of pit-vipers viz., Malabar pit-viper (*Trimeresurus malabaricus*), Bamboo pit-viper (*Trimeresurus gramineus*) and Hump Nosed pit-viper (*Hypnale hypnale*) are known from Goa, of which two (*T. malabaricus*, *H. hypnale*) are endemic to Western Ghats. However very little information is available on ecology of these three species. To address this lacuna in our contemporary knowledge the present study was undertaken in 5 sanctuaries in Western Ghats range in the State of Goa Viz. Mhadei wildlife sanctuary, Mollem wildlife sanctuary, Bondla wildlife sanctuary, Netravali wildlife sanctuary and Cotigao wildlife sanctuary of Goa to investigate

the habitat preference of the above three species in the wild.

Intensive survey on foot was carried out during Jan to Dec 2005 in the Western Ghat region of Goa specially the sanctuaries mentioned above, Netravali wildlife sanctuary and Cotigao wildlife sanctuary Bondla wildlife sanctuary, Mollem wildlife sanctuary, Mhadei wildlife sanctuary and the possible habitats of pit vipers were recorded. Locality coordinates were obtained by hand held Geographical Positioning System (GPS). Altitude and temperature were recorded using altimeter and mercury thermometer respectively. Specimens were picked up with the wooden stick. Their morphometric measurements were recorded using transparent plastic tube and Identification of these specimens up to the species level was done following the methodology of Smith [1] and Daniel [4]. Habitat preference of vipers was studied by direct observation of the places where they occur.

The sites selected for the present study viz., Bondla wildlife sanctuary, Mollem wildlife sanctuary, Mhadei wildlife sanctuary, Netravali wildlife sanctuary and Cotigao wildlife sanctuary has three types of vegetation viz. tropical moist deciduous, tropical dry deciduous and semi evergreen type of vegetation. Generally these areas fall at an altitude ranging from 45mt msl to 600mt msl (from South to north) and the temperature usually fluctuates between 15°C to 30°C. *T. malabaricus*, *T. gramineus* and *H. hypnale* were encountered in the study site. The species of pit vipers and their numbers found in all the five different sites of the present study are indicated in Table. 1. Out of the three species, *T. malabaricus* and *H. hypnale* were not found in Bondla wild life sanctuary. All the pit-vipers were mostly encountered in these areas during the monsoons and rest of the season they usually rest near moist places. Pit-vipers prefer the close proximity of their prey as their habitats.

During the survey conducted from Jan 2005 to December 2005, it was observed that *T. malabaricus* and *T. gramineus*, rest for most of the day hours but they become active at night and also found feeding at night exhibiting a nocturnal behavior. Similar observations were made by Whitaker [2] and Murthy [3] in their studies on pit-vipers in the Western Ghats of Maharashtra state.

*T. malabaricus* closely resembles the Bamboo pit viper in their structural form. Like most vipers, it has a triangular head and a narrow neck. It has brownish

coloration, sometimes having darker brown or greenish speckles over the body. *T. malabaricus* are common in altitudes ranging from 700m – 2300 m [3]. However in our study areas we have encountered this species at low altitude ranging from 200m to 600m. A total of around 20 individuals of this species were noted in the selected areas (Table I) ranging in size from 520mm to 900mm. They were usually found in areas of dense vegetation having moist surroundings harboring on large rocks and sometimes on small shrubs. During monsoons they were often found resting in the roofs of old houses or in the drier places in the tree crevices during the day hours.

**Table I: Number of pit viper species encountered in selected sites in Goa during day and night hours.**

Viper sps.	No. of species encountered										
	NWS		MWS		BMWS		CWS		BWS		Total No.
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	
<i>T. malabaricus</i>	—	2	3	5	5	—	1	4	—	—	20
<i>T. gramineus</i>	2	4	—	—	—	1	1	1	1	1	11
<i>H. hypnale</i>	2	1	2	1	5	2	4	2	—	—	19

NWS Netravali Wildlife Sanctuary ; MWS Mhadei Wildlife Sanctuary  
 BMWS Bhagwan Mahaveer Wildlife Sanctuary; CWS Cotigao Wildlife Sanctuary  
 BWS Bondla Wildlife Sanctuary

*T. gramineus* has slightly keeled scales, wide triangular head, thin neck and is green dorsally. This species resemble green whip snake in their coloration but can be differentiated from them due to the presence of a triangular head. In our study area, we have encountered altogether 11 nos. of individuals of this species from Jan to Dec 2005 (Table I) ranging in length from 380mm – 440mm. They are strictly arboreal and were encountered in all the selected areas of study where the vegetation is mostly moist deciduous to semi evergreen to evergreen. Although Mhadei wildlife sanctuary harbors all the favorable climatic and vegetational requirements for this species, we could not find them during the present study. *T. gramineus* prefer cool thick vegetation near stream edges, bamboo and other jungle foliage



**Figure :** (Top left) Bamboo pit viper (*T. gramineus*);  
(Top right) Malabar pit viper (*T. malabaricus*),  
(Bottom) Hump nosed pit viper (*H. Hypnale*)

*H. hypnale* is a small snake with stocky body, short tail and keeled scales. Snout is acutely pointed and turned up at the end with enlarged scales on the head. It is grey or brown dorsally, heavily powdered or mottled within dark brown and with large ovate dark brown lateral spots and pink tail [2]. A total of 19 individuals of *H. hypnale* were encountered with an average length of 410mm – 460mm. *H. hypnale* was found resting either under the stones or under roots of small shrubs. They were seen predominantly residing in the dry leaves in areas harboring large number of their preys such as skinks, small frogs and small toads and were seen to feed on these preys. These observations are in accordance with those of Murthy [3]. The juveniles were seen feeding on very small sized preys.

Often we found that all these pit-vipers remained camouflaged against their background and could be located only with intense search and observation. *T. Malabaricus* and *T. Gramineus* were often encountered while crossing the road during night hours and got killed accidentally by the passing vehicles. During the survey in the month of December in areas of cashew plantation in the site of our study area, we observed most of the *H. hypnale* resting under the roots of the eupatorium bushes in this area. These pit-vipers were often killed by labourers by fear whenever encountered. Therefore, public awareness is urgently required to conserve these endemic species.

From the present investigations we may conclude that *H. hypnale* prefer terrestrial habitat and other two species viz *T. malabaricus* and *T. gramineus* prefer arboreal habitat, all these pit-vipers are nocturnal in habit.

#### **Summary :**

Vipers are classified into two broad groups, viz., true vipers and pit-vipers, on the basis of presence or absence of a facial pit. Pit-vipers belong to the Family Viperidae and sub-family Crotalinae. Majority of the pit vipers exhibit nocturnal behavior and become very active during night hours. In the present study habitat ecology of the three species of pit vipers viz., Malabar Pit Viper (*Trimeresurus malabaricus*), Bamboo pit-viper (*Trimeresurus gramineus*) and Hump Nosed pit-viper (*Hypnale hypnale*) from wildlife sanctuaries of Goa (Western Ghats) was undertaken. Out of these three species, *T. malabaricus* and *H. hypnale* are endemic to Western Ghats. However, very little information is available on ecology of these three species. Hence, the habitat preference of the above three species in the wild, their ecology with respect to the locality and morphometric observations was undertaken.

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