

# Cobra

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*Quarterly Newsletter of the Madras Snake Park Trust*

## THE MADRAS SNAKE PARK TRUST

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### Cover Photo

Dogfaced Water Snake (*Cerberus rhynchops*) preying on a gobiid fish between mangrove roots at Pichavaram, South India: The dogfaced water snake is a brackish water species found all over the Indo-Pacific coast. It prefers estuarine swamps, mangrove and mudflats, feeding mainly on fish though occasionally it strays into rice fields and freshwater in pursuit of frogs. This snake reaches a maximum length of 125 cm and is rear-fanged. Its bite is however not lethal to humans. Dogfaced water snakes give birth to live young. The overall grey-olive brown dorsal colour, white underside and the black bands along the sides are characteristic, besides the keeled scales and frontally placed bulging eyes. The dogfaced water snake is so called because of its projected snout which somewhat resembles the face of a bulldog.

—Photo by R.J. Ranjit Daniels

# COBRA

## Quarterly Newsletter of the Madras Snake Park Trust

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### EDITORIAL

Even though the primary objective of the Madras Snake Park Trust is to educate the public regarding the protection and conservation of reptiles in general and snakes in particular, for the sake of popularizing herpetology in India, COBRA publishes articles on amphibians also. We thus find in this issue a collection of articles on field methodology, overviews, notes and book reviews covering both reptiles and amphibians.

# RARITY AND THE HERPETOFAUNA OF THE SOUTHERN EASTERN GHATS INDIA

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## Introduction :

Conservation of biodiversity requires a clear understanding of rarity of the concerned species. By definition rarity would simply mean 'uncommonness' or 'unusualness' and this trait has been a pressing reason for treating such species as particularly fragile, precious or valuable (Rabinowitz, *et al*, 1986).

Biologists recognize three components of rarity: a within habitat component, a between habitat component and a geographic component. However, assessing rarity is by no means simple. It is easily complicated by the scale at which species are assessed. Michael Soule discusses these difficulties and goes on to show that generally, scale-induced biases are minimized when communities of species in large landscapes are dealt with. Thus on a geographical scale, habitat patches introduce the most sampling bias whereas regions, continents and worlds reduce the bias progressively as the scale increases (Soule, 1986).

Complexity of another kind is introduced in identifying the different forms of rarity. Rabinowitz, *et al* (1986) argue that a variety of species with quite different natural history are often lumped together as rare. This lack of precision is said to obscure much interesting biology for a very heterogeneous group of species. For instance, species may be rare because they occur only in rare habitats, they may be very localized in a small area, or they may have a few

individuals. Rabinowitz and colleagues suggest that the above traits are basic to all species and thus we can analyse rarity in the following ways.

- 1) **Geographic range :** Whether a species occurs over a broad area or whether it is restricted to a particular small area.
- 2) **Habitat specificity :** The degree to which species occurs in a variety of habitats or is restricted to one or a few specialized sites.
- 3) **Local population size :** Whether a species is found in large populations somewhere within its range or has small populations wherever found.

Using these traits Rabinowitz and colleagues have identified eight forms of rarity that any species could possibly demonstrate and categorised the British plants under these forms of rarity. They emphasize that such a method can be useful in assessing the status of a number of species simultaneously though not entirely free of subjectivity.

A systematic approach to assessing rarity in species has never been attempted in India before. The main reason is that we do not have the kind of data as that used by Rabinowitz and colleagues. Atlases of species distribution on equal sized grids are not available in India for even the best, known of organisms—birds. Nevertheless as it is important that we also understand the patterns of rarity in our species, in this paper we have attempted to analyse and

discuss data on the amphibians and reptiles of the Southern Eastern Ghats.

#### Study Area :

The Eastern Ghats form a discontinuous chain of rather low hills running east-northeast from the Nilgiris in Tamilnadu to the Khondmal hills in Orissa (Fig. 1). Adjoining southern hill ranges such as Biligirirangan hills, Pachaimalai, Javadi hills, Kollimalai hills and Shevroys have also been treated as the Eastern Ghats. The Eastern Ghats have been divided into 3 subsections by biogeographers (Legris and Meher-Homji, 1982). For the present analysis we chose the third sub-section viz., the southern Eastern Ghats which lies between 11—13° N, and 77—80° E. The entire area (c. 49,000 km<sup>2</sup>) falls within the political limits of the state of Tamilnadu with Satyamangalam and Madras as the western and eastern limits respectively.

Legris and Meher-Homji (1982) have broadly treated the study area as 'dry' receiving an annual rainfall of generally not more than 1500 mm. The resultant vegetation type is a scrub-thorn forest community dominated by *Albizzia amara*. The hills in this area are rocky with large boulders and rainfed seasonal streams. Perineal rivers are a few (eg., Palar). The area includes several large reservoirs such as the power generating Stanley Reservoir in Mettur and smaller catchments for irrigation and fishery purposes. Rainfed irrigation tanks and puddles are common along the plains and especially along the east coast and around Chingleput. Rice paddies dot the entire landscape.

#### Data :

Over the years, 115 species of amphibians and reptiles have been reported from the Eastern Ghats (Annandale 1915; Chari, 1960; Das, 1991; Inger and Dutta, 1986; Murthy, 1977, 1985 a & b, 1986, 1987,

1988, 1990 a & b; Murthy and Chandrasekar, 1988; Pillai and Murthy, 1982; Sharma, 1977; Whitaker, 1978a). These include 25 species of amphibians and 90 species of reptiles. However, the exact ranges and habitat preferences of most of these species have not been studied carefully. Therefore for our analysis we have considered only the 50 species for which such information is available.

#### Methods :

Data was collected from the Southern Eastern Ghats over a 10 month period between September 1992 and July 1993. The entire area was divided into 10' grids (18 km × 18 km) using Survey of India Toposheets. A total of 152 grids covered the entire landscape. Seventeen grids were chosen to be representative of the topography and vegetation of the entire landscape (Table 1). These grids were visited at least once and surveyed intensively for the presence of amphibians and reptiles by a team of 2-3 persons. Approximately 5 km of transect length was covered in each grid and the search was restricted to a strip of about 20 m width. A total of 185 hours were spent over these grids of which about 25% was during the night. All amphibians and reptiles were identified and their relative abundances noted. Identification of species was aided by prior acquaintance with museum specimens at the Zoological Survey of India (Madras) and the Bombay Natural History Society (amphibian collections of Daniels; Reg. No. 2856—2917). Wherever feasible, photography was utilized as a technique.

Assigning species to rarity categories was as follows : species known from grids scattered far and wide were treated as widespread and those restricted to one or a few adjacent grids as those with narrow ranges (Fig 2). Similarly, the major habitat type within the study area being

crub and cultivation, only those species restricted to specialized habitats such as rocks, etc., have been treated as species having restricted habitat preferences.

### Results :

The results of the survey are presented in the Appendix. It is apparent that the frog *Rana cyanophlyctis* is the most widespread and abundant species while species such as *Rana keralensis* and the lizard *Ophisops beddomei* are known just by single individuals from single grids. Snakes in general are scarce.

Five forms of rarity are demonstrated in the herpetofauna of the study area (Table 2). Rarity forms 5, 6 and 7 are absent. It can be seen that 32 out of 50 species (64%) are widespread within the study area. Eighteen species are apparently restricted in range to one or two adjacent grids.

### Discussion :

Rabinowitz, *et al* (1986) have discussed seven forms of rarity that plants of the British Isles demonstrate whereas the herpetofauna of the southern Eastern Ghats demonstrate only five. Most of the British plants (86%) are widespread. Such a pattern has been demonstrated by the herpetofauna of the southern Eastern Ghats as well. However 81% of the British plants are widespread and in large populations somewhere over their ranges while only 18% of the herpetofauna in the present study are widespread and locally abundant.

Soule (1986) has shown that patterns of rarity need not necessarily be similar across different groups of organisms. For instance, plants, being sedentary, will demonstrate different forms of rarity than the more mobile animals. However, amongst vertebrate animals, amphibians and reptiles are the most sedentary and also tied by local climatic conditions due to their ectothermy.

It was shown earlier that angiosperms and amphibians respond to patterns of rainfall similarly in the Western Ghats (Daniels, 1992a). Hence some similarity in patterns of rarity between plants and these animals are not totally unexpected.

The most common pattern of rarity in the herpetofauna is form 3—species being widespread with broad habitat preferences though everywhere in small numbers (42%; Table 2). It is also interesting to note that more snakes fall in this category than any other groups. This may be due to either of the two following reasons: 1) snakes being cryptic can easily be overlooked and hence their low relative abundance and 2) snakes being top level predators do generally exist in small populations everywhere. Whatever evidence we have tend to support the second possibility. For instance, we have frequently worked in the study area with a team of native snake catchers—the Irulas. Even with a team of five experienced Irulas and a day's active searching for snakes under bushes and within burrows over large areas (5—10 km<sup>2</sup>), we have never come across more than five snakes. All often these five would represent 3—5 species.

The second largest category of rarity in the herpetofauna is form 8—species being localized, habitat specialists and in small number everywhere (36%). This is however to some extent an artefact of sampling. Fossorial and cryptic species such as the frogs *Kaloula pulchra* and *Uperodon systoma*, lizards *Chameleon zeylanicus*, *Hemidactylus* and *H. brooki* and snakes *Rhamphotyphlops braminus*, *Eryx conicus*, *Amphiesma stolata*, *Bungarus caeruleus* and *Vipera russelli* have definitely been overlooked during the surveys. These species though nowhere abundant are known from a wide range of habitats and are very widespread.

Rabinowitz, *et al* (1986) while discussing the implications of these forms of rarity in

conservation biology have shown that species demonstrating rarities of forms 1 and 3 are not endangered. Species with wide range, broad habitat preference and large population sizes are not rare. Examples include *Rana cyanophlyctis*. In an earlier study of amphibians in the Western Ghats it was shown that this species of frog is the most abundant and widespread of amphibians (Daniels, 1992b). Species with wide ranges and broad habitat preferences such as *Bufo melanostictus*, *Ptyas mucosus* etc., are also not vulnerable, despite being in small numbers everywhere, unless major landscape transformations take place.

Species demonstrating rarity forms 2 and 4—8 are the vulnerable species (Rabinowitz, *et al*, 1986). In the herpetofauna of the southern Eastern Ghats rarity forms 5—7 are not demonstrated. Rarity form 2—species with wide ranges and large local populations but with narrow habitat preferences such as *Rana hexadactyla*, *Hemidactylus maculatus* and *Psammophilus blanfordianus* are sensitive species. These species have sampled a wide variety of habitats over their range and found only a few fit for continued existence.

Rarity form 4 is shown by *Hemidactylus frenatus* and *Rana tigerina*. Whereas the gecko is a commensal of man and hence not endangered, the frog is probably on the decline. This species is the much persecuted Indian bullfrog. It is also likely that the bullfrog is naturally scarce within the study area as this is the eastern fringe of its range in south India. *Rana crassa* is the common bullfrog in the Eastern Ghats (Daniels, pers. obsery).

The critical species are those that demonstrate form 8 rarity. However as discussed above only about half the species in this category are genuinely so. *Rana keralensis* was considered endemic to the Western

Ghats (Daniels, 1992c). However its isolated occurrence in the Eastern Ghats has recently been confirmed first by a specimen from the Shevroys and later by a single example in the Javadi Hills. This species is definitely endangered in the Eastern Ghats—probably having been more widespread in the past. Other species which are genuinely rare in the Southern Eastern Ghats are *Calotes calotes*, *Calotes rouxi*, *Psammophilus dorsalis*, *Ophisops beddomei*, *Cabrita leschenaulti*, *Python molurus* and *Cerberus rhynchops*. *Psammophilus dorsalis* is a species preferring higher hills. *Ophisops beddomei* and *Cabrita leschenaulti* have not been reported from this area before. *Cerberus rhynchops* is an estuarine snake. *Python molurus* is a species listed as endangered in India.

The above analysis has brought to light certain patterns of rarity which might not have emerged through other means. While we do admit that the data is not complete, except in the case of rarity form 8, the overall results seem to be realistic. Earlier herpetofaunal surveys in India have largely been qualitative or when quantitative restricted to just one species. Even the single species surveys have utilized a considerable amount of approximations (eg., Whitaker, 1978b). The only study where the local population of a single species (*Python molurus*) has been precisely estimated is that of Bhupathy (1990). In any event since population is not the only criterion in assessing the status of species as discussed above, and a species by species assessment in a large community is not feasible, we recommend the approach that we have discussed above as practical and reliable.

#### Acknowledgements :

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**Table 1:** The 17 grids surveyed with details of effort, number of species and major vegetation type

Grid No.	Locality	Effort* (Hrs)	No. Species	Vegetation Type
11	Mettur Dam	4.00	9	Scrub
65	Javadi Hills	30.00	30	Scrub
74/80	Yercaud	7.00	14	Scrub
86	Kumargiri	5.00	13	Scrub
88	Kallarayanmalai	6.00	7	Scrub
109	Amriti	6.00	20	Scrub
111	Walajapet	2.00	6	Habitation
126	Palar / Chingleput	5.00	12	Scrub
131	Rajampalayam	5.00	19	Scrub
132	Vedantagal	3.00	10	Plantation
135	Gingee	17.00	15	Scrub
145	Chembarambakkam	5.00	5	Scrub
146	Thiruporur	8.00	16	Scrub
147	Thirukalikundram	2.00	9	Scrub
149	Cheyyur	2.00	7	Habitation
152	Vadanemmel	50.00	31	Cultivation

\* figures rounded

**Table 2:** Categorization of the species of amphibians and reptiles under the eight forms of rarity defined by Rabinowitz, *et al* (1986).

**Form 1 :**

- Wide Geographic Distribution
- Broad Habitat Specificity
- Somewhere Large Local Population Size
- Rana cyanophlyctis*
- Rana crassa*
- Rana limnocharis*
- Calotes versicolor*
- Sitana ponticeriana*
- Mabuya carinata*

**Form 2 :**

- Wide Geographic Distribution
- Restricted Habitat Specificity
- Somewhere Large Local Population Size
- Rana hexadactyla*
- Hemidactylus maculatus*
- Psammodromus blanfordianus*

**Form 3 :**

- Wide Geographic Distribution
- Broad Habitat Specificity
- Everywhere Small Local Population Size
- Bufo melanostictus*
- Microhyla ornata*
- Microhyla rubra*
- Polypedates maculatus*
- Tomopterna breviceps*
- Hemidactylus leschenaulti*
- Mabuya macularia*
- Mabuya trivittata*
- Riopa punctata*
- Varanus bengalensis*
- Lycodon aulicus*

- Oligodon arnensis*
- Xenocropis piscator*
- Atretium schistosum*
- Ahaetulla nasutus*
- Ptyas mucosus*
- Dendrelaphis tristis*
- Naja naja*
- Echis carinatus*
- Lissemys punctata*
- Melanochelys trijuga*

**Form 4 :**

Wide Geographic Distribution  
Restricted Habitat Specificity  
Everywhere Small Local Population Size

**Hemidactylus frenatus**

**Rana tigerina**

**Form 5 :**

Narrow Geographic Distribution  
Broad Habitat Specificity  
Somewhere Large Local Population Size  
Nil

**Form 6 :**

Narrow Geographic Distribution  
Restricted Habitat Specificity  
Somewhere Large Local Population Size  
Nil

**Form 7 :**

Narrow Geographic Distribution  
Broad Habitat Specificity  
Everywhere Small Local Population Size  
Nil

**Form 8 :**

Narrow Geographic Distribution  
Restricted Habitat Specificity  
Everywhere Small Local Population Size

**Uperodon systoma**

**Kaloula pulchra**

**Rana keralensis**

**Hemidactylus triedrus**

**Hemidactylus brooki**

**Calotes calotes**

**Calotes rouxi**

**Psammophilus dorsalis**

**Chameleon zeylanicus**

**Ophisops beddomei**

**Cabrita leschenaulti**

**Rhamphotyphlops braminus**

**Python molurus**

**Eryx conicus**

**Amphiesma stolata**

**Cerberus rhynchops**

**Bungarus caeruleus**

**Vipera russelli**

**Appendix :** A list of species recorded during the present survey with details of range, number of individuals observed, habit and habitat preference.

<i>Species</i>	<i>No. Grids</i>	<i>Indls</i>	<i>Habit</i>	<i>Habitat</i>
<b>Amphibians :</b>				
Family : Bufonidae				
1) <i>Bufo melanostictus</i>	5	13	T	All
Family : Microhylidae				
2) <i>Microhyla ornata</i>	4	8	F	All
3) <i>M. rubra</i>	3	3	F	All
4) <i>Kaloula pulchra</i>	1	5	F	Habitation
5) <i>Uperodon systoma</i>	1	3	F	Habitation
Family : Ranidae				
6) <i>Rana crassa</i>	15	143	H	All
7) <i>R. cyanophlyctis</i>	16	248	H	All
8) <i>R. hexadactyla</i>	8	48	H	Marsh
9) <i>R. keralensis</i>	1	1	H	Hill Stream
10) <i>R. limnocharis</i>	11	42	H	All
11) <i>R. tigerina</i>	3	8	H	Stream
12) <i>Tomopterna breviceps</i>	6	25	F	All
Family : Rhacophoridae				
13) <i>Polypedates maculatus</i>	8	10	A	All
<b>Reptiles :</b>				
<b>Lizards :</b>				
Family : Gekkonidae				
14) <i>Hemidactylus maculatus</i>	3	68	T	Rocks
15) <i>H. triedrus</i>	1	1	F	Acrub
16) <i>H. brooki</i>	1	1	F	Scrub
17) <i>H. frenatus</i>	5	7	A	Habitation
18) <i>H. leschenaulti</i>	4	7	A	All
Family : Agamidae				
19) <i>Sitana ponticeriana</i>	14	107	T	All
20) <i>Calotes versicolor</i>	15	62	A	All
21) <i>C. rouxi</i>	2	5	A	Groves
22) <i>C. calotes</i>	1	1	A	Groves
23) <i>Psammophilus dorsalis</i>	1	4	T	Hills
24) <i>P. blanfordanus</i>	11	132	T	Rocks

<i>Species</i>	<i>No. Grids</i>	<i>Indls</i>	<i>Habit</i>	<i>Habitat</i>
Family : Chameleoniae				
25) <i>Chameleon zeylanicus</i>	1	5	A	Groves
Family : Scincidae				
26) <i>Mabuya macularia</i>	2	7	T	Groves
27) <i>M. carinata</i>	15	54	T	All
28) <i>M. trivittata</i>	7	9	T	All
29) <i>Riopa punctata</i>	8	17	F	All
Family : Lacertidae				
30) <i>Ophisops beddomei</i>	1	1	T	Rocks
31) <i>Cabrita leschenaulti</i>	1	7	T	Scrub
Family : Varanidae				
32) <i>Varanus bengalensis</i>	3	3	F	All
Snakes :				
Family : Typhlopidae				
33) <i>Rhamphotyphlops braminus</i>	1	1	T	Habitat
Family : Boidae				
34) <i>Python molurus</i>	1	1	F	Rocks
35) <i>Eryx conicus</i>	1	2	F	Scrub
Family : Dipsadidae				
36) <i>Lycodon aulicus</i>	3	3	T	All
37) <i>Oligodon arnensis</i>	3	3	T	All
Family : Natricidae				
38) <i>Amphiesma stolata</i>	1	1	T	Scrub
39) <i>Xenochropis piscator</i>	9	9	H	All
40) <i>Atretium schistosum</i>	3	9	H	All
Family : Colubridae				
41) <i>Ptyas mucosus</i>	9	10	T	All
42) <i>Dendrelaphis tristis</i>	2	5	A	Groves
43) <i>Ahaetulla nasutus</i>	6	6	A	All
44) <i>Cerberus rhynchops</i>	1	1	H	Estuary
Family : Elapidae				
45) <i>Bungarus caeruleus</i>	1	1	F	Scrub
46) <i>Naja naja</i>	7	7	T	All

Family : Viperidae

47) <i>Vipera russelli</i>	1	1	T	Scrub
48) <i>Echis carinatus</i>	7	7	T	All

Turtles :

Family : Trionchidae

49) <i>Lissemys punctata</i>	3	3	H	All
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Family : Emydidae

50) <i>Melanochelys trijuga</i>	2	2	H	All
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*A = Arboreal; T = Terrestrial; H = Aquatic; F = Fossorial*

'All' suggests that the species was found using a number of available habitat types.

*Note* : Habit indicates what is generally appropriate for a given species. The habit denoted need not necessarily imply that it is unique.

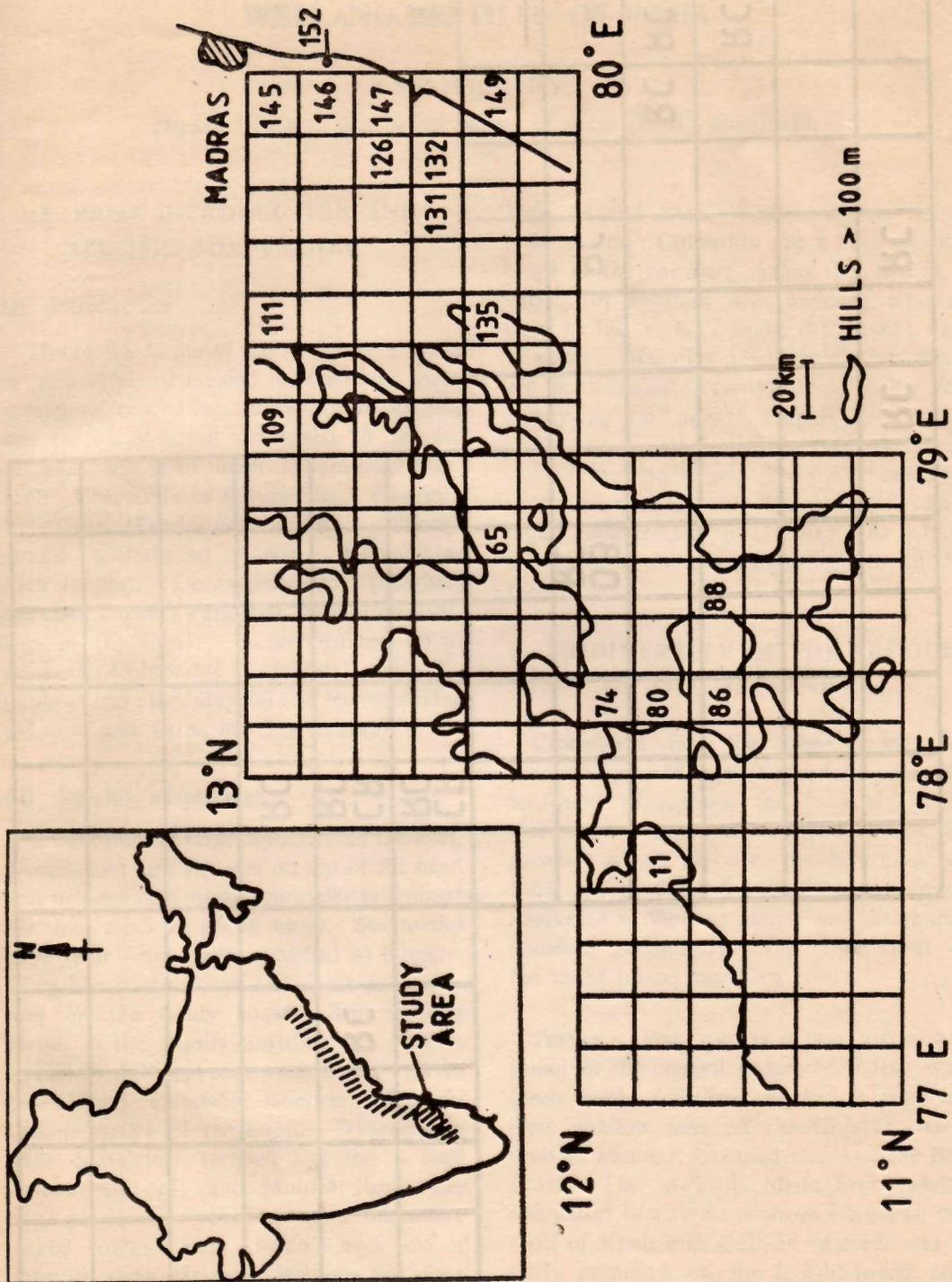


Figure 1 : Map of the Eastern Ghats showing the study area. Grids that were sampled have been numbered.

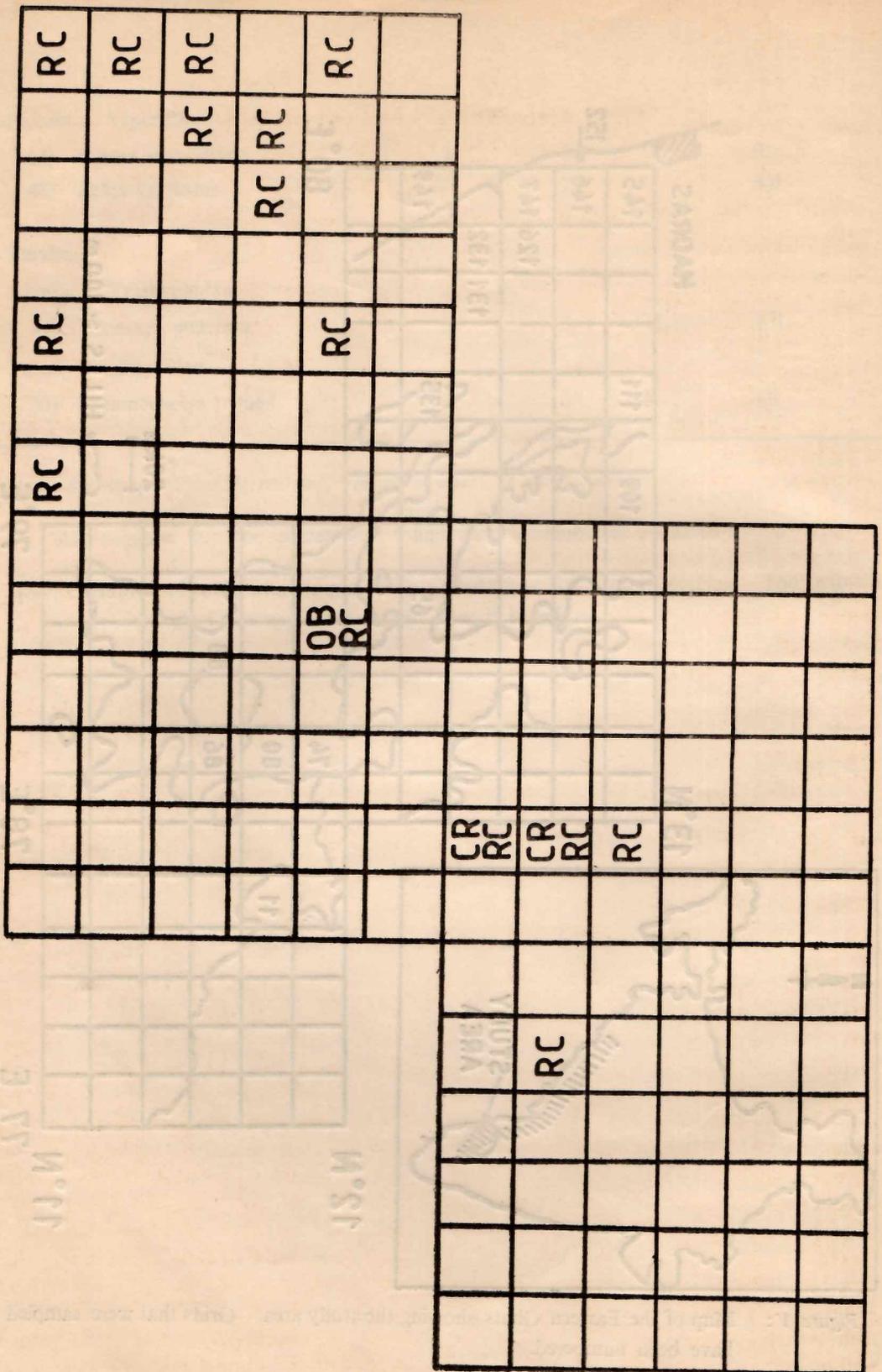


Figure 2 : Typical examples of widespread and narrow ranges.

RC = *Rana cyanophlyctis*; OB = *Ophisops beddomei*; CR = *Calotes rouxi*.

# WETLAND REPTILES OF INDIA

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## I BRIEF INTRODUCTION AND SPECIFIC ADAPTATION

### (i) Introduction

The reptile fauna of the wetlands of India is rich and diversified comprising three species of crocodiles, 29 species of turtles, one species of lizard and nearly 20 species of snakes classified under 11 families. They are : Crocodylidae (Crocodiles, Gharial), Emydidae (Freshwater turtles), Trionychidae (Softshelled turtles), Cheloniidae (Sea turtles), Dermochelyidae (Leather-back Sea Turtles), Varanidae (Monitor lizards) Boidae (Pythons); Acrochordidae (Wart Snakes); Colubridae (Colubrids); Elapidae (Cobras and other elapids) and Hydrophiidae (Marine and Estuarine Sea Snakes).

### (ii) Specific adaptations

Crocodiles are large reptiles with the eyes, nostrils and ears situated on top of the head and possessing a strong muscular tail suited for their mode of life in water. Sea turtles have their front limbs modified as flippers. They live in the ocean and come ashore to nest on the sandy coasts. The wetland turtles of the Family Emydidae are characterised by flattened and webbed feet with an oval-shaped carapace whereas the soft-shelled turtles of the Family Trionychidae have completely webbed feet and a shell covered with soft skin. Monitor lizards are large predaceous reptiles with a snake-like forked tongue, long, flexible neck and a powerful muscular tail. Pythons are giant lethargic non-venomous snakes which kill their prey by constriction. Wart snakes are well adapted to life in brackish and coastal waters with small eyes and nostrils situated

high on the head. They lack the large belly plates. Colubrids are a huge assemblage of the harmless snakes that live in a variety of habitats with amazing adaptations to life on land, under the ground, and in water. Majority are harmless but some are back-fanged secreting toxic saliva for paralysing the prey. Elapids are highly venomous snakes with fixed fangs on either side of the upper jaw. Sea snakes are also venomous with laterally flattened bodies and highly compressed paddle-like tails which are the most obvious adaptations for life in the sea.

## II BIODIVERSITY OF THE REPTILES OF THE WETLANDS

**Crocodiles:** Of the three species of crocodiles, the Mugger (*Crocodylus palustris*) is found throughout the lowlands, the saltwater or estuarine crocodile (*Crocodylus porosus*) occurs all over the east coast of India northwards from Orissa through Andaman & Nicobar islands and the gharial (*Gavialis gangeticus*) is an inhabitant of the more inland northern rivers.

**Turtles :** Five species of sea turtles are found in the coastal waters of India. The green turtle (*Chelonia mydas*) is reported from shallow seas off the Gujarat coasts Gulf of Mannar, Lakshadweep and the Bay Islands, The hawksbill turtle (*Eretmochelys imbricata*) breeds on offshore islands in the Gulf of Kuch and Gulf of Mannar and is fairly common on the Lakshadweep and Andaman and Nicobar islands, The leather-back (*Dermochelys coriacea*) is reported nesting on the Andaman and Nicobar islands and some mainland beaches and in Laksha-

dweep, The loggerhead turtle (*Caretta caretta*) seems to be extremely scarce in Indian waters, and the Olive Ridley turtle (*Lepidochelys olivacea*) is the commonest species of the Indian Ocean with the world's second largest rookery of the turtle located at Gahirmata in the State of Orissa.

Some seventeen species of freshwater turtles (Family Emydidae) classified in six genera namely, *Batagur*, *Hardella*, *Kachuga*, *Geoclemys*, *Cyclemys*, *Heosemys* and *Melanochelys* occur in India. The softshells (Family Trionychidae) include, five species referable to 3 genera namely *Lissemys*, *Aspideretes*, and *Chitra*. Of these the Gangetic softshell (*Aspideretes gangeticus*), the peacock softshell (*A. hurum*), the Chitra softshell (*Chitra indica*), the Leith's softshell (*A. leithii*) mainly inhabit the rivers of the Gangetic and Brahmaputra river system though the last mentioned, extends its ranges to the rivers of the peninsular India.

**Lizards :** The water monitor (*Varanus salvator*), the largest lizard of India, is reported from the mangroves of Sunderbans, Orissa, and the Bay Islands.

**Snakes :** The Indian python (*Python molurus*) is found in the marshes, mangroves, gallery forests and around the wet rocky areas near the jheels throughout India. The wierd looking nonvenomous Wart snake (*Acrochordus granulatus*) is a coastal species and is fairly common in the Chilka Lake on the east coast. Some nine, genera namely, *Natrix*, *Amphiesma*, *Xenochropis* *Atretium*, Boige, *Enhydris*, *Cerberus*, *Gerardia*, *Fordonia* and *Cantoria* of the family colubridae have their representatives in the wetlands of India. Of these, the dog-faced water snake (*Cerberus rhynchops*) is the commonest estuarine snake of India and the Checkered Keelback (*Xenochropis piscator*) is a widely distributed water snake of India. Of the venomous elapids, beside the common cobra (*Naja naja*), the monocellate cobra (*Naja kaouthia*) and the King Cobra (*Ophiophagus hannah*) also are reported from the we lands. Among the sea snakes the beaked sea snake (*Enhydrina schistosus* and the estuarine sea snake (*Hydrophis obseurus*) have firmly established their presence in the brackish waters.

### III. STATUS OF THE WETLAND REPTILES OF INDIA

The threatened reptiles of the Indian wetlands include three species of crocodiles, five species of sea turtles, five species of freshwater turtles and one species of the snakes. Their status as per the IUCN's Red list (1988) is as follows :

#### CROCODILES :

<i>Gavialis gangeticus</i>	Endangered
<i>Crocodylus palustris</i>	Vulnerable
<i>Crocodylus porosus</i>	Endangered

#### TURTLES :

<i>Caretta caretta</i>	Vulnerable
<i>Chelonia mydas</i>	Endangered
<i>Eretmochelys imbricata</i>	Endangered

*Lepidochelys olivacea*  
*Batagur baska*  
*Heosemys silvatica*  
*Kachuga kachuga*  
*Kachuga sylhetensis*  
*Kachuga trivittata*  
*Melanochelys tricarinata*

Endangered  
 Endangered  
 Vulnerable  
 Vulnerable  
 Indeterminate  
 Insufficiently known  
 Insufficiently known

#### SNAKES :

*Python molurus*

Vulnerable

#### IV. CONSERVATION MEASURES TAKEN

##### Crocodiles :

The Government of India's management programme for conserving the Indian Crocodiles was conceived in 1971, and from 1975 onwards several state Governments have followed suit resulting in a fresh lease of life for the giant wetland reptiles. The Nandankanan Biological Park in Orissa continues to be an efficient crocodile management centre. The Madras Crocodile Bank is actively engaged in the captive breeding of the crocodiles.

##### Turtles :

The project to study and conserve the Olive Ridley turtle has yielded results and led to country-wide conservation of the sea turtle nesting grounds of Indian coasts. The state Governments of Madhya Pradesh and Uttar Pradesh have initiated extensive Research programmes for conservation of the freshwater turtles. Of the lizards and snakes, the Water Monitor and the Indian Python were declared as protected species under the Indian Wildlife Act (1972).

#### V. CONSERVATION MEASURES NEEDED

##### Crocodiles :

While the three species of Indian crocodiles have escaped from the brink of extinc-

tion, there is still scope for studies on the breeding biology of these animals. Also there is an acute need for creation of awareness among the public about the ancestry of these reptiles, their role in environment, and the need for conserving them.

##### Turtles :

The lead given by the Government of Madhya Pradesh in sponsoring research on turtle conservation in the River Chambal should be taken up by other States. The status survey of the turtles of India is far from complete. The peninsular rivers such as Godavary, Krishna, and Cauvery have not been explored for their turtle wealth.

##### Snakes :

The present knowledge on the systematics, distribution, ecology and status of the snakes found in the wetlands is meagre. Since a majority of the snakes inhabit the estuaries, they are largely piscivorous and hence the need for further research to assess their role in the wetlands.

#### VI. PUBLISHED WORK

The birds and mammals of the wetlands of India have been accorded some attention but the reptiles of the wetlands are poorly known. Murthy's (1989, 1990) work has focussed our attention on the group. However, a major publication entitled 'Chilka's Fauna', to be issued shortly by the Zoologi-

cal Survey of India, would prove to be a significant database on the fauna of the wetlands of India.

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notes on their habits and distribution. *Brit. Herpetol. Soc. Bull.* 24 : 17-19.

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## SEASONAL AVAILABILITY OF SEA SNAKES (FAMILY : HYDROPHIDAE) IN THE MADRAS WATERS.

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### Introduction

The family Hydrophidae is a highly specialised group of exclusively marine snakes represented by 52 species (Minton, 1975). Distribution of the sea snakes is generally restricted to tropical and subtropical regions of the Indian and Pacific oceans.

Twenty species of sea snakes have been recorded from the west and east coasts of India (Smith, 1943 and Murthy, 1977a). Murthy (1977b) reported ten species belonging to seven genera from the Madras Coast during 1972—77. The present work, January to December '90) was to ascertain the seasonal availability of sea snakes in the Madras area.

### Methods

Specimens washed ashore and those netted by fishermen in the day time between Thiruvanniyur and Thiruvetriyur were

collected from regular fishing points during every month.

### Results and discussion

A list of sea snakes recorded during the study period is given in Table 1. A total of 88 specimens were collected and identified as belonging to 6 species and 5 genera. Out of the six species *Enhydrina schistosa* was most abundant (31 specimens) followed by *Microcephalophis gracilis* (25 specimens). Only one solitary specimen of *Kerilia jerdoni* was observed during the period of study. Availability of sea snakes was highest in June (17) followed by 12 specimens in July.

Murthy (1977b) recorded 10 species out of 50 individuals over a period of 5 years, whereas in the present collection of 88 individuals only 6 species were found. Our study reveals that *Enhydrina schistosa* is most abundant found throughout the year which is in agreement with the findings of

Murthy (1977b). However next in abundance was *Lapemis curtus* according to Murthy (1977b) while it is *Microcephalophis gracilis* in this study. Only 3 specimens of *Lapemis curtus* were caught in this study, *H. fasciatus fasciatus*, *Pelamis platurus* and *Praescutata viperina* collected in earlier surveys have not been encountered in the present study.

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TABLE—I  
SEASONAL AVAILABILITY OF SEA SNAKES—1990

S.No.	Name of species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1.	<i>Microcephalophis gracilis</i>	1	1	1	1	1	2	5	4	3	3	2	1	25
2.	<i>Enhydrina schistosa</i>	2	1	1	4	4	3	4	3	3	2	2	2	31
3.	<i>Hydrophis sparalis</i>	—	1	1	2	2	3	1	1	2	1	1	—	15
4.	<i>Hydrophis cyanocinctus</i>	—	—	—	1	2	5	2	1	1	1	—	—	13
5.	<i>Lapemis curtus</i>	—	—	—	—	—	3	—	—	—	—	—	—	3
6.	<i>Kerilia jerdoni</i>	—	—	—	—	—	1	—	—	—	—	—	—	1
Total of individuals		3	3	3	8	9	17	12	9	9	7	5	3	88
Total species		2	3	3	4	4	6	4	4	4	4	3	2	6

## BOOK REVIEW

### SNAKES OF THE WORLD

(PETER and MYRNA E. WATANABE (1992) *Crescent Books, New York*.  
PP. 176 Pr. Rs. 450/-)

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Most people look upon snakes as among the creations of a lesser god. For them, wildlife means the large mammals and the birds, all to be admired, loved, preserved and protected. Reptiles like snakes, lizards and turtles are hardly worth notice. As for snakes in particular, if they do attract notice, it is only as creatures to be detested, feared and, given half a chance, destroyed. For persons so disposed, this book should be mandatory reading. It will make them truly appreciate this magnificent creature that has been on this planet more than a hundred million years before the first hominid reared up on his hind legs.

Peter Brazaitis was superintendent of herpetology for twenty years at the New York Zoological Park and later became the curator of animals at the New York Zoological Society's Central Park Zoo. His wife and co-author of the book, Myrna E. Watanabe is an ethologist, crocodilian specialist and bio-technologist.

Fear comes from lack of understanding, and this is true of the fear of snakes. Given the habits and habitats of snakes, opportunities rarely come by to most people to see them in their natural environment. Even captive collections of snakes are few. Opportunities are rarer still to study the habits of snakes. So much so, the popular knowledge of snakes is based on myths, legends and grandmother's tales. A book like this, therefore, packed with informa-

tion in a readily assimilable form, replete with superb photographs in colour, provides for study that is at once revealing and fascinating.

The book is divided into seven chapters that together make a comprehensive survey of snakes: Origins and Evolution, Form and Function, Senses, Habits and Behaviour, Habitats and Populations, Venomous Snakes and Snakebites, and Snakes and Humans. This is followed by a gallery of photographs of 58 species, each with details of family, sub-family, common name, scientific name, location and a brief resume of habits and special features. In addition, there are 92 photographs that illustrate the seven chapters.

The appendix lists 66 Zoos in the world with significant snake collections. Of these, the U.S. has as many as 33, followed by six in U.K., five in Canada, four each in Australia and the Republic of South Africa, two each in Switzerland and the erstwhile USSR and one each in Belgium, Brazil, Czechoslovakia, Germany, Hungary, India, Ireland, Japan, Poland and Singapore. The Pune serpentarium is the one listed under India.

While this book tells us how much we know of snakes, it also makes us aware how much more we have to know. Their highly adapted sensory system, for instance, is still not fully understood. There are

significant differences in the structure of the eye among the different species of snakes, depending primarily on their hunting habits. The varying size of the eye, the absence of eyelids, the absence of the fovea centralis in the retina except in two genera of colubrids, the shape of the pupil—either round or elliptical—, good lateral view at the expense of much of forward and binocular vision, the restricted perception of stationary objects, presence or absence of colour vision, absence of tear gland, presence of the Haderian gland—all these are interesting features.

Equally interesting is the snake's sense of smell, how it flicks its tongue back and forth without opening the mouth, through a gap in the lips, and through the tongue transfers scent particles in the air to the paired Jacobson's organ inside its mouth which is a chemo-receptor, a sense organ that responds to chemicals. [A snake may not eat its food if, after being probed by its tongue, the food does not smell right].

Pit vipers, boas and most pythons which hunt at night are capable of detecting warm-blooded animals through special infrared detectors they have on their faces. Pit vipers have loreal pits between the eye and the nostril, while pythons and boas have, on their lips, highly sensitive infra-red receptors which can differentiate between objects that have a temperature difference as little as  $0.2^{\circ}\text{C}$ . We do not know well enough how these receptors function.

The snake's sense of hearing provides an even better example of the acute limitations of our knowledge. Biologists have, for long, asserted that snakes cannot hear sound waves travelling through the air

since they do not have external ears, ear drums, middle ears and Eustachian tubes. We have been told that snakes can hear only vibrations on the ground which are picked up by the substrate via the lower jaw and transmitted to the inner ear which includes the cochlea containing the sound receptors. This book tells us that the quadrate bone that connects the lower jaw to the top of the skull may serve as a receptor for sound waves travelling through the air; the vibration of the quadrate and, perhaps, even the soft tissue around the cochlea would, in turn, cause vibration of the fluid within the cochlea and, hence, stimulation of sound receptors. The authors quote the findings of E. Wever and J. Vernon that some species of colubrid snakes can hear quite well sound waves in the air in the low-frequency range of 0.1 to 0.7 KHZ and that the hissing sound made by snakes in threat displays falls within this range. Therefore, the age-old beliefs about the response of snakes to music may not be all that fanciful even though the cobra swaying its hood to the snake charmer's pipe is a visual response to the movements of the pipe.

It is revelations like these that make us feel truly humble not only because we know so little of the animals with whom we have shared this planet all along but also because we have to accept that some of them have perceptions beyond the range of human senses, whether it is the tiny bee that, through dance movements, conveys a message to other bees on how far and in what direction it has visited nectar and pollen—bearing flowers or the massive elephant that transmits a message to other elephants more than four kilometers away through infra-sonic calls too low in pitch for us to hear.

## NOTES

### INCIDENCE OF CANNIBALISM IN GREEN VINE SNAKE *AHAETULLA NASUTUS*

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Cannibalism is known in rat snake, vipers and krait (Daniel, 1982). On 10th July 1992 we had a chance to observe an adult green vine snake feeding on a new born vine snake (about 1 foot in length) at the Madras Snake Park 8 green vine snakes were kept in a circular cage (5—4—3 mts) and fed at an interval of 8 to 10 days with lizards and toads. While providing food for them on 10-7-1992 an adult green snake of length 1.5 mts. captured a baby vine snake by its head. It took nearly 2 minutes to kill the prey, and 7 minutes to devour it. We report this observation as cannibalism has not been reported in green vine snake which gives birth to live young.

### DORSAL WARTS IDENTIFY INDIVIDUAL COMMON INDIAN TOADS *BUFO MELANOSTICTUS* SCHNEIDER

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The common Indian toad (*Bufo melanostictus*) is the most widespread of Indian amphibians. It ranges from sea level to over 2000 m all over the country. Though it may be found in a wide variety of habitats, it definitely has a preference for human modified landscapes and that makes it apparently more common and abundant in India (Inger and Dutta, 1986; Daniels, 1992).

The common Indian toad is not a very popular amphibian due to its warty skin and the added belief that any contact with the toad causes warts on human skin too. Being a common vertebrate it is much utilized in biology laboratories in schools, col-

leges and by many physiologists in India (eg. Maji *et al*, 1980; Niazi and Niazi, 1990).

The life history of *Bufo melanostictus* in India has been well documented (McCann, 1928). There have been studies on its reproductive biology (Harris, 1952) and diet (Rangaswamy and Channabasavanna, 1973). Nevertheless, there has not been any study on its ecology and behaviour. This species is easily found, can be observed and raised in captivity. Further, it is not a protected species in India.

While closely observing toads within an enclosure for responses to changes in temperature, availability of food and microhabi-

tats, it was noticed that certain toads spend the day and feed at night in certain fixed locations within the enclosure. In order to check whether they were the same animals it was necessary that they had some markers on them for individual identification. Closer observations suggested that the individual toads do differ from one another in the pattern of dorsal warts.

Each *Bufo melanostictus* shows a distinct pattern of black, cornified warts on the dorsal surface. Except in the freshly metamorphosed and toads less than 6 months old, these dorsal warts are typically paired. The first three pairs between the eyes and the paratoid glands are very distinct showing unique patterns (Fig. 1). While examining 25 captive toads at the Madras Crocodile Bank, it was found that each pair can either be of a 'normal' size, exaggerated (bold) or very faint. The two warts in each pair can further be either in level with each other (symmetrical) or not (asymmetrical). Certain warts tend to have a smaller satellite or 'extra' wart beside them. Thus for each pair, it was possible to discern the following four types: normal-symmetrical-extra, normal-symmetrical-none, normal-asymmetrical-extra and normal-asymmetrical-none. Similarly, four types of bold warts and four types of faint warts can be readily recognised. Thus if we recognise 12 patterns for each pair of warts, including the other two pairs, there would be  $12 \times 12 \times 12$  (1728) possible patterns of warts.

The number of possible patterns of warts on toads was checked with the 25 captive

toads. It was found that all just two toads had similar combinations; an eight percent chance of finding two toads with similar dorsal patterns in a small sample. Whether there would be more frequent identical patterns with larger samples remains to be tested. However, it can be said that even if there be, at this stage one can use other clues such as size, colour and the arrangement of other dorsal warts to separate 'tied' toads.

As early as 1956 techniques for marking animals have been discussed. The four basic requirements of marking techniques outlined are 1) they should exert no influence on the survivorship or behaviour of animals, 2) they should not affect the individual's susceptibility to capture, 3) they should identify the animals individually and 4) they should be permanent (Daugherty, 1976). Daugherty discusses the limitations of the conventional marking techniques such as toe-clipping and colour marking. He reports of toe-clipping leading to weight loss in frogs and tags causing considerable irritation to the bearer. However, he recommends freeze-branding as a 'safe' alternative. If all these could be avoided and toads recognised individually by their natural markers, this would be more advantageous. The dorsal warts on *Bufo melanostictus* are excellent markers. Even if there be repetitions in patterns within a population, for manipulative and short-term studies within enclosures or a delimited area, a number of toads with distinct dorsal patterns can be maintained and monitored.

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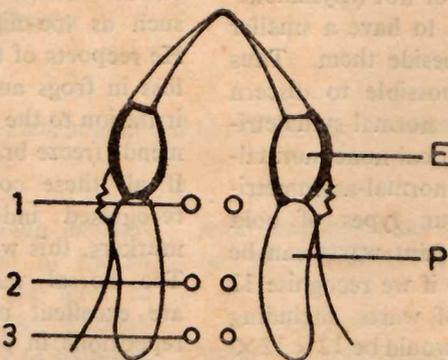


Fig 1 : Head and dorsal anterior half of *Bufo melanostictus* showing a typical set of paired warts. Numbers indicate the different pairs. E—eyes and P—paratoid glands.

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## AIMS AND OBJECTIVES OF THE MADRAS SNAKE PARK TRUST

- i) To maintain and display a captive collection of snakes and other reptiles as a means of education for the public.
- ii) To promote knowledge on snakes and other reptiles and dispel the erroneous beliefs about them.
- iii) To undertake captive breeding of vulnerable species of snakes and other reptiles.
- iv) To aid and assist research in herpetology.
- v) To provide facilities for the identification and classification of snakes and other reptiles and, for this purpose, maintain a museum of study collections.
- vi) To maintain a library of books and other literature on herpetology.
- vii) To publish scientific and semi-scientific literature on snakes and other reptiles.
- viii) To undertake survey on the distribution and status of snakes and other reptiles.
- ix) To provide consultancy services on snakes and other reptiles.
- x) To provide a common forum for amateur herpetologists to interact.