

Cobra

me 27

January - March 1997



Quarterly Newsletter
of the Chennai Snake Park Trust

CHENNAI SNAKE PARK TRUST*

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Cover

Tadpole of the endemic frog *Rana curtipes*

These large tadpoles inhabit hill streams in the Western Ghats moving about in shoals like fish.

Photo : R.J. Ranjit Daniels.

* Consequent on Madras being renamed as CHENNAI, The Madras Snake Park /Madras Snake Park Trust will hereafter be known as Chennai Snake Park/ Chennai Snake Park Trust

A narrow fellow in the grass
Occasionally rides -
You may have met him - did you not
His notice sudden is -

The grass divides as with a comb -
A spotted shaft is seen -
And then it closes at your feet
And opens further on -

He likes a boogy acre
A floor too cool for corn -
Yet when a boy, and barefoot -
I more than once at noon
Have passed, I thought, a whip lash
Unbraiding in the sun
When stooping to secure it
It wrinkled and was gone -

Several of nature's people
I know, and they know me -
I feel for them a transport
Of cordiality -

But never met this fellow
Attended, or alone
Without a tighter breathing
And zero at the bone -

- Emily Dickinson.

Cobra invites articles and short notes on reptiles and amphibians, their ecology, biology, natural history, conservation or other aspects. These may be of scientific or popular interest. Black and white photographs are also welcome.

Please send your contributions to the Editor, **Cobra**, Chennai Snake Park Trust, Rajbhavan Post, Chennai 600 022.

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A Field Guide to the Frogs and Toads of the Western Ghats, India: Part I

R J Ranjit Daniels

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Introduction:

The study of amphibian ecology in India has been considerably hindered by the lack of appropriate identification guides. The available literature is scattered, sometimes outdated, and most of all too technical for use under field conditions. As a result, presently there is little scope for identification of Indian amphibians, with the exception of a few common species, without collecting and bringing them back to the laboratory.

Early attempts in developing a field guide to the amphibians of western India were made by J C Daniel. Although this pioneering work was initiated in the 1960s, it never got completed. The four parts that have been published since then in the Journal of the Bombay Natural History Society have missed out a number of species. Nevertheless, I personally feel that this is by far the first and best effort made in this regard and hence feel compelled to acknowledge this.

Western Ghats have been identified as one of the hotspots of biodiversity in the world. Of the 205 species of amphibians known from India, 120 (60%) occur in the Western Ghats; many being endemic. A few more than 100 of these are anurans (frogs and toads). The rest are caecilians.

Identification:

This guide attempts to describe the adults of 100 species of frogs and toads hitherto known from the Western Ghats in simple terms for easy use both by non-systematists and field workers. Identifying the species without having to kill the frog/toad is the ultimate objective. Hence the description starts by giving relative sizes as small, large, etc. The primary characters used for distinguishing species are external viz., colour, shape, behaviour and call (wherever known). All available information of habitat, range and altitude have also been provided for further help in identifying the species.

The list includes all species of anurans definitely reported from the Western Ghats till present excluding a few species where the appropriate details are not available both with me and the Zoological Survey of India, Madras. These species are *Philautus parkeri*, *Philautus noblei* and *Ranixalus (Rana) gundia*. In certain other species which have been included, there is no available information on live appearance. In such cases the primary distinguishing shape or external structure has been highlighted.

Adult Size:

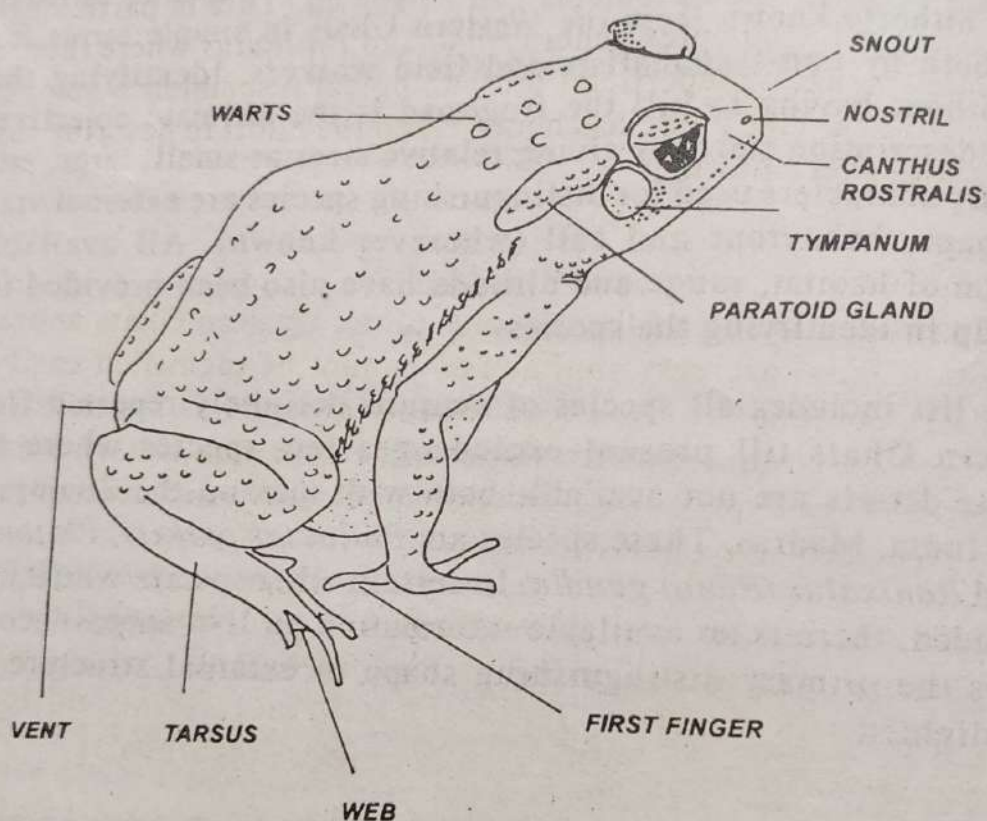
The adult sizes of anurans vary considerably. It is therefore simpler to group the adults by size within a predetermined range and then describe them as small or large relative to the size of the smallest and largest. All sizes mentioned refer to the length of the frog/toad from the tip of the snout to the cloacal end (snout-vent length). Thus the Western Ghats anurans fall into four size classes viz.,

Very small	= less than 2.5 cm
Small	= 2.5 to < 5.0 cm
Medium	= 5.0-8.0 cm
Large	= more than 8.0 cm

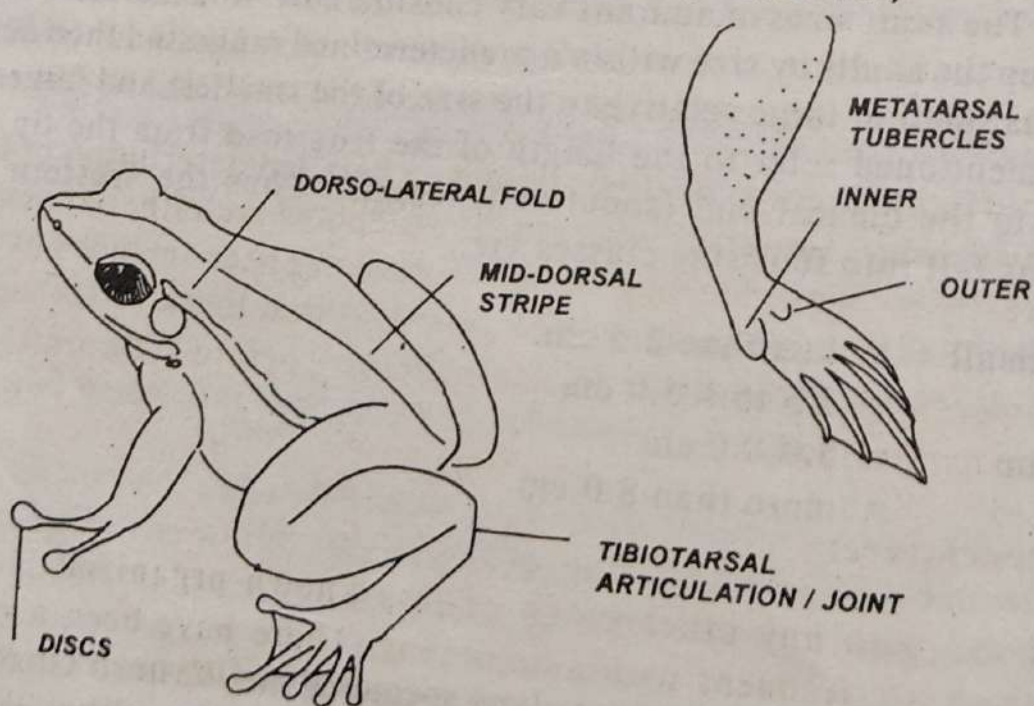
Calls:

Frogs and toads have evolved species specific vocalization. These calls are of primary importance in breeding as most breeding takes place

EXTERNALS OF ADULT ANURANS



HINDLEG OF FROG
(VENTRAL VIEW)



in darkness. Calls are certainly the principal clues that species use in mate choice. In fact, if calls are adequately known and documented, much of our field identification problems can be solved. This is particularly true of species in the complex genera *Rana* and *Philautus* where there is considerable amount of superficial morphological resemblance amongst coexisting species. This guide has hence taken the effort to describe calls of species wherever known.

Tadpoles:

Very little is known of the tadpoles of the Western Ghats anurans. Tadpoles in general are very similar and cannot be identified easily in the field. Anuran tadpoles have been broadly grouped as Types I, II, III and IV based on certain characteristics. The four families of Western Ghats anurans bear Type II and Type IV tadpoles. A brief description of these two types are given below.

Type II Tadpoles - include only a single family viz., Microhylidae. The gills are internal. The opercular chamber is greatly enlarged and bears a single spiracle with a siphon. The spiracle is midventral and located beneath the vent. All microhylids lack keratinous mouthparts.

Type IV Tadpoles - include the majority of anurans. Tadpoles possess a shearing beak and rows of keratinous denticles. Gills are internal. The opercular chamber is deep and provided with a single spiracle with a tubular siphon opening to the exterior. The spiracle is sinistral.

The field guide does not include a detailed description of tadpoles of any species. However, wherever the tadpoles are rather characteristic and easily recognisable, appropriate notes have been included as remarks under the respective species. As a rule, it is best to wait till the tadpoles metamorphose naturally or in the laboratory before the correct identity can be ascertained.

Nomenclature:

As with any other group of less known organisms, taxonomic revisions are frequent with amphibians. There have been a number of changes at the generic and specific levels of the Western Ghats anurans also. I have for convenience (and since most of the detailed descriptions

available of species carry the original generic names) by and large retained the older latin names giving within brackets all synonyms. The genus *Rana* has especially been split into several genera. I have included these revised generic names appropriately, although within parantheses.

Some common anurans have had English names in popular use. However, a majority have had none. I have made an attempt to christen all species appropriately in English by either coining names afresh or borrowing and (sometimes) modifying the existing names as and when necessary.

Acknowledgements:

Besides the early compilations of George A Boulenger and my own field notes on various species of frogs and toads, I have benefited considerably from the works of the following naturalists/herpetologists, whose published and unpublished reports have been of immense value, while preparing this guide.

J C Daniel, R S Pillai, M S Ravichandran, S Thomas Satyamurti, A G Sekar, Humayun Abdulali, Robert Inger, S K Dutta, C R N Rao, Romulus Whitaker, Indraneil Das, Morgan-Davies, Andrew Robertson, W E Duellman and George R Zug.

Keys to Families and Genera of the Western Ghats frogs and toads:

Keys to the families:

1. Skin rough with numerous folds/wrinkles/warts.....2
 Skin smooth and slimy with occasional folds or fine tubercles.....3
2. Slimy skin; body oval and flattened; snout broad and rounded; eyes dorsally placed; limbs short and thick with enlarged finger and toe discs. Tympanum obscure or absent.....*Ranidae*
 Dry skin; head more angled in profile; limbs slender or weak; fingers and toes with or without enlarged discs; eyes lateral and raised above the level of head; bulging parotoid glands present or absent on sides of head. Tympanum distinctly large or reduced; never totally obscure.....*Bufonidae*.

3. Slender; eyes lateral and bulging; very long and thin limbs; toes and fingers with enlarged discs.....*Rhacophoridae*.

Body moderate; stout towards the rear at rest; eyes dorsal or lateral bulged in profile above head; snout conical; limbs muscular, rarely slender; hindlimbs well-developed and long; toes and fingers with or without enlarged discs; toes often fully webbed*Ranidae*.

Body stout; flat and triangular or balloon-like; head small with narrow mouth and short snout; eyes lateral and almost in level with head; tympanum obscure/absent; limbs short and stout; fingers with or without enlarged discs; toes rounded but never with enlarged terminal discs.....*Microhylidae*.

Keys to the genera:

Family *Bufonidae*:

1. Stout; short limbs; belly bulged in profile; small to large adults; fingers and toes without enlarged discs.....*Bufo*.
Slender; limbs longish; adults usually small.....2

2. Fingers and toes with enlarged discs.....*Pedostibes*.
Fingers and toes without enlarged discs; snout short.....*Ansonia*.

Family *Microhylidae*:

1. Very small; adults not exceeding 5 cm snout-vent.....2
Medium; balloon-like; adults exceed 5 cm snout-vent.....3
2. Fingers and not toes, with enlarged discs.....*Ramanella*.
Fingers and toes without enlarged discs.....4
3. Fingers and toes without enlarged discs; blackish-olive with or without yellow marbling on dorsal side*Uperodon*.
Fingers with enlarged discs; brown with reddish dorsal markings.
.....*Kaloula*.

4. Black with red markings on underside.....*Melanobatrachus*.
 Brown with darker markings*Microhyla*.

Family Rhacophoridae:

1. Very small; adults not exceeding 4 cm snout-vent2
 Small to large; adults sometimes exceed 8 cm3
2. Fore arm with lateral extension of skin from shoulder till hand*Rhacophorus*.
 Fore arms without any lateral extension of skin*Philautus*.
3. Fingers scarcely webbed.....*Polypedates*.
 Fingers webbed; sometimes fully*Rhacophorus*.

Family Ranidae:

1. Digits with enlarged terminal discs2
 Digits without enlarged terminal discs3
2. Dorsal skin heavily wrinkled and folded; broad snout; eyes dorsally placed; aquatic and nocturnal; very small, medium or large*Nyctibatrachus*.
 Dorsal skin smooth or with occasional wrinkles or folds4.
3. Adult size very small; not exceeding 2.5 cm.....5.
 Adult size small, medium or large.....*Rana*
 (*Limnonectes*, *Tomopterna*, *Occidozyga*).
4. Adult size very small to small; skin very smooth; snout narrow and pointed; tympanum frequently obscure.....*Micrixalus*.
 Adult size very small to medium.....7.
5. Tympanum distinct*Rana* (*Limnonectes*)
 Tympanum obscure or absent.....6.
6. Skin smooth or occasionally folded.....*Nannobatrachus*.
 Skin wrinkled and folded heavily*Nyctibatrachus*.

7. Small to medium; smooth dorsally; a strong dorso-lateral glandular fold present along entire length of body; if not, toad like habit with thin legs *Rana*.

Very small to medium; smooth and having dorsal folds; somewhat tree frog like build; very agile..... *Rana (Indirana)*.

Family Bufonidae (Toads)

This family includes the true toads. Toads have a worldwide distribution having recently invaded Australia and New Guinea. More than 300 living species have been described hitherto.

Toads are distinguished by their short and robust body with thick glandular skin bearing numerous warts. Most species have well developed parotoid glands. Pupil is horizontal. Adult sizes vary from being small to large. They may be terrestrial or fossorial. Rarely arboreal.

Toads lay eggs in long strings. Development is indirect, in that a typical tadpole/larval stage is included. Tadpoles are described under the Type IV.

Toads of the Western Ghats are in the subfamily Bufoninae except *Ansonia* and *Pedostibes* which belong to the subfamily Adenonominae. The latter are mostly streamside, forest toads, being occasionally arboreal.

Bufo beddomii

Beddome's Toad

Adult Size: Small.

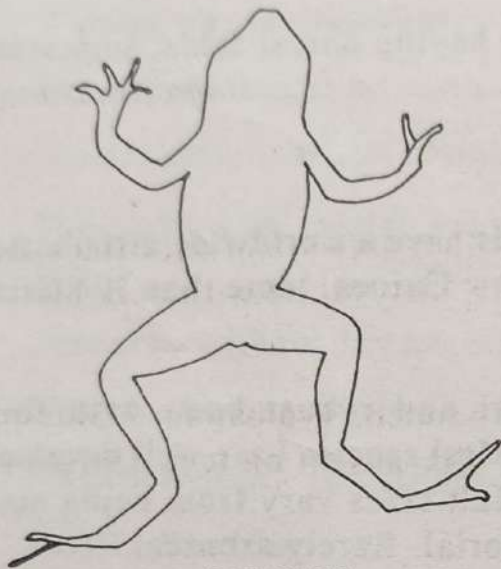
Description of Adult: Brown above with faint black spots. Limbs marbled with carmine (red). Ventrally, marbled brown.

Tympanum indistinct. Toes fully webbed. First finger equal to or shorter than second. Dorsally covered with sharp conical warts especially on head and eyelids. Parotoids are warty with indented margins.

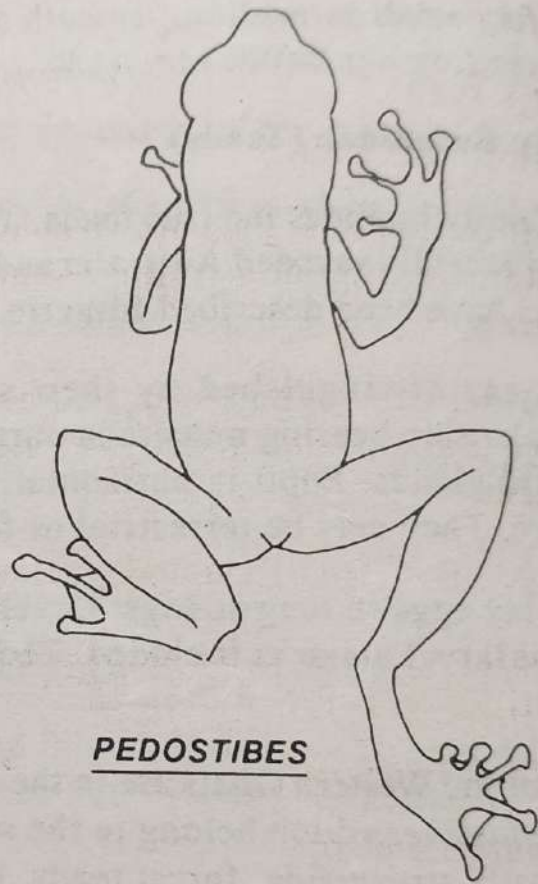
Habitat: Dense forests: evergreen and gallery. Away from water.

Range: Endemic. South Kerala and Maharashtra.

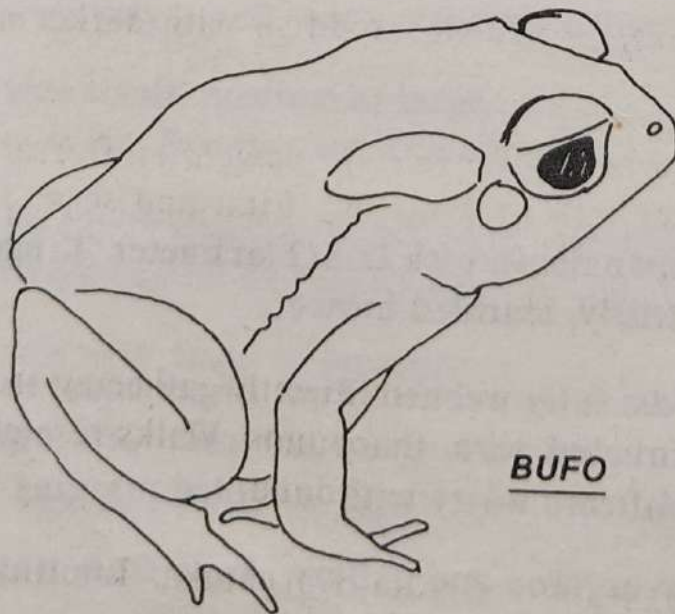
TYPICAL ANURAN ADULT FORMS



ANSONIA



PEDOSTIBES



BUFO

Altitude: 300-1500 m ASL.

Bufo brevirostris

Rao's Toad

Adult Size: Small.

Adult Description: Pale brown above with a network of dark lines. Sides lighter with similar marbling. Ventrally, dirty white with dark blotches. Under surfaces of thighs white.

Head flat without bony ridges. Snout rounded. Tympanum $\frac{2}{3}$ diameter of eye. Parotoids long and prominent. Web absent on toes. Dorsal warts present.

Range: Endemic. Kempholey (Hassan District of Karnataka).

Remarks: This species is based on a single specimen collected and described by C R N Rao in 1937.

Bufo fergusonii

Ferguson's Toad

Adult Size: Small.

Description of Adult: Olive brown - reddish with darker markings on legs.

Overall appearance rather similar to *Bufo parietalis*. Dorsal skin rough. Cranial ridges however less pronounced. First and second fingers are equal in length. Tympanum less than $\frac{1}{2}$ diameter of eye. Parotoids rounded. Toes with little webbing.

Habits: Nocturnal. Feeds on termites, frequently gathering around mounds at time of swarming. Inhabits termite mounds. Walks resembling garden lizards with the body lifted above the ground.

Habitat: Coastal scrub. Range: Kerala, Karnataka, Tamilnadu (Madras) and Orissa. Srilanka.



MICRIXALUS



NYCTIBATRACHUS



OCCIDOZYGA



TOMOPTERNA



RANA

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Bufo hololius

Small Toad

Adult Size: Small.

Description of Adult: Olive brown - grey marbled with brown - red. Ventrally pure white.

Skin smooth. Head without bony ridges. Parotoids flat smooth and reniform. Tympanum as large as eye. First finger slightly longer than second.

Habitat: Scrub jungle-deciduous forests.

Range: Kerala. Chittoor district and Nellore (Andhra Pradesh)

Remarks: The species possibly also occurs in Bangalore.

***Bufo koynayensis* (=sulphureus)**

Yellow or Koyna Toad

Adult Size: Small.

Description of Adult: Uniform dark brown above occasionally with traces of dull chrome-yellow. Bright chrome-yellow patches along the flanks, sides of thighs and shoulders. Lips and ventral surfaces cream. Small irregular spots on throat (occasional). Tubercles sometimes white.

Resembles *B. brevirostris*. Tympanum smaller (less than 1/4 diameter of eye). Parotoids indistinct. Body covered with small black tipped warts. First finger slightly longer than second. Toes with rudimentary web.

Range: Endemic. Koyna (Satara district, Maharashtra).

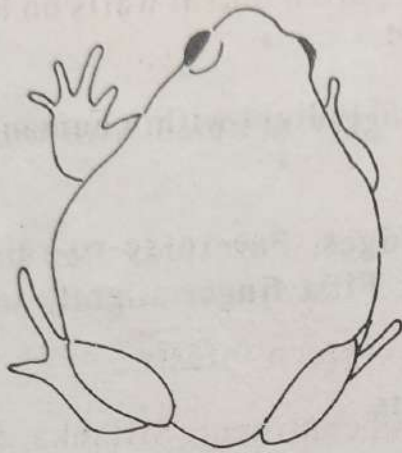
Altitude: About 1200 m ASL.

Bufo melanostictus

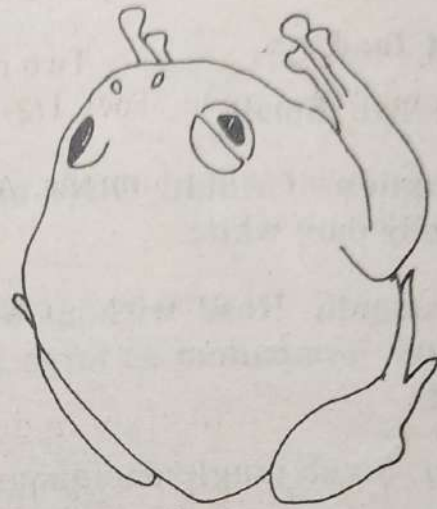
Common Indian Toad

Adult Size: Medium to large.

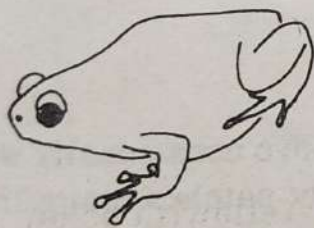
Description of Adult: Yellow to olive brown, red or black. Marbled or plain. White-grey below with fine marblings. Throat in mature males



UPERODON



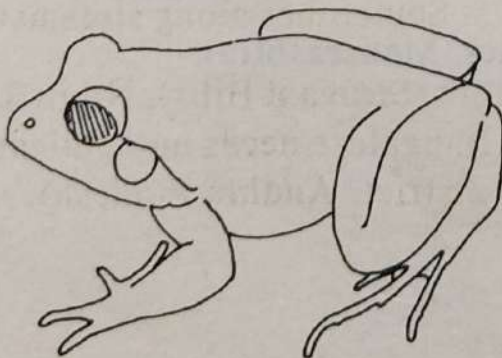
KALOULA



RAMANELLA



MICROHYLA



LIMNONECTES



INDIRANA

yellow-orange. Cornified parts black or tipped black.

Tympanum as large as eye. Two rows of paired dorsal warts on hind neck considerably enlarged. Toes 1/2 webbed.

Habits: Commensal of humans. Attracted to light within human environs and on roadsides.

Call: Typical drumming: 'creo-o-o'; 'cro-ro-ro-ro-ro-ro'. Rather monotonous.

Habitat: Urban. Cultivation to dense evergreen forests.

Range: Entire Western Ghats. Indian Subcontinent. Srilanka. Southeast Asia. China, Philippines.

Altitude: Sea level to the highest hills (upto over 2000 m ASL in the Western Ghats).

Bufo microtympanum

Southern Hill Toad

Adult Size: Medium.

Description of Adult: Dark olive grey-brown. Yellowish below, marbled with brown.

Rather similar to *B. melanostictus*. Distinguished primarily by the very small tympanum which is less than 1/2 diameter of eye and fully webbed toes.

Habitat: Evergreen and secondary forests. Sometimes along streamsides.

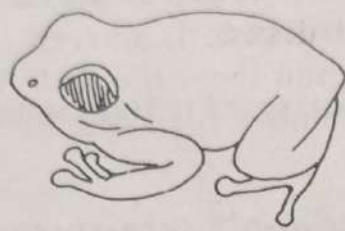
Range: Kanyakumari district to Coimbatore (Siruvani Hills), Nilgiris and Palanis, through Kerala. Occurrence in Bangalore needs authentication. Reported from Horseley Hills (Chittoor district, Andhra Pradesh).

Bufo parietalis

Ridged Toad

Adult Size: Medium to large.

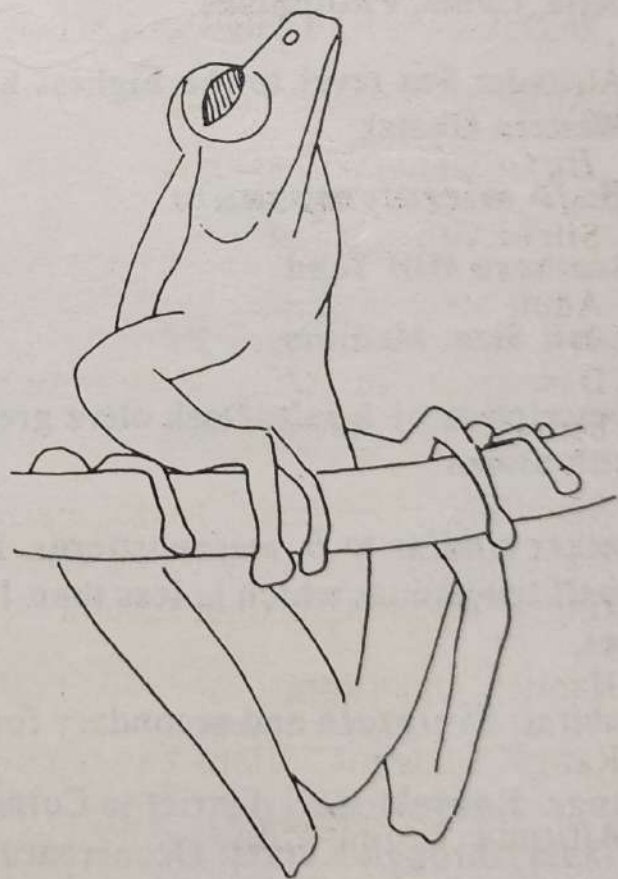
Description of Adult: Yellowish marbled with brown or red. Limbs



PHILAUTUS



RHACOPHORUS



POLYPEDATES

distinctly cross-barred. A dark line extending from behind the eye and along the lateral edge of the parotoid gland.

Cranial ridges prominent and distinctly curved inwards enclosing a smooth pear-shaped concave region above the neck. Dorsal warts distinct. Toes 1/2 webbed. Tympanum smaller than eye. First finger longer than second.

Call: Typical drumming. 'To-to-to-to-to...'. In chorus along streams.

Habitat: Evergreen forests, deciduous and secondary forests. Along foot paths and stream beds.

Range: Endemic. Kanyakumari through Kerala (common in Silent Valley) to Dakshina Kannada (Karnataka).

Altitude: 200-1000 m ASL.

Bufo silentvalleyensis

Silent Valley Toad

Adult Size: Medium.

Description of Adult: Grey-brown with little markings dorsally. Dark below with fine marbling.

Smooth skin. Slender limbs. Parietal ridges directed inwards as in *B. parietalis*. Little webbing on feet. Tympanum 1/2 diameter of eye. First finger little longer than second.

Habitat: Open forest.

Range: Endemic. Silent Valley (Kerala).

Altitude: 800 m ASL.

Bufo stomaticus

Marbled Toad

Adult Size: Medium.

Description of Adult: Yellow-olive brown with or without bold marblings. Upper lip and underparts white.

Skin smoother than *B. melanostictus*. Parotoid glands not cornified. Tympanum about as large as the eye.

Habits: A rather docile toad capable of burrowing into soil.

Call: Described as 'higher pitched and shriller' than *B. melanostictus*.

Habitat: Urban to forests.

Range: Northern Western Ghats. Indian subcontinent. Srilanka.

Pedostibes tuberculosus

Malabar Tree Toad

Adult Size: Small.

Description of Adult: Brownish grey with darker sides. Dorsally marbled paler. A white band from below the eye to the shoulders. A second white band along the flanks. Whitish below, spotted with black.

Slender. Dilated finger and toe discs as in treefrogs. Tympanum distinct; 1/3 diameter of eye. Parotoid glands prominent. Dorsal warts enlarged and thickened into 2 rows along the sides.

Habits: At least partially arboreal.

Habitat: Evergreen to moist deciduous forests. Along streams.

Range. Endemic. Patchily over entire Western Ghats. Kerala and Maharashtra.

Altitude: 250-300 m ASL.

Ansonia kamblei

Maharashtra Torrent Toad

Adult Size: Very small.

Description of Adult: Dark grey above dotted with small black tubercles. Reddish brown oval patch between eyes. Limbs faintly cross-barred. Pale yellowish ventrally. Throat speckled with a median reddish brown area. Rest of under parts mottled with brown.

Tympanum indistinct. Toes 1/2 webbed. Skin covered with small blackish

tubercles dorsally.

Range: Endemic. Karnala (Sholapur, Maharashtra).

Ansonia ornata

Malabar or Black Torrent Toad

Adult Size: Small.

Description of Adult: Black. Underparts with bright yellow-orange blotches.

Cranial ridges and parotoid glands absent. Tympanum $1/2$ diameter of eye. Toes fully webbed.

Habits: Rests motionless and well camouflaged on rocks beside streams. Occasionally on litter. Active during the rains (October).

Habitat: Evergreen and secondary forests in humid and wet zones. Perinneal streams.

Range: Endemic. Brahmagiri Hills in Kodagu district and Neria in Dakshina Kannada district (Karnataka).

Altitude: 600-700 m ASL.

Remarks: Tadpoles are black and stocky with well developed sucker-like mouth. They cling to rocks in torrential water and are capable of scaling slimy rocks.

Ansonia rubigina

Red Torrent Toad

Adult Size: Small.

Description of Adult: Brick red. Brownish below with large orange vermiform markings on throat, belly and underside of thighs.

Cranial ridges and parotoid glands absent. Dorsally tuberculated all over. Digits with swollen (not enlarged) tips. Feet almost fully webbed. Tympanum distinct; $1/2$ diameter of eye.

Habitat: Forest streams. Evergreen forests.

Range: Endemic. Silent Valley (Kerala).

Altitude: 1000 m.

Family Microhylidae (Narrow-mouthed Frogs)

The family Microhylidae has a worldwide distribution although with a tropical orientation. About 280 living species have been described in this family.

Microhylids are very small to medium with stout build and short sturdy limbs. Head is relatively small and pointed. Some species have enlarged discs on digits as in treefrogs. The skin is usually smooth; occasionally warty. Tadpoles are grouped under Type II.

All genera in the Western Ghats except *Melanobatrachus* (Melanobatrachinae) are in the subfamily Microhylinae. These are generally fossorial to arboreal. Development is indirect.

Ramanella anamalaiensis

Anamalai Narrow-mouthed Frog

Adult Size: Small.

Description of Adult: Bright olive above with a broad mid-dorsal stripe from between eyes to the groin where it breaks into irregular markings. A squarish black mark between eyes and a black spot on the upper surface of each eyelid. Sides and limbs reddish brown. Pale brown below with a few white spots.

Upper surface of skin warty. Tips of fingers not enlarged but truncated. Toes not webbed.

Range: Endemic. Base of Anamalai Hills (Tamilnadu).

Ramanella minor

Small Narrow-mouthed Frog

Adult Size: Very small.

Description of Adult: Upper surface of snout olive with a short and dark median band reaching the space between the eyes. A dark spot between

eyes on the upper surface. A dark broad band on back bordered by olive lines. Limbs entirely black. Ventrally black. Abdomen and thighs with whitish spots.

Fingers with well developed discs. Toes without webbing.

Range: Endemic. Sakleshpur (Karnataka).

Ramanella montana

Jerdon's Narrow-mouthed Frog

Adult Size: Small.

Description of Adult: Brown with or without darker spots. Blackish below with white spots or blotches. Limbs cross-barred.

Fingers with enlarged discs. Toes webbed (more extensive in males than females).

Habits: Arboreal. Sometimes inhabiting hollows on tree trunks.

Call: Loud and deeper in tone than *K. pulchra*. 'Brong..brong'.

Habitat: Secondary to dense forests and suburbs (Bombay).

Range: Entire Western Ghats. Srilanka.

Ramanella marmorata

Rainbow Narrow-mouthed Frog

Adult Size: Small.

Description of Adult: Olive to bright reddish brown above. A dark band between eyes. Snout with a triangular or 'V' mark. Dark angular shoulder band. Light yellow to deep olive green limbs. Under parts yellow and red in males. Dark blue and moss green in females.

Fingers with wide triangular discs.

Habits: Observed singly or in small groups between folds of banana leaves.

Habitat: Secondary forests and plantations.

Range: Endemic. Sakleshpur (Karnataka).

Ramanella triangularis

Malabar Narrow-mouthed Frog

Adult Size: Small.

Description of Adult: Dorsally consisting of a lateral streak with a central patch breaking into stripes at the loins at right angles to the length of the frog. A triangular patch encloses the anus. Limbs barred. Ventrally brown spotted with white. A triangular spot between forelegs.

Toes free with vestiges of webbing. Finger tips barely dilated.

Habitat: In home gardens and forests. Under logs and stones and within whorls of leaves.

Range: Endemic. South Western Ghats (Karnataka, Kerala and Tamilnadu).

Altitude: 300 to over 2000 m ASL.

Remarks: C R N Rao has described a subspecies *Ramanella t. rufiventris* from Hassan (Karnataka). This form varies from the type in having red barred limbs and a dark band between eyes. In life the underparts are bright red.

Ramanella variegata

Marbled Narrow-mouthed Frog

Adult Size: Small.

Description of Adult: Olive with black markings. Black markings often coalesce rendering the back almost uniformly dark. White below marbled darker.

Fingers with enlarged discs. Rudimentary webbing on toes. Hind legs with a distinct metatarsal tubercle.

Habits: A commensal of humans to some extent taking shelter in bathrooms. Slow moving given to climbing even glass surfaces. Ascends tall coconut palms and stays within the fronds.

Call: A loud and incessant 'quay-quay-quay...' Soon after the first rains.

Habitat: Urban to open forests and cultivation. Chiefly in the plains.
Range: Tamilnadu and Karnataka. Peninsular India as north as Madhya Pradesh, Orissa and West Bengal. Srilanka.

Altitude: Up to about 1000 m ASL.

Melanobatrachus indicus

Black Narrow-mouthed Frog

Adult Size: Small.

Description of Adult: Black. Thighs with a continuous or interrupted 1/4" broad scarlet band near groin. A few scarlet blotches on breast between forelegs and occasionally on lower sides of hind legs.
Skin on dorsal surface rough.

Habitat: Moist evergreen forests.

Range: Endemic. Hills of Kerala (Anamalais).

Altitude: 1200 m ASL.

Remarks: There has not been any report of this species ever since its first description in 1878.

Microhyla ornata

Ornate Narrow-mouthed Frog

Adult Size: Very small to small.

Description of Adult: Golden to earth brown with darker symmetrical markings on back (frequently arrow-shaped). Legs cross-barred. White below. Throat black in breeding males.

Narrow head and broader trunk characteristic. Fingers and toes without dilated tips. Toes without web. Metatarsal tubercles very small.

Habits: Active. Leaps powerfully and high for its size.

Call: A shrill long drawn 'breep' resembling a finger nail being drawn across a plastic comb. Often in loud choruses after the first rains. Sometimes during overcast days on forest floor from under logs and stones.

Habitat: Urban. Agriculture. Deciduous to evergreen forests.

Range: Entire Western Ghats. Indian subcontinent. Southeast Asia, Srilanka and China.

Altitude: Up to over 1000 m ASL.

Remarks: Tadpoles are transparent and fish-like. Golden dot (visible from above) on midbody characteristic.

Microhyla rubra

Red Narrow-mouthed Frog

Adult Size: Small.

Description of Adult: Reddish brown. Normally without black markings on the back. A black band extending along the sides over the groin and thighs. White below. Breeding males with a dark throat.

Toes 1/3 webbed. Metatarsal tubercle shovel-shaped and prominent.

Habits: More given to burrowing.

Call: A loud and low pitched 'croak'. Rather drawn and paused.

Habitat: Urban. Agriculture. Open forest and scrub.

Range: Entire Western Ghats. Widespread in the Subcontinent and Srilanka.

Altitude: Up to 2000 m ASL (Nilgiris).

Uperodon globulosus

Greater Balloon Frog

Adult Size: Medium.

Description of Adult: Uniformly grey above with whitish-yellow underparts. Black throat in males.

Heavy built. Smooth skin and soft rather limp body. Tympanum concealed. Very large external vocal sacs. Small head with beady eyes. Hind legs with large shovel-like metatarsal tubercle. Legs weak. Fingers and toes without enlarged tips.

Habits: Excellent burrower.

Call: Described as a loud grunt, 'Oink'.

Habitat: Open forest.

Range: Northern Western Ghats (Karnataka-Maharashtra). Gujarat, Orissa, Madhya Pradesh and West Bengal.

Uperodon systoma

Lesser or Marbled Balloon Frog

Adult Size: Medium.

Description of Adult: Olive green-yellow with black marblings. White below. Black throat in breeding males.

Smaller size and distinctly marbled colour pattern separate from *U. globulosus*. Metatarsal tubercles less developed.

Habits: Sluggish. Burrowing. Feeds more or less entirely on winged termites.

Habitat: Scrub, cultivation and deciduous forests.

Range: Kerala, Tamilnadu and Karnataka. Throughout India.

Altitude: Up to 1000 m ASL.

Remarks: This frog is also referred to as the 'funny looking frog'.

Kaloula pulchra taprobanica

Indian Painted Frog

Adult Size: Medium.

Description of Adult: Bright red to flesh-pink with brown, black and white blotches (often symmetrical) on back. Grey below finely freckled. Throat black in breeding males. Limbs occasionally black. Smaller than balloon frogs. Finger tips dilated into large discs. Vocal sac large and extendable.

Habits: Given to both burrowing and climbing. Lives in burrows, tree hollows and between fronds on coconut palms. Backs itself down tree trunks much like treefrogs. Floats in water with vocal sac distended while

calling.

Call: A loud 'brong..brong'. Rather incessantly heard after the first rains. From a distance sounds like slow and deliberate grating of coconut.

Habitat: Urban-open forests.

Range: Karnataka and Tamilnadu (eastern parts). All India. Srilanka.

Altitude: Up to 900 m ASL.

Remarks: Tadpoles are small and active. Bottom dwelling in rain water pools. Development is rapid.

(To be continued)

Impact of Vehicular Traffic on Snakes in Mudumalai Wildlife Sanctuary

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Snakes are thigmotherms and tend to take rest or sit on warm road sides (Sullivan, 1981). As they cross or use the road, they are easily injured or killed by vehicular traffic. Such mortality of snakes in a Sanctuary or National Park will have more impact on rare snakes rather than in unprotected areas. The negative effects of roadways on fauna have been considerably documented in Western countries (Edwards & Slater 1981 ; Brown & Brown 1986 and Korhonen & Norminen 1987). However, few such studies are available in India. An attempt was made in Mudumalai Wildlife Sanctuary to highlight the effect of vehicular traffic on snakes from November 1995 to April 1996.

The Mudumalai Wildlife Sanctuary, located between 11°30' & 11°39' N and 76°27' & 76°43' E, in the Nilgiri District of Tamil Nadu, mainly known for its large mammals, also harbours about 14 snake species (personal observation). The Sanctuary is a part of the Western Ghats and has an undulating terrain with low lying areas. It is drained mainly by the Moyar river with its several tributaries of smaller rivers and streams. The Southwest and Northeast monsoons provide about 600 to 2000 mm rain, at an increasing gradient from east to west of the Sanctuary. The Sanctuary is hence endowed with diverse habitats, rich in fauna and flora. The major vegetation types are thorn forests, dry deciduous and moist deciduous forests.

The Ooty-Mysore highway intersects this Sanctuary and runs along the Moyar river. About 50 to 270 heavy vehicles are using this road daily and it may increase considerably during the tourist season. The type of vegetation present on either side of the roads is dry deciduous.

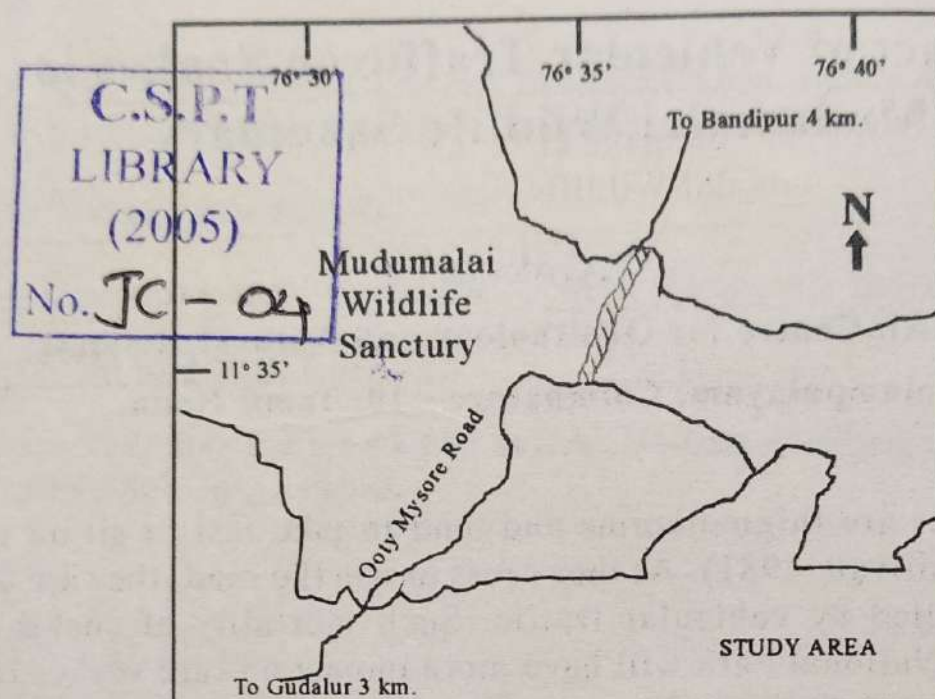


Figure 1. Study area in Mudumalai Wildlife Sanctuary

A 4 km transect was marked in the Ooty-Mysore highway (Fig. 1) within Mudumalai Wildlife Sanctuary. This transect was searched for road kills during 0600 - 0800 hours and 1600 - 1800 hours in the same day. The kills were removed after identification to avoid repetition. All the kills found in the morning survey were assumed to have been killed in the previous night and evening records as killed during the day. Daniel (1983) was used for identifying snakes.

In total, 23 morning and 23 evening surveys were made (23 days survey). During the survey 23 individuals of seven species were found killed on the road (Table 1). The common green vine snake was found killed more ($n=10$) and was followed by the Russell's viper ($n=4$). Except the kukri snake ($n=2$), only one individual was recorded for the rest of the four species. Among the species, the common green vine snake seems to be very prone to roadside mortality wherever it occurs (personal observation). Only studies on the biology of this species would provide reason for the same.

Table 1. Number of snake kills recorded in Mudumalai Wildlife Sanctuary

Species	No. of Road kills		
	Night	Day	Total
Snakes			
Indian python (<i>Python molurus</i>)	1	0	1
Common kukri snake (<i>Oligodon arnensis</i>)	2	0	2
Common wolf snake (<i>Lycodon aulicus</i>)	1	0	1
Common Indian krait (<i>Bungarus caeruleus</i>)	0	1	1
Indian cobra (<i>Naja naja</i>)	1	0	1
Russell's viper (<i>Vipera russelli</i>)	1	4	5
Common green vine snake (<i>Ahaetulla nasutus</i>)	2	10	12
Number of species	6	3	7
Number of individuals	8	15	23

Table 2. Rate of roadside mortality of snakes (n/day for 4 km)
in Mudumalai Wildlife Sanctuary

Species	Road kill rate (n/days surveyed)
Snakes	
Indian python (<i>Python molurus</i>)	0.043
Common kukri snake (<i>Oligodon arnensis</i>)	0.087
Common wolf snake (<i>Lycodon aulicus</i>)	0.043
Common Indian krait (<i>Bungarus caeruleus</i>)	0.043
Indian cobra (<i>Naja naja</i>)	0.043
Russell's viper (<i>Vipera russelli</i>)	0.217
Common green vine snake (<i>Ahaetulla nasutus</i>)	0.522
Total	1.000
Number of days surveyed	23

n = number of snakes

Even though the number of individuals killed was more in day hours, number of species killed was more in night hours. As the activity differs among species, concluding generally whether the snakes were killed more in the night or day is difficult. The python (*Python molurus*) an endangered snake, was also found killed during the study period and it shows the seriousness of this issue.

It is estimated that the road mortality in snakes was one snake / 4 km for 24 hours during the study period (Table 2) and it depends on the intensity of traffic and seasonal changes in snake activity pattern.

Even though there is a speed limit inside the Sanctuary, severe violation can be observed during the peak tourist season. People who accidentally kill animals, are normally fined by the Forest Department. The local people are the informants to the Forest Department, but they too ignore when snakes get killed. It obviously shows the lack of awareness about the importance of the snakes amongst the public. Highway mortality, as traffic increases, will therefore have serious impact on snake populations.

Acknowledgement :

I thank Dr. Justus Joshua, Dr. S.Bhupathy and Mr. P.Kannan for their critical comments and help.

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Additions to the Reptile Fauna of Silent Valley, Kerala

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Silent Valley National Park is situated in Palghat District of Kerala (between lat. $11^{\circ} 4'$ to $11^{\circ} 14'$ N and long. $76^{\circ} 24'$ to $76^{\circ} 29'$ E). The Park is predominantly of tropical wet evergreen forests with subtropical broad leaved hill forests, montane wet temperate forests and grasslands.

Silent Valley is considered to be very rich in fauna. Murthy (1981 & 86) listed 24 species of reptiles from the area. These included 3 Gekkonids, 5 Agamids, 4 Scincids, 1 Uropeltid, 8 Colubrids, 1 Elapid and 2 Viperids. A survey was conducted in the area during 1994 to 1996 as a part of the research project on reptiles in Nilgiri Biosphere Reserve funded by the Ministry of Environment and Forests. 11 species which have not been recorded so far from the park were collected during the survey and are deposited in Kerala Forest Research Institute (Table 1). The Fauna Volumes of Smith (1935 & 1943) were referred for identification.

Salea horsfieldi and *Ahaetulla perroteti* were obtained from Sispara area in the higher reaches. *Ahaetulla perroteti*, *Salea horsfieldi*, *Calotes rouxi* and *Callophis nigriscens* are endemic to Western Ghats. The present observations add 11 more species to the reptile fauna of Silent Valley National Park making a total of 35.

Table 1. List of reptiles recently collected from Silent valley

Species	Collection Locality	Habitat	Microhabitat
<i>Cnemaspis kandiana</i> (Kelaart)	Chembotti	EVGF*	Bark of live & dead trees
<i>Hemidactylus brookii</i> (Gray)	Sirendri	GLND*	Abandoned building
<i>Calotes rouxi</i> (Dum & Bib)	Poochipara	EVGF	Live trees
<i>Salea horsfieldi</i> (Gray)	Sispara	SHOLA	Bush
<i>Mabuya macularia</i> (Blyth)	Sirendri	EVGF	Leaf litter
<i>Scincella beddomei</i> (Boulenger)	Nellikkal	EVGF	Under boulder
<i>Varanus bengalensis</i> (Daudin)	Nellikkal	EVGF	On the ground
<i>Uropeltis phipsoni</i> (Mason)	Parathodu	EVGF with reeds	Loose soil
<i>Ahaetulla perroteti</i> (Dum & Bib)	Sispara	GLND	Grassland
<i>Oligodon taeniolatus</i> (Wall)	Sispara	EVGF	Treck path
<i>Callophis nigriscens</i> (Guenther)	Sirendri	EVGF with reeds	Treck path

EVGF* - Evergreen forests

GLND* - Grassland

Reference :

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The turtle lives twixt plated decks
which practically conceal its sex.
I think it clever of the turtle
In such a fix to be so fertile.

- Ogden Nash.

An Occurrence of Strange Feeding in *Rana hexadactyla*

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On 2/1/97 (7.0 am) I was accompanying a mixed group of Indian and American students engaged in a study on "Ecology of the Indian Tropics" to the Centre for Advanced Studies in Marine Biology at Parangipettai.

We stopped near the railway crossing (tidal zone) to have a look at a shrimp farm. One of our team members showed us a large frog in a small stream close to the road. The frog had something in its mouth. We decided to investigate further. We went close, the frog was already dead and it was having a large fish in its mouth (only the posterior half visible). We took out the frog from the water and a closer examination revealed that the frog had swallowed a large catfish (*Arius* species).

The question as to whether fish forms a regular diet of the frog is not known to me; we felt that probably the frog must have taken the fish head first then found it unable to swallow since the fins must have started to hurt its throat and both must have died out of choking.

Preliminary Survey of the Forest Calotes (*Calotes rouxi*) in Mudumalai Wildlife Sanctuary, Tamil Nadu

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The Western Ghats are amongst the richest in biological species and remarkable for their endemic species. Of 285 species of vertebrates endemic to the Western Ghats, 60 species are reptiles (Daniels 1993).

Forest Calotes (*Calotes rouxi*) endemic to the Western Ghats is widely distributed over the entire range (Daniel 1983 ; Daniels unpublished). Considering the wide range of distribution of the species, information available on the ecology of *Calotes rouxi* is insignificant. In order to get information on the ecology of forest calotes in Western Ghats in India, the present survey was carried out at the Mudumalai Wildlife Sanctuary.

Mudumalai Wildlife Sanctuary is situated at the westernmost part of Tamil Nadu in the Nilgiri District, covering an area of 321 Sq. km. The Sanctuary is located between 11° 32' to 11° 43' N and 76° 22' to 76° 45' E at an average elevation of 1000 m above sea level. The Sanctuary is surrounded by Bandipur National Park (Karnataka) on the northern side and by Wynaad (Kerala) on the northwestern side. Vast stretches of private forests and cultivated private lands lie south of the Sanctuary. The major forest types identified in the Sanctuary are tropical moist deciduous, dry deciduous forests and thorn forests.

Dry deciduous and thorn forest area of the Sanctuary were surveyed between May 10 - 25, 1991, covering an area of approximately

6 Sq. km. Surveys were carried out by foot between 0730 - 1200 hours and 1500 - 1800 hours. Whenever an animal was sighted, time, habitat type and details on behaviour were recorded.

Of the area surveyed, forest calotes was recorded in Singara slopes where vegetation type is dry deciduous with patches of riverine areas, Circular Road also with dry deciduous forest, Sirur in Sigur Plateau which is characterized by rocky ravines in a scrub jungle (altitude about 950 m) Game Hut Road that runs through a patch of moist and dry deciduous forest mix and Masinagudi where it is scrub jungle along the Moyar river. In all 18 sightings were made; 2 in Singara slopes, 3 in Circular Road, 7 in Sirur, 2 in Game Hut road and 4 in Masinagudi. Most of the animals (11 nos.) were seen basking on rocks under shade or moving in the forested areas. According to Daniel (1983) this lizard is an arboreal species. In all, the encounter rate was highest in Sigur plateau. This rocky ravine area near Masinagudi is inhabited by species such as cicada, monitor lizards, hoofstock, large carnivore and scavengers. In summary the forest calotes in the Sanctuary has the highest density within the dry deciduous forest and scrub jungle.

Acknowledgment :

I thank the staff of Tamil Nadu Forest Department and field assistants Morgan and Maadan for their support during the survey.

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Of Garden Lizards and Jungle Crows

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The Garden lizard (*Calotes versicolor*) is one of the most common and widespread lizards in India. This lizard occupies almost all types of habitat. Generally these lizards are preyed on by snakes and birds of prey. However observations on such predations are very rare. An interaction between jungle crow (*Corvus macrorhynchus*) and garden lizard (*Calotes versicolor*) was noticed twice in the Chennai Snake Park.

On 14.09.95, the first incident was noticed around 10.30 am in the Snake Park. Monitor lizards are kept in a big circular enclosure with a small partition where a few trees are also present. Accidentally one male garden lizard entered into one of these enclosures. Two jungle crows noticed the presence of the lizard. One of the crows suddenly came down and caught the lizard by the tail and flew. The victim turned around and bit the leg of the crow, and the crow loosened its grip. Ultimately the lizard fell down in the pit and went into a water trough. The crows were sitting near the water trough till 11.30 am. During this hour the head of the lizard was seen just above the water level. The crows could not succeed in getting their prey.

The second incident was noticed on 03.12.96 at 10.00 am. A male garden lizard was moving on the ground. Two jungle crows were perched on the barricade and tried to pick up the lizard. One crow came down and approached the lizard and tried to catch the tail. The lizard was trying to attack and turned its head facing the crow but never attempted to escape from the crows. This prolonged for about 2 hours. Later the crows, disturbed by passing humans, flew away from the spot. The lizard moved into the trees.

Random Harvest

To Each According to its Need.

Does a venomous snake have a way of regulating the quantum of venom injected into its prey relative to the size of the prey since a larger prey needs more venom to kill or immobilise it and injecting more venom than necessary into a smaller prey will be a waste? The November 26th 1996 issue of *Notes from NOAH*, the Journal of Northern Ohio Association of Herpetologists gives an account of a series of research papers on this published by Dr. William Hayes of the Biology department, Southern College, Collegedale, Tennessee, U.S. and his colleagues over the last few years.

The research which was conducted on rattlesnakes and mice established a definite correlation between the size of the prey and the amount of venom expended by the snake. Frame-by-frame analysis of the videotapes taken showed that the quantum of venom injected was not dependent on the duration of the bite. The research pointed to a possibility that the snakes have some way of "metering" the amount of venom injected in accordance with the size of the prey. The snakes may use their visual as well as their infrared receptors to determine prey size and consequently, the amount of venom released during a strike.

You Be The Judge!

A case of senseless and mass destruction of a protected species is reported in the October 31st 1996 issue of *Notes from NOAH*. According to CITES, a country which receives an illegal shipment of protected animals must (i) try to return them to the country of origin or (ii) try to find homes for the animals if they cannot be repatriated or (iii) humanely euthanize them if the first two options are not available. One thousand Russian tortoises (protected by CITES), illegally imported into Sweden, were confiscated by the Swedish authorities. SAS Cargo offered to fly the tortoises back to Moscow at no cost with support of WWF and the Tortoise Trust. Offers were also made to find homes for the tortoises. But the Swedish Department of Agriculture chose to freeze the tortoises to death on the plea that this was the only way to stop such illegal import. The Tortoise Trust is demanding the resignation of the Swedish Minister for Agriculture over this issue.

"A habitation and a name" ?

In the December 1995 issue of *Lyriocephalus*, the Journal of the Amphibia and Reptile Research Organization of Sri Lanka (ARROS), appeared an article entitled *Amphibians and Reptiles in Sri Lankan Place Names* by D.G.A. Perera. The article gives a list of place-names (including names of ponds, etc.) associated with various reptiles. The most impressive list is in respect of Snakes. As many as 91 place names in Sri Lanka refer to snakes, sometimes to particular species like cobra, Russell's viper, krait etc.,

Readers are invited to send in place-names in India which are associated with snakes or other reptiles.

The Endangered Act.

In the U.S., the Endangered Species Act (ESA) is in danger. The May, 1996 issue of *USA Today* brought out a report of the threat now faced by this Act which was passed by a nearly unanimous vote by the U.S. Congress in 1973. The Act is being assailed on grounds of being costly, inflexible and contemptuous of private property rights. The ESA is, perhaps, the most comprehensive and purposeful legislation of its kind anywhere in the world. It imposes restrictions and obligations on private citizens as well as Federal agencies in order to ensure that development activities are not at the cost of protection of endangered species and their habitats. The core of the controversy lies in that the ESA does not distinguish on the basis of "popularity" of the species. An endangered slug's habitat needs as much protection as that of the bald eagle. (The listing of the Delhi sands flower-loving fly in San Bernardino County, California forced the taxpayers to spend \$ 3,500,000 to move a planned hospital project 250 feet.)

The perception of the general public seems to be that while some sacrifice of development or payment of higher taxes will be justified in the interests of protection of "charismatic megafauna" - highly visible, aesthetically pleasing species such as the grizzly bear, bald eagle, California condor, seals, grey whales and manatees, the same cannot be the case when it comes to "lower order species" such as snails and insects. But, that brings us back to Lesson One in conservation of bio-diversity. Doesn't it ?

- B. Vijayaraghavan

REPTILE SPECIES ON DISPLAY AT THE CHENNAI SNAKE PARK

(As on 31. 03. 97)

- | | | |
|-----|--------------------------|-------------------------------------|
| 1. | Marsh crocodile | (<i>Crocodylus palustris</i>) |
| 2. | Gharial | (<i>Gavialis gangeticus</i>) |
| 3. | Saltwater crocodile | (<i>Crocodylus porosus</i>) |
| 4. | Morelett's crocodile | (<i>Crocodylus moreletti</i>) |
| 5. | Spectacled cayman | (<i>Caiman crocodilus</i>) |
| 6. | Siamese crocodile | (<i>Crocodylus siamensis</i>) |
| 7. | African dwarf crocodile | (<i>Osteolaemus tetraspis</i>) |
| 8. | Indian soft-shell turtle | (<i>Lissemys punctata</i>) |
| 9. | Pond turtle | (<i>Melanochelys trijuga</i>) |
| 10. | Aldabra tortoise | (<i>Geochelone gigantea</i>) |
| 11. | Star tortoise | (<i>Geochelone elegans</i>) |
| 12. | Common monitor | (<i>Varanus bengalensis</i>) |
| 13. | Water monitor | (<i>Varanus salvator</i>) |
| 14. | Yellow monitor | (<i>Varanus flavescens</i>) |
| 15. | Chameleon | (<i>Chamaeleon zeylanicus</i>) |
| 16. | Green iguana | (<i>Iguana iguana</i>) |
| 17. | Common cobra | (<i>Naja naja naja</i>) |
| 18. | Monocellate cobra | (<i>Naja naja kaouthia</i>) |
| 19. | Black cobra | (<i>Naja naja oxiana</i>) |
| 20. | Common krait | (<i>Bungarus caeruleus</i>) |
| 21. | Banded krait | (<i>Bungarus fasciatus</i>) |
| 22. | Russell's viper | (<i>Vipera russellii</i>) |
| 23. | Saw-scaled viper | (<i>Echis carinatus</i>) |
| 24. | Malabar pit viper | (<i>Trimeresurus malabaricus</i>) |
| 25. | Bamboo pit viper | (<i>Trimeresurus gramineus</i>) |
| 26. | Rat snake | (<i>Ptyas mucosus</i>) |
| 27. | Green vine snake | (<i>Ahaetulla nasutus</i>) |
| 28. | Bronze-back tree snake | (<i>Dendrelaphis tristis</i>) |
| 29. | Flying snake | (<i>Chrysopelea ornata</i>) |
| 30. | Banded racer | (<i>Argyrogena faciolatus</i>) |

- | | | |
|-----|-------------------------|---------------------------------------|
| 31. | Trinket snake | (<i>Elaphe helena</i>) |
| 32. | Common kukri | (<i>Oligodon arnensis</i>) |
| 33. | Wolf snake | (<i>Lycodon aulicus</i>) |
| 34. | Cat snake | (<i>Boiga trigonata</i>) |
| 35. | Checkered keel-back | (<i>Xenochropis piscator</i>) |
| 36. | Olive keel-back | (<i>Atretium schistosum</i>) |
| 37. | Striped keel-back | (<i>Amphiesma stolata</i>) |
| 38. | Green keel-back | (<i>Macropisthodon plumbicolor</i>) |
| 39. | Common sand boa | (<i>Eryx conicus</i>) |
| 40. | Red sand boa | (<i>Eryx johnii</i>) |
| 41. | Indian python | (<i>Python molurus</i>) |
| 42. | Reticulated python | (<i>Python reticulatus</i>) |
| 43. | Dog-faced water snake | (<i>Cerberus rhynchops</i>) |
| 44. | Annulated sea snake | (<i>Hydrophis cyanocinctus</i>) |
| 45. | Yellow sea snake | (<i>Hydrophis spiralis</i>) |
| 46. | Hook-nosed sea snake | (<i>Enhydrina schistosa</i>) |
| 47. | Narrow-headed sea snake | (<i>Microcephalophis gracilis</i>) |

