

## AMPHIBIANS OF THE EASTERN GHATS

KAUSHIK DEUTI, P. G. S. SETHY AND SUKUMAR RAY

*Zoological Survey of India, 27 JL Nehru Road, Kolkata: 700016*

### INTRODUCTION

Eastern Ghats mountain ranges are a series of discontinuous low hill ranges along the Bay of Bengal coast running from the Khondamal hills of Odhisa in the north upto the Sirumalai and Karanthamalai hills of Tamil Nadu in the south and forms the eastern edge of the Deccan plateau. The Eastern Ghats mountain ranges cover the States of Odhisa, Andhra Pradesh, Karnataka and Tamil Nadu. The Eastern Ghats are eroded and cut through by the four major rivers of southern India viz., Mahanadi, Godavari, Krishna and Kaveri which cut the Eastern Ghats into various discontinuous hills. The Eastern Ghats are separated from the Bay of Bengal by the coastal plains.

### LENGTH AND AREA OF THE EASTERN GHATS

The Eastern Ghats are located between 11°30' and 22°03' N latitudes and 76°50' and 86° 30' E longitudes in a north-east to south-west direction. The total extent of the Eastern Ghats is about 1750 kilometers with an average width of 220 km in the north and 100 km in the south. It covers a total area of 75000 sq km.

### ELEVATION OF THE EASTERN GHATS

The elevations of the Eastern Ghats are comparatively lower than the Western Ghats. These mountain ranges have an average height of 450 meters and rarely exceed 1200 meters. However, the highest peak is Arma Konda (1680 meters / 5512 feet) in the State of Andhra Pradesh.

### AGE OF THE EASTERN GHATS

Comparatively the Eastern Ghats mountain ranges are older than the Western Ghats. The history associated with the origin of this range is complicated and takes off from the disintegration of the ancient super continent of Rodinia and assembly of the Gondwana super continent. Like the Western Ghats, the Eastern Ghats are also of great ecological importance.

### GEOGRAPHICAL DISTRIBUTION OF THE EASTERN GHATS – OUR STUDY AREA

The low Sirumalai and Karanthamalai hills are at the southernmost part of the Eastern Ghat mountain ranges in Tamil Nadu. North of the Kaveri river are comparatively higher hills like Kollimalai, Pachaimalai, Shevaroy (Servaroyan), Kalrayan, Chitteri, Palamalai and Mettur hills in north of Tamil Nadu. These higher hill ranges experience a generally cooler and wetter climate than the surrounding plains. These hills harbour several coffee plantations and dry forests. The popular hill station of Yercaud is also situated in the Shevaroy hills. The Biligiri hills which run east from the Western Ghats to the Kaveri river has a wooded ecological strip that connects the Eastern Ghats to the Western Ghats. This region has the second largest wild elephant population in India. Two rivers, Ponnaiyar and Palar Rivers flow from the headwaters on the Kolar Plateau eastward through gaps in the Eastern Ghats to empty into the Bay of Bengal. These two rivers are separated by the Javadi hills. Some isolated areas have waterfalls. The Kiliyur falls is one of them.

Javadi hills rise rather steeply from the plains, constituting an undulating plateau with an average elevation of 800 meters. The highest point is Kambangudi (1166 meters). Cheyyar river, a tributary of the Palar forms the main drainage. Rainfall is fairly distributed in these hills with an average of 850 mm. Pattarikadu and Komatterri Reserve Forests receive the highest rainfall between August to November. The climate is pleasant and cool, the winter months have some frost. The soil types are sandy and red loam. Kollimalai hills comprises of a range of cool and dry hills varying in altitude from 300–1500 meters. To a large extent the area is just steep rocky outcrops covered along the base by medium to dense deciduous forests. However the reaches above 1000 meters and the slopes and valleys therein support a rather unique vegetation, the Sholas, quite resembling the high elevation montane evergreen forests of the Western Ghats in both structure and floristic composition. With an annual average rainfall of 800-900 mm in the Kolli hills, the sholas are certainly very fragile elements in this hilly landscape. Other major elements in the landscape are paddy fields in the valleys, occasional perennial streams, barren and rocky areas, mixed orchards, monoculture of bananas, eucalyptus and silver oak and a variety of crops like pineapple, tapioca and millets. Kolli hills is well known for its fruits and as a summer resort.

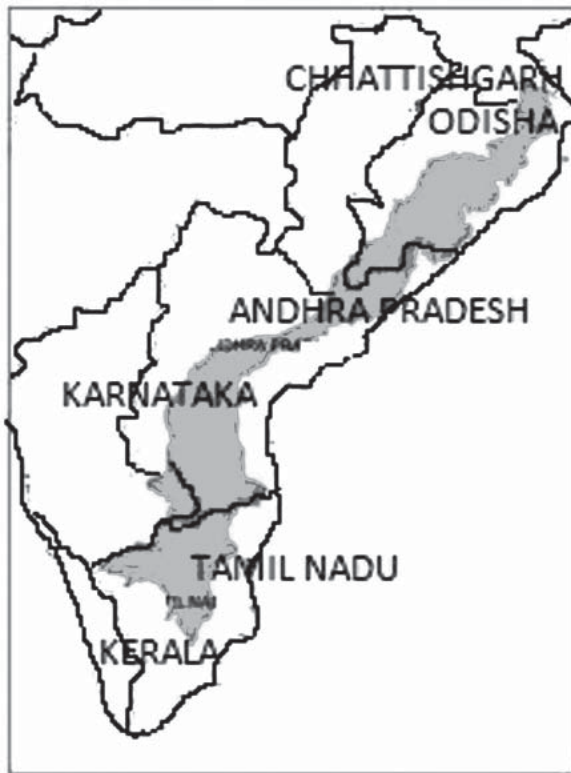
Biogeographers like Legris and Meher-Homji (1982) have divided the Eastern Ghats into three sections based on vegetation and bio-climatic aspects. The southern Eastern Ghats is treated as 'dry' reaching an annual rainfall of not more than 1500 mm. The resultant vegetation type is a scrub-thorn forest community. The hills in this area are rocky with large boulders and rainfed seasonal streams. Perennial rivers are few like Palar. The area includes several large reservoirs such as the hydro-electric power generating Stanley Reservoir in Mettur dam and smaller catchments for irrigation and fishery purposes.

North of the Palar river in the State of Andhra Pradesh, the middle section of the Eastern Ghats

comprises two parallel ranges running north-south. The higher Palikonda-Lankamalai-Nallamalai ranges are in the west and the lower Yerramalai-Velikonda ranges are in the east. The Velikonda range eventually descends to the coastal plains in the northern Nellore district while the Nallamalla Range continues to the Krishna River. The Krishna and Godavari rivers are also separated by a range of low hills. To the north of the Godavari, the Eastern Ghats record an unexpected increase in the height acting as a boundary between the States of Andhra Pradesh and Odhisa. The Vizag hills and Araku Valley in this region are quite scenic and hence popular. Moreover this region has very fertile soil. The biggest characteristic of the Eastern Ghats is that it is extremely fertile resulting in better crops. In fact, the Eastern Ghats act as the watershed of many rivers as the northern part of the Eastern Ghats gets high rainfall. The Simlipal Massif is considered the farthest northeast extension of the Eastern Ghats.

The Eastern Ghats is distributed mainly in four States, namely, Odhisa, Andhra Pradesh, Tamil Nadu and Karnataka. The part of Eastern Ghats found in the Odhisa covers 12 districts such as Cuttack, Khurda, Nayagarh, Phulbani, Boudh, Kalahandi, Gajapati, Ganjam, Rayagada, Nawrangpur, Koraput and Malkanagiri. In Andhra Pradesh Eastern Ghats is located in the following 15 districts, namely, Srikakulam, Visakhapatnam, East Godavari, West Godavari, Khammam, Mahaboobnagar, Nalgonda, Guntur, Krishna, Kurnool, Prakasham, Nellore, Cuddapah, Anantapur and Chittoor. Similarly in Tamil Nadu, Eastern Ghats is located in the following 9 districts, namely, Vellore, Erode, Salem, Namakkal, Dharmapuri, Tiruvanmalai, Tiruchirapalli, Pudukkottai, and Villupuram. In Karnataka Eastern Ghats falls in part of Chamrajnagar and Kolar districts.

Some of the peaks of the Eastern Ghats are: Deomali Parvat, Mahendragiri, Malayagiri, Devagiri, Chandragiri, Turiakonda, Dharakonda, Hatimali, Sambari Konda, Nallamalla, Arma Konda, Mettur, Shevaroy, Kalrayan and Pachamalai.



**Fig. 1.** Map showing Eastern Ghats of India with its states

### FAUNA AND FLORA OF THE EASTERN GHATS

The Eastern Ghats are one of the biologically richest biogeographic zones of India (Rodgers *et al.*, 2008). The diversified ecological niches and environmental situations provide habitat for rich fauna. Eastern Ghats is home to large number of Asiatic elephants. Other large animals such as Leopards, Gaur, Sambhar, Barking deer and Niligiri Tahr abound the landscape. Apart from this there is a large variety of bird species. About 40 species of Reptiles and 25 species of Amphibians are now known from the Eastern Ghats. The Eastern Ghats also holds a rich floral ecosystem with a large number of medicinal plants.

### METHODOLOGY

To determine the amphibian diversity of the Eastern Ghats, four short surveys were conducted in the Eastern Ghats by a team of three amphibian researchers from Zoological Survey of India, Kolkata. The first survey was conducted from 03.09.2009 to 17.09.2009 in the Vizag hills, Araku

Valley and Vizianagaram areas of northern Andhra Pradesh as well as the Semiliguda area of southern Odhisa; the second survey was conducted from 19.08.2010 to 03.09.2010 in Koraput, Rayagada, Muniguda and Kesinga areas of southern Odhisa; the third survey was conducted from 03.02.2011 to 19.02.2011 in Yercaud area of Shevaroy hills and Javadi hills of Tamil Nadu and the fourth survey was conducted from 16.09.2011 to 03.10.2011 in Renigunta, Tirupati hills (including Sri Venkateswara Wildlife Sanctuary) and Horsley Hill areas of southern Andhra Pradesh. Amphibians were collected by first doing a reconnaissance survey of the area during day-time to determine the presence of habitats suitable for amphibians like water-bodies, hill-streams etc. Then in the evening after darkness those habitats were visited with powerful battery-operated torch lights to detect the amphibians present there. Often calls of amphibians led to their micro-habitat and a small AIWA JS-143 stereo cassette recorder with hand-held external microphone was used to record the calls of the amphibians from a distance of 60-90 cm from the calling frog. Most of these amphibians were photographed in the field using a PANASONIC DMC FZ-30 digital camera with a built-in flash. The amphibians collected were killed with chloroform or ethanol, injected with 10% formaldehyde and kept soaked in 10% formaldehyde for 48 hours. Later these were transferred to 70% ethyl alcohol for permanent preservation.

### RESULTS

99 specimens of amphibians belonging to 23 species, 11 genera and 5 families were collected from different areas of the Eastern Ghats as mentioned below. The detailed species accounts of these amphibian species are given below along with their scientific names, common names, original citations, measurements with registration numbers and sex, diagnostic features, colour, secondary sexual characters, habitat and status and distribution (remarks) in the Eastern Ghats. This forms the first scientific document of the amphibians of the Eastern Ghats.

## SPECIES ACCOUNTS

Family BUFONIDAE

### 1. *Duttaphrynus melanostictus*

(Schneider, 1799)

1799. *Bufo melanostictus* Schneider, *Hist. Amph.*, 1: 216.

*Common Name*: Common Indian Toad (English).

*Specimens Examined*: A 11154 from Rayagada, Odhisa (altitude 370 meters above msl) collected on 25.viii.2010, A 11184 from Koraput, Odhisa (altitude 875 meters above msl) collected on 21.viii.2010, A 11185 from Semiliguda, Odhisa (altitude 435 meters above msl) collected on 13.ix.2009 and A 11186 from Araku, Andhra Pradesh (altitude 815 meters above msl) collected on 10.ix.2009. The measurements of the toads as shown in Table 1.

*Size*: 45-109 mm (Snout-vent length).

*Habitat*: Found in all areas of the Eastern Ghats over leaf-litter, beside rain-water pools and also along the roadsides. They hide under logs, stones, in moist holes and huddle together in crevices of tree-trunks. Except during the breeding season they spend the day in any convenient cranny which is cool and dark. Once a toad has found a suitable day retreat it will generally use it as its permanent abode for its nightly forays for food.

*Remarks*: Very common throughout the Eastern Ghats. Terrestrial and nocturnal, they seem to be well-acquainted with their habitat and return to the same site again and again. They have limited powers of hopping and usually walk up to the nearby prey which is detected by sight or sound. They are usually solitary but congregate during the breeding season near water-bodies. They are highly territorial during this time of the year. The species is a prolific breeder laying a few thousand eggs in long translucent strings which is entwined round the stems of grass and aquatic plants. The tadpoles are black and are gregarious and omnivorous. Juveniles wander on land during mornings and afternoons, if the air-temperature is sufficiently low.

### 2. *Duttaphrynus stomaticus* (Lutken, 1862)

1862. *Bufo stomaticus* Lutken, *Vidensk. Meddr. Dansk. Naturh. Foren.*, 14: 305.

*Common Name*: Marbled Toad (English)

*Specimens Examined*: A 11152 from Kesinga, Odhisa (altitude 230 meters above msl) collected on 31.viii.2010 and A 11187 from Semiliguda, Odhisa (altitude 435 meters above msl) collected on 13.ix.2009. The measurements of the toads as shown in Table 2.

**Table 1** : Measurements of the toads collected (in millimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11154 female	65.48	13.43	23.16	8.53	5.23	5.48	6.62	3.70	23.46
11184 male	48.34	9.56	17.65	6.87	4.87	4.87	5.35	2.10	17.87
11185 male	52.74	10.65	18.56	7.28	5.12	4.97	5.64	2.37	18.74
11186 female	76.47	14.63	24.43	9.75	7.56	6.12	7.54	4.87	25.94

**Table 2** : Measurements of the toads collected (in milimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11152 female	66.67	14.85	22.07	8.73	5.18	6.29	5.48	4.62	25.55
11187 male	51.64	9.25	17.76	6.24	5.32	4.97	5.63	2.57	17.84

*Size*: 38-76 mm (Snout-vent length).

*Habitat*: Drier and semi-arid regions of the Eastern Ghats. Dry scrub forest areas preferred but are seen near water bodies especially during the breeding season. Often found in association with Common Indian toads in the same habitat.

*Remarks*: The species is uncommon in most areas of the Eastern Ghats. They are terrestrial and nocturnal. However during the breeding season they can be seen moving around during the day. In areas of scanty rainfall like in the Kalahandi and Rayagada districts of Odhisa they were seen to aestivate during the summer. In this season, they burrow in sandy soil and are found under stones and crevices of tree-trunks. Breeding occurs between June and August and the call of the male is distinctive and can be easily distinguished from that of the Common Indian Toad. The eggs are laid in translucent strings and are pale yellowish green in colour. The tadpoles are small and black with shiny silver spots on the body.

### 3. *Duttaphrynus scaber* (Schneider, 1799)

1799. *Bufo scaber* Schneider, *Hist. Amph.*, 1: 219.

*Common Name*: Rough Dwarf Toad (English)

*Specimens Examined*: A 11330 from Renigunta, Andhra Pradesh (altitude 129 meters above msl)

collected on 20.ix.2011. The measurements of the toad as shown in Table 3.

*Size*: 49 mm (Snout-vent length).

*Habitat*: Drier as well as humid areas of the southern Eastern Ghats.

*Remarks*: The species is uncommon in the Eastern Ghats. It burrows well and is fond of feeding on termites. It can walk with its body lifted above the ground like a garden lizard. Tadpoles are smaller than those of the Common Indian Toad but have larger nostrils and are brownish instead of black.

### Family MICROHYLIDAE

#### 4. *Microhyla ornata* (Dumeril & Bibron, 1841)

1841. *Engystoma ornatum* Dumeril & Bibron, *Erp. Gen.*, 8: 745.

*Common Name*: Ornate narrow-mouthed frog (English).

*Specimens Examined*: A 11180 – A 11183 from Karlapat, Odhisa (altitude 785 meters above msl) collected on 08.ix.2009, A 11189 from Damanjodi, Odhisa (altitude 895 meters above msl) collected on 22.viii.2010, A 11190 from Muniguda, Odhisa (altitude 355 meters above msl) collected on 28.viii.2010 and A 11335 from Renigunta, Andhra Pradesh (altitude 129 meters above msl) collected on 20.ix.2011. The measurements of the frogs as shown in Table 4.

**Table 3** : Measurements of the toads collected (in milimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11330 male	49.37	12.64	17.06	6.57	4.77	4.47	4.31	3.30	17.85

**Table 4** : Measurements of the frogs collected (in milimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11180 male	20.39	5.18	6.52	3.53	1.80	2.31	2.05	hidden	10.26
11181 male	21.31	4.36	6.55	3.25	1.54	2.48	2.00	hidden	10.64
11182 male	21.00	4.26	6.52	3.27	1.70	2.05	2.13	hidden	10.03
11183 male	20.80	4.95	5.96	3.30	2.36	2.38	2.05	hidden	8.35
11189 female	23.67	5.82	7.53	4.35	2.48	2.25	2.60	hidden	11.93
11190 female	23.43	5.64	7.63	4.71	2.62	2.51	2.48	hidden	11.51
11335 male	17.50	3.83	5.33	2.41	1.32	1.42	2.10	hidden	8.91

*Size:* 17-26 mm (Snout-vent length).

*Habitat:* Found among moist leaf-litter all over the Eastern Ghats. It is found throughout the year in areas with adequate cover and moisture. Juveniles are seen in dried up beds of temporary rain-water pools well after the monsoon season.

*Remarks:* Very common throughout the Eastern Ghats. Can call very loudly and jump tremendously when compared to its small size. Breeding commences just after the arrival of the monsoon rains. Several males can be heard calling from evening near temporary rain-water pools. However the call is ventriloquistic and makes location of the small frog sitting in the midst of grass quite difficult. The male remains stationary and is located by the female by its call. About

200 eggs are laid in mucilaginous masses floating in water. The tadpoles are transparent and have a golden-coloured diamond-shaped mark on the head. Their head and body are large but the tail is small ending in a flagellum. The tadpoles are microphagous and move in shoals just below the water surface.

##### 5. *Microhyla rubra* (Jerdon, 1854)

1854. *Engystoma rubrum* Jerdon, *J. Asiat. Soc. Beng.*, **22**: 462-479.

*Common Name:* Red narrow-mouthed frog (English).

*Specimens Examined:* A 11376 – A 11377 from Renigunta, Andhra Pradesh (altitude 129 meters above msl) collected on 20.ix.2011. The measurements of the frogs as shown in Table 5.

**Table 5** : Measurements of the frogs collected (in milimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11376 male	27.99	6.24	8.45	3.91	2.94	3.32	2.97	hidden	13.61
11377 male	21.00	4.82	7.41	3.14	2.31	2.61	2.20	hidden	10.99

*Size*: 21-29 mm (Snout-vent length).

*Habitat*: Sandy beds of streams, forests as well as suburban areas. Adults are attracted to lamps at night and also wander into homes in search of insects. They do not leap as much as the Ornate narrow-mouthed frog.

*Remarks*: A more burrowing species than *Microhyla ornata* and so is not much seen except during the breeding season. The species is not uncommon in the southern part of the Eastern Ghats. A breeding pool attracts a large number of adults who stay crouched on the wet mud and call. The call is similar to the chirping of crickets but is interrupted and not continuous. Breeding season coincides with the monsoons and extends from June to November. However the actual time the males call and pairs mate do not last more than a

day or two. Mounted pairs can be seen swimming and inflating in water at this time. Eggs are laid in rain-water pools and float in flat transparent masses as in *Microhyla ornata* but are larger in size.

#### 6. *Kaloula taprobanica* Parker, 1934

1934. *Kaloula pulchra taprobanica* Parker, *Trust. Brit. Mus. London*: 86-87.

*Common Name*: Painted Frog, Indian Painted Frog, Painted Kaloula (English).

*Specimens Examined*: A 11175 – A 11176 from Sunabeda, Odhisa (altitude 467 meters above msl) collected on 14.ix.2009 and A 11191 – A 11194 from Karlapat, Odhisa (altitude 785 meters above msl) collected on 07.ix.2009. The measurements of the frogs as shown in Table 6.

**Table 6** : Measurements of the frogs collected (in milimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11175 male	45.82	9.37	14.85	5.46	3.25	4.24	4.52	hidden	18.59
11176 juvenile	34.01	6.83	10.13	4.57	2.76	3.17	3.86	hidden	13.33
11191 female	52.93	9.16	16.38	5.56	3.63	5.20	5.76	hidden	17.72
11192 male	49.30	7.41	14.65	5.00	3.75	4.08	5.13	hidden	14.83
11193 male	40.08	6.90	10.59	4.47	2.99	3.63	3.75	hidden	12.54
11194 female	50.59	8.43	13.36	5.10	2.81	4.59	4.52	hidden	14.17

*Size:* 27-58 mm (Snout-vent length).

*Habitat:* Open forests at the edge of forests. Breeds in dirty ponds and pools.

*Remarks:* Uncommon in the Eastern Ghats. The species is very colourful. They are terrestrial, burrowing and nocturnal, emerging from their burrows during the monsoon, sometimes even during the day and are often seen to climb up trees, where they are found in holes in tree-trunks, infested with termites, about one and a half meters above the ground.

#### 7. *Uperodon globulosus* (Gunther, 1864)

1864. *Cacopus globulosum* Gunther, *Rept. Brit. India*: 416.

*Common Name:* Balloon Frog (English).

*Specimens Examined:* A 11167 from Karlapat, Odhisa (altitude 785 meters above msl) collected on 09.ix.2009 and A 11195 from Rayagada, Odhisa (altitude 370 meters above msl) collected on 26.viii.2010. The measurements of the frogs as shown in Table 7.

*Size:* 40-64 mm (male) and 60-84 mm (female).

*Habitat:* Mixed scrub forest with loose sand and soft gravel, littered with piles of decaying logs infested with termites and ground-dwelling ants. Also found on stream-beds having damp soil.

*Remarks:* Uncommon and fossorial, emerging from the under ground only during the breeding season in early monsoon. Occasionally seen in the Eastern Ghats in areas with termites and ground-dwelling ants. They are excellent burrowers using their powerful metatarsal tubercles quickly disappear underground. While burrowing the soil is dislodged by sideways movements of the legs, the frog subsides down into the ground, the eyes disappearing last. The globular shape is due to its enormously distensible lungs. They are feeble swimmers and move on land by a slow walk. Breed in dirty pools of water and drains. The call is a loud grunting *oink*.

#### 8. *Uperodon systoma* (Schneider, 1799)

1799. *Rana systoma* Schneider, *Hist. Amph.*, 1: 144.

*Common Name:* Marbled Balloon Frog (English).

*Specimens Examined:* A 11168 – A 11169 from Karlapat, Odhisa (altitude 785 meters above msl) collected on 08.ix.2009 and A 11178 – A 11179 from Sunabeda, Odhisa (altitude 467 meters above msl) collected on 14.ix.2009. The measurements of the frogs as shown in Table 8.

*Size:* 30-55 mm (Snout-vent length).

*Habitat:* Scrub and deciduous forests, often found under stones and logs.

**Table 8 :** Measurements of the frogs collected (in millimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11168 female	51.89	7.72	13.23	6.29	2.92	4.67	6.75	hidden	18.49
11169 male	31.06	5.74	8.40	3.73	2.33	3.20	3.32	hidden	10.92
11178 juvenile	22.42	4.08	7.23	3.20	1.98	2.33	2.99	hidden	8.61
11179 juvenile	19.43	3.91	5.23	3.47	1.44	2.05	2.59	hidden	6.75

*Remarks:* Not uncommon in the Eastern Ghats but emerges only during the breeding season with the advent of the rainy season. Calls like the bleating of a goat. Adults feed mainly on termites.

Family: DICROGLOSSIDAE

9. *Euphlyctis cyanophlyctis* (Schneider, 1799)

1799. *Rana cyanophlyctis* Schneider, *Hist. Amph.*, 1: 137.

*Common Name:* Skittering Frog, Skipping Frog, Skipper Frog, Water frog (English).

*Specimens Examined:* A 11150 – A 11151 from Kesinga, Odhisa (altitude 230 meters above mean sea level) collected on 01.ix.2010, A 11160 from Muniguda, Odhisa (altitude 355 meters above mean sea level) collected on 29.viii.2010, A 11197 – A 11199 from Semiliguda, Odhisa

(altitude 435 meters above msl) collected on 13.ix.2009, A 11211 – A 11212 from Rayagada, Odisha (altitude 370 meters above msl) collected on 26.viii.2010 and A 11331 from Renigunta, Andhra Pradesh (altitude 129 meters above msl) collected on 20.ix.2011. The measurements of the frogs as shown in Table 9.

*Size:* 30-70 mm (Snout-vent length).

*Habitat:* Found in all types of water-bodies in the Eastern Ghats especially the permanent ones with standing water. The species is also seen in rain-pools and puddles. They are active throughout the year and are both nocturnal as well as diurnal. They spend most of their time in the water or in the vicinity of water-bodies but may migrate for a long distance onto land in the summer months when the temporary pools of water dry up.

**Table 9 :** Measurements of the frogs collected (in milimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11150 male	41.30	13.36	15.21	6.78	4.08	4.36	1.93	3.14	19.50
11151 male	42.74	12.06	13.89	6.88	4.34	4.41	2.13	3.14	19.50
11160 male	33.35	9.57	11.09	5.89	2.61	3.65	3.50	2.76	20.06
11197 female	70.00	19.73	23.26	9.04	5.53	6.68	5.56	5.38	32.02
11198 male	41.45	10.66	13.41	5.89	3.78	4.90	2.26	3.96	20.72
11199 male	42.44	10.33	14.12	5.63	3.65	4.36	3.02	3.78	20.54
11211 male	41.50	9.80	13.66	5.61	3.60	4.57	3.09	3.88	21.53
11212 male	38.07	10.00	13.13	5.41	3.60	4.21	2.99	3.58	20.11
11331 female	52.09	16.17	17.93	7.67	4.31	5.91	2.74	5.10	24.79

*Remarks:* One of the commonest frogs of the Eastern Ghats. They float passively in water with only the nostrils projecting above the surface but when disturbed, can skip smoothly over the water for some distance and then float above the surface with the hind legs held parallel. While calling, the inflated bluish-white vocal sacs of the male project through slits on the floor of the mouth. The call is distinctive and can be heard throughout the year. The eggs are laid in a frothy mass in standing water.

10. *Euphlyctis aloysii* (Joshy *et al.*, 2009)

2009. *Euphlyctis aloysii* Joshy, Alam, Kurabayashi, Sumida & Kuramoto, *Alytes.*, **26**: 101.

*Common Name:* Aloysi Skittering Frog (English).

*Specimens Examined:* A 11340 – A 11343 from Horsley Hill, Andhra Pradesh (altitude 1236 meters above msl) collected on 24.ix.2011. The measurements of the frogs as shown in Table 10.

*Size:* 32-36 mm (Snout-vent length).

*Habitat:* Caverns and pot-holes on exposed rocky plateau with weedy vegetation. The frogs hide among this weed vegetation floating in water during the day but emerge at night to feed on insects.

*Remarks:* The collected specimens constitute the first record of this species from Andhra

Pradesh. It was known only from Mudigere in Karnataka and thus this is a range extension of about 200 km to the east.

11. *Fejervarya keralensis* (Dubois, 1980)

1980. *Fejervarya keralensis* Dubois, *Bull. Mus. Natl. Hist. Nat. Paris.*, **4**(2): 928-929.

*Common Name:* Kerala Warty Frog (English).

*Specimens Examined:* A 11344 from Horsley Hill, Andhra Pradesh (altitude 1236 meters above msl) collected on 24.ix.2011 and A 11378 from Yercaud, Tamil Nadu (altitude 985 meters above msl) collected on 10.ii.2011. The measurements of the frog as shown in Table 11.

*Size:* 37-55 mm (Snout-vent length).

*Habitat:* Forest, streams and wet seepage areas in the hills but also seen in roadside ditches and canals.

*Remarks:* One of the common species of the southern Eastern Ghats, where they are seen in the Shevaroy and Javadi hills. They remain partly buried in mud or sand in wet shaded areas beside small streams, where it is hard to locate them due to their camouflaging colour. They are not very active and do not leap high when disturbed. They dive into water but emerge after a few seconds. They mostly feed on the land and congregate around small rain-water puddles.

**Table 10 :** Measurements of the frogs collected (in millimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11340 male	33.78	12.24	12.77	5.81	3.58	3.65	2.76	3.17	17.93
11341 female	35.99	11.96	13.15	6.68	3.83	4.11	2.56	3.07	19.15
11342 male	34.11	11.83	12.36	5.68	3.45	3.55	2.64	3.14	17.95
11343 male	34.41	12.54	12.67	5.81	3.88	3.68	2.74	2.87	17.37

**Table 11** : Measurements of the frogs collected (in milimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11344 juv	21.71	6.90	7.97	4.39	2.51	2.10	3.60	1.70	12.31
11378 male	33.26	9.72	11.36	5.68	2.17	3.53	3.76	2.18	19.64

### 12. *Fejervarya orissaensis* (Dutta, 1997)

1997. *Limnonectes orissaensis* Dutta, *Hamadryad.*, **22**(1): 1-8.

*Common Name:* Orissa Cricket Frog (English).

*Specimens Examined:* A 11200 – A 11202 from Kesinga, Odhisa (altitude 230 meters above msl) collected on 31.viii.2010 and A 11334 from Renigunta, Andhra Pradesh (altitude 129 meters above msl) collected on 20.ix.2011. The measurements of the frogs as shown in Table 12.

*Size:* males (36 – 47 mm), females (34 – 53 mm).

*Diagnostic features:* Medium-sized Ranid frog with interrupted longitudinal folds on dorsum, smooth ventrum, wider & longer inner metatarsal tubercle and relatively pointed snout. Shorter hind limbs, more rounded finger and toe tips and a greater degree of webbing on the toes.

Head longer than wide, depressed. Snout pointed, extending beyond the mouth, internarial distance broader than the interorbital width. Narial openings are dorsolateral. Tympanum distinct, rounded, diameter less than eye diameter with supratympanic fold extending from posterior corner of eye to forelimbs. Vomerine teeth is distinct.

Finger and toe tips rounded, slightly swollen. First finger is longer than the second, third equal to or slightly longer than first. Subarticular tubercles rounded. Fingers not webbed. Hind limbs moderately long, with two metatarsal tubercles. Inner metatarsal tubercle is oval and larger than the outer metatarsal tubercle. Longitudinal ridges extend from anterior border of outer metatarsal tubercle to tip of fifth toe. Subarticular tubercles rounded, similar to those on fingers. Webbing of fourth extends less than half way between distal and penultimate subarticular tubercles, but that on fifth toe extends beyond distal subarticular tubercle.

**Table 12** : Measurements of the frogs collected (in milimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11200 male	43.38	13.10	14.75	7.87	4.44	4.36	3.55	3.32	25.52
11201 female	46.05	13.18	16.07	7.44	4.01	5.38	3.32	3.65	24.46
11202 female	41.55	11.63	12.82	7.39	4.01	4.85	2.26	3.25	25.73
11334 male	45.23	13.38	14.83	6.80	4.24	5.15	2.51	3.12	21.66

Skin on dorsum of head smooth but body covered with interrupted, longitudinal ridges with small rounded ridges towards posterior border of body. Skin on flanks and chin smooth. Skin on belly and proximal ventral surfaces of thigh is smooth.

*Colour:* Dorsum brown, grey or brick red. A V-shaped marking between eyes which is interrupted by a vertebral band, with or without yellowish narrow or wide vertebral band extending from tip of snout to vent. An X-shaped black patch on middle of body, limbs with complete or incomplete dark cross bars. The sides of the thighs are yellowish white with black speckles. Margins of jaws are with black vertical bars.

*Habitat:* Found during monsoon on grassy lands near water pools.

*Remarks:* The species is very common in the Eastern Ghats. When disturbed jump into water but immediately return to the edges. They are

active at night and hide in grass, below rocks or in small holes near water during the day. Eggs are laid in open temporary rain-water pools, the larvae are free-swimming. The specimen from Renigunta constitutes the first record from Andhra Pradesh State.

13. *Fejervarya syhadrensis* (Annandale, 1919)

1919. *Rana syhadrensis* Annandale, *Rec. Ind. Mus.*, 6: 121-125.

*Common Name:* Small Cricket Frog (English).

*Specimens Examined:* A 11161 – A 11162 from Muniguda, Odhisa (altitude 355 meters above msl) collected on 28.viii.2010, A 11163 – A 11165 from Koraput, Odhisa (altitude 875 meters above msl) collected on 21.viii.2010, A 11203 – A 11207 from Araku valley, Andhra Pradesh (altitude 815 meters above msl) collected on 10.ix.2009. The measurements of the frogs as shown in Table 13.

**Table 13 :** Measurements of the frogs collected (in millimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11161 male	30.50	7.41	8.73	5.13	2.99	3.47	2.18	1.90	14.88
11162 juvenile	22.04	6.27	7.01	3.83	2.08	2.61	2.08	1.32	10.18
11163 male	31.34	6.95	8.76	4.54	2.36	3.47	3.22	1.39	15.97
11164 male	27.55	6.83	7.77	4.52	2.36	2.94	2.10	1.67	14.93
11165 female	29.23	7.01	8.02	4.29	2.26	3.07	2.56	1.70	16.40
11203 male	31.41	6.95	9.09	5.00	2.74	3.63	2.56	2.33	14.70
11204 male	31.80	7.16	8.86	4.74	2.89	2.97	2.48	1.93	13.86
11205 male	30.68	7.13	8.50	4.80	2.26	3.27	2.13	2.08	16.07
11206 female	36.04	8.30	9.90	5.35	3.07	3.12	2.20	2.03	17.93
11207 female	33.57	8.43	9.39	5.35	3.14	3.60	2.28	2.10	19.45

*Size:* Snout-vent length: 27-32 mm (males) and 29-40 mm (females).

*Habitat:* Prefers vicinity of water without being really aquatic. They can be encountered far away from water-bodies under trees in Sal forests, near brooks, in open grassland, pools and ditches.

*Remarks:* One of the commonest species found throughout the Eastern Ghats. Partly diurnal but only calls nocturnally. During the dry winter months hides in leaf-litter of woods or between buttresses of trees. Males call in the evening and night and are easy to locate.

14. *Hoplobatrachus crassus* (Jerdon, 1853)

1853. *Rana crassa* Jerdon, *J. Asiat. Soc. Beng.*, 22: 531.

*Common Name:* Jerdon's Bull Frog (English).

*Specimens Examined:* A 11155 from Rayagada, Odhisa (altitude 370 meters above msl) collected on 26.viii.2010, A 11196 from Kesinga, Odhisa (altitude 230 meters above msl) collected on 31.viii.2010 and A 11328 from Renigunta, Andhra Pradesh (altitude 129 meters above msl) collected on 20.ix. 2011. The measurements of the frogs as shown in Table 14.

*Size:* 40-86 mm (Snout-vent length).

*Habitat:* They spend the day hiding inside crevices on elevated banks of ponds and ditches. They are found during breeding season in temporary rain-water pools.

*Remarks:* The species is quite common in the Eastern Ghats, found along with the Indian Bull

frogs. They are terrestrial, nocturnal and also burrow in the ground.

15. *Hoplobatrachus tigerinus* (Daudin, 1803)

1803. *Rana tigerina* Daudin, *Hist. Nat.*, 1: 42.

*Common Name:* Bull Frog, Indian Bull Frog (English).

*Specimens Examined:* A 11157 from Rayagada, Odhisa (altitude 370 meters above msl) collected on 25.viii.2010, A 11208 from Semiliguda, Odhisa (altitude 435 meters above msl) collected on 15.ix.2009 and A 11329 from Renigunta, Andhra Pradesh (altitude 129 meters above msl) collected on 20.ix. 2011. The measurements of the frogs as shown in Table 15.

*Size:* 50-144 mm (Snout-vent length).

*Habitat:* Found among grasses, bushes and on the leaf-litter. Hide inside hollows at the edge of ponds and ditches. Aestivate inside burrows or under heaps of leaves. Seen frequently on the edges of ponds during breeding season into which they leap headlong at the least sign of danger.

*Remarks:* Very common species in the Eastern Ghats. They are solitary creatures, which aggregate only during the breeding season. In the non-breeding season, they are silent and difficult to locate but with the appearance of the rainy season their highly resonant call can be heard throughout the night. Croaking loudly the males await the arrival of the females which are fought for among potential competitors by kicking strongly with their hind legs. The eggs are laid in ponds and pools where they float first but sink later. The tadpoles are bottom-feeders.

**Table 14 :** Measurements of the frogs collected (in milimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11155 female	76.14	23.97	25.47	12.11	7.13	6.95	3.98	5.28	32.79
11196 male	56.75	19.36	21.74	11.96	5.76	5.45	3.27	4.61	28.56
11328 female	93.75	31.57	38.04	15.72	8.07	11.09	3.45	8.10	43.78

**Table 15 :** Measurements of the frogs collected (in milimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11157 male	54.12	15.41	16.84	9.62	5.25	5.66	2.51	3.35	29.64
11208 female	93.62	30.17	31.67	19.32	10.59	8.25	6.40	7.39	54.99
11329 male	85.64	28.27	31.44	14.90	7.36	10.03	3.86	6.90	38.98

16. *Sphaerotheca breviceps* (Schneider, 1799)  
1799. *Rana breviceps* Schneider, *Hist. Amph.*, 1: 140.

*Common Name:* Indian Burrowing Frog (English).

*Specimens Examined:* A 11139 from Phurlijharan, Orissa (altitude 260 meters above msl) collected on 24.viii.2010, A 11153 from Rayagada, Odhisa (altitude 370 meters above msl) collected on 26.viii.2010 and A 11170 – A 11171 from Karlapat, Odhisa (altitude 785 meters above msl) collected on 09.ix.2009. The measurements of the frogs as shown in Table 16.

*Size:* 38-56 mm (Snout-vent length).

*Habitat:* Terrestrial and subterranean, found near water-bodies only during the early part of the rainy season for short periods of time, often

in association with the Balloon frogs (*Uperodon sp.*).

*Remarks:* Although the species is not very uncommon in the Eastern Ghats, they are seen only at the onset of the monsoon when they come out of their burrows and the males croak near temporary pools of water, usually after a heavy shower. The call is a soft *owing* which can be heard from a good distance. There is no particular breeding site. Tadpoles are bottom-feeders. Juveniles are commonly seen after they metamorphose, hopping around the pools from which they emerged.

17. *Sphaerotheca rolandae* (Dubois, 1983)

1983. *Tomopterna rolandae* Dubois, *Alytes.*, 2(4): 163-170.

*Common Name:* Roland's Burrowing Frog (English).

**Table 16 :** Measurements of the frogs collected (in milimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11139 male	42.54	10.61	18.33	7.21	4.14	6.73	3.12	3.73	18.49
11153 male	50.46	12.47	17.88	6.93	2.87	2.99	2.69	3.65	19.45
11170 female	55.06	14.40	20.80	9.08	7.39	6.52	4.64	4.06	23.82
11171 female	52.80	12.64	20.26	8.86	7.74	6.75	4.08	4.26	23.74

*Specimens Examined:* A 11148 –A 11149 from Kesinga, Odhisa (altitude 230 meters above msl) collected on 31.viii.2010, A 11172 – A 11174 from Tiiri, Odhisa (altitude 828 meters above msl) collected on 23.viii.2010, A 11177 from Semiliguda, Odhisa (altitude 435 meters above msl) collected on 13.ix.2009 and A 11332 - A11333 from Renigunta, Andhra Pradesh (altitude 129 meters above msl) collected on 20.ix.2011. The measurements of the frogs as shown in Table 17.

*Size:* 24-45 mm (Snout-vent length).

*Habitat:* Wet stream beds where it buries itself in the sandy bank. Calling males stay close to the water.

*Remarks:* Common but secretive species in the Eastern Ghats, spending most of its time underground. They are mostly seen during the nights, especially after the rains. Prefer ants and beetles as food.

#### Family RANIDAE

#### 18. *Hylarana malabarica* (Tschudi, 1838)

1838. *Rana malabarica* Tschudi, *Classif. Batrachia.*, **3**: 80.

*Common Name:* Fungoid Frog (English).

*Specimens Examined:* A 11166 from Karlapat, Odhisa (altitude 785 meters above msl) collected on 08.ix.2009. The measurements of the frog as shown in Table 18.

*Size:* 55-71 mm (Snout-vent length).

*Habitat:* Found in Sal forests where it hides under leaf-litter but is to some extent semi-arboreal. Nocturnal, in summer months a large number may gather in moist areas. Terrestrial and reluctant to enter water except for breeding. Breeds in rain-water pools preferring shallow pools holding weeds or grass in forest. The breeding call can be syllabilized as *wuck, wuck, wuck* like drops of falling water.

**Table 17 :** Measurements of the frogs collected (in millimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11148 male	36.62	9.49	12.47	4.97	3.12	4.08	2.76	2.20	13.86
11149 juvenile	28.90	6.88	9.82	4.85	2.64	3.60	2.05	1.47	11.35
11172 female	42.54	10.61	18.33	7.21	4.14	6.73	3.12	3.73	18.49
11173 female	42.21	9.04	14.24	6.90	2.94	5.48	3.37	3.02	15.29
11174 female	38.58	10.18	14.55	6.14	3.09	5.13	2.81	2.13	15.51
11177 male	24.96	7.56	10.08	4.39	2.61	4.36	2.61	1.80	10.94
11332 male	39.59	12.11	14.17	6.93	4.19	4.77	3.25	2.51	14.83
11333 female	40.91	12.54	16.71	7.03	4.11	5.48	4.21	2.94	16.05

**Table 18** : Measurements of the frogs collected (in millimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11166 male	59.10	15.67	19.07	8.99	5.28	6.68	5.91	6.65	29.08

*Remarks:* Species is uncommon in the Eastern Ghats. The crimson colour on the back resembles red bark fungus hence the name fungoid frog. Obliterative pattern of the rest of the body breaks the outline, merging the frog into the background. A powerful fungoid odour is also given out under excitement, which smells like burnt rubber.

19. *Hylarana temporalis* (Gunther, 1864)

1864. *Rana temporalis* Gunther, *Rept. Brit. India*: 444 pp.

*Common Name:* Bronze Frog (English).

*Specimens Examined:* A 11373 – A 11375 from Yercaud, Shevaroy hills, Tamil Nadu (altitude 985 meters above msl) collected on 08.ii.2010. The measurements of the frogs as shown in Table 19.

*Size:* 35-82 mm (Snout-vent length).

*Habitat:* Wet, exposed rocks in small hill-streams shaded by bushes and small trees. Rarely

found in leaf litter on forest floors they feed on ground insects and other small frogs.

*Remarks:* The species is common in the southern part of the Eastern Ghats. It adopts an upright posture at rest while on rocks, litter or fallen logs. It is quite agile both in water and on land. It leaps for a considerable distance into water of hill-streams when disturbed only to swim across and surface again closeby. Call starts with a guttural croak followed by a series of loud *wak*. It calls both during day and night. Eggs are attached few centimeters below water in rock pools.

20. *Hylarana* sp

*Specimens Examined:* A 11336 – A 11337 from Tirumala, Sri Venkateswara Wildlife Sanctuary, Tirupati hills, Chittor district, Andhra Pradesh (altitude 896 meters above msl) collected on 21.ix.2011. The measurements of the frogs as shown in Table 20.

*Size:* 40-46 mm (Snout-vent length).

**Table 19** : Measurements of the frogs collected (in millimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11373 female	46.63	15.26	13.51	8.05	5.48	5.94	4.24	3.93	26.28
11374 male	42.24	13.51	12.62	7.46	4.82	5.41	4.11	3.78	24.28
11375 male	37.13	12.49	12.36	8.05	4.72	5.61	4.80	3.63	21.56

**Table 20** : Measurements of the frogs collected (in milimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11336 male	46.88	13.91	13.10	8.83	5.20	5.94	4.87	5.10	27.33
11337 male	40.74	11.35	10.89	8.17	4.90	4.62	3.98	3.45	23.54

**Diagnostic features:** Body elongated and torpedo-shaped with a relatively narrow waist. Head pointed, slightly longer than broad. Nostrils oval, dorso-laterally positioned, nearer to tip of snout than to eye. Eyes large, its diameter slightly more than the eye-nostril distance. Pupil rounded. Inter-orbital distance greater than upper eyelid width. Inter-orbital distance less than eye diameter. Inter-orbital space flat. Tympanum very distinct and round. Tympanum diameter less than eye diameter. Supra-tympanic fold absent. Mouth extending to posterior corner of eye, tongue oval and bifurcate, free posteriorly. A large rictal gland present. A very broad dorso-lateral fold starting from behind the eye to the inguinal region. Dermal fold on flank from rictal region to inguinal region. Vocal sacs paired but internal. Skin structure smooth. Skin on belly and abdomen smooth.

Arm short and thin. No dermal flap along forearm. Presence of a flat humeral gland on upper arm. Fingers long and thin, lacking webbing. Relative length of fingers:  $3 > 1 > 4 > 2$ . Tips of fingers swollen without distinct grooves. Subarticular tubercles on fingers unique and rounded. Hindlimbs relatively long and stout. Toes long and thin. Relative length of toes:  $4 > 3 > 5 > 2 > 1$ . Webbing on toes moderate, webbing on toe IV reaches between basal and distal subarticular tubercle. Tips of toes swollen without distinct grooves. There is a slight dermal fringe on toe V. Subarticular tubercles on toes rounded. Inner and outer metatarsal tubercle small but distinct.

**Colour:** Dorsum yellowish-brown with a thin bluish-black mid-dorsal line from back of forehead continuing down the mid-dorsum and diverging on the sacrum and continuing separately

to the groin. A similar bluish-black line from tip of snout to eye. Flanks from eye to groin light brownish-grey including the tympanum which is yellowish-brown. A white lateral line below the flanks including the rictal gland. Limbs yellow spotted with bluish-black. Fingers and toes yellow without spots. Eyes black with upper portion golden-yellow.

**Habitat:** The species was collected from dry leaf-litter on a dry stream bed among rocky outcrops

**Remarks:** The species is not uncommon in the Tirupati hills of southern Andhra Pradesh. As it seems to be a new species to science, it is being described separately elsewhere.

#### FAMILY: RHACOPHORIDAE

#### 21. *Polypedates maculatus* (Gray, 1834)

1834. *Hyla maculata* Gray, *Indian Zoology*, 1: 82.

**Common Name:** Common Tree Frog, Common Indian Tree frog (English).

**Specimens Examined:** A 11156 & A 11158 from Rayagada, Odhisa (altitude 370 meters above msl) collected on 26.viii.2010 and A 11209 – A 11210 from Damanjodi, Odhisa (altitude 895 meters above msl) collected on 22.viii.2010. The measurements of the frogs as shown in Table 21.

**Size:** Snout-vent length: 35-55 mm (male), 50-75 mm (female).

**Habitat:** Moist deciduous forest in trees, bushes, shrubs and in the breeding season sometimes on the ground beside ponds, ditches etc. Enters houses where it finds the moist atmosphere of bathrooms very congenial.

**Table 21** : Measurements of the frogs collected (in millimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11156 male	48.46	11.58	15.64	7.77	5.38	5.10	5.23	3.75	22.98
11158 male	45.54	11.81	14.65	7.51	4.26	4.85	4.72	3.32	21.18
11209 female	72.41	19.98	23.49	11.07	7.84	7.69	9.82	6.04	39.31
11210 male	45.84	11.96	13.99	7.79	5.30	5.20	5.25	4.16	26.69

*Remarks:* A very common tree-frog in the Eastern Ghats seen on trees and bushes about 1-6 meters above the ground in all areas of the Eastern Ghats. When resting all four legs are tucked in well under the body. Lays eggs in pendulous foam-nests over hanging water in which the tadpoles fall and develop. These foam-nests measure 7-11 cm in diameter.

**22. *Raorchestes sanctisilvaticus*** (Das & Chanda, 1997)

1997. *Philautus sanctisilvaticus* Das & Chanda, *Hamadryad.*, **22**(1): 21-27.

*Common Name:* Sacred Groves Bush Frog (English).

*Specimens Examined:* 12 specimens (11 males and 1 female) from Araku valley, Andhra Pradesh (altitude 815 meters above msl) collected on 11.ix.2009. The measurements of the frogs as shown in Table 22.

*Size:* 21-25 mm (male) and 24 mm (female).

*Diagnostic features:* Small-sized, relatively robust looking with a narrow waist. Head is short but wider than long, snout flattened, obtusely pointed and projecting beyond mandible. Eyes are large but tympanum is extremely small almost concealed. Nostril is closer to the eye than the tip of the snout. A supratympanic fold commences from posterior corner of eye, passing over the

tympanum and dipping down to cross over at the insertion of the forelimb.

Tips of fingers dilated into large, rounded and flattened disks with distinct circum-marginal grooves. The largest digital disk is on Finger III. Fingers are not webbed. Tibia is long. Tips of toes dilated into flattened disks with circum-marginal grooves. Disks on toes are as large as those on the fingers. Webbing on toes is less. Toe I with rudimentary webbing, outer side without a dermal fringe. Webbing on toe II is up to distal subarticular tubercle on outer and inner fringes. Webbing on toe III is up to basal subarticular tubercle on outer edge, reaching the base of the disks on both sides. Webbing on toe IV is up to basal subarticular tubercle on inner and distal on outer side, reaching base of disks as a narrow sheath. Webbing on toe V is up to distal subarticular tubercle as a broad web, reaching disk base as a narrow sheath on inner side. Outer metatarsal tubercle is absent but there is a small elongated inner metatarsal tubercle.

Dorsum of body with plenty of small irregular tubercles. A narrow median dermal fold is present along the dorsum. Upper eyelids are tuberculate too. Throat, abdominal region and undersurface of thighs are also with large and flattened tubercles. Cloacal opening directed postero-ventrally, slightly below upper level of thighs.

**Table 22** : Measurements of the frogs collected (in millimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11119 male	24.07	6.14	7.79	3.14	1.80	2.81	2.74	1.47	10.64
11120 male	21.94	6.24	7.97	2.99	2.00	2.92	3.27	1.19	10.28
11121 male	25.29	5.71	7.46	3.04	1.82	2.71	2.69	1.32	8.99
11122 male	22.12	5.35	7.84	3.12	1.72	2.87	2.76	1.32	9.88
11123 male	24.10	6.14	7.28	3.37	2.00	2.81	2.87	1.06	11.45
11124 male	22.02	5.56	7.28	3.02	1.34	2.79	2.87	1.54	9.22
11125 male	22.70	6.14	7.95	3.04	2.20	3.14	3.12	1.42	9.90
11126 male	21.94	6.01	7.77	3.37	1.77	2.64	2.48	1.21	10.08
11127 male	24.91	6.27	7.92	3.27	1.95	2.61	2.23	1.39	10.46
11128 male	23.11	5.23	7.77	3.17	2.03	2.64	2.76	1.57	9.80
11129 male	24.73	6.24	8.45	3.63	2.46	2.92	3.42	1.57	11.32
11130 female	24.00	5.38	7.41	2.76	1.95	2.71	2.69	1.47	10.41

**Colour:** Dorsum is deep brownish, unpatterned but fore-head is slightly darker than the rest of the body. Throat is light brown. The fore and hind limbs are banded with dark brown. Tips of digits of fore and hind limbs are pale yellow. Area between axilla and groin with deep yellow and cream reticulations.

**Habitat:** Found on bushes (*Lantana camara*, *Ipomea carnea*, *Chromolaena odorata* and *Solanum verbascifolium*) about 1.2-1.5 meters above the ground beside roadsides, hill-streams and in forested patches.

**Remarks:** A common bush frog inhabiting the northern part of the Eastern Ghats beside roadsides, hill-streams, in forested patches etc. Call is typical of other *Raorchestes* sp consisting of several tik-tik-tik sounds emitted at regular intervals.

The species was described from Sacred Groves of Kapildhara Falls, Amarkantak, Madhya Pradesh and last collected in 1962. IUCN considers the species as Critically Endangered due to its restricted distribution. However, we found the species to be common at Araku Valley, Andhra Pradesh on bushes 1.2-1.5 meters above ground level. This

is a range extension of the species by 600 km south-east of its known area of occurrence.

### 23. *Raorchestes* sp

*Specimens Examined:* 2 specimens (A 11338 – A 11339) from Tirupati hills, Andhra Pradesh (altitude 898 meters above msl) collected on 22.ix.2011. The measurements of the frogs as shown in Table 23.

*Size:* 21 mm (male).

*Diagnostic features:* Small-sized frogs with a robust body and a narrow waist. Head is broader than long. Snout is rounded, projecting slightly beyond the mouth. Snout length is one and a half times the diameter of the eye. The nostrils are closer to the tip of the snout than the eyes. Eyes are not very large but round with well-developed upper eyelids. Intra-orbital length is greater than the eye diameter. Tympanum is small, flattened and two-third the diameter of the eye. There is no supra-tympanic fold. Fore and hind limbs are long and slender. Thighs are well-developed. Fingers and toes are with large, rounded and flattened disks with distinct circum-marginal grooves. Discs on the fingers are larger than on the toes. Fingers are without any webbing. Toes are minutely webbed with two phalanges of the fourth toe free and one phalange of the other toes free of webbing. Skin is smooth on the dorsum and on the chin and throat but granular on the belly and under the thighs.

*Colour:* Dorsum is chocolate or deep brown with hardly any markings except a light X-shaped

marking on the back. There are some indistinct cross-bars on the thighs. Iris is black.

*Habitat:* Found on dry leaf-litter on the floor of a dried up stream among rocky outcrops.

*Remarks:* The species is quite common in the Tirupati hills where they call by sitting on the ground among the fallen leaf litter.

### 24. *Raorchestes terebrans* (Das & Chanda, 1998)

1998. *Philautus terebrans* Das & Chanda, *J. South Asian. Nat. Hist.*, 3(1): 103-112.

*Common English Name:* Boring Bush Frog.

*Specimens examined:* None (reported from literature from paratypes collected in 1877).

*Size:* Snout-vent length is 14.8-21.6 mm (male) and 12.8-16.2 mm (female).

*Diagnostic Features:* Small body-size, body robust with a narrow waist, head wider than long, snout flattened and obtusely pointed, projecting a little beyond mandible. Nostrils are closer to the tip of the snout than the eye. Eyes large, their diameter greater than the eye-nostril distance. Inter-orbital width slightly less than twice the width of the upper eyelid. Inter-narial region narrow. A supra-tympanic fold commences from posterior corner of eye, crossing over the tympanum and dipping down to cross over insertion of fore-limb. Tympanum small, flattened and less than diameter of eye. Nostrils laterally oriented and oval in shape. Vomerine teeth absent. Tongue large, elongate and bifid.

**Table 23 :** Measurements of the frogs collected (in millimeters)

Reg No & Sex	Snout-vent length	Head length	Head width	Snout length	Eye-nostril length	Eye diameter	Inter-orbital length	Tympanum diameter	Tibial length
11338 male	21.20	6.40	8.05	4.14	2.94	2.18	3.12	1.62	11.60
11339 male	21.53	6.57	8.10	4.19	3.02	2.46	3.22	1.67	12.34

PLATE I



1. Eastern Ghats from Horsley Hill, Andhra Pradesh



2. Forested area in Eastern Ghats with stream



3. Common Indian Toad (*Duttaphrynus melanostictus*)



4. Marbled Toad (*Duttaphrynus stomaticus*)



5. Rough Dwarf Toad (*Duttaphrynus scaber*)



6. Ornate narrow-mouthed Frog (*Microhyla ornata*)



7. Red narrow-mouthed Frog (*Microhyla rubra*)



8. Painted Frog (*Kaloula taprobanica*)

## PLATE II

9. Ballon Frog (*Uperodon globulosus*)10. Marbled Balloon Frog (*Uperodon systoma*)11. Skittering Frog (*Euphlyctis cyanophlyctis*)12. Aloysi Skittering Frog (*Euphlyctis aloysii*)13. Small Cricket Frog (*Fejervarya syhadrensis*)14. Kerala Warty Frog (*Fejervarya keralensis*)

15. A hill-stream in Eastern Ghats



16. Collection of amphibians

PLATE III



17. Jerdon's Bull Frog (*Hoplobatrachus crassus*)



18. Indian Bull Frog (*Hoplobatrachus tigerinus*)



19. Burrowing Frog (*Sphaerotheca breviceps*)



20. Roland's Burrowing Frog (*Sphaerotheca rolandae*)



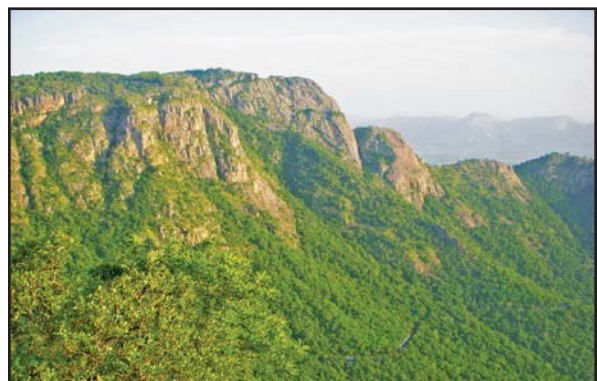
21. Fungoid Frog (*Hylarana malabarica*)



22. Bronze Frog (*Hylarana temporalis*)



23. *Hylarana* sp from Tirupati



24. Tirupati hills in Eastern Ghats

## PLATE IV

25. Common Tree-frog (*Polypedates maculatus*)

26. Collection of Bush Frogs

27. Sacred Groves Bush Frog (*R. sanctisilvaticus* calling)28. Sacred Groves Bush Frog (*Raorchestes sanctisilvaticus*)29. Boring Bush Frog (*Raorchestes cf terebrans*)30. Ground-dwelling Bush Frog (*Raorchestes sp*)

Tips of fingers dilated into large, rounded and flattened disks with distinct circum-marginal grooves. A smooth pale nuptial pad on dorsal surface of the first finger. The largest digital disk is on the third finger which is equal to the horizontal diameter of tympanum. Fingers are not webbed. Tibia long, tips of toes strongly dilated into flattened disks with circum-marginal grooves. Disks on toes are as large as those on the fingers. Reduced webbing on toes. The first toe with rudimentary webbing, outer side without a dermal fringe. Webbing on the second toe up to distal subarticular tubercle on outer and rudimentary webbing on inner edge. Webbing on the third toe is up to distal subarticular tubercle on the outer edge and distal subarticular tubercle on the inner edge. Webbing on the fourth toe is between the distal and basal subarticular tubercle on both sides. Webbing on the fifth toe is to distal subarticular tubercle as a broad web, reaching disk base as a narrow sheath on inner side. Outer side of the fifth toe without a dermal fringe. Tarsal fold absent. A small elongated inner metatarsal tubercle and a larger oval outer metatarsal tubercle.

Dorsum of body with uniformly scattered white-tipped pustules. Upper eyelids smooth. Throat, abdominal region as well as undersurface of thighs coarsely granular. Undersurface of forelimbs weakly tuberculate. Cloacal opening directed postero-ventrally, slightly below upper level of thighs.

*Colour:* Unpatterned brownish-grey dorsally, fore and hind limbs banded with dark brown. A dark inter-orbital bar present. Tips of digits of fore and hind limbs cream-coloured. Throat brownish, abdominal region with brown variegations. An elongated cream patch on inguinal region, anterior to which are two cream spots.

*Remarks:* Collected long back in 1877 from Peddavalasa (altitude about 1000 meters), Golconda hills, Vishakapatnam district of the Eastern Ghats of Andhra Pradesh. We could not locate this species as it remained elusive.

## SUMMARY

The amphibian fauna of the Eastern Ghats was found to be quite rich with at least 24 species belonging to 11 genera and 5 families of Anurans (3 species of Bufonidae, 5 species of Microhylidae, 9 species of Dicroglossidae, 3 species of Ranidae and 4 species of Rhacophoridae). We could collect 23 of these species but the Boring Bush Frog (*Raorchestes terebrans*) which was collected in 1877 from the Vizag hills remained elusive. However, our collection of 12 specimens of the Sacred Groves Bush Frog (*Raorchestes sanctisilvaticus*) from Araku Valley of Andhra Pradesh in September, 2009 is a re-discovery of the species after its original collection in 1962 from Kapildhara waterfalls, Amarkantak, Madhya Pradesh and is a range extension of the species by a distance of about 600 km to the south-east. IUCN considers this species as Critically Endangered due to its previously known restricted distribution and it was considered as one of the Lost Amphibians of India.

Collections of the Aloysi Skittering Frog (*Euphlyctis aloysii*) from Horsley Hill, Andhra Pradesh in September, 2011 and of the Orissa Cricket Frog (*Fejervarya orissaensis*) from Renigunta, Andhra Pradesh also in September, 2011 are new records for the State of Andhra Pradesh. Our collection of a species of *Hylarana* from Tirupati hills, Andhra Pradesh in September, 2011 is of a new species to science which is being described elsewhere.

## ACKNOWLEDGEMENTS

The authors would like to thank the Director, Zoological Survey of India for necessary facilities to conduct this study and to the Research Monitoring Committee, ZSI, Kolkata for sanctioning the project on Amphibian Fauna of the Eastern Ghats. Mr. Swapan Kumar Dey is acknowledged for helping in field work.

## REFERENCES

- Daniel, J.C. 2002. The Book of Indian Reptiles and Amphibians. *Bombay Natural History Society and Oxford University Press*, 238 pp.
- Daniels, R.J.R. 2005. Amphibians of Peninsular India. Universities Press (India) Private Limited. 268 pp.
- Daniels, R.J.R. & Ishwar, N.M. 1994. Rarity and the herpetofauna of the southern Eastern Ghats, India. *Cobra*, **16**: 2-12.
- Daniels, R.J.R. & Ravikumar, M.V. 1998. Amphibians and reptiles of Kolli hills. *Cobra*, **31**: 3-5.
- Das, I & Chanda, S.K. 1997. *Philautus sanctisilvaticus* (Anura: Rhacophoridae), a new frog from the sacred groves of Amarkantak, Central India. *Hamadryad*, **22**(1): 21-27.
- Das, I & Chanda, S.K. 1998. A new species of *Philautus* (Anura: Rhacophoridae) from the Eastern Ghats, south-eastern India. *J. South Asian nat. Hist.*, **3**(1): 103-112.
- Dutta, S.K. 1988. First records of *Bufo stomaticus* and *Bufo fergusonii* (Anura: Bufonidae) from Orissa, with comments on their distribution. *J. Bombay nat Hist. Soc.*, **85**(2): 439-441.
- Dutta, 1990. Ecology, natural history and conservation of herpetofauna of Orissa, India. *Tigerpaper.*, **17**: 20-28.
- Dutta, S.K. 1991. An overview of the amphibian fauna of Orissa. *Herpeton.*, **4**: 7-8.
- Dutta, S.K. & Acharjyo, L.N. 1993. Addition to the herpetofauna of Orissa. *The Snake*, **25**: 149-150.
- Dutta, S.K. & Acharjyo, L.N. 1997. Further additions to the herpetofauna of Orissa, India. *Cobra*, **30**: 1-8.
- Dutta, S.K. 1997. A new species of *Limnonectes* from Orissa, India. *Hamadryad.*, **22**(1): 1-8.
- Dutta, S.K. 2003. A new species of Rhacophorid frog from Simlipal Biosphere Reserve, Orissa, India. *Russian. J. Herpetol.*, **10**(1): 25-32.
- Legris, P. & Meher-Homji, V.M. 1982. The Eastern Ghats: vegetation and bio-climatic aspects, pp 1-17. In: National Seminar on Resources Development and Environment of the Eastern Ghats (24-27 March, 1982), Waltair. Andhra University Press, pp 232.
- Pillai, R.S. & Ravichandran, M.S. 1992. Amphibia of Javadi hills, North Arcot District (Tamil Nadu). *Cobra*, **7**: 5-7.
- Sarkar, A.K. 1993. Amphibia In: Ghosh, A.K. (ed.). *Fauna of Orissa, State Fauna Series*, **4**(Part-1): 39-49, Zoological Survey of India, Calcutta.
- Sarkar, A.K., Chandra, P.K & Ray, S. 1993. Amphibia In: Ghosh, A.K. (ed.). *Fauna of Andhra Pradesh, State Fauna Series*, **5**(Part-1): 65-87, Zoological Survey of India, Calcutta.