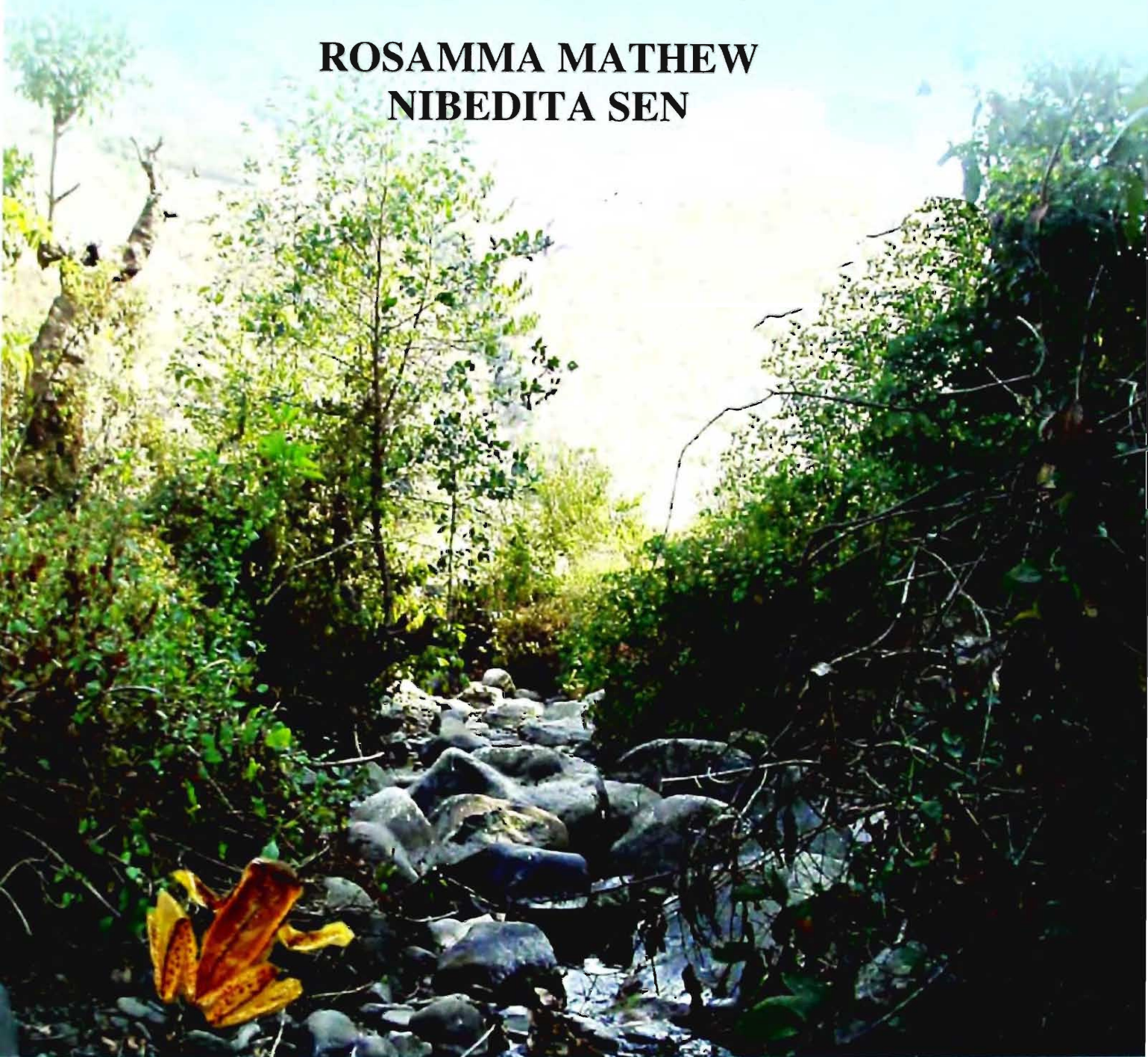


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Studies on little known Amphibian species of North East India

**ROSAMMA MATHEW
NIBEDITA SEN**



ZOOLOGICAL SURVEY OF INDIA

**RECORDS OF THE
ZOOLOGICAL SURVEY OF INDIA**

**Studies on little known Amphibian species
of North East India**

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INTRODUCTION

Amphibian fauna of India has been studied by a number of workers from mid nineteenth century. Leafing through literature we came across a number of publications on the Amphibian fauna of North East India (Ahmed, 2002; Ahmed and Dutta, 2000, 2001; Ahmed and Goswami, 1999; Annandale, 1912; Ao *et al.*, 2003; Bhaduri and Saha, 1980; Bora and Bordoloi, 2001; Bordoloi and Bora, 1999; Bordoloi *et al.*, 2000, 2001, 2003, 2007; Borthakur *et al.*, 2007; Boulenger, 1919; Chanda, 1990-1995, 2002, 2006, 2007; Chanda and Ghosh, 1989; Chanda and Sarkar, 1997; Chanda and Talukdar, 1973; Choudhury *et al.*, 1999, 2001; Das, 1984, 1988; Das and Chanda, 2000; Das *et al.*, 2004; Deuti and Dutta, 2002; Deuti *et al.*, 2000; Dey and Gupta, 1999, 2000; Dey and Ramanujam, 2003; Dutta *et al.*, 2000; Ghosh and Sarkar, 2000; Grosslet *et al.*, 2004; Hooroo *et al.*, 2002; Hora, 1923; Kiyasetuo and Khare, 1986, 1987; Mansukhani and Sarkar, 1981; Mansukhani *et al.*, 1976; Mathew and Sen, 2003, 2005, 2006, 2007, 2008; Mathew *et al.*, 2005; Ningombam and Bordoloi, 2007; Pathak *et al.*, 2001; Pillai and Chanda, 1973, 1976, 1977, 1979, 1981; Pillai and Yazdani, 1973; Roonwal and Kripalani, 1961; Saha and Gupta, 2007; Sahu, 1985; Sarkar and Ray, 2006, Sarkar and Sanyal, 1985; Sarkar *et al.*, 2002; Selim, 2001; Sen, 2004; Sen and Mathew, 2003, 2004, 2006; Sengupta *et al.*, 2001; Singh, 1995; Smith, 1929, 1935; Talukdar *et al.*, 2007; Yazdani and Chanda, 1971). The monographic work on the anurans of North East India by Chanda (1994) is by far the most comprehensive account on the amphibians of North East India. The monograph on Gymnophiona of India by Pillai and Ravichandran (1999) is yet another invaluable work which covers faunal elements of North East India.

While studying the amphibian species of North East India we came across a few species which were known only from the type descriptions of the late nineteenth or early or late twentieth century. Since no studies were directed towards searching these little known species we thought it worthwhile to search for these untraced species. Our target was twelve species of anurans and two species of caecilians which had their type locality in the North East namely *Gegeneophis fulleri*, *Ichthyophis husaini*, *Pedostibes kempi*, *Euphlyctis ghoshi*, *Limnonectes khasianus*, *Limnonectes mawlyndipi*, *Chirixalus doriae*, *Chirixalus shyamrupus*, *Kurixalus naso*, *Nyctixalus moloch*, *Philautus kempiae*, *Philautus namdaphaensis*, *Rhacophorus rhodopus* and *Rhacophorus tuberculatus*.

The Project was approved initially with three field surveys during the financial year 2005-06 (Assam and Arunachal Pradesh; Mizoram and Tripura; and Manipur). Two more surveys were sanctioned during 2006-07 (Mizoram and Arunachal Pradesh). The first survey under the project was to Assam and Arunachal Pradesh and was conducted between 27th May to 5th June 2005; the second survey to Mizoram and Tripura was conducted between 12th to 26th September 2005; the third survey was to Manipur and was conducted between 10th to 24th

February 2006. Mizoram was surveyed again in 2006, between 1st to 11th June 2006 and Arunachal Pradesh from 1st to 15th March 2007. It should be kept in mind that amphibian collections are best available during Monsoon. Therefore, the two surveys conducted in February and March did not yield the best results. It is also to be noted that amphibians are easily available after dusk. On and often movements are restricted after dusk in the study areas which had been a hindrance for collection. More materials from Meghalaya were collected whenever possible and any further addition to the Eastern Regional Station, Zoological Survey of India's (ERS/ZSI) holdings from other surveys was also studied. Besides these fresh material, we also studied the material deposited in the holdings of ERS/ZSI from earlier surveys.

The area of study lies between 21° 57' - 29° 27' N; 89° 42' - 97° 24' E and is part of the biological " hot spot " of the country. It includes the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura.

The climate ranges from temperate and mediterranean type (Meghalaya), moist and humid (Tripura), tropical monsoon- hot wet summer and cool dry winter (Arunachal Pradesh, Assam, Nagaland), moist tropical to moist subtropical (Mizoram), to Tropical and subtropical (Manipur).

Annual rainfall ranges from 1000 mm to 11,436 mm.

Vegetation of the area can be classified into Tropical Moist Deciduous, Semi Evergreen, Tropical Wet Evergreen, Tropical Moist Deciduous, Montane Wet Temperate, Subtropical Pine Forests, Subtropical Broadleaf, Tropical Wet Evergreen, Temperate Forests, Bamboo Forests, Subtropical Pine and Littoral and Swamp Forests (Plate I-II).

The project period, however, proved to be inadequate for the 'search' of these 'Little Known' species as we could collect only four species namely *Kurixalus naso*, *Philautus kempiae*, *Philautus namdaphaensis* and *Rhacophorus rhodopus* from the fourteen listed above. But in the process we added 30 species to the holdings of ERS/ZSI, Shillong including 11 new species and 2 new records for North-East India. The following is a comprehensive report.

Amphibian classification, of late, is undergoing rapid changes. Many taxa included in this work are known at present by different names as is evident from Frost (2008) (www.amnh.org). To avoid complications we have followed here the scientific names more commonly in use. Web formula followed is after Mathew and Sen (2005).

Under each species only original reference has been cited. The names with (*) denotes the new record from the region.

A key to the species has been provided wherever new species are described under different genera.

SYSTEMATIC LIST

Class AMPHIBIA

Order GYMNOPTERODONTA

Family CAECILIIDAE

01. *Gegeneophis fulleri* (Alcock, 1904)

Family ICHTHYOPHIIDAE

02. *Ichthyophis husaini* Pillai and Ravichandran, 1999.

Order ANURA

Family BUFONIDAE

03. *Bufo kiphirensis* sp.nov.

04. *Bufo mamitensis* sp.nov.

05. *Bufo manipurensis* sp.nov.

06. *Bufo mizoramensis* sp.nov.

07. *Bufo nagalandensis* sp.nov.

08. *Bufo scaber* Schneider, 1799*

09. *Bufo wokhaensis* sp.nov.

10. *Pedostibes kempfi* (Boulenger, 1919)

Family MEGOPHYRIDAE

11. *Xenophrys serchhipii* Mathew and Sen, 2007

12. *Xenophrys zunhebotoensis* Mathew and Sen, 2007

Family MICROHYLIDAE

13. *Micryletta inornata* (Boulenger, 1890)*

Family RANIDAE

14. *Euphlyctis ghoshii* (Chanda, 1990)

15. *Limnonectes khasianus* (Anderson, 1871)

16. *Limnonectes mawlyndipi* Chanda, 1990

Family RHACOPHORIDAE

17. *Chirixalus doriae* Boulenger, 1893

18. *Chirixalus senapatiensis* sp. nov.

19. *Chirixalus shyamrupus* (Chanda and Ghosh, 1989)

20. *Kurixalus naso* (Annandale, 1912)

21. *Nyctixalus moloch* (Annandale, 1912)

22. *Philautus garo* Boulenger, 1919

23. *Philautus manipurensis* sp. nov
24. *Philautus kempiae* (Boulenger, 1919)
25. *Philautus namdaphaensis* Sarkar and Sanyal, 1985
26. *Polypedates assamensis* sp. nov.
27. *Polypedates subansiriensis* sp. nov
28. *Rhacophorus rhodopus* Liu and Hu 1960
29. *Rhacophorus subansiriensis* sp. nov.
30. *Rhacophorus tuberculatus* (Anderson, 1871)

ABBREVIATION

SVL	Snout - vent length
HL	Head length (from posterior corner of mandible to tip of snout)
HW	Head width
IUE	Maximum distance between upper eyelids
EL	Eye length
TYD	Maximum tympanum diameter
TYE	Distance between tympanum and eye
IFE	Distance between anterior corner of eyes
IBE	Distance between posterior corner of eyes
EN	Distance from anterior corner of eye to nostril
MN	Distance from posterior corner of mandible to nostril
NS	Distance from nostril to tip of snout
SL	Distance from anterior corner of eye to tip of snout
IN	Internarial distance
MBE	Distance from posterior corner of mandible to posterior corner of eye.
MFE	Distance from posterior corner of mandible to anterior corner of eye.
LFL	Length of forelimb
LHL	Length of hind limb
TL	Tibia length
FL	Femur length
TRL	Length of tarsus
FOL	Foot length

FLL	Length of Forelimb (from elbow to base of outer palmar tubercle).
HAL	Hand length
PD	Minimum distance between parotids
RPL	Length of right parotid
LPL	Length of left parotid
RPW	Width of right parotid
LPW	Width of left parotid
FFL	Length of first finger
SFL	Length of second finger
TFL	Length of third finger
FHFL	Length of fourth finger
TL1	Length of first toe
TL2	Length of second toe
TL3	Length of third toe
TL4	Length of fourth toe
TL5	Length of fifth toe
IMT	Length of inner metatarsal tubercle.
OMT	Length of outer metatarsal tubercle
FFTF	Distance from maximum incurvation of web between 4 th and 5 th toe to tip of 4 th toe.
TFTF	Distance from maximum incurvation of web between 3 rd and 4 th toe to tip of 4 th toe.
MTFF	Distance from distal edge of metatarsal tubercle to maximum incurvation of web between 4 th and 5 th toe.
MTTF	Distance from distal edge of metatarsal tubercle to maximum incurvation of web between 3 rd and 4 th toe.
TTA	Tibio-tarsal articulation-measured by stretching the hind limb towards the head along the side of the body
INDEX	measurements in relation to SVL and expressed in thousand (e.g. index MN = 247 where MN is 18 mm, SVL is 73 mm)
ERS/ZSI	Eastern Regional Station, Zoological Survey of India.
NHPC	National Hydro-electric Power Corporation.

SYSTEMATIC ACCOUNT

Class AMPHIBIA

Order GYMNOPIHIONA

Family CAECILIIDAE

1. *Gegeneophis fulleri* (Alcock, 1904) (Plate III)

1904. *Herpele fulleri* Alcock, *Ann. Mag. Nat. Hist.*, **14** : 271, pl. 7.

Type Locality : Kuttal, 10 km south west of Silchar, Assam.

Location of the type : Zoological Survey of India, Kolkata. (No. ZSIC, 14759).

Material examined : None.

Diagnostic characters : Body increasing in girth gradually from head to terminus, with about 105 folds; vent transverse with a large unsegmented terminal shield behind it. Eyes not visible outside, tentacles behind and below nostril, tongue with two narial plugs. Skin profusely areolated.

Description of the type :

A small specimen measuring 220 mm. Front end of the body narrow (3 mm), gradually increasing in girth towards the hind end where it is 9 mm wide.

Head short (8 mm), snout long, pointed, shark-like, its tip exceeding the mouth. Eyes not visible, covered by skull bones. On removal of skin (as has already been done on one side of the specimen) the minute eye is visible lying under the bones. Nostril laterally placed. About half way between the nostril and eye, and below their level is the slightly elevated tentacle which is a little closer to nostril (1.2 mm) than to eye (1.5 mm) and is placed on a vertical line with the tip of the lower jaw.

The two collars are fairly clear. The first nuchal groove is visible on the throat and on the sides. The skin on the dorsum being damaged, the condition on the dorsal side could not be established. However, Alcock's figure shows that it is distinct dorsally also. Second nuchal groove, though faint could be seen meeting above. The third groove is more distinct and seen all around. Three short transverse dorsal grooves on the second collar, while the first has a single groove.

In all, there are 105 annuli on the body. The folds cross straight across both dorsally and ventrally. Terminal shield measures 1.5 mm and is wrinkled. Vent short, transverse with denticulations in front and behind. Area surrounding vent depressed in the form of a small basin. The five folds preceding the vent are close together.

Dentition : Only a few teeth are seen, the rest damaged. The lower jaw is also damaged and hangs loose. The dental formula given by Taylor (1968) is reproduced since the original

description by Alcock did not give the number of teeth. Premaxillary-Maxillary, 11-11, rather small, recurved, generally smaller than dentary series; prevomers, 5-1-5; palatines, 6-6; dentary, 10-10; the largest and splenials, 4-4.

The tongue is depressed not covering the splenial teeth. Narial plugs visible as bead-like elevations with a moat around. Choanae are placed far forward, close to the prevomeropalatine series of teeth.

Colour : Colour given by Alcock in 1904 is as follows: "Snout and lips yellowish; head light brown; the rest of the body chocolate brown, becoming almost black dorsally in its posterior part; the extreme edges of most of the rings are also blackish in most of their extent" Now the specimen is of a uniform chocolate brown with paler snout and lips.

Scales, according to Taylor (1968), are present for 8-10 folds prior to the beginning of the secondaries. The skin is profusely areolated. The wrong presumption of Alcock that the areolae corresponded with scales has been set right by Taylor as representing glands on the skin. Data and measurements are given in the table.

Distribution : Known only from the type locality namely Kuttal about 10 km south-west of Silchar, in Cachar, Assam, near its border with Manipur. The specimen was discovered in a miscellaneous collection of snakes.

Table of data and measurements on *Gegeneophis fulleri*.

	Type ZSIC Cachar
Total length	220
Head width	4
Snout length	3.1
Body width (Terminal)	9
Eye to tentacle	1.5
Tentacle to nostril	1.2
Eye to nostril	2.3
Snout tip to 1 st groove	8
Snout tip to 2 nd groove	10.5
Snout tip to 3 rd groove	14
Body folds	105
Premaxillary-maxillary	11-11
Prevomeropalatine	11-12
Dentary	10-10
Splenial	4-4

Remarks : Alcock (1904) describing this species originally included it under the genus *Herpele*. Taylor (1968) while reviewing the caecilians of the world has rightly transferred it to the genus *Gegeneophis* and has indicated its relationship to the south Indian species *Gegeneophis ramaswamii* Taylor.

No material of this species could be collected or studied. The description and remarks above are from Pillai and Ravichandran (1999).

Family ICHTHYOPHIIDAE

2. *Ichthyophis husaini* Pillai and Ravichandran, 1999
(Plate III)

1999. *Ichthyophis husaini* Pillai and Ravichandran, *Rec. zool. Surv. India. Occ. paper no. 172* : 36

Type locality : Garo Hills, Meghalaya.

Location of type : Zoological Survey of India, Madras.

Material examined : None

Diagnostic characters : A fairly large species measuring 285 mm; 297 primary and secondary folds of which 9 confined to tail; four folds interrupted by the longitudinal vent; beginning with the vent, the tail tapers to a pointed terminus; no lateral stripe; dorsum brown; venter lighter brown; collars not distinct; nostrils almost at the tip of snout; eyes distinct, small with a circular pale ring around it; body folds cross the dorsum straight across except the few anterior ones which curve forward in the mid dorsal line; ventrally they form backwardly directed angle except those on the last quarter of the body which are fairly straight ; near the vent and behind it, the folds gently arch forward mesially; scales present from the anterior to the hind end of the body.

Measurements of *Ichthyophis husaini*

Total length	285
Tail length	8
Head width	9
Snout length	6
Body width	11
Eye to tentacle	2
Tentacle to nostril	3.5
Eye to nostril	5
Eye to eye	6
Snout tip to 1 st groove	13.5
Snout tip to 2 nd groove	16.5

Snout tip to 3 rd groove	19
Body folds	297
Tail folds	9
Premaxillary-maxillary teeth	17-18
Prevomeropalatine	16-17
Dentary	14-14
Splénial	16-17

Distribution : Meghalaya.

Remark : No material of this species could be collected or studied. The description above is from Pillai and Ravichandran (1999).

Order ANURA

Family BUFONIDAE

The family Bufonidae comprising of true toads is one of the living amphibian families with the largest distribution, being naturally present on all Continents (except Australia and Antarctica) and most major islands. Dubois and Ohler (1999) gave an extensive account of the Asian and Oriental toads of the *Bufo melanostictus*, *Bufo scaber* and *Bufo stejnegeri* groups. Despite its wide distribution and high species diversity, this genus has until now resisted taxonomic splitting.

So far, the genus *Bufo* is represented by five species in North East India namely *B. himalayanus*, *B. macrotis*, *B. melanostictus*, *B. stomaticus* and *B. stuarti*. During the present study, a good number of *Bufo* specimens mainly belonging to the *melanostictus* group were collected from North Eastern States. This included a single specimen of *Bufo scaber* Schneider, 1799, which is being recorded for the first time from North East India.

Detailed examination of the remaining collections revealed many characters of differences among them and also from the already established *Bufo melanostictus* group of species. We have provided a key to separate the species of *melanostictus* group and have described the new taxa assigning differentiating characters to them. The affinities and dissimilarities are expressed in indices and presented in Table for each species.

Key to the species of the genus *Bufo* occurring in North East India

1. Cranial ridges present 2
- Cranial ridges weak or absent 9
2. Cranial ridges black edged 3
- Cranial ridges not black edged 4

3. Snout tip between ridges tuberculated *manipurensis* sp. nov.
 Snout tip between ridges not tuberculated 5
4. Cranial ridges and warts on body white 6
 Cranial ridges and warts on body concolorous 7
5. Tympanum $\frac{2}{3}$ rd the eye diameter *melanostictus*
 Tympanum small, indistinct *himalayanus*
6. Nostril equidistant to eye and snout tip *wokhaensis* sp. nov.
 Nostril closer to snout *nagalandensis* sp. nov.
7. Chest with black round blotches at the shoulder level *mamitensis* sp. nov.
 Chest without black round blotches at the shoulder level 8
8. Body thickly covered with tubercles, toes $\frac{2}{3}$ rd webbed *kiphirensis* sp. nov.
 Body sparsely tuberculated, toes $\frac{1}{3}$ rd webbed *mizoramensis* sp. nov.
9. Cranial ridges weak, parotids small, round 10
 Cranial ridges absent, parotids elongate 11
10. Tympanum $\frac{1}{2}$ the eye diameter *scaber*
 Tympanum equal the eye diameter *macrotis*
11. Snout prominent, canthal ridges sharp *stuarti*
 Snout slightly pointed, truncate between nostrils, Canthal ridges not sharp
 *stomaticus*

3. *Bufo kiphirensis* sp. nov.

(Plate IV)

Material examined : 1 ex.(HOLOTYPE), Reg. No. VA/ERS/ZSI/794, Kiphire GA Rest House compound, Kiphire town, Kiphire district, Nagaland (N 25° 53' 33.9" E 94° 47' 5.5"), Alt.1190 m above msl, 15.9.2006, Coll. R. Mathew and party.

Description of Holotype :

Diagnostic characters : Cranial ridges distinct, colouration of warts and cranial ridges same as the colour of the body; body thickly covered with tubercles; tubercles on dorsum large, uniquely rosette; toes $\frac{2}{3}$ rd webbed.

Dorsum dark brown all over; ventrally paler; body fully covered with various sizes of warts and tubercles, some with pointed spines mostly on posterior side and on limbs; four pairs of roundish vertebral warts anteriorly.

Head broader than long (HW 27 mm, HL 20 mm, MN 18 mm, MFE 14.5 mm, MBE 9 mm); interorbital width broader than inter narial space (IUE 6.5 mm , IN 5 mm); tympanum large, about 70% of eye diameter (TYD 5 mm, EL 7 mm); distance between front of eye more than half of distance between back of eye (IFE 11 mm, IBE 19 mm); snout longer than eye diameter (SL 10.5 mm , EL 7 mm), snout tip tuberculated; cranial ridges prominent; nostril closer to eye than snout tip (NS 5 mm, EN 4 mm) ; tympanum vertically elongate; parotid long, reniform; tongue moderate, oval.

Forelimb moderate; strong, shorter than hand (FLL 16 mm, HAL 18mm); fingers moderate (FFL 13 mm, SFL 12 mm, TFL 19 mm FHFL 15); subarticular tubercles on digits double; palmar tubercles light brown; digit tips swollen.

Hind limbs moderate; tibia slightly shorter than femur (TL 28 mm, FL 29 mm); toes moderate (TL1- 7 mm, TL2- 11.5 mm, TL3- 17.5 mm, TL4- 27mm, TL5- 20mm); metatarsal tubercles light brown, inner metatarsal longer than outer metatarsal tubercle (IMT 3 mm , OMT 1.7 mm); TTA reaches up to the middle of parotid; toes 2/3rd webbed (FFTF 12 mm, TFTF 11 mm, MTFF 14 mm, MTTF 14 mm).

Web formula I 0-1 II 0-1 III 1-2 IV 2-1 V

Measurements (in mm) of *Bufo kiphirensis* sp. nov.

	Holotype		Holotype
SVL	73	FL	29
HL	20	TRL	19
HW	27	FOL	26
IUE	6.5	FLL	16
EL	7	HAL	18
TYD	5	PD	11
IFE	11	RPL	17
IBE	19	RPW	7
EN	4	LPL	17
MN	18	LPW	8.5
NS	5	FFL	13
SL	10.5	SFL	12
IN	5	TFL	19
MBE	9	FHFL	15
MFE	14.5	TL1	7
TL	28	TL2	11.5

	Holotype		Holotype
TL3	17.5	FFTF	12
TL4	27	TFTF	11
TL5	20	MTFF	14
IMT	3	MTTF	14
OMT	1.7		

Bufo kiphirensis shows affinity towards *B. mizoramensis* in HL, HW, EL, TYD, IFE, NS, MBE, MFE, FLL, SFL, FHFL and IMT. It differs from *B. mizoramensis* in MN, TL, FL, TRL, FOL, HAL, PD, RPL, RPW, LPL, LPW, FFL, TFL, TL1-4, OMT, FFTF and TFTF. Further, in *B. kiphirensis* body is thickly tuberculated and toes are 2/3rd webbed whereas in *B. mizoramensis* body is sparsely tuberculated and toes are 1/3rd webbed. Nostril is closer to eye in *B. kiphirensis* and in *B. mizoramensis* nostril is closer to snout.

Bufo kiphirensis shows affinity towards *B. mamitensis* in IBE, EN, MN, MBE, HAL, PD, RPW, SFL, IMT, OMT, FFTF and TFTF. *B. kiphirensis* differs from *B. mamitensis* in EL, SL, TL, FL, TRL, RPL, LPL, TFL, FHFL, MTFF, MTTF. Further, in *B. kiphirensis* tibia length is less than femur length; there are no blotches on chest and nostril is closer to eye whereas in *B. mamitensis* tibia length is more than femur length; two distinct blotches present on chest and nostril is equidistant to eye and snout.

Bufo kiphirensis shows affinity towards *B. wokhaensis* in HL, TYD, MBE, MFE, TRL, HAL, RPW and LPL. It differs from *B. wokhaensis* in HW, IFE, SL, TL, RPL, TFL, FHFL and OMT. Cranial ridges and warts are concolorous to body and the pattern of warts in *B. kiphirensis* is unique whereas ridges and warts are white in *B. wokhaensis*; nostril is closer to eye in *B. kiphirensis* whereas in *B. wokhaensis* it is equidistant to eye and snout.

Bufo kiphirensis shows affinity towards *B. nagalandensis* in HW, IFE, MN, NS, IN, RPW, LPL and FHFL. It differs from *B. nagalandensis* in EL, EN, SL, FL, FOL, FLL, PD, LPW, FFL, TL 4, IMT, OMT, FFTF and TFTF. It also differs in the colouration of warts and cranial ridges which are white in *B. nagalandensis* and in the position of nostril which is closer to snout in *B. nagalandensis*.

Bufo kiphirensis shows affinity towards *B. manipurensis* in HL, MFE, FL, PD, RPL, RPW and TFTF. It differs from *B. manipurensis* in EL, IBE, MN, NS, SL, TL, TRL, FOL, HAL, TFL, OMT, MTFF and MTTF (Table of indices). In *B. manipurensis* cranial ridges are black and nostril is closer to snout.

Bufo kiphirensis shows affinity towards *B. melanostictus* and *B. himalayanus* in the possession of the cranial ridges. It however differs from them in having (i) the cranial ridges and warts concolorous to the body; (2) larger tympanum, (3) body thickly covered with tubercles; 4) tubercles on dorsum large, **uniquely rosette** and (5) toes 2/3rd webbed.

Etymology : The specimen is named after the district from where it was collected.

Distribution : Nagaland.

4. *Bufo mamitensis* sp. nov.
(Plate V)

Material examined : 1 ex. (HOLOTYPE), Reg. No. VA/ERS/ZSI/795, Mausen, Mamit district, Mizoram, (N 23° 54' 29.1" E 92° 27' 24.4"), Alt. 350m above msl, 3.12.2006, Coll. R. Mathew and party.

Description of the Holotype :

Diagnostic characters : Cranial ridges distinct, not black edged; the colour of ridges and warts concolorous to the body; chest with black round blotches at the shoulder level.

Dorsum dark brown; belly paler; four pairs of vertebral warts anteriorly; chest with dark, round blotches at shoulder level; warts on body moderate, round/conical, of various sizes; flanks and limbs with smaller warts.

Head broader than long (HW 35 mm, HL 26 mm, MN 22 mm, MFE 17 mm, MBE 11 mm.); inter orbital width broader than inter narial space (IUE 9 mm, IN 5 mm); tympanum large, about 81% of eye diameter (TYD 7 mm, EL 11 mm); distance between front of eye is more than half of distance between back of eye (IFE 12 mm, IBE 23 mm); nostril equidistant to eye and tip of snout (EN 5 mm, NS 5 mm); tip of snout between ridges minutely tuberculated; tympanum almost round; tongue short, broad, subround.

Forelimbs moderate, strong, shorter than hand (FLL 21 mm, HAL 22 mm); fingers moderate (FFL15 mm, SFL 14 mm, TFL 20 mm, FHFL 16.5 mm); 1st and 2nd fingers close to each other; similarly 3rd and 4th fingers close to each other.

Hind limbs moderate; tibia longer than femur (TL 37 mm, FL 31 mm); toes moderate (TL1-9 mm, TL2-14.5 mm , TL3- 22 mm, TL4- 33 mm, TL5- 23.5 mm); inner metatarsal tubercle longer than outer metatarsal tubercle (IMT 4.5 mm, OMT 2.5 mm); TTA reaches tympanum ; toes webbed (FFTF 15 mm, TFTF 13.5 mm, MTFF 22 mm, MTTF 20 mm).

Web formula I 0-1 II 0-2 III 0-2½ IV 3-0 V.

Measurements (in mm) of *Bufo mamitensis* sp. nov.

	Holotype		Holotype
SVL	90	EL	11
HL	26	TYD	7
HW	35	IFE	12
IUE	9	IBE	23

	Holotype		Holotype
EN	5	LPW	9.5
MN	22	FFL	15
NS	5	SFL	14
SL	11	TFL	20
IN	5	FHFL	16.5
MBE	11	TL1	9
MFE	17	TL2	14.5
TL	37	TL3	22
FL	31	TL4	33
TRL	19	TL5	23.5
FOL	33	IMT	4.5
FLL	21	OMT	2.5
HAL	22	FFTF	15
PD	13	TFTF	13.5
RPL	18	MTFF	22
RPW	8	MTTF	20
LPL	18		

Bufo mamitensis shows affinity towards *B. mizoramensis* in IUE, NS, SL, MBE, MFE, FLL and IMT. It differs from the latter in EL, IFE, IBE, MN, IN, TL, FL, TRL, FOL, HAL, PD, RPW, LPW, FFL, TFL, TL1-5, FFTF, TFTF and MTFF. Nostrils are equidistant to eye and snout in *B. mamitensis* and these are closer to snout in *B. mizoramensis*; further tibia length is more than femur length in *B. mamitensis* whereas tibia length is less than femur length in *B. mizoramensis*.

Bufo mamitensis shows affinity towards *B. nagalandensis* in HL, IUE, TYD, MN and SL. It differs in EL, EN, MFE, TL, FL, TRL, FOL, FLL, PD, RPL, LPL, TFL, FHFL, TL4-5, IMT, OMT, FFTF, TFTF and MTFF. Further eyes are closer to snout and tibia length is less than femur length in *B. nagalandensis*.

Bufo mamitensis shows affinity towards *B. wokhaensis* in IUE, EN, MN, NS, SL, IN, MBE, FOL, FLL, HAL and IMT. It differs from *B. wokhaensis* in HL, HW, TL, FL, TRL, PD, LPL, TFL, MTFF and MTTF. Further in *B. mamitensis* body is moderately tuberculated; cranial ridges and warts are concolorous to body; TTA reaches tympanum; chest with 2 prominent blotches; tibia length is more than femur length whereas in *B. wokhaensis* body is thickly tuberculated; cranial ridges and warts are white; TTA reach parotid glands; no blotches on chest and tibia length is less than femur length.

Bufo mamitensis shows affinity towards *B. manipurensis* in IUE, EL, SL, IN, MBE, FLL, PD, IMT and TFTF. It differs from *B. manipurensis* in HW, TYD, IFE, IBE, MN, TL, FL, TRL, HAL, RPL, LPL, TL5, OMT and MTTF (Table of indices). Further in *B. mamitensis* cranial ridges are concolorous to body; nostril equidistant to eye and snout; tympanum almost round and tongue short, broad, subround and tibia length more than femur length, whereas in *B. manipurensis* cranial ridges are black; nostrils are closer to snout; tympanum is vertically oval ; tongue is elongate and tibia length is less than femur length.

Comparisons are drawn between *B. mamitensis* and *B. kiphirensis* under the description of *B. kiphirensis*

B. mamitensis shows affinity to *B. melanostictus* and *B. himalayanus* in the possession of the cranial ridges. It however differs from them in having the (1) Cranial ridges not black edged; (2) the colour of ridges and warts concolorous to the body, (3) large tympanum and (4) chest with black round blotches at the shoulder level.

Etymology : The specimen is named after the district from where it was collected.

Distribution : Mizoram.

5. *Bufo manipurensis* sp. nov.

(Plate VI)

Material examined : 1 ex. (male) (HOLOTYPE), Reg.No.VA/ERS/ZSI/ 796; 1ex.(male) (PARATYPE) Reg.No.VA/ERS/ZSI/ 797, Chakpi river, Penthakhuwphuw village, Chandel district, Manipur, (N. 24° 19' 08.3" E 94° 01' 50.3"), Alt. 906 m above msl, 18.2.2006, Coll. R. Mathew and party.

Description of the Holotype :

Diagnostic characters : Cranial ridges distinct and narrow; snout tip between ridges tuberculated.

Dorsum dark brown; jaws and limbs barred; snout tip with few tubercles, not thickened; 3 pairs of vertebral warts on the anterior part; dorsum with black tipped, round and conical tubercles and warts of various sizes; warts on limbs smaller, some of them spiny; body short, stumpy.

Head broader than long (HW 17mm, HI 13mm, MN 13.5 mm, MFE 9.5mm, MBE 6 mm); interorbital width broader than inter narial space (IUE 5 mm, IN 2.5 mm); tympanum moderate, vertically oval , about 42% of eye diameter (TYD 2.5 mm, EL 6 mm); distance between front of eye almost half the distance between back of eye (IFE 7.5 mm, IBE 14 mm); snout pointed, shorter than eye diameter (SL 5.5 mm, EL 6 mm); nostril closer to tip of snout (NS 2mm, EN 3 mm); parotid glands elongated, somewhat reniform; tongue elongate.

Forelimbs short, moderate, shorter than hand (FLL 11 mm, HAL 12.5 mm); fingers free;

1st finger longer than 2nd (FFL 8 mm, SFL 7 mm, TFL 11 mm, FHFL 9 mm) ; digit tips blunt; meta carpal tubercles not black; subarticular tubercles double.

Hind limbs short, moderate; tibia shorter than femur (TL 16 mm, FL 19 mm); toes moderate (TL 1- 5mm, TL2- 8 mm, TL3- 11 mm, TL 4-18 mm, TL5- 13.5 mm); metatarsal tubercles distinct, not black; inner and outer metatarsal tubercles are subequal (IMT 2.5 mm, OMT 2.5 mm); TTA reaching posterior end of parotid; toes webbed (FFTF 7 mm, TFTF 7 mm, MTFF 12 mm, MTTF 12 mm).

Web formula **I** 0-1 **II** 0-1 **III** 1-2½ **IV** 2½-0 **V**.

Paratype (Male) Reg. no.V/A/ERS/ZSI/797 : The paratype measuring 45 mm is similar to the holotype in the other morphological characters.

Measurements (in mm) of *Bufo manipurensis* sp. nov.

	Holotype (male)	Paratype (male)		Holotype (male)	Paratype (male)
SVL	47	45	PD	7	8.5
HL	13	13	RPL	11	10
HW	17	16	RPW	4.5	5.0
IUE	5	4	LPL	10.5	11
EL	6	6	LPW	5	5.5
TYD	2.5	2.5	FFL	8	7.5
IFE	7.5	7	SFL	7	7
IBE	14	13	TFL	11	12
EN	3	3	FHFL	9	8
MN	13.5	10.5	TL1	5	4.5
NS	2	2	TL2	8	7
SL	5.5	5	TL3	11	11
IN	2.5	3	TL4	18	17.5
MBE	6	6	TL5	13.5	13
MFE	9.5	9.5	IMT	2.5	2.0
TL	16	15	OMT	2.5	2.0
FL	19	20.5	FFTF	7	7.5
TRL	11	10	TFTF	7	7.5
FOL	18	18	MTFF	12	10
FLL	11	10	MTTF	12	10
HAL	12.5	12			

Bufo manipurensis shows affinity towards *B. melanostictus* and *B. himalayanus* in having cranial ridges black edged but can be differentiated by its tuberculated snout tip; narrow cranial ridge; shorter tibia, tarsus, fingers and toes ; shorter distance between parotid glands and an elongate tongue.

Bufo manipurensis shows affinity towards *B. mizoramensis* in HL, IUE, IFE, EN, MN, MBE, MFE. It differs from the latter in EL, IBE, IN, TL, FL, TRL, PD, RPL, RPW, LPW, FFL, TL 2-4, FFTF, TFTF, MTFF and MTTF. In *B. mizoramensis* cranial ridges are concolorous to body and snout tip is thickly tuberculated.

Bufo manipurensis shows affinity towards *B. nagalandensis* in IUE, SL, MBE, MFE, HAL and OMT. It differs from the latter in EL, TYD, IBE, EN, MN, NS, IN, TL, FL, FLL, PD, TFL, IMT, FFTF, TFTF, MTFF and MTTF.

Bufo manipurensis shows affinity towards *B. wokhaensis* in IUE, EN, SL, MBE, MFE, FLL and IMT. It differs from the latter in EL, IFE, IBE, MN, TL, FL, TRL, HAL, PD, RPL, TL3-4, FFTF, MTFF and MTTF (Table of indices).

Comparison of *B. manipurensis* with *B. kiphirensis* and *B. mamitensis* is shown under the description of respective species.

Etymology : The specimen is named after the state from where it was collected.

Distribution : Manipur.

6. *Bufo mizoramensis* sp. nov. (Plate VII)

Material examined : 1 ex. (Male) (HOLOTYPE), Reg.No. VA/ERS/ZSI/798, Rekdekon village, Kolasib district, Mizoram (N 23° 53' 41.2" E 92° 40' 53.7"), Alt. 890 m above msl, 26.9.2005, Coll. R. Mathew and party.

Description of the Holotype :

Diagnostic characters : Cranial ridges distinct, not black edged, concolorous to body; body sparsely tuberculated; toes 1/3rd webbed.

Dorsum grayish brown with lighter brownish warts, venter paler; anteriorly four pairs of vertebral warts of moderate size; elsewhere the warts are of different sizes, round, conical and spinous; smaller ones towards the sides and limbs; cranial ridges, warts and parotids concolourous with the body; ventrally granulated.

Head broader than long (HW 22 mm, HL 16mm, MN 16.5 mm, MFE 11.5 mm, MBE 7.5 mm); inter orbital width broader than inter narial space (IUE 6 mm, IN 4.5 mm); tympanum moderate, 67% of eye diameter (TYD 4 mm, EL 6 mm); distance between front of eye more than half the distance between back of eye (IFE 9 mm, IBE 16 mm); snout longer than eye diameter (SL 7.5 mm, EL 6 mm); snout tip dark, thickened with smooth warts; cranial ridges

not black; nostril closer to snout (NS 3.5 mm, EN 4 mm); jaws banded; tympanum distinct, vertically elongated; tongue oval.

Forelimbs slender, shorter than hand (FLL 13 mm, HAL 16 mm); faint bands on limbs; digit with swollen tips; fingers slender (FFL 7 mm, SFL 9.5 mm, TFL 14 mm, FHFL 11.5 mm).Hind limbs moderate, tibia shorter than femur (TL 25 mm, FL 28 mm); toes moderate (TL 1-7 mm, TL 2-11, TL 3-16 mm, TL4-24 mm, TL5-16.5 mm); inner and outer metatarsal tubercles subequal (IMT 2.5 mm, OMT 2.5 mm) ; TTA reaches middle of parotid; toes webbed (FFTF 11 mm, TFTF 11 mm, MTFF 12 mm, MTTF 12 mm)

Web formula : I 1-1 II ½-1½ III 1-2¾ IV 3-1 V

Measurements (in mm) of *Bufo mizoramensis* sp. nov.

	Holotype		Holotype
SVL	58	PD	11.5
HL	16	RPL	11
HW	22	RPW	4
IUE	6	LPL	12
EL	6	LPW	5
TYD	4	FFL	7
IFE	9	SFL	9.5
IBE	16	TFL	14
EN	4	FHFL	11.5
MN	16.5	TL1	7
NS	3.5	TL2	11
SL	7.5	TL3	16
IN	4.5	TL4	24
MBE	7.5	TL5	16.5
MFE	11.5	IMT	2.5
TL	25	OMT	2.5
FL	28	FFTF	11
TRL	17	TFTF	11
FOL	23	MTFF	12
FLL	13	MTTF	12
HAL	16		

Bufo mizoramensis shows affinity towards *B. nagalandensis* in HW, IUE, IBE, SL, IN, FOL, MTFF and MTTF. It differs from the latter in EL, EN, MN, TL, FL, TRL, FLL, RPL, RPW, LPL, FFL, TL_{2,3} and IMT. Body is sparsely tuberculated, snout tip thickly tuberculated and cranial ridges are concolorous to the body in *B. mizoramensis* whereas in *B. nagalandensis* body is thickly tuberculated, snout tip not tuberculated and cranial ridges are white.

Bufo mizoramensis shows affinity towards *B. wokhaensis* in IUE, TYD, NS, MFE, OMT. It differs from the latter in HW, IFE, IBE, MN, TL, FL, TRL, FOL, HAL, PD, LPL, LPW, FFL, FHFL, TL_{2,3,4} and TFTF (Table of indices). Further, in *B. wokhaensis*, body is thickly tuberculated, nostrils equidistant to eye and snout and cranial ridges and warts are white.

Comparison of *B. mizoramensis* with *B. kiphirensis*, *B. mamitensis* and *B. manipurensis* are shown under the description of respective species.

B. mizoramensis shows affinity towards *B. melanostictus* and *B. himalayanus* in the possession of cranial ridges. It however can be differentiated from them in having the (1) Cranial ridges distinct, not black edged, (2) ridges and warts concolorous to body; (3) body sparsely tuberculated and (4) toes 1/3rd webbed.

Etymology : The specimen is named after the State from where collected.

Distribution : Mizoram.

7. *Bufo nagalandensis* sp. nov. (Plate VIII)

Material examined : 1 ex.(HOLOTYPE) Reg.No: VA/ERS/ZSI/799, Wokha Rest House Compound, Wokha district, Nagaland (N 26° 6' 20.4" E 94° 15' 24.2"), Alt. 1366 m above msl, 19.9.2006, Coll. R. Mathew and party.

Description of Holotype :

Diagnostic characters : Cranial ridges and warts white; nostril closer to snout.

Dorsum dark brown, venter paler; dorsum with various sizes of warts and tubercles; some warts and tubercles with pointed spines mainly on posterior side of body and limbs; 4 pairs of vertebral warts anteriorly; warts and tubercles not black tipped.

Head broader than long (HW 18 mm, HL 14 mm, MN 12 mm, MFE 10 mm, MBE 6.5 mm); interorbital width broader than inter narial space (IUE 5 mm, IN 3.5 mm); tympanum small, about 53 % of eye diameter (TYD 4 mm, EL 7.5); distance between front of eye slightly more than half the distance between back of eye (IFE 7 mm, IBE 13 mm); snout shorter than eye diameter (SL 6 mm, EL 7.5); upper eyelid warty, cranial ridges prominent; nostril closer to snout (NS 3.5 mm, EN 5 mm); a pair of tubercles between anterior part of eyes; tympanum vertically elongate; parotid elongate, reniform; tongue medium, oval.

Forelimbs moderate, longer than hand (FLL 13.5 mm, HAL 12.5 mm); fingers free (FFL 7.5 mm, SFL 7.5 mm, TFL 12 mm, FHFL 10 mm); subarticular tubercles double.

Hindlimbs moderate; tibia shorter than femur (TL 19 mm, FL 22 mm), toes moderate (TL1-5 mm, TL2-7.5 mm, TL3-11 mm, TL4-19 mm, TL5-13.5 mm); inner metatarsal tubercle longer than outer metatarsal tubercle (IMT 4 mm, OMT 2.5 mm); TTA reaching middle of parotid; digit tips not black, rather brown; toes webbed (FFTF 10 mm, TFTF 10 mm, MTFF 10 mm, MTTF 10 mm).

Web formula : I 0-1 II 0-1 III 1-2½ IV 2½ -0 V

Measurements (in mm) of *Bufo nagalandensis* sp. nov.

	Holotype		Holotype
SVL	48	PD	9
HL	14	RPL	12
HW	18	RPW	4.5
IUE	5	LPL	11
EL	7.5	LPW	4.5
TYD	4	FFL	7.5
IFE	7	SFL	7.5
IBE	13	TFL	12
EN	5	FHFL	10
MN	12	TL1	5
NS	3.5	TL2	7.5
SL	6	TL3	11
IN	3.5	TL4	19
MBE	6.5	TL5	13.5
MFE	10	IMT	4
TL	19	OMT	2.5
FL	22	FFTF	10
TRL	12	TFTF	10
FOL	19	MTFF	10
FLL	13.5	MTTF	10
HAL	12.5		

Bufo nagalandensis shows affinity towards *B. wokhaensis* in IUE, SL, MBE, MFE, TRL and OMT. It differs from the latter in HL, HW, EL, IFE, IBE, EN, TL, FL, FOL, FLL, PD, RPL, FHFL, TL3,4, FFTF and TFTF (Table of indices). Further in *B. nagalandensis* nostrils

are closer to snout whereas in *B. wokhaensis* nostrils are equidistant to eye and snout; toes are more webbed in *B. nagalandensis* and less in *B. wokhaensis*.

Comparison of *B. nagalandensis* with *B. kiphirensis*, *B. mamitensis*, *B. manipurensis* and *B. mizoramensis* is shown under the description of respective species.

Bufo nagalandensis shows affinity towards *B. melanostictus* and *B. himalayanus* in the possession of cranial ridges. It however differs from them in having (1) Cranial ridges and warts white, (2) less warts and tubercles.

Etyymology : The specimen is named after the state from where collected.

Distribution : Nagaland.

*8. *Bufo scaber* Schneider, 1799
(Plate X)

Material examined : 1 ex. (SVL 27 mm), Reg. no. VA/ERS/ZSI/806, Moreh Ward number 1, from a partly dried up stream flowing downwards to Menon river flowing towards Myanmar, Moreh, Chandel District, Manipur, (N 24° 14' 17.8" E 94° 18' 03.0"), Alt. 171m above msl, 22.2.2006, Coll. R. Mathew and party.

Diagnostic characters :

Snout somewhat smooth; lateral sides of head without warts; skin between eyes, eyelids and the region behind eye with round and conical warts; back and flanks with round (smoothened, small and large) and conical warts; limbs covered with warts and spines; ventrally with smaller warts; dorsum light brown, ventrally whitish.

Head broader than long; cranial ridges not very prominent; snout rounded, protruding, its length shorter than eye diameter; canthus rostralis not sharp; loreal region concave; inter orbital space flat, less than eye diameter; nostrils rounded, closer to tip of snout ; tympanum half the eye diameter; tympanum-eye distance less than half tympanic diameter; parotid glands very prominent, round, not warty or spiny but thickened and somewhat uneven; tongue elongate; supratympanic fold absent.

Forelimbs moderate; tips of fingers round, not dilated; subarticular tubercles prominent, double; a single prominent round palmar tubercle; palm and fingers with many tubercles; relative length of fingers from shortest to longest, II < IV < I < III.

Hind limbs moderate; toe tips round, not dilated; subarticular tubercles prominent; inner metatarsal tubercle oval, prominent; outer metatarsal tubercle roundish oval; relative length of toes from shortest to longest I < II, V < III < IV; toes webbed.

Web formula : I ½- 1/3 II 0-¼ III 0-¼ IV ¼-½ V

Habitat notes : This specimen was literally dug out from the dried up stream bed in the early spring. Other species collected in the similar way from the same spot were *Micryletta*

inornata and *Hoplobatrachus tigerinus*. The collection spot was shaded by vegetation and undisturbed.

Measurements (in mm) of *Bufo scaber*

	Holotype		Holotype
SVL	27	LPL	03
HL	8	LPW	03
HW	10	FFL	04.3
IUE.	3.5	SFL	04
EL	04	TFL	06
TYD	02	FHL	04
IFE	03	TL1	03
IBE	08	TL2	04
EN	02	TL3	06
NS	1.5	TL4	09
SL	03	TL5	06
IN	02	IMT	1
TL	11.5	OMT	1
FL	11.75	FFTF	4
FOL	15	TFTF	4
RPL	03	MTFF	5
RPW	03	MTTF	5

Remarks : The species is recorded for the first time from North East India. Therefore a detailed description along with habitat notes of the species is included.

Distribution : Manipur

9. *Bufo wokhaensis* sp. nov
(Plate IX)

Material examined : 1 ex. (HOLOTYPE), VA/ERS/ZSI/800, Wokha Rest House compound, Wokha district, Nagaland (N26° 6' 20.4" E 94° 15' 24.2"), Alt. 1366 m above msl, 19.9.2006, Coll. R. Mathew and party.

Description of Holotype :

Diagnostic characters : Cranial ridges and warts white; nostril equidistant between eye and snout.

Dorsum brown, fully covered with warts and tubercles of various sizes; eight pairs of large, round vertebral row of warts from parotid region to groin; ventrally lighter; throat and chest speckled with brown; body stout.

Head depressed, much broader than long (HW 32 mm, HL 24.5 mm, MN 22 mm, MFE 18 mm, MBE 18 mm); cranial ridges white, very prominent; inter orbital width much broader than inter narial space (IUE 9.5 mm, IN 5.5 mm); tympanum large, about 65 % of eye diameter (TYD 6.5 mm, EL 10 mm); distance between front of eye less than half the distance between back of eye (IFE 11 mm, IBE 23 mm); snout longer than eye diameter (SL 11 mm, EL 10mm); nostril equidistant to eye and snout tip (NS 5.5 mm, EN 5.5 mm); jaws white; tympanum vertically oval, brown; parotid glands elongate, perforated; tongue short, subround.

Forelimbs moderate; shorter than hand (FLL 21 mm, HAL 22.5 mm); fingers moderate, 1st finger longer than 2nd (FFL 16 mm, SFL 15 mm, TFL 22 mm, FHFL 16.5 mm); subarticular tubercles on digits double; palmar tubercles white.

Hind limbs short, stout; tibia shorter than femur (TL 28 mm, FL 35 mm); toes moderate (TL1-10 mm, TL2-15 mm, TL3- 23.5 mm, TL4-33 mm, TL5-25 mm); subarticular tubercles on digits single; metatarsal tubercles white; inner metatarsal tubercle longer than outer metatarsal tubercle (IMT 5 mm, OMT 4 mm); heels just touching when hind limbs folded at right angles to the body; TTA reach parotid; toes webbed (FFTf 16.5 mm, TFTf 15 mm, MTFF 18 mm, MTTF 18 mm).

Web formula: I 0-1 II 0-1 $\frac{3}{4}$ III 1-2 $\frac{1}{3}$ IV 2 $\frac{1}{2}$ -0 V.

Measurements (in mm) of *Bufo wokhaensis* sp. nov.

	Holotype		Holotype
SVL	92	MBE	11.5
HL	24.5	MFE	18
HW	32	TL	28
IUE	9.5	FL	35
EL	10	TRL	24
TYD	6.5	FOL	34
IFE	11	FLL	21
IBE	23	HAL	22.5
EN	5.5	PD	15.5
MN	22	RPL	18
NS	5.5	RPW	9
SL	11	LPL	21
IN	5.5	LPW	10

TABLE OF INDICES FOR *BUFO* SPECIES
(All measurements are given as per thousands of SVL)

Characters	<i>Bufo kiphirensis</i>	<i>Bufo mamitensis</i>	<i>Bufo manipurensis</i>	<i>Bufo mizoramensis</i>	<i>Bufo nagalandensis</i>	<i>Bufo wokhaensis</i>
HL	274	289	277	276	292	266
HW	370	389	362	379	375	348
IUE	89	100	106	103	104	103
EL	96	122	128	103	156	109
TYD	68	78	53	69	83	71
IFE	151	133	160	155	146	120
IBE	260	256	298	276	271	250
EN	55	56	64	69	104	60
MN	247	244	287	284	250	239
NS	68	56	43	60	73	60
SL	144	122	117	129	125	120
IN	68	56	53	78	73	60
MBE	123	122	128	129	135	125
MFE	199	189	202	198	208	196
TL	384	411	340	431	396	304
FL	397	344	404	483	458	380
TRL	260	211	234	293	250	261
FOL	356	367	383	397	396	370
FLL	219	233	234	224	281	228
HAL	247	244	266	276	260	245
PD	151	144	149	198	188	168
RPL	233	200	234	190	250	196
RPW	96	89	96	69	94	98
LPL	233	200	223	207	229	228
LPW	116	106	106	86	94	109
FFL	178	167	170	121	156	174
SFL	164	156	149	164	156	163
TFL	260	222	234	241	250	239
FHFL	205	183	191	198	208	179
TL1	96	100	106	121	104	109
TL2	158	161	170	190	156	163
TL3	240	244	234	276	229	255
TL4	370	367	383	414	396	359
TL5	274	261	287	284	281	272
IMT	41	50	53	43	83	54
OMT	23	28	53	43	52	43
FFTF	164	167	149	190	208	179
TFTF	151	150	149	190	208	163
MTFF	192	244	255	207	208	196
MTTF	192	222	255	207	208	196

	Holotype		Holotype
FFL	16	TL5	25
SFL	15	IMT	5
TFL	22	OMT	4
FHFL	16.5	FFTF	16.5
TL1	10	TFTF	15
TL2	15	MTFF	18
TL3	23.5	MTTF	18
TL4	33		

Comparison of *B. wokhaensis* with *B. kiphirensis*, *B. mamitensis*, *B. manipurensis*, *B. mizoramensis* and *B. nagalandensis* is dealt under the description of the respective species. Given below in brief are the differences of *B. wokhaensis* with the above species:

In *B. wokhaensis* cranial ridges are white, nostril is equidistant to eye and snout whereas in *B. kiphirensis* cranial ridges are concolorous and nostril is closer to eye.

In *B. wokhaensis* body is thickly tuberculated, cranial ridges are white, TTA reaches parotid gland, tibia shorter than femur and no blotches on chest whereas in *B. mamitensis* body moderately tuberculated, cranial ridges concolorous, TTA reach tympanum, tibia longer than femur and 2 prominent blotches on chest.

In *B. wokhaensis* cranial ridges are white, nostrils equidistant from eye and snout, parotid glands elongate and perforated whereas in *B. manipurensis* cranial ridges are black, nostril is closer to snout and parotid glands are elongate and reniform.

In *B. wokhaensis* body is thickly tuberculated, nostril is equidistant to eye and snout whereas in *B. mizoramensis* body is sparsely tuberculated and nostril is closer to snout.

In *B. wokhaensis* nostril is equidistant to eye and snout and in *B. nagalandensis* nostril is closer to tip of snout; length and width of head , eye and tympanum diameter, distance between front of eye, back of eye, internarial space , distance between parotids , length of tibia, femur, foot , forelimb, hand, inner and outer metatarsal tubercles and web on toes are less in *B. wokhaensis* than in *B. nagalandensis*

Bufo wokhaensis shows affinity towards *B. melanostictus* and *B. himalayanus* in the possession of cranial ridges. It however differs from them in having (1) Cranial ridges and warts white and (2) nostril equidistant between eye and snout.

Etyymology : The specimen is named after the district from where it was collected.

10. *Pedostibes kempi* (Boulenger, 1919)

1919. *Nectophryne kempi* Boulenger, *Rec.Indian Mus.* Calcutta, 16(2) : 207.

Type locality : Tura, Garo Hills, Meghalaya.

Location of type : Zoological Survey of India, Calcutta, West Bengal, India.

Material examined : None.

Diagnostic characters : Dorsally varying from dark grey to brown. Ventral surface almost dark brown. Skin rough with irregular tubercles of various shapes and sizes all over the body. Ventral surface finely granulated. A large round yellowish spot present on each side of the breast near base of arm.

Head broader than long, depressed; snout short, pointed, slightly projecting beyond mouth; canthal ridges on either side meet near the tip of snout; canthus rostralis distinct, loreal region slightly concave; nostrils laterally situated and much near to tip of snout than to eyes; inter orbital width nearly equal to upper eyelid; eyes prominent and directed downwards; parotid glands prominent; tympanum hidden.

Forelimbs moderately large; fingers moderately long, a little depressed, free, with rudiment of webs; tips of fingers dilated into rounded tips; first finger shorter than second, third finger much longer than snout; subarticular tubercles feebly prominent.

Hindlimbs moderately long; tibiotarsal articulation reaching shoulder; tibia nearly four times as long as broad and less than one-third the length of snout to vent; toes more than half webbed with rounded tips; subarticular tubercles small, prominent; inner metatarsal tubercle prominent; outer metatarsal tubercle indistinct.

Measurements (in mm) of *Pedostibes kempi*

	Holotype		Holotype
SVL	30	SFL	5
HL	10	TFL	6.5
HW	11.5	LHL	36
SL	5	TL	12.5
EL	4	TL3	6.5
IUE	4	TL4	8.5
LFL	21.5	TL5	7.5
FFL	3		

Distribution : India : Meghalaya, Garo Hills, Tura.

Remarks : Since no material could be collected or studied, the description is reproduced from Chanda (1994).

Family MEGOPHRYIDAE

The anuran family Megophryidae (*Megas* meaning large, *ophrys* meaning eye brow) comprises of short legged toads which can be distinguished from true toads (Bufonidae) and true frogs (Ranidae) by the following combination of characters: Either the body has a toad-like shape with many warts and no parotids or body not toad-like and the upper eyelid has a characteristic border and the snout tip protrudes above the mouth; the pupil is vertical. Nine species are known from North East India namely *Xenophrys boettgeri*, *X. glandulosa*, *X. kempi*, *X. major*, *X. parva*, *X. robusta*, *X. serchhipii*, *X. wuliangshanensis* and *X. zunhebotoensis*.

11. *Xenophrys serchhipii* Mathew & Sen, 2007 (Plate XI)

2007. *Xenophrys serchhipii* Mathew & Sen, *Cobra*. 1(2) : 21,

Type locality: Agriculture Guest House compound, Serchhip, Serchhip district, Mizoram, India, (N 23° 20' 31.6" E 92° 50' 46.6" Alt. 880 m above msl.).

Location of type: ERS/ZSI, Shillong.

Material examined : 1 ex. Reg.No. V/A/ERS/ZSI/773, Agriculture Guest House Compound, Serchhip, Serchhip district, Mizoram, India, 23.9.2006, Coll. R.Mathew and party.

Diagnostic characters : A small *Xenophrys*, (SVL 37.05 mm), toad like; dorsum dark brown or almost black, without the usual dark triangular mark between the eyes; a 'V' shaped ridge dorsally between eye and shoulder level; dorsum below the tympanic region with longitudinal ridges and small, round and conical warts of varied sizes, these are more on the lateral side; dorsum homogeneously dark; tip of snout concave dorsally; upper eye lid with two prominent warts; ventrally throat and chest brown to black, mottled with white; a pair of axillary and femoral glands;

Head broader than long; nostril prominent, closer to tip of snout; snout sharply pointed, vomerine teeth very prominent, globular, close to each other; tympanum large, oval, depressed, darker, bordered above by the supra tympanic fold, distinct; supra tympanic glandular fold prominent; jaws with white cross bars, that on lower jaw broader; head above with various sizes of round warts.

Forelimb moderate; fingers free, long, 2nd and 4th fingers sub equal in length, 3rd longest; tips of fingers swelled up into small discs; subarticular tubercles indistinct.

Hindlimb moderate; TTA reach up to anterior region of eye; legs above with dark bands; tips of toes swelled up into small discs; toes free with rudiment of web between 2nd and 3rd digits; belly and ventral side of femur and tibia whitish.

Measurements (in mm) of *Xenophrys serchhipii*

	Holotype		Holotype
SVL	37.05	SL	4.43
HL	11.40	IN	3.20
HW	12.45	MBE	4.23
IUE	3.95	MFE	8.19
EL	6.07	TL	18.27
TYD	2.34	FL	19.45
TYE	2.34	TRL	14.20
IFE	5.59	FOL	16.49
IBE	7.14	FLL	9.74
EN	2.73	HAL	9.74
MN	9.91	TFL	5.33
NS	2.32	TL4	8.20

Habitat notes.

This specimen was collected in the night from the Guest House compound as it was trying to enter its hide-out in the earth beneath. On an earlier attempt seeing the collector it had retreated. It was alert and agile and was collected with the help of a net bag.

Distribution : Mizoram.

12. *Xenophrys zunhebotoensis* Mathew & Sen, 2007
(Plate XII)

2007. *Xenophrys zunhebotensis* Mathew & Sen, *Cobra*. 1(2) : 20-21.

Type locality : Nguti (Sukhalu), (a mountain stream with rocks and boulders) (N 25° 58' 45.1", E 94° 30' 24" Alt. 1715 msl), Zunheboto, Zunheboto district, Nagaland, India. Location of type: ERS/ ZSI, Shillong

Material examined : 2 exs. Reg.nos.V/A/ERS/ZSI/774 and 775, Nguti (Sukhalu), collected from a mountain stream with rocks and boulders) (N 25° 58' 45.1", E 94° 30' 24"), Alt. 1715 msl, 10.8.2005, Coll. R. Mathew and party.

Diagnostic characters : A small *Xenophrys*, (SVL 39 mm), dorsum smooth with few ridges and warts; slaty brown above; a dark triangular patch between the orbit ; a broad incomplete 'V' shaped ridge behind the eye, another similar ridge of inverted 'V' shape towards the posterior side thereby imparting an indistinct hourglass pattern on the back; 2 parallel lines on either side between the 'V' shaped ridges; flanks with small round tubercles; ventrally throat and chest the colour of dorsum; abdomen, thighs and shank off white with light round blotches; axial and femoral glands prominent, smaller in males.

Head broader than long; supratympanic glandular fold white, distinct, curving on to the anterior region of the tympanum to give it a round shape; nostril closer to eye; vomerine teeth prominent, close to each other; snout slightly upturned, obtusely pointed.

Forelimbs slender, fingers free with small swollen discs.

Hind limbs slender, TTA reach the middle of eye; digits free with small swollen discs, smaller than that on fingers; legs with dark bands dorsally.

Measurements (in mm) of *Xenophrys zunhebotoensis*

	Female	Male		Female	Male
SVL	39	30	SL	4.50	3.20
HL	11	8.50	IN	3	2.50
HW	12.50	9	MBE	4	2.50
IUE	3.50	3.40	MFE	9	5.50
EL	4.50	3.70	TL	18	15
TYD	3.10	2	FL	15	13
TYE	2.10	1.70	TRL	9	8.20
IFE	5	5	FOL	17.05	13
IBE	11	8	FLL	8.20	7
EN	1.50	1.10	HAL	9.70	9
MN	10	6	TFL	6	5.20
NS	2.20	1.50	TL4	10.50	8

Habitat notes :

The specimens were collected from a torrential mountain stream strewn with rocks and boulders.

Distribution : Nagaland.

Family MICROHYLIDAE

The family Microhylidae comprising of narrow mouthed toads differ from true frogs by the lack of teeth in the upper jaw, the circular or oval shaped tongue and the T- shaped nature of the terminal phalanges of fingers and toes. They differ from true toads by the shape of tongue; round or vertical pupil and smooth skin.

Ten species are so far known from North East India namely *Kalophrynus interlineatus*, *Micryletta inornata*, *Uperodon globulosus*, *Kaloula assamensis*, *K. pulchra*, *K. taprobanica*, *Microhyla berdmorei*, *M. heymonsi*, *M. ornata*, and *M. rubra*.

*13. *Micryletta inornata* (Boulenger, 1890)
(Plate XIII)

1890, *Microhyla inornata* Boulenger, *Proc. Zool. Soc., London* : 37(Type: BMNH, from “Deli, Sumatra)

Material examined : 1 ex. Reg. No.. VA/ERS/ZSI/807, from a stream flowing to the Menon river at Ward no. 1, Moreh, Chandel district, Manipur (N 24° 14' 17.8" E 94° 18' 3"), Alt. 171 m above msl, 22.2.2006, Coll. R. Mathew and party.

Diagnostic characters : A mid dorsal line from snout to tip of vent; skin dorsally minutely tuberculated , tubercles more on the thigh; a glandular fold from tympanum to shoulder; tympanic glandular fold bordered with black, which continues beyond shoulder after abruptly ending at the arm joint; flanks speckled with dark brown; dorsally pink in life; dorsum with dark brown or black spots on either side; ventrally purplish; throat and chest thickly speckled.

Head broader than long, dorso-ventrally compressed; eyes not very prominent; nostril lateral; loreal region slightly concave; no parotids; tympanum feebly marked, large, 3/4th the eye diameter; nostril nearer the tip of snout; tongue elongate; upper jaw toothless; no vomerine teeth;

Forelimbs slender; fingers free; subarticular tubercles very prominent; fingers with round tips, not dilated.

Hind limbs slender; toes free; a small inner metatarsal tubercle and an impression of outer metatarsal tubercle; TTA reaching posterior end of eye; toes not pointed, with round tips, not dilated; subarticular tubercles very prominent.

Measurements (in mm) of *Micryletta inornata*

	Holotype		Holotype
SVL	21	FLL	4.5
HL	5.5	HAL	4.5
HW	6.5	FLL	2
SL	2.5	SFL	2.5
EL	2	TFL	4.5
TYD	1.2	FHL	3
EN	1.5	TL1	2
NS	1	TL2	4
TL	9.5	TL3	6.5
FL	10	TL4	9
TRL	5.5	TL5	6.5
FOL	10		

Distribution : Manipur.

Elsewhere : China; Myanmar; The Malay Peninsula; Indonesia; Thailand

Remark : The only other record of this species in India is that of a juvenile specimen reported by Pillai (1977) from Andaman Islands.

Family RANIDAE

The family Ranidae comprising of typical frogs are mostly cosmopolitan in distribution. These can be distinguished by the presence of toothed upper jaw, free fingers and webbed toes, notched tongue. There are 39 species under 10 genera presently known from North East India.

14. *Euphlyctis ghoshi* (Chanda, 1990)

1990. *Rana ghoshi* Chanda, *Hamadryad* 15(1) : 16-17

Material examined : None

Diagnostic characters : Dorsally light brown with dark irregular blotches. A dark stripe extends from posterior border of eyes to the shoulder. Ventrally pale. Skin of dorsum rough with small tubercles, ventral surface almost smooth. A glandular dorso lateral fold extends from eyes to posterior region of the body, ending near the groin.

Head depressed, broader than long; snout rounded, slightly projecting beyond lower jaw; canthus rostralis concave; nostrils much closer to eyes than to tip of snout; inter narial space about one and half times of interorbital width; tympanum half the diameter of eyes, separated by the latter by a gap about half the tympanic diameter; lower jaw with two tooth-like bony processes that fit in grooves of the upper jaw; vomerine teeth oblique, much nearer each other than to choanae.

Forelimbs moderately long; fingers free with rounded tips; 1st finger slightly longer than 2nd; 3rd finger longest, slightly shorter than snout; subarticular tubercles small but very prominent.

Hindlimbs short; tibiotarsal articulation reaching tympanum; heels just meeting when hindlimbs folded at right angles to body; tibiae twice as long as broad, more than one-third SVL; toes with rounded tips, fully webbed; subarticular tubercles small but prominent; inner metatarsal tubercle oval, prominent, nearly half the length of inner toe; outer meta tarsal tubercle absent.

Measurements (in mm) of *Euphlyctis ghoshi*

	Holotype		Holotype
SVL	60	FFL	8
HL	19.5	SFL	7.5
HW	22	TFL	8
SL	9	LHL	76
EL	8	TL3	14.5
IUE	4	TL4	21.5
TYD	4	TL5	19
LFL	12		

Distribution : Manipur.

Remark : No material of this species could be collected or studied. Therefore Chanda's (1990) original description is reproduced above.

15. *Limnonectes khasianus* (Anderson, 1871)

1871. *Pyxicephalus khasianus* Anderson, *J. Asiat. Soc. Beng.*, **40** : 23

Type locality : Khasi Hills, Meghalaya, India.

Location of type : Not known

Material examined : None

Diagnostic characters : Dorsally uniform brown in colour, spotted with brown on lateral sides; thighs faintly barred. Chin, thorax and legs spotted with brown. Dorsal skin smooth, no trace of tubercles; ventral surface almost smooth.

Head short, broader than long; snout short, rounded; tongue small, notched behind; nostrils directed upwards and backwards, equidistant from eye and tip of snout; eyes large and prominent; tympanum small, covered by skin, faintly visible, more than half the diameter of eyes; two apophyses on the lower jaw; choanae distinct, rounded. Vomerine teeth oblique in position running up to posterior margin of choanae and separated from each other by a narrow space.

Forelimbs : Fingers free, three small subarticular tubercles present on the palm; inner tubercle largest, elongate in shape and more or less similar to the inner metatarsal tubercle.

Hindlimbs : Short; tibia slightly shorter than thigh, inner meta tarsal tubercle shovel shaped and laterally compressed; outer metatarsal tubercle absent.

Distribution : Meghalaya

Remark : No material of this species could be collected or studied. The description above is from Chanda (1994).

16. *Limnonectes mawlyndipi* Chanda, 1990

1990. *Rana mawlyndipi* Chanda, *J. Bengal nat. Hist. Soc.* N. S. 9(1) : 44

Type locality : Mawlyndip, Khasi Hills, Meghalaya, India.

Location of type : National Zoological Collections, Zoological Survey of India, Calcutta, India

Material examined : None.

Diagnostic characters : Dorsally deep brown to blackish, with black canthal and temporal bands. Throat and ventral side of limbs spotted or marbled with black to brown. Skin smooth. A prominent fold extends from posterior corner of eyes above the tympanum to forelimbs. Ventral surface smooth.

Head broader than long, slightly depressed; snout slightly pointed, projecting beyond lower jaw; canthus rostralis obtuse; loreal region slightly concave; nostrils equidistant from eyes and tip of snout; internarial distance about one and half times the interorbital width; tympanum small, prominent, less than half of eyes, separated from the latter by a space of 3/4th the diameter of eyes; eyes large; pupil horizontal; vomerine teeth oblique in position, projecting up to posterior border of choanae; tongue large, entire.

Forelimbs short and stout; fingers long, free, without intercalary ossicles; tips of fingers dilated into small discs; 1st finger a little shorter than 2nd; 3rd finger length equal to snout length; subarticular tubercles well developed.

Hindlimbs long; TTA reaching nostrils; heels strongly overlapping when hindlimbs folded at right angles to the body; tibia 2 ½ times as long as broad, less than half the length from snout to vent; toes long, more than 2/3rd webbed; ultimate phalanges of 4th toe free; tips of toes dilated into prominent discs which are equal to finger discs; subarticular tubercles prominent and well developed; an oval, prominent, inner metatarsal tubercle present; outer meta tarsal tubercle absent; outer metatarsals separated on distal half.

Measurements (in mm) of *Limnonectes mawlyndipi*

	Holotype		Holotype
SVL	83	SFL	12.5
HL	30	TFL	13
HW	35.5	FHL	12
SL	13	LHL	127
EL	7.5	TL	46
IUE	6.5	FOL	45.5
TYD	3	TL3	25
LFL	46	TL4	32
FFL	11.5	TL5	24.5

Distribution : Meghalaya

Remark : No material of the species could be collected or studied. The description above is from Chanda (1990).

Family RHACOPHORIDAE

The family Rhacophoridae comprising of the Asiatic tree frogs are characterized by the presence of forked terminal phalanges with intercalated cartilage. They are arboreal in habitat and have large adhesive pads on digit tips; generally both fingers and toes are webbed. North East India has 6 genera and 30 described species.

During the present study quite a few rhacophorid specimens were collected. The detailed examination of this material revealed 5 species new to science under genera *Chirixalus*, *Philautus*, *Polypedates* and *Rhacophorus* which are described herein. We have provided a key to differentiate the newly described species from the already known species of North East India.

Key to the species of the genus *Chirixalus* of North East India

- 1. Head as long as broad 2
Head broader than long 5
- 2. Inner metatarsal tubercle absent *shyamrupus*
Inner metatarsal tubercle present 3
- 3. Toes fully webbed *senapatiensis*
Toes not fully webbed 4
- 4. Toes 2/3rd webbed *doriae*
Toes 3/4th webbed *vittatus*
- 5. Fingers free *simus*
Fingers 1/2 webbed *cherrapunjiae*

17. *Chirixalus doriae* Boulenger, 1893

1893. *Chirixalus doriae* Boulenger, *Ann. Mus. Civ. Stor. Nat. Genova.*, (2)13 : 341
Type locality: Karin Bia-po, Burma.
Location of types : Museo Civico di Storia Naturale di Genova “Glacoma Doriae” Via Brigata Liguria, Genova, Italy : Naturhistorisches Museum, Zooloische Abtheilung, Postfach 417, 1014 Wien, Austria and British Museum (Natural History), London, U.K.

Material examined : None.

Diagnostic characters : Dorsally varying from dark grey to brown; two dorsolateral glandular folds extending from anterior to posterior region of the body; limbs dark brown with indistinct cross-bars; ventral surface of belly and limbs almost white; eyes blackish; a faint dark line extends from anterior corner of eye to tip of snout; skin smooth, sometimes several minute tubercles present on the dorsum; ventrally smooth.

Head as long as broad, slightly depressed; snout pointed, projecting a little beyond lower jaw; canthus rostralis prominent; loreal region slightly concave; nostrils much nearer to tip of snout than to eyes; inter narial distance equal to inter orbital width which is slightly broader than eyes; tympanum distinct, slightly depressed, half the diameter of the eyes, separated from the eyes by a space about $1/3^{\text{rd}}$ of tympanic diameter.

Forelimbs moderately long, slender; fingers moderately long, free, tips of fingers dilated into rounded tips; 1st finger a little shorter than 2nd; 3rd finger longest, shorter than snout; subarticular tubercles indistinct.

Hind limbs long, slender; TTA reaching tip of snout; heels overlapping when hind limbs folded at right angles to body; tibia $4 \frac{1}{2}$ times as long as broad, less than half the length from snout to vent; toes long and slender; 4th toe longest, shorter than snout; tips of toes dilated into small rounded discs; toes $2/3^{\text{rd}}$ webbed; both inner and outer metatarsal tubercles present.

Measurements (in mm) of *Chirixalus doriae*

	Holotype		Holotype
SVL	20	SFL	3
HL	6	TFL	.5
HW	6	LHL	36
SL	7.5	TL	9
EL	3	FOL	9
IUE	3.5	TL3	3.5
TYD	1.5	TL4	5
LFL	10	TL5	3.5
FFL	3.5		

Distribution : Arunachal Pradesh; China; Indo-China; Myanmar.

Remark : No material of the species could be collected or studied. The description above is from Chanda (1994).

18. *Chirixalus senapatiensis* sp. nov.
(Plate XIV)

Material examined : 1 ex. (HOLOTYPE), Reg. No. VA/ERS/ZSI/804, Mabing river bed,

Kangpokpi, Senapati district, Manipur (N 25° 10' 6.6" E 93° 58' 24.7"), Alt. 1082 m above msl, 12.2.2006, Coll. R. Mathew and party.

Description of the Holotype :

Diagnostic characters : Dorsum light brown; a vertebral dark band present; a glandular fold laterally from snout to groin along eye and tympanum; a 'V' shaped mark below the eyes; dorsum smooth; belly white, granular.

Head as broad as long (HW 6 mm, HL 6 mm, MN 5 mm, MFE 4 mm, MBE 2 mm) ; inter orbital width broader than inter narial space and eye diameter (IUE 2.5 mm, IN 2 mm, EL 1.8 mm); distance between front of eye more than half the distance between back of eye (IFE 4 mm, IBE 5.5 mm) ; jaws white; supra tympanic fold prominent; tympanum round; nostril closer to tip of snout than to eye (EN 2 mm, SN 1.5 mm); snout longer than eye diameter (SL 3.5 mm, EL 1.8 mm)

Forelimbs slender, shorter than hand (FLL 3.5 mm, HAL 4 mm); finger tips with enlarged, circum marginally grooved discs; discs on fingers larger than that on the toes; 4th and 5th fingers with rudiment of web.

Hind limbs moderate; tibia shorter than femur and longer than foot (TL 9 mm, FL 10 mm, FOL 7.5 mm); toes almost fully webbed; TTA reaching anterior corner of eye; inner meta tarsal tubercle present; outer meta tarsal tubercle absent. There is a slight abnormality in the specimen. On its right leg the 3rd, 4th and 5th toes are of sub equal length; the left leg is with normal digits. Since the specimen has an abnormal right foot, web formula of both the feet are given.

Web formula (left leg) I ½-0 II 0-0 III 0-0 IV 0-0 V

(right leg) I ½-½ II 0-1- III 0-0 IV 0-0 V

Measurements (in mm) of *Chirixalus senapatiensis*

	Holotype		Holotype
SVL	19	EL	1.8
HL	6	SN	1.5
HW	6	SL	3.5
MN	5	IUE	2.5
MFE	4	HAL	4
MBE	2	FLL	3.5
IFE	4	TL	9
IBE	5.5	FL	10
IN	2	FOL	7.5
EN	2		

Chirixalus senapatiensis shares similarities with *C. vittatus* in IUE, EL, MBE, TL and FLL. It differs from the latter in HL, HW, MN, IFE, IBE, NS, SL, MFE, FL, FOL and HAL. Further, in *C. senapatiensis* HL, HW, IFE, IBE, EN, NS, SL, IN, MFE and FL are more and FOL, HAL are less than in *C. vittatus*.

Chirixalus senapatiensis shows affinity towards *Chirixalus vittatus* but can be differentiated from it by the following characters: Dorsum uniform light brown in *C. senapatiensis*, speckled all over with purple in *C. vittatus*; hind limbs with brownish spots arranged along its length in *C. senapatiensis*, limbs with faint cross bands in *C. vittatus*. Snout more pointed in *C. senapatiensis*, snout less pointed in *C. vittatus*. Toes almost fully webbed in *C. senapatiensis*, toes 3/4th webbed in *C. vittatus*.

Web formula for *C. senapatiensis* I ½-0 II 0-0 III 0-0 IV 0-0 V

Web formula for *C. vittatus* I ½-2 II 0-0 III 0-0 IV 0-0 V

Chirixalus senapatiensis shows affinity towards *C. shyamrupus* in having the head as long as broad. However, it differs from *C. shyamrupus* in having the toes fully webbed and in the presence of inner metatarsal tubercle.

Chirixalus senapatiensis differs from *C. cherrapunjiae* and *C. sinus* in having head as long as broad (versus broader than long); and fully webbed toes (versus 3/4th webbed in *C. cherrapunjiae* and 2/3rd in *C. sinus*).

Chirixalus senapatiensis shows affinity towards *C. doriae* in having head as long as broad and the presence of inner metatarsal tubercle. But it differs from *C. doriae* in having fully webbed toes (versus 2/3rd webbed), 4th and 5th fingers with rudiment of web (versus fingers free), TTA reaching anterior corner of eye (versus TTA reaching tip of snout) and outer metatarsal tubercle absent (versus outer metatarsal tubercle present).

Habitat notes : The specimen was collected from under the stone in the river bed. An *Amolops gerbillus* was also picked up from the surrounding.

Etymology : The specimen is named after the district from where it was collected.

19. *Chirixalus shyamrupus* (Chanda and Ghosh, 1989)

1989. *Philautus shyamrupus*, Chanda and Ghosh, *J. Bombay nat. Hist. Soc.* 86(2) : 215-217.

Material examined : None

Diagnostic characters : Dorsally varying from grey to brown; a dorsolateral white band on either side extending from posterior region of eyes and ending posteriorly near the vent; limbs dark brown to grey; ventral surface dirty white; a dark narrow line from the inter orbital region extends posteriorly to the hind end of the body.

Head as long as broad; snout obtusely pointed, slightly longer than eye; canthus rostralis distinct; nostrils closer to tip of snout than to eyes; internarial distance less than inter orbital

width which is equal to eyes; tympanum distinct, 2/3rd eye diameter; tongue free and deeply notched behind.

Fore limbs moderately long and slender; fingers free with prominent rounded tips; 1st finger shorter than 2nd.

Hind limbs fairly long; TTA reaching nostrils; when hind limbs folded at right angles to the body heels just meeting; tibia half of SVL; toes more than 2/3rd webbed; subarticular tubercles not prominent; both inner and outer metatarsal tubercles absent.

Measurements (in mm) of *C. shyamrupus*

	Holotype		Holotype
SVL	19.6-25	LFL	14-16.5
HL	4-6.5	FFL	2-3.5
HW	4-6.5	SFL	2.5-4
IUE	2-3.5	TFL	3.5-5
EL	2.5-3.5	LHL	27-43.5
TYD	1.2-2.4	FOL	6-9
SL	3.5-4.5	TL3	2.5-5
TL	9.3-12.5	TL4	3-4.5
		TL5	2-3

Distribution : India : Arunachal Pradesh.

Remark : No material of this species could be collected or studied. The description above is from Chanda (1994), who reported it to be a rare frog.

20. *Kurixalus naso* (Annandale, 1912)
(Plate XXI)

1912. *Rhacophorus naso* Annandale, *Rec.Indian. Mus*, 8 : 12

Type locality : “Egar stream between Renging and Rotung” Arunachal Pradesh, India.

Location of type : National Zoological Collection, Zoological Survey of India, Calcutta, India.

Material examined : 1 ex., Regd. No.VA/ERS/ZSI/769, District Park, Zebawk, Lunglei district, Mizoram, (Alt.1128 m above msl, N. 22° 50' , E. 92° 49'), 22.9.2005, Coll. R.Mathew and party; 13 adults (2 females and 11 males) and 10 juveniles; Regd.No. VA/ERS/ZSI/728, District Park, Lunglei district, Mizoram, 4.6.2006, Coll. R. Mathew and party.

Diagnostic characters : Body moderately stout. Dorsal surface purplish–brown in females (lustrous green and brown in males); irregularly marked with dark slate colour; irregular paler markings on the sides; limbs irregularly marked; fingers and toes barred with alternate brown

and grey stripes; ventral surface dirty white, shaded posteriorly with dark grey; dark grey spots on throat and an irregular reticulation of the same shade on the chest; ventral surface of hands and feet grey, with the tubercles white; a white spot on the soles in the place where an external metatarsal tubercle would be. Skin of dorsal surface rugose with many prominent and irregular tubercles; a small subquadrangular dermal projection on the snout; rounded tubercles scattered on the basal part of the thighs; ventral surface coarsely granular, more so on the chest and throat than on the belly. A fairly distinct dorso-lateral fold and a more prominent one running from the eye above the tympanum to the shoulder; serrated cutaneous fringes present on the outer edges of the forearm and the shin.

Head rather broad, triangular, with convex sides; snout much longer than orbit, pointed, convex above; nostril on an elevated point, much nearer tip of snout than eye; inter orbital width broader than inter narial width; canthus rostralis indistinct; loreal region concave, almost horizontal; tympanum distinct, vertically oval, about 2/3rd the diameter of eye, bordered by tympanic glandular fold; eye large, round; loreal region concave; no papilla on the tongue; vomerine teeth forming two small, almost circular patches, one close to the inner margin of each choana; choanae small.

Forelimbs stout, not very long. Fingers with rudimentary web; their disks well developed, transversely oval; that on the 3rd finger almost as large as the tympanum; subarticular tubercles well developed.

Hindlimbs stout, not very long; TTA reaches the eye; toes almost completely webbed, their discs similar to those on the fingers; subarticular tubercles well developed; a somewhat elongate, but not very prominent inner metatarsal tubercle; outer metatarsal tubercle absent.

Preserved specimens do not retain the original colour.

Measurements (in mm) of *Kurixalus naso*

	Male	Female		Male	Female
SVL	30	43	SL	4.5	8
HL	10	14	TYD	1.8	3.2
HW	11	16	TYE	0.7	1
MN	8.5	10	IN	2.8	4
IUE	3	5	MBE	2.5	4.5
EL	3.6	5.5	MFE	6.5	8
IFE	5	7.5	TL	16	23.5
IBE	9	13	FL	15	23
EN	2	4.5	TRL	7	13
NS	2	3.5	FOL	14	19

	Male	Female		Male	Female
FLL	5.5	7	FFTF	3.5	6.5
HAL	9.5	13	MTTF	8	13
TFTF	5	9	MTFF	9.5	14

Habitat : Trees by the side of stream. The first specimen in 2005 was collected from the tree trunk during day. This was spotted on tree trunk some 7 meters above ground level. A second visit in June 2006 yielded one more specimen from the hollow of a bamboo used in fencing. Towards dusk a female specimen was spotted camouflaged on a tree trunk about a meter above the ground. More males and a female were collected in the rainy night from the park, from children’s swings, tree trunks and ground. The District Park lies adjacent to forests and being a new set up is fairly untouched by human interference and has a rich faunal wealth. The state government is establishing it as a District Sports Complex.

Distribution : Arunachal Pradesh, Mizoram.

Remarks : This species was known only from the original description of Annandale,1912. Mathew and Sen (2008) reported it from Mizoram.

21. *Nyctixalus moloch* (Annandale, 1912)

1912. *Phrynoderma moloch* Annandale, *Rec. Indian Mus.*, 8 : 18.

Type locality : Upper Renging, Abor Country, Assam (Arunachal Pradesh), India.

Location of type : National Zoological Collection, Zoological Survey of India, Calcutta, India.

Material examined : None.

Diagnostic characters : Grey to brown with black spots on dorsum. A large blackish patch on both sides of fore and hind limbs and a white patch present on the axilla; thighs with irregular dark bands; ventrally almost black; prominent warts and tubercles of various shapes and sizes scattered all over the dorsum which are comparatively larger on the head and shoulder region and much smaller on the dorsal surface of the limbs; belly and sides granulated; ventral surface of the body including limbs and throat almost smooth.

Head a little broader than long, slightly depressed; snout rounded; canthus rostralis prominent; loreal region concave, oblique; nostrils a little closer to tip of snout than to eyes; inter orbital space a little broader than eye; tympanum large, prominent, as large as the diameter of the eyes; vomerine teeth slightly oblique in position, running from the anterior margin of choanae, much closer to each other than to choanae.

Forelimbs moderately long, slender; fingers long, free with large discs; disc of 3rd finger nearly equal to tympanum; 1st finger longer than 2nd; 3rd finger longest, longer than snout; subarticular tubercles small, but prominent.

Hind limbs long; TTA reaching eyes; heels just meeting when hind limbs folded at right angles to the body; tibia 3 to 4 times as long as broad, half the length from snout to vent; toes 2/3rd webbed with prominent well developed discs; web reaching all the toes except 4th toe where it extends nearly to disc as a narrow fringe; subarticular tubercles small, moderately prominent; a small indistinct inner metatarsal tubercle present; outer metatarsal tubercle absent.

Measurements (in mm) of *Nyctixalus moloch*

	Male	Female		Male	Female
SVL	42	-43.5	FFL	6	- 6.5
HL	18.5	-19	SFL	5.5	- 6
HW	20	-20.5	TFL	7	-7.5
SL	5	-5.5	LHL	78	-79.5
EL	5	- 6	TL	21	-22
IUE	5.5	- 6	FOL	23.5	-24
TYD	5	- 6	TL3	9.5	-10
LFL	28.5	- 29	TL4	11.5	-12
			TL5	9	-9.5

Distribution : Arunachal Pradesh.

Remark : No material of this species could be collected or studied. The description above is from Chanda (1994).

Key to the species of the genus *Philautus*

1. Tympanum distinct or indistinct 2
- Tympanum hidden *kempiae*
2. Nostrils closer to snout *andersoni*
- Nostrils equidistant to snout and eye 3
3. Fingers with rudiment of web 4
- Fingers without rudiment of web 5
4. A chocolate brown marking on dorsum, starting from eye and continued to groin as a band, flanks yellowish with irregular brown patches *manipurensis*
- An 'H' shaped irregular dark marking on dorsum, dark spots on flanks, dark broad bars on limbs *shillongensis*
5. A white band connecting eyes dorsally *namdaphaensis*
- No white band connecting eyes 6

6. Toes webbed at base 7
Toes half webbed *sāhai*
7. Inner and outer metatarsal tubercles present *annandalii*
Inner and outer metatarsal tubercles absent *garo*

22. *Philautus garo* Boulenger, 1919
(Plate XV)

1919. *Philautus garo* Boulenger, *Rec.Indian Mus.*, **15** : 207
Type locality: Tura, Garo Hills, Meghalaya, India.
Location of type: British Museum (Natural History) London, U.K.

Material examined : 1 ex. (SVL 18 mm) Reg.No. VA/ERS/ZSI/808, from the forest floor littered with dead bamboo leaves, adjoining ERS/ZSI/Office compound, (evening collection), Risa Colony, Shillong, 29.5.2006, Coll. Nirmal Sapkota.

Diagnostic characters : A dark triangular patch starting along the middle of eyes; another dark patch starting from behind the eye and above the tympanum continue mid dorsally towards the groin where it bifurcates towards either side leaving the main band to continue to the vent. Limbs with broad dark bands; head dorsally from snout to front of eyes with a light yellowish patch; lateral sides of head dark brown ; head dorsally with small and medium tubercles; body with small tubercles laterally; throat and belly heavily and chest lightly speckled with brown.

Head broader than long; snout pointed; canthus rostralis distinct; inter orbital width broader than internarial space and eye diameter; tympanum distinct; supra tympanic glandular fold from eye to shoulder prominent; tympanum separated from eye by a space about ¼th its own diameter; nostrils slightly closer to eye; tongue broad, thick, slightly notched.

Forelimbs slender, fingers free, moderate; 1st finger shorter than 2nd; finger tips with dilated discs.

Hind limbs slender, moderate, TTA reaching the anterior corner of eyes; toes webbed at the base between 2nd,3rd, 4th and 5th; discs on toes smaller than that of fingers; subarticular tubercles prominent; an indistinct inner metatarsal tubercle; outer metatarsal tubercle absent; heels overlap when limbs folded at right angles to the body.

Measurements (in mm) of *Philautus garo*

	Holotype		Holotype
SVL	18	IUE	2
HL	5	EL	1.8
HW	6	IFE	2.8
MN	4	IBE	4.5

	Holotype		Holotype
EN	1.5	TL	7.5
NS	1.8	FL	8
SL	3	FOL	6.5
IN	1.5	FLL	4
MBE	1.5	HAL	4.5
MFE	3.5		

Distribution : Meghalaya.

Remarks : Boulenger (1919) described this species from Tura in Garo Hills district of Meghalaya. The present material is the second specimen to be collected and studied. However, Ao et.al. (2003) reported the species as new record for Nagaland without giving detailed description or photograph of the species.

23. *Philautus manipurensis* sp.nov.
(Plate XVI)

Material examined : 1 ex. (HOLOTYPE), Reg.No. VA/ERS/ZSI/810, Tumzane river, Leimatak, Churachandpur district, Manipur, (N 24° 35' 22.7", E 93° 39' 51.6"); Alt. 685 m above msl, 15.2.2006, Coll. R.Mathew and party.

Description of the Holotype

Diagnostic characters : Dorsum smooth; tympanic region with few rounded tubercles; belly granular; a chocolate brown mark starting from the eyes above continue as a band towards the groin; head from snout to the beginning of eyes yellowish; flanks yellowish with irregular brown patches; ventrally dirty white speckled all over with brown, particularly on throat and chest.

Head broader than long (HW 9 mm, HL 7.5 mm, MFE 4.5 mm, MBE 2.5 mm); interorbital distance equals inter narial space (IUE 3 mm, IN 3 mm); snout obtusely pointed, slightly projecting beyond lower jaw, more than eye diameter (SL 4 mm, EL 3 mm); canthus rostralis prominent; loreal region concave; tympanum fairly distinct, depressed, 67% of the eye diameter (TYD 2 mm, EL 3 mm), separated from the eye by about ¾th its own diameter; vomerine teeth absent.

Forelimbs shorter than hand (FLL 4.5 mm, HAL 6 mm); fingers moderate with rudiment of web; finger tips with well developed discs; 1st finger shorter than 2nd; subarticular tubercles prominent.

Hind limbs moderately long; tibia shorter than femur (TL 12.5 mm, FL 13.5 mm); TTA reaching nostrils; toes almost 2/3rd webbed; toe tips with distinct discs which are smaller than that of fingers; discs on fingers and toes white with circum-marginal groove; an indistinct inner metatarsal tubercle present, outer metatarsal tubercle absent.

Web formula : I 1-1½ II ½ - 1¾ III 1- 2 IV 2-1 V

Measurements (in mm) of *Philautus manipurensis* sp. nov.

	Holotype		Holotype
SVL	25	SL	4
HL	7.5	IN	3
HW	9	MBE	2.5
IUE	3	MFE	4.5
EL	3	TL	12.5
TYD	2	FL	13.5
IFE	4	TRL	6
IBE	8	FOL	10
EN	2	FLL	4.5
NS	2	HAL	6

Philautus manipurensis shares similarities with *P. garo* in MN, IUE, IFE, EN, SL and HAL. It differs from the latter in HL, HW, EL, IBE, NS, IN, MBE, TL, FL, FOL and FLL. Further HL, HW, EL, IBE, IN, TL, FL and FOL are more and NS, FLL are less in *P. manipurensis* than in *P. garo*.

Philautus manipurensis shares similarities with *P. namdaphaensis* in MN, IUE, IBE, EN, MFE. It differs from the latter in HL, HW, EL, IFE, SL, IN, TL, FL, FOL and FLL.

Philautus manipurensis shares similarity with *P. shillongensis* in the presence of rudiment of web on fingers but differ from the latter in its larger size, darker colouration and distinctly lobed tongue.

Philautus manipurensis differs from *P. kempiae* in the presence of tympanum.

Philautus manipurensis differs from *P. andersoni* in having nostril equidistant to eye and snout (versus nostril closer to snout) and colouration.

Philautus manipurensis differs from *P. annandalii* in having 2/3rd webbed toes (versus toes webbed at base), inner metatarsal tubercle present (versus both inner and outer metatarsal tubercle present).

Philautus manipurensis differs from *P. sahai* in having rudiment of web in fingers (versus free fingers), toes 2/3rd webbed (versus toes ½ webbed)

Habit : Stout build.

Habitat : The single specimen was collected from the bank of Tumzane river, Leimatak. Collection spot was the dried up river course and the specimen was taken from under pebbles

and dry leaves by an uprooted tree shaded by bamboo growth. Serious efforts were made to collect additional material of this species from this particular spot and elsewhere in North-East India during the study period but no more material could be collected.

Etymology : The specimen is named after the State from where collected.

Distribution : Manipur.

24. *Philautus kempiae* (Boulenger, 1919)
(Plate XVII)

1919. *Ixalus kempiae* Boulenger, *Rec. Indian Mus.*, **16**: 208
Type locality: Tura, Garo Hills, Meghalaya, India.
Location of type: British Museum (Natural History), London, U.K.

Material examined : 1 ex.(Male), Reg.No. VA/ERZ/ZSI/ 809 (SVL 21 mm.) Sohra, East Khasi Hills district, Meghalaya, 4.7.2006, Coll. R. Mathew and party.

Diagnostic characters : Dorsum light grey; tuberculated; a mid dorsal line from tip of snout to vent; a supratympanic glandular fold from eye to shoulder prominent; eyes connected with a dark band and a triangular dark patch behind;

Head broader than long, tympanum an impression, depressed, round, large; nostril closer to snout; tongue large, deeply notched; inter orbital width broader than eye diameter and broader than inter narial width.

Forelimbs moderate; shorter than hand, elbow region broad; fingers long, free, with large discs which are grooved.

Hind limbs moderate, femur longer than tibia, toes long, 3/4th to fully webbed; TTA crosses posterior end of eye; inner meta tarsal tubercle present; outer meta tarsal tubercle indistinct.

Measurements (in mm) of *Philautus kempiae*

	Holotype		Holotype
SVL	21	NS	1.5
HL	6	SL	3
HW	7	IN	1.6
MN	5.3	MBE	1.8
IUE	3	MFE	4.5
EL	2.5	TL	8.5
IFE	4	FL	9
IBE	6	FOL	8
EN	1.6	FLL	4.5
		HAL	5

Distribution : Meghalaya.

Remark : This species so far was known only from the original description of Boulenger, (1919). The present material is the second specimen of this species to be collected and studied. It was spotted by its call which was distinguishably different from that of the more common *Philautus shillongensis*.

25. *Philautus namdaphaensis* Sarkar and Sanyal, 1985
(Plate XVII)

1985. *Philautus namdaphaensis* Sarkar and Sanyal, *Rec. zool. Surv. India.*, 82(1-4) : 285-295.

Material examined : 1 ex.(Male), Reg. No. V/A/ERS/ZSI/837; (SVL 22 mm), Daribokgre, Nokrek Biosphere Reserve, East Garo Hills district, Meghalaya, 01.05.08, Coll. R. Mathew and party,

Diagnostic characters : Dorsum dark brown, speckled with irregular brown spots; a thin mid dorsal line from snout to vent; limbs dark brown above with indistinct cross bands; a prominent white band between the eyes covering the anterior part of the upper eyelids; thigh, tibia and groin laterally brownish with dark blotches; ventrally dirty white; dorsal skin more or less smooth or with minute scattered tubercles; belly and under surface of thighs granular; throat and upper surface of limbs smooth.

Head slightly broader than long; snout subacuminate; canthus rostralis not very distinct; nostril slightly closer to snout; inter orbital width more than eye length; tympanum fairly distinct.

Fore limbs fairly stout; fingers moderate with discs; sub articulator tubercles very distinct.

Hind limbs fairly stout; toes moderately long; TTA reaching between eye and nostril; toes nearly ½ webbed; inner meta tarsal tubercle indistinct; outer meta tarsal tubercle absent.

Measurements (in mm) of *Philautus namdaphaensis*

	Holotype		Holotype
SVL	22	SN	1.5
HL	6	IUE	2.5
HW	6.5	EL	2
MN	5	SL	3
MFE	4.2	FLL	4.5
MBE	1.8	HAL	5
IFE	4	FL	10
IBE	7	TL	10
IN	2	FOL	8
EN	1.8		

Distribution : Arunachal Pradesh.

Key to the species of the genus *Polypedates*

1. Skin on head co-ossified *leucomystax*
 Skin on head not co-ossified 2
2. Head longer than broad *taeniatus*
 Head as long as or broader than long 3
3. Head as long as broad 4
 Head broader than long 5
4. Nostrils closer to snout, tympanum $\frac{2}{3}$ rd eye diameter *assamensis*
 Nostrils equidistant to eye and snout, tympanum $\frac{3}{4}$ th eye diameter *himalayensis*
5. Toes fully webbed, nostrils closer to eye *gongshanensis*
 Toes not fully webbed 6
6. Head without Hour-glass shaped pattern dorsally *subansiriensis*
 Head with Hour-glass shaped pattern dorsally 7
7. Fingers free, toes $\frac{1}{2}$ webbed *megacephalus*
 Fingers minutely webbed, toes $\frac{3}{4}$ th or more webbed *maculatus*

26. *Polypedates assamensis* sp. nov.

(Plate XVIII)

Material examined : 1 ex. (HOLOTYPE), Reg.no. VA/ERS/ZSI/803, Gerukamukh , outside the main gate of NHPC HQs, Dhemaji District, Assam, 3.7.2007, Coll. R. Mathew and party.

Description of the Holotype :

Diagnostic characters : Dorsum brown, smooth, strewn with irregular, black spots, and without the hour-glass shaped mark; head skin not co-ossified; a smooth, dark band from nostril to eye; thighs with cross bands on upper half and with round yellowish spots on the hinder region; upper jaw bordered with white band; limbs banded; belly off white with irregular dark patches on thorax and abdomen; a dark band from snout to shoulder along nostril and eye.

Head as long as broad (HW 13.5 mm, HL 13.5 mm, MFE 7 mm, MBE 3.5 mm); canthus distinct; loreal region concave; snout long, protruding beyond lower jaw, longer than eye diameter (SL 6 mm, EL 5 mm); nostril closer to tip of snout (NS 2 mm, EN 4 mm); inter orbital width broader than inter narial space (IUE 5 mm, IN 3 mm) ; tympanum depressed,

60% of the eye diameter (TYD 3 mm, EL 5 mm); tongue moderate, thick, deeply notched; vomerine teeth in oblique series, closer to choanae than to each other.

Forelimbs moderate, shorter than hand (FLL 9.5 mm, HAL 11.5 mm); fingers long, free; 1st finger shorter than 2nd; tips with well developed discs.

Hind limbs long, tibia as long as femur (TL 23 mm, FL 23 mm); TTA reaches between eye and nostril on the right and up to snout on the left; toes 2/3rd webbed (FFTF 9 mm, TFTF 8.5 mm, MTFF 11 mm, MTTF 11 mm); inner metatarsal tubercle prominent, conical; outer meta tarsal tubercle absent; subarticular tubercles moderate; thigh behind and flanks posteriorly with round yellowish spots.

Web formula : I 1-1 II ½ - 2 III 1-2 IV 2-1 V

Measurements (in mm) of *Polypedates assamensis* sp. nov.

	Holotype		Holotype
SVL	45	MBE	3.5
HL	13.5	MFE	7
HW	13.5	TL	23
IUE	5	FL	23
EL	5	TRL	11.5
TYD	3	FOL	17
TYE	1	FLL	9.5
IFE	7	HAL	11.5
IBE	12	FFTF	9
EN	4	TFTF	8.5
NS	2	MTFF	11
SL	6	MTTF	11
IN	3		

Habit : Of moderate build.

Habitat : Collected at night from shrubs bordering the pool of water, accumulated during the monsoon showers, by the road side along with other common anuran species including *Polypedates leucomystax*. Forest land borders the other side of the road.

Since skin on head is not co-ossified, the specimen falls under *maculatus* group. Therefore the comparison is drawn with *Polypedates maculatus*. *Polypedates assamensis* is closer to *P. maculatus* in IUE, EL, TYD, TYE, IBE, MBE, FLL, TRL, FFTF and MTTF. It differs from the latter in HL, HW, IFE, EN, NS, SL, IN, MFE, TL, FL, FOL, HAL and TFTF.

P. assamensis shares similarities with *P. subansiriensis* in HL, EL, TYD, TYE, IBE, EN, NS, IN, MBE, MFE, TL, FLL and TFTF. It differs from the latter in HW, IUE, IFE, SL, FL, TRL, FOL, HAL, FFTF, MTFF and MTTF. Further, head as long as broad in *P. assamensis* (index HL 300, HW 300), whereas in *P. subansiriensis* head is broader than long (index HL 313, HW 339); TTA reaches between eye and nostril in *P. assamensis* and it reaches snout in *P. subansiriensis*; tympanum sunk in *P. assamensis* whereas depressed but not sunk in *P. subansiriensis*; toes 2/3rd webbed in *P. assamensis* and toes 3/4th webbed in *P. subansiriensis*.

Fingers free in *P. assamensis*; fingers slightly webbed in *P. maculatus*. 1st finger shorter than 2nd in *P. assamensis* ; 1st finger as long as 2nd in *P. maculatus*.

Polypedates assamensis differs from *P. taeniatus* in having head as long as broad (versus longer than broad) and dorsum without bands (versus with bands).

Polypedates assamensis differs from *P. himalyensis* in having nostril closer to snout (versus nostril equidistant) and tympanum 2/3rd eye diameter (versus tympanum 3/4th eye diameter).

Polypedates assamensis differs from *P. gongshanensis* in having head as long as broad (versus head broader than long), nostril closer to snout (versus nostril closer to eye) and toes 2/3rd webbed (versus toes fully webbed).

Polypedates assamensis differs from *P. megacephalus* in not having an hour-glass shaped pattern dorsally and toes 2/3rd webbed (versus 1/2 webbed).

Etymology : The specimen is named after the state from where collected.

Distribution : Assam.

27. *Polypedates subansiriensis* sp. nov. (Plate XIX)

Material examined : 1 ex. (HOLOTYPE), Reg.no. VA/ERS/ZSI/802, Soro village, Lower Subansiri District, Arunachal Pradesh, (N. 27° 31' 05.1" E 93° 50' 30.9"), Alt. 1550 m above msl, 3.6.2007, Coll. R..Mathew and party.

Description of holotype :

Diagnostic characters : Dorsum minutely granular, venter broadly granular; dorsum with indistinct white (brownish-yellow in life) spots; a broad , smooth, darker band from eye to nostril; skin below this band granular; a black streak from nostril to shoulder along eye; hand and tarsus margined with white slightly raised dermal fringe.

Head broader than long, depressed (HW 19 mm, HL 17.5 mm, MFE 9 mm, MBE 4.5 mm); vomerine teeth in oblique rows, closer to choanae than to each other; snout longer than eye diameter (SL 9 mm, EL 5.5 mm); inter orbital width broader than internarial width (IUE 8 mm, IN 3.5 mm) and eye length (EL 5.5 mm); tympanum depressed , 73% of eye diameter

(TYD 4 mm, EL 5.5 mm), not sunk; supratympanic glandular fold prominent; skin on head loose; nostril closer to snout (EN 5.5 mm, NS 2.5 mm); upper lip with a white bordering line; tongue short, broad, of medium thickness, deeply notched.

Forelimbs moderate, shorter than hand (FLL 12.5 mm, HAL 18 mm); fingers free; 1st finger shorter than 2nd.

Hind limbs long, tibia slightly shorter than femur (TL 29 mm, FL 30 mm); TTA reaching snout; thighs with usual round yellow spots; limbs with cross bands; toe discs much smaller; toe tips not round; toes $\frac{3}{4}$ webbed (FFTF 9.5 mm, TFTF 11.5 mm, MTFF 18 mm, MTTF 15 mm); inner metatarsal tubercle present, outer metatarsal tubercle absent.

Web formula : I $\frac{1}{2}$ -1 II 0-1 III 0-2 IV $2\frac{1}{2}$ V

Measurements (in mm) of *Polypedates subansiriensis* sp. nov.

	Holotype		Holotype
SVL	56	MBE	4.5
HL	17.5	MFE	9
HW	19	TL	29
IUE	8	FL	30
EL	5.5	TRL	16
TYD	4	FOL	27
TYE	2	FLL	12.5
IFE	10	HAL	18
IBE	15	FFTF	9.5
EN	5.5	TFTF	11.5
NS	2.5	MTFF	18
SL	9	MTTF	15
IN	3.5		

P. subansiriensis shares similarities with *P. maculatus* in HW, EL, IFE, IBE, SL, HAL, TFTF and MTTF. It differs from the latter in HL, IUE, NS, IN, MFE, TL, TRL, FLL and MTFF. Moreover HL, NS, IN, MFE, TL, FFTF are less in *P. subansiriensis* and more in *P. maculatus*; and IUE, TYE, TRL, FOL, FLL, and MTFF are more in *P. subansiriensis* and less in *P. maculatus*. Further, head is broader than long in *P. subansiriensis* (index HW 339, HL 313), and in *P. maculatus* head is as broad as long (index HW 343, HL 343). Tympanum 73% of eye diameter in *P. subansiriensis* and 63% of eye diameter in *P. maculatus* (as long as eye in *P. maculatus* as per Boulenger 1882). Fingers free in *P. subansiriensis*, slightly webbed in *P. maculatus*. 1st finger shorter than 2nd in *P. subansiriensis* and 1st finger as long as 2nd in *P. maculatus*.

The comparison of *P. subansiriensis* with *P. assamensis* is already elaborated under the description of *P. assamensis*.

Polypedates subansiriensis differs from *P. taeniatus* in having head broader than long (versus head longer than broad), TTA reaching snout (versus TTA reaching corner of eye) and dorsum without bands (versus with bands).

Polypedates subansiriensis differs from *P. himalayensis* in having head broader than long (versus head as long as broad), nostril closer to snout (versus nostril equidistant to eye and snout), TTA reaching snout (versus TTA reaching between eye to nostril).

Polypedates subansiriensis differs from *P. gongshanensis* in having nostril closer to snout (versus nostril closer to eye), 3/4th webbed toes (versus fully webbed toes).

Polypedates subansiriensis differs from *P. megacephalus* in having 3/4th webbed toes (versus 1/2 webbed toes), not having hour glass pattern on dorsum (versus having hour glass pattern on dorsum).

Etymology : The specimen is named after the district from where collected.

Distribution : Arunachal Pradesh.

Key to the species of the genus *Rhacophorus*

- 1. Head as broad as long *suffry*
 Head broader than long or longer than broad 2
- 2. Head longer than broad 3
 Head broader than long 4
- 3. Snout triangular, pointed with protruding appendage *translineatus*
 Snout pointed without protruding appendage *tuberculatus*
- 4. Fingers not fully webbed 5
 Fingers fully webbed 6
- 5. Fingers 1/3rd webbed, nostrils nearer to snout, TTA reaching snout tip
 *appendiculatus*
 Fingers partly webbed, nostrils equidistant to eye and snout, TTA reaching between eye and nostrils, flanks with an axillary spot *rhodopus*
- 6. Web between fingers and toes blackish 7
 Web between fingers and toes not blackish 8
- 7. Nostrils nearer to snout *nigropalmatus*
 Nostrils equidistant to eye and snout *reinwardtii*

8. Flanks without spots, dorsum green *maximus*
Flanks with spots 9
9. Dorsum green, flanks with two dark bluish spots *bipunctatus*
Dorsum brownish to greenish yellow, flanks with more than two turquoise spots of
varying sizes *subansiriensis*

28. *Rhacophorus rhodopus* Liu and Hu, 1960
(Plate XX)

1960. *Rhacophorus rhodopus* Liu and Hu, *Acta Zoologica Sinica*, "1959" 11(4), 509-533

Material examined : 1 ex. Reg. No. V/A/ERS/ZSI/599, Nameri National Park, Sonitpur district, Assam, 20.06.03. Coll. B. Hussain.

Diagnostic characters : Dorsum reddish brown intermixed with variable brown and black spots; limbs dorsally with faint cross bands; undersurface of hind limbs reddish brown; a small, more or less round black spot on each side below the armpit (as per Sarkar and Sanyal, 1985, a large, more or less round black spot behind armpit); ventral surface brownish; dorsum including limbs scattered with minute warts; belly and lower surface of thighs granular; chest and throat smooth; supra tympanic glandular fold present; a dermal fringe along the outer margin of fore arm (except humerus) and fourth finger and along the tarsus and fifth toe; transverse flap of skin on vent and heel.

Head broader than long; snout longer than eye diameter ; canthus rostralis not very prominent; nostril closer to snout; inter orbital width less than the eye diameter; tympanum not very prominent, about ½ eye diameter.

Fore limbs stout; fingers webbed, webs reach the base of penultimate phalanges of first and third fingers; 1st finger shorter than 2nd; discs on fingers slightly larger than toe discs; subarticular tubercles well developed; a long, prominent palmar wart laterally at the base of 1st finger.

Hind limbs slender; toes long, nearly entirely webbed; web from disc to disc except on the 4th toe where it reach the penultimate phalange; TTA reach eye; inner meta tarsal tubercle indistinct; outer metatarsal tubercle absent.

Measurements (in mm) of *Rhacophorus rhodopus*

	Holotype		Holotype
SVL	35	EL	3.5
HL	10	IFE	6.2
HW	12	IBE	9.5
MN	8.5	EN	3.1
IUE	3	NS	2.5

	Holotype		Holotype
SL	6	TRL	8
TYD	2	FOL	16
TYE	0.75	FLL	7
IN	3	HAL	10
MBE	3.5	TFTF	4.5
MFE	5	FFTF	5
TL	17	MTTF	11.5
FL	18	MTFF	12

Distribution : Arunachal Pradesh

29. *Rhacophorus subansiriensis* sp. nov
(Plate XXII, XXIII)

Material examined : 1 ex. (HOLOTYPE) (Male) Reg. No. VA/ERS/ZSI/ 801; 3 exs. (PARATYPES), Reg. Nos. VA/ERS/ZSI/ 805,811 and 812 Ziro-Hapoli, Forest area behind the NHPC Guest House, Lower Subansiri district, Arunachal Pradesh, 2.6.2007, Coll. R. Mathew and party.

Description of the Holotype

Diagnostic characters : Dorsum varies from brownish yellow to greenish yellow with dark irregular markings all over and indistinct pin head size black spots; limbs with dark cross bands; ventrally belly, forelimbs and web on fingers yellowish; hind limb and web reddish orange; laterally one large axillary spot on either side followed by two smaller spots; a thick dermal fringe from 5th toe extends along lateral edge of tarsus to heel projecting in a calcar on lateral edge of heel; vent with a square medially notched supra cloacal fold; ventrally areolated.

Head broader than long (HW 12.5 mm, HL 12 mm, MFE 7 mm, MBE 4 mm); snout acutely pointed (SL 5.5 mm, EL 4 mm); nostril equidistant to eye and snout tip (EN 2.5 mm, NS 2.5 mm); interorbital width broader than internarial space (IUE 2.7 mm, IN 2.5 mm); eye prominent; pupil horizontal; lips white; tympanum large, 75% of eye diameter (TYD 3 mm, EL 4 mm), vertically oval, narrow towards the supratympanic glandular fold; faintly distinct; vomerine teeth oblique in position, closer to choanae than to each other; tongue large, moderately thick, deeply notched; supratympanic glandular fold bordering tympanum; canthus distinct.

Forelimbs moderate, shorter than hand (FLL 6 mm, HAL 11 mm); fingers extensively webbed; web formula I 1-1 II 0-1 III 0-0 IV; digit tips with enlarged circum marginal groove; narrow dermal fringe extends along lateral margin of 4th finger to base of hand.

Hind limbs slender, tibia as long as femur (TL 18 mm, FL 18 mm) , TTA reaches nostrils;

limbs with cross bands; toes fully webbed (FFTF 4.5 mm, TFTF 4.5 mm, MTTF 10 mm, MTFF 10 mm) ; thick dermal fringe from 5th toe extends along lateral edge of tarsus to heel projecting in a calcar on lateral edge of heel.

Measurements (in mm) of *Rhacophorus subansiriensis* sp. nov.

	Holotype		Holotype
SVL	39	MBE	4
HL	12	MFE	7
HW	12.5	TL	18
IUE	2.7	FL	18
EL	4	TRL	9
TYD	3	FOL	15
IFE	6	FLL	6
IBE	11.5	HAL	11
EN	2.5	FFTF	4.5
NS	2.5	TFTF	4.5
SL	5.5	MTFF	10
IN	2.5	MTTF	10

Description of Paratypes (males)

There are slight variations in the morphological measurements and number and size of the axillary spots in the paratypes as observed below.

- i) Paratype I Has one large axillary spot followed by 3 small black spots on either side.
- ii) Paratype II Has one large axillary spot on the right side and on the left side one large axillary spot followed by 2 smaller spots.
- iii) Paratype III Has one large axillary spot followed by 3 smaller spots on the right side and 2 smaller spots on the left side.

Measurements (in mm) of *Rhacophorus subansiriensis* sp. nov.

	Paratype I	Paratype II	Paratype III		Paratype I	Paratype II	Paratype III
SVL	38	37	37	TYD	3	2.5	2.5
HL	12	11.5	11.5	IFE	7	7	7
HW	12.5	12	12	IBE	10.5	11	11
IUE	5	4	3.5	EN	2.5	2.5	2.5
EL	4.5	4	4	NS	3	2.5	3

	Paratype I	Paratype II	Paratype III		Paratype I	Paratype II	Paratype III
SL	6	5.5	5.2	FOL	15	16	15.6
IN	4	3	3.5	FLL	7	6	6
MBE	4	4	3	HAL	11	11	11
MFE	6	6.5	6.5	FFTF	4.5	5	5
TL	18	17.5	18	TFTF	4.5	5	5
FL	17	18	18	MTFF	11	11	11
TRL	10	9	8.5	MTTF	11	11	11

Rhacophorus subansiriensis shows affinity towards *R. bipunctatus* in HL, EL, EN, MFE, TL, FLL and TFTF and also in the presence of lateral spots.

It differs from the latter in HW, IUE, TYD, IFE, IBE, NS, SL, IN, FL, TRL, FOL, HAL, MTFF and MTTF which are less in *R. subansiriensis*.

Further, tympanum is larger in *R. subansiriensis* and smaller in *R. bipunctatus*; web on hand less in *R. subansiriensis* and more in *R. bipunctatus*.

Rhacophorus subansiriensis is comparatively smaller species (males, SVL 37-39 mm); where as *Rhacophorus bipunctatus* (SVL 35-60) is larger species.

Dorsum varies from brownish yellow to greenish yellow with few pin head sized black spots (and in paratype III with few white spots) in *R. subansiriensis* and dorsum bright green with black and white pin head sized spots in *R. bipunctatus*.

R. subansiriensis shares similarities with *R. rhodopus* in IFE, NS, IN, HAL and TFTF.

It differs from the latter in HL, HW, IBE, EN, SL, MFE, FL, FOL, FLL, MTFF, MTTF.

Further in *R. subansiriensis* lateral spots are larger and more in number whereas in *R. rhodopus* there is a small, single round spot below armpit (but as per Sarkar and Sanyal, 1985, large, more or less round black spot behind armpit).

Rhacophorus subansiriensis differs from *R. suffry* in having spots on flanks (versus no spots on flanks).

Rhacophorus subansiriensis differs from *R. translineatus* (i) in the shape of head, (ii) not having the appendage on snout, (iii) in having the flank spots and (iv) in colouration of the body.

Rhacophorus subansiriensis differs from *R. tuberculatus* (i) in having spots on flanks (versus no spots on flanks) and (ii) head broader than long (versus longer than broad).

Rhacophorus subansiriensis differs from *R. appendiculatus* in having flank spots (versus no spots).

Rhacophorus subansiriensis differs from *R. reinwardtii* in not having black spots on web.

Etymology : The specimen is named after the district from where collected

Distribution : Arunachal Pradesh.

30. *Rhacophorus tuberculatus* (Anderson, 1871)

1871. *Polypedates tuberculatus* Anderson, *J. Asiat. Soc. Bengal*, **40** : 26.

Type locality: Sibsagar, Assam, India.

Location of type: Not traced.

Material examined : None.

Diagnostic characters : Dorsal surface of head and limbs dull clay, sparingly powdered with black and suffused more or less with yellow; canthus rostralis with black margin; occasionally a narrow black white-edged line extending backwards along each side from the eye to the base of hind limbs, while back of the head as well as dorsum ornamented with two large irregular marks outlined by similar lines; tubercles of the abdomen and thighs darker; faint black bands present on the tibia and femur.

Head of moderate size, slightly longer than broad; snout rounded, slightly pointed; nostrils closer to tip of snout; tympanum more or less distinct, about 2/3rd diameter of eyes; vomerine teeth closer to the anterior corner of choanae.

Forelimbs moderate; fingers broadly webbed; webs reaching the discs of 2nd and 4th fingers; discs large, about 1/3rd larger than toe discs. A small oblong metacarpal tubercle present.

Hind limbs : Moderately long; TTA reaching anterior region of eye; toes fully and broadly webbed; tips of toes dilated into large, prominent discs; subarticular tubercles more or less prominent; inner metatarsal tubercle present, outer metatarsal tubercle absent.

Distribution : Assam, West Bengal

Remark : No material of this species could be collected or studied. The description above is from Chanda (1994).

DISCUSSION

The project on “Little known amphibian species of North East India” was taken up to trace the 14 little known species reported from North East India. Within the limited time frame we could trace 4 species namely, *Kurixalus naso*, *Philautus kempiae*, *Philautus*

namdaphaensis and *Rhacophorus rhodopus*. In course of time, it may be possible that the remaining “little known” species would also be collected. It is remarkable that during the study period we could collect and describe 11 new species of anurans from the study area.

Though there are no special methods for collecting caecilians it is important to know the likely areas and the right time to search for them. Our efforts at collecting the caecilian specimens, though resulted in the collection of some Ichthyophid specimens, it did not yield the “little known” *Gegeneophis fulleri* and *Ichthyophis husaini*.

During the course of this study we collected a good number of interesting anuran specimens which not being common struck the eyes. These included Bufoids, Megophryids, Microhylids and Rhacophorids.

Several biological species probably remain hidden under the name of *Bufo melanostictus* Schneider, 1799, as size, morphology and colour show a high variation within the very extensive range currently allocated to this species (Dubois and Ohler, 1999). Our study on the materials collected during the project period revealed differences in characters among the *Bufo* specimens which resulted in the description of six new species from North East India.

We feel that the region with its variable habitats is conducive for a flourishing Megophryid species diversity which needs to be further explored.

Rhacophorids, likewise, is another complex group which needs further extensive search, collection and study.

Detailed study of the presently collected material revealed 6 new species of the genus *Bufo* namely *Bufo kiphirensis* sp. nov., *Bufo mamitensis* sp. nov., *Bufo manipurensis* sp. nov., *Bufo mizoramensis* sp. nov., *Bufo nagalandensis* sp. nov., *Bufo wokhaensis* sp. nov., 2 new species of *Megophryids* namely *Xenophrys serchhipii* Mathew and Sen and *Xenophrys zunhebotoensis* Mathew and Sen; and 5 new species of Rhacophorids namely *Chirixalus senapatiensis* sp. nov., *Philautus manipurensis* sp. nov., *Polypedates assamensis* sp. nov., *Polypedates subansiriensis* sp. nov. and *Rhacophorus subansiriensis* sp. nov.

We also recorded 2 species namely *Bufo scaber* and *Micryletta inornata* for the first time from North East India.

Philautus garo Boulenger is yet another species which falls under the “little known” category. We did not include this among the 14 species listed for the present study because Ao *et al.* (2003) had reported it as a new record for Nagaland. However they did not give a detailed description or a photograph of the species. Therefore, we include this in the present study giving a detailed description and a photograph.

Being one of the “Biological Hotspots” of the World, the North East India has much to contribute to the amphibian faunal wealth of the country and to the world at large.

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REFERENCES

- Ahmed, M. F. 2002. Amphibians of North East India. The Rhino Foundation for nature in N. E. India (RFNEI) no. 4 : 15-16.
- Ahmed, M. F. and S.K. Dutta, 2000. First record of *Polypedates taeniatus* (Boulenger, 1906) from Assam, N. E. India, *Hamadryad*, **25**(1) : 49-50 .
- Ahmed, R. and A. Dutta, 2001. Ecology and status of the Anurans fauna of 11 districts of Brahmaputra valley of Assam, *Cobra*, **45** : 13-21.
- Ahmed, M. F. and U. C. Goswami, 1999. Amphibians in and around Gauhati .University, Guwahati, Assam, *Frogleg*, **3**(2) : 3.
- Annandale, N. 1912. Zoological results of the Abor Expedition (1911-1912). 1. Batrachia. *Rec. Indian Mus. Calcutta*, **8**(1) : 7-86.
- Ao, J. M.; S. Bordoloi and A. Ohler, 2003. Amphibian fauna of Nagaland with nineteen new records from the state including five new records for India. *Zoos' Print Journal*, **18**(6) : 1117-1125.
- Bhaduri, J.L. and S.S. Saha, 1980. Extension range of the narrow-mouthed frog, *Uperodon globulosum* (Gunther) to Kamrup district, Assam. *J. Bombay nat. Hist. Soc.*, **77** : 151-152.

- Borah, M. M. and S. Bordoloi, 2001a. Rediscovery of *Bufo macrotis* Boulenger (Amphibia : Anura) in Arunachal Pradesh, India. *Zoos' Print Journal*, **16**(8) : 574.
- Borah, M. M. and S. Bordoloi, 2001b. Nine new records of amphibia (Anura) from Arunachal Pradesh, India , *J. Bombay nat. Hist. Soc.*, **98**(1) : 123-126.
- Bordoloi, S and M. M. Borah, 1999, First record of *Hoplobatrachus crassus* (Jerdon, 1853) from north eastern region in Assam and Arunachal Pradesh. *J. Bombay nat. Hist. Soc.*, **96**(1) : 158
- Bordoloi, S., M. M. Borah, K. Sharma and S. N. Kalita 2000, An overview of amphibian fauna of Arunachal Pradesh. *J. Assam Sci. Soc.*, **41**(4) : 363-371
- Bordoloi, S.; M. M. Borah; P. Chakravarty and B. Sinha, 2001. First record of the ranid frog *Paa annandalii* (Boulenger, 1920) from North Eastern Region (Arunachal Pradesh) of India with a note on its larval stages. *Curr. Sci.*, **80**(9) : 1219-1222.
- Bordoloi, S., M. M. Borah, P.K. Sarmah and J. Sharma 2003. Amphibian and insect fauna of amphibian habitats of Dehang–Debang Biosphere Reserve, Arunachal Pradesh. *Himalayan Biosphere Reserves*, Vol. **4**(1 and 2) : 33-38.
- Bordoloi, S., T. Bortamuli and A. Ohler, 2007. Systematics of the genus *Rhacophorus* (Amphibia : Anura) : identity of red-webbed forms and description of a new species from Assam. *Zootaxa*, **1653** : 1-20.
- Borthakur, R.; J. Kalita; B. Hussian and S. Sengupta 2007. Study on the *Fejervarya* (Anura : Dicroglossidae) species of Assam. *Zoos' Print Journal*, **22**(4) : 2639-2643.
- Chanda, S.K. 1990 a Amphibian (Anura) species and their altitudinal distribution in north-east India. *J. Bombay nat. Hist. Soc.*, **87** : 157-158.
- Chanda, S.K. 1990 b. A new frog of the genus *Rana* (Ranidae : Anura) from Manipur, north eastern India. *Hamadryad*, **15**(1) : 16-17.
- Chanda, S.K. 1990 c. *Rana mawlyndipi* a new frog (Ranidae) from Khasi Hills, Meghalaya, India. *J. Bengal Nat. Hist.*, **9**(1) : 44-45.
- Chanda, S.K. 1991 . Amphibians of north-east India, present status and distribution. *Herpeton*, **4** : 1-7.
- Chanda, S.K. 1992 .Further note on the distribution pattern of amphibia in north-eastern India. *J. Bengal Nat. Hist. Soc.*, (N.S.) **11**(1) : 25-33.
- Chanda, S.K. 1993. Food and feeding habit of some amphibian species of North East India. *Rec. zool. Surv. India*, **93**(1-2) : 15-29.
- Chanda, S.K. 1994. Anura (Amphibia) of north-eastern India. *Mem. zool. Surv. India*, **18** : 1-143.

- Chanda, S.K. 1995. Amphibian fauna of Meghalaya, Zoological Survey of India. *State Fauna Series*, 4(Part 1) : 455-482.
- Chanda, S.K. 2002. *Handbook- Indian Amphibians* : i-viii, 1-335 pp. Published-Director, Zoological Survey of India, Kolkata.
- Chanda, S.K. 2006. Amphibia : *Fauna of Nagaland*, *State Fauna Series*, 12 : 427-432.
- Chanda, S.K. 2007. Amphibia : *Fauna of Mizoram*, *State Fauna Series*, 14 : 537-544.
- Chanda, S.K. and A.K.Ghosh, 1989. A new frog of the genus *Philautus* Gistel, from the proposed Namdapha Biosphere Reserve, Arunachal Pradesh, North-East India. *J Bombay nat. Hist. Soc.*, 86(2) : 215-217.
- Chanda, S. K. and A. K. Sarkar, 1997, The validity of *Philautus shyamrupus* Chanda and Ghosh (Anura : Rhacophoridae) *Hamadryad*, 22(1) : 46-47
- Chanda, S.K. and S. K. Talukar, 1973. Preliminary observation on the foam nest and early development of a frog *Rhacophorus* sp. *J. Assam Sci. Soc.*, 16(2) : 32-34.
- Choudhury, N. K.; B. Hussain ; M.Baruah; S.Saikia and S. Sengupta, 2001 a. Amphibian fauna of Kamrup district, Assam, with notes on their natural history *Hamadryad*, 26(2) : 276-282.
- Choudhury, N.K.; M. F. Ahmed and S. Sengupta, 2001 b. Distribution of *Bufo stomaticus* Lutken, Amphibia, Family Bufonidae, in Assam, N. E. India. *J. Bombay nat. Hist. Soc.* 98(3) : 457-459.
- Choudhury, N.K.; J. Gogoi and S. Sengupta, 2001 c. *Chirixalus vittatus* (Striped tree frog) *Herpetological review*, 32(2) : 112-113.
- Choudhury, P.; M. Baruah and S. Sengupta, 1999. Range extension in *Uperodon globulosus* (Gunther, 1864) in Assam. *J. Bombay nat. Hist. Soc.*, 96(1) : 157.
- Das, I. 1984. Occurrence of the Indian Salamander (*Tylototriton verrucosus*) in Shillong. *Hamadryad*, 9(2) : 11.
- Das, I. 1988. On a collection of some amphibia and chelonia from Meghalaya *Hamadryad*, 13(2) : 17-20.
- Das, I. and S.K. Chanda, 2000. A new species of *Scutiger* (Anura : Megophryidae) from Nagaland, North-Eastern India *Herpetological Journal*, England, 10 : 69-72.
- Das, I.; S. Sengupta; M. F. Ahmed and S.K. Dutta, 2004. A new species of *Kaloula* (Anura : Microhylidae) from North eastern India. *Hamadryad*, 29(1) : 101-109
- Deuti, K and S.K. Dutta, 2002. First record of Boulenger's tree frog *Chirixalus vittatus* (Anura : Rhacophoridae) from Mizoram, North-east India. *J. Bombay nat. Hist. Soc.*, 99(1) : 126.

- Deuti, K.; S. Biswas; M.F. Ahmed and S.K. Dutta, 2000. Rediscovery of *Chirixalus sinus* Annandale, 1915 (Anura : Rhacophoridae) from Assam and West Bengal eastern India. *Hamadryad*, **25**(2) : 215-217.
- Dey, M. and A. Gupta, 1999. Ecology of the anurans of Barak valley, Assam. *Frog-Leg*, **3**(2) : 3-4.
- Dey, M. and A. Gupta, 2000. Record of *Kaloula pulchra* (Gray, 1831) (Anura : Microhylidae) from Cachar District, Assam, N. E. India. *Hamadryad*, **25**(2) : 214-215.
- Dey, M. and S.N. Ramanujam , 2003. Record of *Pterorana khare* Kiyasetuo and Khare, 1986 (Anura : Ranidae) from Aizawl district, Mizoram, north-eastern India. *Hamadryad*, **27**(2) : 255-256 .342 + i-xxii
- Dubois, A. and A. Ohler, 1999. Asian and Oriental toads of the *Bufo melanostictus*, *Bufo scaber* and *Bufo stejnegeri* groups (Amphibia, Anura) : a list of available and valid names and redescription of some name-bearing types. *J. South Asian Nat. Hist.*, ISSN 1022-0828. Vol. 4, No. 2, pp. 133-180, 32 figs., 2 tabs.
- Dutta, S. K.; M.F. Ahmed and I. Das, 2000. *Kalophrynus* (Anura : Microhylidae), a new genus for India, with description of a new species, *Kalophrynus orangensis*. from Assam State. *Hamadryad*, **25**(2) : 67-74.
- Frost, D. R. 2008 Amphibian species of the world: an online reference. (V.5.1) (25th March, 2008) Electronic database accessible at (<http://research.amnh.org/herpetology/amphibia/index.php>)
- Ghosh, M. and A. Sarkar, 2000. Record of *Kaloula pulchra* (Gray, 1831) (Anura : Microhylidae) from Cachar district, Assam; N. E. India. *Hamadryad*, **25**(2) : 214-215.
- Grosselet, O.; S. Sengupta; A. Gupta; M.Vauche and S.Gupta. 2004. *Microhyla heymonsi* Vogt, 1911 (Anura : Microhylidae) from mainland India, with bioacoustic analysis of its advertising call. *Hamadryad*, **29**(1) : 131-133.
- Hooroo, R. N. K.; S. Khongwir and B.B.P. Gupta, 2002. Record of *Kaloula pulchra* (Gray, 1831) (Anura : Microhylidae) from Cherrapunjee, Meghalaya, north eastern India *Hamadryad*, **27**(1) : 146-148.
- Hora, S. L. 1923. Observations on the fauna of certain torrential streams in the Khasi Hills. *Rec. Indian Mus.*, Calcutta, **24** : 584-591.
- Khare, M. K. and Kiyasetuo. 1986. A new record of frog, *Chirixalus vittatus* (Boulenger, 1887) from north-eastern hills of India. *Zoologica. Orientalis*, **3**(1-2) : 47-49.
- Kiyasetuo and M. K. Khare 1986. A new genus of frog (Anura : Ranidae) from Nagaland at the North-eastern hills of India. *J. Exp. Sci.*, **1** : 12-17.
- Kiyasetuo 1987. A new record of *Rhacophorus bissaculus* Taylor, from North Eastern Hills of India. *J. Assam Sci. Soc.*, **29**(3) : 16-19.

- Mansukhani, M. R. and A.K. Sarkar, 1981. Notes on some amphibian collections from Tripura, India. *Rec. zool. Surv. India*, **79** : 267-273.
- Mansukhani, M.R.; J.M. Julka and A.K. Sarkar, 1976. On the occurrence of the Himalayan Newt, *Tylototriton verrucosus* Anderson, from Arunachal Pradesh, India. *Newl. Zool. Surv. India*, Calcutta, **2**(6) : 243-245.
- Mathew, R. and N. Sen, 2003a. A rediscovery of *Micrixalus borealis* Annandale, 1912 (Ranidae : Anura : Amphibia) from Meghalaya, India, *Cobra*, **53** : 1-4
- Mathew, R. and N. Sen, 2003b. On *Philautus shillongensis* Pillai and Chanda, 1973, an endemic bushfrog (anura : Rhacophoridae) of Meghalaya, India, with notes on it's morphology and habitat. *Cobra*, **53** : 9-12
- Mathew, R. and N. Sen, 2005a. *Fejervarya teraiensis* (Dubois) (Ranidae : Anura : Amphibia) in North East India. *Cobra*, **59**(Jan.-Mar.) : 1-4.
- Mathew, R. and N. Sen, 2005b. The Web in Anurans (Amphibia) *Cobra*, **62** : 1-22.
- Mathew, R. and N. Sen, 2006a. Occurrence of *Rana humeralis* Boulenger, 1887 in Arunachal Pradesh and Assam and notes on *Rana nigrovittata* (Blyth, 1855) (Amphibia : Anura : Ranidae) in Assam. *Rec. zool. Surv. India*, **106**(1) : 81-82
- Mathew, R. and N. Sen, 2006b. Notes on abnormalities/deformities in Anurans (Amphibia). *Cobra*, **63**(Jan.-Mar.) : 6-10.
- Mathew, R. and N. Sen, 2007. Description of two new species of *Xenophrys* (Amphibia: Anura: Megophryidae) from North East India. *Cobra*, I issue, **2** (Apr.-Jun.) : 18-28.
- Mathew R. and N. Sen. 2008. Rediscovery of *Rhacophorus naso* Annandale, 1912 (Amphibia : Anura : Rhacophoridae) from Mizoram, North East India. *Rec. zool. Surv. India*, **108**(Part I) : 41-42.
- Mathew, R.; N. Sen and A.B. Meetei, 2005. A note on the colour pattern in *Philautus shillongensis* Pillai and Chanda, 1973 (Anura : Rhacophoridae). *Cobra*, **61** : 27.
- Ningombam, B and S. Bordoloi, 2007. Amphibian fauna of Loktak lake, Manipur, India with ten new records for the state. *Zoos' Print Journ.*, **22**(5) : 2688-2690.
- Pathak, J.; B. K. Baruah and S. Sengupta. 2001. Taxonomic study on the amphibians of Rangjuli (Goalpara, Assam). *Cotton College Research Journal* (Centenial issue) **1** : 199-210
- Pillai, R. S. 1977. On two frogs of the family Microhylidae from Andaman including a new species. *Proc. Indian Acad. Sci.*, **86** B(2) : 135-138.
- Pillai, R.S. and S.K. Chanda, 1973. *Philautus shillongensis*, a new frog (Ranidae) from Meghalaya, India. *Proc. Indian Acad. Sci.*, **78B** : 30-36.

- Pillai, R.S. and S.K. Chanda, 1976. The distribution pattern of amphibia in North East India. *J. Assam Sci. Soc.*, **19** : 1-4.
- Pillai, R.S. and S.K. Chanda, 1977. Two new species of frogs (Ranidae) from Khasi Hills, India. *J. Bombay nat. Hist. Soc.*, **74**(1) : 136-140.
- Pillai, R.S. and S.K. Chanda, 1979. Amphibian fauna of Khasi Hills, Meghalaya. *Rec. zool. Surv. India*, **75** : 383-395.
- Pillai, R.S. and S.K. Chanda, 1981. Amphibian fauna of Garo Hills, Meghalaya with description of a new species of *Rana*. *Rec. zool. Surv. India*, **79** : 159-168.
- Pillai, R.S. and G.M. Yazdani, 1973. *Bufoïdes*, a new genus for the rock toad, *Ansonia meghalayana* Yazdani and Chanda, with notes on its ecology and breeding habits. *J. Zool. Soc. India*, **25**(1-2) : 65-70.
- Pillai, R.S. and M. S. Ravichandran, 1999. Gymnophiona (Amphibia) of India, a taxonomic study. *Rec. zool. Surv. India, Occ. Paper. No.*, **172** : 1-117.
- Roonwal, M. L. and M. B. Kripalani, 1961. A new frog, *Philautus cherrapunjiae*, (Family, Ranidae) from Assam, India with field observations on its behaviour and metamorphosis. *Rec. Indian Mus.*, Calcutta, **59**(1-2) : 325-333.
- Saha, B.K. and B.B.P. Gupta, 2007. Diversity of anuran fauna at Kakoiijana reserve forest, Bongaigaon, Western Assam, India. *Cobra*, (Jan.-Mar.), Vol. 1 issue 1 : 12-17.
- Sahu, A.K. 1985. New record of the fungoid frog *Rana malabarica* Tschudi, 1838 (Anura: Ranidae) from N. E. India. *Geobios New reports*, **4**(2) : 170-172
- Sarkar, A.K. and D. P. Sanyal, 1985. On a collection of amphibia from Namdapha National Park, Tirap district, Arunachal Pradesh. *Rec. zool. Surv. India*, **82**(1-4) : 285-289.
- Sarkar, A.K.; S. Das and S. Ray, 2002. *Amphibia, Fauna of Tripura, State Fauna Series*, **7**(Part I) : 179-190.
- Sarkar, A.K. and S. Ray, 2006. Amphibia: *Fauna of Arunachal Pradesh, State Fauna Series*, **13**(Part I) : 285-316.
- Sen, N. 2004. Further notes on statewide distribution of the amphibian fauna of North-East India. *Rec. zool. Surv. India*, **102** (Part 3-4) : 105-112.
- Sen, N. and R. Mathew, 2003. Range extension of *Pterorana khare* Kiyasetuo and Khare 1986 (Anura : Ranidae) with notes on some morphological characters. *Cobra* : 5-8.
- Sen, N. and R. Mathew, 2004. Occurrence of *Euphlyctis hxadactylus* (Lesson, 1834) (Amphibia : Anura : Ranidae) in North East India with notes on its morphological characters. *Cobra*, **55** : 1-6

- Sen, N. and R. Mathew, 2006. Notes on a rare frog, *Pterorana khare* Kiyasetuo and Khare, 1986 from North East India with report on its hitherto unknown female. *Rec. zool. Surv. India*, **106**(2) : 121-122.
- Selim, K. 2001. Notes on *Tylototriton verrucosus* Anderson : a critically endangered newt from Manipur. *J. Bombay nat. Hist. Soc.*, **98**(2) : 291-292.
- Sengupta, S.; N.K.Choudhury and I. Das, 2001. *Leptobrachium smithi* Matsui, Nabhitabhata and Panha, 1999 (Anura : Megophryidae), a new record for India. *J. Bombay nat. Hist. Soc.*, **98**(2) : 289-290.
- Singh, K.S., 1995. On a collection reptiles and amphibians of Manipur. *Geobios New reports* **14**(2) : 135-145.
- Smith, M. A. 1929. On a collection of amphibians and reptiles from the upper reaches of the Brahmaputra, *Rec. Indian Mus.*, Calcutta, **31** : 77-80.
- Smith, M. A. 1935. The amphibians and reptiles obtained by Capt. Kingdom Ward in Upper Burma : Assam and Tibet. *Rec. Indian Mus.*, **37**(2) : 237-240.
- Talukdar, S.; R. Soud and K. Deuti, 2007. Range extension of the Assam painted frog, *Kaloula assamensis* (Anura : Microhylidae) to western Assam. *Cobra* (Jan.-Mar.), vol. **1** : 18-20.
- Yazdani, G. M. and S. K. Chanda, 1971. A new toad, *Ansonia meghalayana* (Family : Bufonidae) from Meghalaya (Assam), India, with observations on its breeding on *Pandanus furcatus* Roxb (Pandanales : Pandanecea) *J. Assam Sci. Soc.*, **14**(1) : 76-80.

PLATE - I



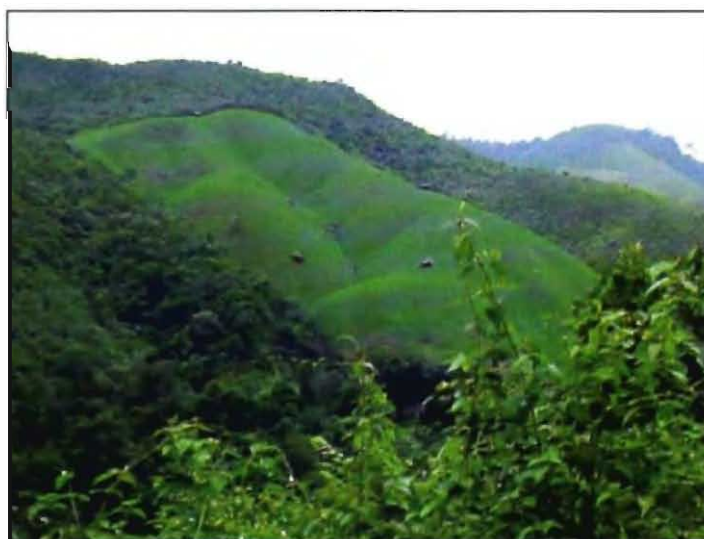
The Ganga Lake at Itanagar



The Nohkalikai falls at Cherrapunjee



Jhuming cultivation, a way of life in the North-East



Jhum cultivation on hills



Sippi river, Daporijo

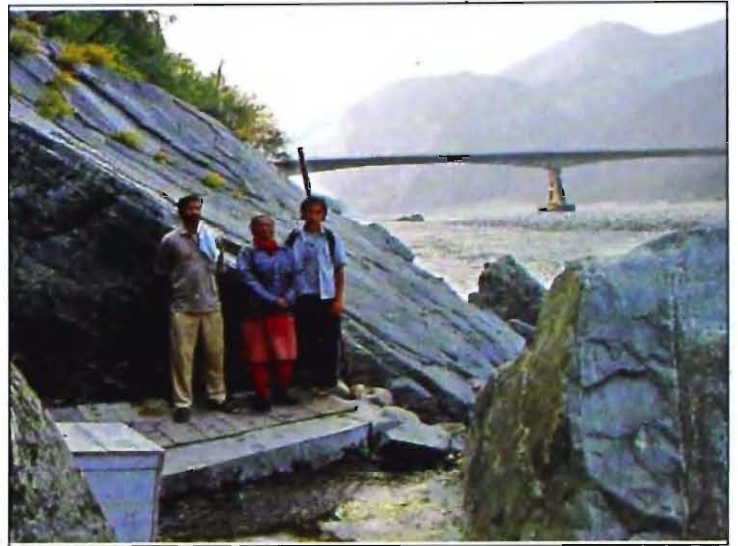


The survey team at Mayudia Pass

PLATE - II



Enroute to Kibitho



The survey party at Parashuram Kund



At a wayside View Point, Mizoram

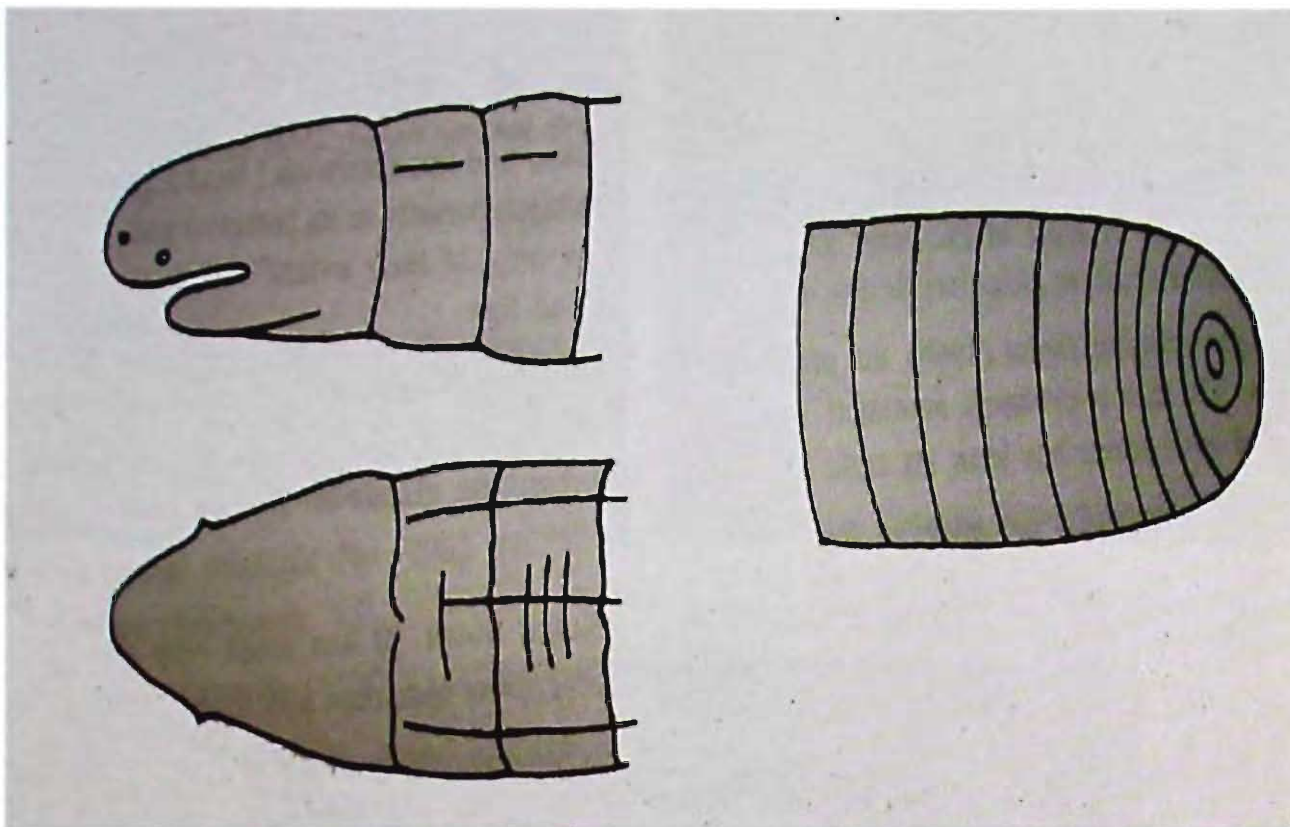


Leimatak, Manipur

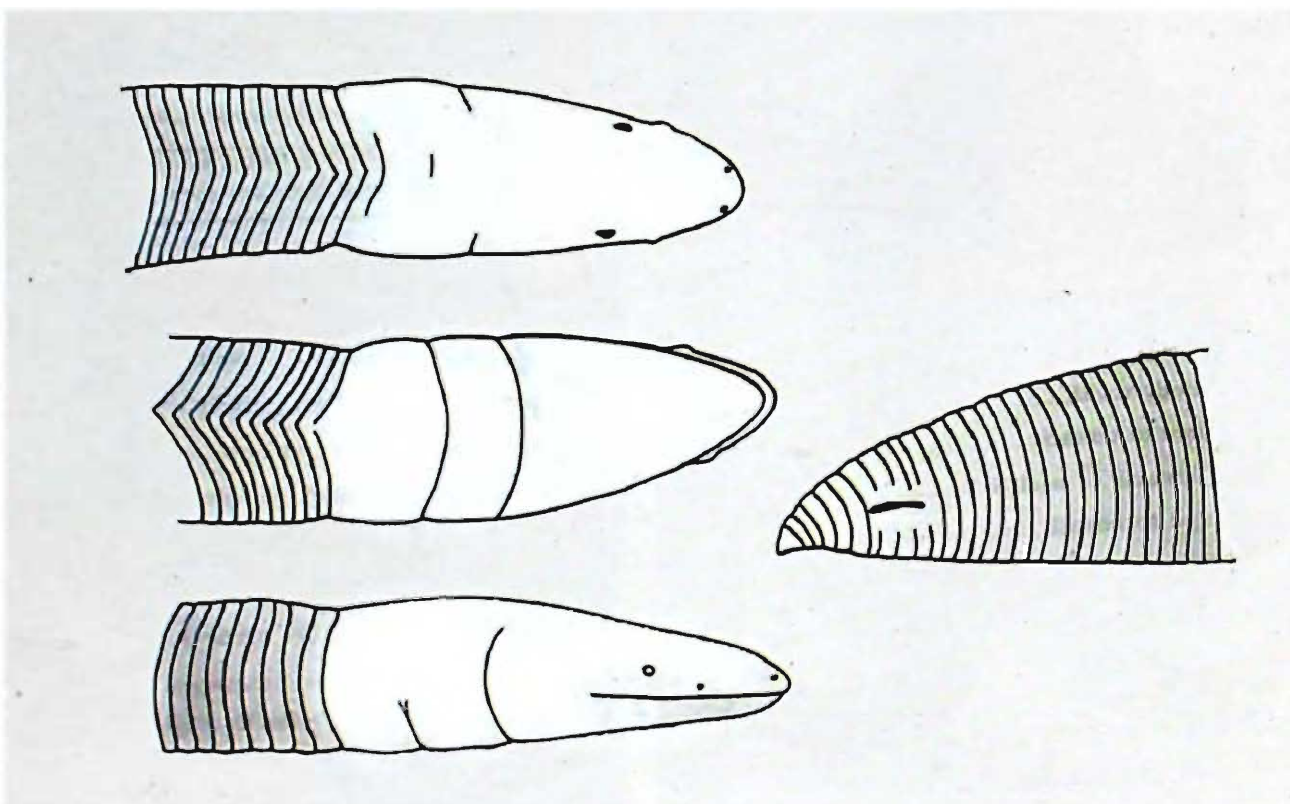


At Daporijo

PLATE - III



Gegeneophis fulleri (dorsal and ventral view)



Ichthyophis husaini (dorsal, ventral, lateral view of head and the position of vent)

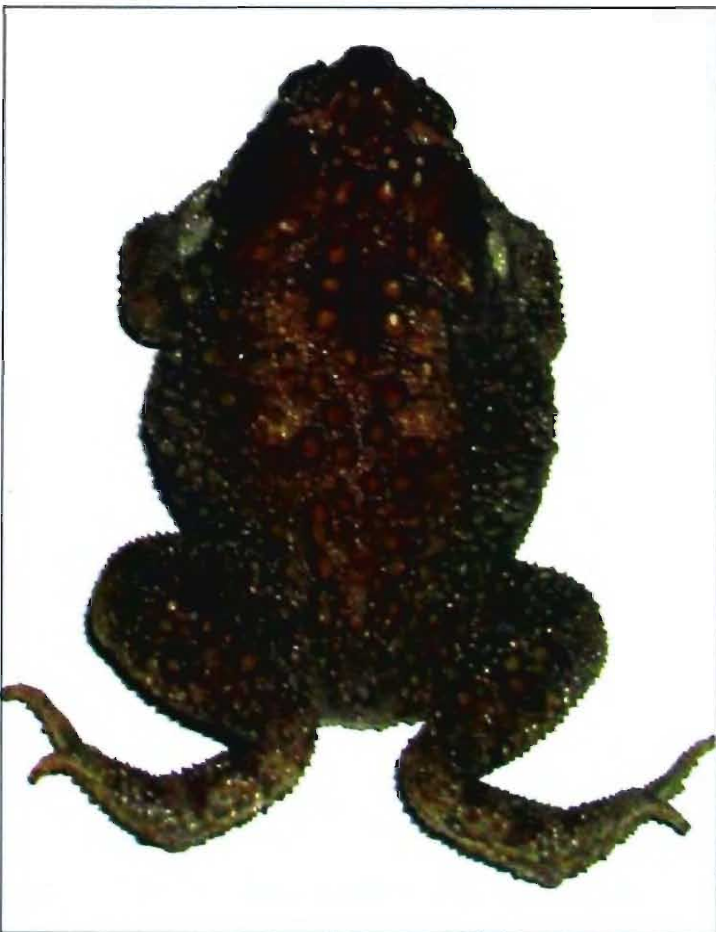
PLATE - IV



Bufo kiphirensis sp. nov.
(lateral view, showing tympanum)



Bufo kiphirensis sp. nov.
(ventral view, showing feet)



Bufo kiphirensis sp. nov. (dorsal view)



Bufo kiphirensis sp. nov. (ventral view)

PLATE - V



Live specimen of *Bufo manitensis* sp. nov.
(dorsal view)



Live specimen of *Bufo manitensis* sp. nov.
(front view showing back blotches on chest)



Bufo manitensis sp. nov. (lateral view, showing tympanum and nostrils)



Bufo mamitensis sp. nov. (dorsal view)



Bufo manitensis sp. nov.
(showing back blotches on chest)

PLATE - VI



Bufo manipurensis sp. nov. (lateral view)



Bufo manipurensis sp. nov. (dorsal view)

PLATE - VII

Bufo mizoramensis sp. nov. (dorsal view)



Bufo mizoramensis sp. nov.
(lateral view)

Bufo mizoramensis sp. nov.
(ventral view)



PLATE - VIII



Bufo nagalandensis sp. nov.
(dorsal view)



Bufo nagalandensis sp. nov.
(ventral view)

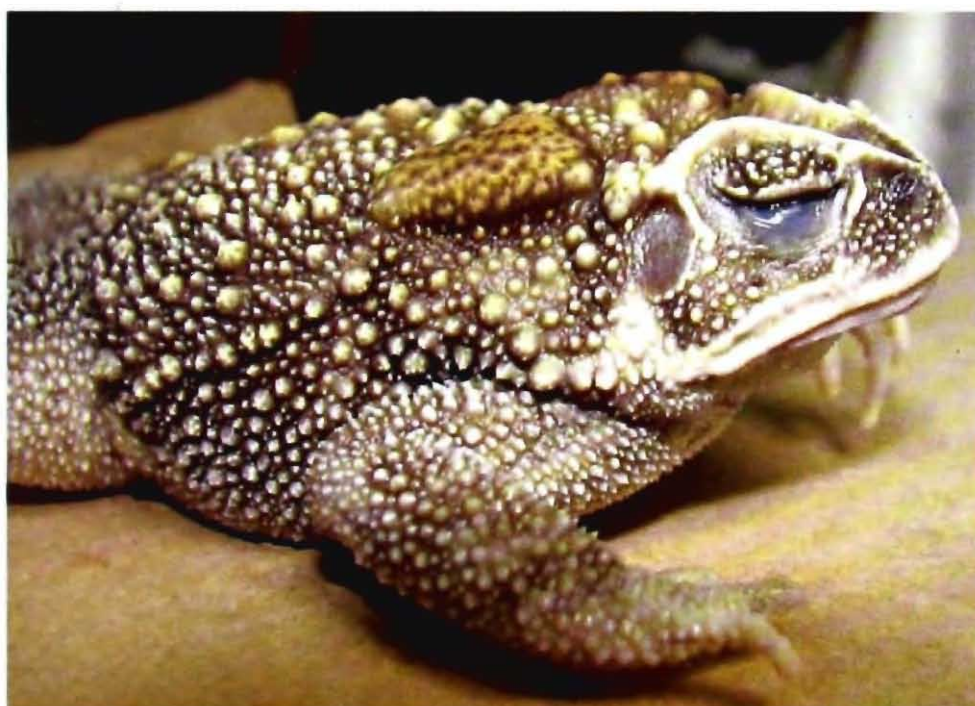


Bufo nagalandensis sp. nov.
(lateral view)

PLATE - IX



Bufo wokhaensis sp. nov. (dorsal view))



Bufo wokhaensis sp. nov. (lateral view)

PLATE - X



Bufo scaber (dorsal view)



Natural habitat of *Bufo scaber*

PLATE - XI



Xenophrys serchhipii (dorsal view)



Xenophrys serchhipii (close up view of head)



Xenophrys serchhipii (Ventral view)



Xenophrys serchhipii (lateral view)

PLATE - XII



Xenophrys zunhebotoensis (female), dorsal view



Xenophrys zunhebotoensis (female), lateral view



Xenophrys zunhebotoensis sp. nov.
(ventral view)



Xenophrys zunhebotoensis sp. nov. (slit abdomen showing eggs)

PLATE - XIII



A live specimen of *Micryletta inornata*



Natural habitat of *Micryletta inornata*

PLATE - XIV



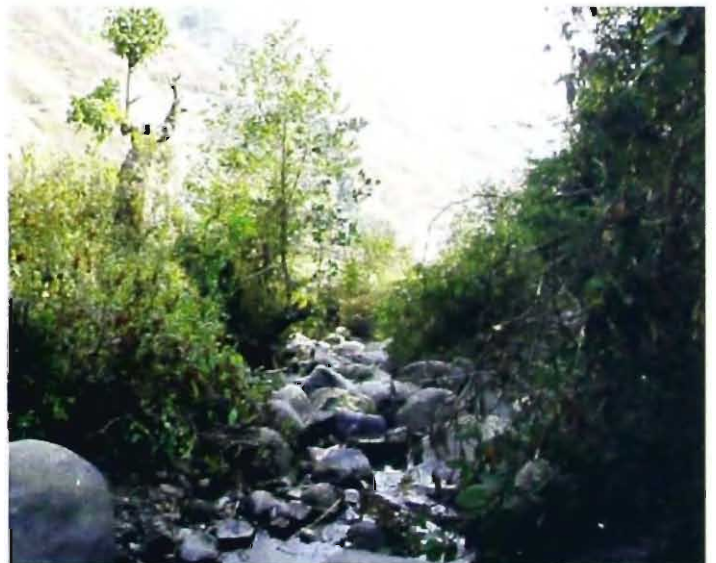
A live specimen of *Chirixalus senapatiensis* sp. nov.



Chirixalus senapatiensis sp. nov.
(ventral view showing web and disks)



Chirixalus senapatiensis sp. nov.
(lateral view)

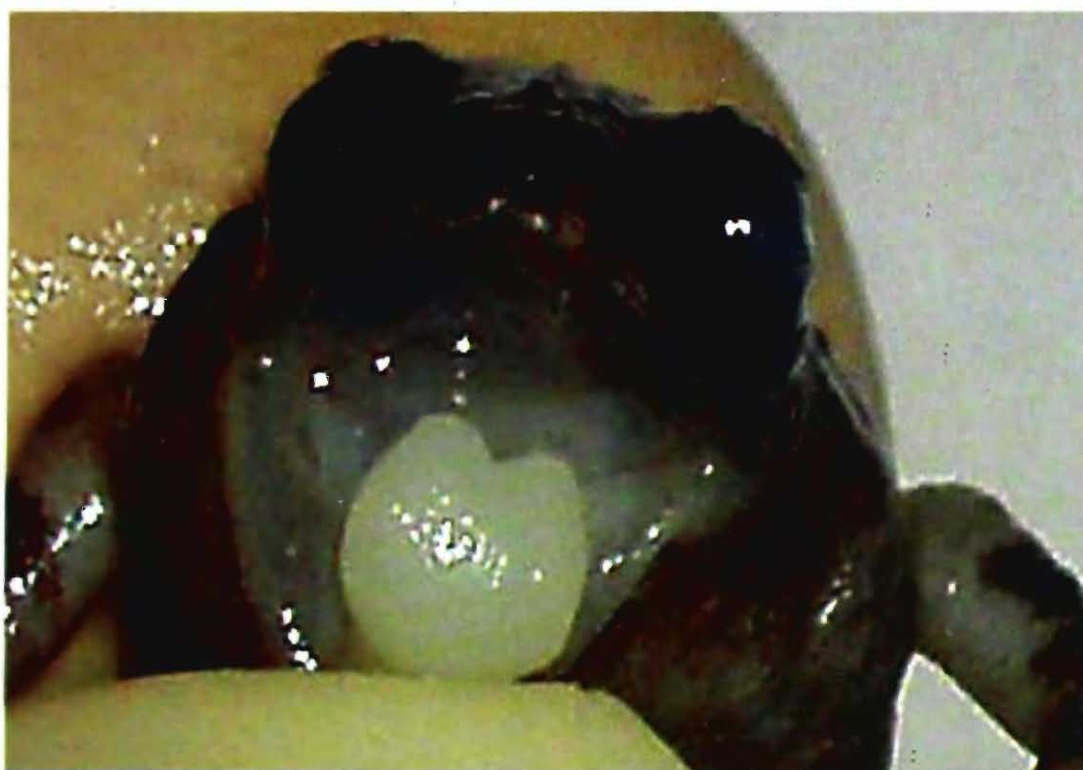


Habitat of *Chirixalus senapatiensis* sp. nov.

PLATE - XV



Philautus garo (showing dorsal colour pattern)



Tongue in *Philautus garo*

PLATE - XVI



A live specimen of *Philautus manipurensis* sp. nov.
(lateral view)



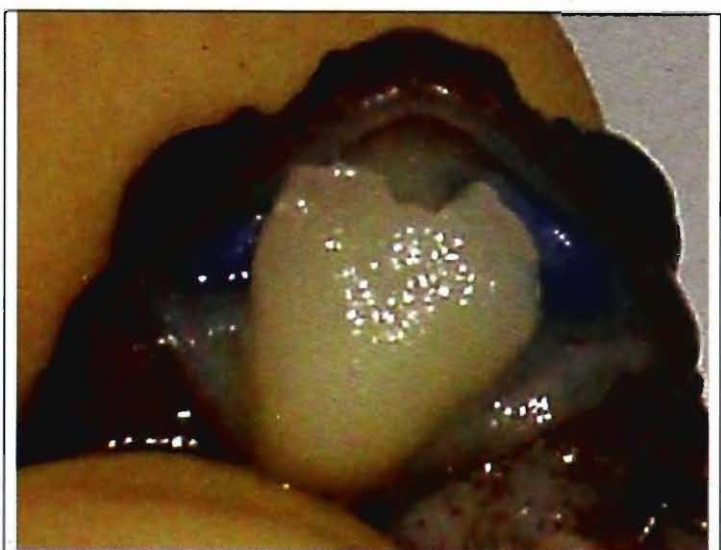
A live specimen of *Philautus manipurensis* sp. nov.
(dorsal view)



Philautus manipurensis sp. nov.
showing pattern on leg



Philautus manipurensis sp. nov.
showing disks



Tongue in *Philautus manipurensis*



Habitat, *Philautus manipurensis* sp. nov.

PLATE - XVII



A live specimen of *Philautus kempiae*



Habitat, *Philautus kempiae*



Philautus namdaphaensis (dorsal view)



Philautus namdaphaensis (ventral view)

PLATE - XVIII

Polypedates assamensis sp. nov.
(showing round, yellow spots on thighs)



Polypedates assamensis sp. nov.
(showing tympanum)



Polypedates assamensis sp. nov.
(ventral view)

PLATE - XIX



Polypedates subansiriensis sp. nov.
(lateral view, showing white dermal fringe
on hand and tarsus)

Polypedates subansiriensis sp. nov.
(dorsal view, showing round, yellow spots
on thighs)



Polypedates subansiriensis sp. nov.
(ventral view)

PLATE - XX



Rhacophorus rhodopus, (dorsal view)



Rhacophorus rhodopus, (ventral view)



Rhacophorus rhodopus, (showing the axial spot)

Rhacophorus rhodopus,
(lateral view, showing tympanum)



PLATE - XXI



Kurixalus naso



Habitat, *Kurixalus naso*

PLATE - XXII



Rhacophorus subansiriensis sp. nov. (type specimen in living condition)



Colour variants in
Rhacophorus subansiriensis sp. nov.



Colour variants in
Rhacophorus subansiriensis sp. nov.

PLATE - XXIII



Rhacophorus subansiriensis sp. nov.
(showing dorsal pattern)



Rhacophorus subansiriensis sp. nov.
(holotype and paratype)



Rhacophorus subansiriensis sp. nov. Showing colouration and spots



Rhacophorus subansiriensis sp. nov. Showing flank spots)