

Inventory and Natural History of Lizards in Jeypore Reserve Forest, Assam

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INTRODUCTION

Tropical forests are the planet's most biologically diverse ecosystems (Lewin 1986). Northeastern India is a biodiversity hotspot and possesses tropical evergreen forests. In Assam, 59.4% of the total forest area is categorized as reserve forest (RF). Thus, for the study of biodiversity of northeastern region, it is convenient to concentrate in the reserve forests (Sengupta et al. 2000). The Assam Valley Tropical Wet Evergreen Forest (Champion & Seth 1968) of Jeypore is located in eastern Assam and among the last remaining lowland rain forests in northeastern India (Kakati 2004). Faunal and floral characteristics of this reserve forest have attracted

biologists' attentions from British colonial period. *Oligodon erythrorhachis* and *Dendrelaphis gorei* were described from Namsang, Jeypore by British herpetologist Frank Wall in the year 1910. Thereafter, no such investigation has been made by any herpetologist.

The remarkably rich lizard fauna of sub-tropical forest in Assam has been the subject of a few investigations and the present knowledge is based mainly in publications which were decade old (Gogoi et al. 2001). No detailed study has been carried out so far from Assam and only 44 species (Ahmed et al. 2009) have been reported from northeastern region. The present study mainly emphasized to evaluate the lizard diversity and natural history

in Jeypore Reserve Forest of Assam for conservation.

MATERIAL & METHODS

Study area

The study has been carried out in Jeypore Reserve Forest (Fig. 2) located in Dibrugarh District of Upper Assam lying between 27006'–27016'N & 95021'–95029'E. The study area was notified as a reserve forest way back in 1888. The total area of the RF is 108km² of which, 20km² falls under the Dihing Patkai Wildlife Sanctuary that was declared in June 2004. The terrain of the area varies with slightly undulating plains to hills which are the foothills of the Patkai Range. The reserve forest is continuous with the forests of Arunachal Pradesh. Burhi Dihing, Namsang and the Dilli rivers are the main rivers forming a part of the boundary of the reserve. Many small perennial streams and nullahs also flow within the forest. Swamps and grassland patches also occur inside the forest.

The forest is a contiguous forest tract with Upper Dihing RF, Dirak

Image 1a. Woodland

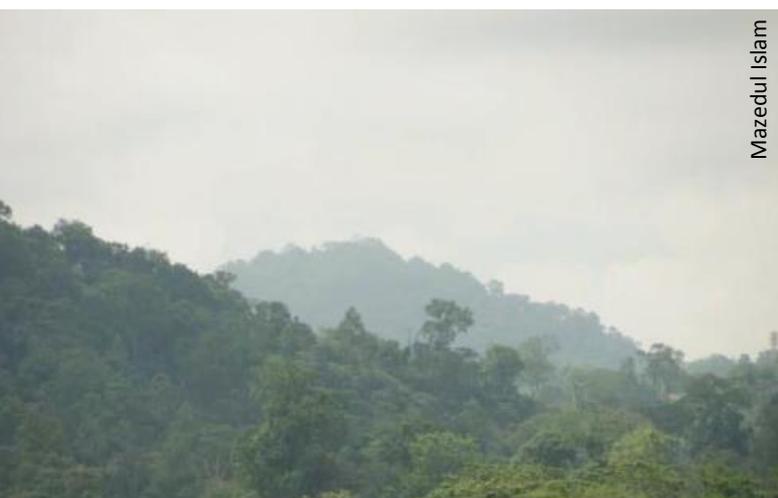


Image 1b. Grassland



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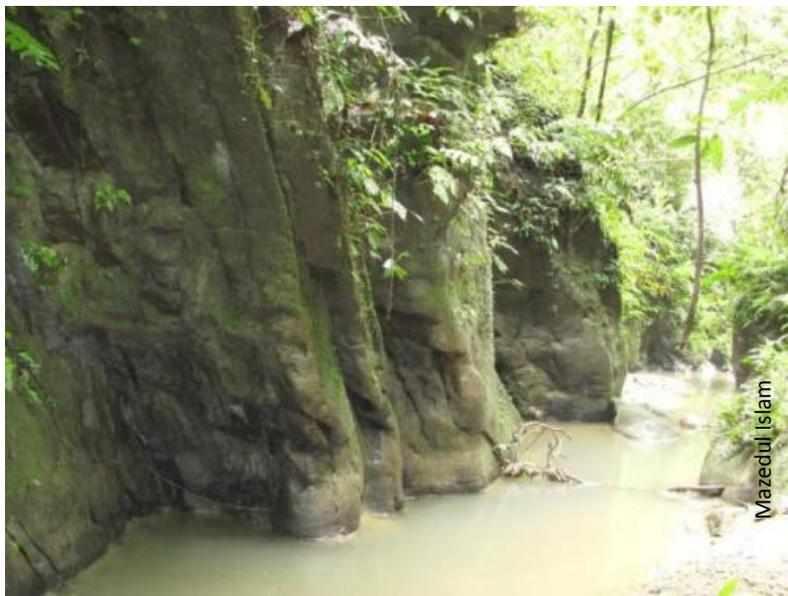


Image 1c. Perennial water body



Image 1d. Bamboo patches

RF, Dilli RF, Makumpani RF, Desali RF and Digboi West Block expanding over three districts of upper Assam namely Dibrugarh, Tinsukia and Sivsagar districts. The area forms the largest contiguous tropical rainforest extant in the whole of Brahmaputra Valley (Choudhury 1996).

Although the forest is located in a matrix of tea plantations, settled agriculture and rural settlements, the degree of disturbance is much less when compared to other protected areas of the state. The peripheral areas of the forest is encroached by the local people for tea plantations but the core area of the forest is intact and without any disturbance. A vast portion in the central part of the RF is relatively inaccessible due to the dense vegetation (Image 1a,b,c,d), hilly terrain and lack of forest trails. The RF is relatively undisturbed in terms of intrusions and disruptions by humans, although logging activities have taken place in the past.

Soil type is alluvium of the Brahmaputra and the Burhi Dihing

river, the former being almost neutral while the latter is acidic (Kakati 2004). Shallow soils are common with underlying rocks and boulders. Sub-soils in the foothills consist of mostly boulders and pebbles, under a layer of sandy loam over which lies a layer of humus. The foothills along the Buri Dihing River in the south are made up of upper tertiary rocks, the

Tipam sandstone, rich in oil deposits (Das 1965; Chand 1990; Choudhury 1995).

The study area has a tropical climate characterized by high humidity, heavy rainfall and cold weather starting from November till February (Kakati 2004). It receives rainfall from the south-

Table 1. List of lizards with some morphometric measurements (one individual), microhabitats and status [C = Common; r = Rare (>5) NM = Not measured].

	Species	SVL (mm)	TL (mm)	Microhabitat	Status in study area
1	<i>Hemidactylus frenatus</i>	42	47	Trees, houses	C
2	<i>Hemidactylus brookii</i>	52	64	Trees, houses	C
3	<i>Hemidactylus garnotii</i>	59	66	Trees	r
4	<i>Hemidactylus platyurus</i>	51	61	Trees, bridge	C
5	<i>Cyrtodactylus khasiensis</i>	77	92	Bridge, forest floor	C
6	Gekko gecko	133	112	Trees	r
7	<i>Calotes versicolor</i>	92	262	Garden	C
8	<i>Ptyctolaemus gularis</i>	67	158	Forest floor, tree barks	C
9	<i>Draco norvillii</i>	68	124	Trees	r
10	<i>Lygosoma albopunctata</i>	59	83	Near human habitation	r
11	<i>Eutropis multifasciata</i>	110	203	Leaf litter, forest floor, near human habitation, stream	C
12	<i>Eutropis macularia</i>	74	65	Leaf litter, forest floor, Near human habitation	C
13	<i>Sphenomorphus maculatus</i>	69	101	Leaf litter, stream	C
14	<i>Sphenomorphus indicus</i>	75	130	Leaf litter	C
15	<i>Takydromus khasiensis</i>	58	190	Bushes, forest floor	C
16	<i>Varanus bengalensis</i>	NM	NM	Forest floor, stream	C
17	<i>Varanus salvator</i>	NM	NM	River side	r
18	<i>Varanus flavescens</i>	NM	NM	River side	r

west monsoon (May–September) and the north-east monsoon (December–April). The monsoon lasts till September, but occasional rains occur throughout the year. Heavy rainfall occurs during July and August. Winds are generally of moderate velocity. Thunderstorms occasionally occur in March–April. The average annual rainfall ranges between 2314–2400 mm. There is relatively dry period between November–February. Average annual maximum temperature ranges from 23 to 36 °C and average annual minimum temperature ranges from 11 to 27 °C. Weather data for the study duration was obtained from the weather station at Namsang Tea Estate, near Jeypore Reserve Forest.

Methods

Field study has been carried out between January–December 2009. Observations were made by walking along forest trails or streams at all times of the day following active search methods and opportunistic observation methods. Lizards were recorded while observing on the ground or trees or potential microhabitats like leaf litters, crevices, beneath the bark, among the base of trees and dead trees

lying on the ground, holes in the base of the hill slope, wetlands, river beds and all of which were abundant around the study area and might possibly provide shelters for lizards. The lizards were caught, identified, photographed, measured the SVL (Snout to Vent Length) and TailL (Tail Length) and released in the same place thereafter. An identification was made only after examining the escalation in detail and obtaining morphometric measurements where needed as per the standard identification guide. Identification of the species was done using the identification keys of Smith (1935) and Das (2003) Common English name of Lizard species follows Das (1997, 2002) and Ahmed et al. (2009). We also noted GPS locations of every species encountered during survey.

RESULTS

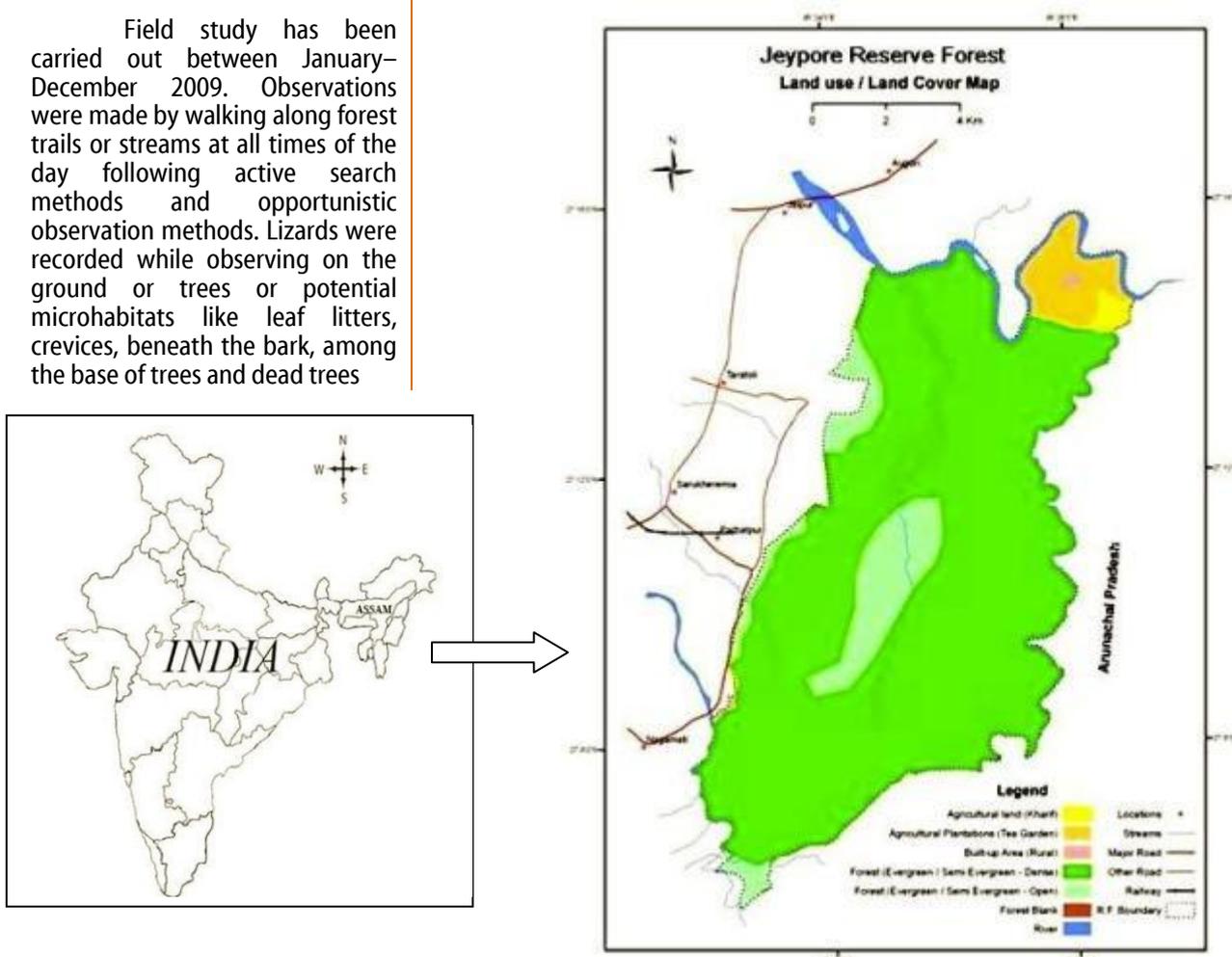
Lizard Diversity

Altogether 301 individuals were encountered belonging to 18 lizard species. The lizards were captured for measurements and photographed during the study. All the 18 identified lizard species belongs to five families comprising of six gekkonids, five scincids, three agamids, three varanids and one lacertid (Table 1). Among the identified lizard species one species was a range extension and another species was rediscovered after 116 years.

Range Extension

The species *Takydromus khasiensis* Boulenger, 1917 was

Figure 1. Land-use and land-cover map of Jeypore Reserve Forest.





Eutropis multifasciata (juvenile)

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Eutropis multifasciata (adult)

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earlier reported from Barail WS by Das et al. (2009) and this was the only locality in Assam. But we found a healthy population in the Jeypore RF.

Rediscovery

The species *Draco norvillii* was described by Alcock in 1895 from Dum Dooma locality of Assam. After that, the species has been reported by certain workers from Arunachal Pradesh and Myanmar (Uetz et al. 2012). However, since 1895, there was not a single report of *Draco norvillii* from the state of Assam. We recorded one adult female and one juvenile from Jeypore RF that shows that viable population still survives in Assam.

Species accounts

Family: Scincidae

1. Many-lined Grass Skink *Eutropis multifasciata* (Kuhl, 1820)

It was commonly found in the study area. The body measurements of the species were: SVL 110mm, TL 203mm and 40 individuals were encountered. We encountered the first individual of the species on 17 March 2009 at 08:20h in Tipam Mandir (27015'00"N & 95024'56"E). The species was subsequently recorded from Charaipung, Namsang Mukh and Dilli Ghat. Most of the sightings of the species were from the forest edge or disturbed habitats within the forest, secondary

and degraded forest areas and roadside areas. The species was also observed in breeding colouration with light orange flank with prominent white spots. The juveniles were recorded in the month of May. The edges of the flank scales in juveniles were white and that was crescent shaped and the margins of the labials were black.

2. Bronze Grass Skink *Eutropis macularia* (Blyth, 1853)

It was commonly found in study area. The body measurements were: SVL 74mm, TL 65mm, and we encountered 20 individuals. We captured a gravid female from Namsang Mukh (27014'56"N & 95025'04"E) that

Eutropis macularia (adult)



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Eutropis macularia (juvenile)



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Sphenomorphus maculatus (breeding colour)



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Sphenomorphus maculatus (non-breeding colour)

laid three eggs in captivity and was collected from leaf litter near the forest edge and disturbed habitats at 13:15h on 14 March 2009. The species were also seen in breeding colouration in the month of May. During breeding season, the flank becomes dark orange in colour and the white spots appear distinct. The juveniles were seen in the month of July. The flanks and limbs of juveniles were black with prominent white spots.

3. Spotted Litter Skink
Sphenomorphus maculatus (Blyth, 1853)

It was commonly found in study area. SVL 69 mm, TL 101mm and we encountered 45 individuals.

We encountered the first individual at 12:54h on 14 March 2009 from Namsang Mukh (27014'51"N & 95025'18"E), from the bank of evergreen forest stream. *S. maculatum* in breeding colour was also recorded on 15 July 2009 at 11:00h near Charaipung which was basking in the sun-flecks on the leaf litters. Another individual was recorded from Namsang Mukh trail while crossing the road on 7 August 2009 at 08:30h and was in breeding color. The juveniles were frequently encountered in the month of June.

4. Himalayan Litter Skink
Sphenomorphus indicus (Gray, 1853)

It was common in study area. SVL 75mm, TL 130mm and 10 individuals were encountered. The first individual was recorded from Mohonsingh area (27013'28"N & 95025'28"E) at 09:39h on 15 March under the leaf litter. The species was also sighted in the Charaipung and Central Road. The habitat was dense and sunlight could not reach the forest floor. There was no significant difference in colouration among the adults and juveniles. The juveniles were first observed during the month of July.

5. White-spotted Supple Skink
Lygosoma albopunctata (Gray, 1846)

It was uncommon in study



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Sphenomorphus indicus (adult)



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Sphenomorphus indicus (juvenile)



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Lygosoma albopunctata (adult)

Lygosoma albopunctata (juvenile)

area. The body measurements of the species were such as, SVL 59mm, TailL 83mm and four individuals were encountered. The first individual was recorded from Nagaghat (27015/00'N & 95024/56'E) area just after the sunset (18:15h) while crossing the road. The species was not found inside the forest area. One female was also caught and laid three eggs in the captivity. The species shows colour variation during different stages of life. During breeding season the flanks become dark yellow colour with prominent white spots and the body of the juveniles becomes bronze colour and tail orange colour.

Family: Agamidae

6. Indian Garden Lizard *Calotes*

versicolor (Daudin, 1802)

It was commonly found in study area. SVL 92mm, TL 262mm and 10 individuals were encountered. Although this species is a forest edge and fencerow species, it is not abundant in the forest and mostly associated with human modified habitats (27014/54'N & 95024'56"E), 12:30h, 15 March 2009. Individuals were sighted from tea gardens, roadside vegetation, forest-habitation and forest-agriculture field edges. Most of the sightings were in arboreal situations up to 2–5 m above ground.

7. Blue-throated Lizard *Ptyctolaemus gularis* (Peters, 1864)
It was common in study area.

SVL 67mm, TL 158mm and 11 individuals were recorded. The first individual was recorded from tree trunk 1m above the ground on Central road (27012'03"N & 95027'03"E) area on 16 March 2009 at 08:29h. We also recoded it from Tipam Mandir area, Hapkata and Beka Dalang area. Most of them were female which can easily be identified from its bar like structure on the blue spot in the gular pouch and the male by dark blue round spot. The juveniles were recorded in the month of May.

8. Norvill's Flying Lizard *Draco norvillii* Alcock, 1895

It was rarely found in study area. SVL 68mm, TL 124mm and two individuals were encountered. The

Calotes versicolor (adult)



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Calotes versicolor (sub-adult)



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Ptyctolaemus gularis (adult)



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Ptyctolaemus gularis (juvenile)

first individual encountered, was a juvenile found lying near the roots of *Dipterocarpus macrocarpus* at 11:00h in the Hapkata area (27012'44"N & 95026'31"E) in the month of September. The juvenile was seen with its umbilical cord basking in the sunlight on the ground. Another female was recorded from a tree 4m above the ground basking in the morning light of December. Head wider than long; nostril directed upward; nine supralabials; the tympanum half covered with small scales; gular appendage of female is yellow in colour and less than the length of head (2/3 of head length); five ribs supported the patagium on each side; caudal crest absent and the lateral side of the tail denticulated; the lateral margins of forelims and hind limbs

were with thorn like scales; the distance between the armpit to groin 34mm.

Body grayish above, a more or less distinct light transverse bars across the middle of the back. The base of the gular pouch was scarlet in colour. The neck and head regions were with greenish markings. Patagium of the female with numerous white spotted lateral lines and vertical yellow broken lines. The upper half of the patagium was black in colour and lower half was scarlet. The belly was yellowish in colour. The tail was with alternate white and black bands. In case of juveniles the upper part of patagium was grayish in colour and lower part was orange.

Family: Gekkonidae

9. Asian House Gecko *Hemidactylus frenatus* Duméril & Bibron, 1836

It was commonly found in study area. SVL 42mm, TL 47mm and 30 individuals were encountered. The first individual was sighted on the tree trunk 1m above the ground at 11:30h on 19 September 2009. The species are mostly seen in the forest camps inside the forest and on the *Ficus* trees near the forest edges. This species was also recorded from roadside vegetation near the tea garden.

10. Brook's House Gecko *Hemidactylus brookii* (Gray, 1845)

It was common in the study area. SVL 52mm, TL 64mm,

Draco norvillii (adult female)



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Draco norvillii (juvenile)



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Hemidactylus frenatus



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Hemidactylus brookii

five individuals were encountered. Brook's House Gecko was first recorded from the abandoned forest camp near Nagaghat at night on 1 April 2009 at 20:00h. The lizard is also subsequently recorded from human habitation near to RF. The lizard was mainly seen during the night time as it is nocturnal in activity.

11. Garnot's Gecko *Hemidactylus garnotii* Duméril & Bibron, 1836

It was uncommon in the study area. SVL 59mm, TL 66mm and number of individual encountered was two. The first individual was recorded from bamboo near human habitation during day time (2:00h) on 25 September 2009 in Hapjan. The body and limbs were marked

with white spots and the spots were larger in the tail region in compare to the body and limbs.

12. Flat-tailed Gecko *Hemidactylus platyurus* (Schneider, 1792)

It was common in the study area. SVL 51mm, TL 61mm and five individuals were encountered. The first individual was recorded from tree hole of *Vatica lanceaefolia* 2m above the ground during day time on 7 September 2009 from Hapkata. After two days we again recorded two individuals, one male and one female from a tree hole of same species which was full of termites from the same locality.

13. Khasi Hills Bent-toed Gecko *Cyrtodactylus khasiensis* (Jerdon, 1870)

It was commonly found in study area. SVL 77mm, TL 92mm and seven individuals were encountered. The first individual was recorded from Kothalguri area from forest floor on 2 August 2009. Later we recorded more individuals from that area from different habitat. The lizard was also seen in the wooden bridge during our night survey.

14. Tokay Gecko *Gekko gekko* (Linnaeus, 1758)

It was uncommon in the study area. SVL 133mm, TL 112mm and only two individuals were

Hemidactylus garnotii



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Hemidactylus platyurus



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Cyrtodactylus khasiensis (adult)



Gekko gecko (adult)

during the entire survey periods. The first Tokay gecko was recorded from a Ficus tree which was calling during day time (9:00h) in the Dilli Ghat (27008'33"N & 95022'35"E) area (Namrup). The Tokay gecko was only recorded from the westernmost boundary of the forest near the Dilli River.

Family: Lacertidae

15. Khasi Hills Long-tailed Lizard *Takydromus khasiensis* Boulenger, 1917

It was commonly found in the study area. SVL 58mm, TL 190mm and number of individuals recorded was 100, the first individual whom we recorded was from Golmari (27010'38"N & 95027'27"E) area from the road side which was foraging on the

ground on 13 May 2009 at 12:30h. Later we recorded many individuals from Natun Ali, Central Road, Shilikha Road, Mohan Singh Road. We observed that the colouration changed during the course of time. During May the colour of the flank was white and later it changed to green. We have seen that the juveniles were also with green colouration. From the observation we found that the colouration changed in the breeding season.

Family: Varanidae

16. Bengal Monitor *Varanus bengalensis* (Daudin, 1802)

It was commonly found in the study area. Five individuals were encountered during the study

period This species is often seen during breeding seasons (August–September). They lay eggs in the termite mound and gourd their eggs from nearby trees. The first individual was recorded from Huguri Pathar (27009'30"N & 95027'38"E) area and the species subsequently recorded from Tipam Mandir, Central Road and Naharjan area.

17. Yellow Monitor *Varanus flavescens* (Hardwicke & Gray, 1827)

It was rarely found in the study area. Only one individual was recorded during the entire survey periods. The only individual was recorded from Hati Muta stream (27012'59"N & 95026'35"E). The species is very rare due to hunting pressure.

Takydromus khasiensis (breeding colour)



Takydromus khasiensis (non-breeding colour)





Rajeev Basumatary

Varanus bengalensis



Rajeev Basumatary

Varanus salvator

18. Water Monitor *Varanus salvator* (Laurenti, 1768)

It was uncommon in the study area. Only two individuals were encountered during the survey. The first individual was recorded near from Golmari Beel (27009'28"N & 95027'45"E, 200m). This species is consumed locally and this is a real threat to the species.

DISCUSSION

The high diversity of lizard fauna in Jeypore reserve forest indicates the high potentiality of the habitat in eastern Assam. However, most of the records and collections of lizards are entirely dependent on opportunistic sightings, road killed and upon chance encounters in their natural habitats and the complete inventory is rarely possible. Certainly, there are some species, especially the arboreal, nocturnal and secretive ones that have not been adequately sampled or listed.

It also indicates that, the species richness is higher than any other forest of northeastern India based on numbers sighted in a single forest patch (see Das et al. 2009; Pawar &

Birand 2001). Among all the 18 species recorded in Jeypore Reserve forest, the distributions of three species are only reported from a single locality in Assam, viz., *Varanus flavescens* was only recorded from Kaziranga National Park, *Takydromus khasiensis* from Barail Hills (Das et al. 2009) and *Draco norvillii* from type locality Doom Dooma (Alcock, 1895).

Present study also opined that, the lizards are uncommon within the forested habitat. The most abundant species are those that are associated with the forest edge or disturbed habitats within the study area. *Sphenomorphus maculatus*, *Eutropis multifasciata*, *Eutropis macularia*, *Hemidactylus frenatus* and *Takydromus khasiensis* are the most abundant species in the study area. *Varanus flavescens* and *Draco norvillii* are the two rarest species only three individuals were recorded during entire survey period.

The species *Lygosoma albopunctata*, *Sphenomorphus maculatus*, *Sphenomorphus indicus*, *Eutropis multifasciata* and *Eutropis macularia* are observed foraging under

the leaf litter or basking in the sunflecks besides the road. Again, *Ptyctolaemus gularis* are mainly found in the dense forest foraging on the forest floor or basking on the tree trunks. The species *Calotes versicolor* are usually observed in low shrubs or tree trunk in the forest edge and fencerows of the tea gardens. Again, *Hemidactylus frenatus*, *Hemidactylus brookii*, *Hemidactylus garnotii* are human commensals, they are mainly found in and around the forest camps of the study area. However, the species *Takydromus khasiensis* are found in the bushes in the open canopy areas inside the forest or roadside. *Varanus* are mainly sighted near the streams and termite mounds during breeding seasons where they lay their eggs. A detailed study will likely reveal more numbers of species with ecological and behavioral characters from this area in near future.

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