



## Herpetofauna of Katerniaghat Wildlife Sanctuary, Uttar Pradesh, India

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**Abstract:** A herpetofaunal inventory based on field surveys, literature records and photographic records is presented for Katerniaghat Wildlife Sanctuary and its environs, situated in the Terai region of Uttar Pradesh, India. We list a total of 10 species of amphibians and 42 species of reptiles from the area. Compiled observations presented here include biological notes on the Critically Endangered *Gavialis gangeticus* and new locality records and natural history information of poorly known species including *Polypedates taeniatus* and *Sibynophis sagittarius*. Besides recording members of currently recognized species complexes, the study also documents species that were either conferred to closely related species (e.g., *Fejervarya* cf. *teraiensis*) or their identity remains to be ascertained (e.g., *Kaloula* sp.). The present study indicates that species count at Katerniaghat Wildlife Sanctuary is likely to increase with additional surveys and systematic work.

**Keywords:** Herpetofauna, India, inventory, Katerniaghat Wildlife Sanctuary, Terai.

## INTRODUCTION

Katerniaghat Wildlife Sanctuary (27°55'–28°25'N & 81°–81°25'E), is located in Bahraich District of Uttar Pradesh. This typical Terai ecosystem is spread over an area of 400km<sup>2</sup> and is characterized by extensive alluvial plains, wetlands, grasslands, woodlands and moist forests. The vegetation of the study area can be categorized into riverine forests, mixed Sal forest, teak *Tectona grandis* plantation, woodlands and alluvial grasslands. Except riverine forests which are characterised by the dominance of moist evergreen species, all other categories are deciduous in nature (Tripathi & Singh 2009). The riverine habitat (Girwa River) of the Sanctuary (18km length) is bounded upstream by the Nepalese border and downstream by the Girijapuri Barrage. The sanctuary is home to large animals such as tiger, elephant, leopard and Gangetic dolphin, and is regarded as an important habitat of the Critically Endangered *Gavialis gangeticus*. The Sanctuary also holds a key population of *Crocodylus palustris* and several freshwater turtle species. Past studies on herpetofauna include those of Hallermann et al. (2001), Basu (1989) and Talukdar & Dasgupta (1977). However, general information on diversity and distribution of herpetofaunal species is scanty.

**Abbreviations:** BMNH - The Natural History Museum, London; ZSIC - Zoological Survey of India Kolkata; ZMH - Zoologisches Institut und Zoologisches Museum von Hamburg. SCL - Straight carapace length; CCL - Curve carapace length; PL - Plastral length; SVL - Snout to vent length, TL - Tail length.



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## Study Area

The field investigations were conducted in the following localities: Base Camp (28°20.243'N & 81°07.855'E): Human habitation surrounded by degraded grasslands, secondary growth and abandoned constructions; Boat point (28°20.310'N & 81°07.858'E): Open grassland area and river; Girjapuri Barrage road (28°16.557'N & 81°06.140'E): Forest road surrounded by thick woodland and waterbodies; Vaisalot, Nishangada (28°14.155'N & 81°12.919'E): Deciduous forest, teak plantation and swampy areas; Mayla Nullah (28°20.396'N & 81°06.876'E): small channel of Girwa River having thick forest and cane brakes along two sides; Kauriala (28°18.401'N & 81°05.586'E): large riverine habitat with dense riverside grasslands; Bhabanipur Village (28°19.968'N & 81°08.738'E): Human habitation and grazing lands, scrub and open forest; Amba (28°19.142'N, 81°09.851'E): riverside habitat with grazing lands and deciduous forest; Amba Ghat (28°18.924'N & 81°10.869'E): riverside open area with human habitation and plantation areas; Watch Tower Point (28°19.968'N & 81°08.738'E): Riverside extensive riverside moist grassland; Madhab Nullah (28°20.277'N & 81°06.135'E): channel of Girwa River with extensive grassland and woodland on both side; Gharial Nesting Island (28°20.146'N & 81°08.824'E): Sandy river island with grassy patches, the mass gharial nesting spot; Mahadeva Taal: 28°18.401'N & 81°05.586'E: Large wetland with extensive macrophytic growth (Image 1).

## MATERIALS AND METHODS

Field records for the study comes from observations of AD and LC from 11 to 30 June 2008; 4 to 22 December 2008 and 28 February to 08 March 2009. However, the study also incorporates other literature records and reliable photographic records. Field observations were made opportunistically. Data have been supplemented with the earlier observations of DB and SC from in and around the Sanctuary. Active searches involving turning rocks and logs, peeling bark and digging through leaf litter. During the day, besides active search, basking reptiles were also searched along forest trails, forest edges and along

river banks. Crocodiles were observed from motor boats, river shore transects and from watch tower. For frogs, observations were sometimes made on the basis of calls heard along forest trail, forest edges and along streams between 1800–2200 h, aided by flashlights. Records of road kills and dead specimens in fishing nets were studied and incorporated in this paper. Individuals of the species were captured by hand and released at the point of capture after examination or were observed using a binocular. A Canon Digital S3IS was used for photography. Data on locality, habitat and microhabitat, sex, reproductive data, syntopic species (if any) were recorded. Behavioural observations were recorded in a field data sheet. Morphometric data on specimens were used for identification. Frogs, lizards and snakes were released at their respective capture site once their specific identity and photography was over.

Geographic coordinates for survey sites were recorded with a Garmin 12 receiver GPS. Interactions with local residents were held to make them aware of the local herpetofauna and to supplement field observations. Species were identified using the keys of Smith (1935, 1943); Schleich & Kästle (2002); Das (1995); and Dutta (1997). Nomenclature and taxonomic arrangement in the text follows Frost (2009) for amphibian, Das (2003) and Uetz (2007) for reptiles.

## Species account

### Amphibians

#### Bufonidae Gray, 1825

##### *Duttaphrynus melanostictus* (Schneider, 1799):

Recorded from Base camp, Girjapuri Barrage, Bhabanipur and near staff quarters. Frequently encountered in and around human habitations, plantations, river banks, under rocks, wood piles and roadside areas.

##### *Duttaphrynus stomaticus* (Lütken, 1862):

Recorded from near Base camp during June 2008. The individual was feeding on insects on a forest trail surrounded by human habitation and degraded grassland at around 2000h.

#### Dicroglossidae Anderson, 1871

*Hoplobatrachus tigerinus* (Daudin, 1803): Calling aggregation was observed during June. Individuals found to inhabit temporary water pool, mud bank and

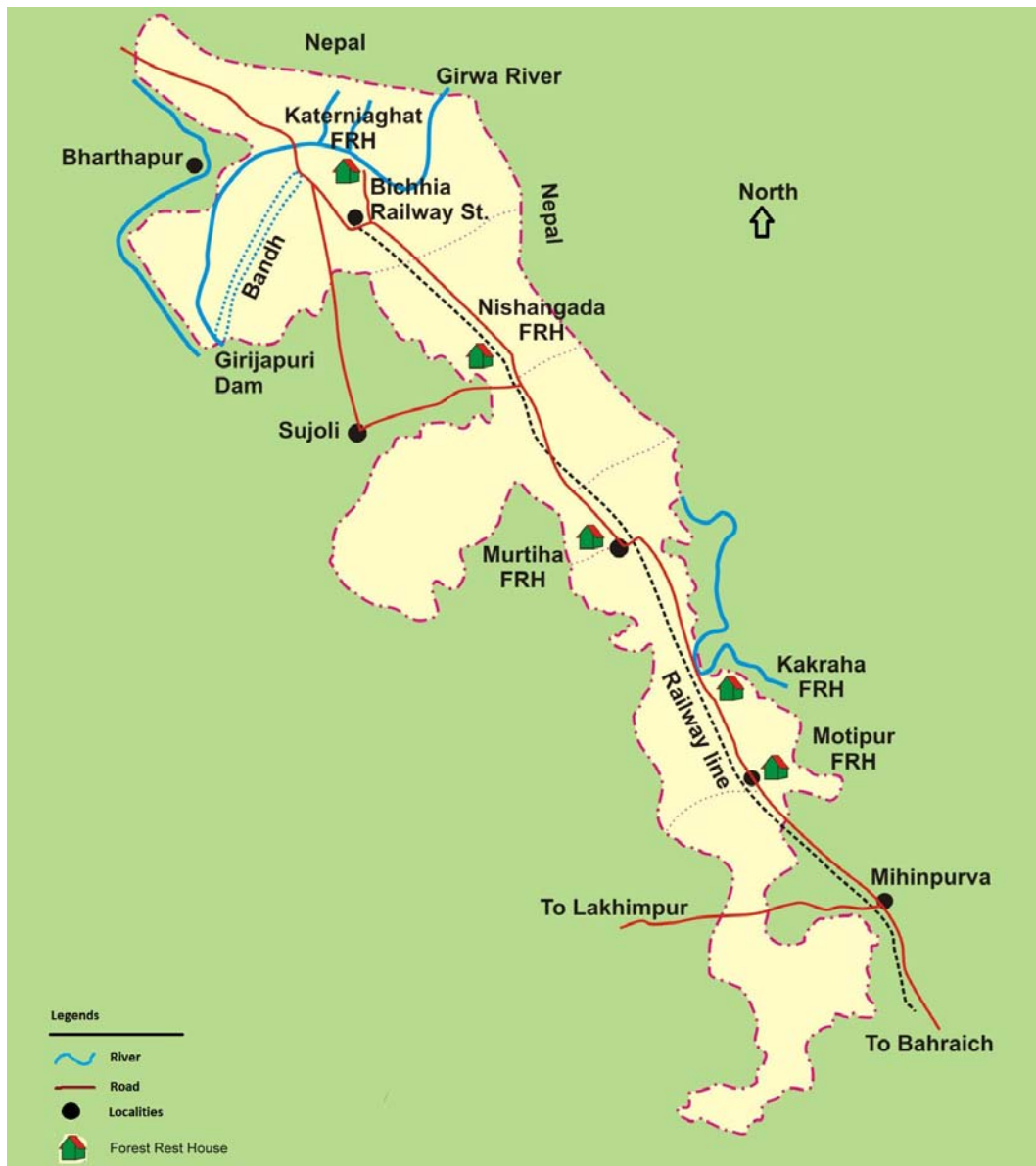


Image 1. Map of Katerniaghath Wildlife Sanctuary, India

open grassy space. Calling males are yellowish in colour dorsally. This colouration is reported to be an indicator of good general physiological condition and sexual activity in males (Abdulali 1985). Juveniles observed in the month of June along the river bank. The species frequently observed as road-kill on the segment between Katerniaghath to Bichhia.

***Fejervarya cf. teraiensis* (Dubois, 1984):** Recorded from Boat point. Individuals had a broad cream coloured mid dorsal line; dorsum with longitudinal skin folds, light in colour, whitish patches along side of body, forelimb and hind limb not very distinctly barred. Observed in moist grass near river. *Fejervarya*

*teraiensis* was reported from Uttar Pradesh by Hegde et al. (2009) and eastward up to Nagaland (Ao et al. 2003). However, the species is reported to be present in the entire Terai zone of Nepal inhabiting 71–400 m elevation (Schleich & Kästle 2002).

***Fejervarya sp.:*** Recorded from Boat point and base camp. Individuals of the species are characterised by absence of a mid-dorsal line; dorsum with dark brown blotches, longitudinal skin fold absent, limbs barred throughout. It inhabits areas with moist grass near seasonal and perennial water bodies.

The species differs from *Fejervarya nepalensis* in not having a mid dorsal line, from *Fejervarya pierrei*



in absence of middorsal line and long longitudinal skin folds, from *F. teraiensis* in having a small size (*F. teraiensis*, SVL 43–51). However, the species showed close resemblance with *Fejervarya syhadrensis* (absence of mid-dorsal line, absence of dorsal longitudinal skin folds and small SVL 33mm) but only differs in absence of reddish or orange patches which considered to be an important character for *F. syhadrensis* (sensu Schleich & Kastle 2002). Further investigation with good sample size might help in specific identity of this species.

***Euphlyctis cyanophlyctis* (Schneider, 1799):** Frequently encountered in lentic and lotic habitats in and around the sanctuary. The species is used as fishing bait in the fringe areas.

#### Microhylidae Günther, 1858

***Kaloula* sp. (Image 2):** The first individual of this interesting microhylid was observed on 12 June 2008. It fell from a *Cassia* tree from a height of 6–7 m as it was dislodged from tree hole by a *Varanus bengalensis*. The second individual was recorded on 21 June at 1900h. Its head was protruding from a hole in a standing dead tree ca. 1.2m above ground. Both frogs were found near base camp close to grassland forest edge.

The two individuals showed colouration similar to *K. assamensis* and morphometrical similarity to *K. taprobanica* however with different web formula ( $I\frac{1}{2}-III\frac{1}{2}-2III2-2IV2\frac{1}{2}-\frac{1}{2}V$ ). A similar animal is depicted in the Schleich & Kästle (2002) where it is



Image 2. *Kaloula* sp.

treated under the nomen *Kaloula taprobanica*. Due to paucity of sample, we could not ascertain its specific status and suggest further study of the Katerniaghath population.

***Microhyla ornata* (Duméril & Bibron, 1841):** Large calling aggregation was recorded around base camp and boat point during June. Individuals call from moist grass and leaf litter of open grassland especially after rains.

#### Rhacophoridae Hoffman, 1932

***Polypedates taeniatus* (Boulenger, 1906) (Image 3):** Calling aggregation was observed during 16–21 June 2008 near boat point. Calling males were observed on moist grass blades, bushes and on ferns and were located ca. 70cm–1.5m above the ground.

Ray (1991) reported the species as *Rhacophorus taniatus* from Dudhwa National Park and recorded the habitat of the species as tall grassy patches near dense *Sal Shorea robusta* forest with considerable undergrowth of herbaceous plants. However, during this study individuals were only recorded from open grassland.

Type locality of the species is Purnia (Bihar). We observed a colour photograph of the species from



Image 3. *Polypedates taeniatus*





Image 4. *Chiromantis dudhwaensis*



Image 5. *Hemidactylus flaviviridis*

Behala area of West Bengal. Eastward, the species is recorded from north bank alluvial grasslands of Assam (Ahmed & Dutta 2000). Elsewhere, it was recorded from Nepal and Bangladesh (Anders et al. 1998).

***Chiromantis dudhwaensis* (Ray, 1992) (Image 4):** Calling aggregation of the species was recorded near Base Camp and Ferry Ghat during June 2008. Calling individuals were photographed from waterlogged and marshy areas inhabiting shrubs, grass blades and *Ipomea* sp. at 50cm–1.5m above substrate. A detail note on the breeding habit of the species appears in Biswas (2000).

## Reptiles

### Gekkonidae Gray, 1825

***Hemidactylus flaviviridis* Rüpell, 1835 (Image 5):** Base Camp, Watch Tower; Individuals also observed on *Ficus* tree bark at 170cm height and under woodpiles near houses. This is the common house gecko of the study area. Earlier records of the species is from Nishangada (15km from the base camp) by Hallermann et al. (2001).

***Hemidactylus brookii* Gray, 1845:** Individuals were found inhabiting house walls up to 3m from the ground. However, majority of the encounters are from low walls, culverts and on the ground. Gravid females observed in the month of June.

Employing a molecular systematic approach Bauer et al. (2010) recovered two distinct clad what has long been considered a single, but polytypic, *Hemidactylus*

*brookii*. One consisting of specimens from Borneo (Sarawak), Myanmar, Peninsular Malaysia and Karnataka, southwestern India, and another specimen from Sri Lanka, Mauritius and Kerala, southwestern India. The name *H. brookii* is restricted to the species occurring in East Asia and in parts of India (including Karnataka, but probably most of the subcontinent). The available name *H. parvimaclatus* was applied to population of southern India and Sri Lanka and is found to be restricted to that zone. Bauer et al. (2010) also indicated towards further hidden species within Indian *H. brookii* population. Keeping the taxonomic uncertainty in mind and lacking detail in morphological and molecular data, we keep our Katerniaghat taxa confer to *Hemidactylus brookii* pending further studies.

***Hemidactylus frenatus* Schlegel, 1836:** One individual of the species was photographed from Vaisalot of Nishangada. It was located under an information board of a teak plantation area by day.

### Agamidae Gray, 1827

***Calotes versicolor* (Daudin, 1802):** Recorded from Base Camp, Nishangada, Bhabanipur Village. Inhabit grassland, scrub, plantation and human habitation. Majority of the individuals were sighted in arboreal situations 30cm–4m above ground. Males in breeding colouration were observed during June. In northern India, they are known to lay eggs during summer (Das



Image 6. *Lygosoma punctata*

2002). We observed juveniles during the month of December.

#### Scincidae Gray, 1825

***Eutropis carinata* (Schneider, 1801):** Observed from Bhawanipur Village during June. A single individual was foraging among leaf-litter of a teak plantation area close to human habitations. Earlier, the species had been recorded from Nishangada (Hallermann et al. 2001).

***Lygosoma punctata* (Gmelin, 1799) (Image 6):** Recorded from near the base camp during March 2009. The individual was found among accumulated leaf-litter near degraded grassland and plantation area at around 1100h.

#### Varanidae Merrem, 1820

***Varanus bengalensis* (Daudin, 1802):** Individuals were sighted in the backyard of human habitation, along the river bank, grassland, teak plantation, agriculture fields and even seen crossing paved roads. Individuals were observed in arboreal situations ca. at 2–5 m above ground. A juvenile was observed during the month of June.

***Varanus flavescens* (Hardwicke & Gray, 1827):** Photographed by SC on metalled forest road in the buffer area of Katerniaghat Wildlife Sanctuary on 06 June 2010. The area was surrounded by teak plantation area.

#### Typhlopidae Merrem, 1820

***Ramphotyphlops brahminus* (Daudin, 1803):** Found inside a cracked floor of the base camp at



Image 7. *Python bivittatus*

around 2130h.

#### Boidae Gray, 1825

***Eryx conicus* (Schneider, 1801):** The record of the species is based on Hallermann et al. (2001) from Nishangada.

#### Pythonidae Fitzinger, 1826

***Python bivittatus* Kuhl, 1820 (Image 7):** Recorded from near the base camp. During June, one individual was observed while it was crossing paved road at around 1840h. surrounded by grassland and plantation area. Two basking individuals were observed under thick *Ipomea* growth during February 2009 near abandoned Katerniaghat railway station. This area is a known nesting site for pythons in the area (Romulus Whitaker, pers. comm. June 2008). We observed remains of eggshells, suggesting earlier nesting activity.

*Python bivittatus* is recently been re-assessed as a distinct species by Jacobs et al. (2009). The westernmost distributional limit of this species is represented by three disjunct wild populations known from Royal Chitwan National Park, Royal Bardia National Park of Nepal and Corbett Tiger Reserve of India (Barker & Barker 2008).

SC also photographed the same subspecies from the nearby (90km to the west of Katerniaghat WLS) Dudhwa National Park in Uttar Pradesh. Thus, report of *Python bivittatus* from Katerniaghat and Dudhwa further fill in the distributional gap in India.

#### Colubridae Opperl, 1811

***Amphiesma stolatum* (Linnaeus 1758):** First





Image 8. *Dendrelaphis tristis*



Image 9. *Lycodon aulicus*

sighting is from the Katerniaghat Forest Range Office while it was moving among leaf litter of a teak plantation area during June 2008. Subsequently, on 14 June 2008, one dead female was observed on a forest trail surrounded by Terai grasslands.

***Boiga forsteni* (Duméril, Bibron & Duméril, 1854):** Hallermann et al. (2001) recorded the species from Nishangada area of the sanctuary. The photograph of an individual female (SVL 1680mm, TL 376mm) provided in that paper corresponds to the variety 1 as described in Mohapatra et al. (2009).

***Chrysopelia ornata* (Shaw, 1802):** Record of the species is based on Basu (1989) who reported a specimen with pholidosis: ventral 214, subcaudals: 115, scale row 18: 16.

***Dendrelaphis tristis* (Daudin, 1803) (Image 8):** One male (SVL 670mm, TL: 315mm) from human habitation and plantation forest edge near the base camp during March 2009. It was occupying a hole within the entrance gate to a house. The individual was reported to be regularly using the hole from more than 20 days. The nearby areas include extensive lemon plantation and grassland.

Pholidosis: supralabials 9/9, 5 and 6 touches eye, infralabials 10/10, first five touches anterior genial, sixth touches posterior genial, preocular: 1, postocular: 2, temporals: 2+2; ventral: 195, anal: 2; subcaudals: 110, dorsal scale rows: 15:15:11.

***Enhydryis sieboldii* (Schlegel, 1837):** A female individual (SVL 645mm, TL 93mm) reported from Nishangada by Hallermann et al. (2001).

***Lycodon aulicus* (Linnaeus, 1758) (Image 9):** First individual was found in a crevice of a wooden window frame ca. 2.5m above ground at around 1900h during June 2008. Another individual was obtained from a wall crack of the same building during June. One individual was killed by a *Rattus* sp.

All the individuals had small yellowish bars that broaden laterally and dissolve into yellowish edged lateral scales. Thus, corresponds to the variety forma typica.

***Lycodon jara* (Shaw, 1802):** Talukdar & Dasgupta (1977) reported a specimen of *Lycodon jara* from Katerniaghat and was the first record of the species from Uttar Pradesh. Further western record of the species is from Dehradun and Rajaji National Park (Hussain & Roy 1992). Although the species was repeatedly collected from Orissa, West Bengal, Arunachal Pradesh (Boulenger 1913; Whitaker & Captain 2004; Abhijit Das pers. obs. 2007) Assam (Sclater 1891; Das et al. 2009) Meghalaya (Sclater 1891), Manipur (Singh 1995) and Mizoram (Abhijit Das pers. obs. 2009). It is also known from Nepal and Bangladesh.

***Ptyas mucosa* (Linnaeus, 1758) (Image 10):** Single individual was rescued from human habitation close to extensive Terai grassland during June. Locally known as “Dhamin”.

***Psammodynastes pulverulentus* (Boie, 1827):** The record of the species is from Nishangada (ZMH R 04825), 5km south of the Nepal border by Hallermann et al. (2001). In India, the southernmost distributional limit of the species is Mahendragiri (18.56°N &



Image 10. *Ptyas mucosa*

84.21°E; elev.1093m) Srikakulam District of Andhra Pradesh (Mohapatra et al. 2010), northern West Bengal (Ahmed & Dasgupta 1992), northeastern India (Ahmed et al. 2009). The Katerniaghat record appears to be the westernmost distributional limit of the species. Also found in Nepal, Bhutan, Bangladesh, Myanmar, China, Laos, Cambodia, Vietnam, Thailand, Taiwan and the Philippines (Schleich & Kästle 2002; Das 2002).

***Sibynophis sagittarius* (Cantor, 1839) (Image 11):** A specimen was observed and photographed by DB in the area lying between Bhabanipur Village and Amba in March. It was found below leaf-litter beneath riverine forest undergrowth adjoining a cattle trail.

*Sibynophis sagittarius* is often considered as junior synonym of *Sibynophis subpunctatus* (Wall 1907 & Morgan 1973). Captain et al. (2004) showed that *S. sagittarius* and *S. subpunctatus* are morphologically distinct and geographically disjunct in their distribution. *S. sagittarius* is currently known from Himachal Pradesh, Uttarakhand, Uttar Pradesh, Madhya Pradesh, Bihar, Orissa, West Bengal (Wall 1923; BMNH 1930.5.8. 161 dried skull; Sclater 1891; Ahmed & Dasgupta 1992; Das 2002; Saikia et al. 2007; Dutta et al. 2009). Record of the species from northeastern India, Assam, Nicobars, Myanmar and Malaysia (Sclater 1891; Boulenger 1893; Das 2002; Schleich & Kästle 2002; Captain et al. 2004) are doubtful or erroneous (Wall 1923; Ahmed & Dasgupta 1992; Ahmed et al. 2009; www.calacademy.org/research/herpetology/myanmar). Elsewhere it is known from Nepal (Schleich & Kästle 2002) and Bangladesh (Kabir et al. 2009).

Image 11. *Sibynophis sagittarius*

***Xenochrophis piscator* (Schneider, 1799):** One juvenile was caught from the boat point while it was moving through moist grass near the river during June. One individual (SVL 40cm, TL 10cm) was found in shallow water near a sand bar of the Girwa River during December. Largest individual (SVL 80cm and TL: 30cm) was found dead on a fishing hook near Koriala-Girwa confluence. The individual had pholidosis: 145 ventrals, 83 subcaudals, anal: 2, 19:19:17 rows of scales, 9 supralabial of which 4 and 5 touch eye, 9 infralabial, first 5 touch anterior genial, postocular 2, preocular 1, temporal 2+2. The postocular streak not distinct and neck is without distinct crossband. Only the outer edges of the ventral scales were black.

***Xenochrophis schnurrenbergeri* Kramer, 1977:** Specimen number ZMH R04814 collected from Nishangada, Uttar Pradesh was reported by Hallermann et al. (2001) as *Xenochrophis piscator piscator*. This specimen was later identified as *Xenochrophis schnurrenbergeri* by Vogel & David (2006), and reported as a first record of the species for northern India. Of late, *X. schnurrenbergeri* is reported from Orissa, Bihar, West Bengal and Assam (Ahmed et al. 2009, Purkayastha et al. 2010, Mohapatra et al. 2010). Also found in Nepal (Kramer 1977).

#### Elapidae Boie, 1827

***Bungarus caeruleus* (Schneider, 1801):** One individual was observed near Katerniaghat bus stop at night. The area is surrounded by human habitation.

***Bungarus fasciatus* (Schneider, 1801) (Image 12):** One individual was photographed during December 2007 near Katerniaghat forest range office. It was



**Image 12. *Bungarus fasciatus***

active on a forest trail at night (Ramesh Pandey, pers. comm. June 2008).

***Naja naja* (Linnaeus, 1758) (Image 13):** Recorded from Nishangada while it was crossing a paved road surrounded by teak plantation area at 1030hr during June. The second individual was killed when it entered human habitation near Base Camp. This venomous species is locally known as “Phitara”.

#### Viperidae Boie, 1827

***Daboia russelii* (Shaw & Nodder, 1797):** Observed in the Amba-Bhawanipur Village watch tower point area in riverside habitat close to grassland-forest edge. Juvenile observed basking in riverside grass patch close to forest trail. During summer, one adult was seen in a tree hole at the base of the trunk.

#### Trionychidae Fitzinger, 1826

***Chitra indica* (Gray, 1831):** Single individual was recorded basking on a flat, sandy riverbank of Amba ghat at around 1030h during December 2008. Two individuals of *Nilssonia gangeticus* were also observed at the same spot in December 2008. Local people narrated that the species start nesting from July and continue up to October. Das (1995) reported that in the Chambal region, the species nests from end August up to mid- September.

It is not conclusively known if double clutching occurs in the species in which case the first clutch could be laid at the beginning of the rainy season in July or



**Image 13. *Naja naja***

even earlier in June when the monsoon start, while the second clutch could follow about a month and half later in August–September. Ashutosh Tripathi, studying the reproductive biology of the species confirms its earliest nesting on 17 July in the Ganga River in Farrukhabad District in Uttar Pradesh.

***Nilssonia gangeticus* (Cuvier, 1825):** Recorded at various points along the 4km Girwa River stretch from boat point to Amba Ghat. Frequently observed on newly emerged sandbars where they bask with gharials. Individuals often spotted while surfacing for breathing. One individual was seen feeding on submerged vegetation during February 2009. In northern India (Chambal River), Vasudevan (1998) recorded the nesting season from late July to end of October with peak activity during late August. We presume that similar nesting season prevail in Katerniaghat also.

***Nilssonia hurum* (Gray, 1831):** Reported as *Aspideretes hurum* by Hallerman et al. (2001) from Nishangada area of the sanctuary. *N. hurum* has been reported from other parts of the Terai by Das et al. (2010).

***Lissemys punctata andersoni* Webb, 1980 (Image 14):** During August 2006, one individual was photographed in a grazing ground next to the Girwa River (Ramesh Pandey, pers. comm. June 2008).





Image 14. *Lissemys punctata andersoni*



Image 15. *Melanochelys trijuga*



Image 16. *Melanochelys tricarinata*

Earlier, specimens (ZMH R00856-59) were reported from Monem River, Nishangada by Hallermann et al. (2001).

#### Geoemydidae Theobald, 1868

***Cyclemys gemeli* Fritz, Guicking, Auer, Sommer, Wink & Hundsdörfer, 2008:** Fritz et al. (2008) showed that sub adult female ZMH R00288 collected from Nishangada, Bahraich, Uttar Pradesh, India, approximately 5km S. Nepali border, leg. G.A. von Maydell during German India Expedition 1955/1957 represents the newly described *Cyclemys gemeli* thus making the record as the westernmost distributional limit of the species in India. Elsewhere, the species is reported from localities in northeastern India and northern West Bengal (Das et al. 2009; Praschag et al. 2009).

***Geoclemys hamiltonii* (Gray, 1831):** One shell (SCL 31cm) was observed near a seasonal water pool at the grassland-deciduous forest edge. Forest staff narrated that the turtle was presumably killed and eaten by local 'Tharu' people.

***Hardella thurjii* (Gray, 1831):** Observed by SC in streams and rivulets leading to Mahadeva Tal. Earlier, Das (1995) reported the species from the Katerniaghat Wildlife Sanctuary. *H. thurjii* is apparently less frequently encountered in large rivers and more frequently in smaller slow flowing streams and wetlands such as beels in Assam. Similar suitable

habitats also available in Katerniaghat Wildlife Sanctuary. Thus we presume that, further survey will record new distributional localities for the species from the study area.

***Melanochelys trijuga* (Schweigger, 1914) (Image 15):** An individual male (CCL 12cm, PL 8cm.) encountered while it was crossing Barrage road at around 1730hr during June 2008. The area is surrounded by thick forest and water bodies.

Based on subspecific characters provided in Das (1995), we refer our individual to the subspecies *Melanochelys trijuga indopeninsularis*.

***Melanochelys tricarinata* (Blyth, 1856) (Image 16):** First male (CCL: 190mm, PL: 120mm. carapace width: 97mm) was recorded from Watch tower road on 21 June 2008 at 1620hr. It was crossing the forest



Image 17. *Morenia petersi*Image 18. *Pangshura tectum*

trail surrounded by extensive terai grassland. The males carry a distinct plastral concavity. One female (PL 115mm, SCL 135mm) was recorded during March 2009 while it was crossing grassland trail at 0850h.

***Morenia petersi* (Anderson, 1879) (Image 17):** Recorded from near Mahadeva Tal in the month of December 2008. Mahadeva Tal is a large wetland/ Marsh area with extensive macrophytic growth. In Uttar Pradesh, the species was reported from Dudhwa National Park (Javed & Hanfee 1995). In India, *Morenia petersi* is known from Uttarakhand (Bahuguna 2010), Bihar and West Bengal (Das 1995), Assam (Ahmed et al. 2009). Also found in Bangladesh and Nepal.

***Pangshura tectum* (Gray, 1831) (Image 18):** Two basking individuals were observed from Maila Nullah during June. The individuals were observed on logs close to thick cane brake of Maila Nullah. During February, one complete shell (SCL 82mm, PL 74.25mm) was obtained from near a temporary water pool of grassland-deciduous forest edge. During October 2009, SC photographed an individual on the left efflux embankment of Girwa Barrage while it was crossing the road in the evening. This species appears to avoid open large rivers unlike the closely related *P. tentoria* and *P. smithii* which were recorded from Girwa river.

***Pangshura tentoria* (Gray, 1834) (Image 19):** Most frequently observed turtle species during the study period. Sighting records are from Boat point, watch tower, Amba and Bhabanipur. Individuals frequently observed while basking on river-side logs as well as in mid river. Individuals also observed on

Image 19. *Pangshura tentoria flaviventer*

accumulated vegetation on a log sharing the basking space with juvenile Gharial.

Egg lying was observed during December 2008. A total of nine nests were traced from flat sandbank of Amba Ghat. The nests are located at a distance of 15–32m from water and are close to grassy patches. The clutch size observed as 7–9 elongated eggs measuring 44.40 x 25.15 mm. One female (CCL 230mm, SCL 215mm, PL 225mm) found while it was digging the sand at around 1300h. Urinates when captured.

Hallermann (2001) reported the subspecies *P. tentoria tentoria* from Nishangada, however, our individuals correspond to the subspecies *Pangshura tentoria flaviventer* in having an unpatterned yellowish plastron, a yellowish stripe on first three vertebrae, head brownish with a pink patch behind the eyes. Schleich & Kästle (2002) regarded *P. tentoria flaviventer* as distinct species without detail description. However,

we maintain the *P. tentoria flaviventer* following Fritz & Havas (2007).

***Pangshura smithii* (Gray, 1863):** Single individual was photographed while it was basking on a log close to watch tower river bank at around 0930hr during March 2009. Two individuals of *P. tentoria* were also basking on the same log.

We are unable to comment on the subspecific status of the individual encountered. The nominate subspecies *Pangshura smithii smithii* characterised by a blotched plastron is known from Katerniaghat (Das 1995).

### Crocodylidae Cuvier, 1807

***Crocodylus palustris* Lesson, 1831 (Image 20):** Recorded from Boat point, Nesting Island, Madhab Nullah, Mayla Nullah, Bhabanipur, Barrage, Amba and Occur syntopically with Gharial. However, from the observed comparative abundance of the two species it would seem that the Gharial is more abundant in the open river which is avoided by Mugger, the latter preferring stagnant and semi stagnant habitats of wetlands and smaller streams. Basking individuals were observed on sandbanks, sandbars, vegetated river bank as well as mudbank. Large individuals found inhabiting small rivulets ca. 2–3 km away from the main channel. Capable of climbing ca. >60° riverbank and utilise riverbanks with grassy ledges for resting. Muggers were also found inhabiting small to large wetlands with extensive macrophytic growth. An individual feeding on a bovine carcass was observed during July. During August, one individual was recorded to feed on a Gharial hatchling.

In Katerniaghat, nesting season coincides with that of the Gharial and a nest was located in July on the same river Island where communal nesting of Gharial occurred. The nest was 24cm deep, clutch size is 18 eggs and each egg measured 77.20 x 49.74 mm.

### Gavialidae Gmelin, 1789

***Gavialis gangeticus* (Gmelin, 1789) (Image 21):** Basking individuals were observed on sand banks and sand bars. Newly created sand bars are frequently used and those in the mid river or which are remotely placed sand bars are preferred for basking. Besides using sand banks, juveniles also bask on mud banks and on emergent logs or vegetation lodged into the river bed. Basking places sometimes shared with *Crocodylus*



Image 20. *Crocodylus palustris*



Image 21. *Gavialis gangeticus*

*palustris*, *Nilssonia gangeticus*, *Pangshura tentoria*, *Dendrocygna javanica* and *Tadorna ferruginea*. The highest count for a single day was 105 individuals on 09 December 2008 of which 35 were recognized as adults. Largest number of adult males with “gharas” were eight on 20 December 2008. During high water in June–July, large individuals were observed inside small sub channels, 1–2 km from main river channels. Communal nesting was observed on a 40m long and 6–7 m wide sandy island with grassy patches. Nesting began in March. Nests were observed as 32–40 cm deep. One nest had 46 eggs. Average size of the eggs measured 82.21 x 60.07. Hatchlings measuring SVL 132–150 mm, TL 180–190 mm (N = 5) observed on 16 June 2008. Five to six hatchlings were seen taking refuge near grassy roots or in depressions along the



river bank.

The first Gharial population survey in Katerniaghat was in 1975–1976, and previous to our work, the last study of Gharial was done in 2001–2002 (Singh 1978; Srivastava 1981; Singh 2003). From 2008–09, we found 27 nests; a 7% increase since 2001 and 96% increase since 1975. Nests were found in seven sites. Additionally, one clutch was found in shallow water and five eggs were deposited in the open on a sand bar (not in a nest). Two nests were destroyed by flooding/erosion. The island on which most Gharial had nested since 1988 was completely destroyed by floods during July 2008, and most nests were lost. The concentration of nests in such small areas makes the population vulnerable. A detailed paper on gharial population and habitat study in Katerniaghat WS is in preparation.

## DISCUSSION

Based on field and literature records, the study documents 42 species of reptiles belonging to 14 families and 32 genera and 10 species of amphibians belonging to four families and eight genera. The family Colubridae is the most speciose genus with 12 species; Geoemydidae with nine species; Trionychidae and Dicoglossidae with four species; Gekkonidae three species; families Bufonidae, Microhylidae, Rhacophoridae, Varanidae, Scincidae, Elapidae each with two species; Agamidae, Typhlopidae, Boidae, Pythonidae, Viperidae, Crocodylidae, and Gavialidae with a single species each.

The record of *Calotes maria*, a Khasi Hill endemic agamid by Hallermann et al. (2001) from Nishangada, Uttar Pradesh, needs to be verified. As the collection in that paper also includes specimens collected from northeastern India and northern West Bengal, so we presume that records of *C. maria*, *E. multifasciata* and *H. platyurus* might have been collected from eastern India and the collection localities are mistakenly recorded as “Nishangada”.

During the present survey, few herpetofaunal species were recorded, the identity of which are either unknown or conferred to closely related species (e.g., *Kaloula* sp., *Fejervarya* sp. *Fejervarya* cf. *teraiensis*). These provisionally identified species may represent previously unknown species, or are members of cryptic species complexes.

According to Bain et al. (2003), most of the species complexes are widespread, although the member species can have only limited ranges within this broad range. Members of the species complexes encountered are *Calotes versicolor* (Zug et al. 2006), *Lycodon aulicus*, *Xenochrophis piscator* (Vogel & David 2006).

Sankaran (1989) reported *Dendrelaphis pictus* from Dudhwa National Park which appears to be the westernmost distributional limit for the species and also indicates its possible occurrence in Katerniaghat. However, *D. pictus* is regarded as a species complex and several populations from south-east Asia and Sundaland have been recently described as new with the taxonomy of the group in the subcontinent remaining unresolved (Rooijen & Vogel 2008; Vogel & Rooijen 2008). *Boiga trigonata*, reported as fairly common in the Terai and Duns of Nepal (Fleming & Fleming 1974), might also occur in Katerniaghat. Similarly, we predict the occurrence of *Coelognathus helena helena*, *Lycodon striatus*, *Psammophis condanarus*, *Oligodon arnensis* and even rare species like *Oligodon kheriensis* and *Elachistodon westermanni*.

The Girwa River is recorded within the natural distribution of *Batagur dhongoka* and *Batagur kachuga* (Fritz & Havas 2007) and recorded from nearby areas of Terai (Mitchell & Rhodin 1996) in southern Nepal. DB collected secondary information on occurrence of both the species from Katerniaghat Sanctuary. However, subsequent field surveys failed to record the two species from the Sanctuary. Thus, it has been hypothesized that the two species are either locally extirpated from their habitats in the Girwa or have become extremely rare because of ecological changes as a result of storage of water after the construction of barrage at Kailashpuri. Thus, while considering the reptilian diversity of Katerniaghat Wildlife Sanctuary the possibility of local extirpations of several species as a result of deforestation in Nepal and modification of river courses and discharge should also be given cognizance.

The Sanctuary is one of the last remaining habitats of the Critically Endangered Gharial (Choudhury et al. 2011). Among the threatened species, *Gavialis gangeticus*, *Crocodylus palustris*, *Chitra indica*, *Nilssonina hurum*, *Nilssonina gangeticus*, *Melanocheilus tricarinata*, *Pangshura tecta*, *Geoclemys hamiltoni*, *Python bivittatus*, *Varanus bengalensis* and *Varanus*



*flavescens* have been accorded the highest legal protection status, under Schedule I of Indian Wildlife (Protection) Act, 1972. *Naja naja*, *Ptyas mucosa* and *Xenochrophis piscator* are listed in Schedule II; all other snake species are listed under Schedule IV of the Act.

The reptilian fauna of Katerniaghat Sanctuary predominantly composed of Indo-Malayan genera (*Amphiesma*, *Chrysopelea*, *Crocodylus*, *Cyclemys*, *Enhydris*, *Lygosoma*, *Naja*, *Psammodynastes*, *Python*, *Ramphotyphlops*, *Varanus* and *Xenochrophis*), followed by genera of Indian radiations (*Bungarus*, *Gavialis*, *Hemidactylus*, *Lissemys*, *Pangshura* and *Melanochelys*) and transitional elements (*Boiga*, *Chitra*, *Dendrelaphis*, *Lycodon*, *Morenia* and *Sibynophis*) (sensu Das 1996). Originally, the Terai was almost entirely covered by dense tropical forest, with grasslands or scrub (Schleich & Kaestle 2002). This might have provided in colonization of wet zone species (*Cyclemys gemeli*, *Chrysopelea ornata*, *Python bivittatus* and *Psammodynastes pulverulentus*) in the Katerniaghat. Basu (1989) also opined that the humid and well-forested areas of Terai and bhabar provide an exclusive corridor of suitable habitat for the spread of reptiles from afforested areas in the east, deep into the Gangetic plain areas.

Katerniaghat Wildlife Sanctuary represents one of the last remaining Terai ecosystems and hence it is of tremendous conservation concern. Considering the dearth of knowledge on diversity, distribution and natural history of the herpetofauna of the region, the present study assumes significance. However, the field observation of the study is limited to a single peak monsoon month (June–July) and subsequent two visits are during winter month where herpetofaunal activity is limited due to low temperature. Thus it is almost certain that the present inventory only represents a fraction of the actual herpetofaunal assemblage and additional survey will reveal hitherto unrecorded species.

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DHRUVAJYOTI BASU was associated with Katerniaghat Foundation and was one of the pioneers in crocodile conservation and research in India. He extensively worked on the distribution and status of Gharial throughout India and also closely associated with the U.P. Forest Department Crocodile Breeding Programme, MCBT, WWF etc. He passed away while conducting a Gharial survey in Assam in April, 2011. **This paper is dedicated to the memory of his indomitable spirit!!** He shared past herpetological observation from the area and guided the team during the survey.

LAUREL CONVERSE was with the Gharial Conservation Alliance, Madras Crocodile Bank Trust, Tamil Nadu, India. Her primary research interest is captive breeding and ex-situ conservation of crocodiles. She carried out the field surveys for along with AD.

SURESH S CHAUDHURY is associated with the Katerniaghat Foundation, Lucknow, Uttar Pradesh, an organization involved in conservation activities in the Terai landscape of India. He is also a wildlife photographer. He was a member of the survey team and also provided past information on the herpetofauna of the region.

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