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URBAN BIODIVERSITY: AN INSIGHT INTO THE TERRESTRIAL VERTEBRATE DIVERSITY OF GUWAHATI, INDIA

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Abstract: This study focuses on the assessment of the terrestrial vertebrate diversity of Guwahati. Twenty-six species of amphibians, 57 species of reptiles, 214 species of birds, and 36 species of mammals were recorded during the study period. Thirty-three species were found to be threatened with extinction and another 62 species need evaluation. A single species of turtle was found to be categorized as Extinct in the Wild under the IUCN Red List of Threatened Species.

Keywords: Assam, Biodiversity, city, Deepor Beel, Guwahati, urban, vertebrate.

Abbreviations: EW: Extinct in the Wild; CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened, LC: Least Concern; DD: Data Deficient; NE: Not Evaluated; NS: Non Scheduled, I: Schedule I of Indian Wildlife Protection Act, 1972; II: Schedule II of Indian Wildlife Protection Act, 1972; III: Schedule III of Indian Wildlife Protection Act, 1972; IV: Schedule IV of Indian Wildlife Protection Act, 1972; V: Schedule V of Indian Wildlife Protection Act, 1972; *: Introduced Species.

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INTRODUCTION

It has been estimated that the urban population of developing countries is growing at the rate of five million people per month. Roughly 70% of global population is expected to be urban by 2050, and the total urban area is expected to triple between 2000 and 2030 (U-Habitat 2013). Recent studies have focussed on the biodiversity of urban areas. A study in Hyderabad documented 1,305 vascular plant species, 30 odonates, 42 spiders, 141 butterflies, 60 fish, 16 amphibians, 41 reptiles, 314 birds and 58 mammal species (Srinivasulu & Srinivasulu 2012). A study at National Environmental Engineering Research Institute campus at Nagpur, Maharashtra recorded 135 vascular plants including 16 monocots and 119 dicots, belonging to 115 genera and 53 families (Gupta et al. 2008). A rapid assessment survey at the campus of Indian Institute of Technology, Madras recorded 298 plant species, 50 butterflies, eight amphibians, 13 reptiles, 51 birds and 12 mammal species (Care Earth 2006). Sudha & Ravindranath (2000) recorded 374 species of plants in Bangalore, where a study of street trees identified 108 species belonging to 33 families (Nagendra & Gopal 2010). A similar study in Delhi found 125 tree species (Bhalla & Bhattacharya 2015). A study in Chennai metropolitan city revealed the presence of 45 species of plants representing 21 families (Muthulingam & Thangavel 2012).

During the past 50 years the population of India has grown 2.5-fold and the urban population five-fold (Taubenböck et al. 2009). Analyses suggest that 8% of terrestrial vertebrate species on the IUCN Red List are imperiled largely because of urban development (McDonald et al. 2008), and 13% of endemics are in ecoregions that are under threat from urban expansion (McDonald et al. 2018). Thus, it is important to take research and conservation efforts regarding urban biodiversity more seriously. In urban landscapes the participation of inhabitants is a must for conservation, where effort must be invested in sensitising the community about the benefits of conserving urban biodiversity. Some of the services provided by urban biodiversity are improvement of air quality and regulation of microclimate by urban parks and vegetation. Tree cover and vegetation also helps in proper percolation of rain water to soil, adding to ground water and reducing floods while improving quality of life by adding aesthetic and recreational value. It has been estimated that a ten percent increase in canopy cover can reduce local temperature by 3–4 °C (Gill et al. 2007; Middel et al. 2015).

Guwahati (26.144°N & 91.736°E), the capital of Assam, is the biggest urbanized centre of northeastern India. The city falls within the Indo-Burma Biodiversity Hotspot, situated between the southern bank of the Brahmaputra River and the foothills of the Shillong plateau. It is spread over 216.79km² area, and has a population of around a million with a density of 2695.43 humans per sq.km. The city is situated on undulating plain with varying altitude of 49.5–55.5 m. The city is surrounded by 18 hills. Guwahati has eight reserve forests (South Kalapahar RF, Fatasil RF, Jalukbari RF, Gotanagar RF, Hengrabari RF, Sarnai Hill RF, Garbhanga RF, Rani RF) and two wildlife sanctuaries (Deepor beel WLS and Amchang WLS) along with an internationally acclaimed wetland and Ramsar Site, the Deepor Beel, within the city limits. Deepor Beel Wildlife Sanctuary (WS) is a part (4.01km²) of the Ramsar site which is 40km² in area. The mighty Brahmaputra River flows through the city for about 25km dividing it into northern and southern areas (Devi & Bhattacharyya 2015).

Guwahati has a tropical monsoon climate and receives about 1,600mm annual rainfall with an average annual temperature of 23°C. Certain patches of forest still exist within the city (Fig. 1). The overall habitat type in the study area mainly comprises of forest patches, scrublands, grasslands, plantations, wetlands, agricultural lands, human settlements and commercial areas. The forest patches are of moist deciduous type (Purkayastha 2012, 2015).

Due to urbanization and anthropogenic pressure, the biodiversity of the city is under stress. Cutting of hills, illegal felling of trees and degradation of wetlands is having an immense adverse effect on the biodiversity of the city. The hills of the city are used for illegal settlements most of which are reserve forest lands raising serious ecological concern. In the hills within Guwahati Municipal Area, there are 65,894 households of which 10,208 are within reserve forests (Devi & Bhattacharyya 2015). Importantly, a large part of Guwahati has been developed by filling of wetlands and the process of filling and degradation of wetlands still continues. Owing to this, Guwahati is seeing a rise of the artificial flood in the low lying city centers.

Due to factors cited above, an assessment of biodiversity of Guwahati becomes important for the formulation of long-term conservation policies. It is a fact that Guwahati has lost a big chunk of its biodiversity, but quantification of the same is not possible as we do not have data on its biodiversity from the past to compare with the present status of biodiversity. This paper provides an inventory of terrestrial vertebrate

biodiversity occurring in the city limits of Guwahati.

MATERIALS AND METHODS

This study was conducted between the year 2011 and 2016 spanning over a period of six years with survey emphasizing on terrestrial vertebrates. The study site was the Guwahati city (26.1859°N, 91.7477°E), the biggest metropolis of northeastern India and the economic hub of the region (Fig. 1). Since the main goal of the study was to create a checklist, visual encounter survey (Crump & Scott 1994) employing randomized walk (Lambert 1984) was conducted. Active search (Rolfe & McKenzie 2000) was employed specifically for herpetofaunal survey. For herpetofaunal survey, six man hours were invested per survey, with an approximate of six surveys per month from April to October each year between 2011 and 2016. Most of these surveys were undertaken in the evening and early night which also covered observations on nocturnal birds and mammals. Bird surveys were conducted round the year, with more survey efforts being invested during the winters (November–March). We used Olympus 10X50 DPS binocular for the survey. Twelve man hours were generally invested per survey with most conducted in early morning or evening. Mammal survey was conducted in association with bird survey.

Records of rescued animal with locality details by Assam State Zoo were also taken into account while creating the checklist. In most cases animals were photographed and identified using literature (Smith 1931, 1935, 1943; Ahmed et al. 2009; Grimmer et al. 2011; Purkayastha 2012; Menon 2014).

RESULTS

During this study a total of 332 species of terrestrial vertebrates were recorded. Birds were found to be the most diverse group accounting for 214 species, followed by reptiles (57 species), mammals (36 species) and amphibians (25 species).

Amphibia: A total of 26 species of amphibians representing seven families were encountered. Among these, a single species is Vulnerable, four species are Data Deficient and 21 species are Least Concern (IUCN 2017). Of these, 11 species are included in Schedule IV of Indian Wildlife Protection Act, 1972 (IWPA) and rest were non-scheduled species (Table 1; Images 1–16).

Reptilia: A total of 53 species of reptiles representing eleven families were encountered from Guwahati City during the present study. Among these, a single species is Extinct in the Wild (Black Softshell Turtle), two species are Endangered, five are Vulnerable, 31 species are Not Evaluated and 14 species are Least Concern as per the



Figure 1. A map showing different zonation within Guwahati city, Assam

IUCN Red List of Threatened Species (IUCN 2017). Of these, seven species are under Schedule I, three are under Schedule II, 25 are under Schedule IV of Indian Wildlife Protection Act, 1972 (IWPA) and the rest are non-scheduled animals (Table 2; Images 17–43).

Aves: Birds are the most diverse group of animals found in the study area, with 214 species representing 59 families. One species is Critically Endangered (Baer's Pochard), two species each are Endangered (Greater Adjutant Stork, Steppe Eagle) and Vulnerable (Common Pochard, Lesser Adjutant), 14 species are Near Threatened and the rest are Least Concern species (IUCN 2017). Three species are listed in Schedule I, one species in Schedule V, and the rest were in the Schedule IV of Indian Wildlife Protection Act, 1972 (IWPA, Table 3; Images 44–58).

Mammalia: Mammals were represented by 36 species in 21 families. One species is Critically Endangered (Chinese Pangolin), six species are Endangered (Gee's Golden Langur, Bengal Slow Loris, Asiatic Elephant, Hog Deer, Dhole, and Ganges River Dolphin), six species are Vulnerable (Capped Langur, Smooth-coated Otter, Sambar, Leopard, Gaur, and Western Hoolock Gibbon), and the remaining twenty two species are Least Concern (IUCN 2017). A total of 36 species are scheduled under Indian Wildlife Protection Act, 1972 (Schedule I: ten species, Schedule II: 14 species, Schedule III: four species, Schedule IV: a single species, Schedule V: five species and two non-scheduled species (Images 59–63).

Conservation status

The conservation status of about 60% of the reptilian fauna recorded from Guwahati is yet to be evaluated (IUCN 2017), creating conservation concerns. Of all the turtles mentioned here, most of these are found in temple ponds of Ugratara and Kamakhya. Though protected by law, unorganized turtle trade for flesh and as pet still continues within the city. There also exists illegal trade for local bird species such as parakeets which are sometimes sold under the veil of exotic bird trade.

Threats

The major threats to the terrestrial vertebrates of Guwahati perceived during the study are:

1. Habitat destruction and alteration: Many of the green patches are cleared away for constructional activities. Even the hills are used for settlement more than ever before with the city becoming the economic hub of the region. Again these hills are continuously exploited for resources. The city itself is fast losing its floral diversity and many of the trees planted through

afforestation program lack suitability to provide nesting sites for birds. Moreover, concrete structures are replacing the age old Assam type houses which used to have nooks and corners providing living space to birds. Stone quarries and felling of trees in the hills is making the situation worse (All India Disaster Mitigation Institute 2014). The blasting of dynamite in stone quarries has made many species leave the area and surroundings. The blasting activities adjacent to Deepor Beel poses a challenge to its birdlife.

2. Degradation and filling up of wetlands: Most of Guwahati is reclaimed from wetlands and the process is a continuous one. As a result of the loss of wetland, we are losing out on a wide range of biodiversity which in turn is disturbing the local ecological balance. Due to filling up of the wetland, the city is under artificial floods more than ever before (All India Disaster Mitigation Institute 2014). Deepor beel, the biggest wetland of the city, suffers from degradation of water quality, encroachment, and development of industries around it. The wetland famous for its birdlife is fast losing its glamor with fewer birds visiting the place.

3. Lack of interest: Urban biodiversity conservation gets the least priority in the conservation arena in the region. In fact, the term urban biodiversity is alien to many policy makers. Thus very few efforts are taken in the region for research and conservation of urban biodiversity.

DISCUSSION

Cities form less than 3% of the terrestrial surface of the Earth, but they are responsible for 78% of carbon emissions, 60% of residential water use, and 76% of the wood used for various industrial purposes (Grimm et al. 2008). On the other hand, urban trees absorb pollutants to improve air quality and reduce the effects of greenhouse gases and, in some cases, they may do so three times more effectively than adjacent exurban forests (Akbari 2002). Since urban ecosystem is a human modified one, human induced habitat alteration makes the ecosystem susceptible to invasion of non-native species (Aggarwal & Butsch 2012). In this study, we also found an invasive reptile, *Hemidactylus flaviviridis* Rüppell, 1835, which was initially restricted to the commercial area but now has started spreading to residential areas and having a negative effect on native gecko populations (Das et al. 2011). The gecko made its way to the city through the interstate transportation system. Similarly, introduction of exotic trees is a threat not only to native trees but

also the biodiversity dependent on these native trees. A decline in bird diversity was seen with the increase in exotic plant species in Delhi (Khera et al. 2009). It is a myth that cities cannot be rich in biodiversity. Infact, with proper management plan and peoples participation cities can serve as a hub of biodiversity. A study of 61 gardens in the city of Sheffield, UK, found 4,000 species of invertebrates, 80 species of lichen, more than 1,000 species of plants (McDonald et al. 2008). One of the most developed cities in the world, Singapore still has a wealth of biodiversity. Among the native species recorded are 2,145 vascular plants, 52 mammals, 364 birds, 301 butterflies, 127 dragonflies, 103 reptiles, 400 spiders, 66 freshwater fishes, and 255 hard corals. Between 2000 and 2010, intensive surveys found more than 500 species of plants and animals new to Singapore, of which more than 100 were new to science (Cities & Biodiversity Outlook 2012). All of this points to the potentially huge scope of urban biodiversity research.

Since most of the studies in terms of biodiversity are conducted within protected areas (Brandon & Wells 1992; Scott et al. 2001; Rodrigues et al. 2004), human aspect in the framework of biodiversity is not well studied. India's population is currently about 30% urban and is expected to become 50% urban by about 2044 (Cities & Biodiversity Outlook 2012). All these point to the fact that our country will have more urbanized space than ever before with more proportion of biodiversity occupying these urbanized spaces. Thus we are in need of better understanding of the multidimensional aspect of urban biodiversity taking in consideration, the human aspect for formulating long term research and conservation policies.

Recommendations

1. Afforestation effort is to be hastened, but the selection of plant species is an important aspect. Often fast growing trees, usually exotic, are selected for the purpose rather than suitable trees, such as fruiting trees and trees which the birds generally prefer for building nests.

2. Artificial living space, more specifically for birds has to be created by installing nesting boxes and bird feeders. Not only shall it help birds but shall also help generate interest amongst masses regarding conservation of urban biodiversity.

3. Children's urban biodiversity tour is another important aspect that would help create awareness and conserve the biodiversity of Guwahati. These tours can be a part of schools ecological club program; can also be conducted through district administration. We can

only save things we love and can only love things that we have seen, thus these tours shall serve the purpose of conservation in long run.

4. Deepor Beel is one of the most sensitive spots in terms of wetland birds, with 104 species of wetland birds recorded by us in the year 2016 including the endangered Greater Adjutant Stork which has a population of around 240 in the wetland. Unfortunately, this wetland is facing dual problems. The wetland is degrading mainly due to anthropogenic activity, and there is a tug of war between the community and an administration unable to find common ground. The current need to secure the future of the wetland is to adopt an approach that includes water quality improvement of the wetland via bioremediation (bacterial treatment) and a study of the socioeconomic structure of community living around the wetland to provide alternative sources of livelihood to the community who are primarily fishermen (this may include promotion of local handicraft, skill development programme for handicraft using water hyacinth, ecotourism, development of fisheries in government land, etc.). The selective incentive can be provided to the fishermen to encourage "no-fishing" in breeding seasons to help increase the productivity of the wetland.

5. Turtles are one of the most vulnerable groups of vertebrates with about half of the species threatened with extinction (Turtle Conservation Coalition 2011). Thus, through captive breeding programme with the stock in the temple ponds, and subsequently through release of the hatched turtles to the wild, we can boost the wild population of these threatened animals. The temple ponds can thus serve the role of a breeding, conservation and education centers in terms of turtles.

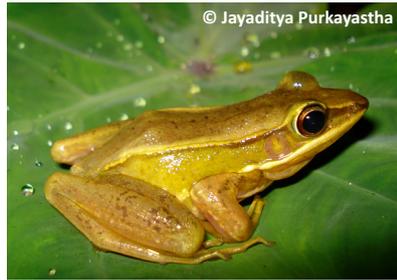
REFERENCES

- Aggarwal, S. & C. Butsch (2012).** Environmental and ecological threats in Indian mega cities, pp. 66–80. In: Richter, M. M. & U. Weiland (eds.). *Applied Urban Ecology: A Global Framework*. Blackwell Publishing Ltd. UK, 240pp.
- Ahmed, M.F., A. Das & S.K. Dutta (2009).** *Amphibians and Reptiles of Northeast India, A Photographic Guide*. Aranyak, Guwahati, xiv+170pp.
- Akbari, H. (2002).** Shade trees reduce building energy use and CO₂ emissions from power plants. *Environmental Pollution* 116: 119–126.
- All India Disaster Mitigation Institute (2014).** *Review of Studies on Urban Floods in Guwahati from Flood Knowledge to Urban Action*. Assam State Disaster Management Authority, Assam, India, 71pp.
- Bhalla, P. & P. Bhattacharya (2015).** Urban Biodiversity and Green Spaces in Delhi: a case study of new settlement and Lutyens' Delhi. *Journal of Human Ecology* 52(1–2): 83–96.
- Brandon, K.E. & M. Wells (1992).** Planning for people and parks design dilemmas. *World Development* 20: 557–570.
- Care Earth (2006).** Rapid Assessment of Biodiversity on the Campus of

Table 1. Checklist of amphibian diversity of Guwahati

Family	Common name	Scientific name	IUCN/RL	IWPAS
Bufonidae	Common Asian Toad	<i>Duttaphrynus melanostictus</i> (Schneider, 1799)	LC	NS
	Marbled Toad	<i>Duttaphrynus stomaticus</i> (Lütken, 1864)	LC	NS
Megophryidae	Red-eyed Frog	<i>Leptobrachium smithi</i> (Matsui et al. 1999)	LC	NS
	White-lipped Horned Toad	<i>Megophrys major</i> Boulenger, 1908	LC	NS
	Concave-crowned Horned Toad	<i>Megophrys parva</i> (Boulenger, 1893)	LC	NS
Microhylidae	Ornate Narrow-mouthed Frog	<i>Microhyla ornata</i> (Duméril & Bibron, 1841)	LC	NS
	Berdmore's Narrow-mouthed Frog	<i>Microhyla berdmorei</i> (Blyth, 1856)	LC	NS
Rhacophoridae	Garo Hills Bush Frog	<i>Philautus garo</i> (Boulenger, 1919)	VU	NS
	Six-lined Tree Frog	<i>Polypedates teraiensis</i> (Dubois, 1987)	LC	NS
	Double-spotted Tree Frog	<i>Rhacophorus bipunctatus</i> Ahl, 1927	LC	NS
	Annandale's Pigmy Tree Frog	<i>Chiromantis simus</i> (Annandale, 1915)	LC	NS
Dicroglossidae	Nepal Cricket Frog	<i>Fejervarya nepalensis</i> (Dubois, 1975)	LC	IV
	Pierre's Cricket Frog	<i>Fejervarya pierrei</i> (Dubois, 1975)	LC	IV
	Small Cricket Frog	<i>Fejervarya syhadrensis</i> (Annandale, 1919)	LC	IV
	Terai Cricket Frog	<i>Fejervarya teraiensis</i> (Dubois, 1975)	LC	IV
	Skittering Frog	<i>Euphlyctis cyanophlyctis</i> (Schneider, 1799)	LC	IV
	Indian Bull frog	<i>Hoplobatrachus tigerinus</i> (Daudin, 1802)	LC	IV
	Khasi Wart Frog	<i>Limnonectes khasianus</i> (Anderson, 1871)	DD	IV
Ranidae	Assam Hills Frog	<i>Clinotarsus alticola</i> (Boulenger, 1882)	LC	IV
	Theobald's Ranid Frog	<i>Hylarana tytleri</i> (Theobald, 1868)	LC	IV
	Bhamo Frog	<i>Humerana humeralis</i> (Boulenger, 1887)	LC	IV
	Cope's Assam Frog	<i>Hydrophylax leptoglossa</i> (Cope, 1868)	LC	IV
	Sengupta's Cascade Frog	<i>Amolops assamensis</i> (Sengupta, Hussain, Choudhury, Gogoi, Ahmed & Choudhury, 2008)	DD	IV
	Gerbil Stream Frog	<i>Amolops gerbillus</i> (Annandale, 1912)	LC	IV
Ichthyophidae	Garo Hills Caecilian	<i>Ichthyophis garoensis</i> (Pillai & Ravichandran, 1999)	DD	NS
	Manipur Moustached Ichthyophis	<i>Ichthyophis moustakius</i> Kamei et al. 2009	DD	NS

Image 1. *Duttaphrynus melanostictus*Image 2. *Megophrys parva*Image 3. *Leptobrachium smithi*Image 4. *Microhyla ornata*Image 5. *Limnonectes khasianus*Image 6. *Fejervarya nepalensis*

Image 7. *Fejervarya teraiensis*Image 8. *Hoplobatrachus tigerinus*Image 9. *Clinotarsus alticola*Image 10. *Humerana humeralis*Image 11. *Hydrophylax leptoglossa*Image 12. *Hylarana tytleri*Image 13. *Amolops assamensis*Image 14. *Philautus garo*Image 15. *Rhacophorus bipunctatus*Image 16. *Ichthyophis moustakius*

Indian Institute of Technology. Madras, India, 64pp.
Crump, M.L. & N.J. Scott Jr. (1994). Visual encounter surveys, pp. 84–92. In: Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek & M.S. Foster (eds.). *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Smithsonian Institution Press, Washington, D.C, 364pp.

Das, M., J. Purkayastha, A.M. Bauer & S. Sengupta (2011). *Hemidactylus flaviviridis* an invasive gecko in Assam. *Northwestern Journal of Zoology* 7(1): 98–104.

Devi, U. & K.G. Bhattacharyya (2015). Transport of trace metals by the rainwater runoff in the urban catchment of Guwahati, India, pp. 225–240. In: Raju, J.N., W. Gossel & M. Sudhakar (eds.). *Management of Natural Resources in a Changing Environment*. Springer International Publishing, 297pp.

Gill, S.E., J.F. Handley, A.R. Ennos & S. Pauleit (2007). Adapting cities for climate change: the role of the green infrastructure. *Built Environment* 33: 115–133

Grimm, N.B., S.H. Faeth, N.E. Golubiewski, C.L. Redman, J. Wu, X. Bai & J.M. Briggs (2008). Global change and the ecology of cities. *Science* 319(5864): 756–760.

Grimmett, R., C. Inskipp & T. Inskipp (2011). *Birds of the India, Pakistan, Nepal, Bangladesh, Bhutan, Sri Lanka and the Maldives*. Princeton University Press, New Jersey, 528pp.

Gupta R.B., P.R. Chaudhari & S.R. Wate (2008). Floristic diversity in urban forest area of NEERI Campus, Nagpur, Maharashtra (India). *Journal of Environmental Science and Engineering* 50(1): 55–62.

IUCN (2017). The IUCN Red List of Threatened Species. Version 2017-3. <<http://www.iucnredlist.org>>. Downloaded on 05 December 2017.

Khera, N., V. Mehta & B.C. Sabata (2009). Interrelationships of birds and habitat features in urban green spaces in Delhi, India. *Urban Forestry and Urban Greening* 8: 187–196.

Table 2. Checklist of reptilian diversity of Guwahati

Family	Common name	Scientific name	IUCN/RL	IWPAS
Agamidae	Common Garden Lizard	<i>Calotes versicolor</i> (Daudin, 1802)	NE	NS
	Blue-throated Lizard	<i>Ptyctolaemus gularis</i> (Peters, 1864)	NE	NS
Gekkonidae	Common House Gecko	<i>Hemidactylus frenatus</i> (Duméril & Bibron, 1836)	LC	NS
	Brook's House Gecko	<i>Hemidactylus brookii</i> (Gray, 1845)	NE	NS
	Garnot's House Gecko	<i>Hemidactylus garnotii</i> (Duméril & Bibron, 1836)	NE	NS
	Flat-tailed House Gecko	<i>Hemidactylus platyurus</i> (Scheider, 1792)	NE	NS
	*Yellow-bellied Gecko	<i>Hemidactylus flaviviridis</i> (Rüppell, 1835)	NE	NS
	Northern House Gecko	<i>Hemidactylus aquilonius</i> (McMahan & Zug, 2007)	NE	NS
	Tokay Gecko	<i>Gekko gecko</i> (Linnaeus, 1758)	NE	IV
	Assamese Day Gecko	<i>Cnemaspis assamensis</i> (Das & Sengupta, 2000)	NE	NS
		<i>Cyrtodactylus</i> sp 1		NS
	<i>Cyrtodactylus</i> sp 2		NS	
Scindae	Many Lined Skink	<i>Eutropis multifasciata</i> (Kuhl, 1820)	NE	NS
	Bronze Skink	<i>Eutropis macularia</i> (Blyth, 1853)	NE	NS
	Spotted Forest Skink	<i>Sphenomorphus maculates</i> (Blyth, 1853)	NE	NS
	White-spotted Supple Skink	<i>Lygosoma albopunctata</i> (Gray, 1846)	NE	NS
Varanidae	Bengal Monitor Lizard	<i>Varanus bengalensis</i> (Daudin, 1802)	LC	I
	Yellow Monitor lizard	<i>Varanus flavescens</i> (Gray, 1827)	LC	I
Typhlopidae	Brahminy Blindsnake	<i>Indotyphlops braminus</i> (Daudin, 1803)	NE	IV
	Diard's Blindsnake	<i>Argyrophis diardii</i> (Schlegel, 1839)	LC	IV
Pythonidae	Burmese Python	<i>Python bivittatus</i> (Kuhl, 1820)	VU	I
Colubridae	Rainbow Water Snake	<i>Enhydris enhydris</i> (Schneider, 1799)	LC	IV
	Common Wolf Snake	<i>Lycodon aulicus</i> (Linnaeus, 1758)	NE	IV
	Zaw's Wolf Snake	<i>Lycodon zawii</i> Slowinski, Pawar, Win, Thin, Gyi, Oo & Tun, 2001	LC	IV
	Rat Snake	<i>Ptyas mucosa</i> (Linnaeus, 1758)	NE	II
	Indo-Chinese Rat Snake	<i>Ptyas korros</i> (Schlegel, 1837)	NE	IV
	Red-necked Keelback	<i>Rhabdophis subminiatus</i> (Schlegel, 1837)	LC	IV
	Painted Bronzeback	<i>Dendrelaphis proarchos</i> (Wall, 1909)	NE	IV
	White-barred Kukri Snake	<i>Oligodon albocinctus</i> (Cantor, 1839)	NE	IV
	Günther's Kukri Snake	<i>Oligodon cinereus</i> (Günther, 1864)	LC	IV
	Buff Striped Keelback	<i>Amphiesma stolatum</i> (Linnaeus, 1758)	NE	IV
	Eastern Cat Snake	<i>Boiga gokool</i> (Gray, 1835)	NE	IV
	Green Cat Snake	<i>Boiga cyanea</i> (Duméril, Bibron & Duméril, 1854)	NE	IV
	Assamese Cat Snake	<i>Boiga quincunciata</i> (Wall, 1908)	NE	IV
	Checkered Keelback	<i>Xenochrohis piscator</i> (Schneider, 1799)	NE	II
	Bar-necked Keelback	<i>Xenochrohis schnurrenbergeri</i> (Kramer, 1977)	NE	IV
	Painted Keelback	<i>Xenochrohis cerasogaster</i> (Cantor, 1839)	NE	IV
	Common Mock Viper	<i>Psammodynastes pulverulentus</i> (Boie, 1827)	NE	IV
	Copper-headed Trinket Snake	<i>Coelognathus radiatus</i> (Schlegel, 1837)	LC	IV
	Trinket Snake	<i>Coelognathus helena</i> (Daudin, 1803)	NE	IV
	Long-nosed Whip Snake	<i>Ahaetulla nasuta</i> (Laçèpede, 1789)	NE	IV
Ornate Flying Snake	<i>Chrysopelea ornata</i> (Shaw, 1802)	NE	IV	
Elapidae	Monocled Cobra	<i>Naja kaouthia</i> (Lesson, 1831)	LC	II

Family	Common name	Scientific name	IUCN/RL	IWPAS
	Banded Krait	<i>Bungarus fasciatus</i> (Schneider, 1801)	LC	IV
	Greater Black Krait	<i>Bungarus niger</i> Wall, 1908	NE	IV
Viperidae		<i>Trimeresurus</i> sp.		IV
	Gumprecht's Green Pit Viper	<i>Trimeresurus gumprechtii</i> David, Vogel, Pauwels & Vidal, 2002		IV
Trionychidae	Ganges Soft-shelled Turtle	<i>Nilssonina gangetica</i> (Cuvier, 1825)	VU	I
	Black Soft-shelled Turtle	<i>Nilssonina nigricans</i> (Anderson, 1875)	EW	IV
	Peacock Soft-shelled Turtle	<i>Nilssonina hurum</i> (Gray, 1831)	VU	I
	Indian Flap-shelled Turtle	<i>Lissemys punctata</i> (Bonnaterre, 1789)	LC	I
	Indian Narrow-headed Softshell Turtle	<i>Chitra indica</i> (Gray, 1831)	EN	IV
Geoemydidae	Assam Roofed Turtle	<i>Pangshura sylhetensis</i> (Jerdon, 1870)	EN	NS
	Indian Tent Turtle	<i>Pangshura tentoria</i> (Gray, 1834)	LC	NS
	Indian Roofed Turtle	<i>Pangshura tecta</i> (Gray, 1831)	LC	NS
	Indian Eyed Turtle	<i>Morenia petersi</i> (Anderson, 1879)	VU	NS
	Spotted Pond Turtle	<i>Geoclemys hamiltonii</i> (Gray, 1831)	VU	I

Image 17. *Ptyctolaemus gularis*Image 18. *Calotes versicolor*Image 19. *Sphenomorphus maculatus*Image 20. *Lygosoma albopunctata*Image 19. *Eutropis carinata*Image 22. *Gekko gecko*Image 23. *Hemidactylus brookii*Image 24. *Pangshura sylhetensis*Image 25. *Cuora amboinensis*



Image 26. *Geoclemys hamiltonii*



Image 27. *Nilssonia nigricans*



Image 28. *Lissemys punctata*



Image 29. *Argyrophis diardii*



Image 30. *Amphiesma stolatum*



Image 31. *Boiga cyanea*



Image 32. *Coelognathus radiatus*



Image 33. *Chrysopelea ornata*



Image 34. *Dendrelaphis proarchos*



Image 35. *Lycodon zawi*



Image 36. *Oligodon albocinctus*



Image 37. *Ptyas korros*



Image 38. *Psammodynastes pulverulentus*



Image 39. *Rhabdophis subminiatus*



Image 40. *Xenochrophis cerasogaster*

Image 41. *Enhydryis enhydryis*Image 42. *Bungarus fasciatus*Image 43. *Trimeresurus* sp.

Table 3. Checklist of avian diversity of Guwahati

Family	Common name	Scientific name	IUCN/RL	IWPAS
Anatidae	Fulvous Whistling Duck	<i>Dendrocygna bicolor</i> (Vieillot, 1816)	LC	I
	Lesser Whistling Duck	<i>Dendrocygna javanica</i> (Horsfield, 1821)	LC	IV
	Graylag Goose	<i>Anser anser</i> (Linnaeus, 1758)	LC	IV
	Bar-headed Goose	<i>Anser indicus</i> (Latham, 1790)	LC	IV
	Ruddy Shelduck	<i>Tadorna ferruginea</i> (Pallas, 1764)	LC	IV
	Common Shelduck	<i>Tadorna tadorna</i> (Linnaeus, 1758)	LC	IV
	Cotton Pygmy Goose	<i>Nettapus coromandelianus</i> (Gmelin, 1789)	LC	IV
	Gadwall	<i>Mareca strepera</i> (Linnaeus, 1758)	LC	IV
	Eurasian Wigeon	<i>Mareca penelope</i> (Linnaeus, 1758)	LC	IV
	Mallard	<i>Anas platyrhynchos</i> Linnaeus, 1758	LC	IV
	Northern Shoveler	<i>Spatula clypeata</i> (Linnaeus, 1758)	LC	IV
	Northern Pintail	<i>Anas acuta</i> Linnaeus, 1758	LC	IV
	Garganey	<i>Spatula querquedula</i> (Linnaeus, 1758)	LC	IV
	Common Teal	<i>Anas crecca</i> Linnaeus, 1758	LC	IV
	Red-Crested Pochard	<i>Netta rufina</i> (Pallas, 1773)	LC	IV
	Common Pochard	<i>Aythya ferina</i> (Linnaeus, 1758)	VU	IV
Baer's Pochard	<i>Aythya baeri</i> (Radde, 1863)	CR	IV	
Ferruginous Duck	<i>Aythya nyroca</i> (Güldenstädt, 1770)	NT	IV	
Podicipedidae	Little Grebe	<i>Tachybaptus ruficollis</i> (Pallas, 1764)	LC	IV
	Great Crested Grebe	<i>Podiceps cristatus</i> (Linnaeus, 1758)	LC	IV
	Black-necked Grebe	<i>Podiceps nigricollis</i> Brehm, 1831	LC	IV
Ciconiidae	Asian Openbill	<i>Anastomus oscitans</i> (Boddaert, 1783)	LC	IV
	Black-necked Stork	<i>Ephippiorhynchus asiaticus</i> (Latham, 1790)	NT	IV
	Lesser Adjutant	<i>Leptoptilos javanicus</i> (Horsfield, 1821)	VU	IV
	Greater Adjutant	<i>Leptoptilos dubius</i> (Gmelin, 1789)	EN	IV
Phalacrocoracidae	Indian Cormorant	<i>Phalacrocorax fuscicollis</i> Stephens, 1826	LC	IV
	Great Cormorant	<i>Phalacrocorax carbo</i> (Linnaeus, 1758)	LC	IV
	Little Cormorant	<i>Microcarbo niger</i> (Vieillot, 1817)	LC	IV
Anhingidae	Orinetal Darter	<i>Anhinga melanogaster</i> Pennant, 1769	NT	IV
	Great White Pelican	<i>Pelecanus onocrotalus</i> Linnaeus, 1758	LC	IV
	Spot-billed Pelican	<i>Pelecanus philippensis</i> Gmelin, 1789	NT	IV
Ardeidae	Gray Heron	<i>Ardea cinerea</i> Linnaeus, 1758	LC	IV
	Purple Heron	<i>Ardea purpurea</i> Linnaeus, 1766	LC	IV
	Great Egret	<i>Ardea alba</i> Linnaeus, 1758	LC	IV

Family	Common name	Scientific name	IUCN/RL	IWPAS
	Intermediate Egret	<i>Ardea intermedia</i> Wagler, 1829	LC	IV
	Little Egret	<i>Egretta garzetta</i> (Linnaeus, 1766)	LC	IV
	Cattle Egret	<i>Bubulcus ibis</i> (Linnaeus, 1758)	LC	IV
	Indian Pond Heron	<i>Ardeola grayii</i> (Sykes, 1832)	LC	IV
	Striated Heron	<i>Butorides striata</i> (Linnaeus, 1758)	LC	IV
	Black-crowned Night Heron	<i>Nycticorax nycticorax</i> (Linnaeus, 1758)	LC	IV
Ardeidae	Black-headed Ibis	<i>Threskiornis melanocephalus</i> (Latham, 1790)	NT	IV
	Glossy Ibis	<i>Plegadis falcinellus</i> (Linnaeus, 1766)	LC	IV
Pandionidae	Osprey	<i>Pandion haliaetus</i> (Linnaeus, 1758)	LC	I
Accipitridae	Black-shouldered Kite	<i>Elanus axillaris</i> (Latham, 1801)	LC	IV
	Cinereous Vulture	<i>Aegypius monachus</i> (Linnaeus, 1766)	NT	IV
	Himalayan Griffon	<i>Gyps himalayensis</i> Hume, 1869	NT	IV
	Crested Serpent Eagle	<i>Spilornis cheela</i> (Latham, 1790)	LC	IV
	Changeable Hawk-eagle	<i>Nisaetus cirrhatus</i> (Gmelin, 1788)	LC	IV
	Lesser Spotted Eagle	<i>Clanga pomarina</i> (Brehm, 1831)	LC	IV
	Steppe Eagle	<i>Aquila nipalensis</i> Hodgson, 1833	EN	IV
	Grey-headed Fish Eagle	<i>Ichthyophaga ichhyaetus</i> (Horsfield, 1821)	NT	IV
	Pied Harrier	<i>Circus melanoleucos</i> (Pennant, 1769)	LC	IV
	Shikra	<i>Accipiter badius</i> (Gmelin, 1788)	LC	IV
	Black Kite	<i>Milvus migrans</i> (Boddaert, 1783)	LC	IV
	Grey-headed Fish Eagle	<i>Ichthyophaga ichhyaetus</i> (Horsfield, 1821)	NT	IV
	Long-legged Buzzard	<i>Buteo rufinus</i> (Cretzschmar, 1827)	LC	IV
Rallidae	White-breasted Waterhen	<i>Amaurornis phoenicurus</i> (Pennant, 1769)	LC	IV
	Purple Swampphen	<i>Porphyrio porphyrio</i> (Linnaeus, 1758)	LC	IV
	Eurasian Moorhen	<i>Gallinula chloropus</i> (Linnaeus, 1758)	LC	IV
	Eurasian Coot	<i>Fulica atra</i> Linnaeus, 1758	LC	IV
Recurvirostridae	Black-winged Stilt	<i>Himantopus himantopus</i> (Linnaeus, 1758)	LC	IV
	Pied Avocet	<i>Recurvirostra avosetta</i> Linnaeus, 1758	LC	IV
Charadriidae	Northern Lapwing	<i>Vanellus vanellus</i> (Linnaeus, 1758)	NT	IV
	Gray-headed Lapwing	<i>Vanellus cinereus</i> (Blyth, 1842)	LC	IV
	Red-wattled Lapwing	<i>Vanellus indicus</i> (Boddaert, 1783)	LC	IV
	Little Ringed Lapwing	<i>Charadrius dubius</i> Scopoli, 1786	LC	IV
Jacanidae	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i> (Scopoli, 1786)	LC	IV
	Bronze-winged Jacana	<i>Metopidius indicus</i> (Latham, 1790)	LC	IV
Scolopacidae	Common Sandpiper	<i>Actitis hypoleucos</i> Linnaeus, 1758	LC	IV
	Wood Sandpiper	<i>Tringa glareola</i> Linnaeus, 1758	LC	IV
	Marsh Sandpiper	<i>Tringa stagnatilis</i> (Bechstein, 1803)	LC	IV
	Spotted Redshank	<i>Tringa erythropus</i> (Pallas, 1764)	LC	IV
	Black-tailed Godwit	<i>Limosa limosa</i> (Linnaeus, 1758)	NT	IV
	Temminck's Stint	<i>Calidris temminckii</i> (Leisler, 1812)	LC	IV
	Common Snipe	<i>Gallinago gallinago</i> (Linnaeus, 1758)	LC	IV
Glareolidae	Small Pratincole	<i>Glareola lactea</i> Temminck, 1820	LC	IV
Laridae	Brown-Headed Gull	<i>Larus brunnecephalus</i> Jerdon, 1840	LC	IV
	Black-headed Gull	<i>Larus ridibundus</i> Linnaeus, 1766	LC	IV
	Pallas's Gull	<i>Larus ichhyaetus</i> Pallas, 1773	LC	IV
	Whiskered Tern	<i>Chlidonias hybrid</i> (Pallas, 1811)	LC	IV

Family	Common name	Scientific name	IUCN/RL	IWPAS
	River Tern	<i>Sterna aurantia</i> Gray, 1831	NT	IV
Columbidae	Rock Pigeon	<i>Columba livia</i> Gmelin, 1789	LC	IV
	Oriental Turtle Dove	<i>Streptopelia orientalis</i> (Latham, 1790)	LC	IV
	Eurasian Collared Dove	<i>Streptopelia decaocto</i> Frivaldszky, 1838	LC	IV
	Red-collared Dove	<i>Streptopelia tranquebarica</i> (Hermann, 1804)	LC	IV
	Western Spotted Dove	<i>Spilopelia suratensis</i> (Gmelin, 1789)	LC	IV
	Grey-capped Emerald Dove	<i>Chalcophaps indica</i> (Linnaeus, 1758)	LC	IV
	Yellow-footed Pigeon	<i>Treron phoenicopterus</i> (Latham, 1790)	LC	IV
	Green Imperial Pigeon	<i>Ducula aenea</i> (Linnaeus, 1766)	LC	IV
Cuculidae	Pied Cuckoo	<i>Clamator jacobinus</i> (Boddaert, 1783)	LC	IV
	Large Hawk Cuckoo	<i>Hierococcyx sparverioides</i> (Vigors, 1831)	LC	IV
	Common Hawk Cuckoo	<i>Hierococcyx varius</i> (Vahl, 1797)	LC	IV
	Plaintive Cuckoo	<i>Cacomantis merulinus</i> (Scopoli, 1786)	LC	IV
	Asian Koel	<i>Eudynamis scolopaceus</i> (Linnaeus, 1758)	LC	IV
	Green-Billed Malkoha	<i>Phaenicophaeus tristis</i> (Lesson, 1830)	LC	IV
	Greater Coucal	<i>Centropus sinensis</i> (Stephens, 1815)	LC	IV
Tytonidae	Barn Owl	<i>Tyto alba</i> (Scopoli, 1769)	LC	IV
Strigidae	Oriental Scops-owl	<i>Otus sunia</i> (Hodgson, 1836)	LC	IV
	Brown Hawk-owl	<i>Ninox scutulata</i> (Raffles, 1822)	LC	IV
	Brown Fish-owl	<i>Ketupa zeylonensis</i> (Gmelin, 1788)	LC	IV
	Tawny Fish-owl	<i>Ketupa flavipes</i> (Hodgson, 1836)	LC	IV
	Collared Owlet	<i>Glaucidium brodiei</i> (Burton, 1836)	LC	IV
	Asian Barred Owlet	<i>Glaucidium cuculoides</i> (Vigors, 1831)	LC	IV
	Jungle Owlet	<i>Glaucidium radiatum</i> (Tickell, 1833)	LC	IV
	Spotted Owlet	<i>Athene brama</i> (Temminck, 1821)	LC	IV
	Brown Hawk Owl	<i>Ninox scutulata</i> (Raffles, 1822)	LC	IV
Caprimulgidae	Long-tailed Nightjar	<i>Caprimulgus climacurus</i> Vieillot, 1825	LC	IV
Apodidae	House Swift	<i>Apus nipalensis</i> (Hodgson, 1836)	LC	IV
	Asian Palm Swift	<i>Cypsiurus balasensis</i> (Gray, 1829)	LC	IV
Alcedinidae	Common Kingfisher	<i>Alcedo atthis</i> (Linnaeus, 1758)	LC	IV
	Stork-billed Kingfisher	<i>Pelargopsis capensis</i> (Linnaeus, 1766)	LC	IV
	White-throated Kingfisher	<i>Halcyon smyrnensis</i> (Linnaeus, 1758)	LC	IV
	Pied Kingfisher	<i>Ceryle rudis</i> (Linnaeus, 1758)	LC	IV
Meropidae	Blue-bearded Bee-eater	<i>Nyctornis athertoni</i> (Jardine & Selby, 1830)	LC	IV
	Green Bee-eater	<i>Merops orientalis</i> Latham, 1802	LC	IV
	Chestnut-headed Bee-eater	<i>Merops leschenaulti</i> Vieillot, 1817	LC	IV
	Blue-tailed Bee-eater	<i>Merops philippinus</i> Linnaeus, 1766	LC	IV
Coraciidae	Indian Roller	<i>Coracias benghalensis</i> (Linnaeus, 1758)	LC	IV
	Dollarbird	<i>Eurystomus orientalis</i> (Linnaeus, 1766)	LC	IV
Bucerotidae	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i> (Shaw & Nodder, 1807)	LC	IV
Megalaimidae	Coppersmith Barbet	<i>Psilopogon haemacephalus</i> (Müller, 1776)	LC	IV
	Great Barbet	<i>Psilopogon virens</i> (Boddaert, 1783)	LC	IV
	Lineated barbet	<i>Psilopogon lineatus</i> (Vieillot, 1816)	LC	IV
	Blue-throated Barbet	<i>Psilopogon asiaticus</i> (Latham, 1790)	LC	IV
Picidae	Fulvous-breasted Woodpecker	<i>Dendrocopos macei</i> (Vieillot, 1818)	LC	IV
	Stripe-breasted Woodpecker	<i>Dendrocopos atratus</i> (Blyth, 1849)	LC	IV

Family	Common name	Scientific name	IUCN/RL	IWPAS
	Lesser Yellownape	<i>Picus chlorolophus</i> Vieillot, 1818	LC	IV
	Greater Yellownape	<i>Chrysophlegma flavinucha</i> (Gould, 1834)	LC	IV
	Gray-headed Woodpecker	<i>Picus canus</i> Gmelin, 1788	LC	IV
	Common Flameback	<i>Dinopium javanense</i> (Ljungh, 1797)	LC	IV
	Black-rumped Flameback	<i>Dinopium benghalense</i> (Linnaeus, 1758)	LC	IV
	Greater Flameback	<i>Chrysocolaptes guttacristatus</i> (Tickell, 1833)	LC	IV
Falconidae	Common Kestrel	<i>Falco tinnunculus</i> Linnaeus, 1758	LC	IV
	Red-necked Kestrel	<i>Falco chicquera</i> Daudin, 1800	NT	IV
	Oriental Hobby	<i>Falco severus</i> Horsfield, 1821	LC	IV
	Peregrine Falcon	<i>Falco peregrinus</i> Tunstall, 1771	LC	IV
Psittacidae	Rose-ringed Parakeet	<i>Psittacula krameri</i> (Scopoli, 1769)	LC	IV
	Blossom-headed Parakeet	<i>Psittacula roseata</i> Biswas, 1951	NT	IV
	Red-breasted Parakeet	<i>Psittacula alexandri</i> (Linnaeus, 1758)	NT	IV
Vangidae	Large Wood-shrike	<i>Tephrodornis virgatus</i> (Temminck, 1824)	LC	IV
	Common Woodshrike	<i>Tephrodornis pondicerianus</i> (Gmelin, 1789)	LC	IV
Artamidae	Ashy Woodswallow	<i>Artamus fuscus</i> Vieillot, 1817	LC	IV
Aegithinidae	Common Iora	<i>Aegithina tiphia</i> (Linnaeus, 1758)	LC	IV
Campephagidae	Short-billed Minivet	<i>Pericrocotus brevirostris</i> (Vigors, 1831)	LC	IV
	Scarlet Minivet	<i>Pericrocotus flammeus</i> (Forster, 1781)	LC	IV
	Large Cuckooshrike	<i>Coracina macei</i> (Lesson, 1831)	LC	IV
Laniidae	Brown Shrike	<i>Lanius cristatus</i> Linnaeus, 1758	LC	IV
	Long-tailed Shrike	<i>Lanius schach</i> Linnaeus, 1758	LC	IV
	Gray-backed Shrike	<i>Lanius tephronotus</i> (Vigors, 1831)	LC	IV
Oriolidae	Black-hooded Oriole	<i>Oriolus xanthornus</i> (Linnaeus, 1758)	LC	IV
Dieruridae	Black Drongo	<i>Dicrurus macrocercus</i> Vieillot, 1817	LC	IV
	Ashy Drongo	<i>Dicrurus leucophaeus</i> Vieillot, 1817	LC	IV
	Bronzed Drongo	<i>Dicrurus aeneus</i> Vieillot, 1817	LC	IV
	Hair-crested Drongo	<i>Dicrurus hottentottus</i> (Linnaeus, 1766)	LC	IV
	Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i> (Linnaeus, 1766)	LC	IV
Monarchidae	Black-naped Monarch	<i>Hypothymis azurea</i> (Boddaert, 1783)	LC	IV
Corvidae	Common Green Magpie	<i>Cissa chinensis</i> (Boddaert, 1783)	LC	IV
	Rufous Treepie	<i>Dendrocitta vagabunda</i> (Latham, 1790)	LC	IV
	House Crow	<i>Corvus splendens</i> Vieillot, 1817	LC	V
	Large-billed Crow	<i>Corvus macrorhynchos</i> Wagler, 1827	LC	IV
Hirundinidae	Barn Swallow	<i>Hirundo rustica</i> Linnaeus, 1758	LC	IV
	Asian Plain Martin	<i>Riparia chinensis</i> (Gray, 1830)	LC	IV
	Collared Sand Martin	<i>Riparia riparia</i> (Linnaeus, 1758)	LC	IV
Stenostiridae	Gray-headed Canary Flycatcher	<i>Culicicapa ceylonensis</i> (Swainson, 1820)	LC	IV
Paridae	Great Tit	<i>Parus major</i> Linnaeus, 1758	LC	IV
Pycnonotidae	Black-crested Bulbul	<i>Pycnonotus flaviventris</i> (Tickell, 1833)	LC	IV
	Red-vented Bulbul	<i>Pycnonotus cafer</i> (Linnaeus, 1766)	LC	IV
	Red-Whiskered Bulbul	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	LC	IV
Phylloscopidae	Tickell's Leaf Warbler	<i>Phylloscopus affinis</i> (Tickell, 1833)	LC	IV
	Greenish Warbler	<i>Phylloscopus trochiloides</i> (Sundevall, 1837)	LC	IV
Locustellidae	Straited Grassbird	<i>Megalurus palustris</i> Horsfield, 1821	LC	IV
Cisticolidae	Zitting Cisticola	<i>Cisticola juncidis</i> (Rafinesque, 1810)	LC	IV

Family	Common name	Scientific name	IUCN/RL	IWPAS
	Common Tailorbird	<i>Orthotomus sutorius</i> (Pennant, 1769)	LC	IV
	Dark-necked Tailorbird	<i>Orthotomus atrogularis</i> Temminck, 1836	LC	IV
	Jungle Prinia	<i>Prinia sylvatica</i> Jerdon, 1840	LC	IV
	Plain Prinia	<i>Prinia inornata</i> Sykes, 1832	LC	IV
Zosteropidae	White-bellied Yuhina	<i>Erpornis zantholeuca</i> (Blyth, 1844)	LC	IV
	Orinetal White-eye	<i>Zosterops palpebrosus</i> (Temminck, 1824)	LC	IV
Leiothrichidae	Striated Babbler	<i>Argya earlei</i> (Blyth, 1844)	LC	IV
	Jungle Babbler	<i>Turdoides striata</i> (Dumont, 1823)	LC	IV
Irenidae	Asian Fairy Bluebird	<i>Irena puella</i> (Latham, 1790)	LC	IV
Muscicapidae	Oriental Magpie Robin	<i>Copsychus saularis</i> (Linnaeus, 1758)	LC	IV
	White-rumped Shama	<i>Kittacincla malabarica</i> (Scopoli, 1788)	LC	IV
	Blue Whistling Thrush	<i>Myophonus caeruleus</i> (Scopoli, 1786)	LC	IV
	Black-backed Forktail	<i>Enicurus immaculatus</i> (Hodgson, 1836)	LC	IV
	Taiga Flycatcher	<i>Ficedula albicilla</i> (Pallas, 1811)	LC	IV
	Black Redstart	<i>Phoenicurus ochruros</i> (Gmelin, 1774)	LC	IV
	Blue rock Thrush	<i>Monticola solitarius</i> (Linnaeus, 1758)	LC	IV
	Common Stonechat	<i>Saxicola torquatus</i> (Linnaeus, 1766)	LC	IV
Turdidae	Black-throated thrush	<i>Turdus atrogularis</i> Jarocki, 1819	LC	IV
Sturnidae	Common Hill Myna	<i>Gracula religiosa</i> Linnaeus, 1758	LC	I
	Jungle Myna	<i>Acridotheres fuscus</i> (Wagler, 1827)	LC	IV
	Bank Myna	<i>Acridotheres ginginianus</i> (Latham, 1790)	LC	IV
	Common Myna	<i>Acridotheres tristis</i> (Linnaeus, 1766)	LC	IV
	Asian Pied Starling	<i>Gracupica contra</i> (Linnaeus, 1758)	LC	IV
	Chestnut-Tailed Starling	<i>Sturnia malabarica</i> (Gmelin, 1789)	LC	IV
Chloropseidae	Golden-Fronted Leafbird	<i>Chloropsis aurifrons</i> (Temminck, 1829)	LC	IV
Dicaeidae	Scarlet-backed Flowerpecker	<i>Dicaeum cruentatum</i> (Linnaeus, 1758)	LC	IV
Nectariniidae	Purple Sunbird	<i>Cinnyris asiaticus</i> (Latham, 1790)	LC	IV
	Crimson Sunbird	<i>Aethopyga siparaja</i> (Raffles, 1822)	LC	IV
	Little spiderhunter	<i>Arachnothera longirostra</i> (Latham, 1790)	LC	IV
Motacillidae	Citrine Wagtail	<i>Motacilla citreola</i> Pallas, 1776	LC	IV
	GrayWagtail	<i>Motacilla cinerea</i> Tunstall, 1771	LC	IV
	White Wagtail	<i>Motacilla alba</i> Linnaeus, 1758	LC	IV
	Paddyfield Pipit	<i>Anthus rufulus</i> Vieillot, 1818	LC	IV
	Rosy Pipit	<i>Anthus roseatus</i> Blyth, 1847	LC	IV
	Olive-Backed Pipit	<i>Anthus hodgsoni</i> Richmond, 1907	LC	IV
Passeridae	House Sparrow	<i>Passer domesticus</i> (Linnaeus, 1758)	LC	IV
	Eurasian Tree Sparrow	<i>Passer montanus</i> (Linnaeus, 1758)	LC	IV
Estrildidae	White-rumped Munia	<i>Lonchura striata</i> (Linnaeus, 1766)	LC	IV
	Scaly-breasted Munia	<i>Lonchura punctulata</i> (Linnaeus, 1758)	LC	IV
	Tricolored Munia	<i>Lonchura malacca</i> (Linnaeus, 1766)	LC	IV
Ploceidae	Black-breasted weaver	<i>Ploceus benghalensis</i> (Linnaeus, 1758)	LC	IV
	Baya weaver	<i>Ploceus philippinus</i> (Linnaeus, 1766)	LC	IV



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Image 44. Greylag Goose



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Image 45. Little Cormorant



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Image 46. Oriental Darter



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Image 47. Small Pratincole



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Image 48. Citrine Wagtail



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Image 49. Greater Adjutant



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Image 50. White-rumped Shama



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Image 51. Black-hooded Oriole



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Image 52. Green Bee-eater



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Image 53. Indian Roller



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Image 54. Grey-headed Canary-flycatcher



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Image 55. Hoopoe



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Image 56. House Sparrow



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Image 57. Oriental Pied Hornbill



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Image 58. Spotted Owlet

Table 4. Checklist of mammalian diversity of Guwahati

Family	Common name	Scientific name	IUCN/RL	IWPAS
Cercopithecidae	Capped Langur	<i>Trachypithecus pileatus</i> (Blyth, 1843)	VU	I
	*Gee's Golden Langur	<i>Trachypithecus geei</i> Khajuria, 1956	EN	I
	Assamese Macaque	<i>Macaca assamensis</i> M'Clelland, 1840	NT	II
	Rhesus Macaque	<i>Macaca mulatta</i> (Zimmermann, 1780)	LC	II
Hylobatidae	Western Hoolock Gibbon	<i>Hoolock hoolock</i> (Harlan, 1834)	VU	I
Lorisidae	Bengal Slow Loris	<i>Nycticebus bengalensis</i> (Lacépède, 1800)	EN	I
Elephantidae	Asiatic Elephant	<i>Elephas maximus</i> Linnaeus, 1758	EN	I
Bovidae	Gaur	<i>Bos gaurus</i> Smith, 1827	VU	I
Suidae	Wild Boar	<i>Sus scrofa</i> Linnaeus, 1758	LC	III
Cervidae	Barking Deer	<i>Muntiacus muntjak</i> (Zimmermann, 1780)	LC	III
	Sambar	<i>Rusa unicolor</i> (Kerr, 1792)	VU	III
	Hog Deer	<i>Axis porcinus</i> (Zimmermann, 1780)	EN	III
Felidae	Leopard	<i>Panthera pardus</i> (Linnaeus, 1758)	VU	I
	Jungle Cat	<i>Felis chaus</i> Schreber, 1777	LC	II
	Leopard Cat	<i>Prionailurus bengalensis</i> (Kerr, 1792)	LC	I
Canidae	Golden Jackal	<i>Canis aureus</i> Linnaeus, 1758	LC	II
	Bengal Fox	<i>Vulpes bengalensis</i> (Shaw, 1800)	LC	II
	Dhole	<i>Cuon alpinus</i> (Pallas, 1811)	EN	II
Herpestidae	Indian Mongoose	<i>Herpestes javanicus</i> (Hilaire, 1818)	LC	II
Viverridae	Large Indian Civet	<i>Viverra zibetha</i> Linnaeus, 1758	LC	II
	Small Indian Civet	<i>Viverricula indica</i> (Hilaire, 1803)	LC	II
	Common Palm Civet	<i>Paradoxurus hermaphroditus</i> (Pallas, 1777)	LC	II
Mustelidae	Smooth-coated Otter	<i>Lutrogale perspicillata</i> (Hilaire, 1826)	VU	II
Leporidae	Indian Hare	<i>Lepus nigricollis</i> Cuvier, 1823	LC	IV
Manidae	Chinese Pangolin	<i>Manis pentadactyla</i> Linnaeus, 1758	CR	I
Soricidae	Asian House Shrew	<i>Suncus murinus</i> Linnaeus, 1766	LC	NS
Hystriidae	Himalayan Crestless Porcupine	<i>Hystrix brachyura</i> Linnaeus, 1758	LC	II
Sciuridae	Himalayan Hoarybellied Squirrel	<i>Callosciurus pygerythrus</i> (Hilaire, 1832)	LC	II
	Particolored Flying Squirrel	<i>Hylopetes alboniger</i> (Hodgson, 1836)	LC	II
Muridae	Black Rat	<i>Rattus rattus</i> (Linnaeus, 1758)	LC	V
	House Mouse	<i>Mus musculus</i> Linnaeus, 1758	LC	V
	Lesser Bandicoot Rat	<i>Bandicota bengalensis</i> (Gray, 1835)	LC	V
Pteropodidae	Indian Flying Fox	<i>Pteropus giganteus</i> (Brünnich, 1782)	LC	V
	Greater Short-nosed Fruit Bat	<i>Cynopterus sphinx</i> (Vahl, 1797)	LC	V
Vespertilionidae	Indian Pipistrelle	<i>Pipistrellus coromandra</i> (Gray, 1838)	LC	NS
Platanistidae	Ganges River Dolphin	<i>Platanista gangetica</i> (Roxburgh, 1801)	EN	I



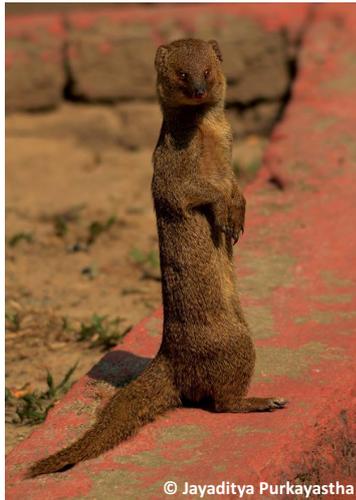
Image 59. Fruit Bat



Image 60. Rhesus Macaque



Image 61. Golden Jackal



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Image 62. Mongoose



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Image 63. Elephants at Deeporbeel

- Lambert, M.R.K. (1984).** Amphibians and Reptiles, pp. 205–227. In: Cloudsley-Thompson, J.L. (eds.). *Sahara Desert*. Key Environments, Pergamon Press, London, 348pp.
- McDonald, R.I., B. Güneralp, C. Huang, K.C. Seto & M. You (2018).** Conservation priorities to protect vertebrate endemics from global urban expansion. *Biological Conservation* 224: 290–299.
- McDonald, R.I., P. Kareiva & R.T.T. Forman (2008).** The implications of current and future urbanization for global protected areas and biodiversity conservation. *Biological Conservation* 141: 1695–7103.
- Menon, V. (2014).** *Indian Mammals - A Field Guide*. Hachette Book Publishing Indian Pvt. Ltd., 528pp.
- Middel, A., N. Chhetri & R. Quay (2015).** Urban forestry and cool roofs: assessment of heat mitigation strategies in Phoenix residential neighborhoods. *Urban Forestry & Urban Greening* 14: 178–186.
- Muthulingam, U. & S. Thangavel (2012).** Density, diversity and richness of woody plants in urban green spaces: A case study in Chennai metropolitan city. *Urban Forestry and Urban Greening* 11(4): 450–459.
- Nagendra, H. & D. Gopal (2010).** Street trees in Bangalore: Density, diversity, composition and distribution. *Urban Forestry & Urban Greening* 9(2): 129–137.
- Purkayastha, J. (2012).** *Urban Herpetofauna, Amphibian and Reptiles of Guwahati - A Pictorial Guide*. Students' store, Guwahati, 64pp
- Purkayastha, J. (2015).** *An Amateur's Guide to Birds of Assam*. EBH Publisher, Guwahati, 144pp.
- Rodrigues, A.S.L., S.J. Andelman, M.I. Bakarr, L. Boitani, T.M. Brooks, R.M. Cowling, L.D.C. Fishpool, G.A.B. da Fonseca, K.J. Gaston, M. Hoffmann, J.S. Long, P.A. Marquet, J.D. Pilgrim, R.L. Pressey, J. Schipper, W. Sechrest, S.N. Stuart, L.G. Underhill, R.W. Waller, M.E.J. Watts & X. Yan (2004).** Effectiveness of the global protected area network in representing species diversity. *Nature* 428: 640–643.
- Rolfe, J.K. & N.L. McKenzie (2000).** Comparison of methods used to capture herpetofauna: an example from the Carnarvon Basin. *Records of the Western Australian Museum* 61: 361–370.
- Scott, J.M., F.W. Davis, R.G. McGhie, R.G. Wright, C. Groves & J. Estes (2001).** Nature reserves: do they capture the full range of America's biological diversity? *Ecological Applications* 11: 999–1007.
- Smith, M.A. (1931).** *The Fauna of British India, Including Ceylon and Burma Vol. I. Loricata, Testudines*. Taylor and Francis, London, xxviii+185pp+2pls
- Smith, M.A. (1935).** *The Fauna of British India, Including Ceylon and Burma Vol. II. Sauria*. Taylor and Francis, London, xiii+440pp+1pl.
- Smith, M.A. (1943).** *The Fauna of British India, Ceylon and Burma, Including the whole of the Indo-Chinese region. Vol. III. Serpentes*. Taylor and Francis, London, xii +583pp+1map.
- Srinivasulu, C. & B. Srinivasulu (2012).** *Glimpse of Biodiversity of Greater Hyderabad*. Greater Hyderabad Municipal Corporation, Hyderabad; Osmania University, Hyderabad & Zoo Outreach Organisation, Coimbatore, 86pp.
- Sudha, P. & N.H. Ravindranath (2000).** A study of Bangalore urban forest. *Landscape and Urban Planning* 47(1–2): 47–63.
- Taubenböck H., M. Wegmann, A. Roth, H. Mehl & S. Dech (2009).** Urbanization in India: Spatiotemporal analysis using remote sensing data. *Computers, Environment & Urban Systems* 33(3): 179–188.
- Turtle Conservation Coalition (2011).** *Turtles in Trouble: The World's 25+ Most Endangered Turtles and Freshwater Turtles*. Lunenburg, MA: IUCN/SSC Turtle and Freshwater Turtle Specialist Group, Turtle Conservation Fund, Turtle Survival Alliance, Turtle Conservancy, Chelonian Research Foundation, Conservation International, Wildlife Conservation Society, and San Diego Zoo Global, 54pp.
- U-Habitat (2013).** *State of the World's Cities, Prosperity of Cities State of the World's Cities* (iSeries title), 207pp. Downloaded on 22 June 2017.



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