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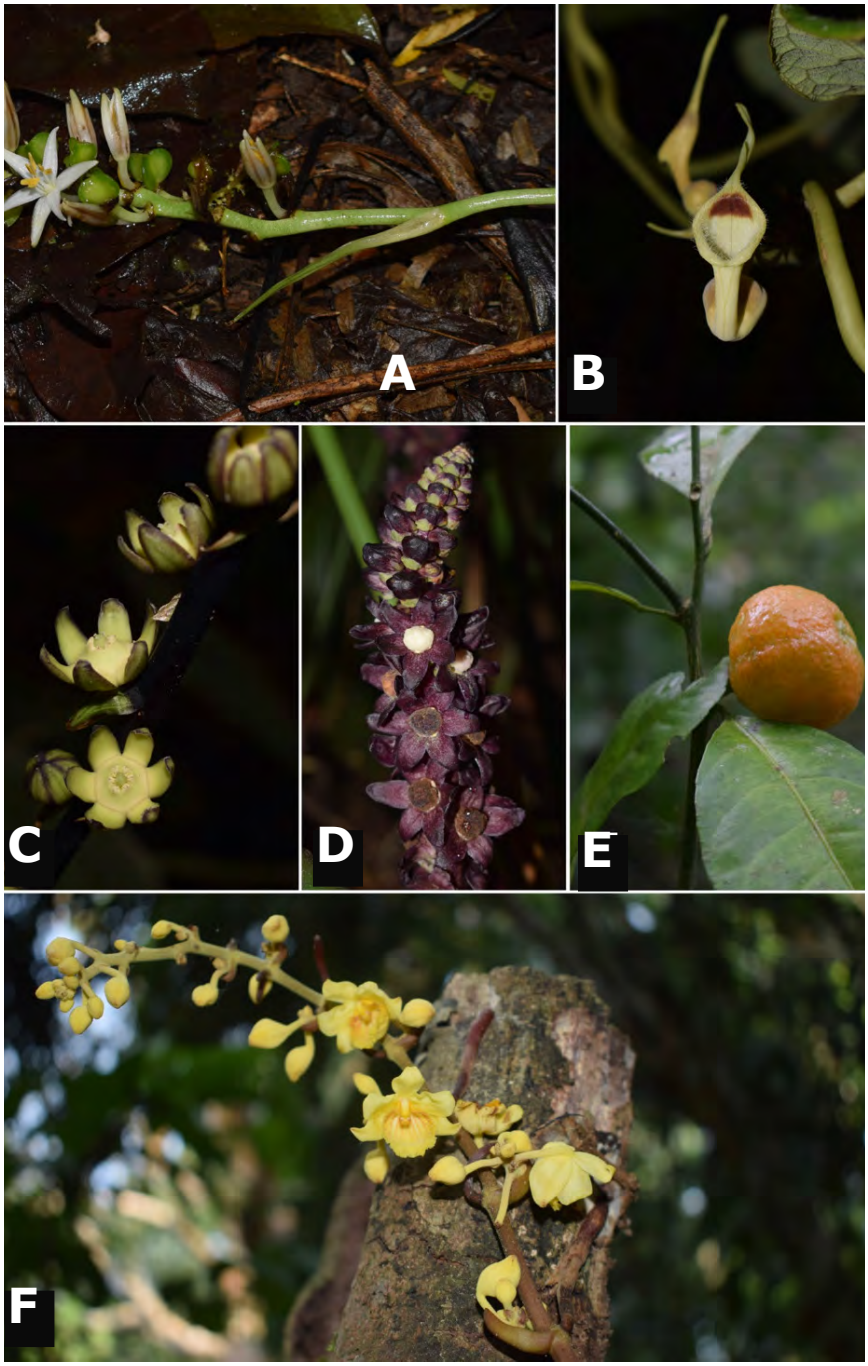
Contents

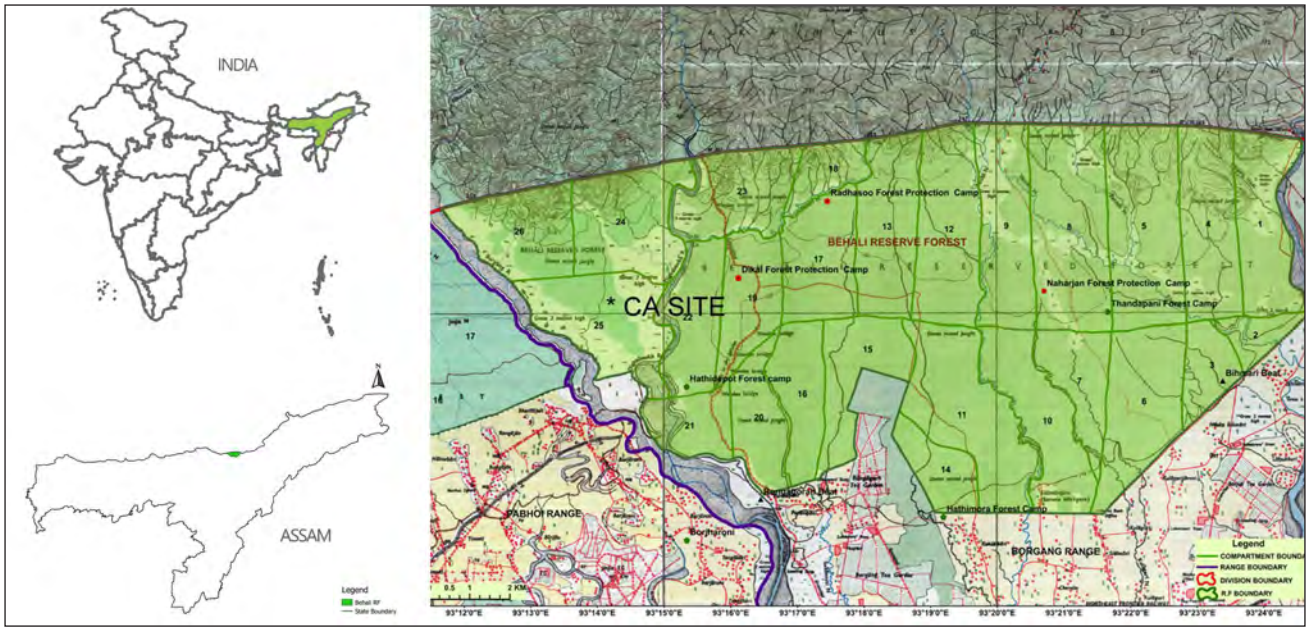
Journey of a forest towards extinction: a multi-perspective approach for the demand to declare Behali Reserved Forest as a wildlife sanctuary

Introduction

Behali Reserved Forest (BRF) declared in 1917 is the last remaining semi-evergreen forest in the Biswanath District of Assam, India (Borah & Tangjang 2020). BRF is a part of Sonitpur Elephant Reserve and declared as an Important Bird Area in 1994 and a Key Biodiversity Area in 2014. Initially, with a total geographical area of about 140 km^2, the dense patches in the reserved forest are now shrunk to only 60 km^2 due to illegal encroachment and deforestation (Sarma et al. 2009; Tiwari et al. 2017). This forest once connected the Pakke Tiger Reserve and Nameri National Park in the west, through Naduar RF, Papum RF, and Biswanath RF; to Chenglijan and Gohpur reserved forests in the east; and Kaziranga National Park in the south, creating a freeway for migration of the endangered elephants and other wildlife. However, this long belt of forests is



Some important plant species of Behali Reserved Forest: A. *Chlorophytum assamicum*; B. *Aristolochia assamica*; C. *Peliosanthes macrophylla* var. *assamensis*; D. *Tupistra stoliczkana*; E. *Citrus indica*; F. *Galeola nudifolia*. © Dipankar Borah.



Map of Behali Reserved Forest.

Behali RF as a corridor between two famous protected areas of Assam. (Source: Google Earth).

now severely fragmented, leaving a small portion intact, others diminishing into huge agricultural landscapes (Kushwaha & Hazarika 2004).

A short overview of biodiversity

The biodiversity that this forest holds cannot be summed up in a few words. Remaining unexplored for nearly a century, the BRF has now produced wonders. Around 308 plant species including 37 orchids (Borah et al. 2020a), 52 mammals, 282 birds, 23 snakes, 11 turtles, 11 lizards, 12 amphibia, and 275 species of butterflies are reported so far from this forest (Upadhyaya & Bordoloi 2016–17). This region has been neglected for decades in terms of exploratory scientific research activities, but in recent years, three new plant taxa, including several interesting floral records have been found in the forest which has suddenly brought hope and enthusiasm for support in alert locals.

The richness of this small forest patch can be gauged from the fact that it is inhabited by some of the threatened, schedule listed (WPA 1972; IUCN 2021) and endemic mammals (Table 1) and other wildlife: Rufous-necked Hornbill *Aceros nipalensis*, Wreathed Hornbill *Aceros undulatus*, White-winged Duck *Asarcornis scutulata*, Great Hornbill *Buceros bicornis*, Woolly-necked Stork *Ciconia*

Aerial view of the semi-evergreen forests of Behali. © Dipankar Borah.

episcopus, Lesser Adjutant *Leptoptilos javanicus*, River Tern *Sterna aurantia*, Red-headed Vulture *Sarcogyps calvus*, Southeastern Asian Box Turtle *Cuora amboinensis*, Keeled Box Turtle *Cuora mouhotii*, Black Pond Turtle *Geoclemys hamiltonii*, Tricarinate Hill Turtle *Melanochelys tricarinata*, Indian Softshell Turtle *Nilssonia gangeticus*, Indian Peacock Softshell Turtle *Nilssonia hurum*, King Cobra *Ophiophagus hannah*, Burmese Python *Python bivittatus*, and Black Softshell Turtle *Nilssonia nigricans* (Upadhaya & Bordoloi 2016–17). Among the reported butterflies, 20 butterflies are termed as 'rare' by Kehimkar (2016): Small Green Awlet *Burara amara*, Orange Awlet *Burara harisa*, Brown Pied Flat *Coladenia agni*, Swinhoe's Flat *Celanorrhinus zea*, Green-striped Palmer *Pirdana major*, White Dragontail *Lamproptera curius*, Lesser Jay *Graphium evemon*, Great Blue Mime *Papilio paradoxa*, Moth Butterfly *Liphyra brassolis*, Moore's Cupid *Shijimia moorei*, Hewitson's Dull Oakblue *Arhopala oenea*, Yellow Disc Tailless Oakblue *Arhopala perimuta*, Bifid Plushblue *Flos diardi*, White Banded Royal *Dacalana cotys*, Mandarin Blue *Charana mandarinus*, Silver Royal *Ancema blanka*, Malayan Nawab *Polyura moori*, Blue-striped Palmfly *Elymnias patna*, Unbroken Sergeant *Athyma pravara*, and Painted Courtesan *Euripus consimilis*.

The BRF has an enormous potential of being a major butterfly tourism hotspot both for butterfly enthusiasts and researchers alike.

The recently discovered plant species *Aristolochia assamica*, *Chlorophytum assamicum*, and *Peliosanthes macrophylla* var. *assamensis* are only found in this region and are considered endemic to northeastern India, of

which the latter two are so far known only from this forest (Borah et al. 2020a).

The studies on biodiversity and vegetation structure (Borah et al. 2021) in BRF enriches the floristic wealth of Assam, emphasizing the richness of these semi-evergreen patches in the northern boundary of the state, which are one of the last known representatives of such forests in Assam. Moreover, this forest provides a variety of micro and macro habitats for a varied number of life forms, many of which still remain unexplored.

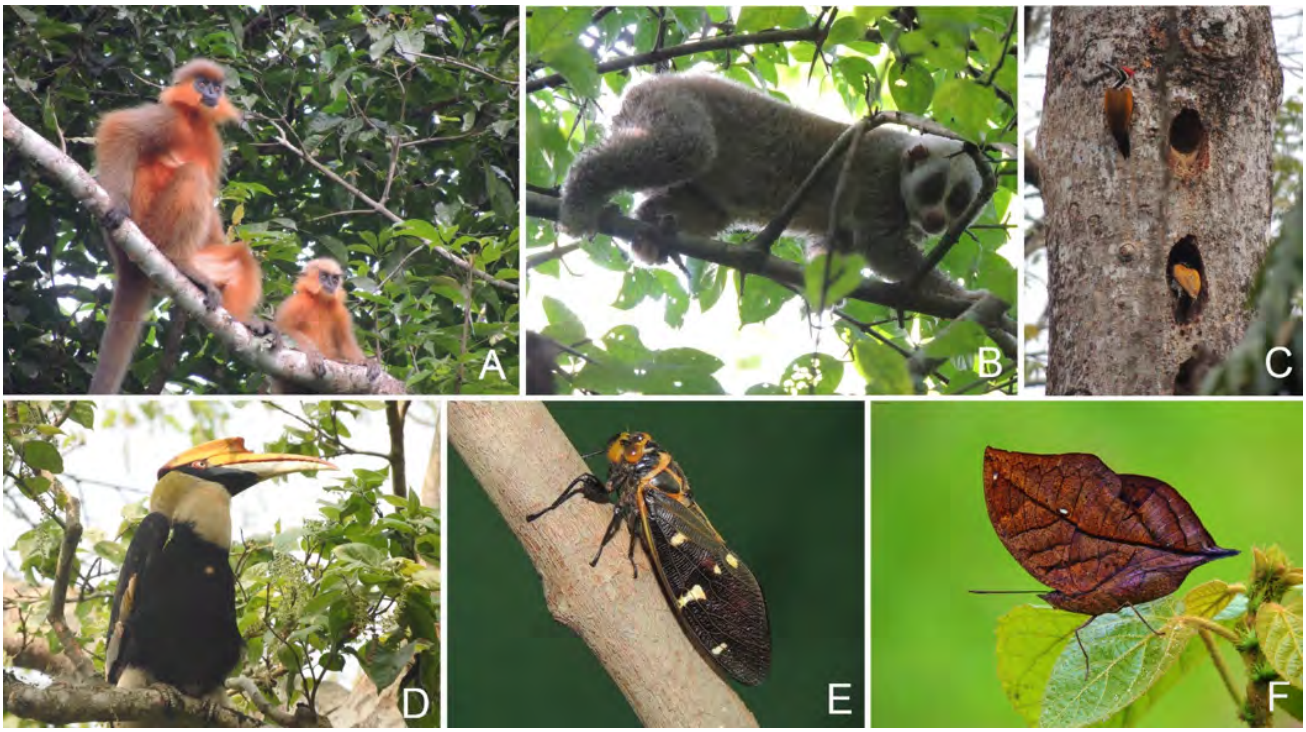
Archaeological Significance

BRF is also a storehouse of many archaeological relics that provide it a merit of historicity. One of the ancient towns of 14th century built by Boro-barahi kings remains hidden in its dense vegetation. Sculptured palaces, tanks, stone boundary walls, among others can be seen dispersed till now. A heritage that not only evokes legends among the locals but also seeks protection as a part of scattered rich history of the region. Also, a rampart named Rajgarh is one of the many garhs which runs through the BRF, built by the Ahom king Swargadeo Pratap Singha.

The most attractive historical ruin, Maidam Pukhuri, unaccounted for several decades, is also located in the natural territory of BRF; findings there include a tank built between early 9th to 14th centuries and stone bound borders covering an area of 0.26 ha that remain till this date.

Forest-People Relationship

This forest has an immersive relation with the ethnic communities secured in a collective conscious. These indigenous communities



Some key faunal representative elements of Behali Reserved Forest: A. Capped Langur; B. Bengal Slow Loris; C. Greater Golden-back Woodpecker; D. Great Hornbill; E. *Cicada Balinta octonotata*; F. Orange Oak-leaf. © Parixit Kafley and Ranjit Kakati.

Table 1. List of the mammalian species of BRF.

	Common Name	Scientific Name	IUCN Status	WPA Status (WPA 1972)
1.	Bengal Slow Loris	*Nycticebus bengalensis*	EN	Sch I (Part I)
2.	Rhesus Macaque	*Macaca mulatta*	LC	Sch II (Part I)
3.	Assamese Macaque	*Macaca assamensis*	NT	Sch II (Part I)
4.	Capped Langur	*Trachypithecus pileatus*	VU	Sch I (Part I)
5.	Asian Elephant	*Elephas maximus*	EN	Sch I (Part I)
6.	Red Muntjac	*Muntaicus muntjac*	LC	Sch III
7.	Sambar	*Rusa unicolor*	VU	Sch III
8.	Hog Deer	*Axis porcinus*	EN	Sch III
9.	Gaur	*Bos gaurus*	VU	Sch I (Part I)
10.	Indian Wild Boar	*Sus scrofa*	LC	Sch III
11.	Pigmy Hog	*Porcula salvania*	EN	Sch I (Part I)
12.	Tiger	*Panthera tigris*	EN	Sch I (Part I)
13.	Common Leopard	*Panthera pardus*	VU	Sch I (Part I)
14.	Indo-Chinese Clouded Leopard	*Neofelis nebulosa*	VU	Sch I (Part I)
15.	Jungle Cat	*Felis chaus*	LC	Sch II (Part II)
16.	Leopard Cat	*Felis bengalensis*	LC	Sch I (Part I)
17.	Fishing cat	*Prionailurus viverrinus*	VU	Sch I (Part I)
18.	Common Palm Civet	*Paradoxurus hemaphroditus*	LC	Sch II (Part II)
19.	Binturong	*Arctictis binturong*	VU	Sch I (Part I)
20.	Small Indian Civet	*Viverricula indica*	LC	Sch II (Part II)
21.	Large Indian Civet	*Viverra zibetha*	LC	Sch II (Part II)
22.	Yellow-throated Marten	*Martes flavigula*	LC	Sch II (Part II)
23.	Crab-eating Mongoose	*Urva urva*	LC	Sch II (Part II)
24.	Small Indian Mongoose	*Herpestes auropunctatus*	LC	Sch II (Part II)
25.	Grey Wolf	*Canis lupus*	LC	Sch I (Part I)
26.	Golden Jackal	*Canis aureus*	LC	Sch II (Part II)
27.	Wild Dog	*Cuon alpinus*	EN	Sch II (Part I)
28.	Indian Fox	*Vulpes bengalensis*	LC	Sch II (Part II)
29.	Himalayan Black Bear	*Ursus thibetanus*	VU	Sch II (Part II)
30.	Sloth Bear	*Melursus ursinus*	VU	Sch I (Part I)
31.	Hog Badger	*Arctonyx collaris*	VU	Sch I (Part I)
32.	Smooth-coated Otter	*Lutrogale perspicillata*	VU	Sch II (Part II)
33.	Eurasian Otter	*Lutra lutra*	NT	Sch II (Part II)
34.	Indian Hare	*Lepus nigricollis*	LC	Sch IV
35.	Hispid Hare	*Caprolagus hispidus*	EN	Sch I (Part I)
36.	Indian Pangolin	*Manis crassicaudata*	EN	Sch I (Part I)
37.	Chinese Pangolin	*Manis pentadactyla*	CR	Sch I (Part I)
38.	House Shrew	*Suncus murinus*	LC	-
39.	Pigmy White-toothed Shrew	*Suncus etruscus*	LC	-

	Common Name	Scientific Name	IUCN Status	WPA Status (WPA 1972)
40.	White-tailed Mole	*Parascaptor leusura*	LC	-
41.	Indian Crested Porcupine	*Hystrix indica*	LC	Sch IV
42.	Himalayan Crestless Porcupine	*Hystrix brachyura*	LC	Sch II (Part I)
43.	Black Giant Squirrel	*Ratufa bicolor*	NT	Sch II (Part II)
44.	Red Giant Flying Squirrel	*Petaurista petaurista*	LC	Sch II (Part II)
45.	Hoary-bellied Squirrel	*Callosciurus pygerthrus*	LC	-
46.	Pallas's Squirrel	*Callosciurus erythraeus*	LC	-
47.	Himalayan Striped Squirrel	*Tamiops macclenllandi*	LC	Sch IV
48.	Indian Flying Fox	*Pteropus medius*	LC	Sch V
49.	Greater Short-nosed Fruit Bat	*Cynopterus sphinx*	LC	-
50.	Black-bearded Tomb Bat	*Taphozous melanopogon*	LC	-
51.	Greater False Vampire	*Megaderma lyra*	LC	-
52.	Pipistrelle Bat	*Pipistrelle* spp.	-	-

inhabit around the boundaries of BRF. More than 50% of these people are dependent on the forest for either sustenance or for maintaining their ethnic identity. Borah et al. (2020b) worked on the Karbi and Munda communities residing in those fringe villages and reported a total of 100 NTFPs procured by them from the forest. Among these, many are categorized as edibles providing nutritional supplement, medicinal plants used to treat the prevalent diseases, and then plants related to their rituals and customs and several other categories. Two plants *Mesua ferrea* and *Gnetum gnemon* were also prioritized in the study as potential NTFPs which if included in effective policies can support these communities boosting their economy and help achieve a sustainable forest management through rehabilitation of degraded forest grounds. The inextricable connection between culture and the ecological diversity is an undeniable phenomenon which supports the notion that Biocultural diversity, a concept that explores close embeddedness of culture, biology and language, amplifies in the recent times. It is emphasized that language and other cultural elements of these communities bear tremendous 'environmental knowledge' which could be endangered or wiped out completely if their habitat are lost due to their own lack of preservation related awareness or from outside forces like alluring marketing profits (Vidal & Dias 2016). The achievement of perfect balance between needful use and regeneration of forest life, especially plants, is a much sought-after prize.

Challenges

Attempts have been made by the Sonitpur forest department for the protection of this reserve but being severely understaffed, it is unable to effectively monitor the complete forest area. As a result, serious encroachment, illegal tree felling and hunting is rampant in its boundaries. From 1984 to 2021, nearly 57% of forest cover, i.e., a total 79.91 km^2 was lost due to these cataclysmic destructive activities (Tiwari et al. 2017; Borah & Tangjang 2020).

The northwestern and eastern boundaries were severely affected, whereas the southern boundary and western boundary did not change much due to the fact that these boundaries were continuously monitored because of their easy accessibility and were already surrounded by company tea gardens and the slopes of the river Borgang which acts as barriers. The rapidly declining forest area has posed severe threats on these species and their habitats. Blocking of the well-known elephant corridors (e.g., Kathonibari, Nasbor, and Behali) is another problem for the area, which has escalated man-elephant interactions in recent times.

Also, there are a large number of people involved in the illegal and extensive procurement of firewood. The collected piles are directly sold to the nearby hotels or brick factories; hence, the collectors are bound to provide more firewood for better profit. They cut the new branches of trees while collecting dry wood so that they could continue to find the dry firewood. Such clever plots could result in extensive deterioration of forest regeneration and affecting its structure in a very short period.

It has been a demand for several years to declare it a wildlife sanctuary by Nature's Bonyopran (A non-governmental organization working for Behali Reserved Forest), but no government so far has paid any serious attention to these worried voices (Sekhsaria 2021). Nineteen memorandums have been sent since 1996 by the NGO for its upgradation into a wildlife sanctuary, but their consequences are yet to be seen on the ground.

So far there is no designated protected area in the upper-north bank of the state. Hence there is an immediate need for one to safeguard such biodiversity as well as to provide a safe passage for the migratory species.

Scope of Ecotourism

The forest of Behali has a potential for ecotourism too, where the major attraction would be adventurous trekking inside the dense forest under unending canopies, and birding that would prize some of the most exciting findings; also camping, discovering the exotic and delicious ethnic food culture and experiencing traditional clothing styles with the residential locals.

Some key points to consider its upgradation to a protected area

1. Home for more than 950 species, this semi-evergreen forest is worthy of attention. The importance of this forest in hosting this large sum of biodiversity as well as providing an umbrella for the eco-conscious ethnic communities is a serious matter to look up.

2. The present forest is the last patch of forest in the district which provides ecosystem services such as maintaining water cycle, nutrient cycle, carbon storage, and oxygen requirement, apart from hosting the threatened and local biodiversity. Losing this will seriously hamper all the basic necessities of neighbouring inhabitants and threaten their lives.

3. It is the only forest in Assam where three new plants were discovered for science *Chlorophytum assamicum*, *Aristolochia assamica*, and *Peliosanthes macrophylla* var. *assamensis* and the latter two are so far

only located in this forest. Also, this is the only locality in Assam with the occurrence of rare and endangered *Citrus indica*, *Galeola nudifolia*, *Pandanus unguifer*, and *Tupistra stoliczkana*.

4. White-winged Duck, Bengal Slow Loris, Capped Langur and hornbills are some of the key faunal diversities that attract tourists to visit the area. Apart from these species, several rare varieties of butterflies and birds attract seasonal tourists.

5. The northeastern part of the district comprises grasslands and riparian shrub lands of the recently extended Kaziranga National Park. This allows the migration of several animals through the river banks to this reserve forest. In fact, there is still a chance to recover the habitats for three of the large mammals (One horned Rhino, Asiatic Buffalo, and Royal Bengal Tiger) which were sighted in the reserve till the last decade.

6. Encroachment of land, burning of forests, and hunting of wildlife can still be seen in the border areas of the reserve, which is a very serious concern that brings into question the survival of the forest for more than the next five years. Almost 48% is lost, as a result only 60 km^2 of intact forest is left of the original notified area of 140 km^2.

Conclusion

With increasing pressure from humans on all the sides for their specific need and greed, the forest is shrinking very fast losing its important habitats. The local youths and some researchers with the active NGO are trying their best to create mass awareness among the people and control the felonious activities to some extent. These enthusiasts have been trying to tackle the problem with continuous efforts of repeated surveys, proper documentation and are also trying to grab the attention of the stakeholders and policy makers through publishing research articles, sensitizing the local people and creating a citizens' movement.

However, the problems mentioned above still linger and continue to increase, coupled with the increasing human population and migration, border conflicts, open grazing and land clearing which add to the serious concern for the reserve. With increased awareness on the importance of this habitat and role of the existing biodiversity, there is a chance to save this last forest of the district and its wildlife from being completely perished in a few decades. But the initiatives are to be put into action now since we are already very late, if not too late, to salvage the remaining area of the forest from devastation.

References

Borah, D. & S. Tangjang (2020). Behali Reserve Forest of Assam, Northeast India – unique elements of flora, its threats and protection, pp. 407–418.. In: Kunz, M. (ed.). *The Role and Functioning of Landscape Parks in Biosphere Reserves*. Torun, Poland.

Borah, D., S. Tangjang, A.P. Das, P. Kafley & A.A. Khapugin (2020a). Native vascular flora of Behali Reserve Forest (Assam, India) with global IUCN red list assessment of two endemic species, *Contribuţii Botanice* 55: 27–48. http://dx.doi.org/10.24193/Contrib.Bot.55.2.

Borah, D., S. Tangjang, A.P. Das, A. Upadhaya & P. Mipun (2020b). Assessment of non-timber forest products (NTFPs) in Behali Reserve Forest, Assam, northeast India. *Ethnobotany Research & Applications* 19: 43. https://doi.org/10.32859/era.19.43.1-15

Borah, D., B. Das, S. Tangjang, A.P. Das & A.A. Khapugin (2021). Assessment of woody species

diversity and composition along a disturbance gradient in Behali Reserve Forest of Biswanath district, Assam, India. *Ecological Questions* 32(1): 1–25. https://doi.org/10.12775/EQ.2021.009

IUCN (2021). The IUCN Red List of Threatened Species. Version 2021–1. <https://www.iucnredlist.org>

Kushwaha, S.P.S. & R. Hazarika (2004). Assessment of habitat loss in Kameng and Sonitpur Elephant Reserves. *Current Science* 87(10): 1447–1453.

Sarma, P.K., R. Borah, S. Upadhaya, S. Dutta & G. Mahanta (2009). *A Handbook of Behali Reserved Forest.* Nature's Bonyopran, Assam, 66 pp.

Sekhsaria, P. (2021). The State of Wildlife in northeast India 1996–2011: A compilation of news from the Protected Area Update. Anand Press, Gujarat, 295 pp.

Tiwari, S.K., S. Kyarong, A. Choudhury, A.C. Williams, K. Ramkumar & D. Deori (2017). Elephant corridors of northeastern India. In: Menon V., S.K.Tiwari, K. Ramkumar, S. Kyarong, U. Ganguly & R. Sukumar R. (eds.) *Right of Passage: Elephant Corridors of India 2nd Edition*. Conservation Reference Series No. 3. Wildlife Trust of India, New Delhi.

Upadhyaya, S. & R. Bordoloi (2016–17). *Atobi*. Nature's Bonyopran, Assam, 96 pp.

Vidal, F. & N. Dias (2016). *Endangerment, Biodiversity and Culture*. Routledge, London and New York, 277 pp.

WPA (1972). "The Indian Wildlife (Protection) Act, 1972" from the Official website of: Government of India, Ministry of Law and Justice, Legislative Department.

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Juvenile feeding behaviour in Lesser Mouse-tailed Bat

Lesser Mouse-tailed Bat *Rhinopoma hardwickii* that belongs to the family Rhinopomatidae, suborder Yinpterochiroptera, order Chiroptera in class Mammalia, sub-phylum Vertebrata, phylum Chordata in kingdom Animalia is a small bat known to range from as far east as Thailand westward through Myanmar, India, Pakistan, and Iran. They can also be found in the African Sahara mostly north of 15 ^{0}N but have been known to occupy as far as Kenya. Morphologically it is covered with soft fur on the body with greyish to dark brown in colour but not on its face, rear abdomen, and rump. The lower parts are paler in colour, large rhomboid-shaped ears have transverse ridges across the pinna and are connected across the forehead with well-developed tragi. The uropatagium is small and envelops less than a fourth part of the tail. It prefers to roost in desert and semi-desert climate conditions in grassland and oases but can occasionally be found in gardens and orchards too. Its preferential roost consist of natural caves, houses, pyramids, manmade tunnels, wells, forts, havelies (bungalows). Pureshwar Mahadev Temple (23.263035 ^{0}N & 69.369872 ^{0}E) located in the limits of village Lakhadi, tehsil Nakhatrana of district Kachchh in Gujarat part of the Great Indian Desert

(The Thar) is an ancient temple of Lord Shiva, that has become more popular after it remarkably sustained the adverse impact of severe earthquake in 2001, is known to harbour collectively 140–150 individuals of Lesser Mouse-tailed Bat, and Greater Mouse-tailed Bat *Rhinopoma microphyllum* at its dark to semi-dark dilapidated premises that has limited human interference. Both these species of bats are commonly found throughout the Katchchh district of Gujarat in India and known to share the common roosts at many a palace. Morphologically, in the first instance both these species look similar to a common man but can be distinguished well by expert bat biologists based on their prominent morphological features. The tail in *R. microphyllum* is thick and generally smaller than their forearms length whereas its comparatively thin and generally larger than their forearms length in *R. hardwickii*. In overall appearance *R. microphyllum* is comparatively robust and darker in colour than *R. hardwickii* and thus called by their common names.

We have been carrying out a systematic bat diversity survey in Katchchh district of Gujarat since December 2020 and thus have periodically observed this mixed colony of both the bat species. June through July is noted period of parturition in both these species of bats here in this geographical region and we have thus been able to observe their maternity colony at Pureshwar Mahadev Temple roost. On 6

Click here to watch the video

August 2021 we observed mothers carrying their pups (juveniles), separated pups roosting aside by their mothers and subadults roosting collectively. We noted feeding behaviour of the pups and found that mothers of both these are quite keen to provide easy access of nipple feeding to their pups. Hungry pups were seen to feed for 20–25 seconds from their mother, and repeat if hungry.

Every time the pups attempted to feed, the mother changed her position to enable them easier and better feeding. A few pups were grown enough to hang alongside their mothers while the rest were too small and were still holding on to their mother's body. We observed the feeding pattern for about 30 minutes and documented a video visual wherein a pup of *R. hardwickii* is seen suckling the nipple of its mother (watch linked Video).

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"Surprise, I have a mate": Behavioural observation of the Indian Giant Flying Squirrel *Petaurista philippensis* (Elliot 1839) in the Kevdi Eco-camp site, Chhota-Udepur, Gujarat

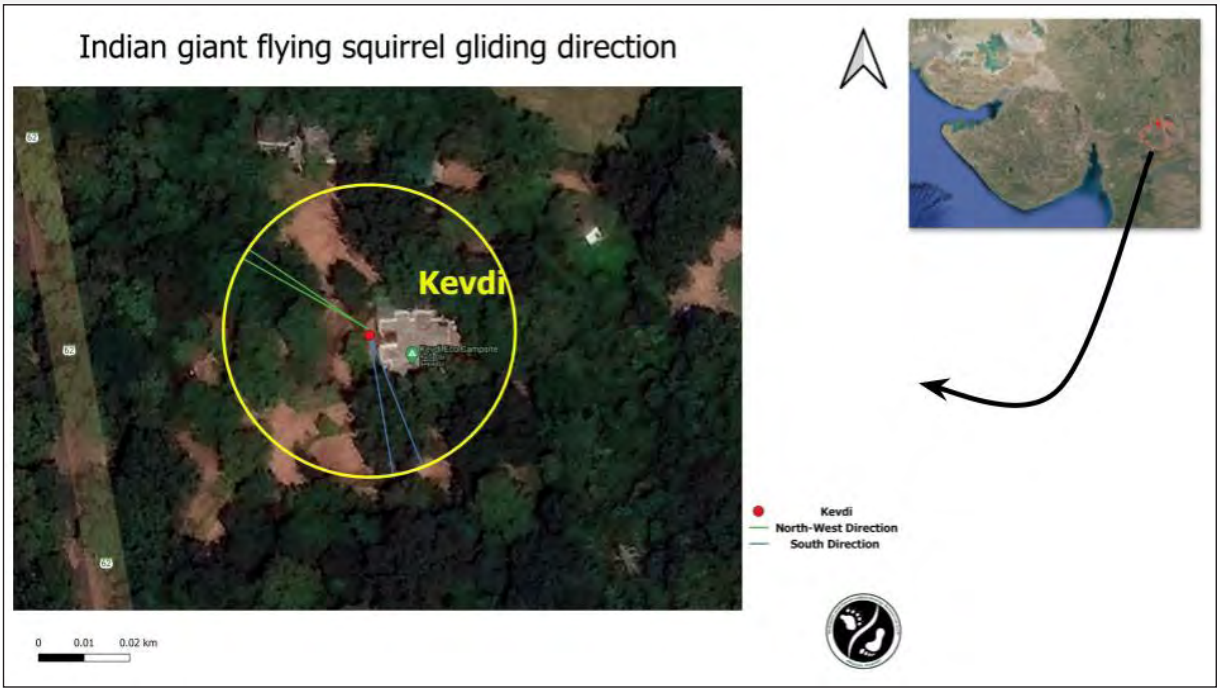
Out of the 18 species of flying squirrels (Koli & Bhatnagar 2016) the Indian Giant Flying Squirrel (IGFS) *Petaurista philippensis* is one of the 13 flying squirrels found in the Indian subcontinent. The IGFS inhabits in the elevation range of 180–2,300 m in the deciduous, mixed deciduous, and moist evergreen forests (Prater 1980). IGFS was found to be confined in the eastern belt of Gujarat but is well populated in central Gujarat compared to other regions of the state (Singh & Dharaiya 2021).

Sighting of the mating pair of IGFS. © Pratik Desai.

As part of the on-going project on Sloth Bear corridor and outreach in central Gujarat, we have been conducting regular sign surveys for Sloth Bear in different parts. The present surprised mating pair of the flying squirrel is observed at Kevdi Eco-camp site located in Chhota-Udepur District. The team was aware about the IGFS presence in the camp and made regular dusk visit around that location where the squirrel was found regularly gliding from a Mahua *Madhuca longifolia* tree to other trees.

IGFS is an arboreal nocturnal mammal spending most of the day time sleeping in the tree cavities or holes (Prater 2005).

They emerge from their nest cavities 20–45 minutes after sunset (Sharma 2007) and



Map showing gliding (north-west and south) direction of the Indian Giant Flying Squirrel in the Kevdi-eco camp site.

they can glide more than 30 m, but prefers short glides (10–20 m) (Koli et al. 2011).

From 20 January 2021 till 1 February 2021, we observed single squirrel gliding from the resident Mahua tree and gliding on another Mahua tree between dusk (1840–1900 h). A single flying squirrel was observed gliding in the north-west and south direction regularly on alternate days.

The degree of the movement was observed in between 299^{0}NW to 303^{0}NW and 158^{0}S to 170^{0}S direction. On 2 February we observed two squirrels grooming for the first time in these 11 days of the observation. Early summer is considered as the breeding season for IGFS in India (Zacharias & Bhardwaj 1997; Koli et al. 2011). Referring Koli et al. (2011), we concluded the observation was of a mating pair of the squirrel. Later, on 12 March 2021, we observed same mating pair grooming each other for few minutes and later gliding in the 299^{0}NW to 303^{0}NW direction. Mating pair spends more time in scrutinizing surroundings after emerging out of the cavity after the sunset.

Globally, IGFS is categorized as a species of Least Concern (Walston et al. 2016), and Near Threatened in southern Asia (Molur et al. 2005). It is a Schedule II species according to the Indian Wildlife (Protection) Act, 1972 (Molur et al. 2005). Habitat fragmentation is one of the major reasons for the decrease in abundance of arboreal mammals and isolation of many species into small population (Umapathy & Kumar 2000). Although its status is 'Least Concern' globally, the species should be protected in western India, as its distribution range

is shrinking over time and the population trend is unknown. A detailed scientific study on its breeding biology and threats to the population may help in formulating conservation strategies for this species and its habitat.

References

Koli, V.K. & C. Bhatnagar (2016). Seasonal variation in the activity budget of Indian Giant Flying Squirrel *Petaurista philippensis* in tropical deciduous forest, Rajasthan, India. *Folia Zoologica* 65(1): 38–45. https://doi.org/10.25225/fozo.v65.i1.a6.2016

Koli, V.K., C. Bhatnagar & D. Mali (2011). Gliding behaviour of Indian Giant Flying Squirrel *Petaurista philippensis* Elliot. *Current Science* 100(10): 1563–1568.

Molur, S., C. Srinivasulu, B. Srinivasulu, S. Walker, P.O. Nameer & L. Ravikumar (2005). Status of non-volant small mammals: Conservation Assessment and Management Plan (C.A.M.P.) workshop report. Zoo Outreach Organisation/CBSG-South Asia, Coimbatore, India, 618 pp.

Prater, S.H. (1980). *The Book of Indian Animals.* Bombay Natural History Society and Oxford University Press, Mumbai, India.

Prater, S.H. (2005). *The Book of Indian Animals*. Bombay Natural History Society and Oxford University Press, Mumbai.

Sharma, S.K. (2007). Study of biodiversity and ethno-biology of Phulwari Wildlife Sanctuary, Udaipur (Rajasthan). PhD Thesis, Mohanlal Sukhadia University, Udaipur, India.

Singh, N. & N. Dharaiya (2021). Distribution and relative abundance of Indian Giant Flying Squirrel *Petaurista philippensis* in Gujarat, India. *Journal of Wildlife and Biodiversity* 5(1): 53–62. https://doi.org/10.22120/JWB.2020.130618.1163

Umapathy, G. & A. Kumar (2000). The occurrence of arboreal mammals in the rain forest fragments in the Anamalai Hills, south India. *Biological Conservation* 92: 311–319.

Walston, J., J.W. Duckworth & S. Molur (2016). *Petaurista philippensis* (errata version published in 2020). The IUCN Red List of Threatened Species 2016: e.T16724A184098981. https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T16724A184098981.en. Downloaded on 04 June 2021.

Zacharias, V.J. & A.K. Bhardwaj (1997). Observations on the Flying Squirrels *Petaurista philippensis* (Elliot) and *Petinomys fuscocapillus* (Jerdon) in Periyar Tiger Reserve and its Neighbourhood. *Indian Forester* 123(10): 973–974.

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Record of the Redback Spider from the Eastern Ghats of Tamil Nadu

The genus *Latrodectus* Walckenaer, 1805 is represented by 32 species worldwide (Shrestha & Dorr 2020). *L. hasselti* Thorell, 1870 is scattered in southern and southeastern Asian countries including India (Pocock 1900; Tikader 1987). Until 2007, only *L. hasselti* was known for India (Pocock 1900; Daniel & Soman 1961; Tikader 1987; Siliwal & Kumar 2001; Hippargi et al. 2012). Later, *L. geometricus* Koch, 1841 (Shukla & Gour Broome 2007), *L. elegans* Thorell, 1898 (Kananbala et al. 2012) and *L. erythromelas* Schmidt & Klaas, 1991 (Srinivasulu et al. 2013) have been added to the Indian list (Parasharya et al. 2015). Simon (1897) considered Indian *L. hasselti* as a separate subpopulation and described it as a subspecies *L. hasselti indicus*. But Levi (1959) mentioned that its origin is unclear.

***Latrodectus hasselti* from Kiluvamalai RF, Madurai District, Tamil Nadu. © R.Kishore & P. Dailiah Roopha.**

The reports on the presence of *L. hasselti* from India are very modest. In India, it was first reported from Pune, Maharashtra (Simon 1897; Pocock 1900) and later on from Thane, Maharashtra (Daniel & Soman 1961), Bhavnagar, Gujarat (Patel 1973; Tikader 1987), Vadodara, Gujarat (Siliwal & Kumar 2001), Great Indian Bustard Sanctuary, Nannaj and Yedshi Ramling Ghat Wildlife Sanctuary, Solapur, Maharashtra (Hippargi et al. 2012). Recently, it was spotted in Hisar, Haryana by Goyal & Malik (2017). In Tamil Nadu, it was reported from Coimbatore, extending the known range to the southern part of Western Ghats (Kumar & Siliwal 2005). The earlier records point out the distribution of *L. hasselti* from the hill ranges of western India ranging from Gujarat to Tamil Nadu (Kumar & Siliwal 2005).

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Location of Redback Spider *Latrodectus hasselti* recorded in Kiluvamalai RF, Madurai District, Tamil Nadu.

Distribution of *Latrodectus hasselti* in India.

In 2019, during our study on faunal diversity in the thorn forests of Kiluvamalai in the Madurai District, Tamil Nadu, we sighted Redback Spiders. Kiluvamalai is a small hillock adjacent to Alagar Hills in Eastern Ghats with thorny vegetation and rocky terrain. The hill rejuvenates its greenery in the monsoon and post monsoon period from October to February.

On a hot sunny day of 30 December 2019 at 10.35h, we sighted a Redback Spider, an adult female on a piece of rock. A silky cobweb was observed near the spider beneath the rock. Another mature female spider of the same species was sighted within two meters from the previous individual. Photographic documentation was done in the field. The spiders were handled with caution during photographic documentation as the author was aware that the spider belongs to black widow spider family even though not sure about its

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species identity. The spiders were later identified to be *L. hasselti* with the help of illustration and descriptions in the literature (Pocock 1900; Goyal & Malik 2017).

The present record from Kiluvamalai, representing the southern part of the Eastern Ghats in Tamil Nadu is about 215 km southward from Coimbatore, the recent past record from Tamil Nadu along the Western Ghats. Kiluvamalai is separated from Palani Hills of Western Ghats by 30 km and forms a part of the discontinuous hills that includes Sirumalai, Perumalai, Alagar Hills, and Karanthamalai running along the southern Eastern Ghats (Narayanan 2016). This is the first report of *L. hasselti* in the Eastern Ghats of India and the second report in Tamil Nadu (being the southernmost occurrence of this species in India).

References

Daniel, J.C. & P.W. Soman (1961). Observations on the spider *Latrodactus hasseltii indicus* Simon with a note on arachnidism. *Journal of the Bombay Natural History Society* 58(3): 823–826.

Goyal, V. & V. Malik (2017). The first record of the redback spider *Latrodectus hasselti* Thorell (Araneae: Theridiidae) from Haryana, north India. *Journal of Environment and Bio-Sciences* 31(2): 441-442.

Hippargi, R.V., P.M. Bolde, S.V. Manthen & A.R. Shaikh (2012). Ecology of venomous spider *Latrodectus hasselti* Thorell, 1870 (Araneae:Theridiidae) from Solapur and Osmanabad District, Maharashtra. Indian *Journal of Arachnology* 1(1): 169–174.

Kananbala, A., K. Manoj, M. Bhubaneshwari, A. Binarani & M. Siliwal (2012). The first report of the widow spider *Latrodectus elegans* (Araneae: Theridiidae) from India. *Journal of Threatened Taxa* 4(7): 2718–2722. https://doi.org/10.11609/JoTT.o3152.2718-22.

Kumar, M.G. & M. Siliwal (2005). Range extension of *Latrodectus hasselti* Thorell, 1870 (Araneae: Theridiidae). *Zoos' Print Journal* 20(11): 2072.

Levi, H.W. (1959). The spider genus *Latrodectus* (Araneae, Theridiidae). *Transactions of the American Microscopical Society* 78 (1): 7–43.

Narayanan, T.B. (2016). Birds of Alagarkovil range, Dindigul District, Tamil Nadu. *Indian Birds* 12(4&5): 119–127.

Parasharya, B.M., R.V. Vyas & B.H. Patel (2015). Status and distribution of red-backed spider, *Latrodectus hasselti* Thorell (Araneae: Theridiidae) in Gujarat State, Western India. *Journal of Biological Control* 29(4): 171–178.

Patel, B.H. (1973). Some interesting theridiid spiders (Araneae: Theridiidae) from Gujarat, India. *Bulletin of British Arachnological Society* 2(8): 149-152

Pocock, R.I. (1900). *The fauna of British India, Archnida*. Taylor and Francis, London, 279 pp.

Schmidt, G. & P. Klaas (1991). Eine neue *Latrodectus* Spezies aus Sri Lanka (Araneida: Theridiidae). *Arachnologischer Anzeiger* 14: 6–9.

Shrestha, B. & T. Dorr (2020). First records of the black widow spider *Latrodectus elegans* Thorell, 1898 (Araneae: Theridiidae) from Nepal. *Journal of Threatened Taxa* 12(10): 16385–16388. https://doi.org/10.11609/jott.5796.12.10.16385-16388.

Shukla, S. & V.G. Broome (2007). First report of the brown widow spider, *Latrodectus geometricus* C.L. Koch (Araneae: Theridiidae) from India. *Current Science* 93: 775–777.

Siliwal, M. & D. Kumar (2001). First report of the brown widow spider, *Latrodectus geometricus* C. L. Koch (Araneae: Theridiidae) from India. *Current Science* 81: 1170-1171.

Simon, E. (1897). Arachnides recueillis par M.M. Maindron a Mascate, en octobre 1896. *Bulletin du Museum (national) d'histoire naturelle,* Paris 1897: 95–98.

Srinivasulu, C., B. Srinivasulu, S.M.M. Javed, M. Seetharamaraju, S.A. Jyothi, C.A. Srinivasulu & F. Tampal (2013). Additions to the araneofauna of Andhra Pradesh,

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Invertebrate Conservation & Information Network of South Asia (ICINSA)

India - part II. Records of interesting species of the comb-footed genera *Latrodectus*, *Rhomphaea* and *Coleosoma* (Araneae: Theridiidae). *Journal of Threatened Taxa* 5(10): 4483–4491. https://doi.org/10.11609/JoTT.o2660.4483-91

Tikader, B.K. (1987). *Handbook of Indian spiders*. Zoological Survey of India, Calcutta.

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Record of *Cyclosia midamia*, a day-flying poisonous moth from Tanahun District, Nepal

Cyclosia midamia (Herrich-Schäffer, [1853]) is a day-flying moth that belongs to the order Lepidoptera of the family Zygaenidae (subfamily Chalcosiinae). It looks fascinating and mimics the Spotted Blue Crow. Mimicry and aposematic (denoting colouration to repel predators) in this species is due to the high concentrations of two chemicals lotaustralin and cyanoglucosides linamarin. They release hydrocyanic acid by decomposition of these two chemicals which is poisonous to birds and predators (Naumann et al. 1999; Yen et al. 2005). *Cyclosia midamia* has six subspecies, viz: *C. m. alcathoe* Jordan, 1907, *C. m. dolosa* Jordan, 1907, *C. m. midamia* (Herrich-Schäffer, [1853], *C. m. padangana* Jordan, 1907, *C. m. submaculans* Walker, 1859,

***Cyclosia midamia* upper side. © MS Miya.**

***Cyclosia midamia* under side. © MS Miya.**

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and *C. m. trepsichrois* Butler, 1883 (http://insecta.pro/taxonomy/41774).

In a male, the forewings have two series of small white spots. Hindwings also have two series of spots but contain less or more. One white spot is present in the cell of each underside. Sub-marginal spots (two series) are present on both wings. The outer margin, apex and costa have brilliant blue color whereas the inner area is purplish. The antennae are metallic blue, the collar is spotted blue; abdomen, thorax and the head are black (Hampson 1892). In females, forewings have two spots in the cell, two below the cell, two in beyond the cell. Hindwings have well represented two series of spots along with two spots in the cell (Butler 1875; Moore 1882; Hampson 1892).

Cyclosia midamia is distributed in Bhutan, Borneo, China, Burma, India, Bangladesh, Malaysia, Thailand, Singapore, Vietnam, Laos, Indonesia, and Nepal (Hampson 1892; Endo & Kishida 1999). In Nepal, it is among the 37 species of the Zygaenidae family reported by Haruta (1992) and Smith (2010). But its distribution in Nepal is not well described yet. This is the first report from Tanahun District.

During the survey of butterflies, on 13 July 2020 (1245 h, sunny), a single specimen was sighted in Sanja Village (28.074^0 N and 84.210^0 E, 644m) of Byas municipality 6, Tanahun District, Nepal. The species was feeding on the nectar of Balsam *Impatiens balsamina* in the yard of a house. It was initially confused for a butterfly but later learnt identified as a moth. It fed on the flower for about five minutes and flew away. The species was photographed during its feeding and later identified with the help of experts and literature (Hampson 1892) and online reference (https://thebutterflydiaries.wordpress.com/category/zygaenidae, http://www.jpmoth.org, https://www.projectnoah.org/spottings/1458623637).

References

Butler, A.G. (1875). The Transactions of the Linnean Society of London (Vol. 2). London, Printed for the Society by W. Lewis at the Cambridge University Press [etc.], 559pp. https://archive.org/details/transactionsofli7579linn/page/559/mode/1up?view=theater Accessed on 04.v.2021.

Endo, T. & Y. Kishida (1999). Endless Collection Series, Day-Flying Moths, 92 pp. http://www.jpmoth.org Accessed on 04.v.2021.

Hampson, G.F. (1892). *The Fauna of British India, including Ceylon and Burma. Moths.* Vol. I. Taylor and Francis Ltd., London, 527pp.

Haruta, T. (1992). *Moths of Nepal, Part 1.* Tinea. 13 (Supplement 2). Japan Heterocerists' Society, Tokyo, 122 pp.

Moore, F. (1882). *The Lepidoptera of Ceylon* (Vol. 2). L. Reeve & Company, 46 pp. https://archive.org/details/lepidopteraofcey02moor/page/46/mode/1up?view=theater Accessed on 05.v.2021.

Naumann C.M., G.M. Tarmann & W.G. Tremewan (1999). The western Palaearctic Zygaenidae (Lepidoptera). Apollo Books, Stenstrup, Denmark, 304 pp.

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Invertebrate Conservation & Information Network of South Asia (ICINSA)

Smith, C. (2010). *Lepidoptera of Nepal*. Himalayan Nature, Nepal.

Yen, S.H., G.S. Robinson & D.L. Quicke (2005). The phylogenetic relationships of Chalcosiinae (Lepidoptera, Zygaenoidea, Zygaenidae). *Zoological Journal of the Linnean Society* 143(2): 161–341. https://doi.org/10.1111/j.1096-3642.2005.00139.x

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First reports of the Alida Angle from Tirupati, India

India has three representatives of the genus of *Caprona*, family *Hesperiidae*, subfamily *Pyriginae*, tribe *Tagiadini*; namely, *C. agama*, *C. ransonnettii*, and *C. alida*. To the best of our knowledge, *Caprona alida vespa* De Nicéville, 1891 has been documented from the Eastern Ghats with photographic evidence only from Madurai and Thiruvannamalai districts of Tamil Nadu in India (Kunte et al. 2020) and has not been reported in surveys conducted in the state of Andhra Pradesh. Surveys conducted at the Nagalapuram Hills (Best 1954), Nagarjuna Srisailam Tiger Reserve (Rao et al. 2004), Warangal (Samatha et al. 2012), and Nelapattu Bird Sanctuary (Gupta & Rao 2013) have not reported the presence of *Caprona alida vespa*. Here, we report six new occurrence records of the species with photographic records from Tirupati and Chittoor, Andhra Pradesh. To the best of our knowledge, these are the first records from Andhra Pradesh.

Photographs of *Caprona alida vespa* from this study. Photographs correspond to sightings in Table 1. UP—Upperside | UN—Under side | A—Sighting 1 UP view | B—Sighting 5, Individual 1 UP view | C—Sighting 3 UN view | D—Sighting 5, Individual 2, UN view. © Harsha Kumar.

Individuals of *Caprona alida vespa* were identified with a combination of opportunistic sightings and targeted searching in potential habitats during the months of August, September, and November between 2017 and 2019. All our records of the species were from low elevation (0–200 m) dry open scrub and low-lying rocky outcrops found in Tirupati described by their *Acacia* sp., *Ixora pavetta*, *Dodonaea viscosa*, *Memecylon* sp., *Maytenus emarginata*, *Zizyphus* sp., and *Grewia* sp. associations. Since there is seasonal variation in members of this

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Table 1. Sightings of *Caprona alida vespa* from Tirupati.

Sighting number	Date	No of individuals	Locality	GPS
1	17.ix.2017	1	Mangalam	13.6639 N, 79.4814 E
2	19.x.2019	1	Kalyani Dam	13.6566 N, 79.2696 E
3	2.xi.2019	1	Mamanduru Forest	13.7541 N, 79.4682 E
4	8.xi.2019	1	Mamanduru Forest	13.7548 N, 79.4668 E
5	9.xi.2019	2	Mamanduru Forest	13.7537 N, 79.4648 E

Table 2. Key to identifying species of *Caprona* in southern India. WSF—Wet Season Form | DSF—Dry Season Form | UPF—Upper fore-wing | UPH—Upper hind-wing.

Feature	Golden Angle *Caprona ransonnettii potiphera*	Spotted Angle *Caprona agama agama*	Alida Angle *Caprona alida vespa*
Basal colors of wings and spots - WSF	UPF dark brown and UPH heavily marked with brown/ golden spots	UPF black and UPH heavily marked with white spots	UPF dark brown, white spots on UPF bordered with black and UPH heavily marked with black spots
Basal colors of wings and spots - DSF	UPF light brown and UPH weakly marked - DSF	UPF brown, white spots on UPF bordered with black and UPH weakly marked - DSF	UPF light brown, white spots on UPF bordered with black and UPH heavily marked with dark brown spots
UPF cell markings and color	White hyaline spot at base of cell on UPF absent - DSF and WSF	White hyaline spot at base of cell on UPF: a) absent - DSF; b) present - WSF	White hyaline spot at base of cell on UPF present - DSF and WSF
UPF cell markings and color	Markings at end cell on UPF absent - DSF and WSF	White hyaline crescent spot on cell end of UPF: a) absent - DSF; b) present - WSF	Brown opaque crescent spot on cell end of UPF present - DSF and WSF

genera in terms of appearance, we prepared a general key to distinguish between members, compiling keys from Swinhoe (1912-1913), Blyth (1957), Yutaka (2012), and Kunte et al. (2020).

Our findings illustrate a significant range extension of *Caprona alida vespa* of close to 200 km from its previous records at Thiruvannamalai, Tamil Nadu. It is very likely that the Alida Angle *Caprona alida vespa* is present in districts other than Chittoor within the state of Andhra Pradesh, but has escaped the attention of most butterfly watchers. It is also likely to have been misidentified as one of the other *Caprona*. This work illustrates the need for systematic survey of many taxa including butterflies in the low lying, dry rocky outcrops of Eastern Ghats in Andhra Pradesh reinforced by serious specimen collection drives.

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References

Best, A.E.G (1954). Notes on butterflies of Nagalapuram Hills, Eastern Ghats. *Bombay Natural History Society* 52: 365-373.

Blyth, W. (1957). *Butterflies of the Indian Region*. Bombay Natural History Society.

Goswami, R., O. Thorat, V. Adithya & S.N. Karimbumkara (2018). A preliminary checklist of butterflies from the northern Eastern Ghats with notes on new and signifi-cant species records including three new reports for peninsular India. *Journal of Threatened Taxa* 10(13): 12769–12791. https://doi.org/10.11609/jott.3730.10.13.12769-12791

Gupta, B.M. & C.P.V. Rao (2013). A preliminary report on the butterflies of Nelpattu Bird Sanctuary, Andhra Pradesh, India. *Zoo's Print.* 28(1): 26-27.

Kunte, K., S. Sondhi & P. Roy (2020). Butterflies of India, v 2.85, Indian Foundation for butterflies. https://www.ifoundbutterflies.org/. Accessed on: 28.v.2020.

Rao, T.K., P.M. Raju, M.S.M Javed & S.R. Krishna (2004). A checklist of butterflies of Nagarjunsagar Srisailam Tiger Reserve, Andhra Pradesh. *Zoos' Print Journal* 19(12): 1713–1715. https://dx.doi.org/10.11609/JoTT.ZPJ.1184.1713-5

Samatha, C.H., C.H. Sammaiah & N.V. Kumar (2012). Butterfly diversity of Kakatiya University Campus, Vidhyaranyapuri, Warangal, Andhra Pradesh. *Zoo's Print* 27(10): 26–28.

Swinhoe, C. (1912–1913). Lepidoptera Indica. Vol. X. Rhopalocera. Family Hesperiidae (concluded). Sub-families Celaenorrhinae, Hesperiinae, Pamphilinae, Astictopterinae, Suastinae, Erionotinae, Matapinae, Notocryptinae, Plastingiinae, Erynninae. Reeve and Co, London, 364 pp.

Yutaka, I. (2012). A checklist of butterflies in Indo-China: Chiefly from Thailand, Vietnam and Laos. http://yutaka.it-n.jp/. Accessed on: 29.v.2020.

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Butterflies of Visakhapatnam District, Andhra Pradesh, India

There are over 20,000 species of butterflies recorded in the world of which 1,500 species are reported from India (Kunte et al. 2021). Below is the list of authors and the number of species they have reported from the Eastern Ghats. Gunathilagaraj et al. (1998) – 150 species from Eastern Ghats, Goswami et al. (2018) – 102 species from northern Eastern Ghats, Ramamurty et al. (2013) – 78 species from Visakhapatnam, Andhra Pradesh, Rao et al. (2004) – 89 species from Nagarjunasagar and Srisailam Tiger Reserve, and Raju et al. (2003) – 68 species from Visakhapatnam.

A detailed study of butterflies was carried out from August 2016 to August 2018 in the Eastern Ghats forests of Visakhapatnam District and urban environments of Visakhapatnam City. Visakhapatnam District is one of the nine coastal districts of Indian state of Andhra Pradesh (15.9129^0 N, 79.7400^0 E). Visakhapatnam (17.6868^0 N, 83.2185^0 E) is the largest city serving as headquarters of the Visakhapatnam District. It has a tropical wet and dry climate. The annual mean temperatures range between 24.7–30.6 ^{0}C (76–87 ^{0}F), with the maximum in the month of May and the minimum in January. It collects an average of 955 mm of rainfall per year. The Eastern Ghats region of Visakhapatnam District falls under tropical monsoon climate receiving rainfall from both south-west and north-east retreating monsoons. The rainfall ranges 60–160 cm. The mean temperature in January ranges 20–25 ^{0}C. The maximum temperature goes up to 41 ^{0}C during summer. The forests include dry evergreen, semi-evergreen forests, dry savannah forests, and tropical dry scrub forests.

A total of 11 areas were selected from Visakhapatnam District, of which six areas were from Eastern Ghats forests and five areas from urban environments of the city. Bi-monthly visits were undertaken in the Eastern Ghats forests areas - Chintapalli (17.8713^0 N, 82.3533^0 E), G K Veedhi (17.8629^0 N, 82.1965^0 E), Ananthagiri (18.1969^0 N, 82.9979^0 E), Paderu (18.0806^0 N, 82.6645^0 E), Aaraku (18.3273^0 N, 82.8775^0 E), Sileru (18.0482^0 N, 82.0339^0 E) and in Visakhapatnam urban environments - Kambala Konda (17.7664^0 N, 83.3496^0 E), Thotlakonda (17.8261^0 N, 83.4105^0 E), Indira Gandhi Zoological Garden (17.7692^0 N, 83.3500^0 E), Simhachalam Hills (17.7664^0 N, 83.2506^0 E), and Biodiversity Park (17.7289^0 N 83.3367^0 E).

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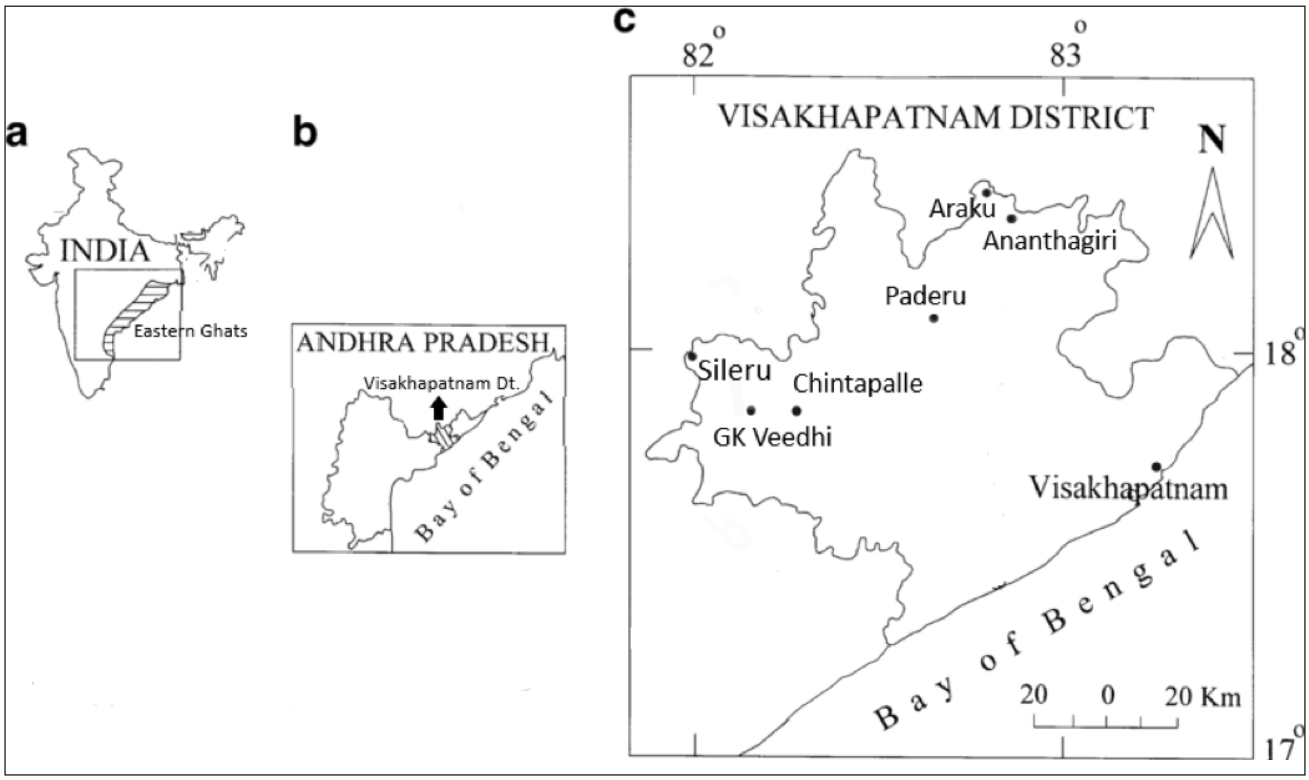

Study area map showing Visakhapatnam District.

Observations were made through transects, each of 500 m length with 5 m on either side. One to three transects at every site were covered. Observations were taken in the morning from 0800 to 1200 h when the butterflies were most active. Abundance of butterflies in different habitats were recorded. The encountered butterflies were identified while they were in flight or in resting. Identification of the species was done mostly through photographic evidence. Species which are difficult to identify were caught by hand net and released after examination. Species identification and classification are mainly as per Evans (1932), Gunathilagaraj (1998), Kunte (2000), Kehimkar (2008), and Kunte et al. (2021).

In the present study, 105 species belonging to six families were recorded (Table 1). The family Nymphalidae (Brush-footed butterflies) was dominated with 36 species, whereas the family Riodinidae (Metalmarks/ Punches and Judies) was lowest with only one species. The family Lycaenidae (Blues) was represented with 23 species, Pieridae (Whites & Yellows) with 22 species, Papilionidae (Swallowtails) with 12 species, and Hesperiidae (Skippers) with 11 species. Observed species were grouped into six

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categories: Urban Common (UC) – 40%, Urban Occasional (UO) – 40%, Urban Rare (UR) – 20%, Forest Common (FC) – 13%, Forest Occasional (FO) – 62%, and Forest Rare (FR) – 25%, on the basis of their habitat preference and number of sightings in the field.

Twelve species were recorded as new to Visakhapatnam District—*Troides helena*, *Colotis amata*, *Delias hyparete*, *Eurema brigitta*, *E. laeta*, *Ixias pyrene*, *Lethe europa*, *Vanessa cardui*, *Ypthima baldus*, *Y. ceylonica*, *Virachola isocrates*, and *Freyeria trochylus*.

Seven species are legally protected in India under the Wildlife (Protection) Act, 1972—*Pachliopta hector* under Schedule I, *Euploea mulciber* & *Appias libythea* under Schedule IV, and *Hypolimnas misippus*, *Lampides boeticus*, *Euchrysops cnejus*, & *Tanaecia lepidea* under Schedule II.

Twelve species were exclusively found in the Eastern Ghats forests of Visakhapatnam District but not in urban environments—*Troides helena*, *Delias hyparete*, *Ixias pyrene*, *Ariadne ariadne*, *Symbrenthia lilaea*, *Tanaecia lepidea*, *Ypthima baldus*, *Ypthima ceylonica*, *Ypthima huebneri*, *Caleta decidia*, *Talicada nyseus*, and *Sarangesa dasahara*. Two species were found only in urban environments of Visakhapatnam—*Appias libythea* and *Abisara bifasciata suffusa*.

The study shows that both forests and urban areas are rich in butterfly diversity. The major threats affecting the abundance in forest areas are habitat destruction, degradation & fragmentation, monoculture practices like rice and coffee plantations, conversion of forest land into agricultural fields, mining activities, podu or shifting cultivation, hunting, and grazing (Ganesh et al. 2015; Goswami et al. 2018). Invasion of alien species like Lantana *Lantana camara*, Parthenium *Parthenium hysterophorus*, African Wattle *Acacia auriculiformis* and Eupatorium *Chromolaena odorata* also pose a threat to native species.

In urban areas the butterfly habitats are adversely affected due to pollution, industrialization and urbanization. Planting of vast stretches of monotypic and exotic species like Bougainvillea *Bougainvillea spectabilis*, Madagascar Almond *Terminalia mantaly*, and Buttonwood *Conocarpus lancifolius* in majority traffic islands and road dividers pose a threat to the native species. Landscaping is seen everywhere for beautification purposes, which leaves no native herbal plants for the butterflies and larvae to flourish. Making every possible inch of urban space with concrete, not only depletes the water table but also reduces wild patches that attract butterflies.

Ecotourism is to be encouraged by giving enough guidance and support to the

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Table 1. List of Butterflies recorded in the Eastern Ghats forests and urban environments of Visakhapatnam District, Andhra Pradesh.

	Family	Scientific Name	Common Name	Sch. WPA-1972	"Habitat & Relative Abundance"
1	Papilionidae (Swallowtails)	*Graphium agamemnon* (Linnaeus 1758)	Tailed Jay		UC, FO
2		*Graphium doson* (C. & R. Felder 1864)	Common Jay		UC, FO
3		*Graphium nomius* (Esper 1799)	Spot Swordtail		UO, FR
4		*Graphium sarpedon* (Linnaeus 1758)	Common Blue Bottle		UR, FR
5		*Pachliopta aristolochiae* (Fabricius 1775)	Common Rose		UC, FC
6		*Pachliopta hector* (Linnaeus 1758)	Crimson Rose	Sch I	UO, FR
7		*Papilio clytia* Linnaeus 1758	Common Mime		UR,FR
8		*Papilio crino* Fabricius 1793	Common Banded Peacock		UR, FO
9		*Papilio demoleus* Linnaeus 1758	Lime Swallotail		UC, FO
10		*Papilio polymnestor* Cramer 1775	Blue Mormon		UO,FO
11		*Papilio polytes* Linnaeus 1758	Common Mormon		UC, FO
12		*Troides helena* (Linnaeus 1758)	Common Birdwing*		FO
13	Pieridae (Whites & Yellows)	*Appias albina* (Boisduval 1836)	Common Albatross		UC, FO
14		*Appias libythea* (Fabricius 1775)	Western Striped Albatross	Sch IV	UR
15		*Belenois aurota* (Fabricius 1793)	Pioneer		UC, FO
16		*Catopsilia pomona* (Fabricius 1775)	Lemon or Common Emigrant		UC, FO
17		*Catopsilia pyranthe* (Linnaeus 1758)	Mottled Emigrant		UC, FO
18		*Cepora nerissa* (Fabricius 1775)	Common Gull		UC, FO
19		*Colotis amata* (Fabricius 1775)	Small Salmon Arab*		UR, FR
20		*Colotis danae* (Fabricius 1775)	Crimson-tip		UO, FO
21		*Colotis etrida* (Boisduval 1836)	Little or Small Orange-tip		UC, FO
22		*Colotis aurora* (Cramer 1780)	Plain Orange-tip		UR, FO
23		*Colotis fausta* (Olivier 1804)	Large Salmon Arab		UC,FO
24		*Delias eucharis* (Drury 1773)	Indian Jezebel		UC, FO
25		*Delias hyparete* (Linnaeus 1758)	Painted Jezebel*		FO
26		*Eurema andersonii* (Moore 1886)	One -spot Grass Yellow		UO, FO

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	Family	Scientific Name	Common Name	Sch. WPA-1972	"Habitat & Relative Abundance"
27	Pieridae (Whites & Yellows)	*Eurema blanda* (Boisduval 1836)	Three-spot Grass Yellow		UO, FO
28		*Eurema brigitta* (Stoll 1780)	Small Grass Yellow*		UR, FO
29		*Eurema hecabe* (Linnaeus 1758)	Common Grass Yellow		UC, FC
30		*Eurema laeta* (Boisduval 1836)	Spotless Grass Yellow*		UR, FO
31		*Ixias pyrene* (Linnaeus 1764)	Yellow Orange-tip*		FO
32		*Leptosia nina* (Fabricius 1793)	Psyche		UC, FC
33		*Pareronia hippia* (Fabricius 1787)	Indian Wanderer		UO, FO
34		*Pieris canidia* (Linnaeus 1768)	Asian Cabbage White		UO, FO
35	Nymphalidae (Brush-footed)	*Acraea terpsicore* (Linnaeus 1758)	Tawny Coster		UC, FO
36		*Ariadne ariadne* (Linnaeus 1763)	Angled Castor		FO
37		*Ariadne merione* (Cramer 1777)	Common Castor		UC, FC
38		*Byblia ilithyia* (Drury 1773)	Joker		UO, FR
39		*Danaus chrysippus* (Linnaeus 1758)	Plain Tiger		UC, FO
40		*Danaus genutia* (Cramer 1779)	Striped Tiger		UC, FO
41		*Elymnias hypermnestra* (Linnaeus 1763)	Common Palmfly		UC, FR
42		*Euploea core* (Cramer 1780)	Common Crow		UC, FO
43		*Euploea mulciber* (Cramer 1777)	Striped Blue Crow	Sch IV	UR, FC
44		*Euploea sylvester* (Fabricius 1793)	Double-Branded Crow		UO, FR
45		*Euthalia aconthea* (Cramer 1777)	Common Baron		UO, FR
46		*Hypolimnas bolina* (Linnaeus 1758)	Great Eggfly		UC, FO
47		*Hypolimnas misippus* (Linnaeus 1764)	Danaid Eggfly	Sch II	UC, FO
48		*Junonia almana* (Linnaeus 1758)	Peacock Pansy		UO, FO
49		*Junonia atlites* (Linnaeus 1763)	Grey Pansy		UR, FR
50		*Junonia hierta* (Fabricius 1798)	Yellow Pansy		UC, FO
51		*Junonia iphita* (Cramer 1779)	Chocolate Pansy		UC, FC
52		*Junonia lemonias* (Linnaeus 1758)	Lemon Pansy		UC, FC
53		*Junonia orithya* (Linnaeus 1758)	Blue Pansy		UO, FR
54		*Lethe europa* (Fabricius 1775)	Bamboo Treebrown*		UR, FR
55		*Melanitis leda* (Linnaeus 1758)	Common Evening Brown		UC, FC
56		*Melanitis phedima* (Cramer 1780)	Dark Evening Brown		UR, FO
57		*Moduza procris* (Cramer 1777])	Commander		UO, FR

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	Family	Scientific Name	Common Name	Sch. WPA-1972	"Habitat & Relative Abundance"
58	Nymphalidae (Brush-footed)	*Mycalesis perseus* (Fabricius 1775)	Common Bushbrown		UC, FC
59		*Mycalesis subdita* (Moore 1890)	Tamil Bushbrown		UO, FO
60		*Neptis hylas* (Linnaeus 1758)	Common Sailer		UC, FC
61		*Phalanta phalantha* (Drury 1773)	Common Leopard		UC, FO
62		*Charaxes bharata* C. & R. Felder 1867	Indian Nawab		UR, FR
63		*Symbrenthia lilaea* (Hewitson 1864)	Common Jester		FO
64		*Symphaedra nais* (Forster 1771)	Baronet		UO, FR
65		*Tanaecia lepidea* (Butler 1868)	Grey Count	Sch II	FR
66		*Tirumala limniace* (Cramer [1775])	Blue Tiger		UC, FC
67		*Vanessa cardui* (Linnaeus 1758)	Painted Lady*		UO, FR
68		*Ypthima baldus* (Fabricius 1775)	Common Five-ring*		FO
69		*Ypthima ceylonica* Hewitson 1865	White Four-ring*		FR
70		*Ypthima huebneri* Kirby 1871	Common Four-ring		FC
71	Riodinidae (Metalmarks)	*Abisara bifasciata suffusa* Moore 1882	Suffused Double-banded Judy		UR
72	Lycaenidae (Blues)	*Acytolepis puspa* (Horsfield 1828)	Common Hedge Blue		UO, FO
73		*Caleta decidia* (Hewitson 1876)	Angled Pierrot		FO
74		*Castalius rosimon* (Fabricius 1775)	Common Pierrot		UC, FO
75		*Catochrysops strabo* (Fabricius 1793)	Forget-me-not		UO, FR
76		*Chilades laius* (Stoll 1780)	Lime Blue		UO, FO
77		*Chilades pandava* (Horsfield 1829)	Plains Cupid		UO, FO
78		*Curetis acuta* Moore 1877	Acute Sunbeam		UO, FR
79		*Euchrysops cnejus* (Fabricius 1798)	Gram Blue	Sch II	UO, FR
80		*Freyeria trochylus* (Freyer 1845)	Orange-spotted Grass Jewel*		UO, FO
81		*Jamides bochus* (Stoll 1782)	Dark Cerulean		UO, FR
82		*Jamides celeno* (Cramer 1775)	Common Cerulean		UC, FC
83		*Lampides boeticus* (Linnaeus 1767)	Pea Blue	Sch II	UO, FO
84		*Leptotes plinius* (Fabricius 1793)	Zebra Blue		UO, FO
85		*Prosotas nora* (C.Felder 1860)	Common Lineblue		UC, FO
86		*Pseudozizeeria maha* (Kollar 1844)	Pale Grass Blue		UC, FO

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	Family	Scientific Name	Common Name	Sch. WPA-1972	"Habitat & Relative Abundance"
87	Lycaenidae (Blues)	Rapala iarbus (Fabricius 1787)	Common Red Flash		UR, FR
88		Rathinda amor (Fabricius 1775)	Monkey Puzzle		UC, FO
89		Spalgis epius (Westwood 1851)	Apefly		UO, FR
90		Spindasis vulcanus (Fabricius 1775)	Common Silverline		UC, FC
91		Talicada nyseus (Guerin-Meneville 1843)	Red Pierrot		FO
92		Virachola isocrates (Fabricius 1793)	Common Guava Blue*		UR, FR
93		Zizula hylax (Fabricius 1775)	Tiny Grass Blue		UR, FO
94		Zizina otis (Fabricius 1787)	Lesser Grass Blue		UO, FO
95	Hesperiidae (Skippers)	Badamia exclamationis (Fabricius 1775)	Brown Awl		UR, FR
96		Borbo bevani (Moore 1878)	Lesser Rice Swift / Bevan's Swift		UR, FO
97		Borbo cinnara (Wallace 1866)	Rice Swift		UO, FO
98		Hasora chromus (Cramer 1780)	Common Banded Awl		UO, FO
99		Matapa aria (Moore 1866)	Common Branded Redeye		UO, FR
100		Pelopidas mathias (Fabricius 1798)	Small Branded Swift		UO, FO
101		Sarangesa dasahara (Moore 1866)	Common Small Flat		FO
102		Spialia galba (Fabricius 1793)	Asian Grizzled Skipper		UO, FO
103		Suastus gremius (Fabricius 1798)	Oriental Palm Bob		UO, FO
104		Telicota bambusae (Moore 1878)	Dark Palm-Dart		UO, FO
105		Udaspes folus (Cramer 1775)	Grass Demon		UO, FO

UC-Urban Common; UO-Urban Occasional; UR-Urban Rare; FC-Forest Common; FO-Forest Occasional; FR-Forest Rare.
*** New record to Visakhapatnam District. Sch. WPA-1972=Schedule species under Indian Wildlife (Protection) Act 1972.**

local tribal community. Specific 'Butterfly Watch' tours may be arranged to attract tourists and the revenue must be spent for tribal only in those forest areas. 'Butterfly Farming' is to be encouraged not only to conserve threatened species but also provide alternative means of livelihood to forest dwellers (Kunte et al. 2000; Kehimkar 2008). In urban areas, developing natural butterfly parks and gardens in all school, college, university premises and in all public spaces is an essential step towards conservation of butterflies. On road dividers and traffic islands, by planting suitable nectar and larval

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food plants and by keeping small damp areas with salt and rotten fruits, the local butterfly fauna can be supported. Small patches of wild plants are to be allowed to grow on road sides and vacant spaces which supports many local butterfly species. Creating public awareness by involving students, local people, forest dwellers, and tribals is essential in the conservation of butterflies.

References

Evans, W.H. (1932). *The identification of Indian Butterflies. 2nd edition*. Bombay Natural History Society, Bombay, India, x+454pp+32 pls.

Ganesh, T., V. Aditya, G. Malla & M.B. Prashanth (2015). The 'empty forests' of the northern Eastern Ghats. *Current Science* 109(3): 398–399.

Goswami, R., O. Thorat, V. Aditya & S.N. Karimbumkara (2018). A preliminary checklist of butterflies from the northern Eastern Ghats with notes on new and significant species records including three new reports for peninsular India. *Journal of Threatened Taxa* 10(13): 12769–12791. https://doi.org/10.11609/jott.3730.10.13.12769-12791

Gunathilagaraj, K., T.N.A. Perumal, K. Jayaram & M.G. Kumar (1998). *Some South Indian Butterflies*. Field Guide. Published under Project Lifescape, *Indian Academy of Sciences*, Bangalore, 270 pp.

Kehimkar, I. (2008). *The Book of Indian Butterflies*. Bombay Natural History Society, Oxford University Press. Mumbai, Delhi, Calcutta, Chennai. 497 pp.

Kunte, K. (2000). *Butterflies of Peninsular India*. Indian Academy of Sciences, Bangalore, University Press, Hyderabad. 270 pp.

Kunte, K., S. Sondhi & P. Roy (eds.) (2021). *Butterflies of India, v. 3.15*. Indian https://www.ifoundbutterflies.org/ifoundbutterflies.

Raju, A.J.S., S.P. Rao & V. Ezradanam (2003). Some ecological notes on the butterflies of Visakhapatnam, Andhra Pradesh. *Zoos' Print Journal* 18(6): 1126–1128. https://dx.doi.org/10.11609/JoTT.ZPJ.18.6.1126-8

Ramamurty, M., A. Rohini, S.T.P.L. Ushasri, Ch. Girijarani, P. Sharon, S. Pavani & U. Joshna Rani (2013). Preliminary study on butterfly diversity in the biodiversity park of Rani Chandramani Devi Government Hospital, Visakhapatnam, Andhra Pradesh. *Advances in Pollen Spore Research* XXXI: 151–159.

Rao, K.T., M.P. Raju, S.M.M. Javed & I.S.R. Krishna (2004). A checklist of butterflies of Nagarjunasagar Srisailam Tiger Reserve, Andhra Pradesh. *Zoos' Print Journal* 19(12): 1713–1715. https://dx.doi.org/10.11609/JoTT.ZPJ.1184.1713-5

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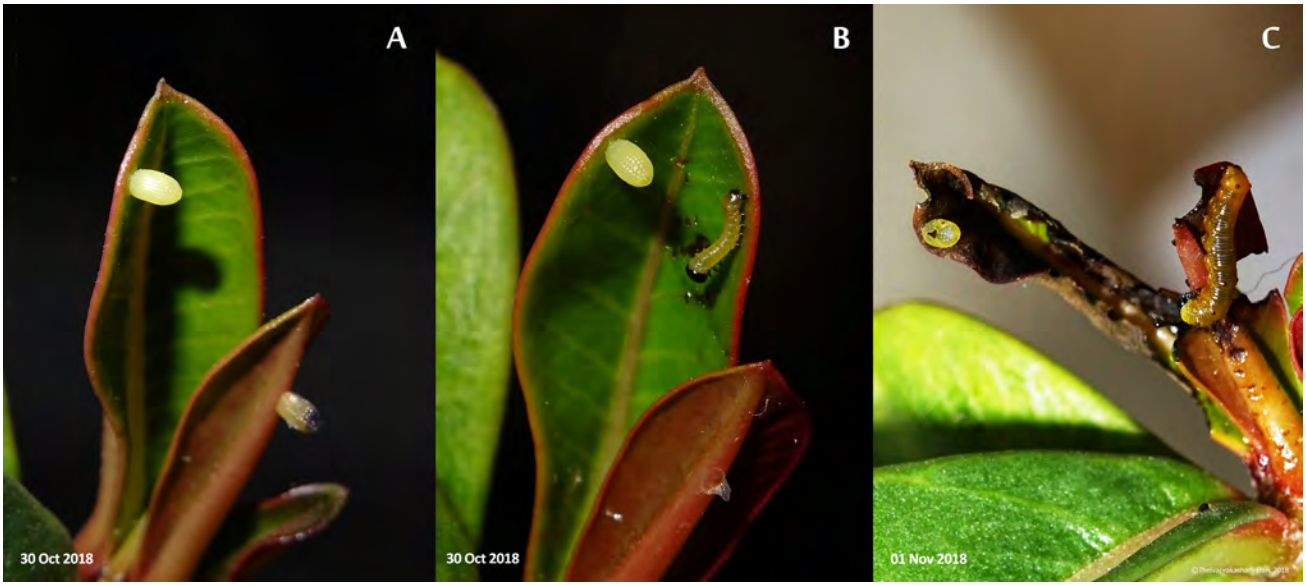
Cannibalisistic behaviour in an early instar larva of Common Crow butterfly



A—Eggs of *Euploea core* butterfly | B—Eclosed larva of *Euploea core* | C—Cannibalized egg (left) and the second instar larvae (right) of *Euploea core* butterfly. ©Theivaprakasham Hari.

Most of the butterflies are phytophagous. On rare occasions, the larva will turn cannibalistic for a period of time either regularly or in the absence of sufficient food supply (Nakahara et al. 2020). Many of the butterflies under the family Papilionidae were reported to be cannibalistic (Dethier 1937); especially, the butterflies that feed on Aristolochiaceae family of plants, namely, *Pachliopta hector* Linnaeus, 1758, *Troides minos* Cramer, 1779, *Pachliopta aristolochiae* Evans, 1932, *Battus philenor* Linnaeus, 1771 (Nishida & Fukami 1989). The propensity for cannibalism is also found among the family Pieridae. The butterflies belonging to the genus *Appias*, namely, *libythea* Fabricius, 1775 and *lyncida* Moore, 1881, eat freshly-formed pupae of their own species, larvae in the process of under moulting and also the larvae and pupae *Leptosia nina* Fabricius, 1793 and *Pontia sisymbryii* Boisduval, 1852 (James 2017). The butterfly larvae from the family Lycaenidae, namely, *Acytolepis*, *Tarucus* (Theivaprakasham pers. obs. 2016), *Tajuria*, *Rapala*, *Arhopala*, *Zesius*, and *Amblypodia* are cannibalistic (De Niceville 1900). Bell (1919) observed that *Zesius chrysomallus* Hübner, 1819 were the greatest

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Close up view of the cannibalized egg by the first and second instar larva of *Euploea core* butterfly. ©Theivaprakasham Hari.

cannibals with respect to larvae of certain Lycaenidae. Under the butterfly family Nymphalidae, *Elymnias hypermnestra* Linnaeus, 1763 (James 2017) and butterflies belonging to subfamily Danainae family, namely, *Danaus chrysippus* Linnaeus, 1758, *Danaus plexippus* Linnaeus, 1758, *Danaus gilippus berenice* Cramer, 1779, and *Euploea core* Cramer, 1780, were reported to cannibalize the eggs (Dixon et al. 1978). Some other butterflies from the family Nymphalidae feeding on family Passifloraceae plants, namely, *Acraea terpsicore* Linnaeus, 1758 (Haribal 1992) and *Heliconius* undergo larval cannibalism (Merrill et al. 2013). The cannibalistic behavior of newly hatched larva that occurs under crowded conditions in the absence of sufficient food has been reported in some butterfly species namely *Danaus chrysippus* Linnaeus, 1758 (Dixon et al. 1978), *Danaus plexippus* Linnaeus, 1758, *Danaus gilippus berenice* Cramer, 1779 (Brower 1961), *Pieris rapae* Linnaeus, 1758 (Watanabe & Yamaguchi 1997), *Colias alexandra columbiensis* Ferris, 1973 in laboratory conditions (Hayes 1982) and *Anthocharis cardamines* Linnaeus, 1758 (Feltwell 1982).

In the present study, we provide evidence that under natural conditions, the larva of the *Euploea core* undergoes egg cannibalism.

The observations were made from the author's garden (11.030N, 76.902E) located at Coimbatore, Tamil Nadu, India. Two female adult butterflies were seen ovipositing an egg each on the tender leaves of *Adenium obesum* (family Apocynaceae) on 28 and 29 October 2018. The plant having eggs was isolated for further observations. On 30 October 2018 evening, a larva emerged out of the first egg (laid on 28 October 2018). The enclosed larva was observed feeding its own hatched egg shell completely. The larva was wandering on the leaf surface

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thereafter. Before feeding on the leaf, the larva was observed to make marks on the leaves through lesions after which they feed on the leaves. On 31 October 2018, the larva was found to feed on the tender leaves followed by partial nibbling of the unhatched second egg. The close-up image of a partially nibbled egg of *Euploea core* is given in Image 2. The next day afternoon (01 November 2018), the larva moulted to the second instar stage. The second instar larva also continued to feed the unhatched egg completely.

The observation described in this paper has shown that the first and second instar of Common Crow *Euploea core* (Cramer, [1780]) exhibit the behaviour of egg cannibalism under natural conditions for a considerable period of time after hatching. Egg cannibalism was commonly observed in some early-stage larva of Danainae when reared in Petri dishes. But, a similar occurrence was rare in natural field conditions (Dixon et al. 1978) as the eggs are laid singly on the leaf of the host plant and very rarely more than one egg on the same leaf (Wynter-Blyth 2009; Zalucki & Kitching 1982). Feltwell (1982) and Hayes (1982) have pointed out that the intra-competition for the food resources due to crowding of larvae as the main reason for egg cannibalism. Brower (1961) observed that in the Monarch and Queen butterfly, the percentage of eggs cannibalized by hatching larvae increases as the initial egg density is increased and this mortality factor is density-dependent.

But in the present observation, the oviposition of two eggs each on different leaves of the same leafy plant invalidates crowding density as a reason for egg cannibalism. The larva had plenty of leaves on the plant as the food resources for survival which negates starvation (Dethier 1937; Cottrell 1984) as a significant ground for egg cannibalism. The significant observation to note in this study is that both the eggs were laid on the tender leaves. Most of the early instar butterfly larvae prefer to feed on young tender leaves (Wynter-Blyth 2009). Coley et al. (2006) observed that the butterfly larva showed doubled growth rates when fed on young leaves than those on mature leaves. In addition, the hardness of the old leaves can also impair the young larva mastication since their mandibular apparatus is very delicate (Bittencourt-Rodrigues & Zucoloto 2009). Hence, the competition for the tender leaf as a food source to the earlier instar would have induced egg cannibalism. Also, the observation of larva to feed on leaf and cannibalize the egg alternatively is unreported elsewhere. Brower (1961) notes that the locomotor activity of larva devouring the shell would cease after the feeding of eggshell due to the chemotactic stimulus from the shell. It would enable the larva to

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initiate the instinctive behavior of feeding on the leaves. Hence the intuitive feeding on the nearby egg is avoided and egg cannibalism is rarely observed in butterflies.

The population stabilization of butterflies in the environment continues through complex food chains combined with other climatic factors and environmental factors like food plant availability and predation (Booton et al. 2019). The larva of the *Euploea core* obtains toxic cardiac glycosides from their food plants. Usually, the larva of the *Euploea core* is less predated by predators because of its unpalatableness (Dixon et al. 1978). Due to lower predation chances of *Euploea core*, the cannibalistic behavior of eggs in the *Euploea core* indicates to be an important strategy for stabilizing their population. However, cannibalism can strongly affect population density when resources are limited and show a density-dependent effect on population dynamics (Brower 1961).

This study presents the new observation of egg cannibalism by the larva of *Euploea core* (Cramer 1780). The findings of this study may open the way for further understanding the role of larval egg cannibalism in intra-species dynamics and population stability. The availability of cannibalistic studies about the butterflies of Indian subcontinent is less. Further observations and laboratory studies of mass breeding in natural and laboratory conditions will help to understand the causes of egg cannibalism and the butterfly larva's survival strategies.

References

Bell, T.R. (1919). The common butterflies of the plains of India (including those met with the hill stations of the Bombay Presidency). *Journal of the Bombay Natural History Society* 26: 941–954.

Bittencourt-Rodrigues, R.S. & F.S. Zucoloto (2009). How feeding on young and old leaves affects the performance of Ascia monuste orseis (Godart) (Lepidoptera, Pieridae). *Revista Brasileira de Entomologia* 53: 102–106.

Booton, R., R. Yamaguchi & Y. Iwasa (2019). A population model for diapausing multivoltine insects under asymmetric cannibalism. *Population Ecology* 61(1): 35–44. https://doi.org/10.1002/1438-390X.1012

Brower, L.P. (1961). Experimental analyses of egg Cannibalism in the Monarch and Queen Butterflies, *Danaus plexippus* and *D. gilippus berenice*. *Physiological Zoology* 34(4): 287–296. https://doi.org/10.1086/physzool.34.4.30161207

Coley, P.D., M.L. Bateman & T.A. Kursar (2006). The effects of plant quality on caterpillar growth and defense against natural enemies. *Oikos* 115(2): 219–228.

Cottrell, C.B. (1984). Aphytophagy in butterflies: its relationship to myrmecophily. *Zoological Journal of the Linnean Society* 80(1): 1–57. https://doi.org/10.1111/j.1096-3642.1984.tb02318.x

De Niceville, L. (1900). The food-plants of the butterflies of the Kanara District of the Bombay presidency with a revision of the species of butterflies there occuring. *Asiatic Society of Bengal* 69(2): 187–278.

Dethier, V.G. (1937). Cannibalism Among Lepidopterous Larvae. *Psyche* 44(4): 110–115. https://doi.org/10.1155/1937/19727

Dixon, C.A., J.M. Erickson, D.N. Kellett & M. Rothschild (1978). Some adaptations between *Danaus plexippus* and its food plant, with notes on *Danaus chrysippus* and *Euploea core* (Insecta: Lepidoptera). *Journal of Zoology* 185(4): 437–467. https://doi.org/10.1111/j.1469-7998.1978.tb03344.x

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Feltwell, J. (1982). *Large White Butterfly: The Biology, Biochemistry, and Physiology of Pieris Brassicae (Linnaeus)*. Springer Netherlands.

Haribal, M. (1992). *The Butterflies of Sikkim Himalaya and Their Natural History*. Gangtok, Sikkim: Sikkim Nature conservation Foundation.

Hayes, J.L. (1982). Diapause and diapause dynamics of *Colias alexandra* (Lepidoptera: Pieridae). *Oecologia* 53(3): 317–322. https://doi.org/10.1007/BF00389007

James, D.G. (2017). *The Book of Caterpillars: A Life-Size Guide to Six Hundred Species from around the World*. The University of Chicago Press Books.

Merrill, R.M., R.E. Naisbit, J. Mallet & C.D. Jiggins (2013). Ecological and genetic factors influencing the transition between host-use strategies in sympatric Heliconius butterflies. *Journal of Evolutionary Biology* 26(9): 1959–1967. https://doi.org/10.1111/jeb.12194

Nakahara, T., J. Horita, R.D. Booton & R. Yamaguchi (2020). Extra molting, cannibalism and pupal diapause under unfavorable growth conditions in *Atrophaneura alcinous* (Lepidoptera: Papilionidae). *Entomological Science* 23(1): 57–65. https://doi.org/10.1111/ens.12399

Watanabe, M. & H. Yamaguchi (1997). Egg cannibalism by newly hatched larvae of the small white butterfly, *Pieris rapae crucivora* (pieridae), on an artificial diet. *Journal of the Lepidopterists' Society* 51(4): 304–315.

Wynter-Blyth, M.A. (2009). *Butterflies of the Indian Region*. Today & Tomorrow's Printers and Publishers. Retrieved from https://books.google.co.in/books?id=kdLDv-jw4P0C

Zalucki, M.P. & R.L. Kitching (1982). Temporal and spatial variation of mortality in field populations of *Danaus plexippus* L. and *D. chrysippus* L. Larvae (Lepidoptera: Nymphalidae). *Oecologia* 53(2): 201–207. https://doi.org/10.1007/BF00545664

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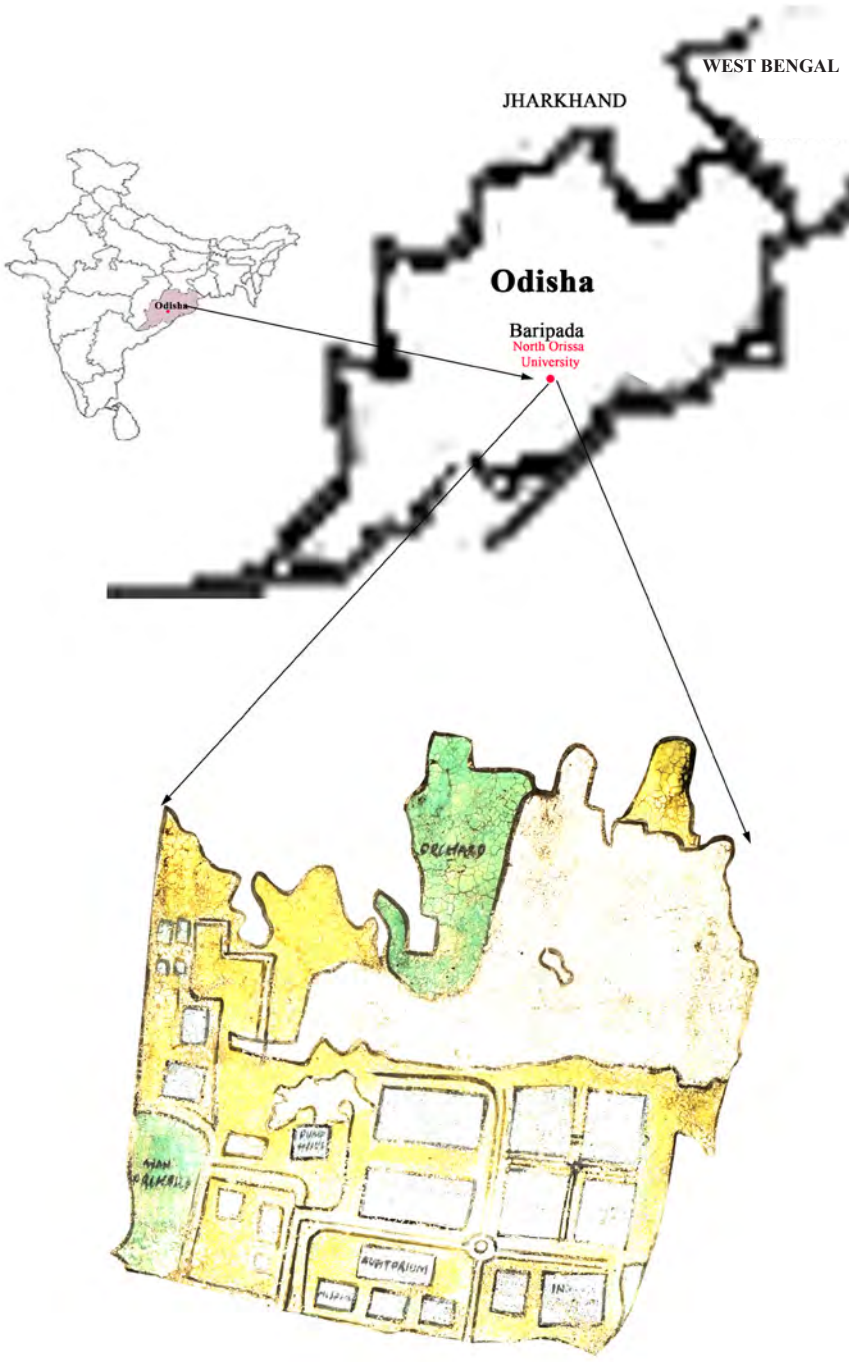
A note on invertebrate fauna of North Orissa University Campus, Odisha, India

The present study deals with the documentation of the invertebrate diversity in North Orissa University (NOU) campus situated in Mayurbhanj District, Odisha. The study aims to maximize and estimate the invertebrate diversity as well as ecological value. Our aim is to develop the green space of the current estate and to contribute, whereas possible, to local, regional and national biodiversity targets. Inside the NOU campus, varieties of ornamental trees *Syagrus romanzoffiana*, *Zinnia peruviana*, *Murraya paniculata*, and *Cassia fistula* have been planted, and many species of butterflies *Ariadne ariadne*, *Danaus chrysippus*, *Melanitis leda*, and *Polyura athamas* provide aesthetic value.



Study area map.

The NOU campus (21.9299^0 N, 86.7658^0 E) of 98 acres is approximately 108 km away from Similipal Biosphere

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Road Network.

Reserve. The campus supports a high diversity of plants including several rare, exotic, as well as native species. The entire campus is rich with green vegetation having garden lands, botanical garden, large trees, shrubs, herbs and grasses of different types. The whole campus has a good concrete road network.

Detailed field surveys were carried out daily from 28 September 2019 to 10 March 2020. Both direct and indirect sampling methods were employed to understand the diversity of invertebrate (butterfly, spider, dragonfly, damselflies) and other insects. The survey covered the autumn (20–30 ^{0}C) and winter (15–28 ^{0}C) seasons. Besides, several trapping methods, random walks, survey transects, trap stations, and point counts were established at each sampling site. The survey was carried out by three persons for a minimum of four hours during each sampling period twice a day (0600–0800 h and 1600–1800 h) for seven days at each site. The invertebrate fauna was observed using the quadrant method and the Lepidoptera, Aranea, Odonata, and Hymenoptera were recorded by frequency of occurrence. For the study of moths as well as other nocturnal invertebrates, we used light trap method and details of the invertebrate-specific methodology using related literature.

The identifications were done by experts, field guides, and relevant literature (Chapman & Capco 1951; Raju & Ramachandran 2016). The use of digital gears (cameras and head torch), butterfly nets, etc. for digital collections and identifications (photos, audio-video clips of different activities of invertebrates) were carried out during the survey. Other observations like habitat, various life stages as well as direct and indirect sign like moults were also recorded. Blattodea, Coleoptera, and Orthoptera were studied by the direct sighting and indirect

Grassland.

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Table 1. Total number of invertebrate and the percentage of occurrence of invertebrate order in the present campus.

	Orders	Species	Percent occurrence
1	Araneae	28	19.71
2	Blattodea	3	2.11
3	Coleoptera	7	4.92
4	Decapoda	1	0.70
5	Diptera	7	4.52
6	Haplotaxida	3	2.11
7	Hemiptera	4	2.81
8	Hirudinida	1	0.70
9	Hymenoptera	8	5.63
10	Lepidoptera	44	30.98
11	Mantodae	1	0.70
12	Orthoptera	5	3.52
13	Odonata	17	11.57
14	Phasmatodea	1	0.70
15	Polydesmida	2	1.40
16	Scolopendromorpha	1	0.70
17	Scorpiones	1	0.70
18	Scutigeromorpha	1	0.70
19	Spirobolida	2	1.40
20	Stylommatophora	5	3.52
Total recorded species		**142**	**100**

signs, like moults, as road kills, and calls along transects as well as quadrants. For measuring the percentage of occurrence of families we used the following formula (Basavarajappa 2006).

$$\text{Percentage Occurrence} = \frac{\text{No. of species of each Family}}{\text{Total no. of different species seen}} \times 100$$

A total of 142 species of invertebrates from 20 orders belonging to 56 families were recorded – the order of Araneae (spiders), Blattodea (roaches and cockroaches), Coleoptera (beetles), Decapoda (crabs), Diptera (flies), Haplotaxida (earthworms), Hemiptera (plant-bug), Hymenoptera (wasps, bees and ants), Hirudinida (leeches) Lepidoptera (butterfly and moth), Libellulidae (skimmers), Mantodae (mantis), Odonata (dragonfly and damselfly), Orthoptera (grasshoppers and crickets), and Phasmatodea (stick insects, stick-bugs), and other insects. One species of ant Dorylus laevigatus was found invasive.

Araneae

A total of 28 species belonging to six families were recorded. Araneidae was recorded as having highest species richness followed by Salticidae, Oxyopidae, Lycosidae, Tetragnathidae, and Pisauridae. Field guides and literature review (Gajbe 2008; Choudhury et al. 2019) helped in the identification alon with expert help.

Odonata

For the identification of odonates, we used the field guides (Subramanian 2005; Nair 2011), experts' help, and various other research papers (Kalita et al. 2014; Silsby 2011). A total of 17 species were recorded belonging to four families from which, Libellulidae was recorded highest species richness, followed by Coenagrionidae, Aeshnidae and lastly Platycnemididae.

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Table 2. List of Araneae.

	Order	Family	Scientific name	Guild	Distribution in Campus
1.	Araneae	Araneidae	*Eriovixa laglaizei*	Orb-weaver spider	C
2.			*Laucage tessellate*	Long- jawed orb weavers	C
3.			*Aranus bilunifer*	Orb-weaver spider	C
4.			*Araneus mitificus*	Orb-weaver spider	C
5.			*Larinia* sp.	Orb-weaver spider	UC
6.			*Argiope aemula*	Signature spider	A
7.			*Neoscona* sp.	Orb-weaver spider	A
8.			*Argiope minuta*	Signature spider	C
9.			*Cyclosa confraga*	Orb-weaver spider	C
10.			*Cyclosa insulana*	Orb-weaver spider	R
11.			*Cylosa spirifera*	Orb-weaver spider	R
12.			*Nephilia pilipes*	Golden orb-web spider	A
13.			*Cyclosa hexatuberculata*	Orb-weaver spider	C
14.			*Thwaitesia* sp.	Mirror spider	C
15.			*Zygeilla* sp.	Orb-weaver spider	A
16.		Lycosidae	*Hippasa* sp.	Wolf spider	C
17.		Oxyopidae	*Oxyopes salticus*	Lynx spider	UC
18.			*Oxyopes bharatae*	Lynx spider	UC
19.			*Peucetia viridians*	Lynx spider	C
20.			*Oxyopes javanus*	Lynx spider	C
21.		Pisauridae	*Dendrolycosa gitae*	Nursery web spider	C
22.		Salticidae	*Marpissa decorate*	Jumping spider	C
23.			*Thyene imperialis*	Jumping spider	C
24.			*Stenaelurillus gabrieli*	Jumping spider	C
25.			*Hyllus semicupreus*	Jumping spider	UC
26.			*Stenaelurillus gabrieli*	Jumping spider	C
27.			*Harmochirus branchiatus*	Jumping spider	UC
28.		Tetragnathidae	*Leucauge decorate*	Long- jawed orb weavers	UC

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Table 3. List of Lepidoptera.

	Order	Family	Scientific Name	Common Name	Distribution in Campus
1.	Lepidoptera	Hesperiidae	*Potanthus omaha*	Lesser Dart	R
2.			*Tanaecia lepidea*	Grey Count	R
3.			*Cigaritis vulcanus*	Common Silverline	R
4.			*Anthene lycaenina*	Common Pointed Cilliatedblue	R
5.			*Castalius rosimon*	Common Pierrot	UC
6.			*Acytolepis Puspa*	Common Hedge Blue	UC
7.		Lycaenidae	*Loxura atymnus*	Common Yamfly	C
8.			*Curetis thetis*	Indian Sunbeam	R
9.		Nymphalidae	*Ariadne ariadne*	Angled Castor	C
10.			*Acraea terrpsicore*	Tawny Coster	C
11.			*Yipthima huebneri*	Common Fourring	C
12.			*Danaus chrysippus*	Plain Tiger	C
13.			*Hypolimnas bolina*	Great Eggfly	R
14.			*Melanitis leda*	Common Evening Brown	C
15.			*Junonia almana*	Peacock Pansy	R
16.			*Junonia atlitles*	Grey Pansy	R
17.			*Ariadne merione*	Common Castor	UC
18.			*Elymnias hypermnestra*	Common Palmfly	R
19.			*Moduza procris*	Commander Butterfly	R
20.			*Euploea sylvester*	Double Branded Crow	C
21.			*Neptis hylas*	Common Sailor	R
22.			*Junonia orithya*	Blue Pansy	R
23.			*Mycalesis perseus*	Bush Brown	UC
24.			*Phalanta phalantha*	Common Leopard	R
25.			*Polyura athamas*	Common Nawab	R
26.			*Euthalia nais*	Baronate	R
27.			*Vanessa cardui*	Painted Lady	R
28.		Pailionidae	*Pachliopta aristolochiae*	Common Rose	R
29.			*Papilio demoleus*	Lime Butterfly	R
30.			*Graphium Agamemnon*	Tailed Jay	R
31.			*Graphium policenes*	Common Swordtail	R
32.		Pieridae	*Eurema hecabe*	Common Grass Yellow	C
33.			*Delias eucharis*	Common Jezebel	UC
34.			*Catopsilia Pomona*	Common Emigrant	C

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	Order	Family	Scientific Name	Common Name	Distribution in Campus
35.	Lepidoptera	Pieridae	*Eurema blanda*	Three Spotted Grassyellow	UC
36.			*Cepora nerissa*	Common Gull	UC
37.		Cambridae	*Samea multiplialis*	Salvinia Stem Borer	C
38.			*Cnaphalocrocis medianails*	Rice Leafroller	C
39.			*Pyrausta purpuralis*	Mint Moth	R
40.		Erebidae	*Mocis frugalis*	Sugarcane Looper	C
41.			*Argina astrea*	Crotalaria Podborer	UC
42.			*Amata huebneri*	Wasp Moth	C
43.		Geometridae	*Scopula ornata*	Lace Border	C
44.		Noctuidae	*Chalciope mygdon*	Triangular Striped Moth	R

Table 4. List of Odonata.

	Order	Family	Scientific Name	Common Name	Distribution in Campus
1	Odonata	Aeshnidae	*Gynacantha dravida*	Indian Dusk Hawker	A
2		Libellulidae	*Orthetrum pruinosum*	Crimson Tailed Marsh Hawk	C
3			*Protamarcha congener*	Common Chaser	C
4			*Brachydiplax farinose*	Emaraled Flanked Marsh Hawk	UC
5			*Urothemis signata*	Greater Crimson Glider	C
6			*Orthetrum Sabina*	Green Marsh Hawk	A
7			*Diplocodes trivialis*	Ground Skimmer	C
8			*Brachydiplax sobrina*	Little Blue Marsh Hawk	UC
9			*Brachydiplax chalybea*	Rufous backed Marsh Hawk	C
10			*Pantala flavescens*	Wandering Glider	R
11		Coenagrionidae	*Ceriagrion coromandelium*	Coromandel Marsh Dart	C
12			*Ischnura aurora*	Golden Dartlet	A
13			*Agriocnemis lecteola*	Milky Dartlet	C
14			*Agriocnemis femina*	Pruinosed Dartlet	R
15			*Pseudagrion decorum*	Three Striped Blue Dart	UC
16			*Agriocnemis pygmaea*	Wandering Midget	C
17		Platycnemididae	*Copera marginipes*	Yellow Bush Dart	C

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Table 5. Checklist of other invertebrates.

	Order	Family	Scientific Name	Common name / Guild	Distribution in Campus
1.	Blattodea	Blattidae	*Blatta orientalis*	Oriental cockroach	C
2.			*Periplaneta americana*	Bombay canary	A
3.		Rhinotermitidae	*Coptotermes gestroi*	Formosan subterranean termite	A
4.	Coleoptera	Carabidae	*Anthia sexguttata*	Six spotted tiger beetle	C
5.		Coccinellidae	*Coccinella septempunctata*	Seven spotted lady beetle	C
6.			*Harmonia axyridis*	Asian multicorored lady beetle	C
7.		Lampyridae	*Lampyris noctiluca*	Common glow worm	C
8.		Scarabaeidae	*Oryctes rhinoceros*	Coconut rhinoceros bettle	C
9.			*Onthophagus cervus*	Dung beetle	A
10.		Tenebrionidae	*Tenebrionidae alphitobius*	Long jointed beetle	C
11.	Decapoda	Portunidae	*Scylla serrata*	Mud crab	C
12.	Diptera	Culicidae	*Anopheles culifacies*	Mosquito	C
13.			*Anopheles jamesii*	Mosquito	C
14			*Anopheles karwari*	Mosquito	C
15.			*Culex bitaeniorhynchus*	Mosquito	C
16.		Rhiniidae	*Stomorhina melastoma*	Fire fly	C
17.		Sarcophagidae	*Sarcophaga nodosa*	Flesh fly	C
18.		Tipulidae	*Cranefly Spp*	Crane fly	C
19.	Haplotaxida	Glossoscolecidae	*Pontoscolex corethrurs*	Earthworm	C
20.		Megascolecidae	*Amynthas corticis*	Earthworm	C
21.			*Perionyx excavates*	Earthworm	C
22.	Hemiptera	Coreidae	*Anasa tristis*	Squash bug	C
23.			*Leptoglossus opposites*	Leaf footed bug	C
24.		Pentatomidae	*Halyomorpha halys*	Brown marmorated stink bug	C
25.		Pyrrhocoridae	*Dysdercus cingulatus*	Red cotton stainer	C
26.	Hirudinida	Hirudinidae	*Hirudinaria manillensis*	Asian medicinal leech	R
27.	Hymenoptera	Apidae	*Apis mellifera*	Honey bee	C
28.		Formicidae	*Oecophylla smaragdina*	Weaver ant	A
29.			*Paratrechina longicornis*	Black crazy ant	A

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	Order	Family	Scientific Name	Common name / Guild	Distribution in Campus
30.	Hymenoptera		*Camponotus pennsylvanicus*	Black carpenter ants	C
31.			*Solenopsis geminate*	Fire ant	C
32.			*Dorylus laevigatus*	Driver ants	R
33.		Sphecidae	*Sphex lucae*	Thread waisted wasp	C
34.		Vespidae	*Ropalidia marginata*	Yellow paper wasp	A
35	Mantodae	Mantidae	*Statilia maculate*	Mantis	C
36.	Orthoptera	Acrididae	*Gesonula punctifrons*	Oyxa grasshopper	A
37.			*Patanga succinct*	Bombay locusts	C
38.		Gryllidae	*Acheta domesticus*	House cricket	A
39.		Gryllotalpidae	*Gryllotalpa orientalis*	Oriental mole cricket	C
40.		Pyrgomorphidae	*Atractomorpha crenulata*	Tobacco grasshoppers	C
41.	Phasmatodea	Lonchodidae	*Carausius morosus*	Indian stick insect	C
42.	Polydesmida	Paradoxosomatidae	*Chondromorpha xanthotricha*	Millipede	A
43.			*Oxidus gracilis*	Hothouse millipede	A
44.	Scolopendromorpha	Scolocrylopidae	*Scolopocryptops sexspinosus*	Bark centipede	C
45.	Scorpiones	Scorpionidae	*Heterometrus bengalensis*	Indian Black Scorpion	C
46.	Scutigeromorpha	Scutigeridae	*Scutigera coleoptrata*	House centipede	C
47.	Spirobolida	Spirobolidae	*Narceus americanus*	Worm millipede	A
48.		Trigoniulidae	*Trigoniulus corallines*	Common Asian millipede	A
49.	Stylommatophora	Achatinidae	*Achatina fulica*	Giant African Snail	C
50.		Ariophantidae	*Ariophanta laidlayana*	Air breathing land snail	C
51.			*Ariophanta interrupta*	Air breathing land snail	C
52.			*Macrochlamys indica*	Air breathing land snail	A
53.		Planorbidae	*Indoplanorbis existus*	Air-breathing freshwater snail	C

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Junonia atlites. © Parvez Khan.

Junonia almana. © Prajna Parimita Sahoo.

Chondromorpha xanthotricha. © Parvez Khan.

Orthetrum Sabina. © Parvez Khan.

Anthia sexguttata. © Parvez Khan.

Argiope minuta. © Prajna Parimita Sahoo.

Nephila pilipes. © Parvez Khan.

Gesunula punctifrons. © Subhadra Barik.

Ceriagrion coromandelium. © Prajna Parimita Sahoo.

Dysdercus cingulatus. © Prajna Parimita Sahoo.

Dorylus laevigatus. © Prajna Parimita Sahoo.

Ropalidia marginata. © Parvez Khan.

Coptotermes gestroi. © Parvez Khan.

A Hive of Honeybee. © Parvez Khan.

A Termitarium. © Parvez Khan.

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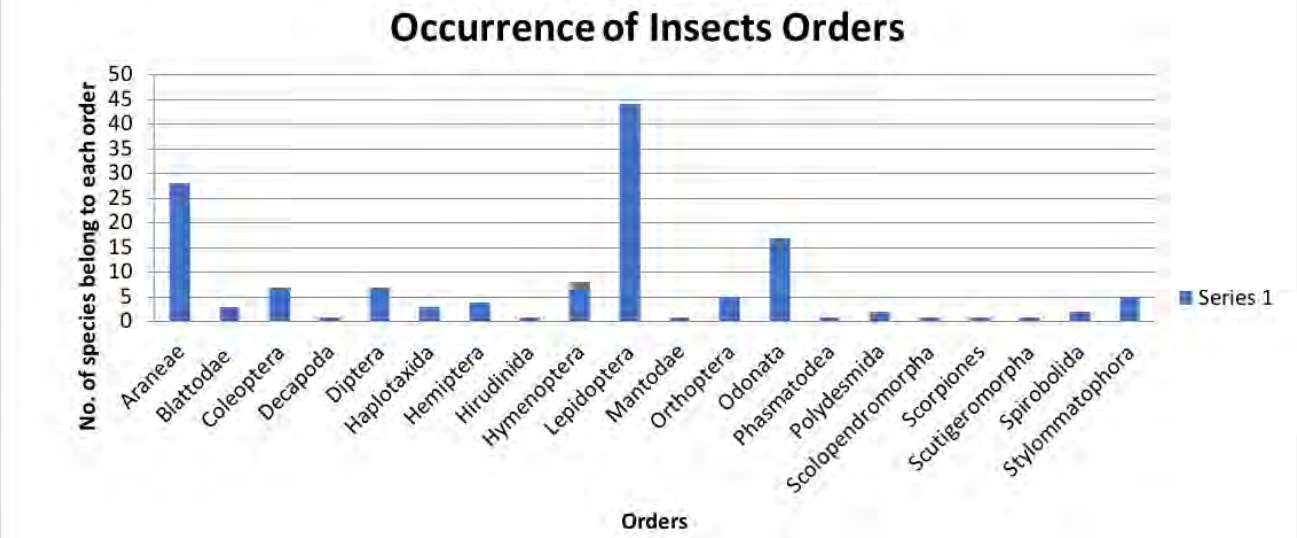
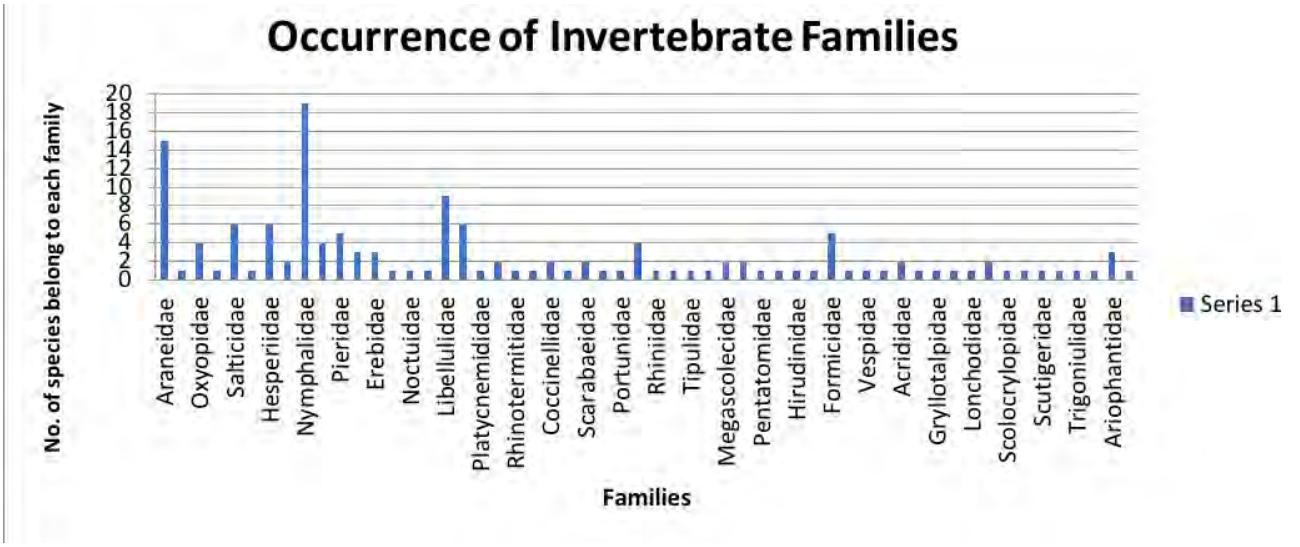


Occurrence of Insect orders recorded from the campus.



Occurrence of Invertebrate families recorded from the campus.

Damselfly species *Orthetrum pruinosum* and *Orthetrum sabina* were observed abundant and one species *Pantala flavescens* was observed only two times.

Hymenoptera

The hymenopterans including ants *Campanotus* sp. and *Dorylus laevigatus*, *Oecophylla* sp., *Paratrechina* sp., *Solenopsis* sp., bees *Apis millifera* wasps *Ropalidia marginata*, *Sphex* sp.) were reported in the diet of the Jungle Owlet and Spotted Owlet. A total of eight species belonging to four families were recorded from the whole study area. Among all the orders, Apidae, showed highest species richness followed by

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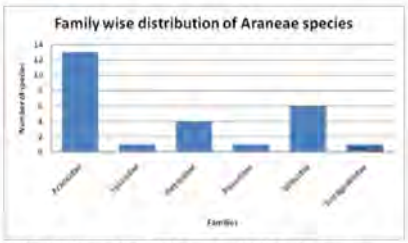

Fig 3. Species richness of the Araneae families recorded from the campus

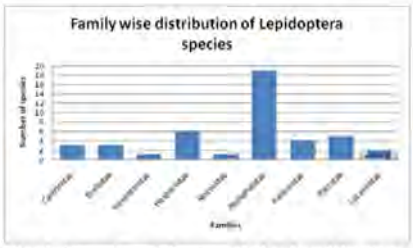

Fig 4. Species richness of the Lepidoptera families recorded from the campus

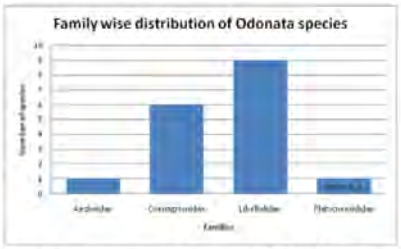

Fig 5. Species richness of the Odonata families recorded from the campus

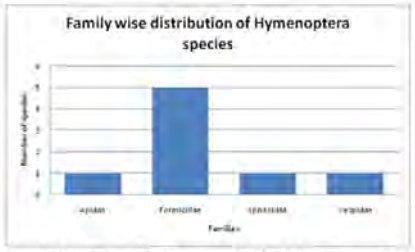

Fig 6. Species richness of the Hymenoptera families recorded from the campus

Formicidae, Sphecidae, and Vespidae recorded during this survey. For the identification of species name and family, we used field guide (Chapman & Capco 1951; Subramanian 2005) and relevant literature (Sureshan 2009).

Lepidoptera

According to the survey, a total of 44 species belonging to nine families were recorded. The order Nymphalidae recorded highest species richness followed by Hesperiidae, Pieridae, Pailionidae, Cambridae, Erebidae, Lycaenidae, Geometridae, and Noctuidae. For the identification of Lepidopterans, we used field guides (Raju & Ramachandran 2016), relevant literatures like (Nerlekar et al. 2016). Some species of butterflies *Polyura athamas*, *Phalanta phalantha*, *Hypolimnas bolina*, and *Tanaecia lepidea* were noticed only one or two times.

Coleoptera

From the order Coleoptera, eight species belonging to five families were recorded, and *Anthia sexguttata* was noticed only one time. Two families of Coleoptera, i.e., Coccinellidae and Scrabaeidae, were reported having two species each, and Carabidae, Lampyridae, & Tenebrionidae were reported having one species each. The checklist is following Kharel et al. (2020).

Blattodea

Three species of Blattodea belong to two families (Blattidae & Rhinotermitidae) were reported. We observed many terminarium and used shadow estimation method for measuring the height (approximately 3.5 m height) of *Coptotermes gestroi's* terminarium.

Besides this, other members of invertebrate order like Stylommatophora were recorded. Five species belonging to three families, Homoptera, Decapoda, Diptera, Haplotaxida, Hemiptera, Isoptera, Hirudinidae (Leech), Mantodae, Orthoptera, Phasmatodea, Polydesmida, Scolopendromorpha, Scorpiones, Scutigeromorpha

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and Spirobolida were reported but in low species occurrence. The research paper (Nagpal & Sharma 1984) and (Nguyen 2007) were used for understanding about millipede and mosquito.

Conclusion

Since it is a preliminary study on the diversity of invertebrate, a lot of research is essential for the same and further collections are needed for getting a detailed record of the invertebrate diversity in NOU. We recognize that activities like changing land-use in form of development inside the campus, habitat loss in form of littering, fire, and removal of herbaceous and arboreal vegetation create a great threat to the invertebrate diversity.

References

Basavarajappa, S. (2006). Avifaunal of agro-ecosystems of Maidan area of Karnataka. *Zoos' Print Journal* 21(4): 2217–2219. https://dx.doi.org/10.11609/JoTT.ZPJ.1277.2217-9
Chapman, J.W. & S.R. Capco (1951). Checklist of the ants (Hymenoptera: Formicidae) of Asia. *Monographs of the Institute of Science and Technology Manila* 1: 1–327.
Choudhury, S.R., M. Siliwal & S.K. Das (2019). Spiders of Odisha: a preliminary checklist. *Journal of Threatened Taxa* 11(9): 14144–14157. https://doi.org/10.11609/jott.3786.11.9.14144-14157.
Gajbe, U.A. (2008). *Fauna of India and the Adjacent Countries: Spider* (Arachnida: Araneae: Oxyopidae). Zoological Survey of India, Volume 3, 117 pp.
Kalita, G.J., B. Boruah & G.N. Das (2014). An observation on odonata (damselflies and dragonflies) fauna of Manchabandha Reserve Forest, Baripada, Odisha. *Pelagia Research Library* 5(1): 77–83.
Kharel, B.P., P. Schoolmeesters & S.K. Sarkar (2020). A first faunistic account on the Onthophagus Latreille, 1802 (Coleoptera, Scarabaeidae, of the Nadia District, West Bengal, with a preliminary checklist from India. *Check List* 16(2): 361–381.
Nair, M.V. (2011). *Dragonflies & Damselflies of Orissa and Eastern India.* Wildlife Organisation, Forest & Environment Department, Government of Orissa, 254 pp.
Nagpal, B.M. & V.P. Sharma (1984). Mosquitoes of Coastal Orissa. *Indian Journal of Malariology* (20):141–145.
Nerlekar, A.N., A.M. Warudkar, G.G. Gowande, S.S. Salve, A. Raut, S.R. Patankar & S.B. Nalavade (2016). A review of the faunal diversity of the Fergusson College campus, Pune, India. *Zoos' Print* XXXI(10): 4–25.
Nguyen, D.A. (2007). Notes on the millipede fauna of the Phong Nha – Ke Bang region. The Rufford SGF Report.
Raju, D. & S. Ramachandran (2016). *Photographic Filed Guide: Wildlife of Central India*. Notion Press, Chennai, 360 pp.
Silsby, J. (2011). *Dragonflies of the World*. Natural History Museum in association with CSIRO Publishing, UK and Europe, 216 pp.
Subramanian, K.A. (2005). *Dragonflies and Damselflies of Peninsular India- A field Guide*. Project Lifescape. Centre for Ecological Sciences, Indian Institute of Bangalore and Indian Academy of Sciences, Bangalore. URL: http://www.ias.ac.in/Publications/Overview/Dragonflies
Sureshan, P.M. (2009). On a collection of Chalcidoidea (Hymenoptera: Insecta) from Orissa, India, *Records of the Zoological Survey of India* 109(4): 87–104.
Wilson, E.O. (1987). The little things that run the world (the importance of and conservation of invertebrates). *Conservation Biology* 1(3): 44–346.

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Macrosiphum fagopyri feeding on *Fagopyrum dibotrys* in the Sikkim and Darjeeling Himalaya

Sikkim Himalaya is the part of the biological hotspot of the world and bestowed rich fauna and flora where the aphid diversity cannot be ignored as these creatures depend on food plants to a large extent.

Fagopyrum dibotrys (D.Don) Hara is the potential medicinal plant for curing several ailments (Watanabe 1998) and contains appreciable amounts of rutin, but it was noted that it was affected by the aphid, *Macrosiphum fagopyri* Ghosh & Raychaudhuri, 1972, found underneath the leaves in the Sikkim and Darjeeling Himalaya. So, these were considered for the study of rutin content in both aphid and food plant. The plant specimen, *Fagopyrum dibotrys*, was collected from the Sikkim Himalaya, Gangtok, and investigated its active principle correlating with the content of the *Macrosiphum fagopyri*. The method of Sakamato & Takamua (1978) followed to isolate the rutin from the leaves and aphid using the methanol extract.

***Macrosiphum fagopyri* Ghosh & Raychaudhuri, 1972.**

New record: *Macrosiphum fagopyri* Ghosh & Raychaudhuri, 1972; 27.3353^0 N & 88.6186^0 E; Date of Collection :13.06.1998. Deposited: QCL-HARC, Sikkim; Coll. D.K Pradhan. *Fagopyrum dibotrys* (D.Don) H. Hara, Fl. E. Himal. 69. 1966; *Polygonum cymosum* Trevian Delect Sem. Hor Vartisl. 1824; *Polygonum dibotrys* D. Don, Prodr. Fl. Nepal. 73. 1825.

Fagopyrum dibotrys is a source of rutin having the potential of production of rutin in 4.8 to 8.5% (Basu & Pradhan 2000). There are three species of *Fagopyrum* namely, *F. tataricum* (L.) Gaertn., *F. esculentum* Moench, and *F. dibotrys*, found in Sikkim. Moreover, there is the report of existence of two varieties

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of *F. dibotrys*, inter alias, *F. dibotrys* var. *alba* Basu & Pradhan and *Fagopryum dibotrys* var. *dibotrys* (Basu & Pradhan 2000; Pradhan 2020).

It was observed that the aphids affected the young as well as the mid-aged leaves of the plant. Thus, the aphid specimen studied and identified as *Macrosiphum fagopyri* Ghosh & Raychaudhuri,1972 referring to the literatures (Chakrabarti 1972; Chakarbarti et al. 1972b; Ghosh & Raychaudhuri 1972; Ghosh 1980; Raychaudhuri 1980). In addition to this, there were some reports of *F. macutatum* (Lehm.) Mansf. ex Hammer as the aphid's food (Chakrabarti 1972; Ghosh 1980; Raychaudhuri 1980). Referring to the UV spectrophotometer and infra–red peaks as well as relative flows of the isolated crystals of aphid's methanolic extract, it was confirmed that the aphids contained the rutin in appreciative amounts. This finding indicates that the rutin content in *Macrosiphum fagopyri* Ghosh & Raychaudhuri 1972 may have biological role, as ecdysone, for the aphids moulting which supports similar studies on the roles of rutin in the aphid moulting (Horwath & Stamp 1993).

Conclusion

The occurrence of *Macrosiphum fagopyri* on the food plant *Fagopyrum dibotrys* in the Sikkim and Darjeeling Himalaya is a new report.

References

Basu, P.K. & D.K. Pradhan (2000). A new report on the availability of two varieties of *Fagopyrum dibotrys* (D.Don) Hara in the Darjeeling and Sikkim Himalayas. *Journal of Hill Research* 13(1): 24–27.

Chakrabarti, S. (1972). *Aphids of north western India with special reference to Kumaon range, Uttar Pradesh*. Ph.D. Thesis. University of Calcutta, India, 435pp.

Chakrabarti, S., A.K. Ghosh & D.N. Raychaudhuri (1972). A new genus, a new species and further records of aphids (Homoptera, Aphididae) from the Kumaon Hills, northwest Himalaya. India. *Oriental Insects* 6: 387–400.

Ghosh, A.K. (1980). Floral assemblage and faunal diversity in Aphidoidea (Homoptera: Aphididae) in eastern India. *Bulletin Zoological Survey of India* 2: 171–176.

Ghosh, A.K. & D.N. Raychaudhuri (1972). Studies on the aphids (Homoptera Aphididae) from eastern India XIII New species and new records from Assam. *Oriental Insects* 6(3): 371–386.

Horwath, K.L. & N.E. Stamp (1993). Use of dietary rutin to study molt initiation in Manducasexta larvae. *Journal of Insect Physiology* 39(11):987–1000.

Pradhan, D.K. (2020). *A Chemotaxonomic approach of an ethnomedicine*, Uluberia Botanical Institute, Howrah.

Raychaudhuri, D.N. (1980). *Aphids of northeast India and Bhutan*.The ZoologicalSociety, Calcutta, 521pp.

Sakamoto, M. & K. Takamura (1978). Consecutive determination of rutin and quercetin by spectrophotometric measurements. *Micro chemical Journal* 23:374–383.

Watanabe, M. (1998). Catechins as antioxidants from buckwheat (*Fagopyrum esculentum* Moench) groats. *Journal of Agricultural and Food Chemistry* 46(3): 839–855.

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A note on common and vernacular names for tiger moths of the genus *Olepa*

The system of scientific naming of an organism is binomial nomenclature, where the scientific name will be having two components. The first component is the generic name or the genus and the second component is the species epithet which is usually a qualifier, like an adjective or a noun in the genitive case. The system of binomial nomenclature was proposed by the Swedish botanist and physician, Carolus Linnaeus in the mid 1700s. Due to his contribution in the field of taxonomy, Linnaeus is known as the 'father of taxonomy'. Taxonomy is a branch of biology of naming, describing, and classifying organisms and includes all plants, animals, fungi, and microorganisms. This system of naming species begins with assigning all species a universal Latin name. All the faunal taxonomic nomenclature and taxonomy is followed after the 'ICZN codes' managed by International Commission on Zoological Nomenclature (ICZN 2012).

Common English names and vernacular names are given to many taxa to locally connect with the people. Giving vernacular or common English name is useful to remember it easily and also to converse with the local people who are not comfortable with using the strange-sounding scientific names used by most of the taxonomists. While coining a vernacular or common English name, it should be kept in mind that they should be brief and descriptive. These names help bridge the gap between the scientist and the common man. The common people particularly farmers, nature enthusiasts and people working in other related fields of biology usually use common English or vernacular names than scientific names (Armstrong & Villet 2019). Communication with the local people to make them understand about goals of conserving the species may be promoted if the use of vernacular names is in practice (Vadivalagan et al. 2012; Cockburn et al. 2014; Bardekar et al. 2019).

The moth genus Olepa Watson, 1980 is from the family Erebidae and the subfamily Arctiinae. Recently, three new species and two new subspecies of *Olepa* moth, namely, *O. ghatmatha* Kalawate, 2020; *O. suryamal* Kalawate, 2020; *O. zedesi* Kalawate, 2020; *O. schleini chandrai* Kalawate, 2020 and *O. suryamal rekhae* Kalawate, 2020 (Kalawate 2020a, b) have been described from the northern Western Ghats, parts of Maharashtra, India. The caterpillars of these moths are polyphagous (Gaur & Kumar

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Table 1. Common English and Vernacular names (for species reported from India) suggested for tiger moth species from the genus *Olepa* Watson, 1980.

	Species of the genus *Olepa*	Suggested common English name	Suggested vernacular (Marathi) name
1.	*O. ocellifera* Walker, 1980	Spotted Tiger Moth	ठिपकेरी वाघ पतंग
2.	*O. duboisi* Orhant, 1986	Scarlet Tiger Moth	शेंदरी वाघ पतंग
3.	*O. kakatii* Orhant, 2000	Kakati's Tiger Moth	काकातीचे वाघ पतंग
4.	*O. ricini* Fabricius, 1775	Ricinus Tiger Moth	रिसिनस वाघ पतंग
5.	*O. schleini* Witt et al., 2005	Witt's Tiger Moth	विटचे वाघ पतंग
6.	*O. clavatus* Swinhoe, 1885	Striped Tiger Moth	पट्टेरी वाघ पतंग
7.	*O. toulgoeti* Orhant, 1986	Southern Indian Tiger Moth	दक्षिण भारतीय वाघ पतंग
8.	*O. koslandana* Orhant, 1986	Crimson Tiger Moth	तांबडा वाघ पतंग
9.	*O. coromandelica* Dubatolov, 2011	Coromandel Tiger Moth	कोरोमंडलचा वाघेरी पतंग
10.	*O. ghatmatha* Kalawate, 2020	Ghatmatha Tiger Moth	घाटमाथाचे वाघ पतंग
11.	*O. suryamal* Kalawate, 2020	Suryamal Tiger Moth	सूर्यमाळचे वाघ पतंग
12.	*O. zedesi* Kalawate, 2020	Zedesi Tiger Moth	झेडेसायचे वाघ पतंग
13.	*O. schleini chandrai* Kalawate, 2020	Chandra's Tiger Moth	चंद्राचे वाघ पतंग
14.	*O. suryamal rekhae* Kalawate, 2020	Rekha's Tiger Moth	रेखाचे वाघ पतंग

2019) and recorded on feasting upon many economically important agricultural and horticultural crops. They are recorded on *Calotropis* sp., *Camellia sinensis*, *Campsis grandiflora*, *Gossypium* sp., *Ricinus communis*, *Helianthus annuus*, *Zea mays*, *Coccinia grandis*, *Solanum melongena*, *Ipomoea batatas*, *Musa* sp., and cucurbits (Shubhalaxmi 2018). This genus is mainly distributed in southern and southeastern Asia (Walker 2007) with the only exception of *O. schleini* Witt et al., 2005 from Israel (Kalawate et al. 2020a). There are a total of 14 species and two subspecies reported from this genus from the world (Kalawate et al. 2020b). In the present paper I propose English common name and vernacular names to the newly described species along with the other species from the genus (Table 1).

These vernacular/common/local names are expected to be useful for communicating with the local public and documentation of the moth details for the Peoples Biodiversity Registers (PBR), State Biodiversity Authorities (SBA) as well as National Biodiversity Authorities (NBA). Also, some of them are pests for some of the food crops and the common names are handy for the farmers and agriculturists.

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References

Armstrong, A.J. & M.H. Villet (2019). Checklist, endemism, English vernacular names and identification of the cicadas (Insecta, Hemiptera, Cicadidae) of KwaZulu-Natal, South Africa. *African Invertebrates* 60(2): 165–193. https://doi.org/10.3897/afrinvertebr.60.35130.

Bardekar, V., R. Kasambe, H. Ogale, D. Thombre & J. Wadatkar (2019). *Marathi names of Butterflies in Maharashtra*. Maharashtra State Biodiversity Board, Pune, 120 pp.

Cockburn, J.J., B. Khumalo-Seegelken & M.H. Villet (2014). IziNambuzane: IsiZulu names for insects. *South African Journal of Science* 110(9/10): 1–13. https://doi.org/10.1590/sajs.2014/20130292.

Gaur, S.K. & K.A. Kumar (2019). Comparative bioefficacy of seed and root extracts of a medicinal plant, *Withania somnifera* when administered to prepupae of lepidopteran insects, *Spodoptera litura* (Lepidoptera: Noctuidae) and *Pericallia ricini* (Lepidoptera: Arctiidae). *Journal of Basic and Applied Zoology* 80: 37. https://doi.org/10.1186/s41936-019-0107-1.

ICZN (2012). Amendment of Articles 8, 9, 10, 21 and 78 of the International Code of Zoological Nomenclature to expand and refine methods of publication. *Zookeys* (219):1–10. doi:10.3897/zookeys.219.3994.

Kalawate, A.S., S. Pawara, A. Shabnam & K.P. Dinesh (2020a). DNA Barcode revealed the occurrence of Paleartic *Olepa* schleini Witt, Müller, Kravchenko, Miller, Hausmann & Speidel, 2005 (Lepidoptera, Erebidae, Arctiinae) from the peninsular India with the report of morphological variations and a new sub species. *Journal of Threatened Taxa* 12(9): 16143–16152. https://doi.org/10.11609/jott.5596.12.9.16143-16152.

Kalawate, A.S., K.P. Dinesh & A. Shabnam (2020b). DNA barcoding unravels three new species and a subspecies of *Olepa* Watson, 1980 (Lepidoptera, Erebidae, Arctiinae) from India, with morphotypes. *Journal of Insect Biodiversity* 19(2): 044–060. https://doi.org/10.12976/jib/2020.19.2.2

Shubhalaxmi, V. (2018). *Field Guide to Indian Moths*. Birdwing Publishers, India, 461 pp.

Vadivalagan, C., C. Gunasekaran & I. Salahudeen (2012). Molecular phylogeny of recurrent road killed butterflies in Nilgiri biosphere reserve, India, using CO1 gene marker. *African Journal of Biotechnology* 11(79): 14433–14439.

Walker, K. (2007). Oriental tiger moth (*Olepa* c.f. *ricini*) Updated on 9/20/2007 10:58:19 AM Available from http://www.padil.gov.au/ pests-and-diseases/pest/main/136351/7683# (Accessed 23 September 2019).

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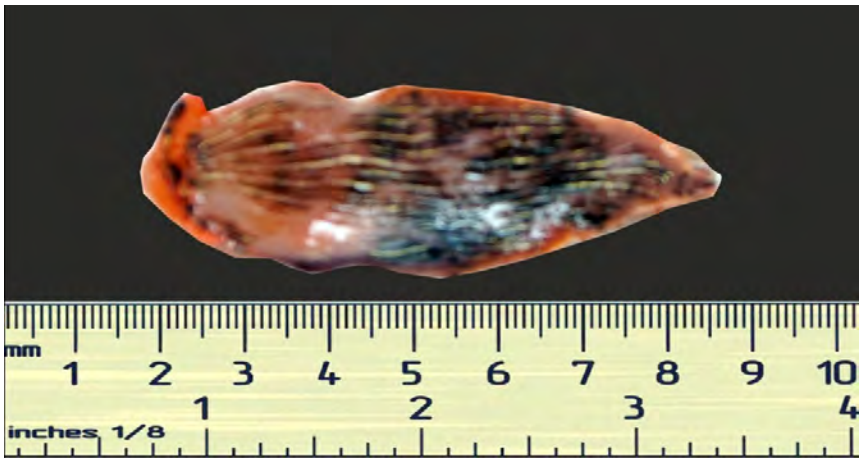
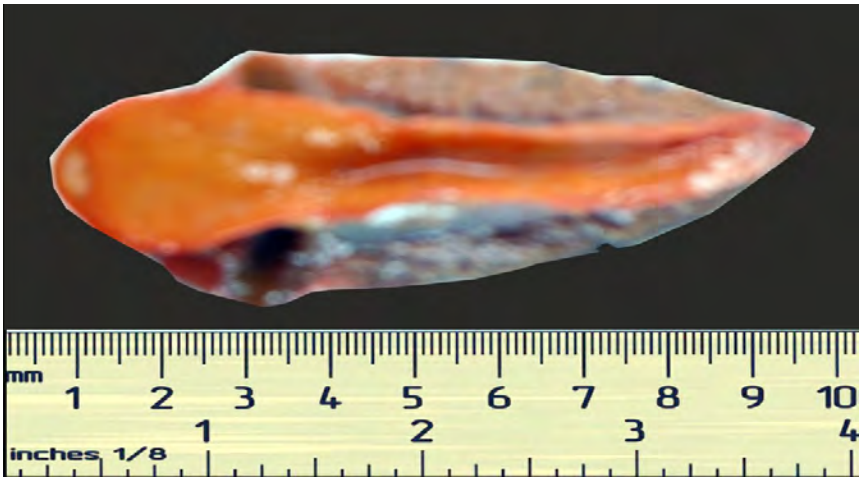
New locality records of the sea slug *Armina juliana* from Puducherry coastal waters, India

The Arminidae constitutes a poorly known group of living nudibranchs occurring mainly in deep waters. Nearly 75 nominal species divided into six genera have been described (Kolb & Wagele 1998). It inhabits burrows in the sediment, mainly in deeper waters; and little is known of its biology (Marcus & Marcus 1960).



Dorsal view of *Armina juliana* from Puducherry coast, India.



Ventral view of *Armina juliana* from Puducherry coast, India.

Characteristics shared by members of the family include an elongated, flattened body narrowing posteriorly, with longitudinal ridges or pustules on the notum, the latter bearing marginal sacs along its marginal edge; they have a distinct oral veil and retractile rhinophore with a caruncle in front; the radula typically having a broad denticulated rachidian tooth, and partly denticulated falciform laterals. All these characteristics, except for the caruncle and the subnotal lamellae, which probably have evolved within the Arminidae and are typical for some, but not all genera, are plesiomorphic and autapomorphies have yet been recognized for the Arminidae (Kolb 1998). The

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genus *Armina* has more than 50 nominal species and includes the more derived forms of the group. Although *Armina* exhibits a worldwide distribution, more species have been reported in the western Atlantic waters (Marcus & Marcus 1967; Kolb & Wagele 1998). In India, recently Sethi & Rajapackiam (2012) reported the species from Chennai coastal waters. Although several investigations of sea slugs in Indian waters exist, the occurrence and reporting of *Armina* spp. appears to be rare (Ramya et al. 2014). This report is a record of *Armina juliana* at Puducherry coastal waters, 150 km south of Chennai.

In a recent Invertebrate survey along the Puducherry coast, we observed one specimen of *Armina juliana* in trawl catches during the month of May 2019 at a depth of 50–150 m. The fishing gear operated for the above catch was 34 m fish trawl. External features were examined directly when specimens were available, by photographs, or by literature review (Ardila & Diaz 2002). No vouchers were collected, but the photo vouchers (MUZSP-121) have been deposited at the zoological collections in Department of Zoology, Sir Theagaraya College, Chennai, India.

Systematics

Class: Gastropoda Cuvier, 1797
Sub-class: Heterobranchia Brumeister, 1837
Order: Nudibranchia Cuvier, 1817
Family: Arminidae Rafinesque, 1814
Genus: *Armina* Rafinesque, 1814
Armina juliana Ardila & Diaz, 2002

The living animals are bright red in colour with contrasting white longitudinal notal ridges; the anterior margin of the oral veil and the apical portion of the rhinophores are also white. The body is elongated, flattened, narrowing posteriorly. The notum bears 34 longitudinal dorsal ridges, whose margins do not exhibit any black spots of pigment shimmer.

The oral veil is distinct. Two club-shaped rhinophores; each one with about 10 vertical lamellae. Eyes are visible through the epidermis at the outer base of each rhinophore. A caruncle is also distinguishable in front of the rhinophores. The genital opening is located on the right side, anterior to the branchial lamellae. The anal papilla is located slightly behind the midpoint (3/5 of total length, from anterior). There are 21 branchial lamella on each side of the body and 15 hyponotal lamellae.

A deep groove is present along the center of the foot sole. The pedal gland is white and located at the posterior end of the foot sole. Marginal sacs (each about 0.7 mm in diameter) are hardly distinguishable macroscopically on both sides just behind

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the branchial lamellae. The rachidian tooth is broad (112 µm) and bears 12 elongated denticles on either side of the median cusp. The first lateral tooth is short, bulky, and denticulated on the outer side of the cusp. The remaining lateral teeth are elongated and also bear denticles which become progressively smaller towards the marginal tooth rows.

Armina juliana can be distinguished from other species by one or more characters by the shape presence of radular teeth, branchial and hyponotal lamella, and distance between the rhinophores.

The species *A. juliana* looks similar to *Armina babai* but, some differential characters exist like pale yellow colour with a smooth body surface, and the notum have 35 longitudinal ridges; whereas, *A. juliana* have bright red body colour and white longitudinal notal ridges, having 34 longitudinal dorsal ridges; the number of branchial and hyponotal lamellae is smaller in *Armina juliana* compared with *Armina babai*. In addition, *Armina juliana* also differs from *Armina mulleri*, it has apparently a dark, opaque notum with light yellow or pale reddish ridges followed by the number of branchial and hyponotal lamellae. The species was originally described by Ardila & Diaz (2002), from the Caribbean coast of Columbia at a depth range of 310–460 m in the soft bottom sediments. It has also been reported from the isolated localities from Atlantic to eastern Pacific Ocean. In Indian waters, the species was first reported by Sethi & Rajapackiam (2012) from Chennai coastal waters. After seven years this species is again reported from the southeastern coast of Puducherry. The nudibranchs of the particular area are not well studied and the present study is part of the biodiversity exploration of the area.

Sea slug is known to possess anti-cancer compounds which are very useful in pharmacological and pharmaceutical industries. Dolastatin-10, ILX651, Cemadotin and Kahalalide-F are marine natural anti-cancer compounds derived from sea slugs which are under various stages of clinical trials (Haefner 2003). However, in India the sea slugs are considered as a low value by catch and hence discarded or used for poultry and fish feed production companies.

References

Ardila, N.E. & J.M. Diaz (2002). *Armina juliana* (Nudibranchia: Arminoidea: Arminidae), a new species from the southern Caribbean. *Boletin de Investigaciones Marinas y Costeras* 31: 25–31.

Haefner, B. (2003). Drugs from the deep: marine natural products as drug candidates. *Drug Discovery Today* 8: 536–544.

Kolb, A. (1998). Morphology, anatomy and histology of four species of *Armina* Rafinesque, 1814 (Nudibranchia, Arminoidea, Arminidae) from the Mediterranean Sea and Atlantic Ocean. *Journal of Molluscan Studies* 64: 355–386.

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Kolb, A. & H. Wagele (1998). On the phylogeny of the *Arminidae* (Gastropoda, Opisthobranchia, Nudibranchia) with considerations of biogeography. *Journal of Zoological Systematics & Evolutionary Research* 36: 53–64.

Marcus, E. & E. Marcus (1960). Opisthobranchs from American Atlantic warm waters. *Bulletin of Marine Sciences of the Gulf & Caribbean* 10: 129–203.

Marcus, E. &E. Marcus (1967). Some opisthobranchs from Sapelo Island, Georgio, USA. *Malacologia* 6: 199–222.

Ramya, M.S., S. Ravichandran & R. Anbuchezhian (2014). First discovery of *Armina babai* (Gastropoda, Nudibranchia, Arminoidea) from southeast coast of India. *Journal of Asia-Pacific Biodiversity* 7: 364–366.

Sethi, S.N. & S. Rajapackiam (2012). Occurrence of the sea slug, *Armina juliana* (Ardila and Diaz, 2002) off Chennai coast. *Marine Fisheries Information Series Technical & Extension Series*, No. 211.

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Unexpected sighting of Small Pratincole nest site in the Cauvery River in Tamil Nadu

Bird watching is a popular hobby the world over. Due to their varied lifestyles, conspicuousness, diurnal habits, interesting plumage, and calls, it attracts humans to observe them from time immemorial. Birds are also regarded as good subjects for exploring several questions of ecological and conservation significance (Urfi 2003). The Small Pratincole, a small wader from the pratincole family also called Little Pratincole *Glareola lactea* (Temminck, 1820) comes under the order Charadriiformes in the Glareolidae family. This species is distributed in the Indomalayan and Palearctic biogeographical regions (BirdLife International 2021), is a resident breeder in India.

The Small Pratincole is pale sandy grey in colour and has short legs and a short square-ended tail. The short beak is an adaptation to aerial feeding to catch the insects. The head is brown in colour. The wings are grey and have black primaries and blackish underwing-coverts in flight, the belly is white (Grimmett et al. 2011). Breeding starts from December to March on gravel or sandbanks near rivers and lakes, laying two to four eggs in a ground scrape. From the IUCN Red List, it

A Small Pratincole nest observed with eggs (1 & 2), chicks (3 & 4), incubating the eggs (5 & 6), and adult birds (7 & 8). © T. Siva.

Unexpected sighting

On 11 April 2021, I, along with a few bird enthusiasts had gone for bird watching along the Cauvery riverside near the Tropical Butterfly Park (10.876^0 N, 78.628^0 E) in Tiruchirappalli District, Tamil Nadu. We started observing birds from 0700 h and recorded around 54 species along the river bank. As we were observing across the river, I observed a small island that was formed in the center across the river due to the differential water flow. We sighted some bird movements on the island and on closer observation found it to be a Small Pratincole that was flying around and settling on the island and either sitting or walking along the island.

The water depth of the river up to the island was just about a feet and we managed to wade our way closer to the island with curiosity to look for more. When on the island, we observed the species near a nest with two eggs so we took care not to disturb the habitat and carefully counted around 12 nests with 23 eggs and two chicks, each placed a meter apart. Each nest had a maximum of three and a minimum of two eggs. However, since we did not walk up on the island and just surveyed the habitat walking around it, I assume there would be more nests in the range of 15 to 20. The eggs camouflaged with the sand colour having small brown spots on the eggshells. The newly hatched chicks were observed to have soft fluffy feathers. We then returned to prevent any disturbance to the nest site of the Small Pratincole. I later surveyed the literature for the nest sites of Small Pratincole. Though there are distribution records available, there is no information on nest sites for Tamil Nadu. This information can be helpful for the researchers to study this bird species, making this observation an important record for conserving the bird and its habitat along the Cauvery River.

References

BirdLife International (2021). Species factsheet: *Glareola lactea*. Downloaded from http://www.birdlife.org on 01.vii.2021.

Grimmett, R., C. Inskipp & T. Inskipp (2011). *Birds of the Indian subcontinent*. Oxford University Press, New Delhi. pp528.

Urfi, A.J. (2003). Breeding Ecology of Birds: Why do some species nest singly while others are colonial? *Resonance* 8(7): 22–32.

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A record of electrocution of Egyptian Vulture at Jorbeer, Rajasthan, India

Egyptian Vultures on pylon.

The Egyptian Vulture *Neophron percnopterus* is a resident species of northern India. It plays an important ecological role by removing municipal waste and animal carcasses.

Egyptian Vultures normally feed on carrion and generally prefer forested habitats to human-dominated areas. They quite often use electricity poles as resting sites during stopover in the winter time. This behaviour can have lethal penalty as some poles of the low-voltage networks in particular are awfully dangerous for the birds—when perching, and taking off—as they can get electrocuted. The poles are mainly hazardous for the juvenile and young vultures. Electrocution at power lines and supporting units is a major cause of non-natural mortality in birds of prey (Lehman et al. 2007).

Numerous populations of raptors including Black Kite *Milvus migrans*, Cinereous Vulture *Aegypus monachus*, Golden Eagle *Aquila chrysaetos*, Steppe Eagle *Aquila nipalensis*, Greater Spotted Eagle *Aquila clanga*, Common Kestrel *Falco tinnunculus*, and Saker Falcon *Falco cherrug* are known to be directly affected by electrocution as a result of unsustainably low adult and juvenile survival probability (Sergio et al. 2004; González et al. 2007; Jenkins et al. 2010; Perez-Garcia et al.

Table 1. Showing the yearly death rate of Egyptian Vulture from 2015 to 2019.

	Year	Total populations of Egyptian Vulture	Number of Mortality	death rate in %
1	2015	1310	19	1.45
2	2016	1610	22	1.37
3	2017	1800	31	1.72
4	2018	1850	24	1.30
5	2019	2240	33	1.47
		Total	**129**	**(Avg.) 1.46**

Wing injury of the Egyptian Vulture.

2011). The Egyptian Vulture is prone to electrocution due to its habit of perch on power lines in desert areas where no trees are available for roosting (Donázar et al. 2002; pers. obs.). Despite a wealth of information and data on deaths caused by accidents of avian interactions with power lines, problems persist throughout the world (Lehman 2001; Jenkins et al. 2010). Avian electrocutions are also widely reported from Europe and Africa, where persistent electrocution mortality has been implicated in Egyptian Vulture *Neophron percnopterus* declines (Angelov et al. 2012).

In Rajasthan, Thar Desert is an inhospitable area for migratory birds. In this hot and arid environment, about 510 species of birds can be seen in the Rajasthan State (Grimmett & Inskipp 2003).

The Thar Desert despite being one of smallest deserts of the world has a high avian diversity. The Thar Desert is not isolated and endemicity of avifauna is very low. Most of the birds of Thar Desert have wide distribution. Out

of endangered species of feathered creatures, five birds are Critically Endangered, one species is Near Threatened, one species is Endangered, and 11 species are Vulnerable.

Seven species of vultures have been observed at Jorbeer Area, Bikaner (Rajasthan)—The King Vulture *Sarcogyps calvus*, Cinereous Vulture, Eurasian Griffon Vulture *Gyps fulvus*, Himalayan Griffon Vulture *Gyps himalayensis*, Long-billed Vulture *Gyps indicus*, White-backed Vulture *Gyps bengalensis*, and Egyptian Vulture *Neophron percnopterus*. Of these, six species are winter migratory species. Only the Egyptian Vulture is resident.

In Bikaner, two subspecies of Egyptian Vulture are found including *N. p. ginginianus* (Latham 1790) and *N. p. percnopterus* (Linnaeus, 1758) all year round. Total population of Egyptian Vulture in Jorbeer, Bikaner is 2,240 including both juvenile and adults (Table 1). The place where maximum number of vultures are found

Egyptian Vulture not able to fly.

Electricuted vulture completely incapacitated.

in Jorbeer is on the 17.5 km-long power line. During the first few flying days, inexperienced birds are still anxious in the air, especially while perching or taking off, and have the propensity to crash into electric poles. Electrocution on badly designed power poles is increasingly shown to pose a threat for the populations of raptors. Egyptian Vulture is one of the Near Threatened species of the world and an Action Plan for Vulture Conservation (APVC) 2020–2025 has been taken up by

Egyptian Vulture mortality by power lines.

the MoEFCC, Government of India to prevent them from becoming a threatened species. Their population is declining rapidly. From last five years (2015–2019), 129 electrocution cases of the Egyptian Vultures in winter have been reported (Table 1). Highest mortality of *Neophron percnopterus* was reported in the year 2017. Average percentage of power line death is 1.46 in the last five years. The main threats to Egyptian Vultures are direct mortality caused by humans by electrocution, decrease accessibility of food, and habitat destruction.

The current report describes a single case of the rescue and rehabilitation after electrocution. On 10 May 2020, around 1310 hours, we found one more, one year old Egyptian Vulture at Shivbari Rural (27.989N, 73.365E), near Jorbeer Conservation Reserve, Bikaner, Rajasthan. It was incapacitated to fly due to wing injury. It was rescued for necessary treatment and rehabilitation. The Egyptian Vulture was depressed and unfit to fly due to electric shock with skin burn and wing bone damage. It was submitted to the local forest department.

The veterinarian provided treatment of Amoxicillin as an antibiotic and Meloxicam as pain killer drug along with dressing the wounds. An efficient way of avoiding such incidents is to deploy specially designed insulators on poles. Bikaner's Jorbeer is an unusual feeding destination for vultures in Asia (largest vultures' site). There are many dangers with food including electrocution, drugs, pesticides, and Feral dogs. Government of India should take care of every migratory vulture here and reduce the death rate.

This report highlights the urgent need to plan and retro-fit power lines in India with non-

hazardous support structures. With this report we provide information about power lines in Bikaner, Rajasthan as it continues to cause mortality of Egyptian Vultures, especially juvenile and young ones.

References

Angelov, I., I. Hashim & S. Oppel (2012). Persistent electrocution mortality of Egyptian Vultures *Neophron percnopterus* over 28 years in East Africa. *Bird Conservation International* 23: 1–6. https://doi.org/10.1017/S0959270912000123

Donázar, J.A., C.J. Palacios, L. Gangoso, O. Ceballos, M.J. González & F. Hiraldo (2002). Conservation status and limiting factors in the endangered population of Egyptian Vulture *Neophron percnopterus* in the Canary Islands. *Biological Conservation* 107: 89–98.

González, L.M., A. Margalida, S. Manõsa, R. Sánchez, J. Oria, J.I. Molina, J. Caldera, A. Aranda & L. Prada (2007). Causes and spatio-temporal variations of non-natural mortality in the Vulnerable Spanish Imperial Eagle *Aquila adalberti* during a recovery period. *Oryx* 41: 495–502.

Jenkins, A.R., J.J. Smallie & M. Diamond (2010). Avian collisions with power lines: a global review of causes and mitigation with a South African perspective. *Bird Conservation International* 20: 263–278.

Lehman, R.N. (2001). Raptor electrocution on power lines: current issues and outlook. *Wildlife Society Bulletin* 29:804–813.

Lehman, R.N., P.L. Kennedy & J.A. Savidge (2007). The state of the art in raptor electrocution research: a global review. *Biological Conservation* 126: 159–174.

Perez-Garcia, J.M., F. Botella, J.A. Sanchez-Zapata & M. Moleon (2011). Conserving outside protected areas: edge effects and avian electrocutions on the periphery of Special Protection Areas. *Bird Conservation International* 21: 296–302.

Sergio, F., L. Marchesi & V. Penteriani (2004). Electrocution alters the distribution and density of a top predator, the eagle owl *Bubo bubo*. *Journal of Applied Ecology* 41: 836–845.

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Understory forest birds of nature reserves of Budongo and Bugoma Forests: A preliminary assessment of forest recovery

The rare Black-eared Ground Thrush recorded in BGNR. © Eric Sande.

Forests provide habitats for 75% of all bird species (FAO & UNEP 2020) and 78% of threatened bird species (BirdLife International 2017). Forest birds are categorized as forest specialists (FF species), typically inhabiting the forest interior; forest generalists (F species), inhabiting undisturbed forest but are commoner in secondary forests; and forest visitors (f species), often recorded in forest but are not dependent upon it (Bennun et al. 1996). Uganda has 1,057 species of birds of which 18%, 12%, and 10% are FF, F, and f species, respectively (Carswell et al. 2005). A few detailed forest bird studies have previously been done in Uganda (Dranzoa 1997; Owiunji & Plumptre 1998). This study assessed the diversity of understory forest birds in the nature reserves of Budongo

Locations of Budongo Central Forest Reserve (1.783^{0}N, 31.853^{0}E) and Bugoma Central Forest Reserve (1.333^{0}N, 31.683^{0}E) (Fuller et al. 2004).

Table 1. Location of the four study sites.

Study site	Longitudes	Latitudes
Bugoma (Nature Reserve)	1.2909	31.0604
Budongo Nature Reserve (N15)	1.7199	31.5163
Budongo (N3)	1.7262	31.5301
Budongo (W21)	1.7442	31.5722

Table 2. Comparison of specialists and generalists in BGNR and BDNR.

	Shannon Index		Hutcheson t-test		
	Budongo	Bugoma	t	df	Sig
Generalists	1.70	1.257	2.350	51	P>0.05
Specialists	2.705	2.220	4.059	187	P<0.01

and Bugoma Central Forest Reserves and compared the diversity in three different compartments of Budongo Forest namely: N15 (unlogged nature reserve), N3 (logged in 1947–52), and W21 (logged in 1963–64 and 1996–97).

Budongo Central Forest Reserve (BDCFR) (793 km^2) lies on the escarpment north-east of lake Albert comprising colonizing, mixed, *Cynometra*, *Cynometra*-mixed, swamp-forest types and is home to 360 species of birds. Bugoma Central Forest Reserve (BGCFR) (300 km^2) on the other hand is situated on top of an escarpment overlooking Lake Albert on the edge of the Western Rift Valley with half of the forested portion dominated by iron wood *Cynometra alexandri* whilst 38% is mixed forest. BGCFR is home to 225 species of birds (Byaruhanga et al. 2001).

Data were collected using mist-netting (November–December 2017). Nets were opened 0800–1800 h. A standard netting effort of 7,200 m-net-hours (30 nets x 12 m each x 10 hours a day x 2 days) was used in each of the two nature reserves and compartments under study. The location (start of the net line) in each of the study sites is shown in Table 1.

Trapped birds were marked on the belly with a permanent marker pen (red or blue colour). The ink would not get off within two days that we spent at every netting site. The birds were not ringed because there was no plan of going back to the same netting site to establish

bird recovery. Individuals recaptured during the first or second day were not included in the total species count to avoid double counting.

A total of 20 species (15 specialists and 5 generalists) and 28 species (21 specialists, 6 generalists, and 1 forest visitor) were recorded in Bugoma Nature Reserve (BGNR) and Budongo Nature Reserve (BDNR), respectively (Appendix 1). The diversity of generalists was not significantly different in the two nature reserves while the diversity of specialist was significantly higher in BDNR than in BGNR (P <0.01) (Table 2). The lower diversity of specialists in BGNR can among other reasons, be attributed to the high incidences of logging observed which was not the case in BDNR.

Incidences of Logging in BGNR observed during the time when the study was done. © Eric Sande.

Five specialists were relatively more abundant (where n ≥10 individuals) in at least one of the two nature reserves (Table 3). The rare Black-eared Ground Thrush was only recorded in BGNR.

In BDCF, the diversity of specialists and generalists was similar between N3/N15, N3/W21, and N15/W2 (Table 4). The similarity in the diversity of specialists in the N15 (unlogged), N3 (five decades after logging), and W21 (two decades after logging) preliminarily shows that most likely the two logged forest compartments are approaching recovery and can provide appropriate environment for the survival

Table 3. Relative abundance of the most common specialists in the two nature reserves.

	No. of birds trapped			
Species	**BGNR**	**BDNR**	**X2**	**Sig (P)**
Olive Sunbird	24	5	12.45	<0.01
Red-tailed Bristlebill	14	5	4.26	<0.05
Olive-green Camaroptera	2	10	5.33	<0.05
Yellow-streaked Greenbul	22	4	12.46	<0.01
Forest Robin	22	10	4.50	<0.05
Cabanis's Greenbul	10	18	2.29	>0.05
Brown-chested Alethe	5	12	2.88	>0.05
Fire-crested Alethe	13	6	2.58	>0.05

Table 4. Comparison of specialists and generalists diversity between differently managed compartments of BDF.

	Shannon Index		Hutcheson t-test		
N3/N15	**N3**	**N15**	**t**	**df**	**Sig**
Generalists	1.987	1.700	0.166	54	P>0.05
Specialists	2.601	2.705	0.848	199	P>0.05
N3/W21	**N3**	**W21**			
Generalists	1.987	2.014	0.196	69	P>0.05
Specialists	2.601	2.589	0.024	218	P>0.05
N15/N3	**N15**	**W21**			
Generalists	1.700	2.014	1.669	58	P>0.05
Specialists	2.705	2.598	0.853	179	P>0.05

Table 5. Comparison of the most common specialists between compartments in BDFR.

	No. of birds trapped			
Species	**N15**	**N3**	**X^2**	**Sig (P)**
Brown-chested Alethe	12	31	8.40	<0.01
Yellow-streaked Greenbul	4	19	9.78	<0.01
Cabanis's Greenbul	18	0	18.00	<0.01
Fire-crested Alethe	6	12	2.00	>0.05
Forest Robin	6	11	1.47	>0.05
Olive-green Camaroptera	5	10	1.67	>0.05
	N3	**W21**		
Brown-chested Alethe	31	11	9.52	<0.01
Pale-breasted Illadopsis	3	11	4.57	<0.05
Yellow-streaked Greenbul	19	16	0.26	>0.05
Fire-crested Alethe	12	7	1.32	>0.05
Forest Robin	11	8	0.47	>0.05
Olive-green Camaroptera	10	5	1.67	>0.05
	N15	**W21**		
Cabanis's Greenbul	18	0	18.00	<0.01
Yellow-streaked Greenbul	4	16	7.20	<0.01
Brown-chested Alethe	12	11	0.04	>0.05
Pale-breasted Illadopsis	4	11	3.27	>0.05

of many forest specialists like the unlogged one.

Seven specialists were relatively more abundant (where n ≥10 individuals in atleast one of the three compartments) of BCFR. The Brown-chested Alethe was significantly more abundant in N3 compared to N15 and W21. The relative abundance of Yellow-streaked Greenbul was significantly higher in N3 than N15; in W21 than N15 but it was the same in N15 and W21. The Pale-breasted Illadopsis was significantly more abundant in W21 than in N3 but its abundance was not significantly different in W21 and N15 (Table 5).

The two logged forest compartments can also provide appropriate microhabitats for the survival of many forest specialists. This was further confirmed by the fact that out of the six commonest specialists in the three compartments, the relative abundance of the Fire-crested Alethe, Forest Robin and Olive-green Camaroptera was not significantly different in the three compartments while Brown-chested Alethe was most common in N3, Pale-breasted Illadopis in W21 and Yellow-streaked Greenbul in N3 and W21. Our results show that in BDCFR today, the previously logged compartments can now accommodate some forest specialists in higher numbers than the

Appendix 1. Bird species trapped in Budongo and Bugoma Central Forest Reserves.

SPP	Category	BGN	BDN	N3	W21
African Dwarf Kingfisher *Ceyx lecontei*	FF	0	2	1	2
African Pygmy Kingfisher *Ceyx picta*	f	0	1	2	0
Blue-breasted Kingfisher *Halcyon malimbica*	F	0	0	1	1
Black-eared Ground Thrush *Zoothera cameronensis*	FF	1	0	0	0
Blue-shouldered Robin-Chat *Cossypha cyanocampter*	F	0	0	0	5
Blue-throated Brown Sunbird *Cyanomitra cyanolaema*	FF	0	0	0	2
Brown Illadopsis *Illadopsis fulvescens*	FF	2	1	9	2
Brown-chested Alethe *Alethe poliocephala*	FF	5	12	31	11
Brown-eared Woodpecker *Campethera caroli*	FF	0	0	3	0
Buff-spotted Woodpecker *Campethera nivosa*	FF	2	1	2	0
Cabanis's Greenbul *Phyllastrephus cabanisi*	FF	10	18	0	0
Cameroon Sombre Greenbul *Andropadus curvirostris*	FF	0	0	1	1
Cassin's Grey Flycatcher *Muscicapa cassini*	F	1	0	0	0
Chestnut Wattle-eye *Dyphorophyia castanea*	FF	0	2	0	0
Chocolate-backed Kingfisher *Halcyon badia*	FF	0	0	0	1
Dusky crested-Flycatcher *Trochocercus nigromitrata*	F	0	5	2	1
Dusky Long-tailed Cuckoo *Cercococcyx mechowi*	FF	0	0	0	1
Fire-crested Alethe *Alethe diademata*	FF	13	6	12	7
Forest Robin *Stiphrornis erythrothorax*	FF	22	6	11	8
Green Hylia *Hylia prasina*	F	5	1	4	4
Green-backed Twinspot *Mandingoa nitidula*	FF	0	1	0	0
Grey-headed Negrofinch *Nigrita canicapilla*	F	0	0	0	1
Grey-throated Flycatcher *Myioparus griseigularis*	FF	0	2	2	1
Honeyguide Greenbul *Baeopogon indicator*	FF	0	0	1	0
Jameson's Antpecker *Parmoptila jamesoni*	FF	0	1	0	1
Jameson's Wattle-eye *Dyphorophyia jamesoni*	FF	0	0	3	4
Little Greenbul *Andropadus virens*	F	2	4	4	13
Olive Sunbird *Cyanomitra olivacea*	FF	24	5	7	5
Olive-green Camaroptera *Camaroptera chloronota*	FF	2	5	10	5
Pale-breasted Illadopsis *Illadopsis rufipennis*	FF	2	4	3	11
Red-bellied Paradise Flycatcher *Terpsiphone rufiventer*	F	0	3	3	0
Red-headed Bluebill *Spermophaga ruficapilla*	F	0	3	2	3
Red-tailed Ant-Thrush *Neocossyphus rufus*	FF	0	3	1	0
Red-tailed Bristlebill *Bleda syndactyla*	FF	14	5	9	9
Red-tailed Greenbul *Criniger calurus*	FF	0	1	1	0
Rufous Flycatcher-Thrush *Stizorhina fraseri*	FF	3	2	3	0
Scaly-breasted Illadopsis *Illadopsis albipectus*	FF	1	5	7	2
Tambourine Dove *Turtur tympanistria*	F	5	0	6	3

SPP	Category	BGN	BDN	N3	W21
White-tailed Ant-Thrush *Neocossyphus poensis*	FF	1	3	3	0
Yellow-streaked Greenbul *Phyllastrephus flavostriatus*	FF	22	4	19	16
Yellow-whiskered Greenbul *Andropadus latirostris*	F	15	5	10	4
Yellow Longbill *Macrosphenus flavicans*	FF	0	0	0	4
Yellow-rumped Tinkerbird *Pogoniulus bilineatus*	F	0	0	2	1

unlogged nature reserve. So, preliminarily one can say that probably the previously logged compartments are approaching full recovery. Cabanis's Greenbul was however only recorded in nature reserves for both BGCFR and BDCFR but not in the logged compartments of the later. This is because the two nature reserves which are predominantly *Cynometra* (the climatic climax Eggeling 1947) probably provide the most appropriate habitat for the survival of this FF species.

In conclusion, although the strict nature reserves have been set aside for research and conservation, the BGNR is in a sorry state due to rampant timber harvesting. Thus, in its current state, it may not be a good control to assess effects of logging on biodiversity. BDNR on the other hand has remained quite intact owing to the presence of intensive ecological research since 1990, hence, it is apparent higher diversity of specialists. Preliminary results have indicated the logged compartments are almost fully recovering since the diversity of specialists in these compartments and that of the nature reserve was not significantly different.

References

Bennun, L., C. Dranzoa & D. Pomeroy (1996). The forest birds of Kenya and Uganda. *Journal of the East African Natural History Society* 85(1): 23-48. https://doi.org/10.2982/0012-8317(1996)85[23:TFBOKA]2.0.CO;2
BirdLife International (2017). One in eight of all bird species is threatened with global extinction. Downloaded from http://www.birdlife.org on 26/08/2021
Byaruhanga, A., P. Kasoma & D.E. Pomeroy (2001). *The Important Bird Areas in Uganda*. Kampala, Nature Uganda.
Carswell, M., D.E. Pomeroy, J. Reynolds & H. Tushabe (2005). Bird atlas of Uganda. British Ornithologists' Club, London.
Dranzoa, C. (1997). The survival of understorey birds in the tropical rainforest of Ziika, Uganda. *Ostrich* 68: 68–71. https://doi.org/10.1080/00306525.1997.9639714
Eggeling, W. (1947). Observations of the ecology of the Budongo rainforest. *Journal of Ecology* 34: 20–87. https://doi.org/10.2307/2256760
FAO & UNEP (2020). *The State of the World's Forests 2020. Forests, biodiversity and people*. Rome.
Fuller, R., P. Akite, J.B. Amuno, C. Flockhart, J.M. Ofwono, G. Proaktor & R. Ssemmanda (2004). *Recovery of the Nahan's francolin: decline of a globally threatened bird in the forests of central Uganda*. Final Project Report, Durham UK.
Owiunji, I. & A.J. Plumptre (1998). Bird communities in logged and unlogged compartments in Budongo Forest, Uganda. *Forest Ecology and Management* 108(1) 115–126. http://dx.doi.org/10.1016/S0378-1127(98)00219-9

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Is formation of new heronries a result of degradation of old heronries? An insight of Keoladeo-Complex heronries

A heronry is an aggregation of colonial birds. It usually includes tree nesting waders and divers, such as storks, egrets, spoonbills, cormorants, and herons. Nesting is primarily driven by water availability, and other factors such as nesting substrate, climate, predation, and human disturbance, may also affect it (Vijayan 1987, 1991). However, there is little explanation on what causes the formation of new heronries and abandoning of old heronries. In this article, the authors discuss the Keoladeo-Complex (KNP-Complex) heronries to suggest a possible mechanism in the formation of new heronries.

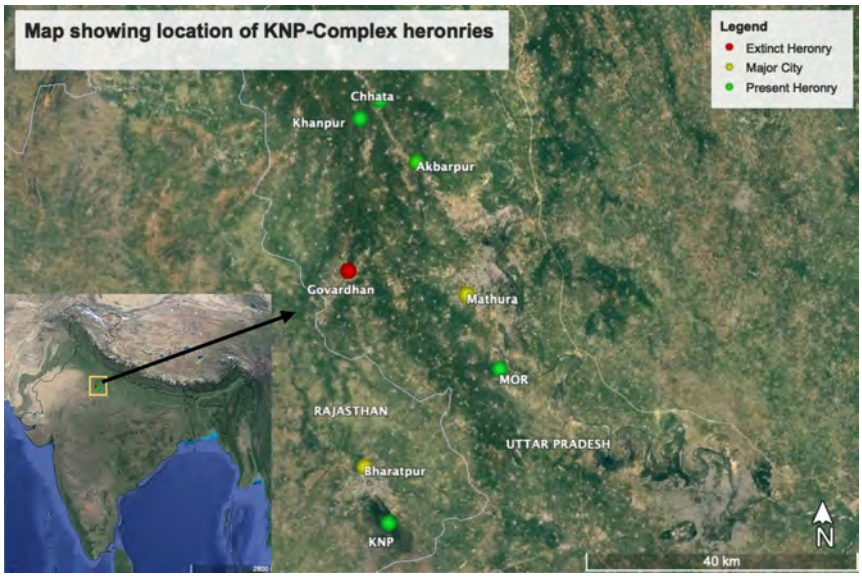

Figure 1. Map showing location of Keoladeo (KNP)-Complex heronries.

Authors identify KNP-Complex as the set of heronries located in the district of Bharatpur and Mathura, India (Figure 1, Table 1). It includes six heterospecific breeding aggregations of colonial birds. These include 15 breeding species of wader and divers (Vijayan 1991; Dwevedi et al. 2014; Tiwary et al. 2015). Among these, KNP is a large wetland heronry and others are small village tank heronries. All heronries of the complex are located within ~35kms of radius. These heronries are composed of colonial birds, numbers ranging from a few nests to hundreds. These heronries include nests of Painted Stork *Mycteria leucocephala*, Eurasian Spoonbill *Platalea leucordia*, Black-headed Ibis *Threskiornis melanocephalus*, Oriental Darter *Anhinga melanogaster*, Little Cormorant *Phalacrocorax niger*, Indian Cormorant *Phalacrocorax fuscicollis*, Little Egret *Egretta garzetta*, Intermediate Egret *Mesophoyx intermedia*, Cattle Egret *Bubulcus ibis*, Indian Pond Heron *Ardeola grayii*, Black-crowned Night Heron *Nycticorax nycticorax*, Openbill Stork *Anastomus oscitans*, and Grey Heron *Ardea cinerea*. Nesting of these species usually starts after summers and with the

Figure 2. Images showing nesting of birds at Akbarpur heronry in Mathura: a) Painted Stork, b) Spoonbill, c) Painted Stork and Little Cormorant, and d) Black-headed Ibis. © Rajneesh Dwivedi.

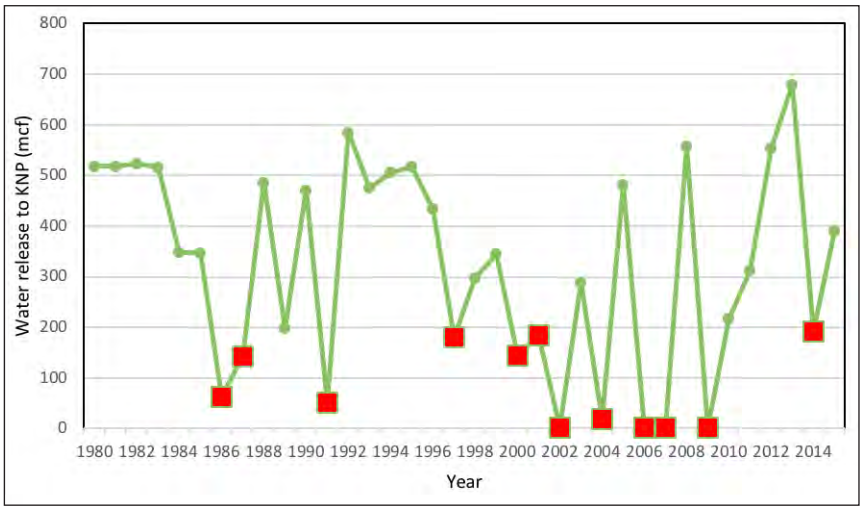

Figure 3. Plot showing water released to the KNP since 1980 (WR—Water released from Ajan Dam in million cubic feet), *Water release data was obtained from the KNP authorities. Data points in red colour shows the year of breeding failure at KNP (Note the low volume of water released in these years).

beginning of the monsoon. The above species are mostly dependent on aquatic food and hence are affected by water conditions.

Recently, our research team, in the year 2019, encountered another unreported heronry in Mathura. It is located at 27.64^0 N & 77.56^0 E in the Akbarpur Village, close to already existing Chhata Heronry (Dwevedi & Urfi 2012). It is a heterospecific heronry composed of nests of Black-headed Ibis, Painted Stork, Little Cormorant, and Spoonbill (Figure 2). Though three individuals of Oriental Darter were spotted, no nest was recorded. It is to be noted that Black-headed Ibis and Painted Stork are Near Threatened birds (BirdLife International 2021). Hence, this heronry is of conservation significance.

In the KNP-complex, the largest and oldest heronry is Keoladeo Ghana National Park (KNP) located in Bharatpur, Rajasthan. The rest of the five heronries are located in the district of Mathura (Table 1). These four heronries have come into existence in the past

Table 1. Heronries located in the KNP-Complex.

Heronry	District	Present Age* (In Years)	First Reported	Nearest existing heronry	Breeding failures at KNP
Keoladeo National Park (KNP)	Bharatpur	>250	NA	MOR (27.5 km)	1979, 1987, 1991, 1997, 1999, 2000, 2002, 2004, 2006, 2007, 2009, 2014
Mathura Oil Refinery (MOR)	Mathura	~20	2001	KNP (27.5 km)	
Chhata	Mathura	~50 to 40	2010	Khanpur (4.0 km)	
Khanpur	Mathura	~15	2013	Chhata (4.0 km)	
Akbarpur	Mathura	~12	2019	Khanpur (10.5 km)	

* as confirmed with the local people or published records.

two decades. One heronry also existed in Govardhan, and no one has recorded any nesting here in the past several decades (Dwevedi et al. 2014).

KNP is the oldest and largest colony in the KNP-complex and therefore, possibly function as the source of bird population to other heronries. It is possible that birds flew out of KNP to search for new breeding habitats during the years of drought. These heronries are geographically close to each other (Figure 1, Table 1) therefore, the movement of individual birds between these heronries is very much possible.

Though not a strong evidence, small heronries of KNP-complex have formed either in the year of drought or immediately after drought years (Table 1). Infrequent droughts could have proven good for the formation of large heronry such as KNP (Frederick & Ogden 2001) but in the past two decades droughts have become more frequent and the water supply from Ajan Dam has been disrupted multiple times at KNP (Figure 3). This has contributed to the continuous deterioration of habitat at KNP and caused a reduction in the breeding population of birds at KNP (Dwevedi et al. 2021). Prima facie observations suggest a link between heronries of KNP-complex and each being dependent on one another for long-term survival. Smaller heronries, probably function as a refuge to the breeding birds in times of water scarcity or any other disturbance at KNP, however, this needs to be verified through population genetics and satellite/geotagging of birds.

KNP-complex supports a large number of heronry birds including many species of conservation importance. Encroachment, waste dumping, water pollution, eutrophication etc. are threatening the existence of small heronries (Dwevedi et al. 2014), hence, these small heronries require the attention of local authorities/ forest department/panchayat and local people participation. Public participation is particularly key to the conservation of these heronries. Many of these heronries have religious/spiritual/traditional and cultural values (Dwevedi et al. 2014; Tiwary et al. 2014), therefore, the participation of local people can achieve greater success in their conservation.

References

BirdLife International (2021). IUCN Red List for birds. Downloaded from http://www.birdlife.org on 24.viii.2021.

Dwevedi, R. & A.J. Urfi (2012). Discovery of a large heronry at Chhata, near Mathura, in western Uttar Pradesh. *Journal of the Bombay Natural History Society* 108(3): 231–232.

Dwevedi, R., S.K. Singh & V. Krishna (2014). Heronries of Mathura District, western Uttar Pradesh, India. *Indian BIRDS* 9(4): 93–95.

Dwevedi, R., V. Deo, J. Sethy, R. Gupta & M. Mylswamy (2021). Performance of imputation-based models in predicting breeding population trend of a near-threatened bird in changing water regime: A 36-year long-term case study of Painted Stork, *Mycteria leucocephala*. *Journal of Applied and Natural Science* 13(3): 1072–1082. https://doi.org/10.31018/jans.v13i3.2876

Frederick, P.C. & J.C. Ogden (2001). Pulsed breeding of long-legged wading birds and the importance of infrequent severe drought conditions in the Florida Everglades. *Wetlands* 21(4): 484–491.

Tiwary, N.K., B.B. Sharma & A.J. Urfi (2014). Two new nesting colonies of Painted Stork *Mycteria leucocephala* from northern India. *Indian BIRDS* 9(4): 85–88.

Vijayan, V. (1987). Keoladeo National Park Ecology Study. Bombay Natural History Society, Bombay.

Vijayan, V. (1991). Keoladeo National Park Ecology Study: Final Report, 1980–1990. Bombay Natural History Society, Bombay.

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Incidence of *Cinara thujafilina* on *Platycladus orientalis* (L.) Franco from, Pandharpur District - Solapur (M.S.) India

Platycladus orientalis (L.) Franco (Commonly- Morpankhi, Family- Cupressaceae) is an evergreen, monoecious trees or shrubs growing up to 10–60 feet. The shoot is flat and the leaves are scale like. The leaves are arranged in flattened fan shaped growing with resin glands (Farjon 2005).

Aggregation *C. thujafilina.* © S.V. Thite.

They are widely grown as ornamental trees, and are extensively used for hedges. Leaves of *P. orientalis* contain essential oils used to treat fungus infections, cancer, and moles. Hold et al. (2000) described the essential oil derived from the leaves as α-thujone, which is useful as an insecticide and an antihelminthic agent for the treatment of parasitic worms.


C. thujafilina (Adult). © S.V. Thite.

During a routine visit to the campus of K.B.P. Mahavidyalaya, Pandharpur, district Solapur *Platycladus orientalis* found to be infested

Arrow showed development of sooty mould fungus. © S.V. Thite.

with *Cinara* (Cupressobium) *tujafilina* (Del Guercio, 1909). There are total of 35 trees of 14–15 years, which showed aphid infestation.

To find out the spreading of the infestation, a survey of Pandharpur tahsil was conducted in September 2019 to 2020 and the aphid was found to be associated with the host throughout the tehsils.

Cinara is a very large genus that contains more than 200 described species, about 150 of them native to North America, 30 in Europe and the Mediterranean, and 25 in the Far East, and 11 species are known from India (Ghosh 1982). Aphid belonging to the genus *Cinara* are host specific and anholocyclic, however, an ovipara has now been recorded from Iran (Remaudière & Binazzi 2003). Its original range covered the warm regions of Asia (Blackman & Eastop 1988).

Adult of *C. tujafilina* are reddish-brown with a dorsal pattern of bluish-white wax, and two dark brown divergent curved bands running from head to about the level of the cornicles. The body length of the adult is 1.7-3.5 mm (Blackman & Eastop 2019). During the field study, it was observed that adults feed on the branches and foliage. Adults and nymph suck plant sap from the phloem tissue. Due to sap sucking eventually there is a formation of sooty mold fungus and the ants also get attracted to honeydew. The damage caused by *C. tujafilina* results in foliage discolouration which degrades the ornamental value of the host. Heavy infestation was observed from September to November, which decreased up to January.

References

Blackman, R.L. & V.F. Eastop (1988). *Aphids on the World's Trees. An identification and Information Guide*. CAB International & The Natural History Museum, London, 986 pp.

Blackman, R.L. & V.F. Eastop (2019). *Aphids of the World's Plants. An Online Identification and Information Guide*. http://www.aphidsonworldsplants.info. Downloaded on 28 February 2019.

Farjon, A. (2005). Monograph of Cupressaceae of Sciadopitys. Royal Botanic Gardens, Kew.

Ghosh, A.K. (1982). Homoptera: Aphidoidea. Part 2. Subfamily Lachninae. In: The Fauna of India and the Adjacent Countries. Zoological Survey of India, Calcutta, 167 pp.

Hold, K.M., N.S. Sirisoma, T. Ikeda, T. Narahashi & J.E. Casida (2000). Alpha-thujone (the active component of absinthe): gamma-aminobutyric acid type A receptor modulation and metabolic detoxification. Proceedings of the National Academy of Sciences of the United States of America 97(8): 3826–3831. https://doi.org/10.1073/pnas.070042397.

Remaudière, G. & A. Binazzi (2003). Les Cinara du Pakistan. II. Le sous-genre Cupressobium. *Revue Française d'Entomologie* (N.S.) 25: 85–96.

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