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continued on the back inside cover

Cover: Digital illustration of Smooth-coated Otter *Lutrogale perspicillata* by Dupati Poojitha. Reference from the picture taken by Rana & Sugandhi.



Species composition of butterflies associated with nectar feeding on *Libidibia coriaria* (Jacq.) Schltld (Magnoliopsida: Fabales: Fabaceae)

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Abstract: Butterflies are vital bioindicators and pollinators, with their diversity often reflecting ecosystem health. This study assessed the species richness of butterflies visiting *Libidibia coriaria* during its flowering season within the Kerala Agricultural University campus. A total of 41 butterfly species were recorded, representing approximately 29.5% of the 139 butterfly species previously documented from the campus. The high species richness observed around *L. coriaria* underscores its ecological importance as a key nectar source that sustains butterfly foraging activity.

Keywords: Bioindicators, butterfly host, conservation, Divi-divi, foraging behaviour, Kerala Agricultural University, nectar feeding, phenology, plant-pollinator interactions, urban health.

Butterflies, often considered the winged jewels of the insect world, play a vital role as pollinators in diverse ecosystems worldwide. Both in their adult and larval stages, butterflies depend on specific plants for their feeding needs. This intricate relationship between butterflies and plants results in varied distribution patterns of butterflies across different habitats and vegetation types (Huang et al. 2024). As such, the mutualistic connection between butterflies and plants reflects the diversity of plant life in an area and highlights butterflies as indicators of ecosystem health (Nimbalkar et al. 2010). *Libidibia coriaria*, commonly known as Divi-

Divi, is a small to medium-sized evergreen tree belonging to the family Leguminosae. It is distributed throughout central America and northern South America. It has been introduced in India in 1834 as a shade tree in urban landscapes (Chacko et al. 2002). The flowers are small, yellow, and fragrant, and arranged in axillary to subterminal small panicles or clusters, much exceeded by subtending leaves (Deepakkumar & Ramanan 2016). The morphology of flowers, particularly their size and shape, along with the structure of the pollinators' feeding apparatus, determines the effectiveness of plant-pollinator interactions. The flowers of *L. coriaria*, when in bloom, have exposed reproductive structures. Butterflies visiting these flowers move through the inflorescences, during which their legs, proboscis, and head come into contact with the reproductive organs, thereby facilitating pollination (Meerabai 2021). The present study was undertaken to analyse the species composition and feeding behaviour of butterflies associated with nectar foraging on the flowers of *Libidibia coriaria*.

Study area

The observations were taken from the *Libidibia coriaria* trees planted in the main campus of Kerala

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Agricultural University (KAU), situated in Vellanikkara, Thrissur District, Kerala, at a geographic coordinate range of 10.544–10.553 °N and 76.288–76.284 °E (Figure 1). The main campus is also located near the Peechi-Vazhani Wildlife Sanctuary, which is part of the Western Ghats, a globally recognised biodiversity hotspot. During the study period, the average temperature ranged 24.02–31.76 °C, with a mean annual rainfall of 14.1 mm (KAU Weather Station 2024).

Methods

Four individuals of *Libidibia coriaria*, planted along the avenues of the KAU main campus, were selected for the observations. Data were collected twice daily, from 08.30–11.00 h and 15.30–17.00 h, during the flowering period of *L. coriaria* (i.e., August–September). Digital photographs were taken using a Nikon Z 50 mirrorless camera, and the butterflies visiting the flowers were recorded. For every species observed, the duration of each floral visit was noted, and based on these data, the minimum and maximum time spent by each species on the flowers were documented. Species identification was

carried out using field guides by Kunte (2000), Kehimkar (2008), and Bhakare & Ogale (2018).

RESULT AND DISCUSSION

A total of 41 butterfly species, comprising 1,106 individuals and representing five families, were recorded during the study period (Table 1; Image 1–34). The families Nymphalidae, Hesperidae, and Papilionidae were the most species, each accounting for 24.39% of the total species documented ($n = 10$) followed by Pieridae ($n = 6$) and Lycaenidae ($n = 5$) (Figure 2).

Nymphalidae—*Hypolimnas bolina* was the most frequent floral visitor ($n = 150$), with a nectar-feeding duration ranging from 40–47 s per visit, whereas *Danaus genutia* exhibited the longest nectar-feeding duration among the recorded nymphalids (53–57 s per visit).

Lycaenidae—Among the Lycaenidae, *Rapala manea* was the most dominant nectar feeding species ($n = 60$), exhibiting the longest feeding duration of 88–96 s per visit followed by *Jamides celeno* (19–23 s per visit) and *Acytolepis puspā* (16–22 s per visit).

Hesperidae—Nectar-feeding durations were longest

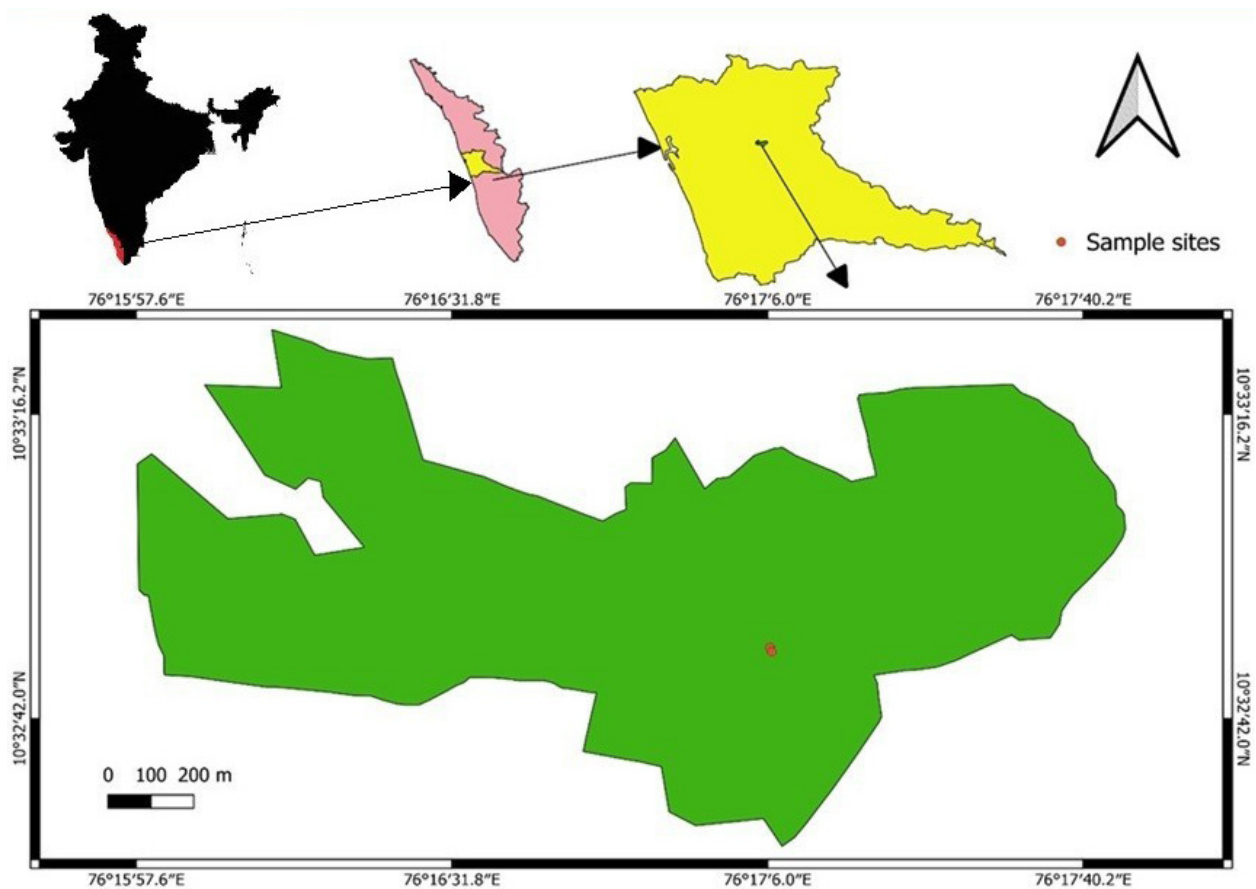


Figure 1. Location map of the Kerala Agricultural University main campus.

Table 1. Species composition of butterflies recorded during the nectar feeding on *Libidibia coriaria*.

	Common name	Scientific name	No. of individuals recorded	Time spent on nectar feeding (s)
Family: Papilionidae				
1.	Crimson Rose	<i>Pachliopta hector</i> (Linnaeus, 1758)	30	90–98
2.	Common Rose	<i>Pachliopta aristolochiae</i> (Fabricius, 1775)	20	72–80
3.	Tailed Jay	<i>Graphium agamemnon</i> (Linnaeus, 1758)	56	12–16
4.	Common Jay	<i>Graphium doson</i> (C. & R. Felder, 1864)	34	11–18
5.	Common Bluebottle	<i>Graphium sarpedon</i> (Linnaeus, 1758)	15	15–18
6.	Common Mormon	<i>Papilio polytes</i> (Linnaeus, 1758)	2	10–12
7.	Blue Mormon	<i>Papilio polymnestor</i> (Cramer, 1775)	2	6
8.	Lime Butterfly	<i>Papilio demoleus</i> (Linnaeus, 1758)	1	5
9.	Southern Birdwing	<i>Troides minos</i> (Cramer, 1779)	3	5–7
10.	Common Mime	<i>Papilio clytia</i> (Linnaeus, 1758)	10	10–13
Family: Pieridae				
11.	Common Emigrant	<i>Catopsilia pomona</i> (Fabricius, 1775)	219	97–115
12.	Great Orange Tip	<i>Hebomoia glaucippe</i> (Linnaeus, 1758)	1	6
13.	Three-spot Grass Yellow	<i>Eurema blanda</i> (Boisduval, 1836)	2	9–12
14.	Common Grass Yellow	<i>Eurema hecabe</i> (Linnaeus, 1758)	22	9–13
15.	Common Jezebel	<i>Delias eucharis</i> (Drury, 1773)	73	35–39
16.	Mottled Emigrant	<i>Catopsilia pyranthe</i> (Linnaeus, 1758)	3	9–12
Family: Nymphalidae				
17.	Great Egg Fly	<i>Hypolimnys bolina</i> (Linnaeus, 1758)	150	40–47
18.	Common Leopard	<i>Phalanta phalantha</i> (Drury, 1773)	7	5–12
19.	Chocolate Pansy	<i>Junonia iphita</i> (Cramer, 1779)	24	12–19
20.	Striped Tiger	<i>Danaus genutia</i> (Cramer, 1779)	7	53–57
21.	Rustic	<i>Cupha erymanthis</i> (Drury, 1773)	5	6–9
22.	Common Castor	<i>Ariadne merione</i> (Cramer, 1777)	10	7–13
23.	Tamil Yeoman	<i>Cirrochroa thais</i> (Fabricius, 1787)	4	7–10
24.	Glassy Tiger	<i>Parantica aglea</i> (Stoll, 1782)	4	9–12
25.	Blue Tiger	<i>Tirumala limniace</i> (Cramer, 1775)	2	37
26.	Common Crow	<i>Euploea core</i> (Cramer, 1780)	7	19–21
Family: Lycaenidae				
27.	Slate Flash	<i>Rapala manea</i> (Hewitson, 1863)	60	88–96
28.	Common Cerulean	<i>Jamides celeno</i> (Cramer, 1775)	11	19–23
29.	Common Hedge Blue	<i>Acytolepis puspa</i> (Horsfield, 1828)	7	16–22
30.	Redspot	<i>Zesius chrysomallus</i> (Hübner, 1819)	4	4–12
31.	Red Pierrot	<i>Talicauda nyseus</i> (Guérin-Meneville, 1843)	1	4
Family: Hesperidae				
32.	Common Banded Awl	<i>Hasora chromus</i> (Cramer, 1780)	32	84–91
33.	Dark Palm Dart	<i>Telicota ancilla</i> (Moore, 1878)	4	96–117
34.	White Banded Awl	<i>Hasora taminatus</i> (Hübner, 1818)	18	61–67
35.	Chestnut Bob	<i>Iambrix salsala</i> (Moore, 1865)	81	90–96
36.	Restricted Demon	<i>Notocrypta curvifascia</i> (Felder & Felder, 1862)	38	67–76
37.	Brown Awl	<i>Badamia exclamationis</i> (Fabricius, 1775)	51	11–87
38.	Rice Swift	<i>Borbo cinnara</i> (Wallace, 1866)	96	80–88
39.	Ceylon Swift	<i>Parnara bada</i> (Moore, 1878)	1	19
40.	Indian Palm Bob	<i>Suastus gremius</i> (Fabricius, 1798)	6	70–76
41.	Conjoined Swift	<i>Pelopidas conjuncta</i> (Herrich-Schäffer, 1869)	1	12

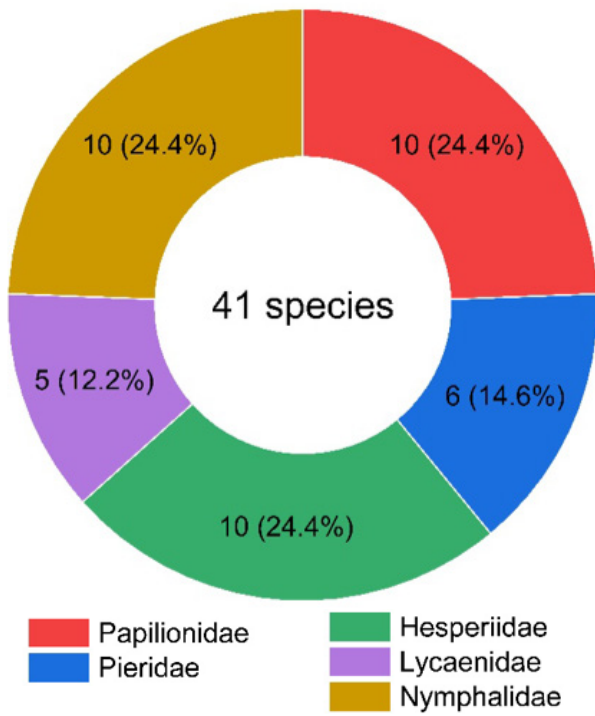


Figure 2. Family-wise distribution of butterflies associated with nectar feeding on *Libidibia coriaria*.

in *Telicota ancilla* ($n = 4$), with visits ranging from 96–117 s, suggesting that skippers, particularly this species, engage in more prolonged floral foraging. In addition to *T. bambusae*, other hesperiids such as *Lambrix salsala* (90–96 s), *Hasora chromus* (84–91 s), and *Borbo cinnara* (80–88 s) also demonstrated consistently longer feeding durations compared to most other butterfly species recorded in the study.

Pieridae—Among the Pierids, *Catopsilia pomona* ($n = 219$) spent the longest time on nectar feeding, with durations ranging from 97–115 s per visit. This was followed by *Delias eucharis* (35–39 s per visit) and *Eurema hecabe* (9–13 s per visit), reflecting considerable variation in foraging duration among species within the family.

The temporal distribution and relative abundance of butterfly families observed throughout the flowering period of *Libidibia coriaria* is illustrated in Figure 3. Nymphalidae and Pieridae exhibited sustained and widespread presence across most days, indicating their continuous activity and possibly broader adaptability to the flowering period of *Libidibia coriaria*. Papilionidae and Hesperidae exhibited relatively narrower fluctuations in

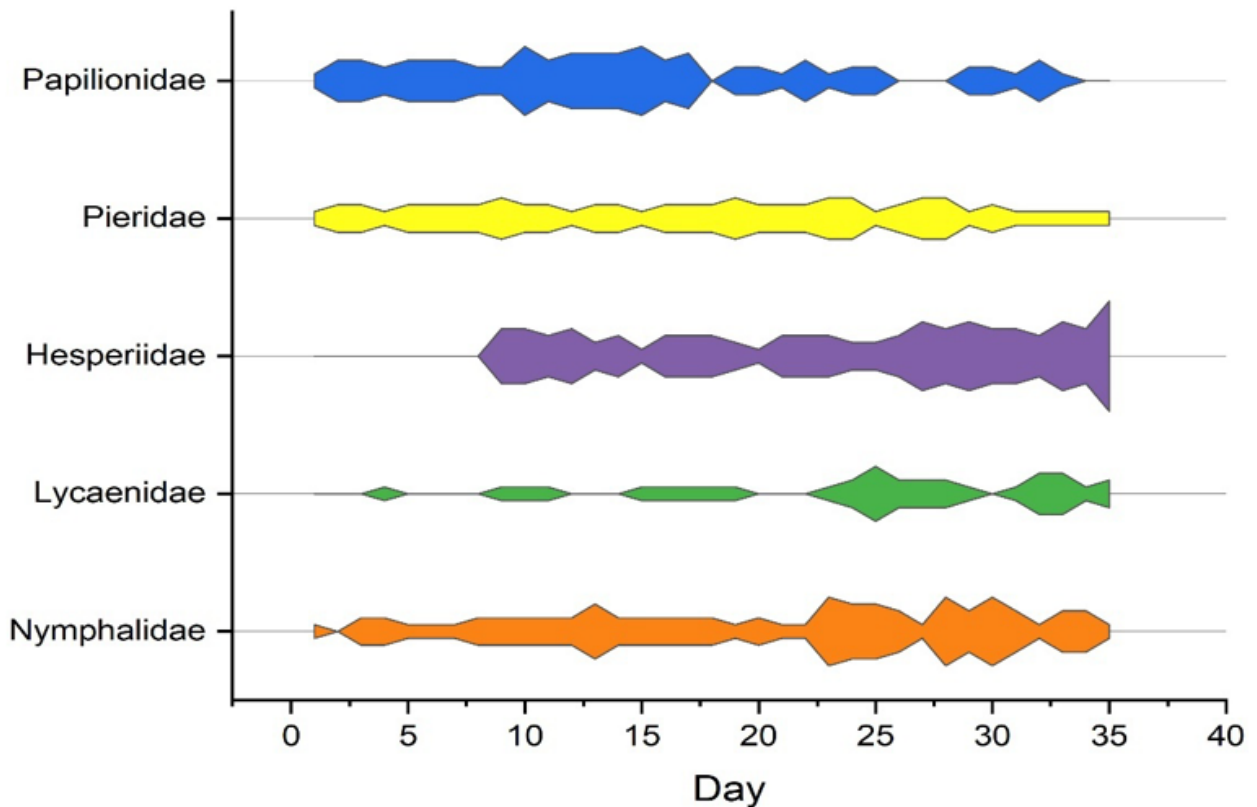


Figure 3. Temporal distribution and relative abundance of butterfly families associated with nectar feeding on *Libidibia coriaria*.



Image 1. *Acytrolepis puspa*.



Image 2. *Ariadne merione*.



Image 3. *Badamia exclamatonis*.



Image 4. *Borbo cinnara*.



Image 5. *Catopsilia pomona*.



Image 6. *Cirrochroa thais*.



Image 7. *Cupha erymanthis*.



Image 8. *Danaus genutia*.



Image 9. *Delias eucharis*.



Image 10. *Euploea core*.



Image 11. *Eurema blanda*.



Image 12. *Eurema hecabe*.



Image 13. *Graphium agamemnon*.



Image 14. *Graphium doson*.



Image 15. *Hasora chromus*.



Image 16. *Hasora taminatus*.



Image 17. *Hypolimnna bolina*.



Image 18. *Iambrix salsala*.



Image 19. *Jamides celeno*.



Image 20. *Junonia iphita*.

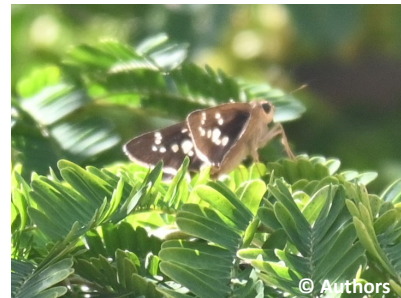


Image 21. *Notocrypta curvifascia*.

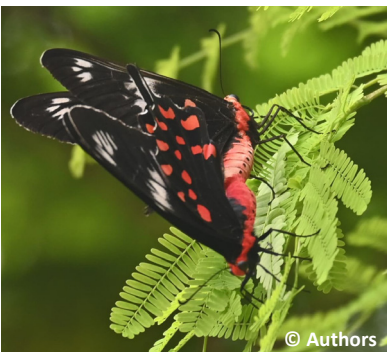


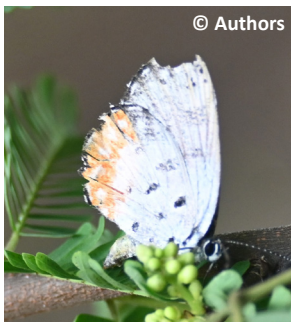
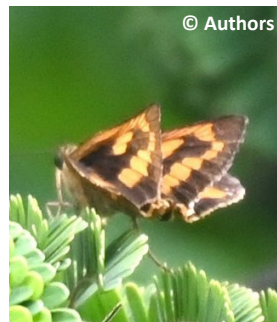
Image 22. *Pachliopta hector*.



Image 23. *Papilio clytia*.



Image 24. *Papilio polytes*.

Image 25. *Parantica aglea*.Image 26. *Parnara* sp.Image 27. *Pelopidas conjuncta*.Image 28. *Phalanta phalantha*.Image 29. *Rapala manea*.Image 30. *Suastus gremius*.Image 31. *Talicauda nyseus*.Image 32. *Telicota ancilla*.Image 33. *Troides minos*.Image 34. *Zesius chrysomallus*.

abundance, indicating distinct periodic peaks in activity. Papilionidae were more active during the blooming stages of *Libidibia coriaria*, while Hesperidae showed increased activity during the later stage of flowering.

CONCLUSION

A total of 41 butterfly species documented in this study represents approximately 29.5% of the 139 species previously recorded from the KAU campus (Aneesh et al. 2013), highlighting the ecological significance of *Libidibia coriaria* as an important nectar resource. These findings emphasize the species' role in supporting butterfly diversity and foraging activity during its flowering phase. Notably, the strong association between floral

resource availability and butterfly presence aligns with the observations of Martínez-Adriano et al. (2018), who reported that plant species serve as limiting factors for butterfly diversity and emphasized the functional role butterflies play in pollination networks, particularly in tropical habitats.

Despite being an introduced species, *L. coriaria* supports high butterfly diversity during its flowering phase, likely due to its abundant floral display, accessible floral morphology, and favourable nectar composition. This study underscores the importance of maintaining a diversity of nectar resources, to sustain pollinator networks, enhance habitat quality, and support long-term biodiversity conservation.

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Articles

Predicting the potential habitat of *Tragopan blythii* (Jerdon, 1870) (Aves: Galliformes: Phasianidae) in Mehao Wildlife Sanctuary of Arunachal Pradesh, India

– Eba Tapo & Gibji Nimasow, Pp. 28455–28467

Composition and ecological guild structure of birds at Chaudhary Devi Lal University campus, Haryana, India

– Harkrishan Kamboj, Vijay Singh, Vivek Goyal & Vinay Malik, Pp. 28468–28478

New record of two natricine snakes, *Hebius gilhodesi* (Wall, 1925) and *Herpetoreas davidi* Nguyen et al., 2024 (Reptilia: Squamata: Colubridae), from India

– Sourav Dutta, Bitupan Boruah & Abhijit Das, Pp. 28479–28494

Diversity and distribution pattern of geometrid moths (Insecta: Lepidoptera: Geometridae) along the altitudinal gradient, Kumaun Himalaya, India

– Narendra Singh Lotani & Chandra Singh Negi, Pp. 28495–28509

New distribution records and taxonomic studies of ascomycetous fungi *Xylaria* and *Daldinia* (Ascomycota: Xylariales: Xylariaceae) in Karnataka, India

– S. Bharath Kumar, A. Muthu Kumar & Praveen Kumar Nagadesi, Pp. 28510–28523

Identification of wildlife crime hotspots in Punjab, India via kernel density estimation analysis

– Navdeep Sood & Rohan Kumar, Pp. 28524–28533

Communications

Assessing nutritional status of Chital *Axis axis* (Erxleben, 1777) (Mammalia: Artiodactyla: Cervidae) through bone marrow condition of predated individuals in Kanha Tiger Reserve, India

– Shravana Goswami, Ujjwal Kumar & Yadvendra V. Jhala, Pp. 28534–28539

Smooth-Coated Otter *Lutrogale perspicillata* (Mammalia: Carnivora: Mustelidae) observation near a community reservoir in Bannerghatta National Park

– Amrita Nair & Avinash Krishnan, Pp. 28540–28545

Range extension records of Tibetan Snowcock, Tibetan Sandgrouse, and Western Tragopan in Uttarakhand, India

– Anuj Joshi, Ranjana Pal, Vineet K. Dubey & Sambandam Sathyakumar, Pp. 28546–28551

Morphological and statistical perspectives on genital sexual dimorphism in Eupterotidae Swinhoe, 1892 (Insecta: Lepidoptera)

– Sujata Saini & Shabnum Shafi, Pp. 28552–28563

Distribution of rheophytes in Kopili River Basin, Assam and Meghalaya, India

– Jayanta Das & Deepak K. Baruah, Pp. 28564–28572

Short Communications

First photographic record of Smooth-coated Otter *Lutrogale perspicillata* from the canals in Upper Ganga Ramsar Site, Uttar Pradesh, India

– Aftab Alam Usmani, Pichaimuthu Gangaiamaran, Ruchi Badola & Syed Ainul Hussain, Pp. 28573–28577

First camera-trap evidence of a ferret badger *Melogale sp.* (Mammalia: Carnivora: Mustelidae) from the community forests of Manipur, India

– Chingrisoror Rumthao, Monesh Singh Tomar & Sushanto Gouda, Pp. 28578–28581

Species composition of butterflies associated with nectar feeding on *Libidibia coriaria* (Jacq.) Schltld (Magnoliopsida: Fabales: Fabaceae)

– V. Ajay Krishna, M.P. Gopika, S. Adithyan & K.S. Aneesh, Pp. 28582–28589

New distribution records of five species of freshwater palaemonid prawns (Crustacea: Decapoda) in Nagaland, India

– K. Valarmathi, Pp. 28590–28593

Range extension of the lichenized ascomycete, *Cladonia fruticulosa* Kremp., 1882 (Lecanoromycetes: Lecanorales: Cladoniaceae), from Similipal Biosphere Reserve of Odisha

– Shubham Pradhan, Satyabrata Dash, Bijayananda Sahoo & Biswajit Rath, Pp. 28594–28599

Notes

First photographic record of *Chitoria sordida sordida* (Moore, 1866) (Insecta: Lepidoptera: Nymphalidae: Apaturinae) from Arunachal Pradesh, India

– Roshan Upadhaya, Rajesh Gopinath, R. Mahesh & Gaurav Joshi, Pp. 28600–28603

Westward range extension of the Greater Bluewing *Rhyothemis plutonia* Selys, 1883 (Insecta: Odonata: Libellulidae) into Uttarakhand, India

– Omkar Sanjay Damle, Pp. 28604–28606

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