ISSN 0972- 1800

BIONOTES

VOLUME 22, NO. 1 QUARTERLY JANUARY-MARCH, 2020

Date of Publication: 28th March, 2020

BIONOTES

A Quarterly Newsletter for Research Notes and News
On Any Aspect Related with Life Forms

BIONOTES articles are abstracted/indexed/available in the Indian Science Abstracts, INSDOC; Zoological Record; **Thomson Reuters (U.S.A); CAB International (U.K.); The Natural History Museum Library & Archives, London: Library Naturkundemuseum, Erfurt (Germany)** etc. and online databases.

Publication Policy
Information, statements or findings published are the views of its author/ source only.

Manuscripts
Please E-mail to petersmetacek@gmail.com.

Guidelines for Authors
BIONOTES publishes short notes on any aspect of biology. Usually submissions are reviewed by one or two reviewers.
Kindly submit a manuscript after studying the format used in this journal (http://www.entosocindia.org/). Editor reserves the right to reject articles that do not adhere to our format. Please provide a contact telephone number. Authors will be provided with a pdf file of their publication.

Address for Correspondence
Butterfly Research Centre, Bhimtal, Uttarakhand 263 136, India. Phone: +91 8938896403.
Email: butterflyresearchcentre@gmail.com

From Volume 21
Published by the Entomological Society of India (ESI), New Delhi (Nodal Officer: V.V. Ramamurthy, ESI, New Delhi)
And
Butterfly Research Centre, Bhimtal
Executive Editor: Peter Smetacek
Assistant Editor: Shristee Panthee
Butterfly Research Trust, Bhimtal

Published by Dr. R.K. Varshney, A Biologists Confrerie, Raj Bhawan, Manik Chowk, Aligarh (up to volume 20 (2018)) R.N.I. Registration No. 71669/99.

Cover Photo by Parixit Kafley of *Samia canningi* ejecting fluid from tip of abdomen.

TABLE OF CONTENTS

SEVERE INFESTATION OF *PODAGRICA FUSCICORNIS* (CHEVROLAT, 1837) (CHRYSOMELIDAE) ON A NEW HOST PLANT *ACALYPHA INDICA* (L.) (EUPHORBIACEAE) FROM ODISHA, INDIA

ASHIRWAD TRIPATHY

Department of Silviculture and Agroforestry, Faculty of Forestry, Birsa Agricultural University, Kanke, Ranchi, Jharkhand, 834006

ashirwadaspire351@gmail.com

Reviewer: Peter Smetacek

Podagarica fuscicornis (Chevrolat, 1837) (Coleoptera: Chrysomelidae: Galerucinae) is a species of small jumping beetle. Chrysomelids are leaf beetles but, unlike other leaf beetles, they have a characteristically enlarged femora. The enlarged femora allows these insects to jump when they are disturbed, due to which they are also known as flea beetles. The adult flea beetles feed on plant leaves, stems and petals. During normal feeding, small holes are made on the leaf surface but during heavy infestation they damage a larger area by the combined effect of all the individuals. They are considered as a pest on many agricultural crops including mustard and rapeseed. Numerous garden plants are also attacked by these beetles, which feed on the flowers of *Gardenia* and *Rothmannia* species. *Podagarica fuscicornis* mainly infests plants belonging to Malvaceae family (Dobson, 2001). Common marshmallow (*Althaea officinalis* L.), *Alcea rosea, Lavatera, Malva,* Cotton (*Gossypium* sp.) and Kenaf (*Hibiscus cannabinus*) are commonly infested by these beetles (Farahbakhsh, 1961; Modarres Awal, 1997; Bohinc *et al*., 2011; Troukens, 2018). Adults feeds on flowers and leaves while larvae feed on the roots. Also, it has been recorded damaging plants belonging to Lamiaceae and Urticaceae (Petitpierre, 1985). The global distribution of *P. fuscicornis* is from the Canary Is., Portugal and the U.K. eastwards through the European Mediterranean region (as far north as Poland, Denmark and Ukraine) to Asia (Azerbaijan, Turkey, Western Arabian Peninsula, India (Kerala)) and southwards to Africa (Algeria, Tunisia, Morocco) (Bohinc *et al*., 2011; Sebastian & Akhilesh 2016; Aslan & Ghahari, 2017). Here, a new host plant was recognised as *Acalypha indica* (L.) (Euphorbiaceae). Despite of its medicinal properties the plant is also considered as an obnoxious weed throughout India. This infestation was observed in the morning 9:14 am on 11 October, 2019 in Jemadeipur Village (20.17967°N, 85.09559°E), Nayagarh Dist., Odisha, India. The feeding behaviour was observed in the field. The specimens were collected in vials containing 70% ethanol and sent to entomologists at the Department of Entomology, College of Agriculture, OUAT, Bhubaneswar, Odisha for proper identification of the specimen. The present record appears to extend the known distribution of this species eastwards from Kerala to Odisha.

Acknowledgement

I am grateful to the entomologists at the Department of Entomology, College of Agriculture, OUAT, Bhubaneswar, Odisha for proper identification of the specimen.

References

Aslan E. G. & H. Ghahari. 2017. An Annotated Synopsis of the Flea Beetles of Iran with New Records (Coleoptera: Chrysomelidae: Galerucinae: Alticini).

Transactions of the American Entomological Society 143(3): 633-667.

Bohinc, T., M. Vidrih & S. Trdan. 2011. Massive occurrence of *Podagrica fuscicornis* (L.) (Coleoptera, Chrysomelidae) on common marshmallow (*Althaea officinalis* L.). *Acta agriculturae Slovenica* 97. 10.2478/v10014-011-0020-x.

Dobson, J.R. 2001. An infestation of *Podagrica fuscicornis* (Linnaeus) (Chrysomelidae) on cultivated Malvaceae. *The Coleopterist* **10(2):** 50.

Farahbakhsh Gh. 1961. Chrysomelidae (Coleoptera). Pp. 89–92 in: Farahbakhsh Gh (ed.), *A checklist of economically important insects and other enemies of plants and agricultural products in Iran*. Department of Plant Protection, Ministry of Agriculture Publication, Tehran. 133 pp.

Modarres Awal, M. 1997. Chrysomelidae, Halticidae. Pp. 151-153 in: Modarres Awal M (ed.), *List of agricultural pests and their natural enemies in Iran*. Ferdowsi University Press, Mashhad. 429 pp.

Petitpierre, E. 1985. Notas faunisticas y ecologicas sobre Chrysomelidae (Coleoptera) de Mallorca y Catalunya. *Bolleti - Societat d'Historia Natural de les Balears*, 29: 31-36.

Sebastian, C. D., & P. Akhilesh. 2016. Genetic diversity analysis of the flea beetle, *Podagrica fuscicornis* (Chrysomelidae) using mitochondrial cytochrome oxidase subunit I gene marker. *International Journal of Applied and Natural Sciences*. 6: 17-24.

Troukens W, H. Raemdonck & A. Drumont. 2018. De stokroosaardvlo, *Podagrica fuscicornis* (Coleoptera: Chrysomelidae) in de Benelux. *Phegea* 46(2): 70-72.

Fig. 1-4: showing severe infestation of *Podagarica fuscicornis* (Chevrolat, 1837) on *Acalypha indica* (L.) (Euphorbiaceae).

SAMIA CANNINGI (INSECTA: LEPIDOPTERA: SATURNIIDAE) HAS A FUNCTIONAL PROBOSCIS AND ALIMENTARY CANAL

PARIXIT KAFLEY[1] & PETER SMETACEK[2]

*[*1]Gangmouthan village and post office, Biswanath district, Assam, India 784 167*
parixitk1@gmail.com
[2]Butterfly Research Centre, Bhimtal, Uttraakhand, India
petersmetacek@gmail.com

Reviewer: Stefan Naumann

Introduction

The Saturniidae are a worldwide family of moths, in this family the proboscis is vestigial or absent (Hampson 1892; Barlow, 1982). The adults have a short life span and a very limited daily flight period in order to conserve their energy. They store fat in the abdomen from the larval stage to fuel activity in the adult stage. They are not known to ingest any food or liquid during the adult stage. The genus *Samia* Huebner, [1819] occurs from Pakistan through India to South-east Asia. It has been introduced in Europe, Africa and North America (Peigler and Naumann, 2003). *Samia* belongs to the tribe Attacini in the subfamily Saturniinae. This subfamily contains the largest moths in the world, although *Samia* specimens are generally only moderately large. Peigler and Naumann (2003) note that although published field observations on *Samia* are minimal, there is a large amount of literature in many languages in which *Samia* have been used as study animals in laboratories. These include physical properties and molecular structure of the silk, diapause, cytogenetic, immature and adult morphology, molecular genetics, insect physiology, comparative growth on various host plants, mating and ovi positional behavior, silk spinning behavior, and molecular structure of sex pheromones.

Observation

On 27-06-2019 a male *Samia canningi* (Hutton, 1859) was observed sitting on the ground at a sandy seepage at around 11.00 pm in Gangmouthan, Biswanath district of Assam, India. The moth was observed for around 15 minutes during which multiple photographs were taken using the camera flash to document it's behaviour of imbibing liquids. The insect was then collected as a voucher specimen.

Result and Discussion

Close examination of the photographs taken revealed that it had its vestigial proboscis immersed in the water and was squirting out excess water from the tip of its abdomen. The above observation clearly indicates that the proboscis, despite being vestigial, is functional as is the moth's alimentary canal. In butterflies such behavior is called mud puddling and is used by male butterflies to sequester mineral salts from water (Scoble 1992: 20). When the content of mineral salt is low they ingest large volumes of water and excrete the excess water from the tip of the abdomen exactly as the observed specimens of *S. canningi*. This behavior was observed for moths of the families Noctuidae, Geometridae, plus micromoths of Pyralidae, Pterophoridae and Torticidae in detail by Downes (1973) already. Adler (1982) was the first to show some photos of puddling moths of the families Geometridae and Notodontidae observed in the United States of America, discharging jets of water from their abdomina. The evolution of the soil-visiting habits and their relationship to animal excreta were therein discussed.

Saturniidae and particularly *Samia* have been bred for silk production for centuries and possibly millennia in Assam and have been introduced to Korea, Japan, China, Egypt and Europe (Peigler and Naumann, 2003). The domesticated version of *Samia canningi* is *Samia ricini* which is the only wild silk moth to be totally domesticated, similar to the mulberry silk moth (*Bombyx mori*, (Linnaeus, 1758), family Bombycidae). It does not occur anywhere in the wild and the moths rarely fly (Peigler and Naumann, 2003). Despite the fact that these moths have been bred by humans for centuries, there is no record whatsoever of then imbibing liquid and no evidence to suggest that the vestigial proboscis and alimentary canal are, in fact functional. The only note at all on such a behavior for the family Saturniidae was published by Rougeot (1962: 183), he noted a similar observation for the African genus *Epiphora* Wallengren, 1960, also in the tribe Attacini, from Gabon. A specific determination was not given, but the observation was absolutely similar to ours of *Samia canningi*.

Acknowledgements

We would like to thank Miss Nalini Kafley for bringing my attention to the moth following which the observation was made. I would also like to thank Miss Ambica Agnihotri for her help during the composition of this article. The authors are very grateful to the reviewer for valuable information and suggestions.

References

Adler, P. H. 1982. Soil- and puddle-visiting habits of moths. *Journal of the Lepidopterists' Society*. 36 (3): 161 – 173.

Barlow, H. S. 1982. *An introduction to the Moths of South East Asia*. Malayan Nature Society, Kuala Lumpur. 305 pp., 50 plates.

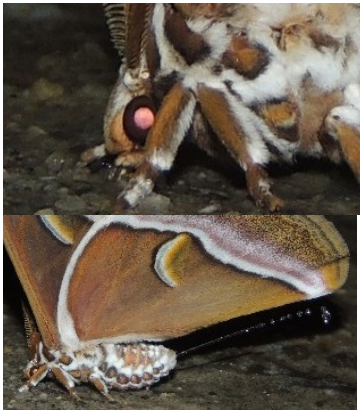
Downes, J. A. 1973. Lepidoptera feeding at puddle-margins, dung, and carrion. *Journal of the Lepidopterists' Society*.27 (2): 89 – 99.

Hampson, G. S. 1892. *The Fauna of British India, including Ceylon and Burma. Moths volume I.* Taylor & Francis, London.xxiii + 527 pp.

Peigler, R. S. & S. Naumann. 2003. *Revision of the Silk Moth genus Samia.* University of the Incarnate Word, San Antonio. 230 pp., 10 maps, 20 plates.

Rougeot, P.-C. 1962. XIV. *Les lépidoptères de l'Afrique noire occidentale.* Fasc. 4. Attacidés (= Saturniidés). *Initiations Africaines, Dakar*: 1 – 214 pp.

Scoble, M. J. 1992. *The Lepidoptera. Form, function and diversity.* The Natural History Museum, London, in association with Oxford University Press,Oxford xi + 404 pp.



Fig, 1&2: *S. canningi* imbibing and ejecting water

Fig. 3: *S.canningi* imbibing water

A NEW REPORT OF PARTIAL ALBINISM IN A HIMALAYAN BULBUL *PYCNONOTUS LEUCOGENYS* FROM UTTARAKHAND, INDIA

PARAMJIT SINGH[1], RAJSHEKHAR SINGH[2], DEVANSHI SINGH[3], SHANKAR KUMAR[4]

[1]PCCF (Retd.)(Uttarakhand Forest Department), 21/II Vasant Vihar, Dehradun, Uttarakhand, 248006, India
paramjit57@yahoo.com
[2]CEO, A Walk in the Woods, 21/II Vasant Vihar, Dehradun, Uttarakhand, 248006, India
walkinwoods.india@gmail.com
[3]Acturial Analyst, 21/II Vasant Vihar, Dehradun, Uttarakhand, 248006, India
devanshisingh95@gmail.com
*[*4]Asst. Professor, Government Post Graduate College, Ranikhet, Almora, 263645,*
kumarshankar86@gmail.com

Reviewer: M. Ackram Awan

Introduction

Uttarakhand is one of the Himalayan states of India, lying to the west of Nepal. It hosts a significant number of India's bird diversity, with many endemic species. Mohan & Sondhi (2015) recorded 693 species of birds from this region. Himalayan Bulbul (*Pycnonotus leucogenys*) is a resident of North Pakistan and the Himalaya. It is a crested bulbul with white cheeks, brownish-grey upper parts and yellow vent. It`s prominently forward pointing crest is brown (Grimmet *et al.*, 2011). This bird is found in dry habitats, open dry scrub, hillsides with scattered raspberry and *Berberis* bushes, hedgerows, bushes around towns and villages and secondary growth (Grimmet *et al.*, 2011). A partially albino Himalayan Bulbul was observed in Uttarakhand, India. The albino stage happens due to lack of the pigment melanin in the birds which causes the feathers to become white. Melanin also gives strength to feathers and protects the bird's eyes from the damage caused by ultra violet rays of the sun.

Observation

Albinism is a rare phenomenon and has been recorded in a few avian species in India. A partially albino Himalayan Bulbul was first photographed at Skimmer Biodiversity Reserve (30^{O}19'29.2"N and 77^{O}59'57.9"E; 644 m amsl), Vasant Vihar, Dehradun, Uttarakhand, when it was foraging amongst leaf-litter on a compost pit on 30th December 2019, at 17:01 hours (IST). The bird was videographed on a mobile phone and photographed with a DSLR camera fitted with a 70–300 mm lens. Identification from photographs was confirmed with the help of Grimmet *et al.* (2011). On 31st December, 2019 the partially albino Himalayan Bulbul was again seen at the same place and photographed along with normal Himalayan Bulbuls at 17:35 hours (IST). On noon of 1st January 2020 it came to a bird feeder in the immediate vicinity of the location where it was first sighted with the resident flock of normally colored bulbuls. During these three sightings, the bird was with the normally colored bulbuls but it appeared that the other bulbuls were harassing it and they did not allow it to come very near to them. Twice we saw it being chased away by other bulbuls.

Discussion

The Skimmer Biodiversity Reserve has a

variety of grasses, bushes, trees and flowering plants (Fig. 1, Map of Skimmer Biodiversity Reserve) and harbours a range of faunal, especially avifaunal, diversity in a semi-urban setting. It is spread over an area of 800 square metres. In the past two years, we have sighted 60 species of birds from this area. Besides the Himalayan Bulbuls, other interesting birds sighted here are Brahminy Myna *Sturnia pagodarum*, Indian Grey Hornbill *Ocyceros birostris*, Shikra *Accipiter badius*, Lineated Barbet *Psilopogon lineatus*, Asian Koel *Eudynamys scolopaceus*, Black-crested Bulbul *Pycnonotus melanicterus*, Scaly Breasted Munia *Lonchura punctulata*, Purple Sunbird *Cinnyris asiaticus*, Baya Weaver *Ploceus philippinus*, Rufous Treepie *Dendrocitta vagabunda*, Indian Silverbill *Euodice malabarica*, Oriental Magpie-robin *Copsychus saularis*, Jacobin Cuckoo *Clamator jacobinus*, Common Hoopoe *Upupa epops*, Greater Coucal *Centropus sinensis*, Pale billed Flowerpecker *Dicaeum erythrorhynchos* and Grey-headed Woodpecker *Picus canus*. Every year, House Sparrow *Passer domesticus*, Oriental White-eye *Zosterops palpebrosus*, Common Tailorbird *Orthotomus sutorius*, Spotted Dove *Streptopelia chinensis*, Oriental Magpie-robin *Copsychus saularis* and Baya Weaver *Ploceus philippinus* breed in this area. A literature review on albinism indicates that this is the first record of partial albinism in Himalayan Bulbul (Van Grouw *et al.*, 2016). There have been reports of full or partially albino birds from India. A partially albino Common House Crow *Corvus splendens* was documented from central Aravalli foothills, Ajmer, Rajasthan by Sharma *et al*. (2015). Partial albinism in a Red-vented Bulbul *Pycnonotus cafer* was also reported from the central Aravalli foothills, Rajasthan by Sharma *et al*., (2018). Total albinism in a Red-vented Bulbul was recorded from Sri Lanka by Gabadage *et al*. (2015). Koul (2019) observed pure and partial albino House Crows (*Corvus splendens*) in Jammu in 2019.

Acknowledgement

The authors are thankful to Mrs. Kamla Singh for letting us make observations in her Reserve and for providing encouragement.

References

Gabadage, D. E., W. M. S. Botejue, A. S. Dias, T. D. Surasinghe & D. M. S. S. Karunarathna. 2015. A case of total albinism in a Red-vented Bulbul *Pycnonotus cafer*. *Indian Birds* 10(6): 162-163.

Grimmet, R., C. Inskipp & T. Inskipp. 2011. Birds of the Indian Subcontinent. 2nd ed. Oxford University Press & Christopher Helm, London. 528 pp.

Koul, S. 2019. First Report of Pure and Partial Albino House Crow (*Corvus splendens*) From Jammu (J. & K.). *International Journal of Recent Scientific Research* 10(02): 30712-30714.DOI:http://dx.doi.org/10.24327/ijrsr.2019.1002.3108

Mohan, D. & S. Sondhi. 2015. An Updated Checklist of the Birds of Uttarakhand. Revised second edition. Uttarakhand Forest Department, Dehradun. vi + 92 pp.

Sharma, V., L. Sharma, R. K. Kumawat & K.K. Sharma. 2015. Sighting of Partial albino Common House Crow *Corvus splendens* from central Aravalli foothills, Ajmer, Rajasthan, India. *Journal on New Biological Reports* 4(2): 162-163.

Sharma, V., D. Yadav, M. Kumari, A.Verma & S. B. Sheikh. 2018. A case of partial Albinism in Red-vented Bulbul (*Pycnonotus cafer*) from Central Aravalli Foothills, Rajasthan. *Journal on New Biological Reports* 7(2): 56-59.

Van Grouw, H., A. Mahabal, R.M. Sharma & S. Thakur. 2016. How common is albinism

really? Colour aberrations in Indian birds reviewed. *Dutch Birding*. 38: 301-309.

Fig. 1: Map of the Skimmer Biodiversity Reserve, Vasant Vihar. Courtesy- *Google Earth ©2018 Google. Image©2019 Maxar Technologies.*

Fig. 2: A partially albino individual of Himalayan bulbul *Pycnonotus leucogenys* (**A**); a normal plumaged Himalayan bulbul can be seen left side close to it (**B**).

NEW RECORD OF *ILLEIS INDICA* TIMBERLAKE, 1943 (COLEOPTERA: COCCINELLIDAE) FROM ODISHA, INDIA

ASHIRWAD TRIPATHY

Department of Silviculture and Agroforestry, Faculty of Forestry, Birsa Agricultural University, Kanke, Ranchi, Jharkhand, 834006

ashirwadaspire351@gmail.com

Reviewer: Peter Smetacek

Obligate biotrophic fungi of Erysiphaceae (Ascomycota: Erysiphales), commonly called powdery mildews are one of the most destructive pathogens with a wide range of host plant species (Glawe, 2008). Economic losses due to powdery mildew infection have been reported in various crops belonging to the families Asteraceae, Cucurbitaceae, Leguminaceae, Malvaceae, Solanaceae and Verbenaceae, besides many cereals and fruit trees (English- Loeb *et al*., 1999; Khodaparast & Abbasi, 2009). The management of the disease typically involves application of fungicides on a regular basis. But a high rate of asexual sporulation by *Erysiphe cichoracearum* (DC.,1805) leads to the development of resistance by this pathogen to benzimidazoles, sterols inhibitors, demethylation inhibitor (DMI) and strobilurins in both laboratory and field experiments (Gubler *et al*., 1996; Del Pino *et al*., 1999; Heaney *et al*., 2000; McGrath, 2001). Due to the above problems, biological control of powdery mildew may offer a solution to the resistance phenomenon and affect the target organism only. There are several biological control agents which include microbial, bacterial (*Bacillus subtilis* Ehrenberg, 1835) and fungal hyperparasites (*Ampelomyces quisqualis* Ces. 1852). Also, numerous species of coccinellids are predators of hemipteran pests such as mealybugs, aphids and scale insects, as well as thrips and mites in all parts of the world (Majerus, 1994). Although majority of coccinellids are predators of other arthropods, not all are purely entomophagous insects. Phytophagy within the Epilachninae and mycophagy (both facultative and obligative), within the Coccinellinae have evolved from a common coccidophagous ancestor (Giorgi *et al*., 2009; Lundgren, 2009). All members of the Psylloborini Casey (Coleoptera: Coccinellidae) are obligate feeders of various powdery mildew conidia and hyphae at all life stages. The cosmopolitan distribution of *Psyllobora* and their wide host range (Sutherland & Parrella, 2009; Joshi & Sharma, 2008) may suggest their importance in natural control of the powdery mildews. During a study of pest status of *Lagerstroemia speciosa* (L.) Pers. in the campus of Orissa University of Agriculture and Technology, Bhubaneswar (20.265816N and 85.810387E) on November 16, 2018, a species of mycophagous beetle was observed feeding on the powdery surface of the *L. speciosa* leaves. The yellow lady bird beetle was collected in vials along with its larva. It was identified as *Illeis indica* Timberlake, 1943 (Coleoptera: Coccinellidae) by Dr. J. Poorani (Project Directorate of Biological Control, Bangalore, India). Its earlier known distribution was from Uttar Pradesh, Jammu & Kashmir, Pakistan and Thailand (Poorani, 2012). Here, it is reported for the first time from peninsular India. The powdery fungus on the leaves of *L. speciosa* was not identified.

References

Del Pino, D., Olalla, L., Canovas, I., Cazorla, F. M., Devicente A. & Tores, J.A. 1999. Resistance to fungicides of *Sphaerotheca*

fuliginea strains isolated from southern Spain. In: *International Proceedings of the Powdery Mildew Powdery Mildew Conference*, Avignon, France, p. 42.

English-Loeb, G., A. Norton, D. M. Gadoury, R. C. Seem & W.F. Wilcox. 1999. Control of powdery mildew in wild and cultivated grapes by a tydeid mite. *Biological Control*, 14(2): 97-103.

Giorgi, J. A., N. J. Vandenberg, J. V. McHugh, J. A. Forrester, S. A. Slipinski, K. B. Miller, L. R. Shapiro & L.R. Whiting, 2009. The evolution of food preferences in Coccinellidae. *Biological Control*, 51(2): 215-231.

Glawe, D. A., 2008. The powdery mildews: a review of the world's most familiar (yet poorly known) plant pathogens. *Annual Review of Phytopatholog*.46: 27-51.

Gubler, W. D., H. L. Ypema, D. G. Ouimette & L. J. Bettiga. 1996. Occurrence and development of resistance in *Uncinula necator* to triadimefon, myclobutanil and fenarimol in California grapevines. *Plant Disease*, 80: 902-909.

Heaney, S. P., A. A. Hall, S. A. Davies & G. Olaya. 2000. Resistance to fungicides in the QoI-STAR cross resistance group: current perspectives. The BCPC Conference: Pests and Diseases, Vol. 2. *Proceedings of an International Conference*, Brighton, UK, 13-16 Nov 2000. 755-762.

Joshi, P. C. & P.K. Sharma. 2008. First Records of Coccinellid Beetles (Coccinellidae) from Haridwar, (Uttarakhand), India, *Nat. Hist. J. Chulalongkorn Univ*., 8(2): 157-167.

Khodaparast, S. A. & M. Abbasi. 2009. Species, host range and geographical distribution of powdery mildew fungi (Ascomycota: Erysiphales) in Iran. *Mycotaxon*, 108: 213-216.

Lundgren, J. G., 2009. Nutritional aspects of non-prey foods in the life histories of predaceous Coccinellidae. *Biological Control*. 51(2): 294-305.

Majerus, M. E. N., 1994. *Ladybirds*. Harper Collins, London, 359 pp.

Poorani. J., 2012. An annotated checklist of the Coccinelidae (Coleoptera) (excluding Epilachninae) of the Indian Subregion. *Oriental Insects*. Vol 36 (1): 1-90.

Sutherland, A. & M.P. Parrella. 2009. Biology and co-occurrence of *Psyllobora vigintimaculata taedata* (Coleoptera: Coccinellidae) and powdery mildews in an urban landscape of California. *Annals of Entomological Society of America*.102(3): 484-491.

Fig. 1&2: *Illeis indica* Timberlake

A COMPENDIUM ON MUSHROOM MITES IN INDIA

RESHMA PARVEEN[1] & SALIL KUMAR GUPTA[2]

Medicinal Plants Research & Extension Centre, RK Mission, Narendrapur, Kolkata-700103

*[1]1000parveenreshma@gmail.com

[2]salil_zsidumdum@yahoo.com

Reviewer: Peter Smetacek

Abstract

The present compendium provides a list of mites occurring both on edible (4 spp.) and wild mushrooms (26 spp.), collected mainly from West Bengal and a few from Kerala. A total of 106 species, under 68 genera, 43 families and 4 orders are reported. Of those, 64 species of mites are represented on edible mushrooms and 57 species of mites are represented on wild mushrooms. This list includes 6 spp. as likely new to science, to be described later, 4 spp. which are hitherto unreported from India and 8 spp. as new occurrence on mushrooms from India. All the species are arranged taxonomic category-wise, giving information regarding their relative abundance and the nature of association with both edible and wild mushrooms. Out of 106 spp., 33 species cause damage, 56 are predators and 16 are of unknown association.

Introduction

Mushrooms on one hand are important components for sustainability of ecosystems and, on the other hand, are of economic importance both for edible and medicinal purposes. Some are parasitic and there are some which may prove to be fatal, if consumed by human beings. Mushroom cultivation is gaining importance day by day because of their manifold uses nowadays. Many mushroom cultivators in West Bengal, especially women, are earning substantially through selling them.

Mushrooms, which can be broadly categorized under 2 groups *viz*. edible and wild, and both are attacked by pests which include insects, mites and nematodes that cause economic loss to the mushroom growers. So far as mites occurring on mushrooms are concerned, not much has been explored from most parts of India. Some of the important publlications are Das (1986), Somchoudhury *et al*. (1987) and Das *et al*. (1987, 1987a, 1988, 1989, 1993). Gupta (2012) provided summarized information of 17 species under 9 genera known till that time from India. Thereafter, Gupta & Pal (2017), Aiswarya *et al*. (2018), Parveen & Gupta (2019, 2020), Mondal & Gupta (2019) provided additional information. Since most of the available information regarding mites of mushrooms is scattered and not accessible to many, it was thought desirable to provide an updated list of mites on mushrooms in India giving all the information available till date.

This list includes 106 species and 68 genera under 43 families and 4 orders from both edible and wild mushrooms. It includes 6 species which appear to be new to science (to be described later), 4 species hitherto unreported from India and also 8 species, which were not known to occur on mushrooms. Apart from listing these species, their relative abundance, the mushroom species on which they had been reported with the nature of association have also been provided.

Materials & Methods

The present compendium of mushroom mites is based mostly upon collections of mites on both edible and wild mushrooms made by the authors from West Bengal (Parveen & Gupta 2019, 2020; Mondal & Gupta, 2019). Besides, other published information available to the authors was also included on this list.

Results and Discussion

Table-1 lists a total of 106 species of mites belonging to 68 genera and 43 families under 4 orders. Of those, 64 species, 51 genera, 28 families, 3 orders have been reported on edible mushrooms and the corresponding figures for wild mushrooms were 57 species, 48 genera, 32 families and 4 orders, respectively. There were many species which were recorded on both types of mushrooms. The present work reports 6 species likely to be new *viz*. *Typhlodromous*-4 spp., *Neocunaxoides*- 1 sp., *Cheylostigmaeus*-1sp.. In addition, 4 species (marked with a single asterisk in Table-1), *viz*. *Charletonia rocciai, Typhlodromous (Anthoseius) egypticus, Hypoaspis lubrica, Macrocheles glaber* were not hitherto reported from India and 8 species (indicated by double asterisks in Table-1) were not reported to occur on mushrooms in India.

Among the mite species, 27 species under 9 families and 3 orders were damage causing in the case of edible mushrooms while corresponding figures for wild mushrooms were 13 species under 5 families and 2 orders. *Acarus siro* and *Tyrophagus putrescentiae* caused damage on edible mushrooms (*Pleurotus* spp.) and *Suidasia nesbitti* and *Tyrophagus putrescentiae* caused damage on wild mushrooms (*Pseudohydnum gelatinosum* and *Chlorophyllum hortense*). As a result of infestation, the mushrooms had shown damage symptoms like blackening of the straw bed, browning of spore-caps and making the stalks hollow, etc.

As far as predatory mites are concerned, the most dominant mites belonged to order Mesostigmata (families Veigaidae, Parasitidae, Ascidae) on edible mushrooms and Ascidae on wild mushrooms. Among Prostigmatid mites, the dominant ones belonged to Cheyletidae (in case of wild mushrooms) and Pyemotidae on edible mushrooms. The predatory mites mostly devoured mites belonging to Acaridae and Suidasiidae. The other 16 mite species reported here were under 16 genera, 14 families and 3 orders and all those were fungal feeding in nature, belonging to Prostigmata (Raphignathidae, Caligonellidae), Mesostigmata (Uropodidae, Resinacaridae) and Oribatida (Galumnidae, Ceratozetidae, Trhypochthoniidae, Oppiidae, Oribatulidae and Austrachipteriidae). It may be mentioned here that oribatid mites were also predominant in some mushrooms.

Through a series of papers, Das (1986), Das *et al*. (1987, 1987a, 1989, 1993) contributed extensively to knowledge of the diversity of mushroom mites along with their bio-ecology and control. Somchoudhury *et al*. through a series of papers (1983-1989) also enriched our knowledge on mushroom mites. Recently, Aiswarya *et al.* (2018) reported 14 species under 18 genera, 12 families, and 3 orders mostly on wild mushroom from Kerala, while Mondal & Gupta (2019) reported 12 species under 10 families on edible mushrooms from West Bengal.

Relative abundance: X= Highly abundant (> 10 specimens/ gram of sample)

Y= Occasional occurrence (>5 specimens but <10 specimens/ gram of sample)

Z= Rare occurrence (<5 specimens/ gram of sample)

Edible mushrooms: 1= *Calocybe indica*, 2= *Pleurotus* spp. (*ostreatus*, *djamor*, *sajor-caju*), 3= *Volvariella volvacea*, 4= *Agaricus bisporus.*

Wild mushrooms: 5= *Chlorophyllum hortense*, 6= *Copalandia cyanescens,* 7=*Crepidotus applanatum,* 8= *Laccaria laccata*, 9= *Ganoderma lucidum,* 10= *Inocybe umbonata,* 11= *Russula kanadii,* l2= *Pseudohydnum gelatinosum,* 13= *Earliella scabrosa,* 14= *Auricularia auricular,* 15= *Coriolopsis occidentalis,* 16= *Russula albonigra,* 17= *Undetermined,* 18= *Ternitomyces* sp., 19= *Lentinus squarrosulus*, 20= *Chlorophyllum molybidites*, 21= *Stereum* sp., 22=*Lenzites* sp., 23= *Marasmius haematocephalus*, 24= *Scleroderma* sp., 25= *Strobilomyces strobilaceus*, 26= *Phlebopus* sp., 27= *Russula congoana*, 28=*Mycena* sp.,

29= *Ganoderma* sp., 30= *Volvariella nigrodisca*, 31=*Dictyophora* sp.
*= New report from India
**= New report on mushroom from India

Acknowledgements
The authors are thankful to Swami Sarvalokananda Maharaj and Swami Vasavananda Maharaj, the Secretary and Assistant Secretary, respectively of R. K. Mission, Narendrapur for providing laboratory facilities. Thanks are also due to Swami Vishwamayananda Maharaj, Secretary, R. K. Mission, Sargachi and Shri Adar Mukherjee, in-charge in mushroom unit of R. K. Mission, Narendrapur for providing samples of mushrooms on which this paper is based.

References

Aiswarya, M., S.K. Gupta & S.P. James. 2018. A preliminary report on Acari inhabiting in different mushrooms of Western Ghats, Calicut, Kerala. *Uttar Pradesh J. Zool*. 38(1): 15-19.

Das, P. 1986. *Bionomics and control of mushroom mites.* Ph.D. thesis. B.C. Agr. Univ., Kalyani: 1-197.

Das, P., A.K. Somchoudhury & A.B. Mukherjee. 1987. Nature and habitat of mushroom mites. *Env.Ecol.* 5(4): 677-680.

Das, P., A.K. Somchoudhury, A.B. Mukherjee & P.K. Sarkar. 1987a. Some aspects of feeding behavior of mushroom mites. *Abst. First Nat. sem. Acar, BCK., Kalyani,* 29-31 Oct., 1987: 24.

Das, P., A.K. Somchoudhury & A.B. Mukherjee. 1988. Source of mite infestation in mushroom. *Env.Ecol.* 6(3): 669-671.

Das, P., A.K. Somchoudhury & A.B. Mukherjee. 1989. Seasonal incidence and assessment of loss caused by mite complex on some cultivated species of mushroom. *Progress in Acarology,* 2: 215-221.

Das, P., A.K. Somchoudhury, A.B. Mukherjee & P.K. Sarkar. 1993. Some aspects of feeding behavior of mushroom mites. In. *Acarological Researches in India* (Eds. A.K. Somchoudhury, A.B.Mukherjee, & Sarkar, P.K.): 271-282.

Gupta, S.K. 2012. *Handbook Injuries and beneficial mites infesting agri-horticultural crops in India and their management,* Nature Books India, New Delhi. 1-362.

Hill, A. & K.L. Deahl. 1978. Description and life cycle of a new species of *Histiosoma* (Acari: Histiostomatidae) associated with commercial mushroom production. *Proc. Entom. Soc. Wash*. 80: 317-329.

Mondal, A. & S.K. Gupta. 2019. Insects and mites occurring on mushroom in South 24 Parganas district of West Bengal. *Int. J. Sci. Res.* 8(2): 67-69.

Mukherjee, A.B. & A.K. Somchoudhury. 1974. Mite pests of mushrooms. FAO *Pl. Prot. Bull.* 22(2): 51.

Parveen, R. & S.K. Gupta. 2019. Some new records of mites occurring in mushroom in South Bengal. *Int. J. Zool. Studies* 4 (5): 8-12.

Parveen, R. & S.K. Gupta. 2020. Diversity of mites (Acari) on wild mushrooms from West Bengal. *Int. J.Agri. & Plant Sci.* 2(1): 1-07.

Somchoudhury, A.K. & A.B. Mukherjee. 1988. Source of mite infesting in mushroom cultivation. *Env. Ecol.* 6(3): 669-671.

Trivedi, T.P. 1988. Occurrence of mites in the beds of cultivated mushroom. Univ. Agri. Sci. Bangalore. *Curr. Res.* 17(9): 125.

Table 1: List of mites both from edible/ wild mushrooms from India with respective hosts/ habitats, relative abundance and nature of association with mushroom species.

Sl. No.	Mites Species			Relative abundance	Edible mushroom (1-4)	Wild mushroom (5-31)	Damage causing	Predator	Others	References
	Order\ Suborder	Family	Species							
1	Sarcoptiformes: Suborder- Oribatida: Cohort-Astigmata	Acaridae	*Acarus siro* Linn.	X	+	+	+	-	-	Parveen & Gupta, 2019 Parveen & Gupta, 2020 Aiswarya *et al*.,2018
2			*Acarus gracilis* Hughes	Z	+	-	+	-	-	Parveen & Gupta, 2019
3			*Acarus farris* Oudemans	Z	+	+	+	-	-	Parveen & Gupta, 2020
4			*Tyrophagus dimidiatus* Hermann	Y	+	-	+	-	-	Gupta, 2012 Das *et al*., 1987 Somchoudhury & Mukherjee, 1988
5			*Tyrophagus berlesei* Michael	Z	+	-	+	-	-	Gupta, 2012
6			*Tyrophagus putrescentiae* Schrank	X	+	+	+	-	-	Gupta, 2012 Parveen & Gupta, 2019 Parveen & Gupta, 2020 Aiswarya *et al*., 2018 Mukherjee & Somchoudhury, 1972
7			*Tyrophagus longior* Gervais	Z	+	+	+	-	-	Parveen & Gupta, 2019 Parveen & Gupta, 2020 Aiswarya *et al*., 2018

8			*Tyrophagus perniciosus* Zachvatkin	Z	-	+	+	-	-	Mukherjee & Somchoudhury, 1974
9			*Rhizoglyphus echinopus* Fumouze and Robin	X	+	-	+	-	-	Gupta, 2012 Parveen & Gupta, 2019 Somchoudhury & Mukherjee, 1988 Das *et al*. 1987, 1988, 1989
10			*Rhizoglyphus robini* Claparede	Y	+	-	+	-	-	Parveen & Gupta, 2019
11			*Caloglyphus oudemansi* Zachvatkin	Z	+	-	+	-	-	Parveen & Gupta, 2019
12			*Caloglyphus mycophagus* Megnin	Z	+	-	+	-	-	Gupta, 2012
13			*Caloglyphus berlesei* Michael	Z	+	-	+	-	-	Parveen & Gupta, 2019
14			*Caloglyphus hughesi* Samsinak	Z	-	+	+	-	-	Aiswarya *et al*., 2018
15		Histiostomidae	*Histiostoma heinemanni* Hill & Diahl	Z	+	-	+	-	-	Gupta, 2012 Das *et al*., 1987, 1989 Somchoudhury & Mukherjee, 1988
16			*Histiostoma ferroniarum* Dufour	X	+	+	+	-	-	Aiswarya *et al*., 2018 Parveen & Gupta, 2019 Parveen & Gupta, 2020
17			*Histiostoma gracilipis* Banks	Z	+	-	+	-	-	Gupta, 2012 Hill & Deahl, 1978
18			*Histiostoma sapromyzarum* Dufour	X	+	+	+	-	-	Parveen & Gupta, 2019 Parveen & Gupta, 2020
19		Glycyphagidae	*Glycyphagus domesticus* De Geer	X	+	-	+	-	-	Aiswarya *et al*., 2018 Parveen & Gupta, 2019
20			*Glycyphagus bicaudatus* Hughes	Z	+	-	+	-	-	Parveen & Gupta, 2019
21			*Glycyphagus ornatus* Kramer	Z	-	+	+	-	-	Aiswarya *et al*., 2018

22			*Austroglycyphagus geniculatus* Vitzthum	Z	-	+	+	-	-	Parveen & Gupta, 2020
23			*Lepidoglyphus destructor* Schrank	X	-	+	+	-	-	Aiswarya *et al*., 2018 Parveen & Gupta, 2019 Parveen & Gupta, 2020
24		Suidasiidae	*Suidasia nesbitti* Sasa	X	+	+	+	-	-	Parveen & Gupta, 2019 Parveen & Gupta, 2020
25	iformes: Suborder-Prostigmata	Tarsonemidae	*Tarsonemus granarius* Lindquist	Z	-	+	+	-	-	Parveen & Gupta, 2020
26			*Tarsonemus myceleiphagus* Austin & Jary	Z	+	-	+	-	-	Gupta, 2012
27			*Tarsonemus confusus* Ewing	Z	+	-	+	-	-	Gupta, 2012
28			*Tarsonemus tarsalis* Canestrini	Z	+	-	+	-	-	Gupta, 2012
29		Pygmephoridae	*Pygmephorus selinicki* Krczal	Z	+	-	+	-	-	New report
30			*Pygmephorus fletchmanni* Wicht	Z	+	-	+	-	-	New report
31		Dolichocybidae	*Dolichocybe keiferi* Krantz	Y	+	-	+	-	-	New report
32		Scutacaridae	***Scutacarus baculitarsus* Norton & Ide	Z	+	-	+	-	-	New report
33		Tydeidae	*Tydeus collyerae* Baker	X	+	-	-	+	-	Parveen & Gupta, 2019
34			***Tydeus gosabaensis* Gupta	Z	-	+	-	+	-	New report
35			***Lorrya stricta* Gupta	Z	+	-	-	+	-	New report
36		Raphignathidae	*Raphignathus* sp.	X	+	-	-	-	+	Parveen & Gupta, 2019
37		Pyemotidae	*Pyemotes herfsi* Oudemans	X	+	-	+	-	-	Parveen & Gupta, 2019
38		Caligonellidae	*Neognathus* sp.	Z	+	-	-	-	+	Parveen & Gupta, 2019

39		Cunaxidae	*Neocunaxoides* sp.n.	Z	+	-	-	+	-	Parveen & Gupta, 2019
40			*Cunaxoides biscutum* Nesbitt	Z	-	+	-	+	-	Parveen & Gupta, 2020
41		Tenuiepalpidae	*Brevipalpus euphorbiae* Mohanasundarum	Z	-	+	-	-	+	Parveen & Gupta, 2020
42		Cheyletidae	*Cheyletus eruditus* Schrank	Y	+	+	-	+	-	Parveen & Gupta, 2020
43			*Cheyletus audex* Oudemans	Y	-	+	-	+	-	Parveen & Gupta, 2020
44			*Eucheyletia sinensis* Volgin	Z	-	+	-	+	-	Parveen & Gupta, 2020
45			*Chelacaropsis moorei* Baker	Z	-	+	-	+	-	Parveen & Gupta, 2020
46		Iolinidae	******Pronematus fleschneri* Baker	Z	-	+	-	-	+	New report
47		Stigmaeidae	*Cheylostigmaeus* sp.n.	Z	-	+	-	+	-	Parveen & Gupta, 2020
48		Erythraeidae	*****Charletonia rocciai* Treat & Flechtmann	Z	-	+	-	+	-	New report
49	Mesostigmata	Blattisociidae	*Lasioseius quadrisetosus* Chant	X	+	-	-	+	-	Parveen & Gupta, 2019
50			*Lasioseius floridensis* Berlese	X	-	+	-	+	-	Parveen & Gupta, 2020
51			******Lasioseius parberlesei* Bhattacharya	Z	-	+	-	+	-	New report
52			*Lasioseius mcgregori* Chant	Z	-	+	-	+	-	Parveen & Gupta, 2020
53			*Lasioseius formosus* Westerboer	Z	-	+	-	+	-	Aiswarya *et al*., 2018
54			*Lasioseius penicilliger* Berlese	Y	+	+	-	+	-	Aiswarya *et al*., 2018
55		Ascidae	*Zercoseius spathuliger* Leonardi	Z	-	+	-	+	-	Parveen & Gupta, 2020
56			******Asca biswasi* Bhattacharyya	Z	+	-	-	+	-	New report
57			*Asca garmani* Hurlbutt	Z	-	+	-	+	-	Parveen & Gupta, 2020
58			*Antennoseius indicus* Bhattacharyya	Y	+	-	-	+	-	Parveen & Gupta, 2019
59			*Gamasellodes bicolor* Berlese	Y	+	+	-	+	-	Parveen & Gupta, 2020
60			*Cheiroseius laelaptoides* Berlese	Z	-	+	-	+	-	Parveen & Gupta, 2020
61			*Platyseius subglaber* Berlese	Z	-	+	-	+	-	Parveen & Gupta, 2020

62		Melicharidae	*Proctolaelaps pygmaeus* Muller	Z	-	+	-	+	-	Aiswarya et al., 2018
63		Parasitidae	*Parasitus assamensis* Bhattacharyya	X	+	-	-	+	-	Parveen & Gupta, 2019
64			*Parasitus consanguineus* Oudemans & Voigts	X	+	-	-	+	-	Parveen & Gupta, 2019 Trivedi, 1988
65			*Parasitus shillongensis* Bhattacharyya	X	-	+	-	+	-	Parveen & Gupta, 2020
66			******Pergamasus primitivus* Oudemans	Z	+	-	-	+	-	New report
67			*Pergamasus crassipes* Berlesei	Z	+	-	-	+	-	Parveen & Gupta, 2019
68			*Pseudoparasitus* sp.	Z	-	+	-	+	-	Aiswarya *et al*., 2018
69		Phytoseiidae	*Typhlodromous* sp. n. 1	Y	+	-	-	+	-	Parveen & Gupta, 2019
70			*Typhlodromous* sp. n. 2	Y	+	-	-	+	-	Parveen & Gupta, 2019
71			*Typhlodromous* sp. n. 3	Y	+	-	-	+	-	Parveen & Gupta, 2019
72			*Typhlodromous* sp. n. 4	Y	-	+	-	+	-	Parveen & Gupta, 2020
73			*****Typhlodromous (Anthoseius) egypticus* EL-Badry	Z	+	-	-	+	-	New report
74			*Neoseiulus fallacies* (Garman)	Z	-	+	-	+	-	Parveen & Gupta, 2020
75			*Amblyseius herbicolus* (Chant)	Z	+	-	-	+	-	Mondal & Gupta, 2019
76		Laelapidae	*Cosmolaelaps indicus* Bhattacharyya	X	+	+	-	+	-	Parveen & Gupta, 2019 Parveen & Gupta, 2020
77			*Cyrtolaelaps* sp.	Z	-	+	-	+	-	Parveen & Gupta, 2020
78			*Hypoaspis miles* Berlese	X	+	-	-	+	-	Somchoudhury & Mukherjee, 1987 Das *et al*., 1989 Gupta, 2012
79	Mesostigmata		*Hypoaspis berlesei* (Oudemans)	Z	+	-	-	+	-	Mondal & Gupta, 2019
80			*Hypoaspis aculifer* Canestrini	Y	+	+	-	+	-	Aiswarya *et al*., 2018

81			*Hypoaspis lubrica* Voigts and Oudemans	Z	+	-	-	+	-	New report
82			**Androlaelaps casalis* (Berlese)	Z	+	-	-	+	-	New report
83			*Ololaelaps* sp.	Z	+	-	-	+	-	New report
84		Eviphidae	*Crassicheles* sp.	Z	+	-	-	+	-	Parveen & Gupta, 2019
85		Polyaspididae	*Polyaspis* sp.	Z	+	-	-	+	-	Parveen & Gupta, 2019
86			*Uropolyaspis* sp.	Z	-	+	-	+	-	Parveen & Gupta, 2020
87	Mesostigmata	Resinacaridae	*Resinacarus resinatus* Vitzthum	Z	+	-	-	-	+	Parveen & Gupta, 2019
88		Rhodacaridae	*Rhodacarus* sp.	Z	+	-	-	+	-	Parveen & Gupta, 2019
89		Uropodidae	*Fuscuropoda marginata* C.L.Koch	X	+	+	-	-	+	Aiswarya *et al*., 2018 Parveen & Gupta, 2019 Parveen & Gupta, 2020
90			*Trematura* sp.	Z	+	-	-	-	+	Parveen & Gupta, 2019
91			*Leiodenychus krameri* (Canestrini)	X	-	+	-	-	+	Aiswarya *et al*., 2018 Parveen & Gupta, 2020
92		Veigaidae	*Veiga uncata* Farrier	X	+	-	+	-	-	Parveen & Gupta, 2019
93		Zerconidae	*Zercon prasadi* Blaszak	Z	-	+	-	+	-	Parveen & Gupta, 2020
94		Sejiidae	*Sejus togatus* Koch	Y	+	+	-	+	-	Parveen & Gupta, 2020
95		Macrocheliidae	*Macrocheles muscaedomesticae* (Scopoli)	Y	+	+	-	+	-	Parveen & Gupta, 2020
96			* *Macrocheles glaber* Muller	Z	-	+	-	+	-	New report
97		Neoparasitidae	*Gamasiphis (Neogamasiphis) bengalensis* Bhattacharyya	Z	-	+	-	+	-	Parveen & Gupta, 2020
98		Ameroseiidae	*Kleemania plumosus* (Oudemans)	Z	-	+	-	-	+	Aiswarya *et al*., 2018

99		Zerconopsidae	*Zerconopsis* sp.	Z	-	+	-	-	+	Aiswarya *et al*., 2018
100		Pachylaelapidae	*Pachylaelaps dorsalis* Bhattacharya	Z	+	-	-	+	-	Mondal & Gupta, 2019
101	Sarcoptiformes: Suborder - Oribatida (excluding Astigmata)	Galumnidae	*Galumna flabellifera* Von Heyden	Y	-	+	-	-	+	Parveen & Gupta, 2020
102		Ceratozetidae	*Ceratozetes* sp.	Y	-	+	-	-	+	Parveen & Gupta, 2020
103		Trhypochthoniidae	*Archegozetes* sp.	Z	-	+	-	-	+	Parveen & Gupta, 2020
104		Oppiidae	*Oppia* sp.	Z	-	+	-	-	+	Parveen & Gupta, 2020
105		Oribatulidae	*Oribatula* sp.	Z	-	+	-	-	+	Parveen & Gupta, 2020
106		Austrachipteriidae	*Lemellobates* sp.	Z	-	+	-	-	+	Parveen & Gupta, 2020

FOUR NEW BUTTERFLY SPECIES FOR NEPAL: *ABISARA CHELA*, *TAGIADES JAPETUS*, *LETHE DURA* & *LETHE DISTANS*

PIET VAN DER POEL[1], COLIN SMITH[2], MAHENDRA SINGH LIMBU[3] & SURENDRA PARIYAR[4]

*[*1]Noordwijkerhout, The Netherland*
pipoel@yahoo.com
[2]Pokhara, Nepal
[3]Godavari, Kathmandu, Nepal
[4]Annapurna Conservation Area Project, Pokhara, Nepal

Reviewer: Peter Smetacek

To record new species for science, a specimen and its description is necessary. However, new records of known species in a different locality or country can be based on photographic evidence showing the relevant characteristics. In 2015, Colin Smith drafted an article about three new species for Nepal, to which he added a fourth early in 2016. However, for reasons unknown, the article apparently never saw the light of day. One of the four species, *Celaenorrhinus nigricans* was reported for Nepal by Sajan KC and Pariyar (2019). The three remaining species and one additional new species for Nepal are presented in this article.

Abisara chela De Nicéville, 1886, Spot Judy ssp *A. c. chela* occurs in Sikkim, India (Varshney and Smetacek, 2015). This species is very similar to *Abisara neophron* (Hewitson, 1861) Tailed Judy, which has been known in Nepal since 1867 (Ramsay, v*ide pers. comm.* Colin Smith, 2017). *A. chela* has a costal white spot on the upper forewing at the end of the pale postdiscal band (Evans, 1932).

A. chela chela was photographed by Piet van der Poel on 2 Dec. 2015 at 1090m elevation near Birethante at the southern side of the Annapurna Conservation Area in the Gandaki area of Nepal. The following day at the same site *A. neophron* was photographed. Generally, the latter is observed in clearings in thick forest. These two observations were at a stream in an open area at some 80m from the nearest forest. *A. chela chela* was again observed by Piet van der Poel on 11 Dec. 2016 along a track in the forest above Lakeside Pokhara at 900m elevation and on 4 Mar. 2018 at a puddle near the forest edge at Rupa Lake at 635m. It was also photographed by Surendra Pariyar on 2 and 29 November 2018 near Chitre in the Annapurna Conservation Area in clearings in forest at 1550 and 1840m elevation. These observations are the highest and the most western observations (Parbat district, west of Pokhara-Kaski District) of the species till date. It was again observed in March 2020 by Surendra Pariyar at Rupa Lake and by Sajan KC in Lamjung at 490m.

Some specimens labelled "*Abisara neophron"* in the Annapurna Natural History Museum in Pokhara were inspected. No specimens of *A. chela* were found among them. Hence, it appears that *A. chela* in recent times extended its range into the greater Pokhara area (Kaski, Parbat and Lamjung Districts). It may have been in the area in between Sikkim and Pokhara for a longer period, but it was never reported, possibly due to the lack of surveys in many parts of Nepal. These observations extend the known range of *A. chela* by more than 400km.

Tagiades japetus (Stoll, [1781]), Common Snow Flat ssp *T. j. ravi* (Moore, [1866])

occurs from Uttarakhand to NE India and from Madhya Pradesh to West Bengal (Varshney and Smetacek, 2015). Consequently, it would be expected to occur in Nepal as well. It is very distinctive, having no white on the upper wings at all, except for an occasional white suffusion, and having clear spots on the forewings. It was listed by Colin Smith in his "Lepidoptera of Nepal" (2010). *T. japetus* was photographed by Colin Smith on 13 March 2010 near Dharan in Sunsari District of the Eastern Terai at about 100m elevation. It was seen in a shrubby area near a dried-up stream bed in thick forest. It was again photographed near Dharan in Sunsari district by Piet van der Poel on 27 March 2018 when it settled for 5 seconds near standing water in a small clearing in thick forest at 250m elevation.

The authors assume that *Tagiades japetus* is present throughout the Terai area of Nepal and that it has only been reported twice due to it being rather elusive.

Lethe dura (Marshall 1882), Scarce Lilacfork was until recently known on the Indian Subcontinent from Sikkim to NE India (Varshney and Smetacek, 2015). Early in 2020, it was reported for the first time from Uttarakhand (Singh and Singh, 2020). It is quite similar to *Lethe sura* (Doubleday [1849]), Lilacfork, but is distinguished by the inner edge of the under hind-wing discal band in spaces 4-6 being angled instead of straight, by the upper forewings being paler outwardly instead of mostly plain brown, and by the discal spots on the upper hindwings being smaller. *L. sura* has been known in Nepal since 1963 (Fujioka) and is fairly seldom seen, usually in or near broadleaved forest. *L. dura* was first photographed in Nepal by Mahendra Singh Limbu at Godavari at 1620m elevation on the 8th of June 2015. Two flying individuals were observed in the same area on the 16th of November 2015 at 1920m. It has been observed in the Godavari area fairly regularly since then. It was also photographed in 2016 in Ilam by Sanjaya Tamang and in November 2019 by Piet van der Poel in Ranibari Park Community Forest at 1320m, not far from the city centre of Kathmandu.

There appears to be some confusion about *Lethe sura* and *L. dura*. The coloured drawing in Doubleday (1949) to which the Funet website links *L. sura* and which is named "*Zophoessa sura"* appears to be what is nowadays called *L. dura.* Moreover, Funet gives as common name for *Lethe sura* "Scarce Lilacfork". Here, we follow the currently accepted species and common names for India (Varshney and Smetacek, 2015). The fact that nowadays *Lethe dura* is regularly observed may make one wonder if it was always there and recently increased in numbers or if it moved in recently.

Lethe distans Butler, 1870*,* Scarce Red Forester, *Lethe chandica* (Moore, [1858[) and *Lethe mekara* (Moore, [1858[), the Angled and Common Red Foresters, are more or less regularly encountered in Nepal. However, *Lethe distans,* the Scarce Red Forester, was never reported before. Varshney and Smetacek (2015) report it from Sikkim to N.E. India. The type locality is Darjeeling (Butler, 1870). It does not have any subspecies. A female of *Lethe sp* was photographed at the Tiger Mountain Resort near Pokhara at 1100m elevation by Hari Bhandari on 15 May 2018. Several people suspected it to be *Lethe distans* (Butler, 1870), the Scarce Red Forester. A second similar female was photographed at the Resort a few months later. Using available resources, including Evans (1932), it was tried to identify the butterfly. The space between the UnH ocellus in space 2 and the discal band was smaller than the width of the ocellus, indicating that it was most probably *Lethe mekara*. During this exercise, Piet van der Poel looked through his pictures of *Lethe chandica* and found one male that was not sharply angled and for which the distance between the ocelli in spaces 2-4 and the discal band was wider than the width of the ocelli for all three of the spaces, hence the Scarce Red Forester. It was photographed on 24 April 2016 on the roadside in a forested area at

1050m not far from the Tiger Mountain Resort. It is the most western observation of *L. distans* till now, a westwards extension of its known range by some 400km.

Lethe distans may have been in Nepal for a long time, and having no record since early 2016 indicates that it is probably very seldom seen, rather than it having extended its range recently.

References

Evans, W.H. 1932. *The identification of Indian butterflies*. Bombay Nat. Hist. Soc., Diocesan Press, Madras.

KC, Sajan & S. Pariyar (2019). New Evidence of Himalayan Small-banded Flat *Celaenorrhinus nigricans nigricans* (de Nicéville, 1885) from Nepal. *Int J Zoology Studies,* Vol.4 issue 5 Sep.2019 p55-57.

Singh A. P. & T. Singh, 2020. Occurrence and association of the Scarce Lilacfork *Lethe dura gammiei* (Moore, [1892]) (Lepidoptera: Nymphalidae: Satyrinae) with Woolly-leaved Oak *Quercus lanata* Smith, 1819 (*Fabaceae*) forest in the Kumaon region of the Indian Himalaya. *J. of Threatened Taxa*, Vol. 12 -3, pp. 15387–15390.

Smith, C. 2010. *Lepidoptera of Nepal*. Himalayan Nature / Sigma General Offset Press, Kathmandu.

Varshney, R.K. & P. Smetacek (eds.) 2015. *A Synoptic Catalogue of the Butterflies of India*. Butterfly Research Centre, Bhimtal and Indinov Publishing, New Delhi.

Fig.1: *Abisara chela*

Fig.2: *Tagiades japetus*

Fig.3: *Lethe distans*

Fig.4: *Lethe dura* ventral view

Fig.5: *Lethe dura* dorsal view

Fig.6: *Lethe dura* ventral

EDESSENA GENTIUSALIS (INSECTA: LEPIDOPTERA: EREBIDAE: HERMININAE): A NEW RECORD FOR INDIA

SHRISTEE PANTHEE[1], AMBICA AGNIHOTRI[2] & PETER SMETACEK[3]

[1&3]Butterfly Research Centre, Bhimtal, Uttarakhand

*[*1]shristeesharma3@outlook.com*

[3]petersmetacek@gmail.com

[2]Uttarakhand Forest Research Institute, Haldwani, Uttarakhand

[2]ambicaagnihotri99@gmail.com

Reviewer: R.C. Kendrick

Introduction

The erebid genus *Edessena* Walker, [1859] is known from China, Japan, Korea, Taiwan and Thailand. Currently two species are placed in the genus, the type species *E. gentiusalis* Walker, [1859] which is known from China, Korea, Japan, Taiwan and Thailand (Kononenko & Pinratana, 2005) and *E. hamada* (Felder & Rogenhofer , 1874) from Russia, Japan, Korea and China (Leley, 2016; Owada, 1987). The record from Thailand was not confirmed as *E. gentiusalis* by Huttacharern & Tubtim (1995) although Kononenko & Pinratana (2005) illustrated their specimens and confirmed the identity as *E. gentiusalis*. Three specimens of *E. gentiusalis* were recorded in India. They were collected at a mercury vapour lamp reflected off a white sheet, to which moths are known to be attracted (Barlow, 1982).

Material Examined

3 exs.: forewing length: 25-27 mm. 1 male 8.v.2019; 1 male and 1 female 5.vii.2019. Km 17 Hunli – Anini road in the Mishmi hills of Lower Dibang Valley district, Arunachal Pradesh, India (600 m elevation) *Leg. et. Coll*. Peter Smetacek, Butterfly Research Centre, Bhimtal, Uttarakhand. The present records constitute an eastward extension to known distribution of this genus and species. The fascies of the material examined matches the illustration of both specimens in Kononenko and Pinratana (2005). It is not common, with one or two specimens attending the screen during their flying period. The current records suggest that there are at least two annual generations. Females possess much shorter palpi than males.

References

Barlow, H.S. 1982. *An Introduction to the Moths of South East Asia*. Malayan Nature Society, Kuala Lumpur. 305 pp., 50 pl.

Hutacharern, C. & N. Tubtim. 1995. *Forest insects in Thailand.* Office of Environmental Policy and Planning, Bangkok. 299 pp.

Kononenko, V. S. & A. Pinratana. 2005. *Moths of Thailand, Volume 3 Noctuidae*. Bro. St. Gabriel in Thailand, Bangkok. 261 pp.45 pl.

Leley, A.C. 2016. *Annotated catalogue of the insects of Russian Far East. Volume 2. Lepidoptera.* Dalnauka, Vladivostok. 2: 1-812.

Owada, M. 1987. *A taxonomic study on the subfamily Herminiinae of Japan (Lepidoptera: Noctuidae)*. Tokyo National Science Museum Monograph 2: 1-208.

Wu, Shipher. 2014. *Systematics of Herminiinae of the Palaearctic and Oriental regions, with a taxonomic revision of the Taiwanese fauna (Lepidoptera, Erebidae)*.Ph.D thesis, National Taiwan University.xi + 357pp.

.

Fig.1: *E. genutusialis*, India. Top & bottom male,

Fig.2: *E. genutusialis*, male palpi

Fig.3: *E. genutusialis*, male ventral view

Fig.4: *E. genutusialis*, male dorsal view

FIRST RECORD OF JOKER BUTTERFLY *BYBLIA ILITHYIA* (INSECTA: LEPIDOPTERA: NYMPHALIDAE) FROM PAKISTAN

MUHAMMAD AKRAM AWAN[1], WALI NOHRIO[2] & DILEEP PERMAR[3]

*[*1]Ayubia town, Taxila, Rawalpindi, Punjab, Pakistan*
ackramawan@gmail.com
[2]ARY News, Mithi, Tharparkar, Sindh, Pakistan
wnohrio@yahoo.com
[3]Nagarparkar, District Tharparkar, Sindh, Pakistan
dileep.permar@hotmail.com

Reviewer: Peter Smetacek

Abstract

Joker Butterfly *Byblia ilithyia* is reported for the first time from Pakistan.

Introduction

The Joker or Spotted Joker *Byblia ilithyia* (Drury, [1773]) is a widespread nymphalid butterfly, found in sub-Saharan Africa, eastwards through the Arabian peninsula to India. In Africa, it is distributed from Senegal in the west, southwards to South Africa and eastwards to Ethiopia (African Butterfly Database, 2020). It is absent in Madagascar. In the Middle East, Belletto & Larsen (1985) reported it from Dhofar in Oman, where it is common and Ju-Amlah, near Sa'dah, in Yemen, where it is very rare. There is no record from Iran (Naderi, 2019) and it was not reported from Pakistan by Tshikolovets & Pages (2016). In South Asia, it occurs in north-western and south-eastern parts of Sri Lanka and in peninsular India from Tamil Nadu northwards to Gujarat and north-eastwards to Chhattisgarh (Varshney &Smetacek, 2015).

Methodology

After a good monsoon, on 24th September 2019 the second author WN photographed a butterfly with his cellphone camera (Oppo F5 Youth) in the Karoonjhar mountain range (24°20′26″N 70°44′0″E), Tehsil Nagar Parkar, District Tharparkar, Sindh province, Pakistan. The first author identified it as *Byblia ilithyia*. On the second occasion, the third author, DP videographed and photographed several individuals of the same species with his Apple Iphone 6s on 4th November 2019 from the same locality.

Discussion

This is the first record of *B. ilithyia* from Sindh province as well as from Pakistan. The Karoonjhar mountains are situated on the northern edge of the Rann of Kutch. They consist of granite rocks and are considered an outlying mass of the crystalline rocks of the Aravalli range. The climate of this mountain range is extreme due to rocky terrain and lack of vegetation. August and September are the only cool months due to monsoon rains (Wikipedia, 2020). *B. ilithyia* inhabits dry regions (Smetacek, 2016). Therefore, it seems to be a resident of the area, not a post-monsoon straggler.The records from September and November suggest a long emergence period of a single brood of the butterfly or else there are at least two annual generations in the area.

Conclusion

Tshikolovets & Pages (2016) did not report this species nor did they include it in the appendix of species likely to occur in Pakistan. Since it has been recorded from Rajkot and Kutch districts of the neighbouring Indian state of Gujarat (Bakos *et al*., 2020), it was expected from border districts like Tharparkar and Badin of Sindh province, Pakistan. More new records for Pakistan can be obtained from

this region if proper exploration is carried out. This is 442nd butterfly species recorded from Pakistan after Awan & Hassan (2019).

References

African Butterfly Database. Species database: *Byblia ilithyia* (Drury, 1773). Retrieved on: 24th February 2020 from: https://abdb-africa.org/species/Byblia_ilithyia

Awan, M. A. & S. Hassan. 2019. First report of Common Five-ring *Ypthima baldus* (Insecta: Lepidoptera: Nymphalidae) for Pakistan. *Bionotes* 21(3): 58-59.

Bakos, P., A., M. Kshirsagar, M. Bhakare, & S. Kalluri. 2020. *Byblia ilithyia* (Drury, [1773]) – Joker. Kunte, K., S. Sondhi & P. Roy (Chief Editors). Butterflies of India, v. 2.74. Indian Foundation for Butterflies. Retrieved on 27th February, 2020 from: http://www.ifoundbutterflies.org/sp/752/Byblia-ilithyia

Balletto, E. & T.B. Larsen. 1985. On a small collection of butterflies from Yemen. *Monitore Zoologico Italiano*. Supplemento, 20:1, 121-133. https://doi.org/10.1080/03749444.1985.10736693

Naderi, A. 2019. *Field Guide to the Butterflies of Iran*. (in Persian) Iran-Shenasi publisher, Tehran. pp. 528.

Smetacek, P. 2016. *A Naturalist's Guide to the Butterflies of India, Pakistan, Nepal, Bhutan, Bangladesh and Sri Lanka*. Reprinted edition. John Beaufoy Publishing Ltd., Oxford. 176 pp.

Tshikolovets, V. & J. Pages. 2016. *The Butterflies of Palaearctic Asia*. XII. The Butterflies of Pakistan. Vadim Tshikolovets publisher, Pardubice, Czechia. 318 + xvii pp.

Varshney, R.K. & P. Smetacek (eds.). 2015. *A Synoptic Catalogue of the Butterflies of India*. Butterfly Research Centre, Bhimtal and Indinov Publishing, New Delhi, ii + 261 pp., 8 pls.

Wikipedia: Karoonjhar mountains. Retrieved on: 24th February, 2020 from: https://en.m.wikipedia.org/wiki/Karoonjhar_Mountains.

Fig.1: *Byblia ilithyia* ventral view

Fig.2: *Byblia ilithyia* dorsal view

CONFIRMATION OF THE EXTRA LASCAR *PANTOPORIA SANDAKA* IN ODISHA, INDIA

SANDEEP MISHRA[1] & DAYA SHANKER SHARMA[2]

*[*1]Biodiversity Education and Research Centre, M14/15, Panchsakha Nagar, Dumduma, Bhubaneswar, Odisha*

[2]Biodiversity and Wildlife Conservation Laboratory, Department of Zoology, University of Lucknow, Lucknow, Uttar Pradesh

sharmadaya0402@gmail.com

Reviewer: Peter Smetacek

The Extra Lascar *Pantoporia sandaka* (Butler, 1892) is superficially nearly identical to the widespread Common Lascar *P. hordonia* (Stoll, [1790]). Varshney & Smetacek (2015) report *P. sandaka* from Uttarakhand to north east India, peninsular India south of Maharashtra and the Andaman islands. Kehimkar (2016) reported *P. sandaka* from peninsular India up to Maharashtra and West Bengal, Uttarakhand-Arunachal, NE (India). This distribution includes Odisha but appears to be not based on any published records or specimen. No previous author clarified the distribution along the east coast of the Indian peninsula, since this was not confirmed earlier.

Material examined

2 exs. Forewing length: 21 mm. Expanse 42 mm: 16.ii.2020. Village Upara Taladiha, Mayurbhanj district, Odisha (21°40'28.3"N; 86°28'41.7"E). *Leg. et coll.* Sandeep Mishra Biodiversity Education and Research Centre, Bhubaneswar, Odisha.

P. hordonia and *P. sandaka* were separated by Eliot (1969). The only way to distinguish adults is to examine the hind wing speculum. This is not visible in photographs of live individuals, hence it is impossible to separate these two species on the basis of photograph of live individuals. *P. hordonia* has been reported from Odisha (Varshney & Smetacek, 2015). The present records confirm the presence of *P. sandaka* in Odisha.

References

Eliot, J.N.1969. An analysis of the Eurasian and Australian Neptini (Lepidoptera: Nymphalidae). *Bulletin of the British Museum (Natural History). Entomology Supplement*. 15: 1-155 pp., 101 figs., 3 pl.

Varshney, R.K. & P. Smetacek (eds.). 2015. *A Synoptic Catalogue of the Butterflies of India*. Butterfly Research Centre, Bhimtal and Indinov Publishing, New Delhi, ii + 261 pp., 8 pls.

Kehimkar, I. 2016. *Butterflies of India.* Bombay Natural History Society, Mumbai. 505 pp.

Fig. 1: *Pantoporia sandaka*

PRELIMINARY OBSERVATIONS ON VISITOR SPECTRUM OF *RHODODENDRON ARBOREUM* IN THE KUMAON HIMALAYA, INDIA

AMBICA AGNIHOTRI[1], ALFRED DANIEL J.[2] & PIET VAN DER POEL[3]

[1]*Uttarakhand Forest Research Institute, Haldwani, Uttarakhand, India*
ambicaagnihotri99@gmail.com
[2]*S. Thangapazham Agricultural College Vasudevanallur, 627 758, Tamil Nadu, India*
danieljalfred@gmail.com
[3]*Noordwijkerhout, The Netherland*
pipoel@yahoo.com

Reviewer: Peter Smetacek

Introduction

Rhododendron arboreum Smith (Ericaceae) is the state flower of Uttarakhand. It is of economic importance because of the edible petals, which are used for squashes and jam as well as for the wood, which is used for fuel. It grows from 1500 to 3600 m elevation and flowers between January and May, depending upon the elevation, soil, slope direction and weather (Polunin & Stainton, 1984). Despite the long flowering season, it is amongst the earliest flowers in the Himalaya along with *Daphne* Linnaeus sp. and *Reinwardtia trigyna* Planch.

The flowers have numerous diurnal visitors, including birds and insects. So far, there is no published information on the pollinator spectrum or the visitor spectrum of *Rhododendron arboreum* in the Kumaon Himalaya.

Methodology

Suitable flowering trees were located and visitors to the flowers were observed and photographed. For identification of insects to genus level, specimens were collected and curated. Observations were undertaken at three locations in the Gagar range of Nainital district, Uttarakhand. The first location was at Maheshkhan Reserve Forest (1900 m) in a mixed broadleaf forest dominated by Himalayan silver oak *Quercus leucotrichophora* A. Camus, the second location was four kilometres ahead of Dhari at *ca*. 1700 m, where some *Rhododendron* trees were flowering in the Chir Pine forest (*Pinus roxburghii* Sarg.). The third location was one kilometre ahead of Dhanachuli Bend at 2000 m elevation in a mixed broadleaf forest similar to the forest at the first site. Observations were undertaken between 10 am and 3 pm, after which insect activity stopped. Specimens were collected from the Dhanachuli Bend site and curated and deposited at the Butterfly Research Centre, Bhimtal.

Observations

We visited Maheshkhan Reserve Forest on 1.iii.2020 from 10 am to 2 pm, after which the sky got overcast and we were forced to return. On 3.iii.2020 and 22.iii.2020, sites in Dhari and Dhanachuli Bend were visited. In between the two dates, the weather was inclement with rain, hail and snow. Dhari site was entirely unproductive while the Dhanachuli Bend site had numerous visitors.

Flowering trees grew on different aspects of the hills and received sunlight at different times, depending upon the direction of the slope. It was found that insects did not visit flowering trees in the shade but waited until the tree was sunlit before visiting it in numbers. Birds were also seen to prefer sunlit trees rather than trees in the shade.

Remarks

Rhododendron arboreum flowers at different times at different elevation. It flowers as early as January or February in some years at the lower part of its altitudinal distribution and as late as mid - May towards the upper end of its distribution. Chand (2017) reported 9 species of birds and a bumble bee (*Bombus* sp.) as visitors of *R. arboreum* flowers in the Garhwal Himalaya. Ollerton *et al.* (2019) reported 8 species of birds visiting these flowers in Nepal.

Not all flowering trees of this species in an area attract bird or insect visitors. Young flowering trees attract fewer visitors than mature flowering trees.

The trees examined in Chir Pine forest had no flower visitors while trees in broadleaf forest attracted a wide spectrum of visitors at the Maheshkhan R.F. and at the Dhanachuli Bend sites. On the 22.iii.2020 there were no butterflies whatsoever on the wing. On 1.iii.2020, in addition to butterflies that visited *R. arboreum* flowers, the following species were on the wing: Indian Cabbage White *Pieris canidia* (Linnaeus, 1768); Spotless Grass Yellow *Eurema laeta* (Boisduval, 1836); Dark Himalayan Oakblue *Arhopala rama* (Kollar, [1844]) and Common Punch *Dodona durga* (Kollar, [1844]). On 1.iii.2020, an overwintering species, the Blue Admiral *Kaniska canace* (Linnaeus, 1763) was active. There were many more flies active on 22.iii.2020 than on 3.iii.2020 at the Dhanachuli Bend site while there were no *Apis* L. species active on 22.iii.2020 at the Dhanachuli Bend site.

Conclusion

It was found that a variety of birds and insects visit flowers of *R. arboreum* for nectar. *R. arboreum* is gregarious and probably constitutes an important food resource at a lean time of the year. The lack of flower visitors in Chir Pine forest at Dhari is probably due to the lack of insect populations in the area, which experiences forest fires regularly. The visitor and pollinator spectrum of *R. arboreum* flowers in the Kumaon Himalaya is still unclear and will require nocturnal observations in addition to daytime observations.

Acknowledgement

AA is grateful to Mr. Sanjeev Chaturvedi, CCF, UKFRI Haldwani for permission to work on this project which has been done under the "*Rhododendron arboreum* Phenological Study In Middle Himalayan Ranges In Relation To Climate Change." project funded by CAMPA.

References

Chand, V.P. 2017. *Reproductive Phenology, Floral Biology and Pollination Mechanism of Rhododendron arboreum Sm. in a Temperate Forest of Garhwal Himalaya, India*. Ph.D Thesis, Uttarakhand University of Horticulture and Forestry, Bharsar. 121 pp.

Ollerton, J., N.P. Koju, S.R. Maharajan & B. Bashyal. 2019. Interaction between birds and flowers of *Rhododendron* spp., and their implications for mountain communities in Nepal. *Plants, People, Planet*. 00:1-6. https://doi.org/10.1002/ppp3.10091

Polunin, O. & A. Stainton. 1984. *Flowers of the Himalaya*. Oxford University Press, Oxford. 580 pp., 128 pl.

Flower visitors of *Rhododendron arboreum*

Class	Family	Species	Location
Insecta	Nymphalidae	Blue Admiral *Kaniska canace*	Maheshkhan

Insecta	Nymphalidae	Chocolate Pansy *Junonia iphita* (Cramer, [1779])	Maheshkhan
Insecta	Calliphoridae	Bluebottles	Maheshkhan, Dhanachuli Bend
Insecta	Syrphidae	Hoverflies	Maheshkhan, Dhanachuli Bend
Insecta	Apidae	Eastern Honeybee *Apis cerana* Fabricius,1793	Maheshkhan, Dhanachuli Bend
Aves	Pycnonotidae	Mountain Bulbul *Ixos mcclellandii*, Horsfield, 1840	Dhanachuli Bend
Aves	Pycnonotidae	Black Bulbul *Hypsipetes leucocephalus* (Gmelin, 1789)	Maheshkhan
Aves	Sittidae	Chestnut bellied Nuthatch *Sitta (castanea) cinnamoventris* , Blyth, 1842	Dhanachuli Bend, a single female