



Open Access

10.11609/jott.2022.14.2.20539-20702

www.threatenedtaxa.org

26 February 2022 (Online & Print)

14(2): 20539-20702

ISSN 0974-7907 (Online)

ISSN 0974-7893 (Print)



ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

Publisher
Wildlife Information Liaison Development Society
www.wild.zooreach.org

Host
Zoo Outreach Organization
www.zooreach.org

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Cover: *Geodorum laxiflorum* Griff.—inflorescence (Orchidaceae) © Ashish Ravindra Bhojar.



Cotesia anthelae (Wilkinson, 1928) (Hymenoptera: Braconidae) a natural parasitoid of *Cirrochroa thais* (Fabricius, 1787) (Lepidoptera: Nymphalidae), first report from the Oriental region

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Abbreviations: ICAR—National Bureau of Agricultural Insect Resources, Bengaluru, India | NHMUK—Natural History Museum, London, United Kingdom | NIM (ICAR-NBAIR)—National Insect Museum.

With around 328 species described worldwide (Yu et al. 2016; Fernández-Triana et al. 2020), the genus *Cotesia* Cameron (Hymenoptera: Braconidae) is considered as one of the most hyper diverse and cosmopolitan microgastrine taxa, popular as key players in biological control from all biogeographical regions of the globe. Fernández-Triana et al. (2020) stated that most of the known hosts of *Cotesia* belong to three families: Nymphalidae, Saturniidae, and Sphingidae in Costa Rica. Gupta & Fernández-Triana (2014) while documenting the diversity, hosts and cocoons of Indian Microgastrinae, have reported host species of some 20 morphospecies of *Cotesia*. Based on Gupta et al. (2016) review of the world

fauna of *Cotesia*, two species with unusual shape of first tergite (narrowing at midlength), deviating from the original set of generic characters, were compared from India and Africa with their respective hosts belonging to Lasiocampidae and Pieridae, respectively. *Cotesia anthelae* (Wilkinson, 1928) is known to be distributed in Australia from the sole confirmed host *Anthela ocellata* (Walker) (Lepidoptera: Anthelidae) (record from type specimens) with white coloured cocoons (Wilkinson 1928; Fagan-Jeffries & Austin 2020). The present study reports the first confirmed butterfly host species of *C. anthelae* along with its hyperparasitoid *Mesochorus* sp. (Hymenoptera: Ichneumonidae) and the first record of *C. anthelae* from the Oriental region.

Material and Methods

Caterpillars of *Cirrochroa thais* (Fabricius) (Lepidoptera: Nymphalidae) were collected feeding on

Editor: P.M. Sureshan, Zoological Survey of India, Calicut, India.

Date of publication: 26 February 2022 (online & print)

Citation: Gupta, A. & P. Manoj (2022). *Cotesia anthelae* (Wilkinson, 1928) (Hymenoptera: Braconidae) a natural parasitoid of *Cirrochroa thais* (Fabricius, 1787) (Lepidoptera: Nymphalidae), first report from the Oriental region. *Journal of Threatened Taxa* 14(2): 20683–20685. <https://doi.org/10.11609/jott.7564.14.2.20683-20685>

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Funding: Indian Council of Agricultural Research (ICAR); Science and Engineering Research Board (SERB) under Department of Science and Technology (DST) and SciGenom Research Foundation (SGRF).

Competing interests: The authors declare no competing interests.

Acknowledgements: AG is thankful to the Indian Council of Agricultural Research and Director, ICAR-NBAIR for research facilities. She gratefully acknowledges support of SERB scheme: CRG/2021/001523 for Braconidae taxonomic studies. PM is grateful to the SciGenom Research Foundation (SGRF) and Sam Santhosh, SGRF for all the logistic support and continued encouragement for the study and fieldwork.



the host plant *Hydnocarpus wightianus* Blume from Nedumpura, Cheruthuruthy, Thrissur district of Kerala in 2020 and during June, 2021 from the same locality. The field collected caterpillars were reared on the natural host plant *H. wightianus*. Parasitoids were collected from the infested caterpillars and were preserved in 70% ethanol for further studies. The voucher specimens of the present study are deposited in the National Insect Museum of ICAR- National Bureau of Agricultural Insect Resources, Bengaluru, India.

Results

Detailed morphological analysis of the gregarious larval parasitoid revealed the primary parasitoid as *C. anthelae* (Image 1) and *Mesochorus* sp. (Image 2) as its hyperparasitoid. The specimens of *C. anthelae* were compared with the images of the holotype (NHMUK 3.c.002) and paratype (NHMUK 3.c.002) illustrated by Fagan-Jeffries & Austin (2020).

Cotesia anthelae (Wilkinson, 1928)

Apanteles anthelae Wilkinson, 1928: 102 (holotype, female, NHMUK).

Cotesia anthelae – Austin & Dangerfield 1992: 21 (transfer from *Apanteles* s.l.).

Diagnosis of *C. anthelae* (Image 1)

Female: Body length 2.5–2.6 mm; general body colour black; legs except coxae, tegulae (light brown), basal ventrites yellowish-brown; apices of hind femora and apical one third of hind tibiae dark brown to black. Hind tibial spurs, palpi and lateral margins of first tergite pale yellow. Pterostigma and wing veins brown. First and second tergites black, rest of metasoma pale at anterior end, darkening towards hypopygium.

Mesosoma: Mesonotum strongly and coarsely punctate, reticulate-rugose punctate near the middle in the apical half; scutellum smooth, sparsely and shallowly punctate, punctures not clearly defined and well separated from each other. Scutoscuteellar sulcus with 6–8 pits. Propodeum with well-marked median longitudinal carina and transverse basal carinae, irregular rugose, interspaces shiny. Forewing with first abscissa of radial vein (2.9) subequal to transverse cubital vein (2.9) and shorter than pterostigma width (3–3.1) (relative measurements). Pterostigma almost subequal to metacarp. Hind coxae shallowly punctate. Longer hind tibial spur less than two third length of hind basitarsus.

Metasoma: Metasoma with first tergite strongly and coarsely punctate in apical third, mostly parallel sided, curving inwards at apical corners; sclerotized portion



Image 1. Primary parasitoid: Female of *Cotesia anthelae* (Wilkinson).



Image 2. Secondary parasitoid: Female of *Mesochorus* sp.

of second tergite rough and ovoid shaped, strongly and distinctly crenulate at posterior margin and lateral edges. Ovipositor sheaths exerted, subequal to length of longer hind tibial spur. Third tergite onwards smooth.

Cocoons: Gregarious in nature; all the cocoons observed were white in colour and mostly arranged vertically on the host dorsal surface (Image 3).

Host: The butterfly *Cirrochroa thais* (Fabricius) (Lepidoptera: Nymphalidae), commonly known as Tamil Yeoman, is known to be distributed in India and Sri Lanka.

Material examined: 10 females (*C. anthelae*), India: Kerala, 10.729N, 76.263E, 11.viii.2020, ex *Cirrochroa thais* (Fabricius), coll. P. Manoj, specimen code: ICAR/ NBAIR/ Brac/Microg/Cot/11820. 5 females (*Mesochorus* sp.), with same data as above, ICAR/NBAIR/Ich/Meso/11820. Deposited in NIM (ICAR- NBAIR).

Distribution: Australia (Victoria (type) and New South Wales) and Oriental region – Kerala, India (present study).



Image 3. Parasitized caterpillar of *Cirrochroa thais* (Fabricius).

Discussion

Wilkinson (1928) included *C. anthelae* in the 'Indo-Australian species of genus *Apanteles*' hence likelihood of its presence in India is not surprising. However, the more interesting aspect is the discovery of its new butterfly host – *C. thais* as the earlier and the only valid host record was from a species of moth – *A. ocellata* (Anthelidae). According to Fagan-Jeffries & Austin (2020), the other host - *Opodiphthera eucalypti* (Scott) (Lepidoptera: Saturniidae) remains 'doubtful' owing to absence of corresponding specimens. Wilkinson (1928) also mentioned that the cocoons were 'apparently' solitary however as per our observations based on multiple rearings it is confirmed that *C. anthelae* is indeed gregarious in nature.

Conclusion

Our studies substantiate the fact that *C. anthelae* is not a host specific parasitoid species as it is capable to parasitize a butterfly species in addition to moth and with its new distribution record in India the species is no more considered to be endemic to Australia.

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Print copies of the Journal are available at cost. Write to:
The Managing Editor, JoTT,
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No. 12, Thiruvannamalai Nagar, Saravanampatti - Kalapatti Road,
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Journal of Threatened Taxa is indexed/abstracted in Bibliography of Systematic Mycology, Biological Abstracts, BIOSIS Previews, CAB Abstracts, EBSCO, Google Scholar, Index Copernicus, Index Fungorum, JournalSeek, National Academy of Agricultural Sciences, NewJour, OCLC WorldCat, SCOPUS, Stanford University Libraries, Virtual Library of Biology, Zoological Records.

NAAS rating (India) 5.64



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ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

February 2022 | Vol. 14 | No. 2 | Pages: 20539–20702

Date of Publication: 26 February 2022 (Online & Print)

DOI: 10.11609/jott.2022.14.2.20539-20702

www.threatenedtaxa.org

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