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Description of a new species of the genus *Parachrysocharis* Girault, 1913 (Hymenoptera: Chalcidoidea: Eulophidae) from Bihar, India

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Abstract. A new species, *Parachrysocharis saccharanus* Ahamad & Zeya sp. nov. is described from Bihar, India. This is the fourth species in the genus *Parachrysocharis* from India. Morphological characteristics, including diagnostic features and measurements, are detailed, and their affinities with closely related species are discussed. We include a key to the species in the genus *Parachrysocharis*. The holotype has been deposited in the Department of Zoology, Aligarh Muslim University, Aligarh (ZDAMU), Uttar Pradesh, India.

Keywords: eulophids, tetrastichinae, taxonomy, new species, key.

Introduction

The genus *Parachrysocharis* Girault, 1913 (Hymenoptera: Chalcidoidea: Eulophidae) comprises a small group of endoparasitic wasps known for their role in biological control. These parasitoids primarily target leaf-mining insects from the orders Lepidoptera, Diptera, and Coleoptera (Graham 1987), making them ecologically significant. Despite their potential importance in integrated pest management, the genus remains poorly studied, with only five recognized species worldwide, four of which have been reported from India (Narendran 2007, Noyes 2019). This limited number suggests that the true diversity of *Parachrysocharis* may be underestimated, highlighting the need for further taxonomic exploration.

Historically, *Parachrysocharis javensis* Girault, (1913) was identified as an effective parasitoid of *Pyrilla* spp., a major pest of sugarcane in India (Gupta et al. 1971). The population dynamics of *P. javensis* are closely tied to its host, declining when Pyrilla populations decrease and increasing as the host population rises. This species has also been observed to be more sensitive to environmental fluctuations than its host. More recently, *Parachrysocharis malabarensis* Narendran 2007 was recorded as an egg parasitoid of *M. sinuata* Atkinson (Binoy et al. 2024), expanding the known host range of the genus. However, despite these records, practical applications of *Parachrysocharis* as a biological control agent remain largely unstudied. The lack of comprehensive literature on their efficacy in pest control programs suggests that more research is needed in this area.

Bihar, an agriculturally significant region in India, hosts a rich diversity of insect fauna, yet its chalcidoid parasitoids remain understudied. *Parachrysocharis* species in this region could be crucial in regulating pest populations, but their diversity, distribution, and ecological roles have not been systematically explored. To address this gap, we describe a new species of *Parachrysocharis* from Bihar, India, providing its morphological characteristics and diagnostic traits. Additionally, we present an updated key to the Indian species of *Parachrysocharis*, contributing to a better understanding of this genus and its taxonomic framework. Here, we provide a brief overview of the genus and key to the species of India.

Materials and methods

The study is based on the materials collected from host *Pyrilla perpusilla* Walker (from sugarcane field) in Pusa farm, Bihar by colleagues Anil Kumar, Vishwajeet, and Arindam Pal. The collected samples were initially preserved in 80% ethanol and subsequently mounted on rectangular cards. Their color and body lengths were recorded before preparing slides, following the methodology of Anwar et al. (2020). The morphological terminology used aligns with the works of LaSalle (1994), Graham (1987), and Narendran (2007). Measurements of body parts were obtained from slide-mounted specimens and later converted to micrometers (µm). The antennal scape length was measured excluding the radicle.

Specimens were photographed using a Nikon SMZ 1000 stereo zoom binocular microscope, while slide-mounted parts were imaged with a digital camera connected to a Nikon Eclipse DM 2500 compound microscope. Line drawings were created based on slide-mounted specimens, utilizing a drawing tube attached to a Nikon Eclipse E200 compound microscope. All identified and type specimens were deposited in the Insect Collections of the Department of Zoology at Aligarh Muslim University, Aligarh, Uttar Pradesh, India (ZDAMU).

The following abbreviations are used:
F1, F2, etc. = funicular segments 1, 2, etc.
C1, C2, etc. = claval segments 1, 2, etc.
SMG = submedian grooves
SLG = sublateral grooves
AOL= Minimum distance between a posterior ocellus and anterior ocellus
POL= Minimum distance between the posterior ocelli.
OOL= Minimum distance between a posterior ocellus and the corresponding eye margin.
T1, T2, etc. = tarsal segments 1, 2, etc.
The following acronyms are used for the depositories of specimens:
ZDAMU = Insect Collections, Department of Zoology, Aligarh Muslim University, Aligarh, Uttar Pradesh, India.

Results

This study describes a new species of *Parachrysocharis* from Bihar, India, expanding the limited knowledge of this genus. It highlights the species' role in pest control and underscores the need for further research to clarify taxonomic uncertainties.

Taxonomy

Genus *Parachrysocharis* Girault

Parachrysocharis Girault, 1913: 177. Type species, *Parachrysocharis javensis* Girault, by original designation. *Parachrysocharis* Girault, 1915: 274–275 (Redescribed).

Parachrysocharis Girault, 1917: 135–136 (Redescribed).

Diagnosis

Female. Vertex without occipital carina; clava with a spicule at apex; mid lobe of mesoscutum with conspicuous coarse longitudinal ridges, scutellum without SMG; propodeum and paraspiracular carina enclosing spiracle on inner side.

Male. Similar to female; funicle 4-segmented and "clothed with long hairs" (Narendran 2007).

Indian species of *Parachrysocharis* Girault, 1913

1. *Parachrysocharis anomalococci,*
(Khan and Shafee)

Syntomosphyrum anomalococci Khan & Shafee, 1980: 332–334, female. Paratype, female, India, Tamil Nadu, Vellore (ZDAMU), examined.

Parachrysocharis anomalococci (Khan & Shafee): Hayat & Shahi 2004: 311. Narendran 2007: 179, diagnosis.

Comments. The above species resembles *Parachrysocharis malabarensis* Narendran in having similar more or less body colour and scape not reaching to anterior ocellus, but differs in the following characters: scape 3.6× as long as broad; mesosoma without any longitudinal ridge reaching posterior margin of mesoscutum; marginal vein 3.25× as long as stigmal vein. In *P. malabarensis*: scape 2.9× as long as broad; mesosoma with longitudinal ridges reaching posterior margin of mesoscutum; marginal vein 2.8×as long as stigmal vein.

Host. Fulgorid on *Ficus* sp. and eggs of *Pyrilla* sp. (Khan & Shafee 1980).

Distribution. India: Uttar Pradesh.

2. *Parachrysocharis javensis*,
Girault

Parachrysocharis javensis Girault, 1915: 274–275, redescription.

Syntomosphyrum udaipurensis Khan & Shafee, 1980: 329–332, female. Holotype, female, India, Odisha, Bhubaneswar (ZDAMU), examined. Synonymy by Bouček 1988: 689.

Comments. The diagnosis of the above species is based on the diagnosis of *P. javensis* provided by Narendran (2007) and on the holotype and paratypes (*Syntomosphyrum udaipurensis*) housed in ZDAMU. The species comes close to *P. malabarensis* Narendran but consistently differs from the latter in following characters: scape 3.4× as long as broad; pedicel longer than F1; POL 4× as long as OOL. In *P. malabarensis*: scape 2.9× as long as broad; pedicel subequal to F1; POL 6× as long as OOL. It also differs from *P. saccharanus* from the characters given in the keys.

Host. *Pyrilla perpusilla* (Walker), *P. aberrans*, *Cenestera affinis* (Atkinson).

Distribution. India: Kerala, Uttar Pradesh, Delhi, (Australia, Java, Sri Lanka).

3. *Parachrysocharis malabarensis*
Narendran

Parachrysocharis malabarensis Narendran 2007: 272, female. Holotype, female, India, Kerala, (ZSIK), examined.

Comment. I have examined the holotype of the species housed in ZSIK, but the holotype was severely glued to the card, therefore, the measurement of different body sclerites was not taken. However, the diagnosis of species is based on the original description and illustration provided by Narendran (2007).

Host. Unknown.

Distribution. India: Kerala

4. *Parachrysocharis saccharanus*
Ahamad & Zeya **sp. nov.**
(Figures 1, 2)

Type materials

Holotype, ♀ (on slide under four coverslips, slide No. EUL.697), INDIA: BIHAR: Pusa farm, 11.x.2022, Coll. Anil Kumar, Vishwajeet and Arindam Pal. (ZDAMU).

Paratypes, 6 ♀♀♀♀♀, 4 ♂ (2 ♀♀ and 1 ♂ on slides under four coverslips, slide Nos. TET.698, TET.699, TET.700; 4 ♀♀♀♀ and 2 ♂♂ on rectangular card) with same data as for holotype. (ZDAMU).

Diagnosis

Parachrysocharis saccharanus Ahamad & Zeya sp. nov. apparently looks similar to *P. javensis* Girault. However, it differs from the latter in following characters: POL 2× as long as OOL; mesoscutum with 10–12 longitudinal ridges and 2 or 3 adnotaular setae on each side; submarginal vein with 4 dorsal setae. In *P. javensis*: POL 4× as long as OOL; mesoscutum with 16–18 longitudinal ridges and with 4 adnotaular setae on each side; submarginal vein with 3 dorsal setae.

Description

Female

Holotype. Length, 0.92 mm (paratype, 0.8–0.94 mm). Head brown to dark brown, gena brown; occipital region dark brown. Antenna with scape and pedicel pale brown; flagellum dark brown. Mesosoma with pronotum dark brown except sides brown; mesoscutum dark brown; scutellum brown; metanotum dark brown. Legs with fore and mid coxae pale light brown, femora and tibiae dark brown; hind coxa dark brown; tarsi of all legs pale brown except last tarsal segment dark brown. Gaster brown to dark brown.

Head (Fig. 1a), in frontal view, 1.09× (paratype, 1.0–1.1×) as broad as high; eye height 2.5× (paratype, 2.2–2.6×) as long as malar space; POL 2× as long as OOL (8:4); antennal toruli situated markedly above the lower eye margin; malar sulcus straight; mandible tridentate; lower margin of clypeus bilobed. Antenna (Fig. 1b) with scape not reaching at level of anterior ocellus, 3× (paratype, 2.8–3.2×) as long as broad, 2.4× (paratype, 2.2–2.6×) as long as pedicel; pedicel 1.25× (paratype, 1.1–1.3×) as long as broad, longer than F3 and shorter than F1 and F2 individually; flagellum with one

anellus; F1 1.5× as long as broad; F2, 1.38× as long as broad; F3, 1.1× as long as broad; clava 3× (paratype, 2.9–3.2×) as long as broad; third claval segment conical.

Mesosoma (Fig. 1c) 1.06× (paratype, 1.0–1.1×) as long as broad; pronotum smooth, narrow, clearly visible in dorsal view; notauli deep and complete; mid lobe of mesoscutum with 3 adnotaular setae on each side, with 10–12 longitudinal ridges; scutellum slightly broader than long, almost smooth with 2 pairs of setae on lateral margins; metanotum with dorsellum smooth, 2.8× (paratype, 2.6–2.8×) as broad as long; propodeum smooth with longitudinal grooves, slightly diverging posteriorly; spiracle rim fully exposed; propodeal callus with 2 setae. Fore wing (Fig. 1d) 2.07× (paratype, 2.0–2.1×) as long as broad with speculum closed; marginal vein + parastigma 1.86× (paratype, 1.78–2.04×) as long as submarginal vein, 4.18× (paratype, 4.09–4.2×) as long as stigmal vein; postmarginal vein absent; longest marginal seta 0.19× (paratype, 0.18–0.26×) maximum wing width. Hind wing (Fig. 1e) 4.4× (paratype, 4.1–5.0×) as long as broad; longest marginal seta 0.6× (paratype, 0.63–0.93×) maximum wing width.

Metasoma (Fig. 1f). Petiole 2× (paratype, 2–2.98×) as broad as long; gaster longer than mesosoma; ovipositor 1.09× (paratype, 1.0–1.35×) as long as gaster, slightly exserted beyond apex of gaster; hypopygium not reaching middle of the gaster; ovipositor 1.44× (paratype, 1.34–1.55×) as long as hind tibia.

Measurements (Holotype slide). Head height: width, 32: 35; eye height, 20; malar space, 8. Antennal segments length: width–scape, 12: 4; pedicel, 5: 4; F1, 6: 4; F2, 5.5: 4; F3, 4.4: 4; C1, 5: 4; C2, 4: 4; C3, 3.5: 3.5; spicula, 2.0. Mesosoma length: width, 34: 32; mesoscutum length: width 14: 32; scutellum, 12: 14; dorsellum length, 4. Fore wing length: width, 85: 41; longest marginal seta, 4.4; submarginal vein length, 18; parastigma length, 1.5; marginal vein length, 32; postmarginal vein length, 0; stigmal vein length, 8. Hind tibia length, 32. Metasoma: petiole length: width, 4: 8; gaster length, 46; ovipositor length, 42.

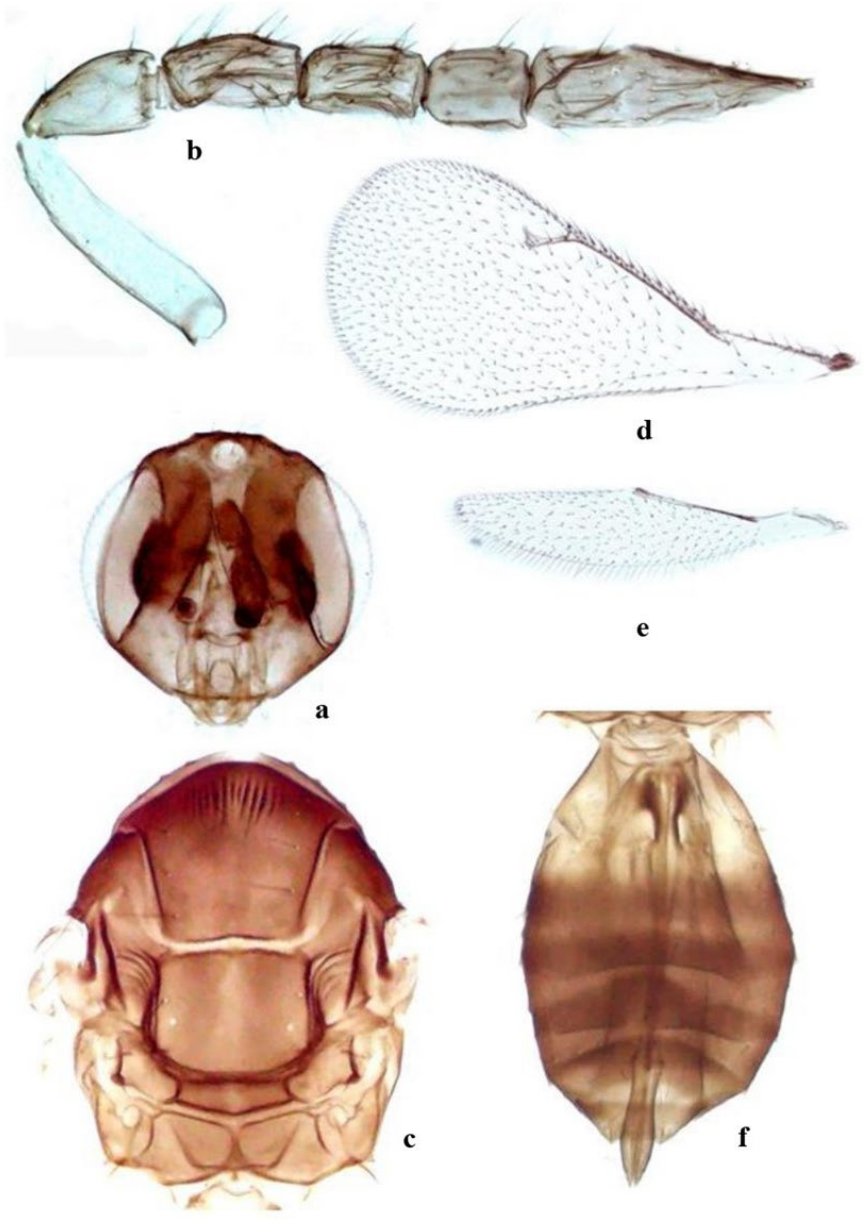

Figure 1. *Parachrysocharis saccharanus* Ahamad & Zeya sp. nov. Holotype, female:
(a), head, in frontal view;
(b), antenna;
(c), mesosoma;
(d), fore wing;
(e), hind wing;
(f), metasoma.

Male

Paratype. Similar to females except for sexual dimorphism, it also differs in the following characters: antenna with four funicular segments, with one anellus and covered with long setae; F1 and F2 pale yellow. Gaster in basal half pale brown, distal half dark brown (Fig. 2c). Head (Fig. 2a), in frontal view, 1.1× as broad as high; eye height 2.4× as long as malar space. Antenna (Fig. 2b) with scape 3.2× as long as broad, 2.5× as long as pedicel; clava 3.1× as long as broad.

Relative measurements. Head height: width, 32: 35; eye height, 20; malar space, 8. Antennal segments length: width–scape, 14: 4; pedicel, 5: 4; F1, 6.5: 5; F2, 6: 5; F3, 5.5: 5; F4, 5: 5; clava, 14: 5. Fore wing length: width, 84: 40; submarginal vein length, 18; marginal vein length, 32; stigmal vein length, 8.

Host. *Pyrilla perpusilla* (from sugarcane field).

Distribution. India: Bihar.

Etymology. This species' name '*saccharanus'* is derived from the host plant, *Saccharum officinarum* (sugarcane).

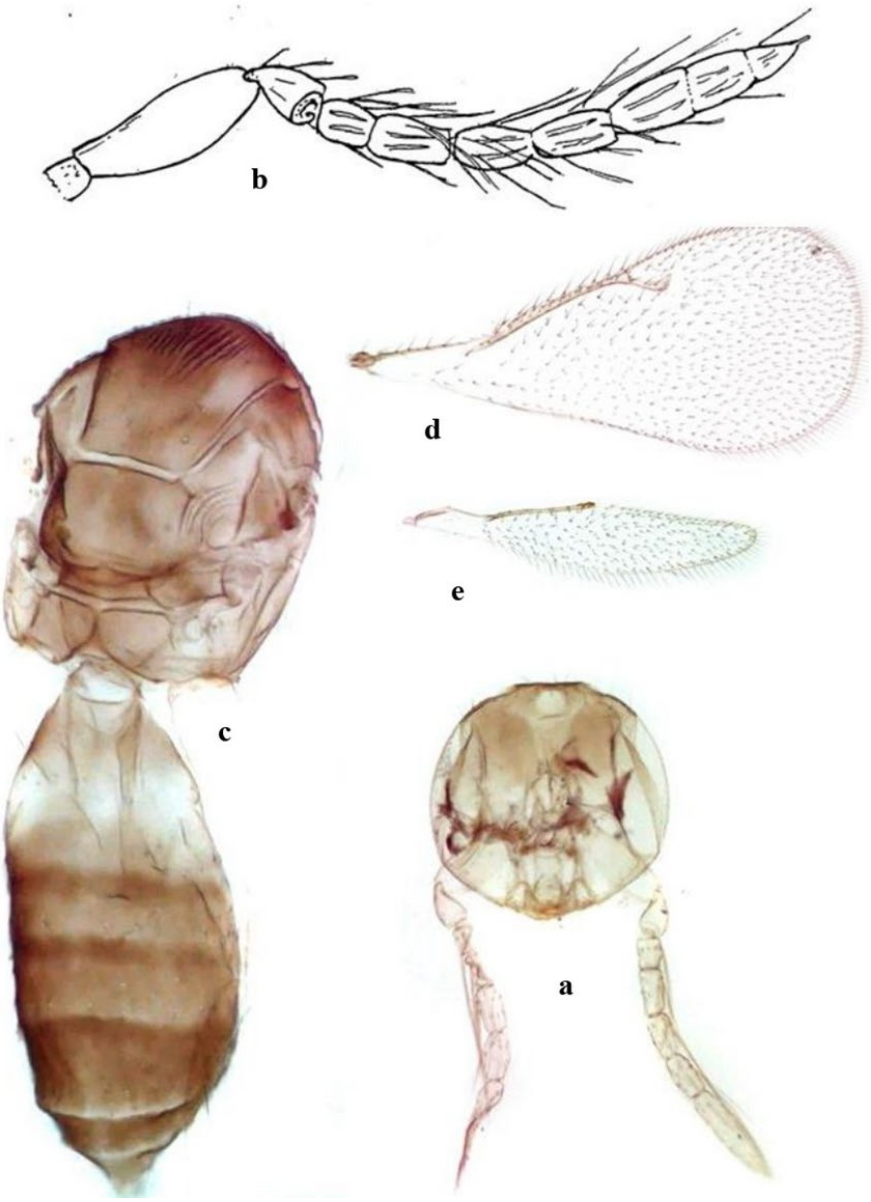

Figure 2. *Parachrysocharis saccharanus* Ahamad & Zeya sp. nov. Paratype, male:
(a), head, in frontal view;
(b), antenna;
(c), mesosoma and metasoma;
(d), fore wing;
(e), hind wing.

Key to Indian species of *Parachrysocharis* Girault, females

1. Mid lobe of mesoscutum with 10–18 longitudinal ridges ……..…… 2
   - Mid lobe of mesoscutum 5 longitudinal ridges ……..… 3
2. Mid lobe of mesoscutum 16–18 longitudinal ridges anteriorly, and with 4–6 adnotaular setae on each side; submarginal vein of fore wing with 3 dorsal setae ……... 1. *P. javensis* Girault
   - Mid lobe of mesoscutum 10–12 longitudinal ridges anteriorly, and with 2–3 adnotaular setae on each side; submarginal vein of fore wing 4 dorsal setae ……..……2. *P. saccharanus* Ahamad & Zeya **sp. nov.**
3. Mesosoma with median longitudinal ridge reaching posterior margin of mesoscutum; marginal vein 2.8×as long

as stigmal vein; propodeal callus with 3 setae …… ……..…… 3. *P. malabarensis* Narendran
- Mesosoma without any longitudinal ridge; marginal vein 3.25× as long as stigmal vein; propodeal callus with 2 setae ……..……..… 4. *P. anomalococci* (Khan & Shafee)

Discussion

The description of a new *Parachrysocharis* species from Bihar, India, significantly contributes to this genus's limited global records. This species is morphologically distinct from the other species of genus *Parachrysocharis* Girault, which is discussed in the key as well as in the short description of each Indian species above. *Pyrilla perpusilla* Walker sucks phloem sap from leaves. This direct and indirect damage affects sugar yield and quality (Butani 1964, Bindra & Brar 1978, Asre et al. 1983). *Parachrysocharis javensis* Girault is an important biocontrol agent (Miah et al. 1986). *Parachrysocharis* species are primarily endoparasitoids of leaf-mining insects across multiple insect orders, playing a crucial role in regulating pest populations in both natural and agricultural ecosystems (Hansson 1997). *Parachrysocharis saccharanus* sp. nov. was observed parasitizing and successfully killing its host, *Pyrilla perpusilla*, a major pest of sugarcane. These climatic factors likely influence the population dynamics and parasitism efficiency, highlighting the potential of *P. saccharanus as* a natural biocontrol agent in such agroecosystems. Despite its potential significance in biological control, *Parachrysocharis* remains poorly studied, particularly in the Indian context, where only three species were documented prior to this study (Narendran 2007, Noyes 2019). This study emphasizes the importance of systematic surveys in expanding our understanding of parasitoid wasps and their applications in biological control.

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