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Description of two new species of *Baryscapus* förster, 1856 (Hymenoptera: Chalcidoidea: Eulophidae) from India

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Abstract
Two new species of *Baryscapus* Förster, 1856, ***B. victus*** Ahamad & Zeya **sp. nov.** and ***B. escula*** **sp. nov.** (Hymenoptera: Chalcidoidea: Eulophidae) are described from India. Illustrations of the holotypes are given. The holotypes have been preserved in the Zoology Department, Aligarh Muslim University (ZDAMU), India.

Keywords: Chalcidoidea, eulophidae, tetrastichinae, new species, *Baryscapus*

Introduction
The genus *Baryscapus* Förster, 1856 [6] is a significant group of parasitoid wasps within the subfamily Tetrastichinae. This genus has a global distribution and is well-known for its parasitoid nature, primarily targeting insects from the orders Lepidoptera, Diptera, and Hymenoptera. Some species are also reported to function as hyperparasitoids (LaSalle, 1994; Noyes, 2019). [13, 16] Their ecological role in regulating insect populations makes them valuable in natural and agricultural ecosystems (Gibson *et al*., 1997). [7] [+]Despite their ecological importance, the taxonomy of *Baryscapus* remains challenging due to the morphological diversity and overlapping diagnostic characters (Schauff *et al*., 1997). [18] India, recognised as a biodiversity hotspot, harbours a wide variety of parasitoid wasps, yet the genus *Baryscapus* remains underexplored in this region (Narendran, 2009). [15] Recent entomological surveys across various Indian habitats have yielded specimens of *Baryscapus*, showing distinct morphological traits that suggest the presence of new species. The descriptions are based on detailed morphological analyses, including comparisons with previously described species (Askew, 2001; Graham, 1987). [2, 9] By contributing to the knowledge of Indian Chalcidoidea, this study emphasizes the importance of biodiversity research in understanding parasitoid diversity and its potential applications in biological control programs.

Material and methods
This study primarily utilized specimens obtained through sweep net sampling. The specimens were preserved in 80% alcohol, and some were mounted on rectangular cards. Detailed examinations were conducted using high-quality slides prepared according to the protocol described by Noyes (1982). [17] Before slide mounting, detailed observations of the body colour were recorded. The body length of the new species is provided in millimeters, while all other measurements were determined using the divisions on a linear scale of an ocular micrometer.
Measurements were conducted at 100× magnification using a microscope, where each division of the ocular micrometer represented 0.01 mm. Photomicrographs of the slide-mounted specimens were captured using a Nikon DS-Fi1c digital camera attached to a Nikon Eclipse Ci compound microscope. Additionally, line drawings of certain body parts were created using a drawing tube connected to a Nikon Eclipse E200 compound microscope.

The abbreviations used in the text are as follows:
C1, C2, C3 = Clava segments 1, 2, 3.
F1, F2, F3 = Funicle segments 1, 2, 3.
OOL: The shortest distance between a posterior ocellus and the adjacent eye margin.
POL: The shortest distance between the two posterior ocelli.
An acronym is used for the depository.
ZDAMU = Department of Zoology, Aligarh Muslim University, Aligarh, India.

Result
Genus *Baryscapus* förster, 1856
Baryscapus Förster, 1856: 84, 86. [6] Type species *Baryscapus centricolae* Ashmead, 1887 by subsequent monotypy. [1]
Baryscapus Förster: Ashmead, 1887: 202. LaSalle & Graham, 1990: 122. [1, 6, 12]
Thriposoma Crawford, 1913: 255. [5] Type species *Thriposoma grafi* Crawford, 1913, [5] by original designation. Synonymy by LaSalle & Graham, 1990:122.
Tetrastichopsis Girault, 1916: 132. Type species *Tetrastichopsis prionomeri* (Girault, 1916), [8] by original designation. Synonymy by LaSalle & Graham, 1990: 122.
[*Syntomosphyrum* Förster: Burks, 1952: 258–264. Misidentification.] [4, 12]
Eutetrastichus Kostjukov, 1977: 189 [11] (as subgenus of *Tetrastichus*). Type species *Eulophus evonymellae* Bouché, 1834, [3] by original designation. Synonymy by LaSalle & Graham, 1990: 122. [12]

Diagnosis
Female: Body exhibits a dark brown colouration, varying from black to striking metallic blue or green, and lacks any pale markings Body dark brown, varying from black to bright metallic blue or green, but without pale markings. The malar sulcus usually distinctly curved. Antenna with funicle and clava, each with 3-segmented. Submarginal vein with 2 or more dorsal setae; postmarginal vein indistinct or absent. Mid lobe of mesoscutum with a variable number of setae. Propodeal spiracle with entire rim exposed (without

an overhanging raised lobe of the callus). Propodeal callus nearly always with 3 or more than 3 setae.

1. ***Baryscapus victus* ahamad & zeya, sp. nov.** (Figures1–6)

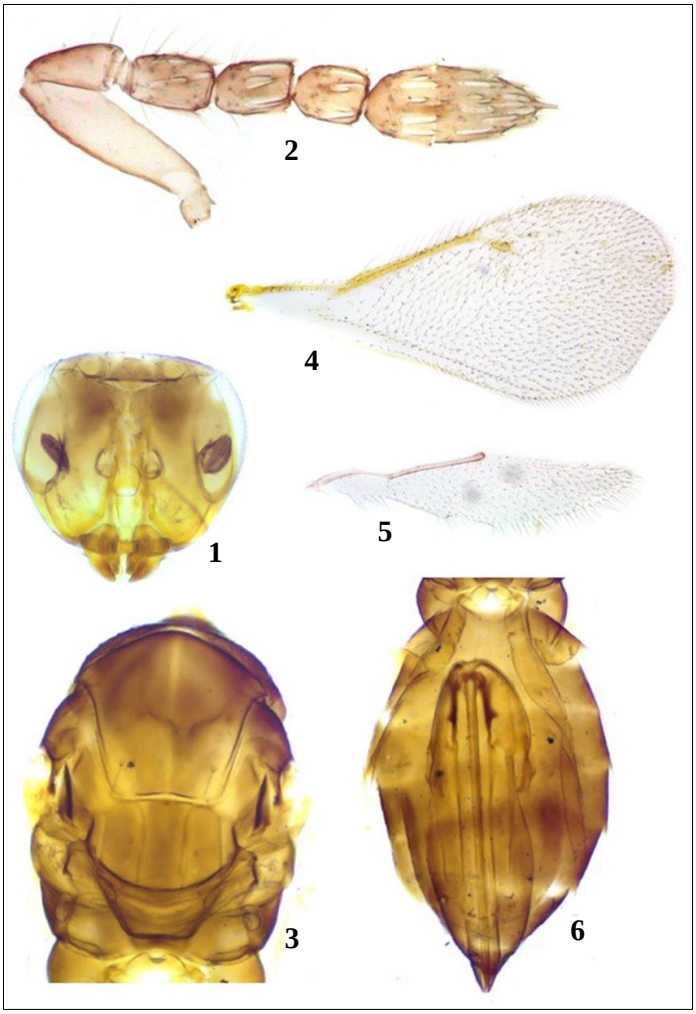

Fig 1–6: *Baryscapus victus* sp. nov. Holotype, female: 1, head, frontal view; 2, antenna; 3, mesosoma; 4, fore wing; 5, hind wing; 6, metasoma

Description

Female: Holotype. Body length, 1.6 mm. Head yellowish brown; clypeus pale brown. Antenna with radicle dark brown; scape and pedicel brown; flagellum dark brown. Mesosoma with mid lobe of mesoscutum dark brown with golden metallic reflection; side lobe of mesoscutum pale brown; scutellum, metanotum, axilla and propodeum dark brown. Gaster dark brown with a bluish metallic reflection. Legs with fore and mid femora pale yellowish brown; tibiae and tarsi 1–3 of all legs pale yellow; hind coxa dark brown; last tarsal segment of all legs pale brown; claw dark brown. Head. Head (Fig. 1), in frontal view, 1.2× as broad as high; eye 2.4× as high as malar space; POL 2× as long as OOL (10:5); torulus located in the middle of the face, distinctly above lower eye margin; gena swollen; malar sulcus curved; mandible with one tooth and one truncation. Antenna (Fig. 2) with scape 3.6× as long as broad, 1.6× as long as pedicel; pedicel 2× as long as broad; funicle segments all longer than broad and F1 the longest; F3 shorter than F1 and F2 individually; all funicular segments with longitudinal sensilla; clava 2.28× as long as broad, with apical spicula, and with longitudinal sensilla.

Mesosoma. Mesosoma (Fig. 3) 1.26× as long as broad; pronotum narrow; mesoscutum 1.6× as long as scutellum; mid lobe of mesoscutum with a complete median line and one row of 4 adnotaular setae on each side; notauli deep and complete; mid lobe of mesoscutum with fine longitudinal striations; mesoscutum and axilla and side lobe, with longitudinal reticulate sculpture; scutellum 1.4× as broad as long with 2 pairs of setae, and with longitudinal striations; width between SMG subequal to a width between SMG and SLG; propodeum constricted medially with a flat median carina; propodeal spiracle fully exposed separated from metanotum by one ocellus diameter; propodeal callus with 3 setae. Fore wing (Fig. 4) 2.2× as long as broad; marginal vein+ parastigma 1.6× as long as submarginal vein, 3.8× as long as stigmal vein; postmarginal vein 0.12× stigmal vein; cubital row of setae extending slightly beyond proximal end of parastigma, with speculum narrowly open. Hind wing (Fig. 5) 4.4× as long as broad.

Metasoma. Metasoma (Fig. 6) distinctly longer than mesosoma; petiole 1.4× as broad as long; hypopygium reaching beyond middle of gaster; ovipositor 1.2× as long as gaster, slightly exserted beyond the apex of gaster, 2.5× as long as hind tibia; each cercus with two setae and sinuate.

Relative measurements: (holotype). Head height: width, 40: 47; eye height, 22; malar space, 9. Antennal segments length: width– scape, 18: 5; pedicel, 7: 4; F1, 8: 4; F2, 7: 4; F3, 6: 4; clava, 14: 6; spicula, 1.5. Mesosoma length: width,

57: 45; mesoscutum, 22: 38; scutellum 18: 26; dorsellum length, 8. Fore wing length: width, 128: 58; submarginal vein length, 28; parastigma length, 1.5; marginal vein length, 45; postmarginal vein length, 1.5; stigmal vein length, 12. Hind wing length: width, 98: 22. Hind tibia length, 35. Metasoma: petiole length: width, 9: 12; gaster length, 100; ovipositor length, 88.

Male: Unknown.
Material examined: Holotype, female (on slide under four coverslips, slide No. TET.651), INDIA: UTTAR PRADESH: Saharanpur, 20.vii.2021, Coll. M. Ahamad (ZDAMU).
Host: Unknown.
Distribution: India: Uttar Pradesh.

Etymology: The species name is an arbitrary combination of letters, and may be taken as a noun in apposition.
Comments: *Baryscapus victus* sp. nov. apparently looks similar to *B. jicus* Narendran in body colour and head with POL 2× as long as OOL but differs as follows: eyes 2.4× as high as malar sulcus; mesoscutum with 4 adnotular setae on each side; scutellum 1.4× as broad as long; speculum narrowly open. In *B. jicus:* eyes 2× as high as malar sulcus; mesoscutum with 5 adnotular setae on each side; scutellum transverse; scutellum 1.7× as broad as long; speculum closed.

1. ***Baryscapus escula*** **Ahamad & Zeya, sp. nov.** (Figures 7–12)

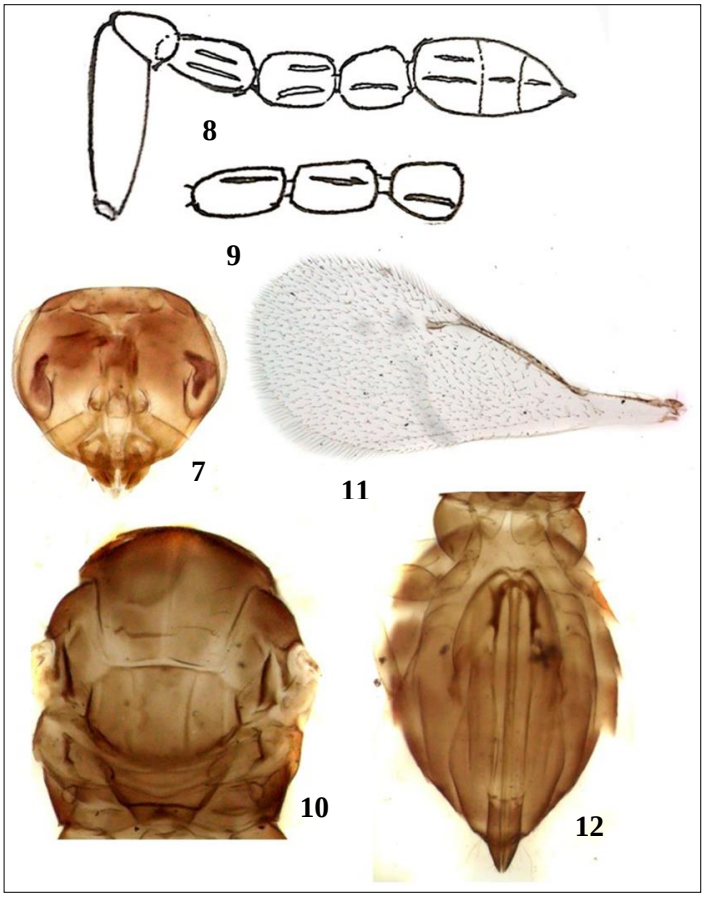

Fig 7–12: *Baryscapus escula* sp. nov. Holotype, female: 7, head, frontal view; 8, antenna; 9, funicle; 10, mesosoma; 11, fore wing; 12, metasoma

Description
Female: Holotype. Length, 1.53 mm. Head dark brown above toruli, below toruli pale brown; ocular margin and ocellar triangle dark brown; occipital region dark brown; clypeus pale yellow. Antenna with radicle yellowish brown; scape pale brown, dorsal margin dark brown; pedicel pale brown with dorsal edge dark brown; flagellum pale yellow to brown. Mesosoma dark brown with greenish metallic reflection; sides of metanotum, and propodeum brown. Gaster dark brown. Legs with fore and mid coxae pale yellow; femora, tibiae yellowish brown; hind coxa dark brown; tarsi of all legs pale brown except last tarsal segment and claw dark brown.
Head. Head (Fig. 7), in frontal view, 1.2× as broad as high; eye height 1.8× as long as malar space; POL 2× as long as OOL (9:4.5); torulus situated slightly above the lower margin of eyes; mandible with one tooth and truncation (partially fused two teeth). Antenna (Fig. 8) with 2 anelli; scape 3.4× as long as broad, 2.8× as long as pedicel; pedicel 1.4× as long as broad, shorter than F1; F1 and F2 subequal in length and width; clava 2× as long as broad with small apical spicula.
Mesosoma. Mesosoma (Fig. 10) as long as broad; pronotum narrow; mesoscutum longer than scutellum; mesosoma with longitudinal striations except sides of metanotum, with rugose reticulate sculpture; mid lobe of mesoscutum with 4 pairs of adnotaular setae; notauli deep and complete; scutellum transverse, 1.6× as broad as long, with 2 pairs of long setae posteriorly, width between SMG broader than width between SMG and SLG; propodeum medially narrow and propodeal callus with 3 setae. Fore wing (Fig. 11) 2.4×

as long as broad; marginal vein+ parastigma 1.46× as long as submarginal vein, 4.5× as long as stigmal vein; cubital row of setae completes with speculum partially closed; submarginal vein with 3 setae. Hind wing 5.8× as long as broad.

Metasoma. Metasoma (Fig. 12) longer than mesosoma; petiole 1.8× as broad as long; hypopygium not reaching the middle of gaster; each cercus with 3 setae, of which one seta long and sinuate. Ovipositor distinctly exserted beyond the apex of gaster,1.2× as long as the gaster, 2.3× as long as the hind tibia.

Relative measurements: (holotype). Head height: width, 33: 40; eye height, 20; malar space, 11. Antennal segments length: width–scape, 14: 4; pedicel, 5: 3.5; F1, 6: 4; F2, 6: 4; F3, 6: 4; clava, 12: 6; spicula, 2. Mesosoma length: width, 42: 42; mesoscutum length: width 20: 42; scutellum, 15: 25; dorsellum length, 4. Fore wing length: width, 112: 47; submarginal vein length, 25; parastigma length, 2; marginal vein length, 35; stigmal vein length, 8. Hind wing length: width, 80: 14. Hind tibia length, 30. Metasoma: petiole length: width, 7: 12; gaster length, 75; ovipositor length, 67.

Male: Unknown.

Material examined: Holotype, female (on slide under four coverslips, slide No. TET.550), INDIA: UTTAR PRADESH: Agra; Yamuna bank, 02.xii.2019, Coll. M. Ahamad (ZDAMU).

Host: Unknown.

Distribution: India: Uttar Pradesh

Etymology: The species named is an arbitrary combination of letters, and may be taken as a noun in apposition.

Comments: *Baryscapus escula* sp. nov. apparently looks similar to *B. victus* sp. nov. in having more or less similar body colour. However, it differs from *B. victus* sp. nov. by the following characteristics: scape 3.4× as long as broad; pedicel subequal to F1; ovipositor 2.3× as long as hind tibia. *B. victus* sp. nov., scape 3.6× as long as broad; pedicel shorter than F1; ovipositor 2.5× as long as hind tibia.

Conclusion

The description of *Baryscapus victus* and *Baryscapus escula* enhances understanding of the genus *Baryscapus* Förster, 1856, [6] in India. Presently, *Baryscapus* is a widely distributed genus, with over 130 described species worldwide (Noyes, 2019), [17] primarily known for their role as parasitoids of various insect hosts. However, in India, the genus remains underexplored, with only a limited number of species documented despite the rich biodiversity. This study adds to the relatively sparse records of *Baryscapus* in India, contributing valuable taxonomic data that supports future research on their diversity, distribution, and ecological significance. Furthermore, these species may have potential applications in biological control, enhancing the role of parasitoid wasps in regulating insect populations and supporting sustainable agricultural practices.

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