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Taxonomic study of Indian species of the genus *Entedon* Dalman (Hymenoptera: Chalcidoidea: Eulophidae), with description of two new species

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ABSTRACT. The Indian species of *Entedon* Dalman (Hymenoptera: Eulophidae: Entedoninae) are reviewed. The review includes seven species, of which *E. shivalikensis* Majeed & Jamali **sp. nov.**, *E. dehradunensis* Majeed & Jamali **sp. nov.** are described and illustrated. *Entedon thoubalensis* (Chisti & Shafee, 1983), *E. gunturensis* (Shafee & Rizvi, 1985), and *E. longicarpus* (Khan & Shafee, 1982) are redescribed and diagnostic characters are presented for two species: *E. punctiscapus* Thomson, 1878, *E. pempheridis* Ferrière, 1930. An identification key to Indian species of the genus *Entedon* is also provided.

Key words: Hymenoptera, Entedoninae, parasitoid, new species, new record

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Introduction

The genus *Entedon* Dalman (Eulophidae: Entedoninae) is comprised of 185 species from the world, of which eight species are recorded from Oriental region and five species are known from India (Noyes, 2020). Parasitic wasps of the genus *Entedon* are considered as solitary or gregarious endoparasitoids of immature stages of weevils, bruchids and the bark beetles, mainly belonging to the family Curculionidae and Chrysomelidae (Schauff, 1988; Rasplus, 1990; Askew, 1991). However, only few taxonomic reviews on regional fauna of the genus have been published (Erdos, 1944; Graham, 1971; Schauff, 1988; Gumovsky, 1999a, 1999b; Gumovsky & Boyadzhiev, 2003; Gumovsky, 2007; Doğanlar & Doğanlar, 2013). In this paper, we record seven species, including two new species: *E. shivalikensis* Majeed & Jamali **sp. nov.** and *E. dehradunensis* Majeed & Jamali **sp. nov.** from India. Species are fully diagnosed and thoroughly illustrated and an identification key to Indian species is also provided.

Material and methods

The present study is based on specimens collected mainly by sweep net from Indian States Karnataka and Uttarakhand. Body colour was represented from card mounted specimens before clearing and mounting them on slide in Canada balsam. Body length for the new species

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is given in millimeters. All other measurements are relative taken from the divisions of a linear scale of a micrometer placed in the eye piece of a compound microscope. These measurements were taken at 100× magnification of the microscope. The photographs of card mounted specimens were taken with digital camera (Nikon DS-Fi2) attached to a stereozoom (Nikon SMZ25) and the photographs of slide mounted parts were taken with a digital camera (Nikon DS-Fi1c) attached to a compound microscope (Nikon Eclipse Ci). Morphological terminology follows [Gibson \(1997\)](#).

The following abbreviations are used in the text:

C1, C2, etc. = Clavomeres 1, 2 etc.

F1, F2, etc. = Funiculars 1, 2 etc.

T1, T2, etc. = Metasomal tergites 1, 2 etc.

AOL = minimum distance between a posterior ocellus and anterior ocellus

OOL = Minimum distance between a posterior ocellus and corresponding eye margin

POL = Minimum distance between the posterior ocelli

The following acronyms are used for the depositories:

BMNH = The Natural History Museum, London, England.

ZDAMU = Insect Collections, Department of Zoology, Aligarh Muslim University, Aligarh, India.

LUZN = Zoological Museum, Lund University, Sweden

NFIC = National Forest Insect Collection, Forest Research Institute, Dehradun, India.

Results

Genus *Entedon* Dalman

Entedon Dalman, 1820: 136, 181. Type-species. *Entedon cyanellus* Dalman, designated by [Ashmead, 1904](#).

Tranocera Curtis, 1829: 114. Type-species *Entedon costalis* by monotypy.

Pleuropachus Westwood, 1837: 437. Type-species *Entedon costalis* Dalman, by original designation
Pleuropachus Foerster, 1856: 78.

Eriglyptus Crawford, 1907: 179. Type-species *Eriglyptus robustus* Crawford, by original designation.
Synonymy by Girault, 1916.

Pelorotelopsella Girault, 1913a: 148. Type-species *Pelorotelopsella genu* Girault, by original designation.
Synonymy by [Bouček, 1988](#).

Entedonella Girault, 1913a: 154. Type-species *Entedonella magnifica*, by original designation. Synonymy by [Girault, 1917](#).

Metacrias Girault, 1913b: 106. Type-species *Metacrias australiansis* Girault, by original designation.
Synonymy by [Bouček, 1988](#).

Uracrias Girault, 1913a: 156. Type-species *Uracrias excelsus* Girault, by original designation.
Synonymy by [Bouček, 1988](#).

Metriocharis Silvestri, 1914: 214. Type-species *Metriocharis viridis* Silvestri, by original designation.
Synonymy by [Bouček & Askew, 1968](#).

Acanthentedon Dodd, 1917: 363. Type-species *Acanthentedon laticeps* Dodd, by original designation.
Synonymy by [Bouček & Askew, 1968](#).

Megalentedon Erdös, 1944: 27 (as subgenus of *Entedon*). Type-species *Entedon thomsonianus* Erdös, by original designation.

Dolichentedon Erdös, 1944: 31 (as subgenus of *Entedon*). Type-species *Entedon cioni* Thomson, by original designation.

Chlorentedon Erdös: 1944: 44 (as subgenus of *Entedon*). Type-species *Entedon subvotus* Thomson, by original designation.

Trochentedon Erdős, 1944: 61 (as subgenus of *Entedon*). Type-species *Entedon crassiscapus* Erdős, by original designation.

Nephelentedon Erdős, 1944: 18 (as subgenus of *Entedon*). Type-species *Entedon subfumatus* Erdős, by original designation.

Metacriasinus Ghesquiere, 1946: 371. Synonymy by Bouček, 1988.

Diagnosis: Female: Head and thorax strongly sclerotized and conspicuously reticulate. Antenna with 1–3 anelli and with five postanellar segments, last two two segments often fused into clava (Fig. 8); mandibles bidentate; pronotum reduced dorsally, expanded at lateral angles, without transverse carina; axillae not advanced; scutellum convex, without any grooves (Fig. 9), sub median area convex, mostly smooth, rarely reticulate; propdeal spiracle on elevated area with lateral subconical projection below second metasomal tergum (T2); stigmal vein petiolate; postmarginal vein about as long as stigmal vein; cubital and basal vein setae are absent.

Male: Generally similar to the females, but differ in some characteristics. Scape has a long sensory strip along the anterior edge. The terminal two segments of flagellum are usually distinctly separated rather than fused and densely setose.

Key to Indian species of *Entedon* Dalman, females

1. Antenna with clava distinctly shorter than F1 (Fig. 2) 2
- Antenna with clava subequal or longer than F1 (Figs 5, 8) 3
2. Antennal scape in basal half pale brown, 4.3× as long as broad, single anellus present (Fig. 2) *E. thoubalensis* (Chisti & Shafee)
- Antennal scape in basal half pale brown, 6.6× as long as broad, anellus absent (Fig. 5).....
..... *E. punctiscapus* Thomson
3. Mesoscutum with complete notauli *E. pempheridis* Ferrière
- Mesoscutum with incomplete notauli (Figs 13, 18) 4
4. Ovipositor occupying only three-fourth length of gaster 5
- Ovipositor occupying whole length of gaster 6
5. Antennal toruli situated slightly above to lower eye margin (Fig. 7); antenna with scape in basal half pale brown, 4.3× as long as broad; a single row of six setae on the basal disc of fore wing (Fig. 10) *E. gunturensis* (Shafee & Rizvi)
- Antennal toruli situated at the level of lower eye margin; antenna with scape completely dark brown, 5.7× as long as broad; basal disc of fore wing asetose (Fig. 14).....
..... *E. longiscapus* (Khan & Shafee)
6. Antennal scape 4.7× as long as broad; fore wing 1.9× as long as broad, setation below marginal vein extend up to half length of marginal vein (Fig. 19)
..... *E. shivalikensis* Majeed & Jamali sp. nov.
- Antennal scape 6.4× as long as broad; fore wing 2.5 × as long as broad, setation below marginal vein extend up to two-third length of marginal vein (Fig. 25)
..... *E. dehradunensis* Majeed & Jamali sp. nov.

***Entedon thoubalensis* (Chisti & Shafee, 1983) (Figs 1-4)**

Pediobius thoubalensis Chisti & Shafee 1983, 19, female. Holotype, Female, India, Manipur, Thoubal (ZDAMU), examined.

Entedon thoubalensis (Chisti & Shafee): Hayat et al. 2005: 9.

Type material examined: Holotype, female (one wing and one antennae on slide). INDIA: MANIPUR: Thoubal, 3.ii.1986; Coll. A.K. Chishti.

Redescription: Female: Body length 1.9 mm. Head dark brown with bluish green reflection. Antenna brown to dark brown except basal half of scape pale white. Mesoscutum and scutellum dark brown with bluish green reflection; dorsellum and propodeum metallic black. All legs with coxae dark brown, femur brown to dark brown, tarsi pale white except last tarsal segments of hind leg brown, fore tibia basal two-third brown, rest pale brown, mid and hind tibiae in basal one-third brown rest pale brown. Gaster metallic brown to black.

Head (Fig. 1) in frontal view, 1.4× as broad as long as broad; fronto-vertex width 0.6× head width; eye height 2.7× as long as malar space. Antennal toruli situated slightly above to lower eye margin. Antenna (Fig. 2) with scape 4.3× as long as broad, 2.54× as long as pedicel; pedicel 1.7× as long as broad; single annulus present; funicle three-segmented, each segment gradually decreasing in length distally; clava two-segmented, 1.8× as long as broad, ending with a distinct spicula.

Mesosoma (Fig. 3) 1.6× as broad; pronotum very narrow not visible in dorsal view; mesoscutum shorter than scutellum with polygonal sculpture; notauli incomplete; mid lobe of mesoscutum with four setae; scutellum longer than broad, with polygonal sculpture and two setae; metanotum narrow and smooth; propodeum smooth medially with a longitudinal carina. Fore wing (Fig. 4) hyaline, disc in basal third asetose, except three setae near ventral margin, 2.2× as long as broad; submarginal vein shorter than marginal vein, marginal vein + parastigma 1.5× as long as submarginal vein, 14.3× as long as stigma vein; postmarginal vein 1.4× as long as stigmal vein; longest marginal seta about 0.05× maximum wing width.

Metasoma: Gaster slightly shorter than mesosoma; ovipositor occupying whole length of gaster, not exerted beyond the apex of gaster.

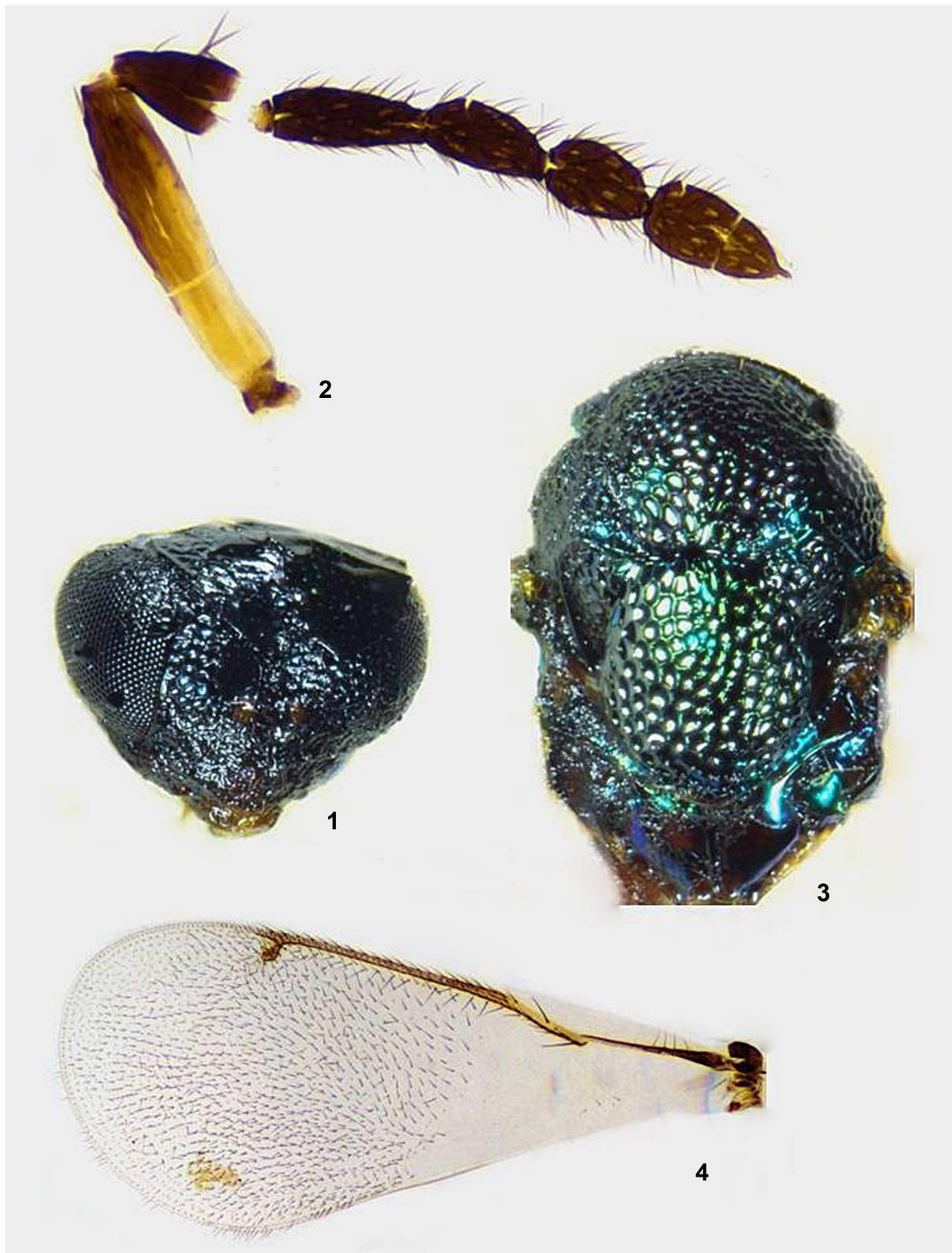
Relative measurements (holotype slide). Antennal segments length- width as follow: scape, 28: 6.5; pedicel, 11: 6.5; F1, 18: 7.3; F2, 15: 8; F3, 12: 8.5; C1, 10: 9; C2, 7: 7.3; spicula, 1.8. Fore wing length: width, 195: 90; longest marginal seta, 5; submarginal vein length, 62; parastigma length, 23.5; marginal vein length, 70; stigmal vein length, 6.5. (Holotype from card). Mesosoma length: width, 100: 64.

Male: Unknown.

Host: Unknown

Distribution: India: Manipur.

Comments: *Entedon thoubalensis* (Chisti & Shafee) comes close to *E. punctiscapus* Thomson 1878, but differs in following characters: Antennal scape in basal half pale brown, 4.3× as long as broad; single annulus present. In *E. punctiscapus*: Antennal scape in basal half pale brown, 6.6× as long as broad; annulus absent.



Figures 1-4. *Entedon thoubalensis* (Chisti & Shafee). Holotype, female: **1.** Head, frontal view; **2.** Antenna; **3.** Mesosoma; **4.** Fore wing.

***Entedon punctiscapus* Thomson, 1878 (Figs 5–6)**

Entedon punctiscapus Thomson, 1878: 247, female. Lectotype, female, Sweden (LUZN), not examined.

Entedon punctiscapus Thomson: [Graham, 1971](#). [Gumovsky, 1997](#). [Shree & Singh, 2015](#): 875, record.

Diagnosis: Female. Body length 2.0 mm. Body generally metallic dark green; head dark green; eyes golden yellow. Antenna dark brown. Wings hyaline without infuscation and veins pale yellow. All legs with coxae and trochanter concolourous with body; femora dark green, tibiae in basal two-third dark brown and cream coloured in apical one-third, all tarsi cream coloured.

Head with polygonal raised reticulation; fronto-vertex deeply reticulated similar to rest of the head, with scattered setae; head depressed in malar sulcus region; scrobal grooves reaching more than half of the face but not reaching to the median ocellus; scrobal space is devoid of polygonal raised reticulation forming a deep ridge and anteriorly forked; eyes pilose with short pilosity; head in dorsal view 3.33× as wide as its length, in frontal view 1.4× as wide as long; POL 1.8× OOL and 2.0× as long as AOL; AOL 0.9× as long as OOL; torulus as long as wide, distance between both the toruli 0.06 mm. Antennal ([Fig. 5](#)) formula 11032, pedicel 2.3× as long as wide, about half of the length of first funicular segment; scape 6.6× as long as wide; funicular segments decreasing in length from F1 to F3; F1 4.2× as long as broad, F2 2.2× as long as broad.

Mesosoma 1.7× as long as broad; pronotum narrow, well sculptured and with a row of setae; mesoscutum with strongly raised polygonal reticulation, 1.2× as broad as long; noutali complete, visible in specific light; axillae a little advanced; scutellum with one pair of long setae in its posterior half, well sculptured with raised reticulation, similar to mesoscutum; propodeum smooth, without reticulation. Forewing ([Fig. 6](#)) 2.2× as long as broad, costal cell 7.5× as long as wide; hindwing 3.8× as long as broad.

Metasoma. Petiole conspicuous, 1.7× as long as wide; gaster distinctly shorter than mesosoma 0.8x as long as broad.

Male: Unknown.

Host: Unknown.

Distribution: India: Uttarakand.

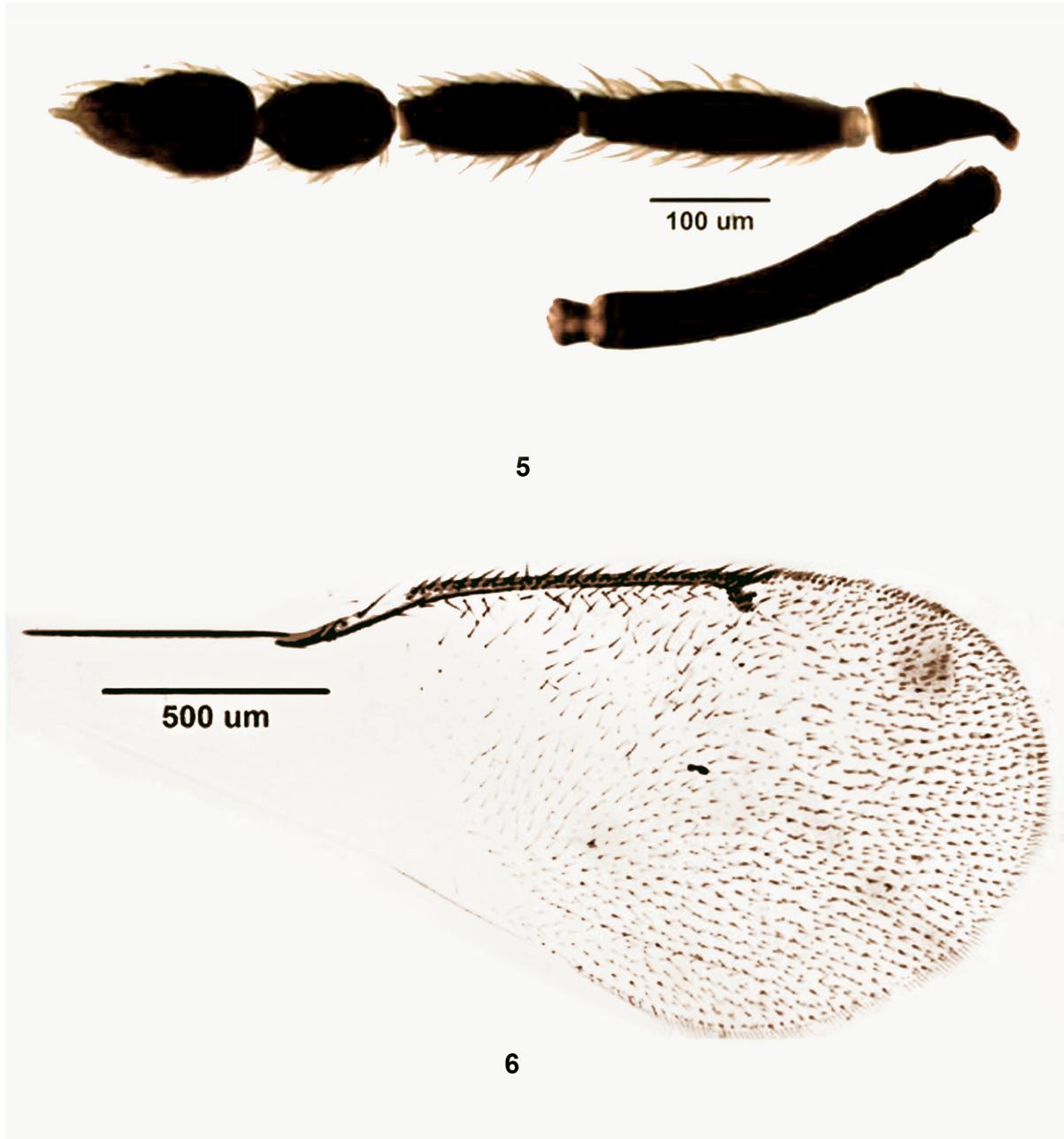
Comments: *Entedon punctiscapus* Thomson appears similar to *E. thoubalensis* (Chisti & Shafee). However, it differs from the latter by the characters given under the comment of *E. thoubalensis*.

3. *Entedon pempheridis* Ferrière, 1930

Entedon pempheridis Ferrière, 1930: 163, female. Holotype, female, India, Tamil Nadu, Coimbatore (BMNH), not examined.

Diagnosis: Female: Body length 1.5–3.4mm. Head, mesosoma and metasoma black, with faint greenish reflection; antenna black with greenish reflection on pedicle, scape pale yellow. Legs black with dark green reflections; knees, end of fore tibia, apical half of middle and hind tibiae except a broad ring near base, yellow. In male the tibiae entirely yellow, except a longitudinal line on the fore tibia.

Head, transverse, truncate behind the eyes; occiput slightly excavate and separated from the vertex by a carina; vertex and face reticulate, more finely near the clypeus; eyes large, oval; cheeks short and smooth; ocelli forming a low triangle, the lateral placed near the occipital carina and much closer to eye margin than to the frontal ocellus; mandible bidentate. Antennal toruli situated below to middle of face slightly above to lower eye margin. Antenna with narrow scape, reaching not quite to front ocellus; pedicel 2.5× as long as broad; one very small annulus; funicle three segmented; F1 longer than pedicel; F2 shorter than F1; F3 oval and broader, as long as pedicel; clava 2 segmented not much longer than F1.



Figures 5-6. *Entedon punctiscapus* Thomson. Female: **5.** Antenna; **6.** Fore wing. Courtesy Dr. Sudhir Singh, Forest Research Institute, Dehradun, India.

Mesosoma. Pronotum short, transverse; mesoscutum and scutellum strongly reticulate, dull; notauli complete but not deep; scutellum a little longer than mesoscutum; propodeum large and smooth with a median carina bordered by two furrows which converge behind; lateral furrows well marked; spiracles small and rounded; wings large reaching to or slightly beyond the tip of abdomen; marginal vein elongate, narrow at end at base; stigmal vein very short almost sessile; postmarginal vein a little longer than stigmal vein. Metasoma oval, about as long as mesosoma; petiole short, broader than long, ovipositor not exerted.

Male: Body length 1.5-2.2 mm. Antenna narrower and longer, scape slightly thickened, pedicel about 1.5× as long as broad; F1 narrow and long, narrow in middle, about 2.5× as long as pedicel; clava not divided, a little longer than F4; abdomen short and oval; petiole about 2.0× as long as broad, shorter than hind coxa.

Host: Unknown.

Distribution: India: Tamil Nadu.

Comments: The above diagnosis is based on the original description and illustrations given by Ferrière (1930). However, it differs from all other Indian species of *Entedon* by the characters given in key.

***Entedon gunturensis* (Shafee & Rizvi, 1985) (Figs 7–10)**

Pediobius gunturensis Shafee & Rizvi, 1985, 162, female. Holotype, female, India, Andhra Pradesh, Guntur (ZDAMU), examined.

Pediobius gunturensis Shafee & Rizvi: [Khan et al. 2005](#): 120.

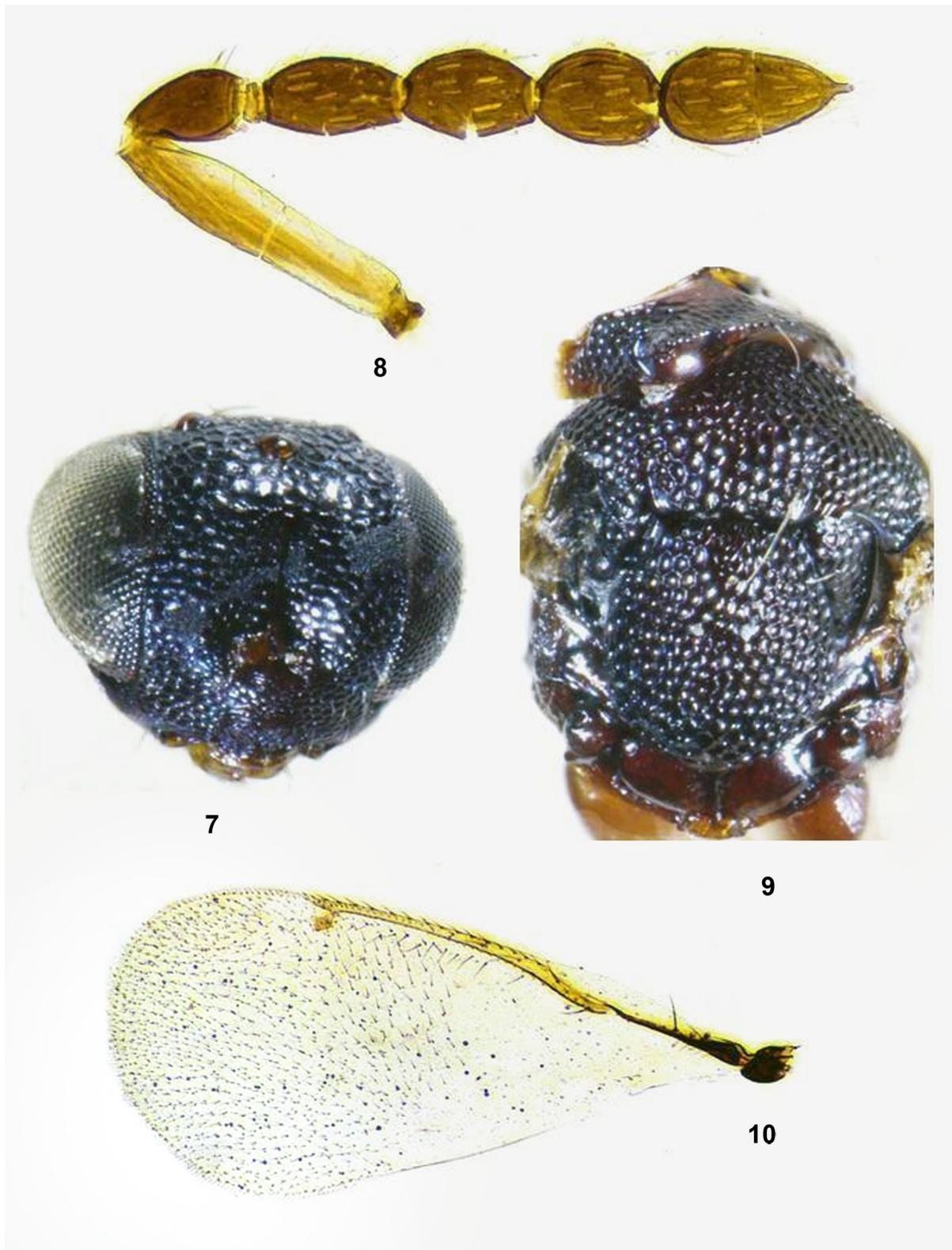
Entedon gunturensis (Shafee & Rizvi): [Hayat et al. 2005](#): 9.

Type material examined: Holotype, female (body on card, one fore wing and one antenna on slide). INDIA: UTTARPRADESH, Guntur, 4.iii.1982, coll. S.A. Shafee.

Redescription: Female: Body length 1.8 mm. Head dark brown to black. Ocelli white and arranged obtuse triangle. Antennae brown, except basal half scape pale brown. Mesosoma dark brown to black. All legs dark brown, except apical three-fourth mid and hind tibiae and tarsi pale white. Gaster dark brown to black.

Head ([Fig. 7](#)). with polygonal sculpture, in frontal view 1.3× as broad as long; fronto-vertex width 0.6× head width; frons with inverted Y-shaped facial line; eye height 3× as long as malar space. Antennal toruli situated slightly above to lower eye margin. Antenna ([Fig. 8](#)) with scape 4.3× as long as broad, 3× as long as pedicel; pedicel 1.39× as long as broad; single annulus broader than long; funicle three-segmented, each segment gradually decreasing in length and increasing in width distally; clava two-segmented, 1.7× as long as broad; second claval segment ending with a short apical spicula.

Mesosoma ([Fig. 9](#)) broader than head; pronotum with six long setae on posterior margin; mesoscutum shorter than scutellum with polygonal raised reticulate sculpture; notauli incomplete; mid-lobe of mesoscutum with four setae; scutellum longer than broad with polygonal sculpture and two setae. Fore wing ([Fig. 10](#)) hyaline, disc aetose nearly in basal half, only a single row of six setae and 2.0× as long as broad as broad; marginal vein + parastigma 1.3× as long as submarginal vein and 12.7× as long as stigma vein; postmarginal vein 1.3× as long as stigmal; longest marginal setae 0.04× maximum wing width.



Figures 7-10. *Entedon gunturensis* (Shafee & Rizvi). Holotype, female: 7. Head, frontal view; 8. Antenna; 9. Mesosoma; 10. Fore wing.

Metasoma. Gaster shorter than mesosoma; ovipositor occupying three-fourth length of gaster, slightly exerted beyond the apex of gaster.

Relative measurements (holotype slide). Antennal segments length: width as follow: scape: 24: 45.5; pedicel, 8: 5.8; F1, 10: 6; F2, 8.5: 6.8; F3, 8.3: 7.3; C1, 7: 7.5; C2, 6: 6.3; spicula, 1.3. Forewing length: width, 132: 65; longest marginal seta, 3; submarginal vein length, 46; parastigma length, 15.5; marginal vein length, 45; stigmal vein length, 4.8. (Holotype from card). Mesosoma length: width 83: 56.

Male: Unknown.

Host: Unknown.

Distribution: India: Andhra Pradesh.

Comments: *Entedon gunturiensis* (Shafee & Rizvi) was described based on a single female collected in Indian state of Andhra Pradesh. It comes close to *E. longicarpus* (Khan & Shafee), but differ in following characters: antennal toruli situated slightly above to lower eye margin; antenna with scape in basal half pale brown, 4.3× as long as broad; a single row of six setae on the basal disc of fore wing. In *E. longicarpus*: antennal toruli situated at the level of lower eye margin; antenna with scape completely dark brown, 5.7× as long as broad; basal disc of fore wing asetose.

***Entedon longicarpus* (Khan & Shafee, 1982) (Figs 11–14)**

Pediobius longicarpus Khan & Shafee 1982, 370, female. Holotype, female, India, Uttar Pradesh, Aligarh (ZDAMU), examined.

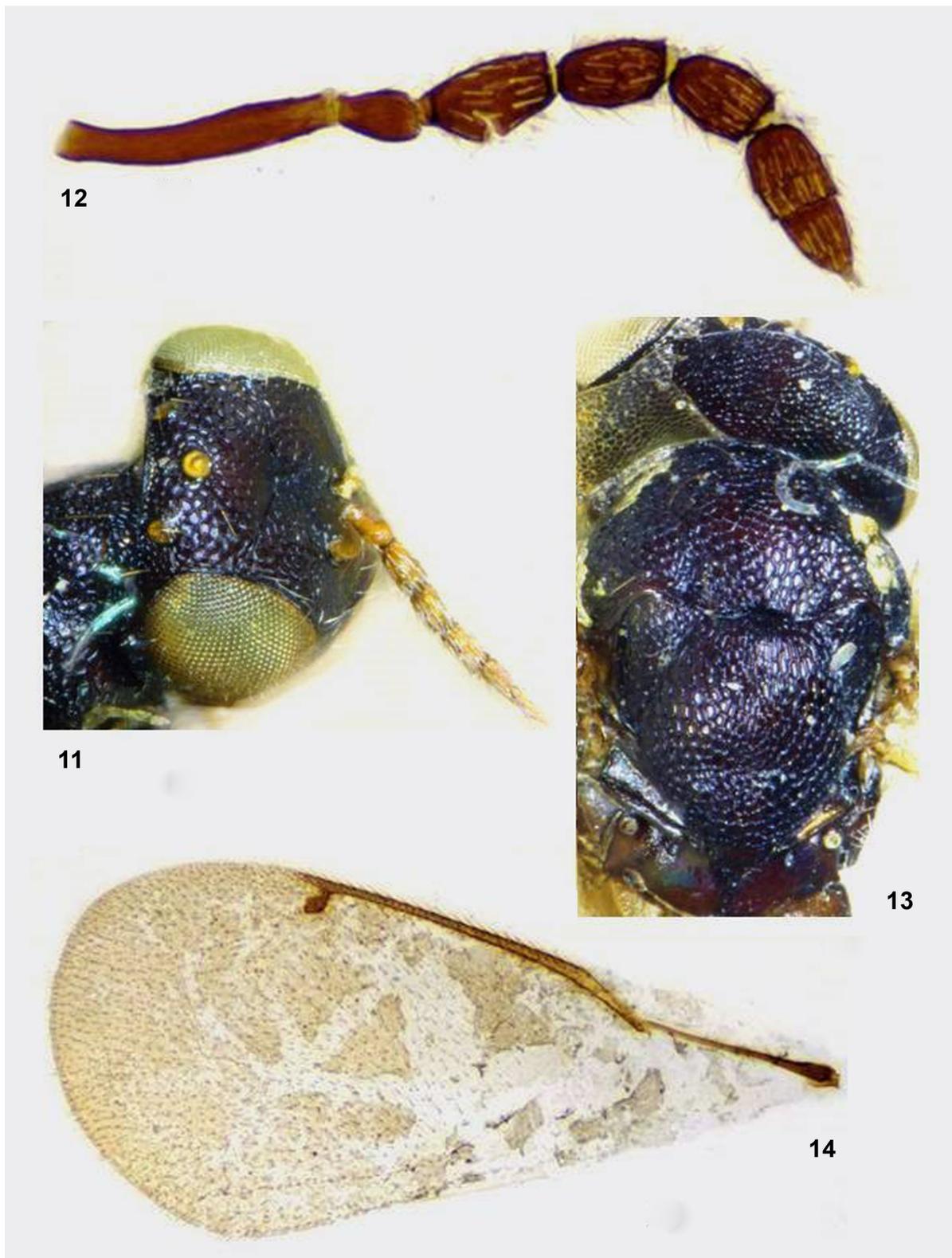
Entedon longicarpus (Khan & Shafee): [Hayat et al. 2005](#): 9.

Material examined: Holotype. Female (one wing and one-antennae on slide). INDIA: UTTAR PRADESH, Aligarh, 10.ix.1977, Coll. M.Y. Khan. (ZDAMU).

Redescription: Female: Body length 2.4mm. Head dark brown to black with bluish reflection. Antenna dark brown and hairy. Mesoscutum and scutellum dark-brown to black with bluish reflection; dorsellum and propodeum dark brown with greenish reflection. Fore and mid legs with coxae, femora, basal one-third tibiae and last tarsal segment brown to dark brown, first three tarsal segments pale white, apical two-third of fore tibia brown, rest pale brown. Gaster metallic dark brown to black.

Head ([Fig. 11](#)) broader than mesosoma, in frontal view, 1.8× as broad as long; fronto-vertex width 0.4× head width; eye height 3.2× as long as malar space. Antennal toruli situated at level of lower eye margin. Antenna ([Fig. 12](#)) with scape 5.7× as long as broad, 4.1× pedicel length; pedicel 1.2× as long as broad; single annulus present; funicle three-segmented, each segment gradually decreasing in length; clava two-segmented 2.3× as long as broad with a short apical spicula.

Mesosoma ([Fig. 13](#)) 1.5× as long as broad; pronotum moderate, visible in dorsal view; mesoscutum shorter than scutellum with polygonal reticulate sculpture; notauli incomplete; mid lobe of mesoscutum with four setae; scutellum longer than broad, with polygonal reticulate sculpture and two setae. Fore wing ([Fig. 14](#)) hyaline, disc in basal third asetose, 2.1× as long as broad; submarginal vein and 13.5× as long as stigma vein; longest marginal setae 0.05× maximum wing width.



Figures 11-14. *Entedon longicarpus* (Khan & Shafee). Holotype, female: **11.** Head, frontal view; **12.** Antenna; **13.** Mesosoma with head; **14.** Fore wing.

Metasoma. Gaster shorter than mesosoma; ovipositor occupying three-fourth length of gaster, slightly exerted beyond the apex of gaster.

Relative measurements (holotype slide). Antennal segments length: width as follow: scape, 30: 5.3; pedicel, 7.3: 6.3; F1, 13:8; F2, 12: 7.5; F3, 10.5: 8.3; C1, 9.5: 8; C1, 9.5: 8; C2, 9: 6.3; spicula, 1.5. Forewing length: width, 183: 88; longest 1 setae, 4.5; submarginal vein length, 61; parastigma length, 17; marginal vein length, 64; stigmal vein length, 6. Hind wing length: width, 143:44; longest marginal setae, 5.5. (Holotype from card): Mesosomal length: width, 96: 66.

Male: Unknown.

Host: Unknown.

Distribution: India: Uttar Pradesh.

Comments: *Entedon longicorpus* (Khan & Shafee) comes close to *E. gunturensis* (Shafee & Rizvi, 1985). However, *E. longicorpus* differs from the latter by the characters given under the comments of *E. gunturensis*

Entedon shivalikensis Majeed & Jamali sp. nov. (Figs 15–20)

<http://www.zoobank.org/2F9C2CB1-500D-4EE8-94A9-BA7235253F58>

Materials examined: Holotype, female (on slide under 4 cover slips). INDIA: UTTRAKHAND, Dehradun, 20.iii.2016, Coll. M.M. Jamali. (ZDAMU).

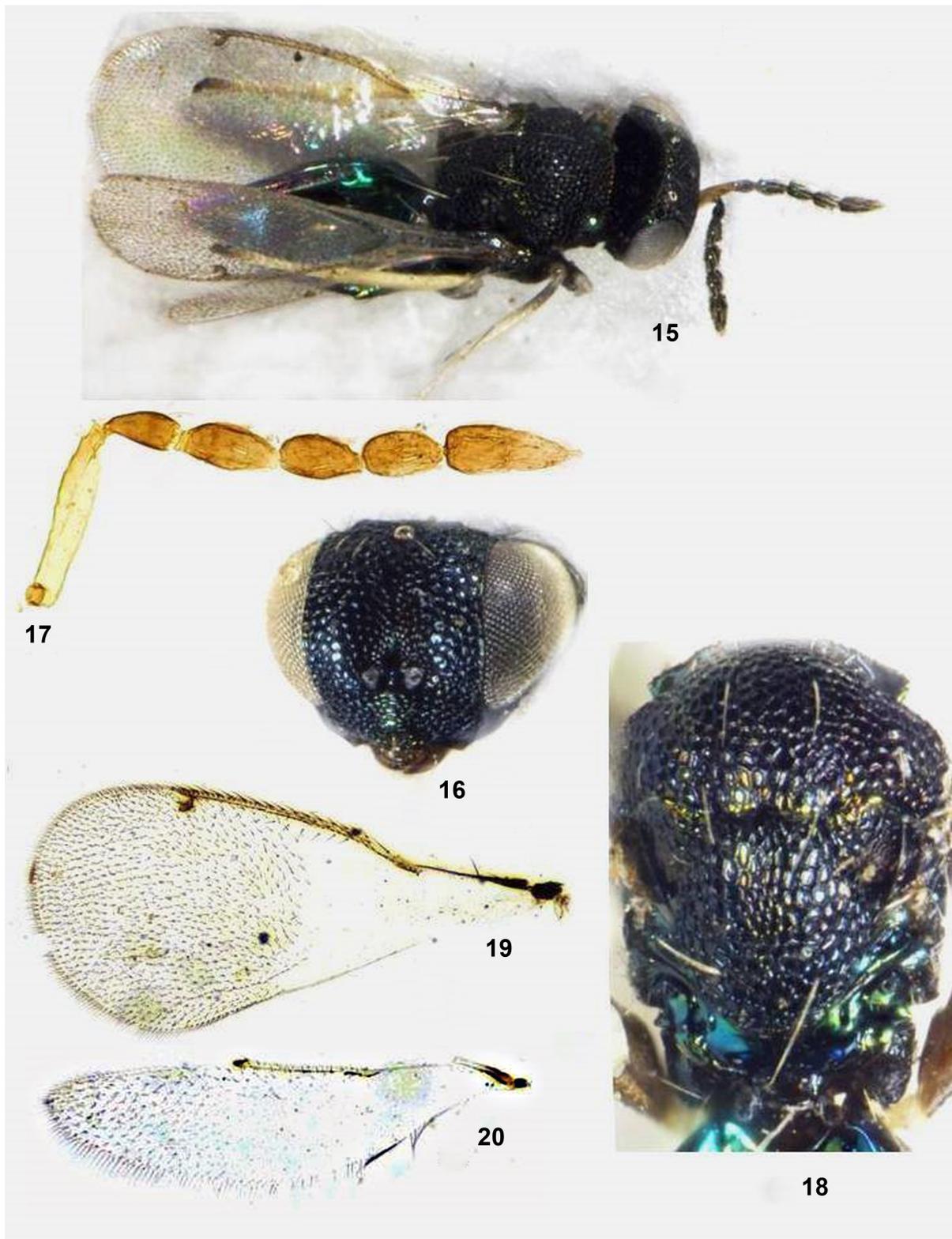
Paratype, female (on card). INDIA, KARNATAKA, Bengaluru, 30.i.2015, Coll. K. Vennakumari. (ZDAMU).

Description: Female: Body (Fig. 15) length 1.8 mm. Head dark brown to black. Antenna with scape basal three-fourth white, rest brown; pedicel and flagellum dark brown. Mesosoma dark brown to black. Wings hyaline. All legs with coxae dark brown; femora largely dark brown with apex pale white; trochanter pale white except fore trochanter dark brown; fore tibia pale white with slight brown infuscation in basal half; mid tibia pale white with brown band proximally; tarsi of fore and mid legs pale white; hind tibia and tarsi pale yellow except the last tarsal segment brown. Gaster dark brown, terga 1-3 with bluish green reflection.

Head (Fig. 16) broader than mesosoma, in front view, 1.4× as broad as long, with polygonal reticulate sculpture; cells are larger in vertex region than facial; eye height 3.3× as long as malar space. Antenna (Fig. 17) inserted markedly above to lower eye margin. Antenna with two annuli; scape 4.7× as long as broad and 2.9× as long as pedicel; funicle three segmented, decreasing in length gradually from F1 to F3; clava two-segmented, 1.5× as long as broad.

Mesosoma (Fig. 18) 1.1× as long as broad; pronotum moderate; mesoscutum shorter than scutellum; notauli incomplete; midlobe of mesoscutum, scutellum and axillae with polygonal reticulate sculpture; metanotum and propodeum smooth; propodeum with well developed carina, diverging anteriorly just beneath dorsellum. Fore wing (Fig. 19) 1.9× as long as maximum width disc nearly asetose basally, with only a row of 9 setae beneath the marginal vein; submarginal vein longer than marginal vein; marginal vein + parastigma 1.4× as long as submarginal vein and 15× as long as stigmal vein; postmarginal vein 1.1× as long as stigmal vein; longest marginal seta 0.05× maximum wing width. Hind wing (Fig. 20) 3.7× as long as broad; longest marginal setae 0.13× maximum wing width.

Metasoma. Petiole: 2.2× as broad as long; gaster longer than mesosoma; ovipositor occupying whole gaster, exerted beyond the apex of gaster; ovipositor 2.3× hind tibia.



Figures 15–20. *Entedon shivalikensis* Majeed & Jamali **sp. nov.** Holotype, female: **15.** Habitus; **16.** Head, frontal view; **17.** Antenna; **18.** Mesosoma; **19.** Fore wing; **20.** Hind wing.

Relative measurements (holotype slide). Head length: width, 44: 61; eye height, 33; malar space, 10. Antennal segments length: width as follow: scape, 21.5: 4.5; pedicel, 7.5: 4.5; F1, 10.5: 5.5; F2, 9.5: 5.25; F3, 9: 5.5; C1, 7.5: 6; C2, 6.5: 4.75; spicula, 2. Mesosoma length: width, 62: 5. Fore wing length: width, 135: 70; longest marginal seta, 3.5; submarginal vein length, 49; parastigma length, 20.5; marginal vein length, 47; stigma vein length, 4.5; postmarginal vein length 5. Hind wing length: width, 107: 29; longest- marginal seta, 4. Hind tibia; 43. Metasoma. Petiole length: width, 2.5: 9; ovipositor length, 100.

Male: Unknown.

Host: Unknown.

Etymology: The species is named after the name of 'Shivalik hills'.

Distribution: India: Karnataka, Uttarakhand.

Comments: The new species *Entedon shivalikensis* Majeed & Jamali sp. nov. comes close to *E. gunturensis* (Shafee & Rizvi). But it differs from that in the following characters: antenna with two annuli; F1 almost 2× as long as broad; fore wing 1.9× as long as broad; 9 vertical setae beneath the marginal vein. In *E. gunturensis*, antenna with single annulus; F1 1.4× as long as broad; fore wing 2.0× as long as broad with 12 vertical setae beneath the marginal vein.

***Entedon dehradunensis* Majeed & Jamali sp. nov. (Figs 21–26)**

<http://www.zoobank.org/4D04706F-33A3-4054-896D-9D7166DE55B0>

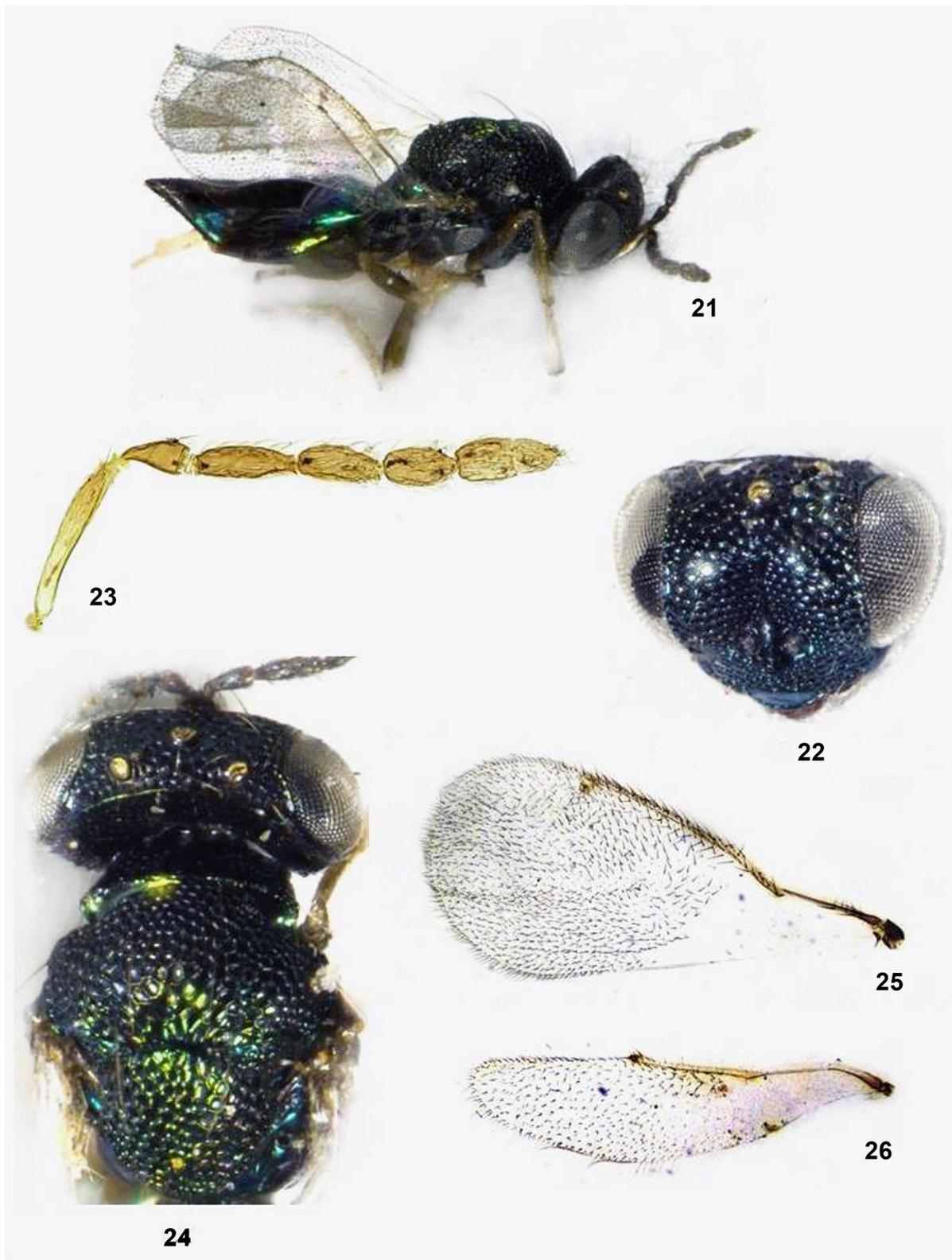
Material examined: Holotype, female (on slide under 4 coverslips). INDIA: UTTARAKHAND, Dehradun, 20.iii.2016, Coll. M.M. Jamali. (ZDAMU).

Description: Female (Fig. 21): Body length 1.9 mm. Head dark brown to black; eye pale brown. Antenna dark brown. Mesosoma dark brown to black except propodeum with bluish reflection. Wings hyaline; hind wing largely hyaline. Fore leg with coxa dark brown, trochanter and femur brown except femur apically white, tibia and tarsi pale white; mid leg with coxa dark brown, trochanter pale white, femur basally brown apically pale white, tibia and tarsi pale white; hind leg with coxa dark brown, trochanter pale white, femur brown, tibia and tarsi white except last tarsal segment brown. Gaster dark brown, except terga T1 and T2 with yellowish brown reflection.

Head (Fig. 22) broader than mesosoma, polygonally sculptured, in front view, 1.4× as broad as long; eye height 3.1× malar space. Antennal toruli situated slightly above to lower eye margin. Antenna (Fig. 23) with scape 6.4× as long as broad and 2.8× as long as pedicel; pedicel 1.8× as long as broad; two annuli first one longer than second; funicle three-segmented, decreasing in length and increasing in width from F1 to F3; clava two-segmented, without constriction, 2.3× as long as broad, ending with an apical spicula.

Mesosoma (Fig. 24) 1.2× as long as broad; pronotum visible in dorsal view; mesoscutum shorter than scutellum, with four setae on midlobe; notauli incomplete; scutellum longer than broad with two setae; mesoscutum, scutellum and axillae with polygonal reticulation. Fore wing (Fig. 25) 2.5× as long as broad; submarginal vein subequal to marginal vein; marginal vein + parastigma 1.4× submarginal vein and 17.8× as long as stigma vein; postmarginal vein, 0.87× stigmal vein; longest marginal seta 0.06× maximum wing width. Hind wing (Fig. 26) 3.8× as long as broad; longest marginal seta 0.2× maximum wing width.

Metasoma. Petiole 4× as broad as long; gaster longer than mesosoma; ovipositor occupying whole length of gaster, not exerted; ovipositor 2.2× long as hind tibia.



Figures 21-26. *Entedon dehradunensis* Majeed & Jamali **sp. nov.** Holotype, female: **21.** Habitus; **22.** Head, frontal view; **23.** Antenna; **24.** Mesosoma; **25.** Fore wing; **26.** Hind wing.

Relative measurements (holotype slide). Head height: width, 48: 66; eye height, 37; malar space, 12. Antennal segments length: width as follow: scape, 24: 3.75; pedicel, 8.5: 4.5; F1, 13: 4.3; F2, 11: 5; F3, 9.5: 5.5; C1, 7.5: 6; C2, 6: 5; spicula, 1. Mesosoma length: width, 68: 58. Fore wing length: width, 168: 70; longest marginal seta, 4.5; submarginal vein length, 50; parastigma length, 22.5; marginal vein length, 49; stigmal vein length, 4; postmarginal vein length, 3.5. Hind wing length: width, 111: 29; longest marginal seta, 5.5. Hind tibia, 49. Metasoma. Petiole length: width, 3: 12; gaster length, 92; ovipositor length, 107.

Male: Unknown.

Host: Unknown.

Etymology: The species is named after the name of location 'Dehradun' from where the type material is collected.

Distribution: India: Uttarakhand.

Comments: The description of new species *Entedon dehradunensis* Majeed & Jamali is based on specimen collected from Dehradun. It comes close to *E. longicarpus* (Khan & Shafee). But it differs in following characters: antennal toruli situated slightly above to lower eye margin; antenna with two annuli; ovipositor occupying complete length of gaster. In *E. longicarpus*: antenna toruli slightly situated at the level of lower eye margin; antenna with one anullus; ovipositor occupying only three-fourth length of gaster.

Discussion

The present study is based on a small collection of *Entedon* Dalman made from some Indian states. No detailed taxonomic studies were conducted in India except the description of four species (Ferrière, 1930; Khan & Shafee, 1982; Shafee, & Rizvi, 1985; Chishti & Shafee, 1988). Out of four described species, three (*E. thoubalensis*, *E. gunturensis*, *E. longiscapus*) were misidentified and placed in the genus *Pediobius* Walker. Here we include seven species, on which three are redescribed and two are described as new species. Hosts are unknown for all the species included in this paper.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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References

- Askew, R.R. (1991) Review of species of *Entedon* Dalman having complete frontal fork with redefinition of the species group *cioni* Thomson (Hymenoptera: Eulophidae). *Entomologica Scandinavica*, 22, 219–229. <https://doi.org/10.1163/187631291X00093>
- Ashmead, W.H. (1904) Classification of Chalcid flies or the superfamily Chalcidoidea, with descriptions of new species in the Carnegie Museum, collected in South America by Herbert H. Smith. *Memoirs of the Carnegie Museum*, 1 (4), 225–551. <https://doi.org/10.5962/bhl.title.10341>
- Bouček, Z. (1988) Australasian Chalcidoidea (Hymenoptera): A biosystematic revision of genera of fourteen families, with a reclassification of species. *CAB International, Wallingford, U.K.*, 832 pp.
- Bouček, Z. & Askew, R.R. (1968) Index of Palaearctic Eulophidae (excl. Tetrastichinae). In: Delucchi, V. & Remaudière, G., eds, *Index of Entomophagous Insects*, 3. Paris: Le François, 9–254 pp.
- Chishti, A.K. & Shafee, A.A. (1988) Species of the genera *Elachertus* Spinola and *Pediobius* Walker (Hymenoptera: Eulophidae) from India. *Indian Journal of Systematic Entomology*, 5(1), 21–23.
- Crawford, J.C. (1907) New North American Hymenoptera. *Journal of the New York Entomological Society*, 15, 179.
- Curtis, J. (1829) A guide to an arrangement of British Insects; being a catalogue of all the named species hitherto discovered in Great Britain and Ireland pp.114 London.
- Dalman, J.W. (1820) Försök till Uppställning af Insectfamiljen Pteromalini, I synnerhet Med afseende pa de I Sverige funne arter. *Kungliga Svenska Vetenskapsakademiens Handlingar*, 41(1), 123–174.
- Dodd, A.P. (1917) Records and descriptions of Australian Chalcidoidea. *Transactions of the Royal Society of South Australia*, 41, 363–364.
- Doğanlar, M. & Doğanlar, O. (2013) Revision of the cyanellus species group of *Entedon* Dalman (Hymenoptera: Eulophidae), with descriptions of new species. *Munis Entomology & Zoology*, 8 (2), 532–548.
- Erdős, J. (1944) Species Hungaricae Generis *Entedon* Dalm. *Kalocsa*, 63 pp.
- Ferrière, C. (1930) Notes on Asiatic Chalcidoidea. *Bulletin of Entomological Research*, 21, 353–360. <https://doi.org/10.1017/S000748530002188X>
- Förster, A. (1856) Hymenopterologische Studien. 2. *Chalcidiae und Proctotrupii*, pp.78 Aachen.
- Ghesquière, J. (1946) Contribution à l'étude de microhyménoptères du Congo Belge. X. Nouvelles dénominations pour quelques genres de Chalcidoidea et Mymaroida. XI. Encore les gn. *Chalcis*, *Smiera*, et *Brachymeria* (Hym. Chalcidoidea). *Revue de Zoologie et de Botanique Africaines*, 39, 367–373.
- Gibson, G.A.P. (1997) Morphology and terminology. In: Gibson G.A.P., Huber J.T., Woolley J.B. (Eds) *Annotated Keys to the Genera of Nearctic Chalcidoidea (Hymenoptera)*. *National Research Council Research Press*. Ottawa, Ontario, Canada, 16–44.
- Girault, A.A. (1913a) Australian Hymenoptera Chalcidoidea - IV. *Memoirs of the Queensland Museum*, 2, 140–296. <https://doi.org/10.5962/bhl.title.9562>
- Girault, A.A. (1913b) Some new genera and species of chalcidoid Hymenoptera of the family Eulophidae from Australia. *Journal of Entomology and Zoology*, 5, 103–112.
- Girault, A. A. (1917) Descriptions of miscellaneous Chalcid-Flies. *Insecutor Inscitiæ Menstruus*, 4, 109–121.
- Graham, M.W.R. de V. (1971) Revision of British *Entedon* (Hymenoptera: Chalcidoidea), with descriptions of four new species. *Transactions of the Royal Entomological Society of London*, 123, 313–358. <https://doi.org/10.1111/j.1365-2311.1971.tb00846.x>
- Gumovsky, A.V. (1997) Review of the genus *Entedon* Dalman, 1820 (Hymenoptera, Eulophidae, Entedoninae) 1. Infrageneric division of the genus with the description of a new subgenus from Africa. *Vestnik Zoologii, Kiev*, 31(5-6), 24–36.

- Gumovsky, A.V. (1999a) Review of the genus *Entedon* Dalman, 1820 (Hymenoptera, Eulophidae, Entedoninae). 4. Revision of Ukrainian species of *hercyna* group. *Vestnik Zoologii*, 33 (6), 27–37.
- Gumovsky, A.V. (1999b) Review of the genus *Entedon* Dalman, 1820 (Hymenoptera, Eulophidae, Entedoninae). 4. Revision of the cyanellus group. *Annales Historico-Naturales Musei Nationalis Hungarici*, 91, 141–176.
- Gumovsky, A.V. & Boyadzhiev, P. (2003) Review of the Bulgarian *Entedon* Dalman, 1820 (Hymenoptera: Eulophidae, Entedoninae). *Acta Entomologica Bulgarica*, 55 (3), 3–32.
<https://doi.org/10.1590/S1519-566X2003000300010>
- Gumovsky, A.V. (2007) A taxonomic revision, biology and morphology of immature stages of the *Entedon sparetus* species group (Hymenoptera: Eulophidae), egg-larval endoparasitoids of weevils (Coleoptera: Curculionidae). *Bulletin of Entomological Research*, 97, 139–166.
<https://doi.org/10.1017/S0007485307004798>
- Hayat, M., Aftab, H. & Perveen, S. (2005) Taxonomic notes on some Indian Eulophidae (Hymenoptera: Chalcidoidea) - 2. On the types of some Eulophinae, Entedoninae and Euderinae. *Oriental Insects*, 39, 1–14. <https://doi.org/10.1080/00305316.2005.10417412>
- Khan, M.Y. & Shafee, S.A. (1982) Species of the genus *Pediobius* Walker (Eulophidae: Entedontinae) from India. *Journal of Natural History Society*, 79, 370–374.
- Khan, M.A., Agnihotri, M. & Sushil, S.N. (2005) Taxonomic studies of eulophid parasitoids (Hymenoptera: Chalcidoidea) of India. *Pantnagar Journal of Research* 2(1) (Special Suppl.), 230pp.
- Noyes, J.S. (2020) Universal Chalcidoidea Database. World Wide Web electronic publication. Available from: <http://www.nhm.ac.uk/chalcidooids> [Accessed 10th September 2020].
- Rasplus, J.Y. (1990) Nouvelles espèces Afrotropicales du genre *Entedon* Dalman et notes sur leur biologie. *Bulletin de la Société Entomologique de France*, 94, 223–245.
- Schauff, M.E. (1988), The species of *Entedon* in America north of Mexico (Hymenoptera: Eulophidae). *Journal of the New York Entomological Society*, 96 (1), 30–62.
- Shafee, S.A. & Rizvi, S. (1985) Three new species of *Pediobius* Walker (Hymenoptera: Eulophidae) from South India. *Journal of the Bombay Natural History Society*, 82 (1), 164–165.
- Shafee, S.A. & Rizvi, S. (1988) Descriptions of three new species of Eulophidae (Hymenoptera) from India. *Indian Journal of Systematic Entomology*, 5 (2), 35–36.
- Shree, A. & Singh, S. (2015) Diversity of family Eulophidae (Hymenoptera: Chalcidoidea) in forest, horticulture, and habitats of Doon valley of Uttarakhand, India. *Indian Forester*, 141 (8), 873–876.
- Silvestri, F. (1914) Viaggio in Eritrea per cercare parassiti della mosca dell olive. Bollettino del Laboratorio di Zoologia Generale e Agraria della R. Scuola Superiore d'Agricoltura, Portici, 9, 188–226.
- Thomson, C.G. (1878) Hymenoptera Scandinaviae 5. *Pteromalus (Svederus) continuation*, pp. 247.
- Westwood, J. (1837) Descriptions of two new Genera belonging to the family Chalcidae. *Entomological Magazine*, 4, 435–438.

مطالعه تاکسونومیک گونه‌های جنس *Entedon* Dalman (Hymenoptera: Chalcidoidea: Eulophidae) در هند، به همراه توصیف دو گونه جدید

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چکیده: گونه‌های جنس *Entedon* Dalman (Hymenoptera: Chalcidoidea: Eulophidae) در هند مورد بازبینی قرار گرفت. در این بازبینی هفت گونه شناسایی شد که از بین آنها دو گونه *E. dehradunensis* Majeed & Jamali **sp. nov.** و *E. shivalikensis* Majeed & Jamali **sp. nov.** توصیف شد و تصاویر آنها ارائه شد. گونه‌های *Entedon thoubalensis* (Chisti & Shafee, 1983)، *E. longicarpus* (Khan & Shafee, 1982) و *E. gunturensis* (Shafee & Rizvi, 1985) مورد توصیف مجدد قرار گرفت و ویژگی‌های گونه‌های *E. punctiscapus* Thomson, 1878 و *E. pempheridis* Ferrière, 1930 در هند تهیه شد.

واژگان کلیدی: بال‌غشاییان، Entedoninae، پارازیتوئید، گونه جدید، گزارش جدید