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## Description of two new species of subfamily Entedoninae (Chalcidoidea: Eulophidae), with some records from India

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### Abstract

Two new species *Baeoentedon farazi* sp. nov. and *Pomphale atturensis* sp. nov. are described in the present study. *Pomphale setosipennis* Hayat & Zeya (1992) and *Euderomphale stomale* Narendran & Hayat (2007) are recorded from Indian States of Karnataka and Uttarakhand respectively. And, a detailed redescription is given for *P. setosipennis*.

**Keywords:** Eulophidae, entedoninae, parasitoids, whitefly, India

### 1. Introduction

Whiteflies belonging to the family Aleyrodidae (Hemiptera) are causing considerable damage to vegetable crops, ornamental plants and other greenhouse crops [9]. They are mainly attacked by various parasitoids belonging to the hymenopteran families such as Aphelinidae (genera *Encarsia*, *Eretmocerus*), Platygastridae (genus *Amitus*), Signiphoridae (often as hyperparasitoids) and Eulophidae [6]. Within the family Eulophidae, the various species of subfamily Entedoninae regulate the populations of whiteflies in natural conditions [6].

In this present paper we deal with three genera of the subfamily Entedoninae. These are *Baeoentedon* Girault (1915), *Pomphale* Husain & Kudeshia (1983) and *Euderomphale* Girault (1916), all are poorly known taxonomically from India. However, the genus *Baeoentedon* was first recorded by Bouček (1988) from 25 Km west of Mudigere, Karnataka. The present study describes two new species, *Baeoentedon farazi* sp. nov., *Pomphale atturensis* sp. nov. Two species *Pomphale setosipennis* Hayat & Zeya, *Euderomphale stomale* Narendran & Hayat are recorded from Indian States of Karnataka and Uttarakhand respectively and, a detailed redescription is given for *P. setosipennis*.

### 2. Materials and Methods

The present study is based on specimens collected mainly by sweep net except one specimen of *P. setosipennis*, which was bred from whitefly (*Aleurocanthus* sp.) on broom creeper (*Cocculus hirsutus*), during 2012 to 2016 from Indian States of Karnataka, Uttar Pradesh and Uttarakhand. Body colour was noted from card mounted specimens before clearing and mounting the specimens on slides in Canada balsam. The body length for the new species is given in millimetres. 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 (one micrometer division = 0.01 mm).

The photographs of card mounted specimens are taken with digital camera (Nikon DS-Fi2) attached to a stereo zoom 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).

The following abbreviation is used in the text:

(MT) = Malaise Trap.

The following acronyms are used for the depositories:

NBAIR = National Bureau of Agricultural Insect Resources, Bengaluru, India.

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

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### 3. Results and Discussions

#### Genus *Baeoentedon* Girault

*Baeoentedon* Girault, 1915: 190. Type species *Baeoentedon peculicornis* Girault, by monotypy.

*Baeoentedon farazi* sp. nov. (Fig. 1–10)

**Female** (holotype) (Fig. 1): Length 0.85–99 (holotype, 0.85×) mm. Head dark brown to black. Antennal scape pale white; pedicel pale brown; annuli dark brown to black; funicle and clava brown to dark brown; claval spicula dark brown. Mesosoma (Fig. 2) dark brown to black. Fore wing (Fig. 8) subhyaline, infumate with yellowish tinge, basal half asetose, remainder densely setose, venation pale brown. Hind wing (Fig. 9) hyaline, venation pale brown. Legs with coxae dark brown; fore femur dark brown except pale brown at apex; fore tibia pale brown to pale white; mid and hind femora and tibiae pale brown to pale white, tarsi of all legs pale white. Gaster metallic black.

**Head:** Head (Fig. 3) in frontal view, smooth slightly broader than mesosoma, 1.28–1.41× (holotype, 1.41×) as broad as high, eye height 1.56–1.85× (holotype, 1.56×) as long as malar space. Antennal (Fig. 5) toruli situated at the level lower eye margin; scape 5–5.06× (holotype, 5×) as long as broad; pedicel 2.14–2.25× (holotype, 2.14×) as long as broad and 0.47–0.5× (holotype, 0.5×) scape length; two annuli, both transverse; funicle almost sub-quadrate, widening apically, with 2 longitudinal sensilla; clava three segmented, 1.79–2× (holotype, 1.79×) as long as broad; spicula with a pair of long bristles at the apex; all segments of clava with 2 longitudinal sensilla.

**Mesosoma** (Fig. 6): Pronotum very narrow, not visible in dorsal view; mesoscutum without notaular line but slightly depressed with dark brown patch in anterior margin, much broader than scutellum; mesoscutum and scutellum with hexagonal, polygonal cell like sculptures; mesoscutum with one pair of long setae in anterior third, anterior margin with 3+3 setae; axillae elongate and advanced in sides of mesoscutum; scutellum with one pair of long setae anterolaterally, reaching down beyond metanotum; metanotum narrow with one seta on either side; propodeum (Fig. 7) with faint longitudinal striations submedially and, with a peculiar type of sculptures proximal to each spiracle. Fore wing (Fig. 8) 2× as long as broad; submarginal vein + parastigma 0.87–1× (holotype, 0.87×) marginal vein and 2.33–2.6× (holotype, 2.33×) as long as stigmal vein; marginal vein with 8 long setae and 2.66× as long as stigmal vein; post marginal vein absent; disc in basal half asetose, remainder setose; longest marginal seta 0.11–0.13× (holotype, 0.13×) maximum wing width. Hind wing (Fig. 9) 5.25–5.53× (holotype, 5.53×) as long as broad; longest marginal seta 0.39–0.59× (holotype, 0.59×) as long as maximum wing width.

**Metasoma:** Gaster slightly shorter than mesosoma; ovipositor (Fig. 10) slightly exerted beyond the apex of gaster, occupying three-fourth of gaster and 1.58–1.66× (holotype, 1.66×) long as hind tibia.

**Relative measurements:** Holotype. Head (length/width), 29/41; eye (height), 17.5; malar space, 11.5; Antenna (length/width), scape, 15/3; pedicel, 7.5/3.5; funicle, 4/3.75; 9.5/6, spicula, 1.25. Forewing (length/width), 78/38; longest marginal seta, 5.25; submarginal vein, 17.5; parastigma, 3.5; marginal vein, 24; stigmal vein, 9. Hind wing (length/width),

65/11.75; longest marginal seta, 6.5; hind tibia, 24; mesosoma, 44/36. Metasoma, 42; ovipositor, 40.

**Material examined: Holotype:** 1 female (on slide under four coverslips, slide No. EUL.143), labelled “INDIA: Karnataka: Bengaluru, Kaval, 4.ii.2015 (MT), Coll. K. Veenakumari”. Paratype: 1 female (on slide under four coverslips, slide No EUL, 79), INDIA: Karnataka: Bengaluru, Kaval, 30.i.2015 (MT), Coll. K. Veenakumari.

**Male:** Unknown.

**Host:** Unknown.

**Distribution:** India: Karnataka.

**Etymology:** The species is named after my closest friend Faraz Ul Haque who passed away last year.

**Comments:** The description of new species *Baeoentedon farazi* sp. nov. is based on specimens collected from Karnataka. It comes close to *Baeoentedon bouceki* [8], but it differs as follows: fore wing subhyaline, infumate with yellowish tinge; 2× as long as broad; antennal (Fig. 4) scape relatively longer, 5× as long as broad; pedicel 2.14× as long as broad; funicle almost sub-quadrate, widening apically; gaster 0.95× mesosoma; ovipositor slightly exerted beyond the apex of gaster. In *B. bouceki* Wang, Huang & Polaszek, fore wing hyaline with pale brown cloud behind stigmal vein, 1.85× as long as broad; antennal scape relatively shorter, 3.25× as long as broad; pedicel 1.52× as long as broad; funicle sub-globular, slightly converging both in basal and apical margin; gaster 0.64× mesosoma; ovipositor not exerted beyond the apex of gaster.

#### Genus *Pomphale* Husain & Kudeshia

*Pomphale* Husain Rauf & Kudeshia, 1983: 112. Type species *Pomphale striptipennis* Husain & Kudeshia, by monotypy and original designation.

#### *Pomphale atturensis* sp. nov. (Fig. 11–18)

**Male** (holotype) (Fig. 11): Length 0.70 – 0.75mm. Head dark brown to black. Antenna dark brown to black. Mesosoma metallic black with bluish reflection except pinkish reflection on propodeum. Fore wing (Fig. 16) largely hyaline, with a dark brown fascia behind stigmal vein to posterior margin; disc with yellowish tinge in basal third; venation brown to dark brown. Hind wing hyaline; venation brown to dark brown. Legs, including coxae, dark brown except 1– 3 tarsal segments pale yellow to pale white and last tarsi dark brown. Gaster dark brown to black with intersegmental region pale brown to brown.

**Head:** Head (Fig. 12) narrower than mesosoma, in frontal view, 1.2–1.4× (holotype, 1.4×) as broad as high; eye height 1.93–2.13× (holotype, 2.13×) as long as malar space; mandible bidentate, apically rounded; maxillary palp and labial palp each with 1-segmented (Fig. 13); antennal toruli situated slightly above to lower eye margin. Antenna (Fig. 14) with scape 2.85–3.57× (holotype, 2.85×) as long as broad; pedicel 1.37–1.5× (holotype, 1.5×) as long as broad and 0.48–0.6× (holotype, 0.6×) scape length; both annuli broader than long, first annulus narrower than second annulus; funicle subquadrate, broader than long, 1.6–2× (holotype, 2×) as broad as long; clava 3-segmented, 2.1–2.5× (holotype, 2.35×) as long as broad (including specula); apical claval segment narrow, triangular and, with apical spicula having a single long seta at apex.

**Mesosoma:** Mesosoma (Fig. 15) subquadrate; pronotum not visible in dorsal view; mesoscutum broader than long with transversely reticulate sculptures and a pair of thick setae in middle, one thick seta at posterior margin just above to each axilla; scutellum with polygonal sculpture and one pair of setae. Fore wing (Fig. 16) 1.9–2× (holotype, 1.93×) as long as broad; submarginal vein + parastigma 1.21–1.4× (holotype 1.21×) marginal vein and 3.41–3.9× (holotype 3.9×) as long as stigmal vein; post marginal vein very short; disc bare in basal third, otherwise densely setose; longest marginal seta 0.18–0.25× (holotype 0.19×) maximum wing width. Hind wing (Fig. 17) 6.37–6.75× (holotype 6.4×) as long as broad; longest marginal seta 0.87–0.93× (holotype 0.93×) as long as maximum wing width.

**Metasoma:** Metasoma longer than mesosoma; petiole transverse, 6.6–11× (holotype, 7.5×) as broad as long.

**Relative measurements:** Holotype. Head (length/width), 24/34; eye height, 16; malar space, 7.5. Antenna (length/width): scape, 10/3.5; pedicel, 6/4; funicle, 2.5/5; clava, 9.25/5; spicula length, 2.5. Forewing (length/width), 60/31; longest marginal seta, 6; submarginal vein length, 15; parastigma length, 4.5; marginal vein length, 16; stigmal vein length, 5; post marginal vein length, 1.5. Hind wing (length/width), 48/7.5; longest marginal seta, 7; hind tibia, 17; mesosoma, 32/31. Metasoma. Petiole (length/width), 1.5/10; gaster, 39. Genitalia. Phallobase, 16.5.

**Material examined: Holotype:** 1 male (on slide under 4 coverslips, slide No. EUL.81), labelled “INDIA: Karnataka, Bengaluru, Attur, 2.vii.2012, Coll. K. Veenakumari”. Paratype: 1 male (slide No. EUL.82) INDIA: Uttar Pradesh, Etah, Jalesar; 2 male (slide Nos. EUL.95 and EUL.96), Hathras, 09.iii.2013, Coll. M.T. Khan.

**Female:** Unknown

**Host:** Unknown

**Distribution:** India: Karnataka, Uttar Pradesh.

**Etymology:** This name of species is derived from the name of the locality from where it was collected.

**Comments:** The new species *Pomphale atturensis* sp. nov differs from the type species *P. striptipennis* Husain & Kudeshia in following characters: eye large, 1.93–2.13× as high as malar space; antennal toruli situated slightly above to lower eye margin; pedicel 1.37–1.5× as long as broad; fore wing bare in basal third, otherwise densely setose, submarginal vein subequal in length to marginal vein. In *P. striptipennis*: eye small, about 0.93× as high as malar space; antennal toruli almost in the line with lower eye margin; pedicel 2× as long as broad; fore wing almost devoid of discal setae, submarginal vein 0.66× marginal vein (Husain & Kudeshia, 1983: Fig. 1–3).

*Pomphale setosipennis* Hayat & Zeya (Fig. 19–26)

*Pomphale setosipennis* Hayat & Zeya, 1992: 183, female. Holotype, female, Gaya, Bihar, India.

### Redescription

**Female** (Fig. 19): Length 0.69 mm. Head dark brown to black. Antenna dark brown to black. Mesosoma metallic black with bluish reflection. Fore wing hyaline and a dark brown fascia behind stigma vein to posterior margin, venation dark brown. Hind wing hyaline, venation dark brown. All legs, including coxae, dark brown except first three tarsal segments pale

white and last tarsal segment brown. Gaster dark brown to black.

**Head:** Head (Fig. 20) 1.15× as broad as mesosoma, in front view, 1.5× as broad as high; eye height 3.54× as long as malar space. Mandible bidentate (Fig. 21). Antennal toruli situated above to lower eye margin. Antenna (Fig. 22) with scape 3.5× as long as broad; pedicel 1.5× as long as broad and 0.48× scape length; both annuli broader than long; funicle nearly transverse, 2.5× as broad as long; clava three segmented, 2.27× as long as broad (including specula); last claval segments triangular and narrow with spicula bearing terminally a long seta.

**Mesosoma** (Fig. 23): Mesoscutum without notaular line, broader than scutellum, with raised polygonal reticulate sculpture, and one pair of setae in middle, a large seta at posterior margin just above to each axilla. Fore wing (Fig. 24) 1.93× as long as broad; submarginal vein + parastigma 1.4× marginal vein and 4.2× as long as stigma vein; marginal vein dorsally with 8 long setae; post marginal vein short 0.4× stigmal vein and 0.13× marginal vein; longest marginal seta about 0.18× maximum wing width. Hind wing (Fig. 25) 5.7× as long as broad; longest marginal seta 0.83× maximum wing width.

**Metasoma:** Petiole 6× as broad as long; gaster longer than mesosoma; ovipositor (Fig. 26) slightly exerted beyond apex of gaster, occupying two-third of gaster length, and 1.76× as long as hind tibia.

**Relative measurements:** Head (length/width), 26/38; eye height, 19.5/10.5; malar space, 5.5; Antenna (length/width): scape, 12.5/3.5; pedicel, 6/4; funicle, 2/5; clava, 9.5/5.5; spicula, 3. Forewing (length/width), 64/33; longest marginal seta, 6; submarginal vein length, 16; parastigma, 5; marginal vein length, 15; stigmal vein length, 5; postmarginal vein, 2. Hind wing (length/width), 52/9; longest marginal seta, 7.5; hind tibia, 17; Mesosoma (length/width), 32/33. Metasoma. Petiole (length/width), 2/12; gaster length, 38; ovipositor, 30.

**Material examined:** INDIA: Karnataka, Ramnagar, 1 female 13.viii.2013, Coll. T. Amutha. Uttar Pradesh, Hathras, 1 female 06.iii.2013, Coll. M.T. Khan.

**Male:** Unknown.

**Host:** Whitefly (*Aleurocanthus* sp.) on broom creeper *Coculus hirsutus* Diels.

**Distribution:** India: Bihar, Karnataka (new record).

**Comments:** The original description of the species is inadequate. Therefore, a detailed redescription is being given for the species. The collected specimen from Uttar Pradesh agrees in almost all the characters with original description of *P. setosipennis* given by Hayat & Zeya (1992). However, it slightly differs from holotype of the species in some characters as follows: body length, 0.69 mm; scape 3.5× as long as broad; hind wing 5.7× as long as broad. In the holotype: body length, 0.95mm; scape nearly 4× as long as broad; hind wing 5.5× as long as broad. Hence, we consider these characters to be minor and, are falling within the expected range of variation of the species.

Genus *Euderomphale* Girault

*Euderomphale* Girault, 1916: 410. Type species *Euderomphale fuscipennis* Girault (= *E. flavimedia* (Howard)),

by original designation.

***Euderomphale stomale* Narendran & Hayat**

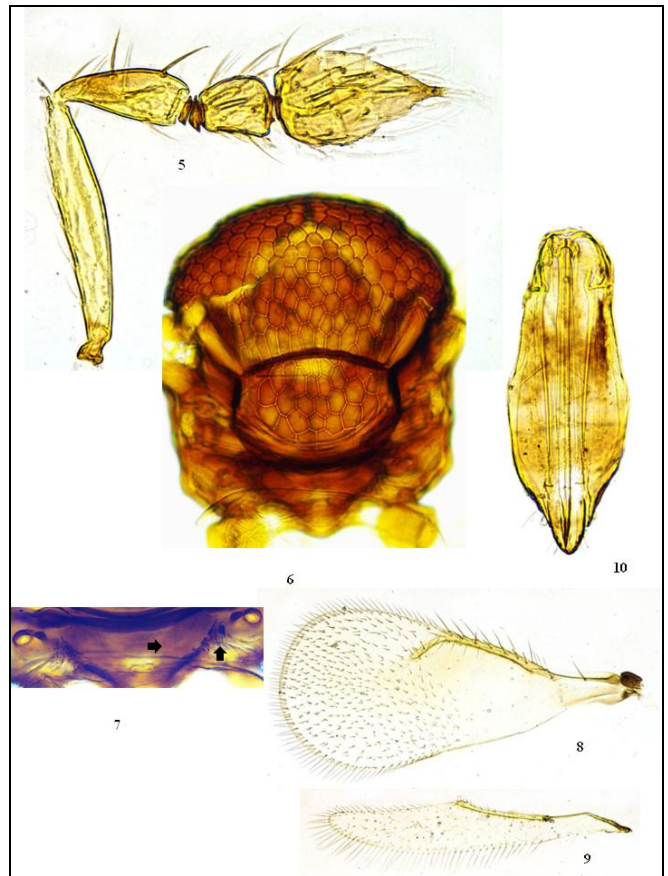
**Material examined:** (ZDAMU, registration No. HYM.CH....): INDIA: UTTARAKHAND, Tehri, Narendranagar, Ananda, 1 female 20.iii.2016, Coll. M. M. Jamali, P.T. Anwar.

**Distribution:** India: Karnataka, Uttarakhand (present record).

**Comments:** The specimen collected from Uttarakhand, agreeing fairly well in almost all the characters with the original description of *Euderomphale stomale* given by Narendran & Hayat (2007). The present study found no characters to separate it from *E. stomale*.

**4. Acknowledgements**

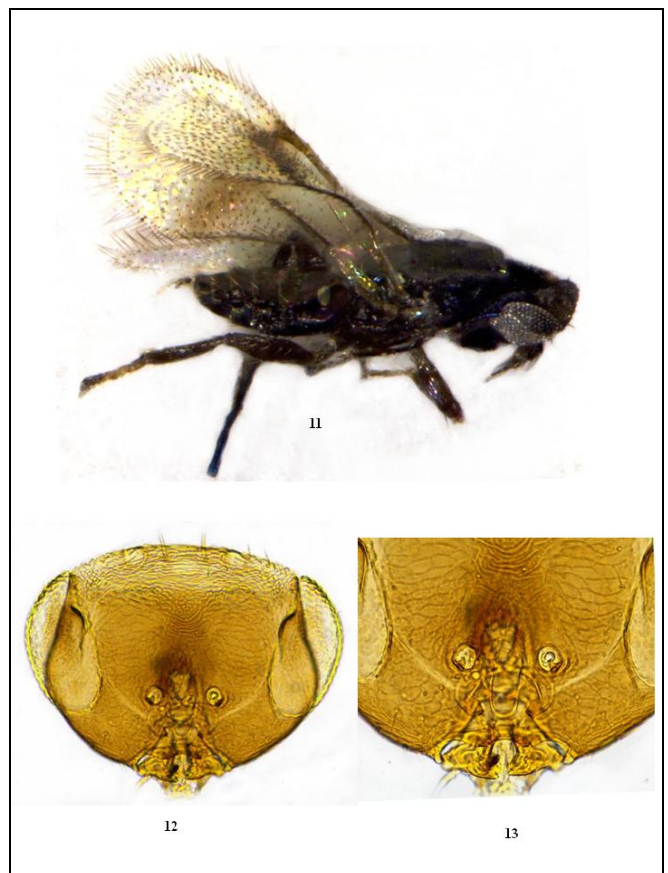
Authors would like to thank the Chairman, Department of Zoology, Aligarh Muslim University, Aligarh, for providing research facilities. We are grateful to Science and Engineering Research Board, Department of Science & Technology (SERB-DST), New Delhi for funding the research project on Parasitic Hymenoptera. Authors also would like thanks the ICAR New Delhi, and the national coordinator of the “Network Project on Insect Biosystematics”, Dr. A. Verghese, National Bureau of Agricultural Insect Resources Bengaluru for financial help. Thanks are due to Dr. Mohammad Hayat the Principal Investigator of the ICAR “Network Project on Insect Biosystematics” AMU Centre, Department of Zoology, Aligarh Muslim University, Aligarh, for help and encouragement. We are also grateful to Dr. K. Veenakumari, Senior Scientist, NBAIR, Bengaluru, for putting the specimens of Eulophidae at our disposal collected by her.



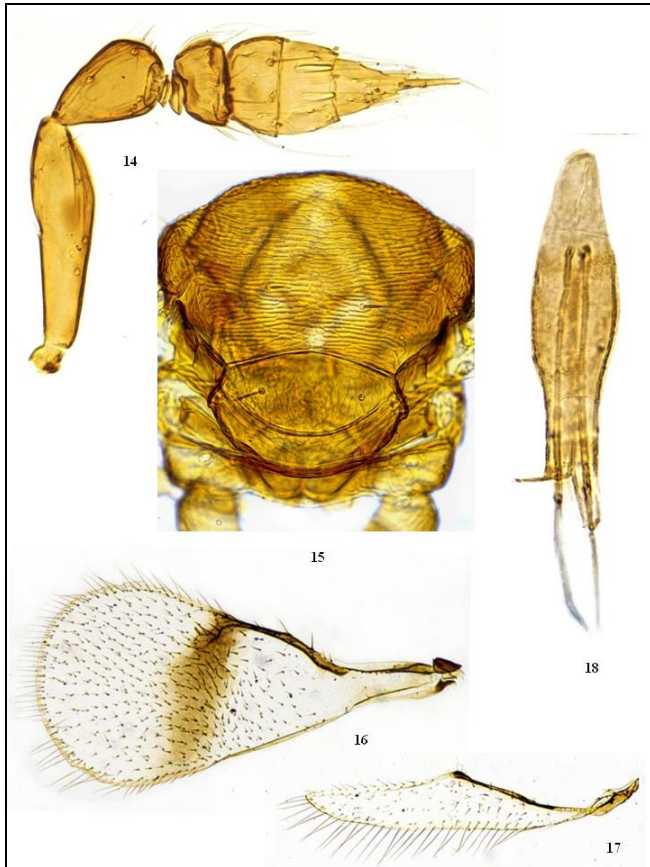
**Fig 5-10:** *Baeoentedon farazi* sp. nov. ♀. 5, antenna; 6, mesosoma; 7, propodeum with faint striations; 8, fore wing; 9, hind wing; 10, Ovipositor.



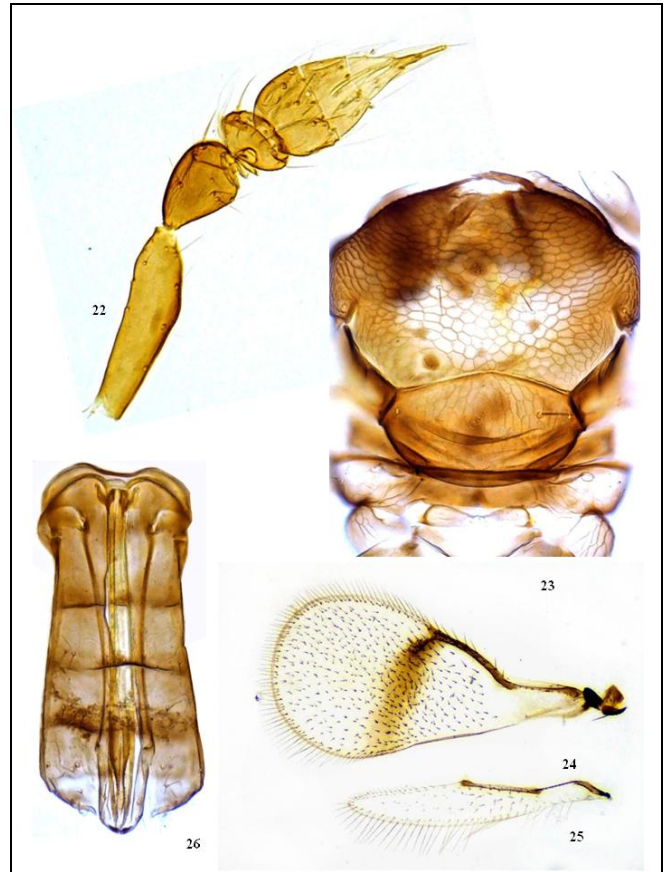
**Fig 1-4:** *Baeoentedon farazi* sp. nov. ♀. 1, habitus image; 2, dorsal view of mesosoma & head; 3, head frontal view; 4, malar sulcus.



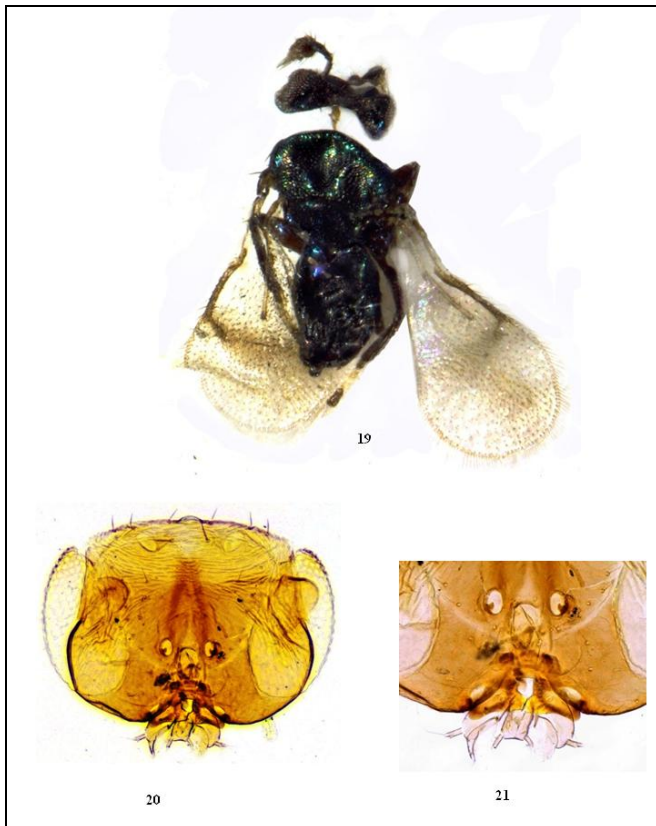
**Fig 11-13:** *Pomphale atturensis* sp. nov. ♂. 11, habitus image; 12, head frontal view; 13, mandible & maxillary palp.



**Fig 14-18:** *Pomphale atturensis* sp. nov. ♂. 14, antenna; 15, mesosoma; 16, fore wing; 17, hind wing; 18, genitalia.



**Fig 22-26:** *Pomphale setosipennis* ♀. 22, antenna; 23, mesosoma; 24, fore wing; 25, hind wing; 26, ovipositor.



**Fig 19-21:** *Pomphale setosipennis* ♀. 19, habitus image; 20, head frontal view; 21, mandible.

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