

Order Hymenoptera, family Gasteruptiidae

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INTRODUCTION

The family Gasteruptiidae is a small group of wasps comprising about 500 described species in two subfamilies, Gasteruptiinae (four genera) (Macedo, 2011; Zhao et al., 2012) and Hyptiogastrinae (two genera) (Jennings & Austin, 2002). They are easily recognized from other Hymenoptera Apocrita by the elongated 'neck' (propleuron), the swollen hind tibiae and the elongate metasoma attached at a high point on the thorax. Adults are free-living insects feeding on nectar mainly on flowers with easily accessible nectar such as are of the families Apiaceae, Asteraceae or Euphorbiaceae, but probably at least some *Gasteruption* species feed on both nectar and pollen (Jennings & Austin, 2004). Gasteruptiidae are also known by their hovering flight during inspection of bee nests (van Achterberg, 2013). The larvae feed on the larval food of solitary bees, after consuming the egg or larva of the bee (Malyshev, 1964, 1965). They select solitary bees of the families Apidae, Colletidae, Halictidae and Megachilidae nesting in stems or in wood, and less often in clay banks or other vertical soil substrates (Zhao et al., 2012; van Achterberg, 2013); as far as known, bees nesting in flat ground are far less often attacked. In Australia, members of the Hyptiogastrinae attend bee nests in the ground (Houston, 1987). There is only indirect evidence that Gasteruptiinae attack wasp nests, e.g. Crabronidae, Sphecidae and solitary Vespidae (Eumeninae) (Jennings & Austin, 2004; van Achterberg, 2013). The pupa of Gasteruptiidae hibernates until the next spring or summer (He, 2004; Jennings & Austin, 2004). Up to now no described species were known from this area, only an undescribed species from the UAE was reported by Jennings & Krogmann (2009).

For the present contribution we were able to examine 234 specimens of Gasteruptiidae from the United Arab Emirates and the Republic of Yemen, belonging to 11 species. All species belong to the genus *Gasteruption* Latreille, 1796 (subfamily Gasteruptiinae). The species are described, keyed and illustrated. Seven species are new to science (*Gasteruption alwathbaense* sp. nov., *G. avanharteni* sp. nov., *G. flabellatum* sp. nov., *G. fuscum* sp. nov., *G. latifrons* sp. nov., *G. rubidum* sp. nov., *G. yemenicum* sp. nov.) and two known species are reported new for the UAE (*Gasteruption argentatum* Semenov-Tian-Shanskij & Kostylev, 1928, and *G. sericeipes* Kieffer, 1911). Two further species, known only by males, are morphologically very close to *G. sericeipes* but differ genetically. We refrain from describing these species for the present.

MATERIALS AND METHODS

This chapter is based on material collected within the framework of the UAE Insect Project, Sharjah, by A. van Harten (= AvH) and by one of the authors (Christian Schmid-Egger = CSE) during two stays in the UAE in March 2009 and January 2011. The specimens were collected by hand net (all material of CSE) and by traps (remaining material). The specimens from Yemen were collected by AvH. The material is deposited in the Naturalis Biodiversity Center Leiden (RMNH), in the collections of C. Saure, Berlin, and of CSE, Berlin, and in the UAE Invertebrate Collection. All holotypes are deposited in RMNH.

The term 'antesternal carina' was coined by van Achterberg (van Achterberg, 2013; Zhao et al., 2012) for the more or less upcurved anterior border of the mesosternum sensu lato. It is

situated above the fore coxae and varies from a narrow non-lamelliform carina to a very wide and upcurved lamella. Additional non-exclusive characters in the key are between brackets. The vein SR1 and the first discal cell are shown in Zhao et al. (2012). Abbreviations used: OOL = ocellar ocular line; POL = posterior ocular line.

The present genetic analysis bases on the mtDNA 'barcode' fragment of the COI gene (5' 658 bp). Extraction of tissue (one dry leg) and data analysis was done at the Zoologische Staatssammlung München, while DNA sequencing was performed at the Canadian Centre for DNA Barcoding. For further details see Hausmann & Hebert (2009). A neighbour-joining tree (K2P distances) was subsequently calculated using BOLD, the Barcode of Life Data Systems. 34 specimens were successfully sequenced using standard primers. The neighbour-joining tree, modified using Fig.Tree v1.4.0 (Appendix 1), was calculated from these specimens. The tree reflects genetic similarity and not phylogenetic relationships. All data will be released through BOLD immediately after publication. A detailed paper about the barcoding of Hymenoptera from Central Europe with a more comprehensive description of the method is in preparation (Schmid-Egger et al., in prep.).

Life history of the species treated here is unknown. Most species were collected in traps; the specimens of CSE, collected in 2009, were mostly collected on flowering *Ochradenus aucheri* (Resedaceae). Detailed information on the collecting period can be found in the section "Specimens examined".

SYSTEMATIC ACCOUNT

Family **Gasteruptiidae** Ashmead, 1900 (Type genus: *Gasteruption* Latreille, 1796)

Subfamily **Gasteruptiinae** Ashmead, 1900

Genus ***Gasteruption*** Latreille, 1796 (Type species: *Ichneumon assectator* Linnaeus, 1758)

Identification key to species of the genus *Gasteruption* from the UAE and Yemen

- 1 Ovipositor present; antenna with 14 segments (females; but unknown of *G. latifrons* sp. nov., *G. sp. 1* and *G. sp. 2*) 2
- Ovipositor absent; antenna with 13 segments (males) 10
- 2 Apex of ovipositor sheath blackish or dark brown, if narrowly lightened apically then pale part at most 0.4 times as long as hind basitarsus 3
- Apex of ovipositor sheath distinctly white or ivory, at least 0.6 times as long as hind basitarsus 6
- 3 Head triangularly incised medio-posteriorly, roundly narrowed behind eyes and nearly square in dorsal view; face wider, frons about 2.5 times as wide as an eye at the level of toruli; mesosoma stout ***Gasteruption latifrons* sp. nov.**
- Head slightly concave medio-posteriorly, linearly narrowed behind eyes and trapezoid or transverse in dorsal view; face smaller, frons about 2.0 times as wide as an eye at the level of toruli; mesosoma slender 4
- 4 Occipital carina obsolescent and non-lamelliform medio-dorsally, hind basitarsus slender and its apical half white; wing membrane hyaline and hind femur dark brown; ovipositor sheath 1.0–1.2 times as long as body ***Gasteruption sericeipes* Kieffer**
- Occipital carina narrowly or moderately lamelliform medio-dorsally; hind basitarsus stout and its apical half dark brown or pale brown; wing membrane hyaline or infusate; hind

- femur variable, dark brown or reddish brown; ovipositor sheath 0.6-0.8 times as long as body **5**
- 5** Vertex densely coriaceous-punctulate, with some separate punctures and rather matt; wing membrane slightly infuscate; middle and hind femur dark brown; hind tibia dark brown with an ivory ring basally; hind tibial spurs and hind tarsus predominantly reddish brown; [apex of ovipositor sheath missing, but considering its closest relatives assumed to be narrowly ivory] *Gasteruption fuscatum* sp. nov.
- Vertex sparsely superficially punctulate and shiny; wing membrane hyaline; middle and hind femur reddish brown; hind tibia tricoloured, dark brown with an ivory ring basally and a big red patch latero-apically; hind tibial spurs and hind tarsus predominantly dark brown *Gasteruption argentatum* Semenov-Tian-Shanskij & Kostylev
- 6** Head trapezoid in dorsal view and linearly narrowed behind eyes; posterior incision of hypopygium up to apical third of hypopygium and V-shaped; hind leg reddish brown, without pale markings *Gasteruption rubidum* sp. nov.
- Head transverse in dorsal view, roundly narrowed behind eyes; posterior incision of hypopygium up to apical 0.4–0.5 of hypopygium and slit-like; hind leg predominantly dark brown, tibia with white or ivory ring basally or subbasally **7**
- 7** Occipital carina moderately or narrowly lamelliform medio-dorsally; [head strongly narrowed behind eyes in dorsal view; mesoscutum smooth and shiny, with few small to medium-sized punctures; apical segment of antenna at least twice as long as subapical segment and somewhat curved and flattened; fore coxa orange-brown] *Gasteruption flabellatum* sp. nov.
- Occipital carina obsolescent and non-lamelliform medio-dorsally (at most sharp-edged) ... **8**
- 8** White apical part of ovipositor sheath about 3.0 times as long as hind basitarsus; middle lobe of mesoscutum coarsely punctate-rugose, lateral lobes rugulose-coriaceous; vertex with shallow depression medio-posteriorly in front of occipital carina; hind tibia with narrow ivory ring subbasally *Gasteruption avanharteni* sp. nov.
- White or ivory apical part of ovipositor sheath 0.6–1.5 times as long as hind basitarsus; middle lobe of mesoscutum with separate large to medium-sized punctures and smooth interspaces, lateral lobes almost without punctures ventrally, shiny or with satin sheen; vertex without shallow depression medio-posteriorly in front of occipital carina; hind tibia with distinct white or ivory ring basally or subbasally **9**
- 9** White apical part of ovipositor sheath less than 0.8 times as long as hind basitarsus; frons, vertex, pronotum, mesoscutum and scutellum smooth and shiny, at most with fine punctulation; middle lobe of mesoscutum with deep 'pit-like' punctures; antero-lateral tooth of pronotum large; hind tarsus uniformly pale brown or ivory *Gasteruption alwathbaense* sp. nov.
- White apical part of ovipositor sheath more than 0.8 times as long as hind basitarsus; frons, vertex, pronotum, mesoscutum and scutellum finely coriaceous or with fine punctulation and with satin sheen; middle lobe of mesoscutum with shallower punctures; antero-lateral tooth of pronotum small; hind tarsomere 1 or 1–2 ivory, contrasting distinctly with apical dark brown tarsomeres *Gasteruption yemenicum* sp. nov.

Males

- 10** Occipital carina moderately or narrowly lamelliform medio-dorsally **11**
- Occipital carina obsolescent and non-lamelliform medio-dorsally (at most sharp-edged) ... **13**

- 11 Wing membrane infusate; vertex very densely punctulate and matt; antenna short, 2.6 times as long as mesoscutum in front of tegulae; antennal segments 10–13 hardly longer than wide *Gasteruption fuscatum* sp. nov.
- Wing membrane hyaline; vertex less densely punctulate and shiny; antenna long, at least 3.0 times as long as mesoscutum in front of tegulae; antennal segments 10–13 almost twice as long as wide 12
- 12 Fourth antennal segment about 1.5 times as long as third segment; hind tibia with a big red patch latero-apically; paramere dark brown apically; hind tibial spurs blackish; hind tarsus dark brown *Gasteruption argentatum* Semenov-Tian-Shanskij & Kostylev
- Fourth antennal segment at least twice as long as third segment; hind tibia without red patch latero-apically; paramere yellowish brown apically; hind tibial spurs reddish; at least hind tarsomere 1–2 ivory *Gasteruption flabellatum* sp. nov.
- 13 Fourth antennal segment hardly longer than third segment and 0.7 times as long as second and third segment combined; wing membrane slightly infusate; body predominantly reddish brown 14
- Fourth antennal segment about twice as long as third segment and as long as or slightly longer than second and third segment combined; wing membrane hyaline; head (and usually mesosoma) black or dark brown 15
- 14 Head slightly concave medio-posteriorly, linearly narrowed behind eyes and trapezoid in dorsal view; face smaller, frons about twice as wide as an eye at the level of toruli; middle lobe of mesoscutum finely punctate-rugose, sides of lateral lobes coriaceous; hind tibia reddish brown, without pale markings *Gasteruption rubidum* sp. nov.
- Head triangularly incised medio-posteriorly, roundly narrowed behind eyes and nearly square in dorsal view; face wider, frons about 2.5 times as wide as an eye at the level of toruli; middle lobe of mesoscutum coarsely reticulate-punctate and shiny, lateral lobes reticulate-rugose; hind tibia subbasally with an ivory patch *Gasteruption latifrons* sp. nov.
- 15 Middle lobe of mesoscutum coarsely reticulate-punctate or reticulate-rugose; vertex with shallow depression medio-posteriorly in front of occipital carina; hind coxa coriaceous and matt dorsally *Gasteruption avanharteni* sp. nov.
- Middle lobe of mesoscutum with separate punctures and smooth interspaces; vertex without depression medio-posteriorly; hind coxa transversely rugulose or striate and shiny dorsally 16
- 16 Middle lobe of mesoscutum with widely spaced, small to large punctures; sides of lateral lobes of mesoscutum virtually without punctures; mesoscutum between punctures smooth and shiny, almost very sparsely and finely punctulate 17
- Middle lobe of mesoscutum with less spaced medium-sized or large punctures; sides of lateral lobes of mesoscutum at least with some medium-sized or large punctures; mesoscutum between punctures (more or less) densely punctulate and with satin sheen 18
- 17 Middle lobe of mesoscutum with large and deep ('pit-like') punctures; antero-lateral tooth of pronotum large; frons and vertex shiny, punctulation less dense; paramere dark brown, not brightened apically on outer side *Gasteruption alwathbaense* sp. nov.
- Middle lobe of mesoscutum with small or medium-sized and shallower punctures; antero-lateral tooth of pronotum small; frons and vertex with dense punctulation and satin sheen; paramere pale brown, brightened apically *Gasteruption yemenicum* sp. nov.
- 18 Third antennal segment hardly longer than second segment; antero-lateral tooth of pronotum medium-sized; paramere brightened apically; hind tibia dark brown with an ivory ring basally; hind basitarsus ivory in the posterior half, rarely pale brown *Gasteruption serripes* Kieffer

- Third antennal segment slightly but distinctly longer than second segment; antero-lateral tooth of pronotum indistinct; paramere not brightened apically; hind tibia besides the basal ivory ring dark brown or reddish brown ventrally; hind basitarsus dark brown or pale brown, without ivory ring **19**
- 19** Hind tibia dark brown ventrally, basal ivory ring distinctly separated from brown part of tibia; hind tibial spurs dark brown; hind tarsus dark brown ***Gasteruption* sp. 1**
- Hind tibia reddish brown ventrally, basal ivory ring indistinctly separated from reddish part of tibia; hind tibial spurs reddish brown; hind tarsus pale brown ... ***Gasteruption* sp. 2**

DESCRIPTIONS

Gasteruption argentatum Semenov-Tian-Shanskij & Kostylev, 1928

Plates 1–5

? *Gasteruption bergi* Kokujev, 1910: 6.

Gasteruption argentatum Semenov-T.-S. & Kostylev, 1928: 87.

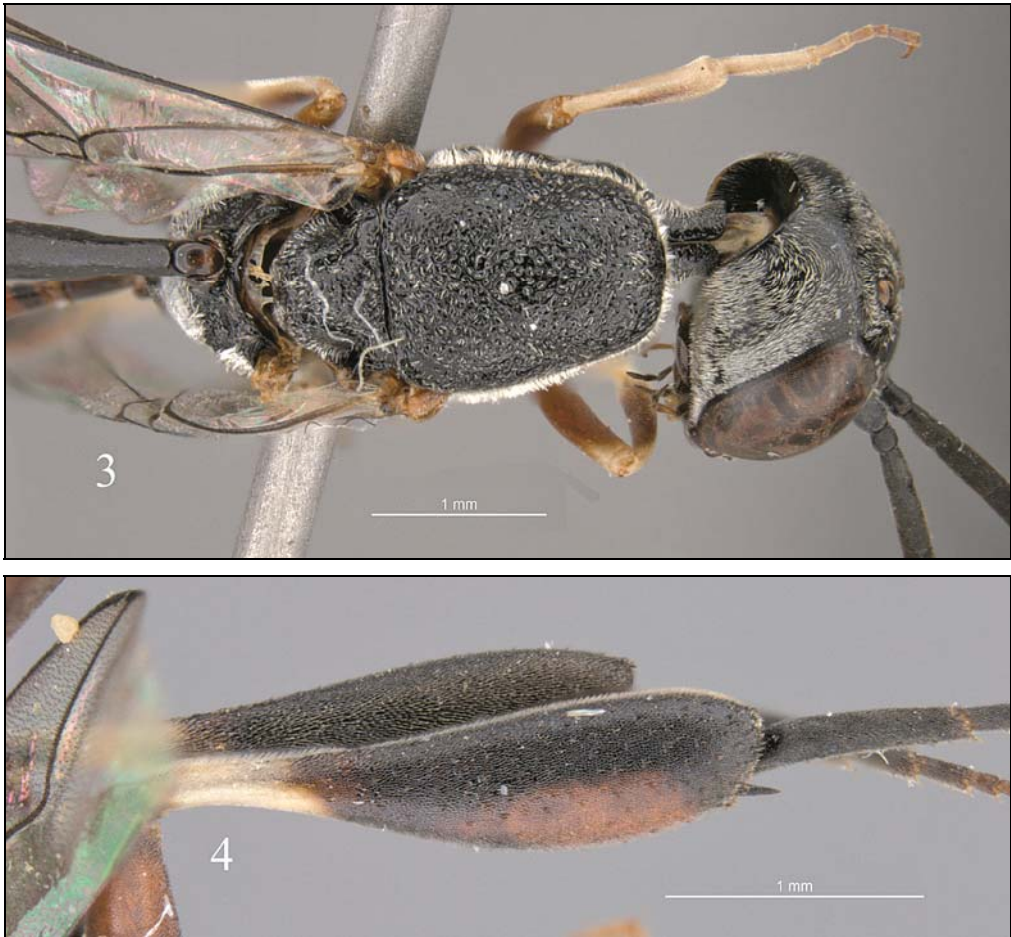
Specimens examined: UNITED ARAB EMIRATES: Jebel Hafit, 24.07°N 55.75°E, 4♂, 2♀, 11–19.iii.2009, leg. CSE.

Diagnosis: The species is well characterized in both sexes by the tricoloured hind tibia with an ivory ring basally and a large red patch latero-apically. The occipital carina is narrowly lamelliform and upcurved medio-dorsally. In female the apical pale part of ovipositor sheath is short, 0.4 times as long as hind basitarsus. Close to the North African *G. ocellatum* Benoit, 1984, but *G. argentatum* has the scapus largely brownish and paler than the pedicellus (both blackish in *G. ocellatum*), the third antennal segment of the male rather slender (stout), the outer side of the hind tibia with a brown patch (entirely blackish or dark brown, except for the ivory subbasal ring) and the first discal cell of the fore wing wide (narrow).

Description of the female: Body length 10.2 mm, length of ovipositor sheath 7.0 mm, length of fore wing 5.2 mm. Head. Head gradually roundly narrowed behind eyes and distinctly curved laterally, slightly emarginate medio-posteriorly. Temple 0.9 times as long as eye in dorsal view. Vertex and frons smooth, shiny and rather sparsely very finely punctulate. Vertex moderately convex posteriorly (in lateral view) and without any depression medio-posteriorly. Occipital carina narrowly lamelliform and upcurved medio-dorsally. Third antennal segment 1.6 times as long as second segment, fourth antennal segment 1.5 times as long as third segment, fifth antennal segment 1.4 times as long as third segment. Eye almost glabrous, with some barely visible short setae. OOL 1.8 times as long as diameter of posterior ocellus. Minimum width of malar space about 0.4 times as long as second antennal segment. Clypeus with a shallow depression medio-ventrally, its lateral corners protruding forward. Mesosoma. Length of mesosoma 1.9 times as long as its height. Propleuron robust, very finely sculptured and shiny, 0.9 times as long as mesoscutum in front of tegulae. Side of pronotum ventrally smooth and shiny with few large punctures, dorsally micro-sculptured and with satin sheen. Antero-lateral tooth of pronotum indistinct and blunt. Antesternal carina narrow and non-lamelliform. Mesopleuron reticulate-rugose, densely covered with silvery setae. Mesoscutum densely covered with large, coalescent punctures, interspaces small and shiny, medio-posteriorly coarsely punctate-rugose. Notauli indistinct. Scutellum shiny, with large punctures. Propodeum coarsely reticulate-rugose, densely covered with silvery setae, medio-longitudinal carina indistinct. Wings. Fore wing: First discal cell parallel-sided. Vein SR1 weakly bent. Legs. Hind coxa coriaceous with satin sheen, but shiny and transversely rugulose dorsally. Length of hind femur, tibia and basitarsus 5.4, 4.5 and 6.0 times their



Plates 1–2. *Gasteruptium argentatum* Semenov-Tian-Shanskij & Kostylev. 1: Female, lateral view; 2: Male, lateral view.



Plates 3–4. *Gasteruption argentatum* Semenov-Tian-Shanskij & Kostylev. 3: Female, dorsal view; 4: Male, hind tibia.

maximum width, respectively. Hind tibia less swollen. Metasoma. Ovipositor sheath 0.7 times as long as body, 1.1 times as long as metasoma, 3.1 times as long as hind tibia and 1.9 times as long as hind tibia and tarsus combined. Apical pale part of ovipositor sheath 0.3 times as long as hind basitarsus. Hypopygium slit-shaped incised apically. Colour. Black. Mandible, clypeus ventrally and tegula reddish brown. Antenna dark brown. Wing membrane hyaline, pterostigma brown. Fore and middle legs reddish brown, coxae somewhat darker and tibiae and tarsi partly ivory. Hind leg predominantly dark brown, but femur pale brown and tibia conspicuously tricoloured with an ivory ring basally and a large red patch latero-apically. Hind tibial spurs dark brown. Second to sixth metasomal tergites reddish brown. Ovipositor sheath blackish with a short ivory tip.

Description of the male: Body length 10.1 mm. Similar to female, but scapus distinctly reddish brown on ventral side. Third antennal segment 1.4 times as long as second segment, fourth antennal segment 1.5 times as long as third segment, and 0.9 times as long as second



Plate 5. *Gasteruption argentatum* Semenov-Tian-Shanskij & Kostylev, male, head, frontal view.

and third segment combined. Paramere partly reddish brown medially and dark brown apically. Aedeagus slightly shorter than paramere.

Variation: Female. Body length 10–11 mm. Ovipositor sheath 1.0–1.1 times as long as metasoma, 3.1–3.3 times as long as hind tibia and 1.9–2.0 times as long as hind tibia and tarsus combined. Male. Body length 10–12 mm. Third antennal segment 1.4–1.5 times as long as second segment, fourth antennal segment 1.3–1.6 times as long as third segment, and 0.8–1.0 times as long as second and third segment combined.

Notes: The Central Asian *Gasteruption bergi* Kokujev, 1910, is only known from the male holotype and the type could not be traced. Therefore, the interpretation is uncertain; the original description contains some hints (e.g. the coarsely punctate scutellum) that it may be a senior synonym of *G. argentatum* Semenov-T.-S. & Kostylev, 1928, but more material from Central Asia should be studied before this possible synonymy can be accepted. The examined lectotype of *G. argentatum* has the head and mesosoma mainly orange or reddish brown, but colour in this group of species is variable; the colour of *G. bergi* agrees with the specimens from the UAE.

Distribution: UAE, Central Asia (Turkmenistan).

***Gasteruption avanharteni* Saure, Schmid-Egger & van Achterberg sp. nov.** Plates 6–8

Specimens examined: Holotype: ♀, YEMEN: Sana'a, 15.37°N 44.22°E, ix.1992, Malaise trap, leg. AvH. Paratypes: 3♂, Sana'a, 15.37°N 44.22°E, ii–iii.1998, Malaise trap, leg. AvH; 2♂, Sana'a, 15.37°N 44.22°E, iv.1998, Malaise trap, leg. AvH; 1♂, Sana'a, 15.37°N 44.22°E, 8.ix.1998, Malaise trap, leg. AvH.

Diagnosis: The species is characterized in both sexes by a shallow depression medio-posteriorly in front of the occipital carina and the superficially punctulate shiny frons. The coarsely punctate-rugose middle lobe of mesoscutum differs significantly from the mainly



Plates 6–7. *Gasteruption avanharteni* Saure, Schmid-Egger & van Achterberg sp. nov. 6: Female holotype, lateral view; 7: Male paratype, lateral view.

coriaceous lateral lobes. Females are defined by the long apical pale part of ovipositor sheath, which is about three times as long as the hind basitarsus. Description of the female: Holotype, body length 10.2 mm, length of ovipositor sheath 11.0 mm, length of fore wing 6.5 mm. Head. Head gradually roundly narrowed behind eyes and weakly curved laterally, slightly



Plate 8. *Gasteruption avanharteni* Saure, Schmid-Egger & van Achterberg sp. nov., female holotype, dorsal view.

emarginate medio-posteriorly. Temple 0.7 times as long as eye in dorsal view. Vertex and frons smooth, superficially punctulated and with satin sheen. Vertex moderately convex posteriorly (in lateral view) and with a shallow depression medio-posteriorly. Occipital carina narrow, hardly lamelliform, sharp-edged medio-dorsally. Third antennal segment 1.5 times as long as second segment, fourth antennal segment 1.6 times as long as third segment, fifth antennal segment 1.5 times as long as third segment. Eye sparsely setose. OOL 1.4 times as long as diameter of posterior ocellus. Minimum width of malar space about 0.4 times as long as second antennal segment. Clypeus with a shallow depression medio-ventrally, its lateral corners protruding forward. Mesosoma. Length of mesosoma 2.7 times as long as its height. Propleuron comparatively robust, coriaceous and with satin sheen, 0.9 times as long as mesoscutum in front of tegulae. Side of pronotum mainly coriaceous and with satin sheen, medially rugose. Antero-lateral tooth of pronotum small. Antesternal carina narrow and non-lamelliform. Mesopleuron finely reticulate-rugose. Middle lobe of mesoscutum coarsely transversely punctate-rugose and with satin sheen. Lateral lobes of mesoscutum coriaceous with some shallow punctures, medially punctate-rugose. Notauli small. Scutellum smooth and with satin sheen, with few medium-sized punctures. Propodeum shiny, coarsely reticulate-rugose, medio-longitudinal carina distinct. Wings. Fore wing: First discal cell parallel-sided. Vein SR1 slightly bent. Legs. Hind coxa coriaceous and matt, even dorsally. Length of hind femur, tibia and basitarsus 4.2, 4.5 and 5.0 times their maximum width, respectively. Hind tibia less swollen. Metasoma. Ovipositor sheath 1.1 times as long as body, 1.4 times as long as metasoma, 5.2 times as long as hind tibia and 3.3 times as long as hind tibia and tarsus

combined. Apical pale part of ovipositor sheath long, 3.0 times as long as hind basitarsus. Hypopygium slit-shaped incised apically. Colour. Black. Mandible, clypeus ventrally, antenna, tegula and pterostigma pale brown. Wing membrane hyaline. Fore and middle legs brown but tibiae and tarsi partly ivory. Hind leg brown but tibia with a narrow ivory ring subbasally and inner side of basitarsus with a pale patch in its apical half. Hind tibial spurs brown. Metasoma uniformly brown. Ovipositor sheath brown, apical part ivory.

Description of the male: Body length 10.4 mm. Similar to female. Third antennal segment 1.5 times as long as second segment, fourth antennal segment 1.9 times as long as third segment, and 1.2 times as long as second and third segment combined. Antenna dark brown. Hind leg dark brown, tibia subbasally with a ventral ivory patch. Hind tibial spurs and hind basitarsus dark brown. Paramere dark brown, brightened apically. Aedeagus somewhat shorter than paramere.

Variation: Male. Body length 10–11 mm.

Derivatio nominis: The species is dedicated to Antonius van Harten, the coordinator of the UAE Insect Project and collector of the species.

Distribution: Yemen.

***Gasteruption flabellatum* Saure, Schmid-Egger & van Achterberg sp. nov.** Plates 9–12

Specimens examined: Holotype: ♀, UNITED ARAB EMIRATES: Jebel Hafit. 24.07°N 55.75°E, 11–19.iii.2009, leg. CSE. Paratypes: 9♂, 6♀, same label data as holotype; 6♂, 5♀, Jebel Hafit, S of al-Ain, 24.07°N 55.75°E, 4–13.i.2011, leg. CSE. 3♀, al-Ain, Jebel Hafit west flank, 24.056°N 55.754°E, 10.iii.2014, leg. H. Roberts.

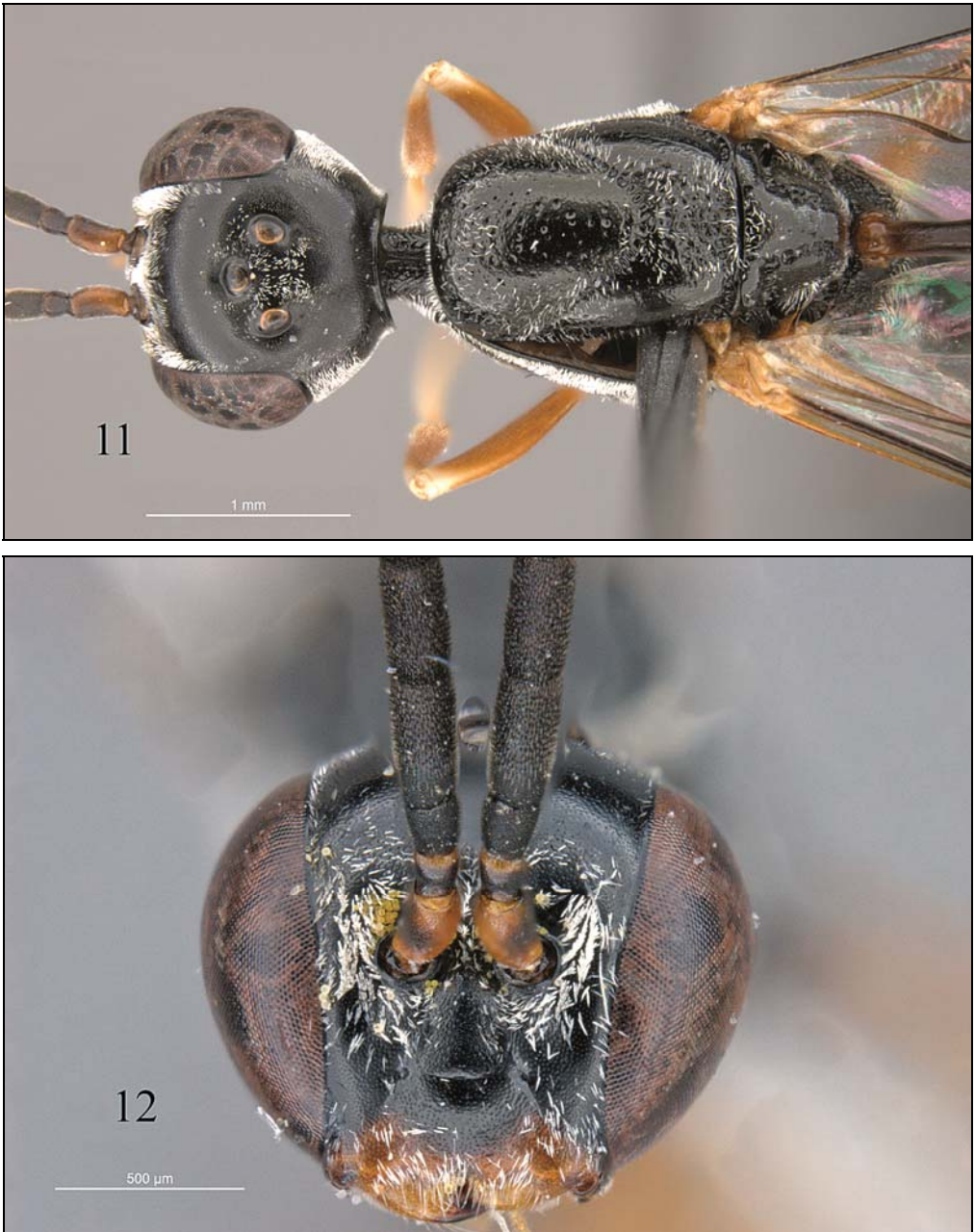
Diagnosis: The species is characterized in both sexes by the medio-dorsally upcurved occipital carina and by the smooth and shiny, sparsely punctate mesoscutum and only punctulate scutellum. The female is unique in the shape of the apical antennal segment, which is at least twice as long as the subapical segment; the apical segment is usually at least slightly curved and flattened, but this varies among the examined females. Furthermore, the female has a reddish fore coxa and a reddish brown scapus, contrasting distinctly with the dark brown antennal segments 2–14. The male is aberrant by having the paramere largely yellowish-brown. The new species shares with *G. alwathbaense* the largely smooth and shiny mesoscutum and scutellum, but differs by having the ovipositor sheath much shorter (3.0–3.5 times as long as hind tibia and 7–8 times as long as hind tibia in *G. alwathbaense*), the longer ivory apical part of the ovipositor sheath, the enlarged apical antennal segment (normal) and the largely yellowish brown paramere of the male (dark brown).

Description of the female: Holotype, body length 10.9 mm, length of ovipositor sheath 7.9 mm, length of fore wing 5.3 mm. Head. Head roundly narrowed behind eyes and strongly curved laterally, truncate (or nearly so) medio-posteriorly. Temple 0.7 times as long as eye in dorsal view. Vertex and frons smooth, with satin sheen and superficial dense punctulation. Vertex moderately convex posteriorly (in lateral view) and without any depression medio-posteriorly. Occipital carina medium-sized lamelliform and upcurved medio-dorsally. Third antennal segment 1.7 times as long as second segment, fourth antennal segment 1.8 times as long as third segment, fifth antennal segment 1.6 times as long as third segment. Apical segment of antenna 2.5 times as long as subapical segment and somewhat curved and flattened. Eye glabrous. OOL 1.3 times as long as diameter of posterior ocellus. Minimum width of malar space about 0.3 times as long as second antennal segment. Clypeus flat, with a shallow depression medio-ventrally, its lateral corners protruding forward. Mesosoma. Length of mesosoma 2.2 times as long as its height. Propleuron robust, densely finely punctate and with satin sheen, 0.8 times as long as mesoscutum in front of tegulae. Side of pronotum finely coriaceous, ventrally with few medium-sized punctures, medially rugose.



Plates 9–10. *Gasteruptium flabellatum* Saure, Schmid-Egger & van Achterberg sp. nov. 9: Female paratype, lateral view; 10: Male paratype, lateral view.

Antero-lateral tooth of pronotum small. Antesternal carina narrow and non-lamelliform. Mesopleuron finely reticulate-rugose, densely covered with silvery setae. Mesoscutum smooth and shiny, with few medium-sized punctures and sparsely finely punctulated interspaces, medio-posteriorly reticulate-rugose. Notauli distinct, deep and narrow. Scutellum shiny and finely punctulated. Propodeum coarsely reticulate-rugose, medio-longitudinal carina distinct and shiny. Wings. Fore wing: First discal cell parallel-sided. Vein SR1 slightly



Plates 11–12. *Gasteruption flabellatum* Saure, Schmid-Egger & van Achterberg sp. nov. 11: Female paratype, dorsal view; 12: Male paratype, head, frontal view.

bent. Legs. Hind coxa coriaceous and with satin sheen but transversely rugulose and shiny dorsally. Length of hind femur, tibia and basitarsus 5.6, 4.2 and 5.5 times their maximum

width, respectively. Hind tibia less swollen. Metasoma. Ovipositor sheath 0.7 times as long as body, 1.1 times as long as metasoma, 3.2 times as long as hind tibia and 2.1 times as long as hind tibia and tarsus combined. Apical pale part of ovipositor sheath 1.5 times as long as hind basitarsus. Hypopygium slit-shaped incised apically. Colour. Black. Mandible, ventral half of clypeus, malar space and tegula reddish brown. Antenna dark brown, but scapus reddish brown. Wing membrane hyaline, pterostigma pale brown and translucent, with dark borders. Fore and middle legs largely reddish brown, particularly the fore coxa bright orange-brown, tibiae and tarsi ivory. Hind leg dark brown, femur partly reddish brown, tibia subbasally ivory, basitarsus (except base) and tarsomere 2–3 ivory. Metasomal tergites mainly pale brown. Ovipositor sheath blackish, but apex broadly ivory.

Description of the male: Body length 10.4 mm. Similar to female. Third antennal segment 1.2 times as long as second segment, fourth antennal segment 2.3 times as long as third segment, and 1.3 times as long as second and third segment combined, but fore coxa blackish. Paramere (except dark brown base) yellowish brown, slightly brightened apically. Aedeagus somewhat shorter than paramere.

Variation: Female. Body length 8–11 mm. Punctures of mesoscutum small or medium-sized. Hind tibial spurs dark brown or reddish brown. Ovipositor sheath 0.7–0.8 times as long as body, 1.1–1.2 times as long as metasoma and 3.0–3.5 times as long as hind tibia. Male. Body length 9–11 mm. Fourth antennal segment 2.1–2.5 times as long as third segment, and 1.1–1.3 times as long as second and third segment combined. Punctures of middle lobe of mesoscutum usually small to medium-sized and distinctly separated, but rarely large and partly merged.

Derivatio nominis: The species is named after the characteristic shape of the apical antennal segment in females.

Distribution: UAE.

Gasteruption fuscatum Saure, Schmid-Egger & van Achterberg **sp. nov.** Plates 13–15

Specimens examined: Holotype: ♀, UNITED ARAB EMIRATES: Ar-Rafah, 25.61°N 55.68°E, 7.iv.2010, in water trap, leg. AvH. Paratype: 1♂, same label data as holotype.

Diagnosis: The species is in both sexes well characterized by the infusate wing membrane. In contrast to most other *Gasteruption* treated here, the occipital carina is narrowly lamelliform and curved up medio-dorsally. The vertex is coriaceous-punctulate, with some punctures, and matt. The antenna of the male is rather short.

Description of the female: Holotype, body length 12.7 mm, length of ovipositor sheath 7.5 mm, length of fore wing 5.9 mm. Head. Head gradually roundly narrowed behind eyes and weakly curved laterally, truncate (or nearly so) medio-posteriorly. Temple 0.9 times as long as eye in dorsal view. Vertex coriaceous, matt and sparsely punctulated. Frons with satin sheen and densely finely punctulation. Vertex distinctly convex posteriorly (in lateral view) and without any depression medio-posteriorly. Occipital carina narrowly lamelliform and upcurved medio-dorsally. Third antennal segment 1.4 times as long as second segment, fourth antennal segment 1.4 times as long as third segment, fifth antennal segment 1.2 times as long as third segment. Eye glabrous. OOL 1.4 times as long as diameter of posterior ocellus. Minimum width of malar space about 0.4 times as long as second antennal segment. Clypeus flat, with a small shallow depression medio-ventrally, its lateral corners protruding forward. Mesosoma. Length of mesosoma 2.3 times as long as its height. Propleuron short and robust, densely finely punctate, with satin sheen, 0.8 times as long as mesoscutum in front of tegulae. Side of pronotum mainly smooth and shiny, ventrally with few medium-sized punctures



Plates 13–14. *Gasteruption fuscatum* Saure, Schmid-Egger & van Achterberg sp. nov. 13: Female holotype, lateral view; 14: Male paratype, lateral view.



Plate 15: *Gasteruption fuscatum* Saure, Schmid-Egger & van Achterberg sp. nov., female holotype, dorsal view.

and dorsally with many small punctures. Antero-lateral tooth of pronotum absent. Antesternal carina narrow, hardly lamelliform. Mesopleuron finely reticulate-rugose, with satin sheen. Mesoscutum with many large punctures, partly merged and with small shiny and finely punctulate interspaces, medio-posteriorly coarsely punctate-rugose. Notauli indistinct. Scutellum smooth and with satin sheen, with few medium-sized punctures. Propodeum shiny, medially with very large punctures, laterally punctate-rugose, medio-longitudinal carina absent. Wings. Fore wing: First discal cell parallel-sided. Vein SR1 slightly bent. Legs. Hind coxa coriaceous with satin sheen and transversely rugulose dorsally. Length of hind femur, tibia and basitarsus 5.2, 3.7 and 4.8 times their maximum width, respectively. Hind tibia comparatively swollen. Metasoma. Ovipositor 0.6 times as long as body, 0.9 times as long as metasoma, 2.9 times as long as hind tibia and 1.8 times as long as hind tibia and tarsus combined. Ovipositor sheath damaged, apex not visible. Hypopygium slit-shaped incised apically. Colour. Black. Mandible, clypeus ventrally and tegula reddish brown. Antenna dark brown but scapus ventrally reddish brown. Wing membrane largely infusate. Pterostigma dark brown. Fore and middle femora brown to reddish brown, tibiae and tarsi partly ivory. Hind leg dark brown, tibia with basal ivory ring, hind tibial spurs and basitarsus (except base) reddish brown. Second to fifth metasomal tergites reddish brown. Basal part of ovipositor sheath dark brown (apical part not visible).

Description of the male: Body length 10.1 mm. Similar to female. Vertex densely finely punctulate and matt. Propodeum overall coarsely reticulate-rugose. Notauli distinct. Third antennal segment 1.2 times as long as second segment, fourth antennal segment 1.8 times as long as third segment, and 1.0 times as long as second and third segment combined. Scapus dark brown. Antenna and particularly the last antennal segments comparatively short. Metasoma predominantly dark brown. Paramere dark brown, not brightened apically. Aedeagus slightly shorter than paramere.

Derivatio nominis: The species is named after the infusate wing membrane in both sexes.
Distribution: UAE.

***Gasteruption alwathbaense* Saure, Schmid-Egger & van Achterberg sp. nov.** Plates 16–18

Specimens examined: Holotype: ♀, UNITED ARAB EMIRATES: Wadi Bih, 25.80°N 56.07°E, 11–19.iii.2009, leg. CSE. Paratypes: 6♂, 2♀, same label data as holotype. 1♂, 1♀, Liwa Oasis, Arada, 23.00°N 53.44°E, 4–13.i.2011, leg. CSE. 1♂, Wadi al-Helo, 24.97°N 56.22°E, 11–19.iii.2009, leg. CSE. 1♂, 1♀, Al Wathba Wetland Reserve, 24.25°N 54.75°E, ii.2015, Malaise trap, leg. A. Saji & AvH; 1♂, 1♀, idem, but iii.2015; 1♂, 1♀, idem, but iv.2015; 1♂, idem., but v.2015.

Diagnosis: The species is uniquely characterized by the smooth and shiny mesoscutum with irregularly dispersed, deep ('pit-like') punctures on the middle lobe, contrasting distinctly with the almost impunctate sides of the lateral lobes combined with the long ovipositor sheath. The antero-lateral tooth of pronotum is distinct and large. In females the apical pale part of ovipositor sheath is comparatively short, 0.6–0.8 times as long as the hind basitarsus. The long ovipositor sheath and the shiny mesoscutum is shared with the Central Asian *G. argentifrons* Semenov-Tian-Shanskij & Kostylev, 1928, but *G. argentifrons* has the mesoscutum densely punctate and interspaces punctulate (sparsely punctate and interspaces smooth in *G. alwathbaense*) and head darker than mesosoma (both black).

Description of the female: Holotype, body length 11.3 mm, length of ovipositor sheath 16.2 mm, length of fore wing 5.0 mm. Head. Head gradually roundly narrowed behind eyes and distinctly curved laterally, slightly emarginate medio-posteriorly. Temple 0.7 times as long as eye in dorsal view. Vertex and frons smooth and shiny, with superficial punctulation. Vertex moderately convex posteriorly (in lateral view) and without any depression medio-posteriorly. Occipital carina narrow, hardly lamelliform medio-dorsally. Third antennal segment 1.2 times as long as second segment, fourth antennal segment 1.8 times as long as third segment, fifth antennal segment 1.6 times as long as third segment. Eye glabrous. OOL 1.3 times as long as diameter of posterior ocellus. Minimum width of malar space about 0.3 times as long as second antennal segment. Clypeus with a small shallow depression medio-ventrally, its lateral corners protruding forward. Mesosoma. Length of mesosoma 2.4 times as long as its height. Propleuron shiny, sparsely and finely punctulate, 0.7 times as long as mesoscutum in front of tegulae. Side of pronotum mainly smooth and shiny, medially with few rugulae. Antero-lateral tooth of pronotum distinct and large. Antesternal carina narrow and non-lamelliform. Mesopleuron shiny, finely rugulose-coriaceous. Mesoscutum smooth and shiny, with separate, irregularly dispersed, large to medium-sized ('pit-like') punctures. Lateral lobes of mesoscutum almost without punctures laterally. Notauli distinct. Scutellum shiny, almost without punctures. Propodeum shiny, coarsely reticulate-rugose, medio-longitudinal carina indistinct. Wings. Fore wing. First discal cell parallel-sided and rather slender. Vein SR1 distinctly bent. Legs. Hind coxa coriaceous and with satin sheen, transversely rugulose and shiny dorsally. Length of hind femur, tibia and basitarsus 4.8, 4.4 and 5.5 times their maximum width, respectively. Hind tibia less swollen. Metasoma. Ovipositor sheath 1.4 times as long as body, 2.1 times as long as metasoma, 7.4 times as long as hind tibia and 4.8 times as long as hind tibia and tarsus combined. Apical pale part of ovipositor sheath 0.6 times as long as hind basitarsus. Hypopygium slit-shaped incised apically. Colour. Black. Mandible, clypeus ventrally and tegula reddish brown. Antenna dark brown. Mesoscutum reddish anteriorly. Wing membrane hyaline, pterostigma pale brown and translucent. Fore and middle legs brown, tibiae and basitarsi largely ivory. Hind leg dark brown, tibia basally with an ivory ring and hind tarsus ivory but basitarsus basally and medially dark brown. Hind tibial spurs pale brown. Metasomal tergites dark brown. Ovipositor sheath blackish, but apex ivory.



Plates 16–17. *Gasteruption alwathbaense* Saure, Schmid-Egger & van Achterberg sp. nov. 16: Female holotype, lateral view; 17: Male paratype, lateral view.

Description of the male: Body length 9.0 mm. Similar to female. Third antennal segment 1.1 times as long as second segment, fourth antennal segment 1.8 times as long as third segment, and 1.0 times as long as second and third segments combined. Paramere dark brown, apically brightened only on inner side. Aedeagus slightly shorter than paramere.

Variation: Female: Body length 8–12 mm, length of ovipositor sheath 13–19 mm. Fourth antennal segment 1.6–1.8 times as long as third segment and fifth antennal segment 1.5–1.7 times as long as third segment. Length of mesosoma 2.2–2.5 times as long as its height. Length of hind femur 4.6–5.0, length of tibia 4.4–4.6 times their maximum width. Ovipositor



Plate 18. *Gasterurption alwathbaense* Saure, Schmid-Egger & van Achterberg sp. nov., female holotype, dorsal view.

sheath 2.1–2.4 times as long as metasoma, 7.0–8.0 times as long as hind tibia and 4.2–5.0 times as long as hind tibia and tarsus combined. Mandible, clypeus ventrally and tegula reddish brown or pale brown. Mesoscutum reddish or blackish anteriorly. Hind tarsus pale brown or ivory. Male: Body length 9–11 mm.

Derivatio nominis: The species is named after the Al Wathba Wetland Reserve, a small protected area south-east of Abu Dhabi, where several of the specimens were collected.

Distribution: UAE.

***Gasterurption latifrons* Saure, Schmid-Egger & van Achterberg sp. nov.**

Plates 19–24

Specimens examined: Holotype: ♂, YEMEN: Manakhah, 12 km NW of, 15.11°N 43.77°E, 3.vii–21.viii.2001, Malaise trap, leg. AvH. Paratype: ♂, al-Kowd, vii–ix.2001, at light, leg. AvH & S. Al Haruri.

Diagnosis: The male is defined by the comparatively wide head, the triangular emargination of the head medio-posteriorly, the slightly infusate wing membrane, the brownish colour of the body, and smooth hind coxa. Moreover the head and mesosoma are shaggy setose. The female is unknown, but the emargination of the head will allow the recognition of the female. It is close to the only Afrotropical species with triangularly emarginated head, *G. exsectum* Schletterer, 1889; it has a short ovipositor and the sheath is dark brown apically. The new species has the hind coxa smooth (striate in *G. exsectum*), the posterior half of the propodeum largely smooth (irregularly rugose), the head and the mesosoma largely brownish (black) and the head with satin sheen dorsally (matt).

Description of the male: Holotype, body length 11.4 mm, length of fore wing 5.2 mm. Head. Head roundly narrowed behind eyes, distinctly triangularly emarginate medio-posteriorly. Temple 0.8 times as long as eye in dorsal view. Vertex and frons smooth and with satin sheen. Vertex distinctly convex posteriorly (in lateral view) and without any depression medio-posteriorly. Occipital carina narrow and non-lamelliform medio-dorsally, but distinctly



Plates 19–20. *Gasteruption latifrons* Saure, Schmid-Egger & van Achterberg sp. nov. 19: Male holotype, lateral view; 20: Male holotype, dorsal view.

lamelliform ventrally. Face comparatively wide, frons about 2.5 times as wide as an eye at the level of toruli. Third antennal segment 1.7 times as long as second segment, fourth antennal segment 1.1 times as long as third segment, and 0.7 times as long as second and third segment combined. Eye setose. OOL 1.8 times as long as diameter of posterior ocellus. Minimum width of malar space about 0.4 times as long as second antennal segment. Clypeus

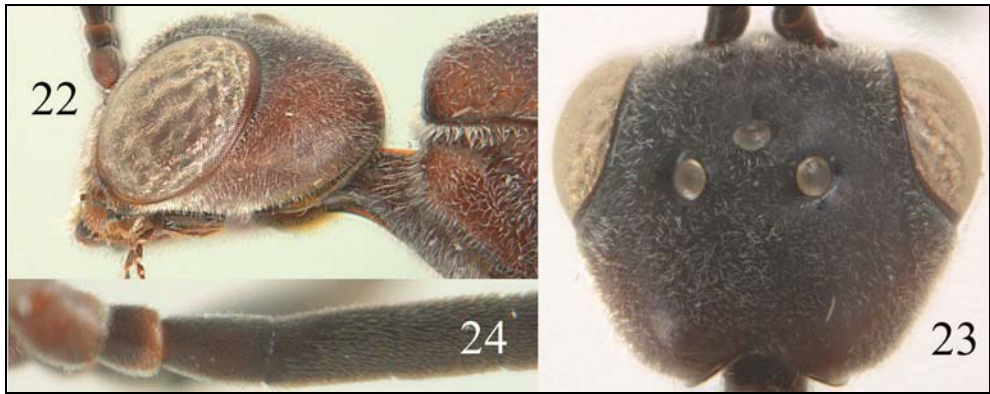


Plate 21: *Gasteruption latifrons* Saure, Schmid-Egger & van Achterberg sp. nov., male holotype, head, frontal view.

with an extended and wide depression medio-ventrally. The whole head is covered with shaggy setae. Mesosoma. Length of mesosoma 1.9 times as long as its height. Propleuron robust, sparsely punctulate and with satin sheen, 0.9 times as long as mesoscutum in front of tegulae. Side of pronotum punctate-rugulose and with satin sheen, medially rugose. Anterolateral tooth of pronotum absent. Antesternal carina narrow and non-lamelliform. Mesopleuron reticulate-rugose. Middle lobe of mesoscutum coarsely reticulate-punctate and shiny. Lateral lobes of mesoscutum reticulate-rugose. Notauli small but distinct. Scutellum finely reticulate-rugulose with few medium-sized punctures and with satin sheen. Propodeum predominantly smooth and shiny, finely reticulate-rugose dorsally, medio-longitudinal carina indistinct. The whole mesosoma is covered with shaggy setae. Wings. Fore wing. First discal cell parallel-sided. Vein SR1 slightly bent. Legs. Hind coxa coriaceous with satin sheen, but aciculate and shiny dorsally. Length of hind femur, tibia and basitarsus 5.0, 4.0 and 6.4 times their maximum width, respectively. Hind tibia comparatively swollen. Metasoma. Aedeagus somewhat shorter than paramere. Colour. Predominantly brown or dark brown. Antenna and pterostigma dark brown. Wing membrane slightly infusate. Fore and middle tibiae with a small ivory ring basally. Basal half of fore and middle basitarsi with an ivory stripe dorsally. Hind tibia with an ivory ventral patch subbasally, hind basitarsus with a short ivory patch baso-dorsally. Hind tibial spurs and paramere brown.

Derivatio nominis: The species is named after the comparatively wide head of the male.

Distribution: Yemen.



Plates 22–24. *Gasteruption latifrons* Saure, Schmid-Egger & van Achterberg sp. nov., male holotype. 22: Head, lateral view; 23: Head, dorsal view; 24: Basal segments of antenna.

***Gasteruption rubidum* Saure, Schmid-Egger & van Achterberg sp. nov.**

Plates 25–27

Specimens examined: Holotype: ♀, YEMEN: Sana'a, 15.37°N 44.22°E, ii–iii.1998, Malaise trap, leg. AvH. Paratypes: 1♂, 1♀, Sana'a, 15.37°N 44.22°E, iii.1992, Malaise trap, leg. AvH; 2♀, Sana'a, ix.1992, Malaise trap, leg. AvH; 3♂, 1♀, Sana'a, ii–iii.1998, Malaise trap, leg. AvH; 1♀, Sana'a, iv.1998, Malaise trap, leg. AvH; 2♂, 2♀, Sana'a, v–vi.1998, Malaise trap, leg. AvH; 1♂, Sana'a, vii.1998, Malaise trap, leg. AvH; 4♂, 1♀, Sana'a, 8.ix.1998, Malaise trap, leg. AvH.

Diagnosis: The species is well characterized in both sexes by the elongate and subconical head (in dorsal view) and the reddish brown coloured body. Females are characterized by the V-shaped incision of the hypopygium, the apically widened ovipositor and the comparatively long ivory part of the ovipositor sheath. The new species resembles West African *G. ifani* Berland, 1950, but the new species has the ovipositor sheath widely ivory apically (dark brown or brown in *G. ifani*) and the propleuron less elongate (0.9–1.0 times versus 1.1–1.3 times as long as length of mesoscutum in front of tegulae). Also similar is the South African *G. solmsi* Kieffer, 1911, but the new species has the head linearly narrowed behind eyes (weakly convex behind eyes in *G. solmsi*), the vertex matt (rather shiny), the mesoscutum punctate (reticulate) and the head and mesosoma reddish brown (black).

Description of the female: Holotype. Body length 12.8 mm, length of ovipositor sheath 8.8 mm, length of fore wing 6.3 mm. Head. Head linearly narrowed behind eyes, subconical and slightly emarginate medio-posteriorly. Temple long, 1.1 times as long as eye in dorsal view. Vertex and frons smooth and dull, without punctures. Frontal carina (between anterior ocellus and toruli) distinct. Vertex slightly convex posteriorly (in lateral view) and without any depression medio-posteriorly. Occipital carina narrow and non-lamelliform medio-dorsally, but remarkably wide lamelliform ('beard-like') ventrally. Third antennal segment 1.4 times as long as second segment, fourth antennal segment 1.1 times as long as third segment, fifth antennal segment 1.0 times as long as third segment. Eye almost glabrous, with few short setae. OOL 2.2 times as long as diameter of posterior ocellus. Minimum width of malar space about 0.3 times as long as second antennal segment. Clypeus flat, with a wide shallow depression medio-ventrally, its lateral corners protruding forward. Mesosoma. Length of mesosoma 2.2 times as long as its height. Propleuron finely coriaceous and with satin sheen, comparatively long, 1.0 times as long as mesoscutum in front of tegulae. Side of pronotum mainly coriaceous and dull, medially reticulate-rugose. Antero-lateral tooth of pronotum small. Antesternal carina narrow and non-lamelliform. Mesopleuron dorsally coriaceous,



Plates 25–26. *Gasteruption rubidum* Saure, Schmid-Egger & van Achterberg sp. nov. 25: Female paratype, lateral view; 26: Male paratype, lateral view.

ventrally reticulate-rugose. Mesoscutum coriaceous and dull, with large separate punctures and shallow transverse rugae, medio-posteriorly reticulate-punctate. Lateral lobes of mesoscutum with fewer punctures than middle lobe. Notauli indistinct. Scutellum coriaceous, with few medium-sized punctures. Propodeum shiny, coarsely reticulate-rugose, with distinct medio-longitudinal carina. Wings. Fore wing: First discal cell parallel-sided. Vein SR1 slightly bent. Legs. Hind coxa coriaceous and matt, dorsally finely transversely rugulose and shiny. Length of hind femur, tibia and basitarsus 4.8, 4.5 and 5.3 times their maximum width, respectively. Hind tibia rather slender. Metasoma. Ovipositor sheath 0.7 times as long as body, 1.1 times as long as metasoma, 3.1 times as long as hind tibia and 1.9 times as long as hind tibia and tarsus combined. Apical pale part of ovipositor sheath about 2.0 times as long



Plate 27: *Gasteruption rubidum* Saure, Schmid-Egger & van Achterberg sp. nov., female paratype, dorsal view.

as hind basitarsus. Apex of ovipositor slightly widened. Hypopygium V-shaped incised apically. Colour. Almost uniformly reddish brown. Wing membrane slightly infusate, pterostigma brown. Fore and middle tibiae ivory basally and apically. Fore and middle basitarsi largely ivory. Hind leg reddish brown, without ivory patches, hind tibial spurs reddish brown. Ovipositor sheath (total length) ivory on inner side and brown on outer side, apical part all around ivory.

Description of the male: Body length 13.2 mm. Similar to female. Third antennal segment 1.4 times as long as second segment, fourth antennal segment 1.3 times as long as third segment, and 0.7 times as long as second and third segment combined. Paramere reddish brown. Aedeagus shorter than paramere.

Variation: Female. Body length 11–14 mm. Third antennal segment 1.4–1.6 times as long as second segment, fourth antennal segment 1.1–1.3 times as long as third segment, fifth antennal segment 1.0–1.2 times as long as third segment. Propleuron 0.9–1.0 times as long as mesoscutum in front of tegulae. Middle lobe of mesoscutum with or without rugae. Length of hind femur, tibia and basitarsus 4.7–5.0, 4.5–4.8 and 5.1–5.4 times their maximum width, respectively. Ovipositor sheath 0.6–0.7 times as long as body, 0.9–1.1 times as long as metasoma, 3.0–3.3 times as long as hind tibia and about 1.9–2.2 times as long as hind tibia and tarsus combined. Apical pale part of ovipositor sheath about 2.0–3.0 times as long as hind basitarsus. Male. Body length 12–13 mm. Head and mesosoma more or less dark brown. Propleuron coriaceous or somewhat rugulose and shiny. Mesoscutum with small, medium-sized or large punctures, with or without rugae.

Derivatio nominis: The species is named after the almost uniformly reddish brown colour of the body in both sexes.

Distribution: Yemen.

***Gasteruption sericeipes* Kieffer, 1911**

Plates 28–30

Gasteruption sericeipes Kieffer, 1911: 191; Pasteels, 1958: 201 (lectotype examined).

Gasteruption spec. – Jennings & Krogmann, 2009: 268 (short description).

Specimens examined: UNITED ARAB EMIRATES: Al-Ajban, 24.36°N 55.01°E, 2♂, 3♀, 25.ii–19.iii.2006, Malaise trap, leg. AvH; 4♂, 2♀, 19–27.iii.2006, Malaise trap, leg. AvH; 3♀, 25.iii–2.iv.2006, Malaise trap, leg. AvH; 2♂, 3♀, 2–9.iv.2006, Malaise trap, leg. AvH; 1♀, 9–16.iv.2006, Malaise trap, leg. AvH; 1♀, 17–24.iv.2006, Malaise trap, leg. AvH; 2♂, 24.iv–2.v.2006, Malaise trap, leg. AvH; 1♀, 1.iv–2.v.2006, Malaise trap, leg. AvH; 1♂, 27.v–26.vi.2006, Malaise trap, leg. AvH; 7♂, 1♀, 10–17.x.2006, Malaise trap, leg. AvH; 5♂, 4♀, 22.x–9.xi.2006, Malaise trap, leg. AvH; 1♂, 2–22.xi.2006, Malaise trap, leg. AvH. Bithnah, 25.18°N 56.23°E, 1♂, 19.x–16.xi.2006, Malaise trap, leg. AvH. Hatta, 24.28°N 56.90°E, 1♂, 11.iv.2006, leg. AvH. Sharjah Desert Park, 25.28°N 55.70°E, 1♀, 30.vi.2008, leg. AvH. Wadi Bih (dam), 25.80°N 56.07°E, 6♂, 2♀, 11–19.iii.2009, leg. CSE; 1♂, 9.iii.2010, leg. AvH. Wadi Hayl, 25.08°N 56.21°E, 9♂, 2♀, 11–19.iii.2009, leg. CSE; Wadi Hayl (240 m), 25.05°N 56.14°E, 2♂, 15.iii.2008, leg. M. Hauser. Wadi al-Helo, 24.97°N 56.22°E, 6♂, 3♀, 11–19.iii.2009, leg. CSE. Wadi Wurayah, 25.40°N 46.28°E, 1♀, 11–19.iii.2009, leg. CSE; 1♀, 8.iv.2009, leg. AvH. Al Wathba Wetland Reserve, iv.2015, 5♂, 4♀, Malaise trap, leg. A. Saji & AvH; 2♂, 4♀, idem, but v.2015.

Diagnosis: The species is only defined by the key characters. In female the apical pale part of ovipositor sheath is short, 0.2–0.3 times as long as hind basitarsus. Similar to the North African *G. saharensense* Benoit, 1984, but *G. sericeipes* has the hind basitarsus of the female partly ivory and rather slender (entirely brown and rather stout in *G. saharensense*), the propodeum and hind coxa dark brown or black (orange-brown) and the lateral lobes of the mesoscutum with satin sheen (rather shiny).

Description of the female from al-Ajban (17–24.iv.2006): body length 12.7 mm, length of ovipositor sheath 14.0 mm, length of fore wing 5.5 mm. Head. Head gradually roundly narrowed behind eyes and distinctly curved laterally, slightly emarginate medio-posteriorly. Temple 0.7 times as long as eye in dorsal view. Vertex and frons smooth, with satin sheen and superficial dense punctulation. Vertex moderately convex posteriorly (in lateral view) and without any depression medio-posteriorly. Occipital carina narrow and non-lamelliform medio-dorsally. Third antennal segment 1.4 times as long as second segment, fourth antennal segment 1.7 times as long as third segment, fifth antennal segment 1.5 times as long as third segment. Eye glabrous. OOL 1.0 times as long as diameter of posterior ocellus. Malar space narrow. Clypeus with a shallow triangular depression medio-ventrally, its lateral corners protruding forward. Mesosoma. Length of mesosoma 2.5 times as long as its height. Propleuron comparatively robust, densely punctulate and with satin sheen, 0.8 times as long as mesoscutum in front of tegulae. Side of pronotum mainly coriaceous and with satin sheen, medially rugose. Antero-lateral tooth of pronotum medium-sized. Antesternal carina narrow and non-lamelliform. Mesopleuron coriaceous, covered with silvery setae. Mesoscutum with many medium-sized to large punctures, interspaces smooth and with satin sheen, lateral lobes with fewer punctures than middle lobe. Notauli indistinct. Scutellum smooth and with satin sheen, with few medium-sized punctures. Propodeum shiny, coarsely reticulate-rugose, medio-longitudinal carina indistinct. Wings. Fore wing. First discal cell parallel-sided. Vein SR1 slightly bent. Legs. Hind coxa coriaceous with satin sheen and transversely rugulose and shiny dorsally. Length of hind femur, tibia and basitarsus 4.7, 4.4 and 5.0 times their maximum width, respectively. Hind tibia less swollen. Metasoma. Ovipositor sheath 1.1 times



Plates 28–29. *Gasteruption sericeipes* Kieffer, 28: Female, lateral view; 29: Male, lateral view.

as long as body, 1.7 times as long as metasoma, 5.5 times as long as hind tibia and 3.5 times as long as hind tibia and tarsus combined. Apical pale part of ovipositor sheath 0.2 times as long as hind basitarsus. Hypopygium slit-shaped incised apically. Colour. Black. Mandible, clypeus ventrally and tegula pale brown. Antenna dark brown. Wing membrane hyaline, pterostigma pale brown and translucent, with darker borders. Fore and middle legs brown, but tibiae and tarsi largely ivory. Hind leg dark brown, but basal third of tibia ivory and tarsomere 1–2 predominantly ivory. Hind tibial spurs dark brown. Second to fifth metasomal tergites reddish brown. Ovipositor sheath dark brown, but apex pale brown.

Description of the male: Body length 10.8 mm. Similar to female, but middle lobe of mesoscutum more densely punctate, punctures more or less merged. Third antennal segment 1.1 times as long as second segment, fourth antennal segment 2.0 times as long as third segment, and 1.0 times as long as second and third segment combined. Paramere brown, brightened apically. Aedeagus slightly shorter than paramere.



Plate 30. *Gasteruption sericeipes* Kieffer, female, dorsal view.

Variation: In colour and size variable species. Female. Body length 8–13 mm, length of ovipositor sheath 7–14 mm. Ovipositor sheath 1.0–1.2 times as long as body, 1.6–1.8 times as long as metasoma, 4.8–5.5 times as long as hind tibia and 3.0–3.5 times as long as hind tibia and tarsus combined. Punctures of mesoscutum range from small to large, more or less evenly spaced, sometimes coalescent. Lateral lobes always with fewer punctures than middle lobe. Hind tarsomere 2–5 variable in colour, more or less ivory. Hind tibial spurs dark brown to reddish brown. Apical pale part of ovipositor sheath 0.2–0.3 times as long as hind basitarsus. Male. Body length 7–11 mm. Third antennal segment 1.1–1.2 times as long as second segment, fourth antennal segment 2.0–2.2 times as long as third segment, and 1.0–1.2 times as long as second and third segment combined. Punctures of mesoscutum, colour of hind tarsus and of hind tibial spurs as in female.

Notes: There is one female with uniformly dark brown hind tarsus. This female may belong to *Gasteruption* sp. 1. Apart from the hind tarsus there are no obvious differences to other females of *Gasteruption sericeipes*. Unfortunately, the ovipositor sheath is damaged and the apex is not visible.

Distribution: UAE, Pakistan.

***Gasteruption yemenicum* Saure, Schmid-Egger & van Achterberg sp. nov.** Plates 31–33

Specimens examined: Holotype: ♀, YEMEN: Lahj, 13.05°N 44.88°E, 1.x–17.xii.2001, Malaise trap, leg. AvH & A. Sallam. Paratypes: 1♂, viii.1999, Malaise trap, leg. AvH & A. Sallam; 2♂, 2♀, iii.2000, Malaise trap, leg. AvH & A. Sallam; 3♂, 1.iv–17.v.2000, Malaise trap, leg. AvH & A. Sallam; 4♂, 1♀, Lahj, ix.2000, Malaise trap, leg. AvH & A. Sallam; 1♂, i.2001, Malaise trap, leg. AvH & A. Sallam; 2♂, iv.2001, Malaise trap, leg. AvH & A. Sallam; 1♂, v.2001, Malaise trap, leg. AvH & A. Sallam; 4♂, 17.v–15.vi.2001, Malaise trap, leg. AvH & A. Sallam; 2♂, 1♀, 1.x–17.xii.2001, Malaise trap, leg. AvH & A. Sallam; 5♀, 17.xii.2001–31.i.2002, Malaise trap, leg. AvH & A. Sallam; all Lahj. 2♂, 2♀, Sana'a, 15.37°N 44.22°E, viii.1992, Malaise trap, leg. AvH; 1♂, ii–iii.1998, Malaise trap, leg. AvH; 3♂, 2♀, E, iv.1998, Malaise trap, leg. AvH; 3♂, 3♀, vii.1998, Malaise trap, leg. AvH; 1♂, 8.ix.1998, Malaise trap, leg. AvH.

Notes: All examined specimens are similar in morphology. However, the taxon includes two BINs (Barcode Index Number; assigned by BOLD). A BIN defines a species and bases on average genetic distance between taxa in the BOLD system. Here the second BIN may be caused by a wide intraspecific genetic variation of the species (about 2%) in combination with a low number of examined specimens. By reason of the similar morphology we treat here the examined specimens as conspecific.

Diagnosis: The species is only defined by the key characters. Among the Afrotropical species it is most similar to *G. leleupi* Pasteels, 1956, from Congo. The new species differs by having the second and third antennal segments normal (slender in *G. leleupi*), POL about twice as wide as diameter of the posterior ocellus (about three times as wide), the fore and middle coxae dark brown (reddish), the occipital carina weakly developed medio-dorsally (distinctly developed) and the white apical part of ovipositor sheath medium-sized (long).

Description of the female:

Holotype, body length 10.1 mm, length of ovipositor sheath 11.2 mm, length of fore wing 4.4 mm. Head. Head directly narrowed behind eyes and weakly curved laterally, truncate (or nearly so) medio-posteriorly. Temple 0.7 times as long as eye in dorsal view. Vertex and frons with very fine punctulation and with satin sheen. Face densely covered with short silvery setae. Vertex moderately convex posteriorly (in lateral view) and without any depression medio-posteriorly. Occipital carina narrow and non-lamelliform medio-dorsally. Third antennal segment 1.4 times as long as second segment, fourth antennal segment 1.8 times as long as third segment, fifth antennal segment 1.6 times as long as third segment. Eye sparsely setose. OOL 1.1 times and POL twice as long as diameter of posterior ocellus. Malar space short. Clypeus with a short and wide depression medio-ventrally, its lateral corners protruding forward. Mesosoma. Length of mesosoma 2.4 times as long as its height. Propleuron densely and very finely punctulate and with satin sheen, 0.9 times as long as mesoscutum in front of tegulae. Side of pronotum finely coriaceous, medially rugose. Antero-lateral tooth of pronotum small. Antesternal carina narrow and non-lamelliform. Mesopleuron mainly coriaceous. Mesoscutum with several medium-sized punctures, interspaces with fine punctulation and with satin sheen. Lateral lobes of mesoscutum with few small punctures laterally and coarsely reticulate-punctate medially. Notauli indistinct. Scutellum with few medium-sized punctures and with satin sheen. Propodeum shiny, reticulate-rugose, medio-longitudinal carina indistinct. Wings. Fore wing: First discal cell parallel-sided. Vein SR1 slightly bent. Legs. Hind coxa coriaceous with satin sheen and transversely striate dorsally. Length of hind femur, tibia and basitarsus 4.7, 4.2 and 5.5 times their maximum width, respectively. Hind tibia less swollen. Metasoma. Ovipositor sheath 1.1 times as long as body, 1.7 times as long as metasoma, 5.7 times as long as hind tibia and 3.4 times as long as hind tibia and tarsus combined. Apical pale part of ovipositor sheath 1.2 times as long as hind basitarsus. Hypopygium deeply slit-shaped incised apically. Colour. Blackish. Mandible, clypeus ventrally and tegula reddish brown. Antenna dark brown. Wing membrane hyaline, pterostigma pale brown with dark borders. Fore and middle legs brown, tibiae and tarsi largely ivory. Hind leg brown, hind tibia subbasally with a distinct ivory ring and hind basitarsus (except base) ivory. Hind tibial spurs brown. Metasomal tergites brown; apical half of hypopygium mainly ivory. Ovipositor sheath dark brown, apex medium-sized ivory.

Description of the male: Body length 7.2 mm. Similar to female, but mesoscutum shiny and punctures of mesoscutum smaller and more spaced. Notauli distinct and narrow. Third antennal segment 1.0 times as long as second segment, fourth antennal segment 2.5 times as long as third segment, and 1.3 times as long as second and third segment combined. Hind



Plates 31–32. *Gasteruption yemenicum* Saure, Schmid-Egger & van Achterberg sp. nov. 31: Female holotype, lateral view; 32: Male paratype, lateral view.

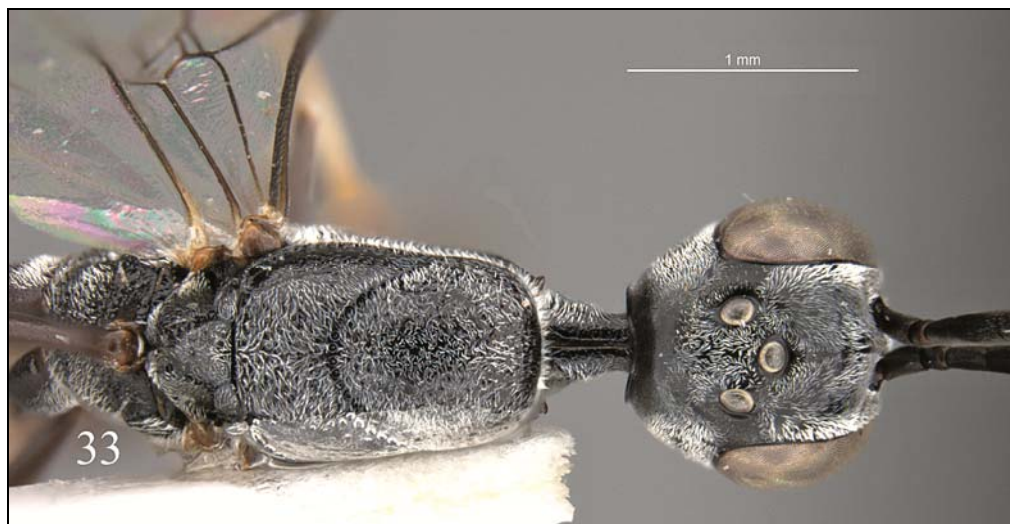


Plate 33. *Gasteruption yemenicum* Saure, Schmid-Egger & van Achterberg sp. nov., female holotype, dorsal view.

tibia with a distinct ivory ring basally, hind basitarsus without ivory patch. Paramere pale brown, paler apically. Aedeagus about as long as paramere.

Variation: In structure and colour variable species. Female. Body length 8–10 mm. Third antennal segment 1.2–1.4 times as long as second segment and fourth antennal segment 1.8–2.0 times as long as third segment. Ovipositor sheath 0.9–1.2 times as long as body, 1.4–1.7 times as long as metasoma, 5.2–5.8 times as long as hind tibia and 3.1–3.6 times as long as hind tibia and tarsus combined. Vertex and frons very finely punctulate or very finely coriaceous. Mesosoma blackish, dark brown or reddish brown. Antero-lateral tooth of pronotum small or medium-sized. Punctures of mesoscutum large to medium-sized, more or less spaced and sometimes even merged. Hind tarsomere 1 or tarsomere 1–2 ivory. Hind tibial spurs dark brown to reddish brown. Apical ivory part of ovipositor sheath 0.8–1.2 times as long as hind basitarsus. Male. Body length 7–9 mm. Third antennal segment 1.0–1.2 times as long as second segment, fourth antennal segment 2.3–2.5 times as long as third segment, and 1.1–1.3 times as long as second and third segment combined. Punctures of mesoscutum medium-sized or small. Hind basitarsus uniformly brown, rarely with an ivory patch in apical half. Hind tibial spurs reddish brown to dark brown.

Derivatio nominis: The species is named after the Republic of Yemen, the country of origin of the type series.

Distribution: Yemen.

Gasteruption sp. 1

Plates 34–35

Specimens examined: UNITED ARAB EMIRATES: Al-Ajban, 24.36°N 55.01°E, 1♂, 19–27.iii.2006, Malaise trap, leg. AvH.

Notes: The female is unknown and the characterisation of this species by the male only is uncertain. Therefore, we refrain from describing this species which is morphologically very close to *G. sericeipes* Kieffer and *G. sp. 2*, but differs genetically (see Appendix 1).

Description of the male: Body length 10.6 mm, length of fore wing 5.0 mm. Head. Head gradually roundly narrowed behind eyes and distinctly curved laterally, truncate (or nearly so) medio-posteriorly. Temple 0.6 times as long as eye in dorsal view. Vertex and frons smooth, with satin sheen and distinct dense punctulation. Vertex moderately convex posteriorly (in lateral view) and without any depression medio-posteriorly. Occipital carina narrow and non-lamelliform medio-dorsally. Third antennal segment 1.2 times as long as second segment, fourth antennal segment 2.0 times as long as third segment, and 1.1 times as long as second and third segment combined. Eye glabrous. OOL 1.4 times as long as diameter of posterior ocellus. Malar space close to eye. Clypeus with a shallow depression medio-ventrally, its lateral corners protruding forward. Mesosoma. Length of mesosoma 2.1 times as long as its height. Propleuron robust, smooth and shiny and with fine punctulation ventrally, 0.6 times as long as mesoscutum in front of tegulae. Side of pronotum shiny ventrally, with satin sheen and dense punctulation dorsally, and with rugulae medially. Antero-lateral tooth of pronotum indistinct. Antesternal carina narrow and non-lamelliform. Mesopleuron finely reticulate-rugose, densely covered with silvery setae. Mesoscutum with large to medium-sized punctures and with satin sheen, interspaces punctulate, medio-posterior part coarsely reticulate-punctate. Notauli distinct and small. Scutellum finely punctulate and with few medium-sized punctures. Propodeum coarsely reticulate-rugose and shiny, medio-longitudinal carina indistinct. Wings. Fore wing: First discal cell parallel-sided. Vein SR1 slightly bent. Legs. Hind coxa coriaceous with satin sheen, but transversely rugulose and shiny dorsally. Length of hind femur, tibia and basitarsus 5.1, 3.2 and 5.0 times their maximum width, respectively. Hind tibia less swollen. Metasoma. Aedeagus about same length as paramere. Colour. Head and mesosoma blackish, metasoma dark brown. Mandible and tegula pale brown. Antenna dark brown. Wing membrane hyaline, pterostigma pale brown. Fore and middle legs pale brown and tibiae and tarsi partly ivory. Hind leg dark brown, only tibia with an ivory ring basally. Paramere dark brown, not brightened apically. Distribution: UAE.

Gasteruption sp. 2

Plate 36

Specimens examined: UNITED ARAB EMIRATES: Al-Ajban, 24.36°N 55.01°E, 4♂, 25.ii–19.iii.2006, Malaise trap, leg. AvH; 7♂, 19–27.iii.2006, Malaise trap, leg. AvH; 1♂, 25.iii–2.iv.2006, Malaise trap, leg. AvH. Wadi Hayl, 25.08°N 56.21°E, 1♂, 11–19.iii.2009, leg CSE; 1♂, 17.iv.2010, leg. AvH.

Notes: The female is unknown and the characterisation of this species by the male only is uncertain. Therefore, we refrain from describing this species which is morphological very close to *G. sericeipes* and *G. sp. 1*, but differs genetically (see Appendix 1: Neighbour-joining tree).

Description of the male: Body length 9.8 mm, length of fore wing 4.7 mm. Head. Head gradually roundly narrowed behind eyes and distinctly curved laterally, slightly emarginate medio-posteriorly. Temple 0.6 times as long as eye in dorsal view. Vertex and frons smooth, with satin sheen and superficial punctulation. Vertex moderately convex posteriorly (in lateral view) and without any depression medio-posteriorly. Occipital carina narrow and non-lamelliform medio-dorsally. Third antennal segment 1.3 times as long as second segment, fourth antennal segment 1.7 times as long as third segment, and 1.0 times as long as second and third segment combined. Eye glabrous or nearly so. OOL 1.3 times as long as diameter of posterior ocellus. Minimum width of malar space about 0.2 times as long as second antennal segment. Clypeus with a shallow depression medio-ventrally, its lateral corners protruding forward. Mesosoma. Length of mesosoma 2.0 times as long as its height. Propleuron robust, smooth (or nearly so) and with satin sheen, 0.7 times as long as



Plates 34–35. *Gasteruption* sp. 1. 34: Male, dorso-lateral view; 35: Male, head, frontal view.

mesoscutum in front of tegulae. Side of pronotum shiny ventrally, finely punctulated dorsally, medially rugose. Antero-lateral tooth of pronotum indistinct. Antesternal carina narrow and non-lamelliform. Mesopleuron finely coriaceous and with satin sheen. Middle lobe of mesoscutum densely punctured, punctures medium-sized and partly coalescent, lateral lobes

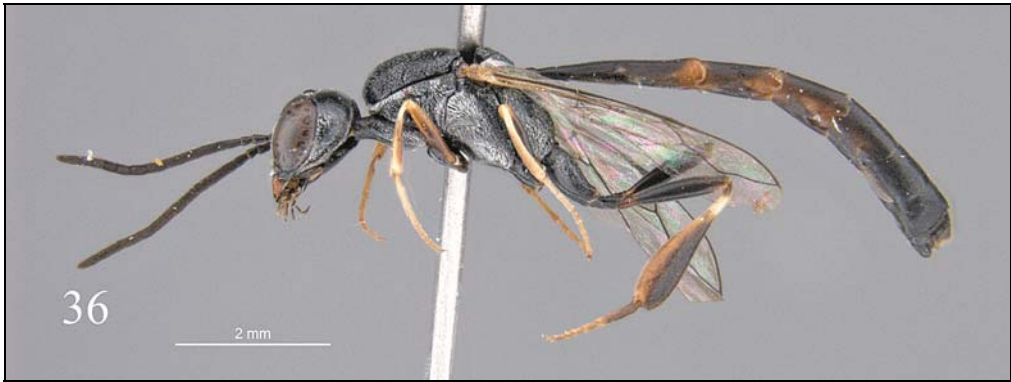


Plate 36. *Gasteruption* sp. 2, male, lateral view.

with fine dense punctulation and few medium-sized punctures. Mesoscutum coarsely reticulate-rugose medio-posteriorly. Notauli indistinct. Scutellum with few punctures, smooth and shiny. Propodeum coarsely reticulate-rugose and shiny, medio-longitudinal carina indistinct. Wings. Fore wing: First discal cell parallel-sided. Vein SR1 slightly bent. Legs. Hind coxa coriaceous with satin sheen and transversely rugulose dorsally. Length of hind femur, tibia and basitarsus 5.7, 4.1 and 5.3 times their maximum width, respectively. Hind tibia less swollen. Metasoma. Aedeagus slightly shorter than paramere. Colour. Head and mesosoma blackish, metasoma dark brown. Mandible and tegula reddish brown. Antenna dark brown. Wing membrane hyaline, pterostigma brown. Fore and middle legs pale brown but tibiae and tarsi partly ivory. Hind femur dark brown. Hind tibia dark brown dorsally and reddish brown ventrally, with an ivory ring basally. Hind tibial spurs reddish brown. Hind tarsus pale brown. Paramere dark brown, not brightened apically.

Variation: Body length 9–10 mm. Third antennal segment 1.3–1.4 times as long as second segment, fourth antennal segment 1.6–1.7 times as long as third segment, and 0.9–1.0 times as long as second and third segment combined.

Distribution: UAE.

DISCUSSION

The analysis of COI sequence data (Appendix 1) confirms the result of the morphological and taxonomical identifications. The examined species of the genus *Gasteruption* are well characterized by traditional taxonomy. However, identification is difficult because of their similar morphology. So, the barcoding results helped to support the status as valid species of the taxa dealt with here.

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Appendix 1: Neighbour-joining tree (Kimura 2 Parameter, all codon positions unweighted) of Gasteruptiidae from the UAE and Yemen, based on sequence variation in the MtDNA COI gene (barcoding fragment, 5'-end, 658 bp), calculated using BOLD systems. Tip label information includes: species name, sample ID, sequence length with number of ambiguous bases in square brackets, Barcode Index Number (BIN, assigned by BOLD).

