

A new genus *Squamophis* of Asteroschematidae (Echinodermata, Ophiuroidea, Euryalida) from Australia

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Abstract

Squamophis, a new genus of brittle star is described. Two species are included in the genus: *Squamophis amamiensis* (Okanishi & Fujita, 2009) from south-western Japan and *Squamophis albozosteres* **sp. n.** from north-western Australia. *Squamophis* **gen. n.** is distinguished from the other genera of the family Asteroschematidae by the following characters: each radial shield is single-layered and is completely covered by plate-shaped epidermal ossicles, and the relative length of the longest arm spine throughout the arms is as long as the length of the corresponding arm segment. *Squamophis albozosteres* **sp. n.** is distinguished from *Squamophis amamiensis* in having white, slightly domed, plate-shaped epidermal ossicles on the aboral side of the body, the ossicles on aboral and lateral portion of the arms form transverse rows, and the other part of aboral side of disc and basal to middle portion of arms are brown but tip of the arms are light purple.

Keywords

taxonomy, *Squamophis*, *Squamophis albozosteres*, new genus, new species

Introduction

The family Asteroschematidae was erected by Verrill (1899) and currently comprises four genera, *Asteroschema* Örsted & Lütken, 1856 (in Lütken 1856), *Astrobrachion* Döderlein, 1927, *Astrocharis* Koehler, 1904, and *Ophiocreas* Lyman, 1869 (Fell 1960; Baker 1980). Recent morphological studies of internal ossicles indicated that some species of the genus *Asteroschema* appear more similar to *Astrocharis*, rather than the other species of *Asteroschema* (Okanishi and Fujita 2009, 2011a). However, the taxonomy of these species was left unresolved.

In this study, a new genus of Asteroschematidae is established for two species, including one that is new. A tabular taxonomic key to the five recent genera of Asteroschematidae is provided.

Materials and methods

Three specimens of the new species were collected on Commonwealth Scientific and Industrial Research Organisation (CSIRO) survey SS05/2007 by R/V Southern Surveyor and are deposited in the Museum Victoria (MV). They were fixed onboard in 70% ethanol.

Ossicles from a paratype of the new species were isolated by immersion in domestic bleach (approximately 5% sodium hypochlorite solution), washed in deionised water, dried in air, and mounted on SEM stubs using double-sided conductive tape. The preparations were sputter-coated with gold-palladium and examined with a Jeol JSM-6380LV SEM.

The terms used to describe asteroschematids follow Okanishi and Fujita (2009, 2011a) and the terms used for the structure of ossicles follow Byrne (1994) and Martynov (2010). Some technical terms for internal dermal ossicles are newly defined in this study. Radial shields of most species of Asteroschematidae are composed of several thin, flat and plate-shaped ossicles (Fig. 1A), which vary in size, smaller toward the center of the disc and larger toward the periphery, and overlap slightly displacing each other (Fig. 1A). In this study, these radial shields are referred to as “multi-layered radial shields”. Each flat ossicle of the multi-layered radial shield is probably connected by soft connective tissue, thus when a multi-layered radial shield is dissected and immersed in domestic bleach, it disassembles into several ossicles. Other radial shields are composed of a single thin, flat and plate-shaped ossicle and are referred to as “single-layered radial shields” in this study (Fig. 1B).

The terms used for the superficial asteroschematid body ossicles have also been inconsistent in previous descriptions. Traditionally, “granules”, “scales” and “tubercles” have been used for the various ossicles on asteroschematid bodies (e.g. Mortensen 1933; Fell 1960; Baker 1980; McKnight 2000). In contrast, a recent histological study used the term “dermal granules” for ossicles on *Asteroschema oligactes* (Byrne, 1994). Use of “dermal ossicles” may be confusing because it would indicate both superficial

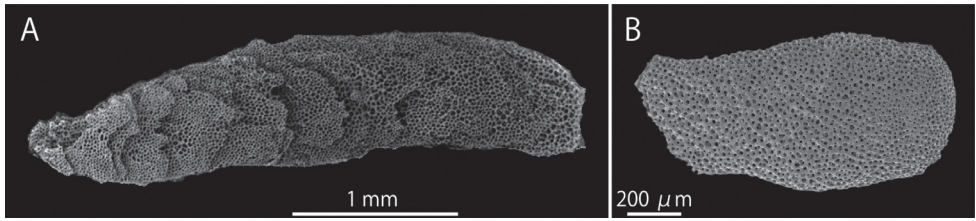


Figure 1. SEM photographs of radial shields of *Asteroschema tubiferum* (NSMT E-2110) (**A**) and *Squamophis albozosteres* sp. n., paratype (MV F-162658) (**B**). **A** multi-layered radial shield **B** single-layered radial shields. The left side of the images are towards the center of the disc and the right side towards the disc margin.

and internal ossicles of echinoderms, including radial shields and vertebrae. Terms like “granules”, “scales” and “tubercles” give the impression that these ossicles are different kinds of ossicles. However, although asteroschematid ossicles can vary in shape, they are essentially the same kind of ossicle. In recent descriptions, we have used the terms “granule-shaped dermal ossicles”, “plate-shaped dermal ossicles” and “cone-shaped dermal ossicles” (Okanishi and Fujita 2009, 2011a, 2011b). Here, we suggest that these various shaped dermal ossicles should all be referred to as “epidermal ossicles”. “Epidermis” is the tissue that covers these superficial ossicles (Byrne 1994) and therefore the term “epidermal ossicle” indicates their superficial position and their difference to internal dermal ossicles. The relative size of ossicles is presented in terms of the length of the longest axis, and was measured using an ocular micrometer on a binocular stereoscopic microscope.

Taxonomy

Family Asteroschematidae Verrill, 1899

<http://species-id.net/wiki/Asteroschematidae>

Type genus: *Asteroschema* Örsted & Lütken, 1856 (in Lütken 1856)

Type species: *Asterias oligactes* Pallas, 1788

Remarks. Four genera are currently recognized within the Asteroschematidae: 1) the type genus *Asteroschema* erected for the Caribbean species *Asterias oligactes* Pallas, 1788 (= *Asteroschema oligactes*); 2) *Ophiocreas*, also erected for the Caribbean species, *Ophiocreas lumbricus* Lyman, 1869; 3) the genus *Astrocharis*, erected for Philippines’ species, *Astrocharis virgo* Koehler, 1904; and 4) *Astrobrachion*, erected for the New Zealand species, *Ophiocreas constrictus* Farquhar, 1900 (= *Astrobrachion constrictum*). The monotypic genus *Ophiuropsis* was erected by Studer 1884 for the Southwest African species, *Ophiuropsis lymani* Studer, 1884. This genus eventually contained one species with two subspecies, *O. lymani lymani* Studer, 1884 and *O. lymani simplex* Mortensen, 1933, but the former subspecies was junior synonymised

with *Asteronyx loveni* Müller & Troschel, 1842 (Asteronychidae) and latter subspecies with *Astrobrachion constrictum* by Baker (1980). Mortensen (1933) erected a subgenus *Astrobrachion* (*Astroscolex*) for one of the two species of *Astrobrachion*, *Ophiocreas adhaerens* Studer, 1884 (= *Astrobrachion adhaerens*) but this taxon was also synonymised with *Astrobrachion* by Baker (1980).

In his key to the genera of Asteroschematidae, Fell (1960) used the following seven characters: 1) relative length of the arms to the disc diameter; 2) absence/presence of oral shields; 3) absence/presence of ventral arm plates; 4) variable covering of the radial shields; 5) shapes and arrangement of epidermal ossicles on the disc and arms; 6) relative length of the longest arm spine in throughout the arms to the corresponding arm segment; 7) and absence/presence of an abrupt increase in arm width between second and third, or third and fourth arm segments. Baker (1980) showed that two of these seven characters, the relative length of the arms to the disc diameter and absence/presence of oral shields were not useful. McKnight (2000) used another character, the degree of separation of the jaws, to distinguish the three Australian genera of Asteroschematidae, *Asteroschema*, *Astrobrachion* and *Ophiocreas*.

Our review of the taxonomic literature and examination of asteroschematid specimens, has indicated to us that several of these characters are not useful for defining genera. We have found that degree of separation of jaws varies in response to animal preservation. The abrupt increase in arm width, supposedly characteristic of *Astrocharis* (see Fell 1960) varies across asteroschematid species. An abrupt increase in width in basal portion of the arms can be observed in the original figures of the type species, *Astrocharis virgo* Koehler, 1904 and of *A. ijimai* Matsumoto, 1911. However, photographs in the holotype description of *Astrocharis gracilis* Mortensen, 1918 (in Mortensen and Stephensen 1918), which was synonymised with *A. ijimai* by Okanishi and Fujita (2011a), show no abrupt increase in width (Mortensen and Stephensen 1918; Döderlein 1927; Okanishi and Fujita 2011a) and *Astrocharis monospinosa* Okanishi and Fujita, 2011a also has no abrupt increase in width (Okanishi and Fujita 2011a).

We propose that four characters are useful for distinguishing the existing genera. The genus *Astrobrachion* has ventral arm plates separating the lateral arm plates on the oral midline throughout the arms, while the other genera have no ventral arm plates at least from the middle to distal portion of the arms. The genus *Astrocharis* has completely naked radial shields, whereas the radial shields of the other genera are completely covered by thick skin or epidermal ossicles. Therefore, the absence/presence of the ventral arm plates and the covering of the radial shields are useful generic diagnostic characters as Fell (1960) showed (Table 1).

The shapes and arrangement of epidermal ossicles on aboral surfaces of the discs and arms have been used to distinguish the four genera (McKnight 2000), however, these ossicles vary in shape with location on the body so it is important only to compare ossicles from similar locations. For this study, we compared epidermal ossicles found on the aboral periphery of the disc and aboral basal portion of the arms, which recently appeared to be useful for distinguishing the species of *Asteroschema* and are expected

Table 1. Tabular morphological key to the genera of the family Asteroschematidae.

Genus	Shape and arrangement of epidermal ossicles on aboral periphery of the disc and aboral basal portion of the arms	Radial shields	Ventral arm plate on middle to distal portion of the arms	Relative length of the longest arm spines to the corresponding arm segment
<i>Asteroschema</i> Örsted & Lütken, 1856*	Cone-shaped and completely in contact, or granule-shaped and slightly in contact	Multi-layered, covered by epidermal ossicles	Absent	Two times longer
<i>Ophiocreas</i> Lyman, 1869	Granule-shaped, slightly in contact or separated, or no epidermal ossicles	Multi-layered, covered by epidermal ossicles or skin	Absent	Two times longer
<i>Astrobrachion</i> Döderlein, 1927	No epidermal ossicles	Multi-layered, covered by skin	Present	The same length
<i>Astrocharis</i> Koehler, 1904	Plate-shaped and completely in contact	Single-layered, naked	Absent	Two times longer
<i>Squamophis</i> gen. n.	Plate-shaped and completely in contact	Single-layered, covered by epidermal ossicles	Absent	The same length

* Except *A. capense* and *A. igloo* which may be related to *Squamophis* gen. n. (see Okanishi and Fujita, 2009, 2011a).

to be useful for generic taxonomy (Okanishi and Fujita, 2009). Although *Asteroschema* and *Ophiocreas* cannot be distinguished by this emended character (leaving aside the two species of *Ophiocreas*, *O. gilolensis* Döderlein, 1927 and *O. spinulosus*, Lyman, 1883, which have additional tubercle-shaped ossicles on the radial shields), the other two genera, *Astrobrachion* and *Astrocharis* can be clearly distinguished as follows: species of *Astrocharis* have only plate-shaped epidermal ossicles, and species of *Astrobrachion* have no epidermal ossicles (Table 1).

Astrocharis has been distinguished by its short arm spines (Fell 1960), but the longest arm spine is twice as long as the corresponding arm segment in *Astrocharis monospinosa* (Okanishi and Fujita 2011a). Since the relative arm spine length on *Asteroschema* and *Ophiocreas* species is approximately the same as that of *Astrocharis monospinosa*, these three genera cannot be distinguished from each other by this character (e.g. Döderlein 1911, 1927, 1930; Baker 1980; McKnight 2000). However, although not mentioned by Fell (1960), the length of arm spines on *Astrobrachion* species is indeed shorter than that of the other genera, being only the same length as the corresponding arm segment. Therefore, the four existing genera can be distinguished by this character as follows: the relative length of the longest arm spines throughout the arms is as long as the length of the corresponding arm segment in *Astrobrachion* but two times longer in the other three genera (Table 1).

Genus *Squamophis* gen. n.

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<http://species-id.net/wiki/Squamophis>

Type species: *Asteroschema amamiense* Okanishi & Fujita, 2009

Other included species: *Squamophis albozosteres* sp. n.

Diagnosis. Aboral periphery of the disc and aboral base of the arms covered completely by contiguous plate-shaped epidermal ossicles. Single-layered radial shields completely covered by epidermal ossicles. No ventral arm plates on middle to distal sections of the arms. Relative length of the longest arm spines the same length as the corresponding arm segment throughout the arms.

Etymology. The generic name is a masculine noun in the subjective case, a compound of Latin, *squama* (prefix, meaning “scale”) referring to the plate-shaped epidermal ossicles on their body and the Greek *ophis* (masculine noun, meaning “snake”), referring to their snake-like arms.

Remarks. Okanishi and Fujita (2009, 2011a) examined internal ossicles of many species of *Asteroschema* and revealed that *A. amamiense* differed in having both single-layered radial shields and contiguous plate-shaped epidermal ossicles, on the aboral periphery of the disc and the aboral base of the arms, that are similar in shape and arrangement to species of *Astrocharis*. Furthermore, a recent molecular phylogenetic analysis (Okanishi et al. in press), based on mitochondrial (16S) and nuclear ribosomal RNA genes (18S, 28S), also showed that *Squamophis albozosteres* sp. n. (as *Asteroschema* sp.) and *Astrocharis monospinosa* form a clade that was separated from the two other species of *Asteroschema* that were sequenced, *A. ajax* A. H. Clark, 1949 and *A. ferox* Koehler, 1904. This new species also had single-layered radial shields and contiguous plate-shaped epidermal ossicles. However, both *A. amamiense* and *S. albozosteres* differed from *Astrocharis* species in having covered radial shields and relatively short arm spines that are only as long as the corresponding arm segment. This morphological and molecular phylogenetic evidence suggests to us that these two species should be distinguished at a generic level from the other species of *Asteroschema* and *Astrocharis*. Therefore, we describe a new genus *Squamophis* for these two species. The distinguishing characters for the new genus are given in Table 1.

The genus *Squamophis* currently comprises two species: *S. amamiensis* (Okanishi & Fujita, 2009) from south-western Japan, 167–168 m and *S. albozosteres* sp. n. from north-western Australia, 95–108 m. *Asteroschema capense* Mortensen, 1925 and *A. igloo* Baker, 1980 may also be related to *S. amamiensis*, based on the similarity of shapes and arrangement of epidermal ossicles (Okanishi and Fujita, 2009). However, we have not examined the nature of radial shields on their type specimens and hence we refrain from transferring these two species to the new genus at this time.

***Squamophis albozosteres* sp. n.**

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http://species-id.net/wiki/Squamophis_albozosteres

Figs 1B, 3–7

Type materials. MV F 162657, holotype, stn SS05/2007 116, off Broome, northwestern Australia, 16°45.09'S, 121°02.48'E – 16°44.36'S, 121°02.12'E, 100–108 m, rocky bottom, 23.3 °C, 30 Jun 2007, epibenthic sled. MV F162658, two paratypes, stn SS05/2007 188, off Ashmore Reef, northwestern Australia, 12°26.42'S, 123°36.03'E – 12°26.58'S, 123°36.35'E, 95–96 m, rocky bottom, 24.8 °C, 7 Jul 2007, benthic dredge (Fig. 2).

Diagnosis. Epidermal ossicles conspicuous white, slightly domed and round plate-shaped, irregularly placed on aboral side of disc and forming two transverse bands on aboral and lateral sides of each arm segment. Rest of the aboral surface uniformly brown except light purple near the tips of arms and finally without color at the tip.

Description of holotype. MV F162657: disc diameter 3.4 mm, arm length approximately 50 mm (Fig. 3).

Disc. Disc five-lobed with slightly notched interradian edges: lacking evidence of fission (Figs 3, 4A). Aboral surface almost flat, but radial shields and their surrounds slightly tumid, covered by white, slightly domed and round plate-shaped epidermal ossicles and brown, flat and polygonal plate-shaped epidermal ossicles (Fig. 4A–C). Epidermal ossicles covered by a thin skin. White epidermal ossicles forming transverse rows at the aboral disc (Fig. 4A), almost uniform in size on aboral disc, 70–120 µm long, approximately 100 µm thick. Brown epidermal ossicles obscured by skin and cannot be observed externally (Fig. 4A–C); relatively large near the periphery, 150–250 µm long, approximately 50 µm thick, and relatively small at the disc center, 100–150 µm long, approximately 50 µm thick. Radial shields completely covered by epidermal ossicles, oblong, approximately 1.2 mm long and 0.6 mm wide, not reaching the center of the disc.

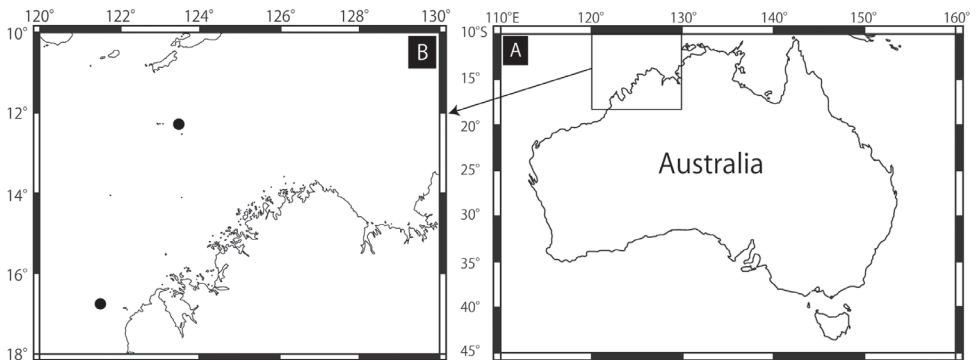


Figure 2. Collected sites of *Squamophis albozosteres* sp. n. Northern solid circle is for Ashmore Reef and southern one is off Broome.

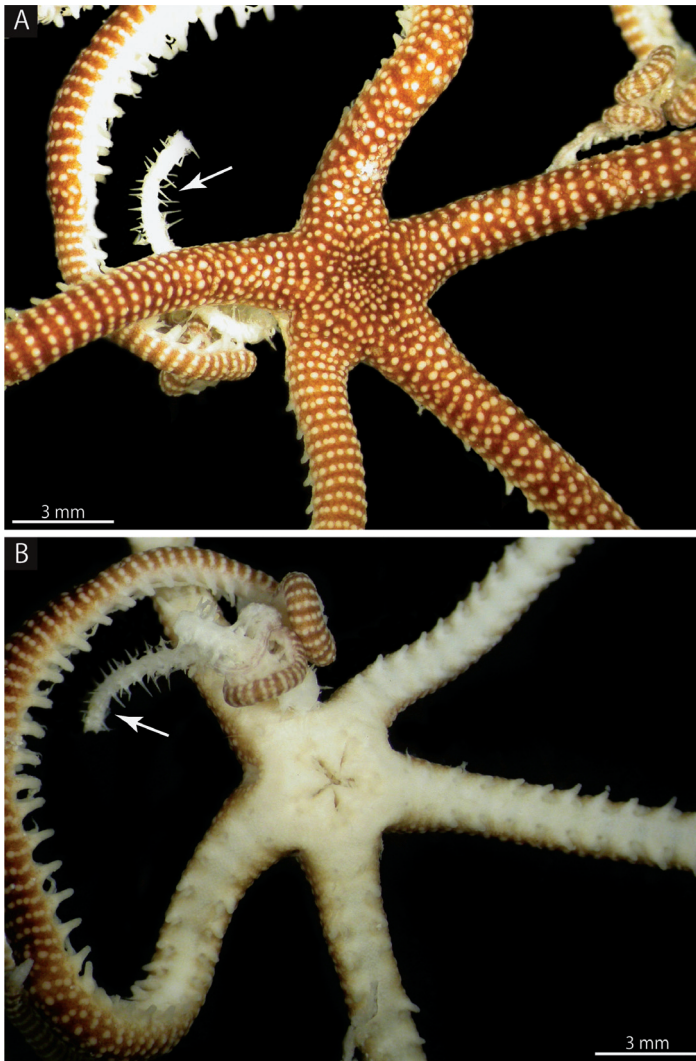


Figure 3. *Squamophis albozosteres* sp. n., holotype (MV F162657). **A** aboral view **B** oral view. Arrows indicate the arm of another ophiuroid gripped by *S. albozosteres*.

Oral surface of disc entirely covered by only white, flat and polygonal plate-shaped epidermal ossicles, 50–100 μm long and approximately 50 μm thick (Fig. 4D–G). Four to five triangular teeth forming a vertical row on dental plate. Domed granule-shaped oral papillae lying on either side of jaw (Fig. 4F).

Lateral interradial surface of disc nearly vertical, covered by epidermal ossicles similar to those on oral surface (Fig. 4H). Two genital slits (0.6 mm long and 0.3 mm wide) present in each interradius. No distinct ossicles suggesting existence of madreporites or oral plates observed on any oral interradius, and only epidermal ossicles covered these surfaces (Fig. 4H).

Figure 4

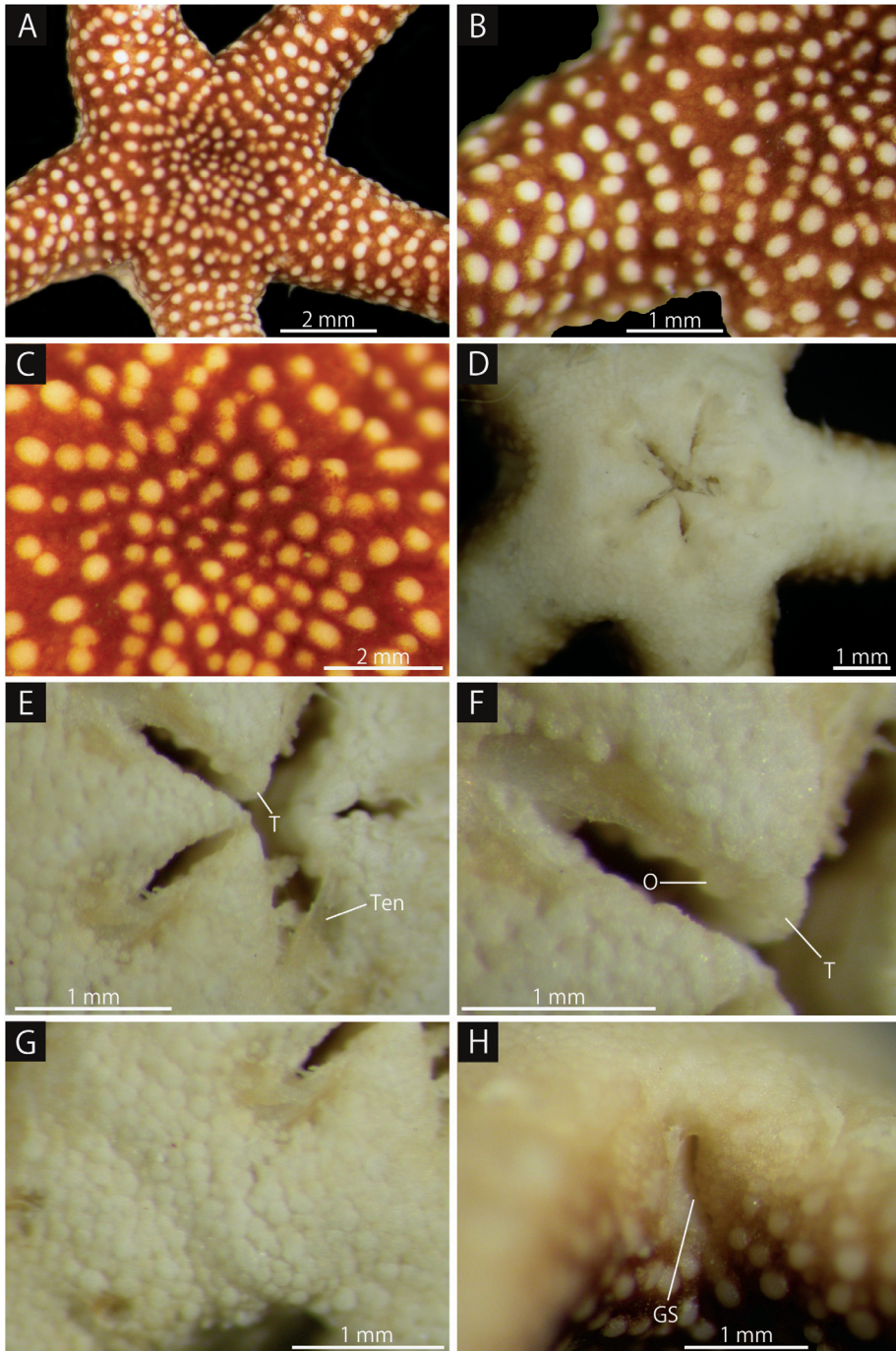


Figure 4. *Squamophis albozosteres* sp. n., holotype (MV F162657). **A** aboral disc and basal portion of the arms **B** periphery of the disc and basal portion of the arm **C** aboral central disc **D** oral disc **E** oral central disc **F** jaws **G** oral periphery of the disc **H** lateral interradius of the disc. Abbreviations: GS - genital slit; O - oral papillae; T - teeth; Ten - Tentacles.

Arms. Arms simple, five in number, no abrupt change in width near the arm base (Fig. 3). The basal portion of the arm 1.4 mm wide and 1.5 mm high, with an arched aboral surface and flattened oral surface. Arms tapering gradually toward the arm tip (Figs 3, 5A, D, G).

The aboral and lateral surface of the base of arms completely covered by white epidermal ossicles, 150–300 μm long, approximately 60 μm thick, and brown epidermal ossicles, 100–300 μm long, approximately 50 μm thick (Fig. 5A, B), similar to those on aboral periphery of disc. Epidermal ossicles on basal portion of arms covered by thin skin. Brown epidermal ossicles obscured by skin, similar to those on aboral surface of disc. Oral surface of the base of arm covered by white epidermal ossicles, 50–100 μm long, approximately 50 μm thick, similar to those on oral surface of disc (Fig. 5C). From basal to middle portion of the arms, the size of plate-shaped epidermal ossicles decreasing on both the aboral and lateral surfaces (Fig. 5D, F), the white domed ones to 100–200 μm and the brown polygonal ones to 100–150 μm . Brown polygonal ones on oral surface decreasing to 50 μm (Fig. 5E). The distal sections of arms covered by scattered granule-shaped epidermal ossicles of 30 μm , finally disappearing near arm tip (Fig. 5G, H).

First to third tentacle pores lacking arm spines; 4th and more distal pores with one arm spine. Arm spines on basal one-third of arm ovoid, minute, approximately one-third to one-half the length of corresponding arm segment (Fig. 5C). Arm spines in middle one-third of arm the same length as corresponding arm segment, bearing fine thorns at their apex (Fig. 5E, F). Arm spines on distal one-third of arm hook-shaped with conspicuous lateral secondary teeth along inner edge (Fig. 5G, H). Length of hook-shaped arm spines gradually decreasing to two-thirds of the corresponding arm segment on distal third of arm, and number of secondary teeth decreasing from two to one. All tentacles pores lacking a sheath around the cylindrical, narrow tube feet (Figs 4E, 5G).

Lateral and ventral arm plates completely concealed by epidermal ossicles over basal to middle portion of arms, but lateral arm plates visible in distal portion of arms (Fig. 5G).

Color. Aboral surface of disc brown, with white spots highlighting the domed epidermal ossicles. Pigmentation on aboral distal portion of arms lighter and appearing purple, finally disappearing at the tip (Fig. 5H). Oral side entirely white (Fig. 3).

Ossicle morphology of one paratype. MV F162658: Disc diameter 5.3 mm, arm length at least 200 mm.

Flat and polygonal plate-shaped epidermal ossicles at aboral periphery of disc, approximately 236 μm long and 43 μm thick (Fig. 6A, B), the white, round and domed plate-shaped epidermal ossicles approximately 136 μm long and 40 μm thick (Fig. 6C, D). On aboral surface at base of arm, domed ossicles slightly oblong, approximately 226 μm long and 34 μm thick (Fig. 6E, F), whereas the other ossicles flat and round, granule-shaped, 64 μm long and 20 μm thick (Fig. 6G, H).

The radial shields flat and oblong, single-layered, approximately 1.15 mm in length and 0.57 mm in width (Fig. 1B).

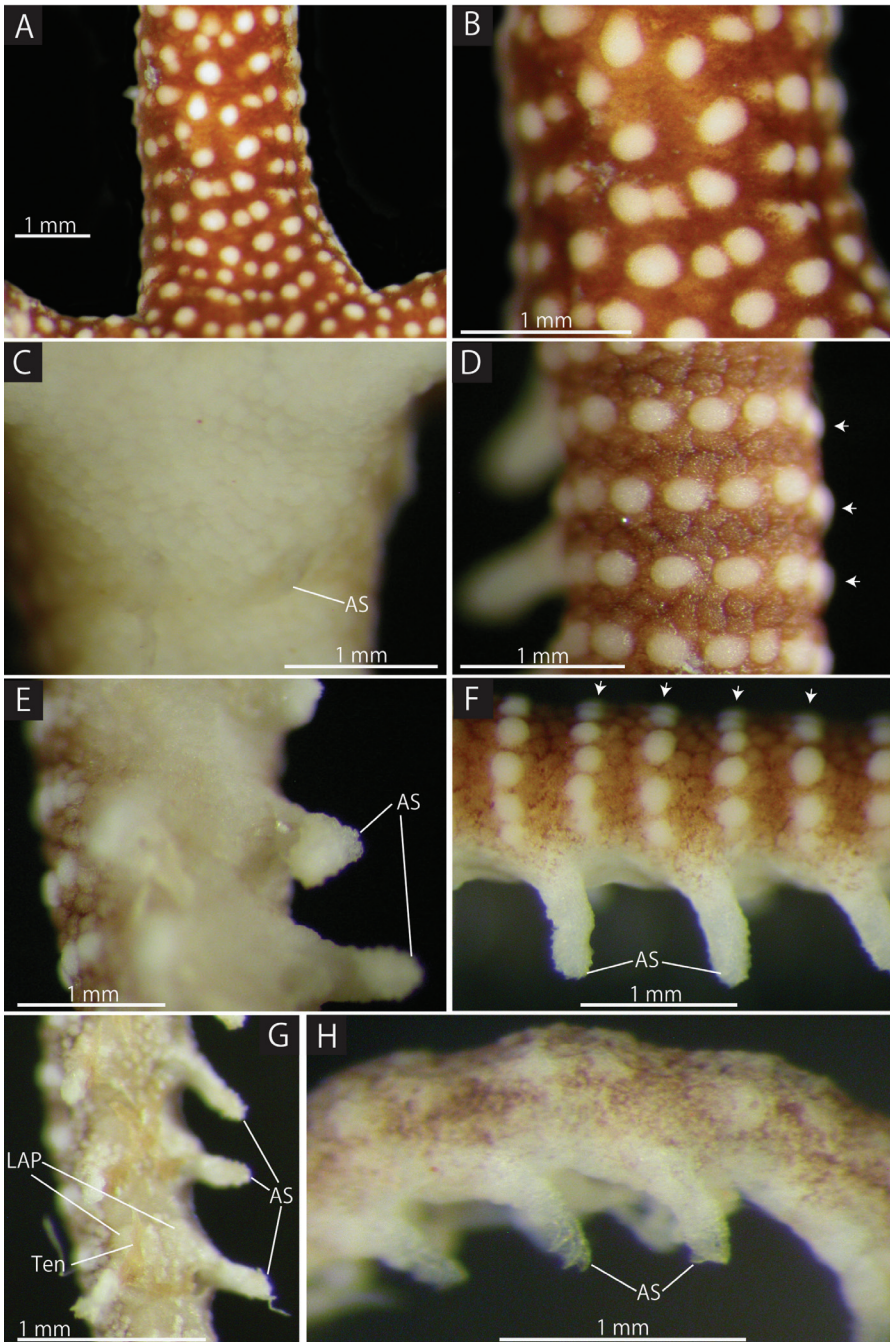


Figure 5. *Squamophis albozosteres* sp. n., holotype (MV F162657). **A, B** aboral basal portion of the arm **C** oral basal portion of the arm **D** aboral middle portion of the arm, each arrow head indicates a row of white ossicles **E** oral middle portion of the arm **F** lateral middle portion of the arm, each arrow head indicates a row of white ossicles **G** oral distal portion of the arm **H** lateral distal portion of the arm. Abbreviations: - AS arm spine; LAP - lateral arm plate; Ten - tentacles.

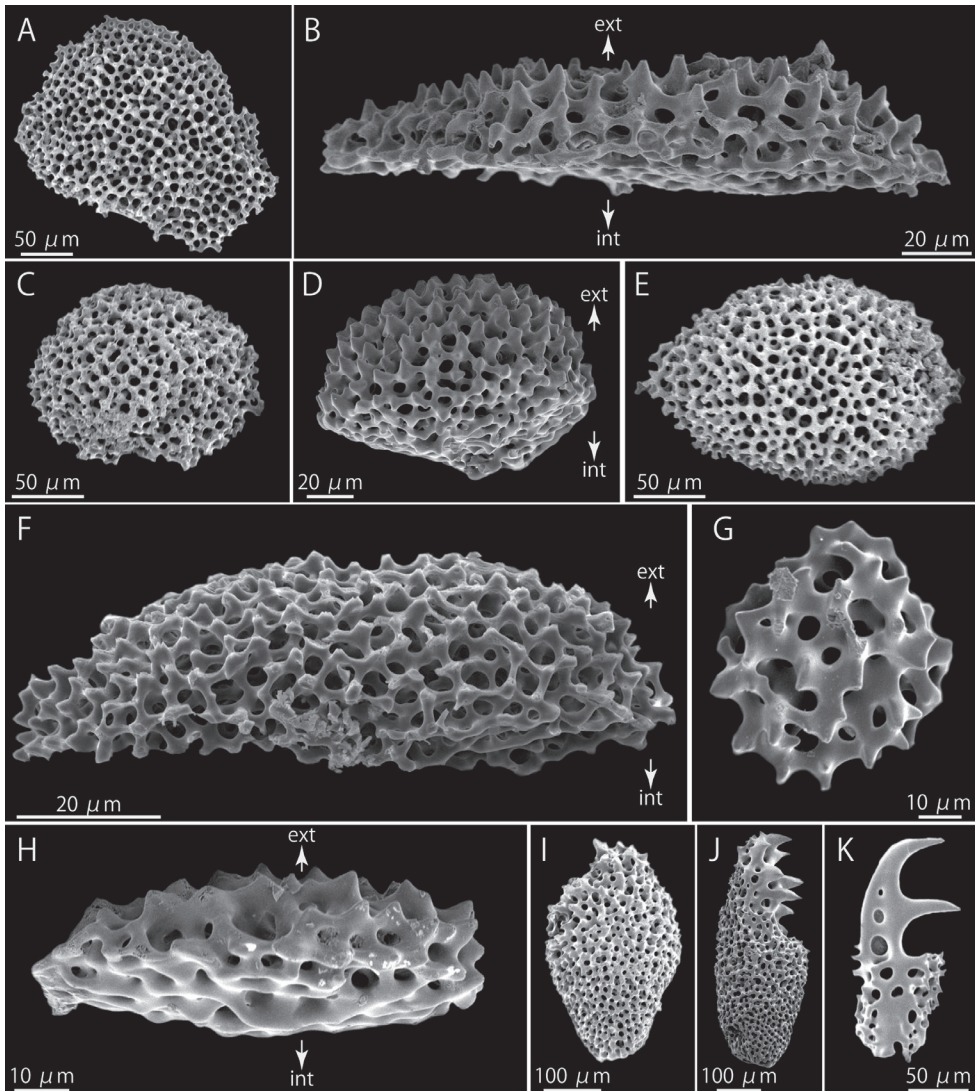


Figure 6. A–K *Squamophis albozosteres* sp. n., paratype (MV F162658). SEM photographs of internal ossicles. **A, B** polygonal plate-shaped epidermal ossicles at the aboral periphery of the disc, external (**A**) and lateral (**B**) views **C, D** domed plate-shaped epidermal ossicles at the periphery of the disc, external (**C**) and lateral (**D**) views **E, F** domed plate-shaped epidermal ossicles on the aboral middle portion of the arm, external (**E**) and lateral (**F**) views **G, H** granule-shaped epidermal ossicles on the oral middle portion of the arm, external (**G**) and lateral (**H**) views **I–K** arm spines from basal (**I**), middle (**J**) and distal (**K**) portion of the arm. Arrows indicate the orientation (**B, D, F, H**): ext - external side; int - internal side.

Arm spines on basal one-third of arm ovoid (Fig. 6I), in middle cylindrical, bearing fine thorns at tip (Fig. 6J), and distally, they hook shaped with conspicuous secondary teeth along inner edge (Fig. 6K). Number of secondary teeth decreasing gradually to one along distal quarter of arm.

Each lateral arm plate associated with one arm spine and has separate muscle and nerve openings (Martynov, 2010) (Fig. 7A). Oral side of each arm vertebra with a longitudinal groove along midline, no oral bridge (Okanishi et al. in press) formed to surround the radial water vessel and nerve (Fig. 7B, C).

Variation. Although only three specimens have been collected, some morphological variation was observed. The smaller holotype (3.4 mm in disc diameter) has no abrupt reduction in arm thickness, but the basal portion of the arm on the two larger paratypes (5.3 mm and 5.6 mm in disc diameter) are slightly widened. The difference between the three specimens may be due to a difference in their sexual maturity or reproductive state similar to the congener, *S. amamiensis* (Okanishi and Fujita 2009).

Distribution. North-western Australia; 95–108 m. Type locality: off Broome, 100–108 m (Fig. 2).

Etymology. The specific name is a masculine noun in apposition formed as a compound of Latin words, *albus* (adjective, meaning “whitish”) and a plural form of *zoster* (masculine noun, meaning “ring”), referring to the rings of white plate-shaped dermal ossicles of arms.

Remarks. *Squamophis albozosteres* sp. n. and its congener, *S. amamiensis*, are similar to each other, however, they can be distinguished by the morphology of the epidermal ossicles on the aboral body and by pigmentation. *Squamophis albozosteres* has conspicuously white, domed and plate-shaped epidermal ossicles on the aboral side of the disc and basal to middle portion of the arms, forming two transverse rows on the lateral and aboral surfaces of each arm segments (Fig. 5F). Whereas *S. amamiensis* has only uniform coloured, flattened and plate-shaped epidermal ossicles on the corresponding surfaces. The aboral body surface of *Squamophis albozosteres* is basically brown with white spots and the tips of the arms are light purple, finally with no color, but that of *S. amamiensis* is uniformly orange or pinkish brown (Okanishi and Fujita 2009).

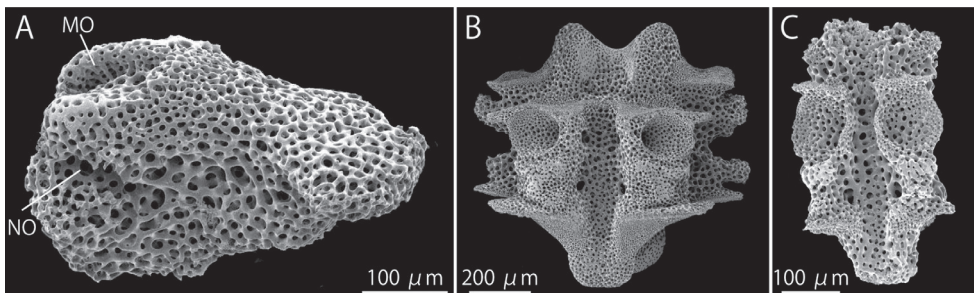


Figure 7. *Squamophis albozosteres* sp. n., paratype (MV F162658). SEM photographs of internal ossicles. **A** lateral arm plate from middle portion of the arm **B, C** vertebrae from middle (**B**) and distal (**C**) portion of the arm, oral views. Abbreviations: MO - muscle opening; NO - nerve opening.

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A well-preserved aneuretopsyichid from the Jehol Biota of China (Insecta, Mecoptera, Aneuretopsyichidae)

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Abstract

The Aneuretopsyichidae is an unspeciose and enigmatic family of long-proboscid insects that presently consist of one known genus and three species from the Late Jurassic to Early Cretaceous of north-central Asia. In this paper, a new genus and species of fossil aneuretopsyichid is described and illustrated, *Jeholopsyche liaoningensis* **gen. et sp. n.** Fossils representing this new taxon were collected from mid Early Cretaceous strata of the well known Jehol Biota in Liaoning Province, China. This finding documents the first formal record of fossil Aneuretopsyichidae in China. In addition, this well-preserved and new material reveals previously unknown and detailed morphological structure of the mouthparts, antennae, head, thorax, legs and abdomen of this distinctive insect lineage.

Keywords

Aneuretopsyichidae, new genus, new species, proboscis, Yixian Formation, China, Early Cretaceous, pollination drops

Introduction

The Aneuretopsychidae is a depauperate and enigmatic, extinct family of mid Mesozoic Mecoptera erected by Rasnitsyn and Kozlov (1990). Currently, only one genus with three species has been described. *Aneuretopsyche rostrata* and *A. minima* were found in the Upper Jurassic Karabastau Formation of the South Kazakhstan (formerly Chimkent) Province in Kazakhstan, and *A. vitimensis* was recovered from the Lower Cretaceous Zaza Formation along the upper reaches of Vitim River, at the Baisa locality of western Transbaikalia in Russia (Rasnitsyn and Kozlov 1990). The establishment of the Aneuretopsychidae was very significant, as it was the first time that a mecopteroid insect was found to have exceptionally prolonged, siphonate mouthparts. The Aneuretopsychidae was initially and tentatively placed by Rasnitsyn and Kozlov (1990) into the Suborder Aneuretopsychina within the scorpionfly clade (Order Panorpida = Mecoptera). Moreover, the taxa was thought to have interesting feeding adaptations similar to cicadas and butterflies, particularly as it was difficult to interpret the first, enigmatic, proboscis observed in Mecoptera of any age.

The Aneuretopsychidae, together with mid Mesozoic Mesopsychidae (Ren et al. 2010a), and Pseudopolycentropodidae (Ren et al. 2010b), and now the Late Permian to Early Triassic Nedubroviidae (Bashkuev 2011), form a particularly interesting clade, the Aneuretopsychina, which lasted 150 million years from the Late Permian to the latest Early Cretaceous. This essentially preangiospermous lineage exhibited a tubular siphonate proboscis, indicating that mid Mesozoic scorpionflies were accessing pollination drops from gymnospermous plants, discussed elsewhere (Labandeira et al. 2007; Ren et al. 2009; Labandeira 2010). Such a mouthpart structure was convergent with and homologous to labial mouthpart elements of the brachycerous dipteran proboscis, but analogous to the maxillary glossae of lepidopterans which evolved during the Early Cretaceous (Labandeira et al. 2007; Labandeira 2010). Grimaldi et al. considered that these three families were not true mecopterans but rather stem-group mecopteroids showing remarkable parallel evolution with the Diptera (Grimaldi and Engel 2005; Grimaldi et al. 2005). By contrast, Ren and colleagues (Ren et al. 2009) indicated that this clade represents a major, early-derived lineage of basal Mecoptera.

Recently, we collected two fossils of Aneuretopsychidae, the first an excellently preserved part and counterpart, and a second poorly-preserved specimen lacking a counterpart, both from the well-known Yixian Formation. The Jehol Biota of the Yixian Formation has yielded abundant fossil insects associated with seed plants, some of which were potential pollen or nectar-feeders, such as members of the Orthoptera, Heteroptera, Coleoptera, Hymenoptera and Diptera (Ren 1998; Ren et al. 2010c). The new taxon reported here provides new morphological details for evaluating the phylogenetic position of this interesting family. Based on its unique venational characters, we erect a new genus with a new species, *Jeholopsyche liaoningensis* gen. et sp. n. The binomial name *Jeholopsyche liaoningensis* has appeared for the first time in Ren et al. (2009). However, diagnostic characters of this genus were mentioned only in the electronic Supporting Online Material, and were therefore not effectively published in

terms of the International Code of Zoological Nomenclature (Article 9; ICZN 1999). We republish this genus and species herein by providing the required detailed description and other information to ensure no conflict with the Code and make the names nomenclatorially available from this paper.

The Early Cretaceous specimens were collected from the Yixian Formation at Huangbanjigou Village, in Shangyuan Township, near Beipiao City of Liaoning Province, China. There is general agreement that the age of the Yixian Formation is of late Barremian age, based on $^{40}\text{Ar}/^{39}\text{Ar}$ date of 125 Ma on sanidine and biotite minerals (Swisher et al. 2002), confirmed by $^{235}\text{U}/^{207}\text{Pb}$ dates on zircon crystals (Wang et al. 2001). This is the date that we accept herein. However, this date remains contentious, particularly for some Chinese scientists. Three potential ages historically have been proposed for the Yixian fossils; namely, the Late Jurassic (Ren et al. 1997; Zheng et al. 2003), the transition from the Late Jurassic to the Early Cretaceous (Chen et al. 2004; Wang et al. 2004; Wang et al. 2005), and the Early Cretaceous (Swisher et al. 1999; Zhou et al. 2003).

Materials and methods

This study is based on two fossil specimens housed in the fossil insect collection of the Key Laboratory of Insect Evolution & Environmental Changes, College of Life Sciences, Capital Normal University, Beijing, China (CNUB; Dong Ren, Curator). The specimens were examined using a Leica MZ12.5 dissecting microscope, and illustrated with the aid of a drawing tube and formatted through Adobe Photoshop CS2 software.

The wing venation nomenclature used in this paper is based on the interpretations and system proposed by Novokshonov (Novokshonov 2002).

Systematic palaeontology

Family Aneuretopsychidae Rasnitsyn & Kozlov, 1990

<http://species-id.net/wiki/Aneuretopsychidae>

Type genus: *Aneuretopsycha* Rasnitsyn & Kozlov, 1990

Emended diagnosis. Moderate-sized insects, mouthpart position most probably opisthognathous; hypognathous placement possible. Adults have a remarkably prolonged, siphonate proboscis, its exterior covered with well-developed dense hairs or microtrichia arranged in distinct annulae; terminus surrounded by a distinctive, lobed, fleshy pseudolabellum. Antennae distinctly longer than proboscis, multiarticulate; articles covered with annulate hairs. Forewing elongate. Sc with multiple branches. Both Rs and MA bifurcating; MP 4-branched. CuA single or probably bifurcating. Hindwing distinctly broader than forewing. Hairs on legs arranged in distinctive rings.

Included genera. In addition to the type genus, *Jeholopsycha* gen. n.

Genus *Jeholopsyche* gen. n.

urn:lsid:zoobank.org:act:EB76FD90-EF08-4907-B75A-71FF4853D614

<http://species-id.net/wiki/Jeholopsyche>**Type species:** *Jeholopsyche liaoningensis* sp. n.

Etymology. The genus name is derived from the Jehol Biota; and *psyche*, from the Greek, meaning “soul” or “mind,” a common suffix for delicately winged insects. Gender feminine.

Diagnosis. In the forewing, Sc with three branches. R1 single. MP originates from stem of MP+CuA a little earlier (more basally) than Rs+MA from R. The Rs+MA bifurcation distinctly basad of the first bifurcation of MP. Both fore- and mid basitarsus shorter than remaining four segments in combined length. The basitarsus in hindlegs almost equal to remaining four segments in combined length.

Composition. Type species only.

Comparison. In the general venation scheme, the *Jeholopsyche* gen. n. differs from *Aneuretopsyche* Rasnitsyn & Kozlov, 1990 by the Sc in the forewing having three branches, R1 single, and Rs+MA bifurcation distinctly basad of the first forking of MP.

***Jeholopsyche liaoningensis* sp. n.**

urn:lsid:zoobank.org:act:4CEF36BC-0B9F-4E57-9E00-877367C5E9F1

http://species-id.net/wiki/Jeholopsyche_liaoningensis

Figs 1–9

Etymology. The specific name refers to Liaoning Province, which includes the site of the fossil's discovery.

Holotype. An almost complete male specimen with well-preserved body and wings, part and counterpart, specimen numbers CNU-M-LB-2005-002-1 and CNU-M-LB-2005-002-2. Forewing length (preserved part) at least 21.5 mm, width 6 mm; body length (excluding antennae and proboscis) minimally 23 mm; proboscis length 6.8 mm; antenna length (preserved part) minimally 10 mm.

Paratype. A poorly-preserved specimen of unknown sex with body and wings, lateral view, specimen number CNU-M-LB-2005-001 (Ren et al. 2009, Fig. 2G).

Locality and horizon. Huangbanjigou Village, Shangyuan Township, Beipiao City, Liaoning Province, China. Yixian Formation, of Early Cretaceous (late Barremian) age.

Description. Male: The specimen shows details of a nearly complete insect (Figs 1–5). A pair of forewings is almost symmetrically arranged, but hindwings are obscure.

Head: Ovipiform in dorsal view, mouthparts opisthognathous or possibly hypognathous. Eyes large, widely separated. Between eyes, frons and clypeus well-developed. Proboscis ca. 6.8 mm long (proboscis length of paratype, 5.8 mm), straight, composed of indistinct labrum proximally and mostly labium, the latter with a distinct, fleshy pseudolabellum apically; mouth ellipsoidal and subterminally placed (Figs

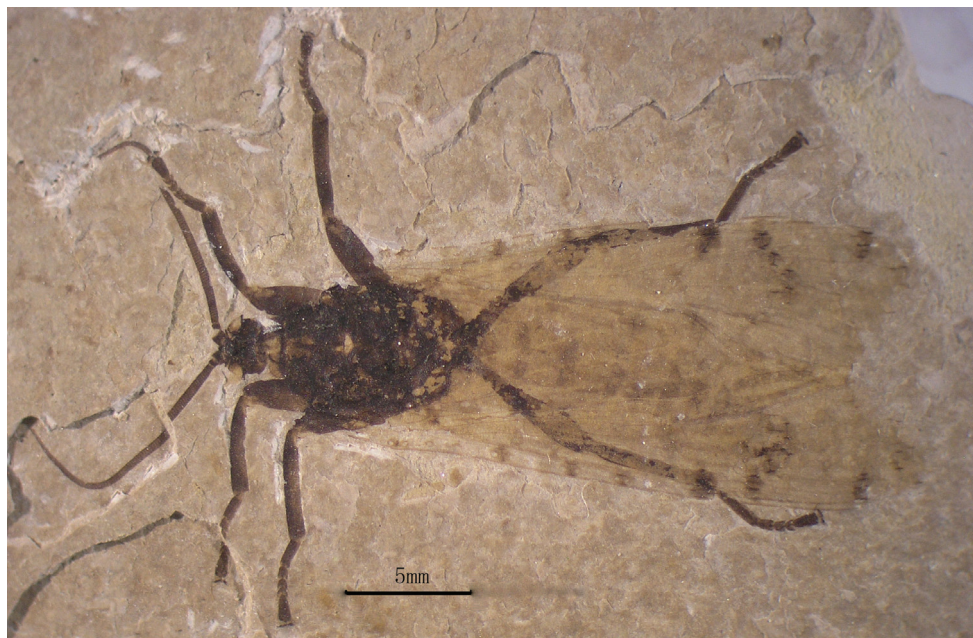


Figure 1. Photo image of *Jeholopsyche liaoningensis*, gen. et sp. n. Holotype, specimen CNU-M-LB-2005-002-1, part.

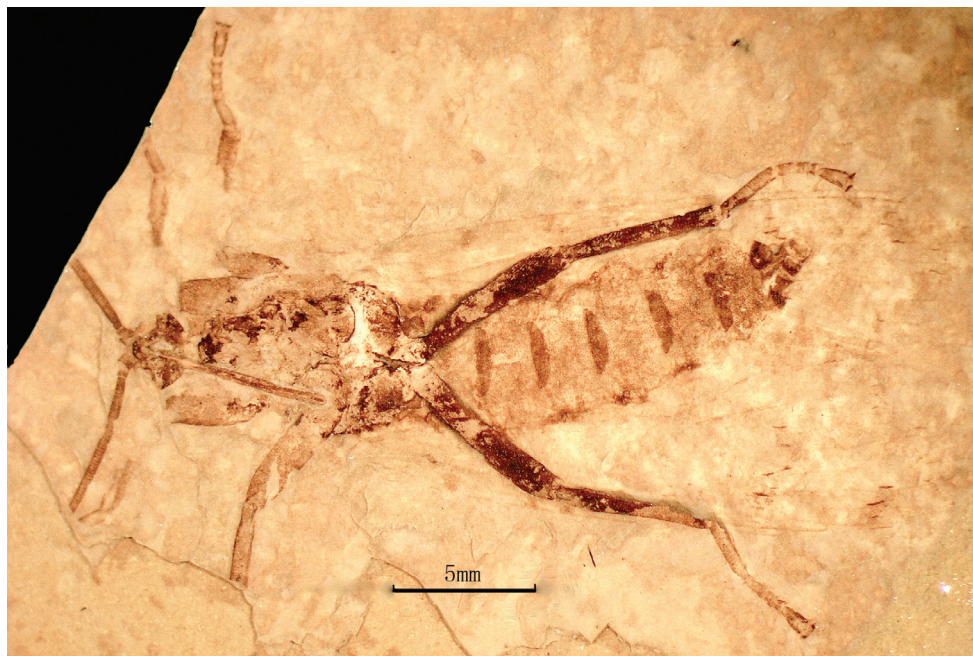


Figure 2. Photo image of *Jeholopsyche liaoningensis*, gen. et sp. n. Holotype, specimen CNU-M-LB-2005-002-2, counterpart.



Figure 3. Photo image of head and antennae of *Jeholopsyche liaoningensis* gen. et sp. n. Holotype, specimen CNU-M-LB-2005-002-1.

7–8). Proboscis siphonate, stylets absent; covered with annulate dense hairs or microtrichia. Antennae distinctly longer than proboscis, flagellum multiarticulate, with annulate hairs.

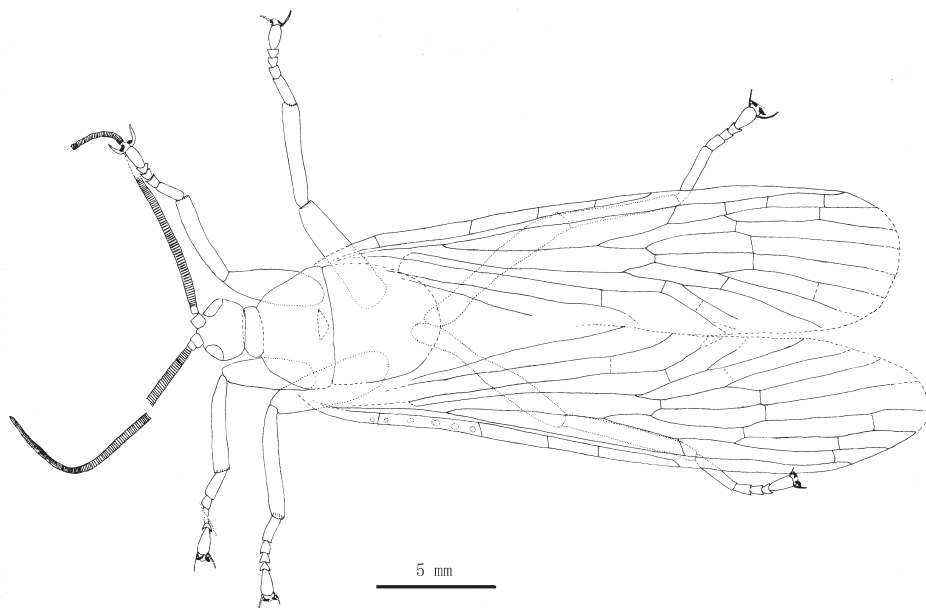


Figure 4. Line drawing of *Jeholopsyche liaoningensis* gen. et sp. n. Holotype in dorsal view, specimen CNU-M-LB2005-002-1.

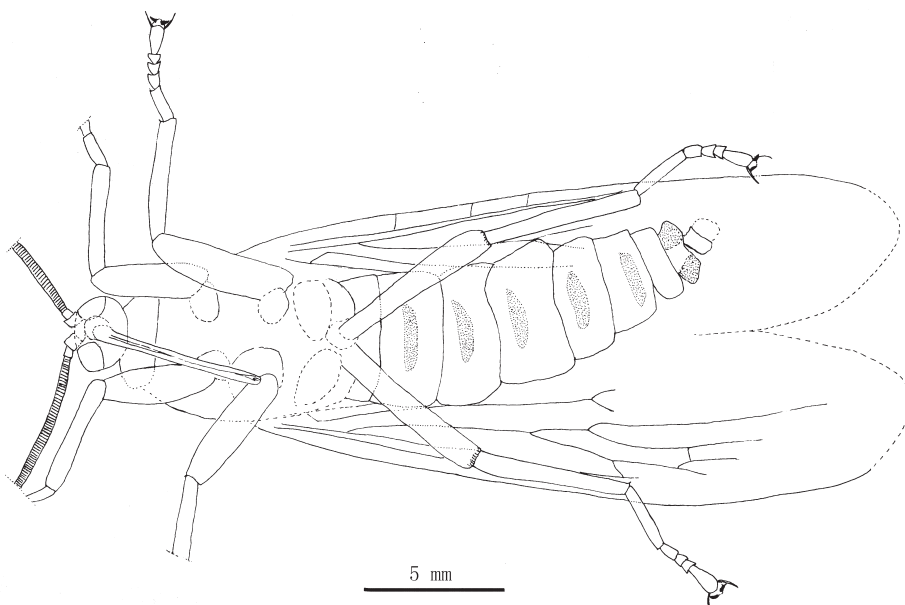


Figure 5. Line drawing of *Jeholopsyche liaoningensis* gen. et sp. n. Holotype in ventral view, specimen CNU-M-LB-2005-002-2.

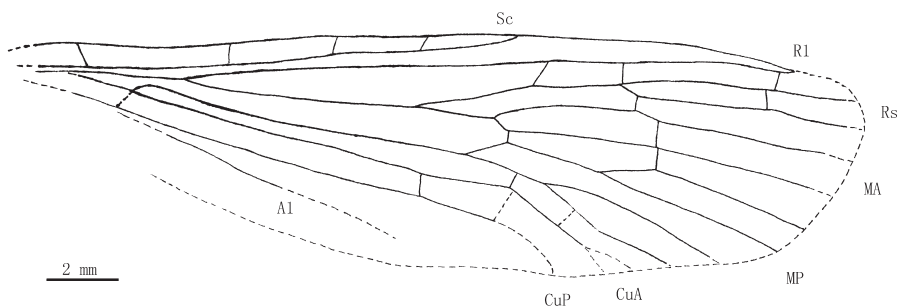


Figure 6. Line drawing of forewing of *Jeholopsyche liaoningensis* gen. et sp. n. Holotype, specimen CNU-M-LB-2005-002-1.

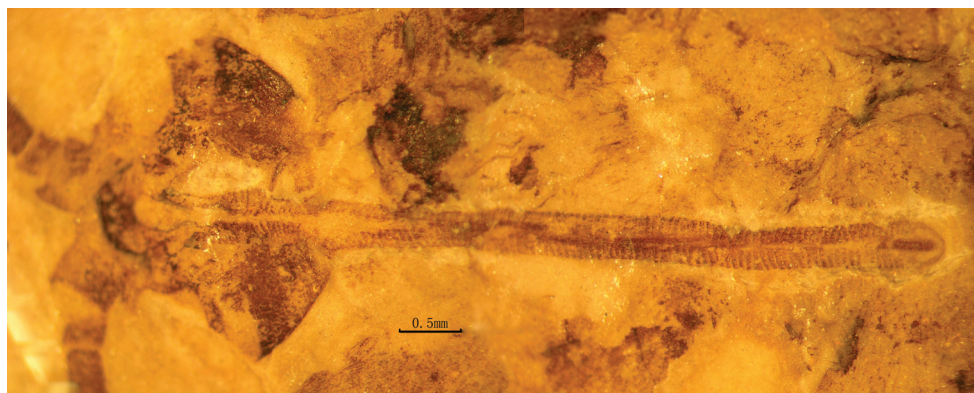


Figure 7. Photo image of proboscis of *Jeholopsyche liaoningensis* gen. et sp. n. Holotype, specimen CNU-M-LB-2005-002-2.

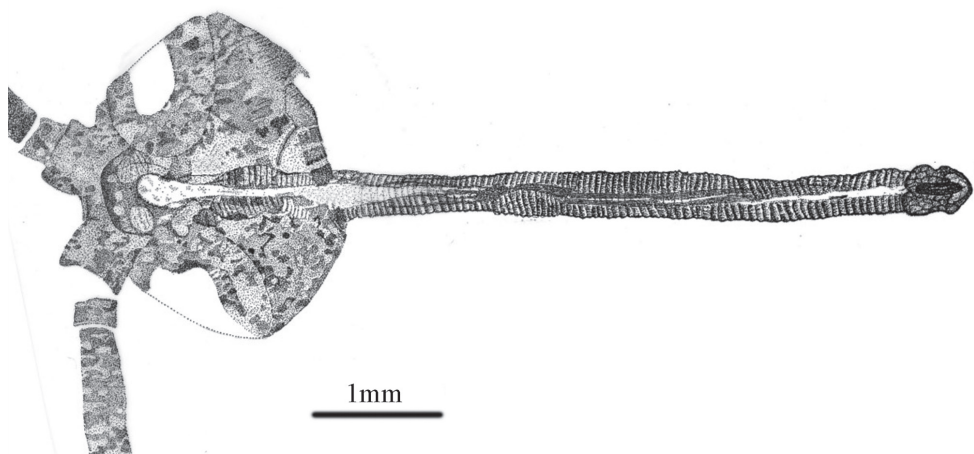


Figure 8. Line drawing of proboscis of *Jeholopsyche liaoningensis* gen. et sp. n. Holotype, specimen CNU-M-LB-2005-002-2.



Figure 9. Photo image of hind tarsi of *Jeholopsyche liaoningensis*, gen. et sp. n. Holotype, specimen CNU-M-LB-2005-002-2.

Thorax: Pronotum small; meso- and metanotum more or less similar to each other; both scutum and scutellum not discernible.

Legs: Coxae smaller than those in typical scorpionflies. The legs entirely covered with annulate pubescence. Tarsi 5-segmented. The fore- and midlegs short, almost equal to antennae in length; their basitarsus distinctly shorter than remaining four segments combined in length. The hindlegs somewhat longer and slender, almost equal to forewing in length, with at least 1 apical spur; the basitarsus longest, almost equal to remaining four segments combined in length. All pretarsi with a pair of distinct claws, each developing a reduced and thickened pulvillus (Fig. 9).

Wings: Forewing slender (length/width ratio about 3.5:1); apical margin obscure, probably rounded; membrane delicate. A humeral vein present at the base of costal area. Sc long, reaching wing margin almost at same level as the MA bifurcation, with three inclined anterior branches; Sc area with some circular pale spots. Pterostigma probably absent. Both Rs and MA with two endings at or near the apical wing margin; Rs forking later than MA; MP forking later than where MA originates from Rs, with 4 long branches. Thyridium untraceable. Anal area broadened distinctly; A1 well developed. Forewing venational details is depicted in Fig. 6; hindwing untraceable.

Abdomen: elongate, tapering apically, with 9 visible segments. Basitergum (T1) small and closely associated with the metathorax; segments 2–6 distinctly longer. Segments 7–8 more slender than 2–6 (Figs 2, 5); segments 9–11 obscure but enlarged, indicating male sex. Cerci unknown.

Discussion and conclusion

Jeholopsyche liaoningensis is the first well-preserved member of the Aneuretopsychidae that exhibits exquisite details of the body, including head and all mouthpart elements, particularly the proboscis. Morphological details of the siphonate proboscis, including setae arranged into annulae, a fleshy pseudolabellum, and an ellipsoidal, subterminal mouth indicate that these insects were fluid feeders on the secretions and exudates from gymnospermous reproductive structures that also co-occur in Yixian deposits. From the proboscis structure and inferred ecological relationships, we conclude that *J. liaoningensis* was a pollinator of gymnosperm hosts that bore deep funnel or other tubular structures laden with nectar-like fluid rewards (Labandeira et al. 2007; Ren et al. 2009). During the mid Early Cretaceous, *J. liaoningensis* also was a member of a diverse guild of long-proboscid insects that included brachycerous flies, kalligrammatid lacewings and perhaps early glossate moths (Labandeira 2010).

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Species of the genus *Thressa* Walker, 1860 from China (Diptera, Chloropidae)

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Abstract

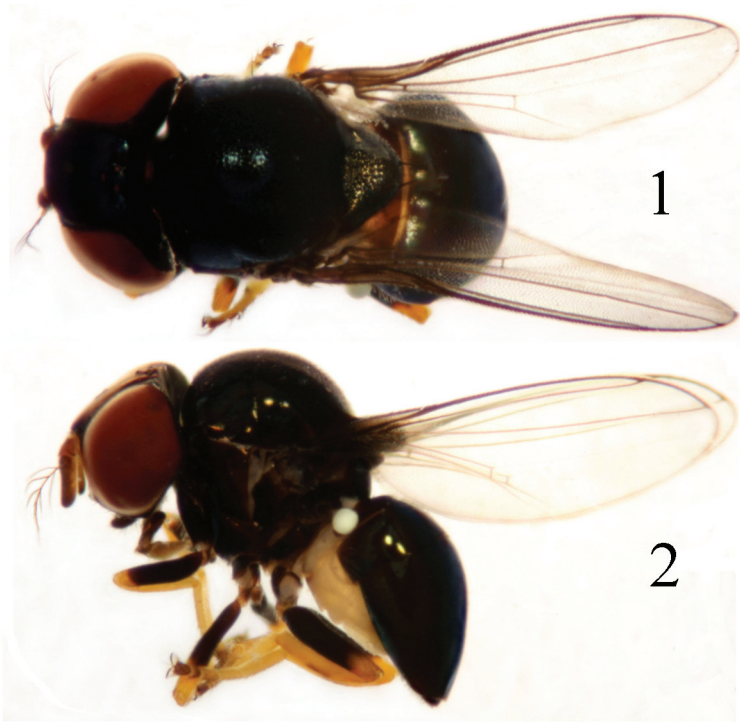
A review of the species of the genus *Thressa* from China is provided. The following four species are described as new to science: *T. bimaculata* **sp. n.**, *T. daiyunshana* **sp. n.**, *T. foliacea* **sp. n.** and *T. longimaculata* **sp. n.** One species, *T. flavior* (Duda), is recorded from China for the first time. A key to the species of the *Thressa* from China is given.

Keywords

Diptera, Chloropidae, *Thressa*, new species, China

Introduction

The genus *Thressa* was erected by Walker (1860). It belongs to the *Thaumatomyia* genus group (Andersson 1977), with the following characters: body (Figs 1, 2) small in size, black species; head higher than long, very large and broad; gena linear; parafacial not visible; ocellar triangle large, covering most of frons, smooth, black with metallic luster; antenna brownish, more or less darkened, scape and pedicel short, postpedicel



Figures 1–2. *Thressa guizhouensis* Yang, male. **1** body, dorsal view **2** body, lateral view.

oval, about twice or more as long as broad, distinctly pubescent; arista peculiar in form, pectinate without marginal pubescence; scutum prominently convex; scutellum short, rounded, basally flat (Andersson 1977; Kanmiya 1983). There are 16 species known worldwide, of which twelve species are only known from the Oriental Region (Sabrosky 1977; Kanmiya 1983; Yang 1992; Nartshuk 1993), three species from the Australian Region (which are also distributed in the Oriental Region) (Sabrosky 1977; Spencer 1986), and one species, *T. spuria* (Thomson), from the Palaearctic Region (China and Pakistan) (Sabrosky 1977; Kanmiya 1983). Nartshuk (1993) reviewed world species, and gave a key to world species except for two species described by Yang (1992) not included.

Presently, five species are known to occur in China (Thomson 1869; Becker and de Meijere 1913; Becker 1916; Yang 1992), including two species from Taiwan, *Thressa beckeri* (de Meijere) and *Thressa cyanescens* (Becker), and three species from continental China, *Thressa spuria* (Thomson), *Thressa guizhouensis* Yang and *Thressa maculata* Yang. Recently, we studied *Thressa* collections including types of two species described by Yang (1992) from the Entomological Museum of China Agricultural University, and found four new species and one species newly recorded from China, which are described in the present paper. A key to the species of the genus from China is presented.

Material and methods

Specimens were studied and illustrated with a ZEISS Stemi 2000–c. Genitalic preparations were made by macerating the apical portion of the abdomen in warm 10% NaOH for 17–20 min, after examination it was transferred to fresh glycerine and stored in a microvial pinned below the specimen. Specimens are deposited in the Entomological Museum of China Agricultural University (CAU), Beijing.

The following abbreviations are used:

ap sc	apical scutellar seta
oc	ocellar seta
orb	orbital seta
if	interfrontal seta
vti	medial vertical seta
vte	lateral vertical seta
pvt	postvertical seta.

Taxonomy

A key to the species of *Thressa* from China (modified from Nartshuk 1993)

- | | | |
|---|--|--------------------------------------|
| 1 | Wing hyaline, with a brown spot near wing apex | 2 |
| – | Wing hyaline, without a brown spot near wing apex | 6 |
| 2 | Costal cell and marginal cell somewhat tinged with brown | |
| | <i>T. longimaculata</i> sp. n. | |
| – | Only costal cell somewhat tinged with brown | 3 |
| 3 | Abdomen entirely black, shiny | 4 |
| – | Abdomen not entirely black, distal portion with yellow in varying degrees ... | |
| | | 5 |
| 4 | Legs yellow, but femora black centrally in female; surstylus basally broad, distally narrowed | <i>T. beckeri</i> (de Meijere, 1913) |
| – | Legs black, but distal part of femora, entire tibiae and tarsi yellow; surstylus short, leaf-shaped | <i>T. foliacea</i> sp. n. |
| 5 | Legs yellow, except for basal fore coxae, mid coxae black; pregonite about as long as postgonite | <i>T. daiyunshana</i> sp. n. |
| – | Legs yellow, except for fore and mid coxae black, fore femora blackish, only distal ends yellow; pregonite shorter than postgonite | |
| | | <i>T. maculata</i> Yang, 1992 |
| 6 | Scutum with yellow spot anterior to scutellum | 7 |
| – | Scutum entirely black, without yellow spot anterior to scutellum | 8 |

- 7 Scutum with 2 slightly impressed short and shallow depressions on dorso-central lines, and 2 small yellow spots on both sides of scutum anterior to scutellum *T. bimaculata* sp. n.
- Scutum without impressed short and shallow depressions on dorsocentral lines, with minutely granulated surface, and a yellow transverse stripe anterior to scutellum *T. flavior* (Duda, 1934)
- 8 Epandrium with a pair of band-like sclerites along posterodorsal notch; cercus with a concavity on ventral margin *T. cyanescens* (Becker, 1916)
- Epandrium without a pair of band-like sclerites along posterodorsal notch; cercus without a concavity on ventral margin 9
- 9 Frons slightly longer than wide (33:28); costal cell almost colorless *T. spuria* (Thomson, 1869)
- Frons about as long as wide; costal cell somewhat tinged with brown *T. guizhouensis* Yang, 1992

***Thressa bimaculata* sp. n.**

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http://species-id.net/wiki/Thressa_bimaculata

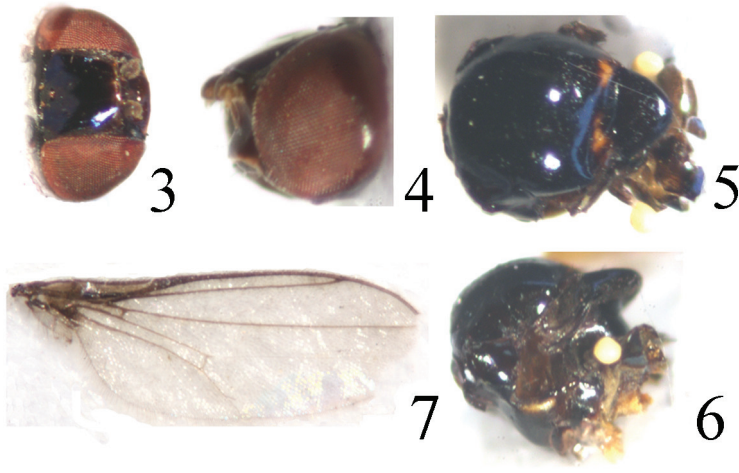
Figs 3–11

Diagnosis. Scutum with 2 small yellow spots on both sides anterior to scutellum. Dorsal portion of katapisternum with a small band-like yellow spot. Legs yellow except tarsomere 5 brown. Abdomen black except tergite 5 medially black and laterally yellow.

Description. Male. Body length 2.0 mm, wing length 1.8 mm.

Head (Figs 3, 4) black without microtomentum, about 0.75 times as long as high, wider than thorax; face sometimes concave in lateral view, bright brown; epistoma yellow; frons black, about as long as wide, projecting only slightly in front of eye, almost entirely occupied by broad ocellar triangle; gena linear; vibrissal angle obtuse; parafacial black, narrow; postgena black; clypeus light black. Ocellar triangle very large and broad, smooth, black, shiny, reaching to anterior margin of frons with broad apex; ocellar tubercle black. Occiput black. Cephalic setae and setulae black, weakly developed; *if* extremely short, in 1 row on the surface of the triangle; *orb* very minute, upright; *oc* extremely small; *pvt* small hair-like, upright, convergent; *vte* shorter than *pvt* and *vti* indistinct. Antenna dark brown, with thick grayish microtomentum, but postpedicel missing in holotype. Proboscis and palpus black with blackish setulae.

Thorax (Figs 5, 6) shiny black without microtomentum, evenly covered with short setulae. Scutum strongly convex, almost as long as wide, with 2 slightly impressed short and shallow depressions on dorsocentral lines, and 2 small yellow spots on both sides of scutum anterior to scutellum. Thoracic pleuron darkish brown except for katapimeron and anepimeron with some pale gray microtomentum; dorsal



Figures 3–7. *Thressa bimaculata* sp. n., male. **3** head, dorsal view **4** head, lateral view **5** mesonotum and scutellum, dorsal view **6** mesonotum and scutellum, lateral view **7** wing.

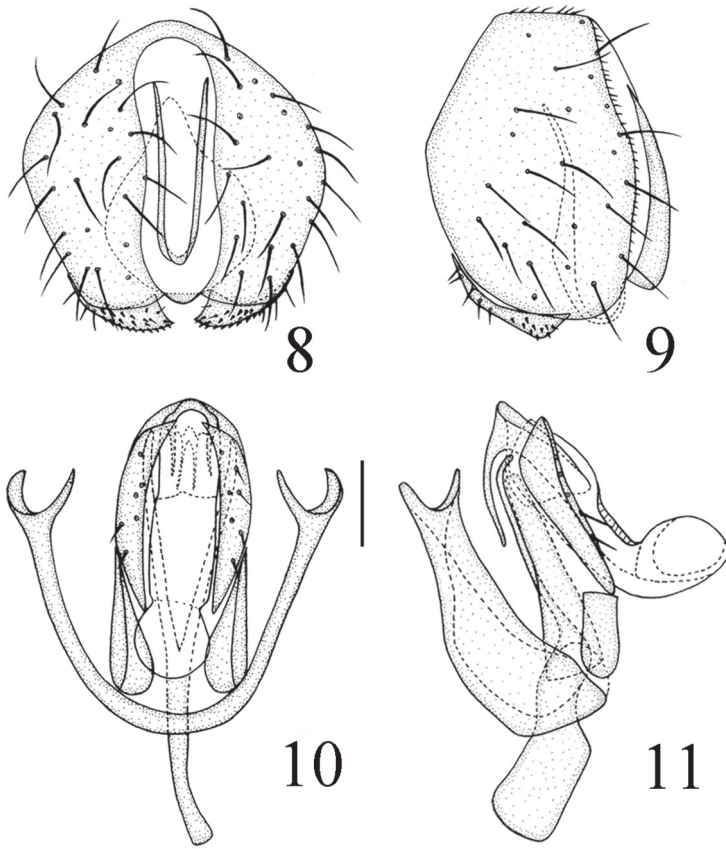
portion of katepisternum with a small band-like yellow spot. Scutellum about 0.7 times as long as wide; *ap sc* short, distinctly shorter than scutellum. Setae and setulae on thorax black. Legs yellow except tarsomere 5 brown. Setulae on legs yellow, but apical portion of tarsi with some brown setulae. Tibial organ distinct, oblong. Wing (Fig. 7) about 2.7 times as long as wide, hyaline without brown spot near wing apex, costal cell somewhat tinged with brown; veins brown. Relative lengths of 2nd : 3rd : 4th costal sections = 5 : 3 : 1; discal cell narrow and long; crossveins r-m and m-m not approximate, r-m at basal 1/3 of discal cell. Halter pale yellow on knob, brown on stem.

Abdomen shiny black except for tergite 5 medially black and laterally yellow; venter yellow. Setae on abdomen black. Male genitalia (Figs 8–11): Epandrium short tubular, weakly sclerotized, yellow with yellow long setulae, with 2 band-like sclerites along posterodorsal notch; surstylus basally broad with short spinous setulae, distally narrowed, attached to epandrium anteroventrally. Cercus small, semicircular in dorsal view. Gonites arranged in a row; postgonite slightly incurved distally with pointed apex, with some sensory setulae, basally gradually narrowed; pregonite shorter than postgonite, basally broad and round, distally narrowed; basiphallus longer than wide, cylindrical; distiphallus cylindrical, longer than basiphallus, extended to basal 1/4 of pregonite, largely membranous but weakly sclerotized on apical end; phallapodeme long, extended near base of basiphallus, with basal stalk broad in lateral view. Hypandrium narrow.

Female. Unknown.

Type material. Holotype ♂, Yunnan: Mengla (21°29'N, 101°33'E, 780m), 9. V. 2009, Guoquan Wang. Male type specimen dry mounted on label laterally on right thorax; postpedicel is missing.

Distribution. China: Yunnan.



Figures 8–11. *Thressa bimaculata* sp. n., male. **8** epandrium, posterior view **9** epandrium, lateral view **10** hypandrium and phallic complex, ventral view **11** hypandrium and phallic complex, lateral view. Scale bar = 0.05mm.

Remarks. The new species is somewhat similar to *T. cyanescens* (Becker) in the scutum with the slightly impressed short and shallow depressions on dorsocentral lines and the abdomen shiny black except tergite 5 medially black and laterally yellow. But it can be separated from the latter by the scutum with 2 small yellow spots on both sides anterior to the scutellum; the dorsal portion of the katapisternum with one small band-like yellow spot; the cercus semicircular in dorsal view. In *T. cyanescens*, the scutum is entirely shiny black; the thoracic pleuron is entirely shiny black except for the microtomentose katapisternum; the cercus has a concavity on the ventral margin (Becker 1916; Kanmiya 1983; Nartshuk 1993).

Etymology. The specific name is from the Latin *bi-* (“two”) and *maculatus* (“maculate”), refers to the scutum with 2 small yellow spots.

***Thressa daiyunshana* sp. n.**

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http://species-id.net/wiki/Thressa_daiyunshana

Figs 12–19

Diagnosis. Thoracic pleuron blackish brown except for posterodorsal portion of katepisternum with a triangular yellowish brown spot; anterodorsal portion of katepimeron with a triangular yellow spot. Cercus triangular in ventral view. Pregonite about as long as postgonite.

Description. Male. Body length 2.9 mm, wing length 2.2 mm.

Head (Fig. 12) black without microtomentum, about 0.8 times as long as high, wider than thorax; face sometimes concave in lateral view, bright brown with a yellow medial stripe more or less on dorsal 1/2; epistoma yellow; frons black, about as long as wide, projecting only slightly in front of eye, almost entirely occupied by broad ocellar triangle; gena narrowed, about 1/10 times as high as postpedicel; vibrissal angle obtuse; parafacial black, linear; postgena black; clypeus light black. Ocellar triangle very large and broad, smooth, black, shiny metallic blue, reaching to anterior margin of frons with broad apex; ocellar tubercle black. Occiput black. Cephalic setae and setulae black, weakly developed; *if* extremely short, in 1 row on the surface of the triangle; *orb* very minute, upright; *oc* subequal to *orb*; *pvt* small hair-like, upright, convergent; *vte* shorter than *pvt* and *vti* indistinct. Antenna darkish brown with thick grayish microtomentum, but pedicel with yellow ventral surface, postpedicel yellow at basoventral portion; postpedicel 2 times as long as wide, parallel-sided; arista pectinate, with 5 branches dorsally and 4 ventrally, apically with some short setulae, black except for basal segment yellow. Proboscis yellow with yellowish setulae and palpus black with black setulae.

Thorax (Figs 13, 14) shiny black without microtomentum, with granulated microsculpture, evenly covered with short setulae. Scutum strongly convex, almost as long as wide. Thoracic pleuron blackish brown except for posterodorsal portion of katepisternum with a triangular yellowish brown spot; anterodorsal portion of katepimeron with a triangular yellow spot. Scutellum about 0.5 times as long as wide; *ap sc* short, distinctly shorter than scutellum. Setae and setulae on thorax black. Legs yellow except for basal fore coxae, mid coxae, tarsomeres 4–5 black. Setulae on legs yellow, but apical portion of tarsi with some brown setulae. Tibial organ distinct, oblong. Wing (Fig. 15) about 2.9 times as long as wide, hyaline with a brown spot near wing apex, costal cell somewhat tinged with brown; veins brown. Relative lengths of 2nd : 3rd : 4th costal sections = 5 : 2.5 : 1; discal cell narrow and long; crossveins r-m and m-m not approximate, r-m at basal 1/3 of discal cell. Halter pale yellow on knob, brown on stem.

Abdomen shiny black except for distal 1/3 of tergite 3 and tergite 4 medially yellow, tergite 5 entirely yellow; venter yellow. Setulae on abdomen brown. Male



Figures 12–14. *Thressa daiyunshana* sp. n., male. **12** head, lateral view **13** head and thorax, dorsal view **14** head and thorax, lateral view.

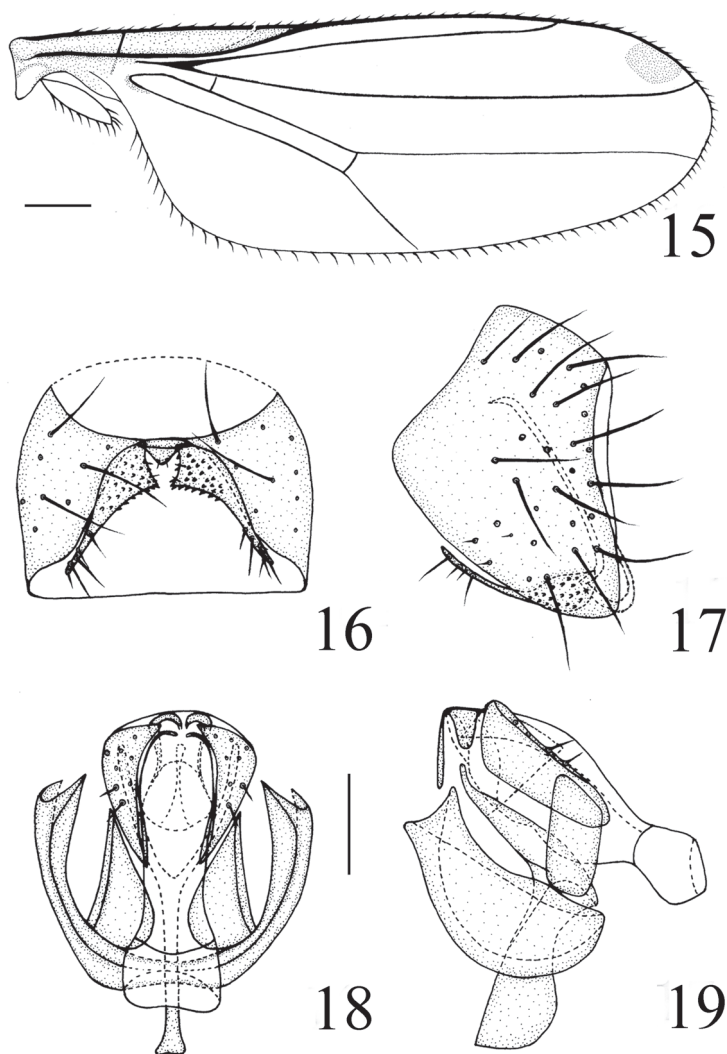
genitalia (Figs 16–19): Epandrium short tubular, weakly sclerotized, yellow with long yellow setulae; surstylus basally broad with short spinous setulae, distally narrowed, attached to epandrium anteroventrally. Cercus triangular in ventral view. Gonites arranged in a row; postgonite slightly incurved distally with pointed apex, basally gradually narrowed, with some sensory setulae; pregonite about as long as postgonite, basally broad and round, distally narrowed; basiphallus longer than wide, cylindrical; distiphallus cylindrical, longer than basiphallus, beyond lower margin of hypandrium, largely membranous but weakly sclerotized on apex; phal-lapodeme long, extended near base of basiphallus, with basal stalk broad in lateral view. Hypandrium narrow.

Female. Unknown.

Type material. Holotype ♂, Fujian: Dehua, Daiyunshan (25°47'N, 118°15'E, 720m), 11. VII. 2010, Xiaoyan Liu. Male type specimen was stored in 75% ethanol.

Distribution. China: Fujian.

Remarks. The new species is somewhat similar to *T. apicalis* (de Meijere) in the wing with a brown spot near the wing apex and the abdomen largely yellow. But it can



Figures 15–19. *Thressa daiyunshana* sp. n., male. **15** wing **16** epandrium, ventral view **17** epandrium, lateral view **18** hypandrium and phallic complex, ventral view **19** hypandrium and phallic complex, lateral view. Scale bar = 0.2mm (15), Scale bar = 0.05mm (16–19).

be separated from the latter by the posterodorsal portion of the katepisternum with a triangular yellowish brown spot; the anterodorsal portion of the katepimeron with a triangular yellow spot; the legs yellow except for the basal fore coxae, mid coxae black. In *T. apicalis*, the dorsal portion of the katepisternum has one elongated yellow spot; the legs are yellow except the basal fore coxae black (de Meijere 1910; Nartshuk 1993).

Etymology. The species is named after the type locality Daiyunshan.

***Thressa foliacea* sp. n.**

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http://species-id.net/wiki/Thressa_foliacea

Figs 20–28

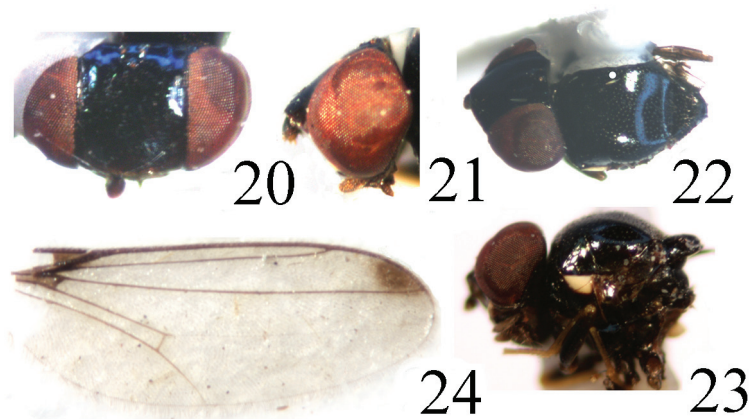
Diagnosis. Antenna black; postpedicel 2.5 times as long as wide. Thoracic pleuron bright black except katapisternum, anepimeron and katepimeron with some pale gray microtomentum; paratergite and dorsal portion of anepisternum with a trapezoidal, bright yellow spot. Surstylus short, leaf-shaped.

Description. Male. Body length 2.3 mm, wing length 1.9 mm.

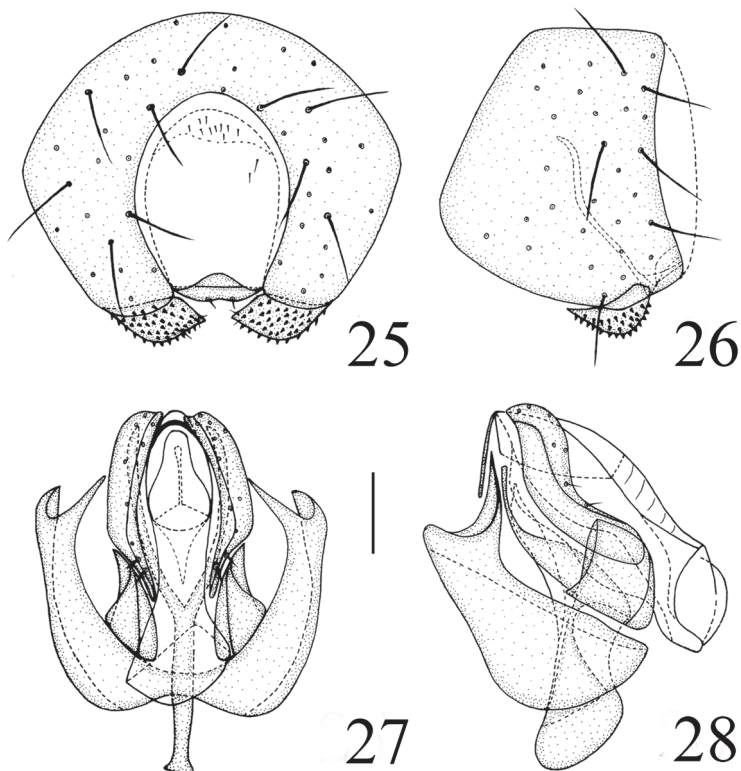
Head (Figs 20, 21) black without microtomentum, about 0.9 times as long as high, wider than thorax; face sometimes concave in lateral view, bright brown with two yellow spots below antenna; epistoma yellow; frons black, 1.1 times as long as wide, projecting only slightly in front of eye, almost entirely occupied by broad ocellar triangle; gena narrow; vibrissal angle obtuse; parafacial black, linear; postgena black; clypeus light black. Ocellar triangle very large and broad, smooth, black, shiny metallic blue, reaching to anterior margin of frons with broad apex; ocellar tubercle black. Occiput black. Cephalic setae and setulae black, weakly developed; *if* extremely short, in 1 row on the surface of the triangle; *orb* very minute, upright; *oc* subequal to *orb*; *pvt* small hair-like, upright, convergent; *vte* shorter than *pvt* and *vti* indistinct. Antenna black with thick grayish microtomentum; postpedicel 2.5 times as long as wide, parallel-sided; arista missing in holotype. Proboscis and palpus blackish brown with brownish setulae.

Thorax (Figs 22, 23) shiny black without microtomentum, with granulated microsculpture, evenly covered with short setulae. Scutum strongly convex, almost as long as wide. Thoracic pleuron bright black except for katapisternum, anepimeron and katepimeron with some pale gray microtomentum; paratergite and dorsal portion of anepisternum with a trapezoidal, bright yellow spot. Scutellum about 0.5 times as long as wide; *ap sc* short, distinctly shorter than scutellum. Setae and setulae on thorax black. Legs black except for distal part of femora, entire tibiae and tarsi yellow. Setulae on legs yellow, but apical portion of tarsi with some brown setulae. Tibial organ distinct, oblong. Wing (Fig. 24) about 2.9 times as long as wide, hyaline with a brown spot near wing apex, costal cell somewhat tinged with brown; veins brown. Relative lengths of 2nd : 3rd : 4th costal sections = 5 : 2.5 : 1; discal cell narrow and long; crossveins r-m and m-m not approximate, r-m at basal 1/3 of discal cell. Halter pale yellow on knob, brown on stem.

Abdomen shiny black; venter yellow. Setulae on abdomen black. Male genitalia (Figs 25–28): Epandrium short tubular, weakly sclerotized, black with long black setulae; surstylus short, leaf-shaped with short spinous setulae. Cercus with a concavity on ventral margin. Gonites arranged in a row; postgonite slightly incurved distally with blunt apex, basal 1/4 obviously narrowed, with some sensory setulae; pregonite shorter, about 0.5 times as long as postgonite, basally broad, distally narrowed; basiphallus



Figures 20–24. *Thressa foliacea* sp. n., male. **20** head, dorsal view **21** head, lateral view **22** mesonotum and scutellum, dorsal view **23** mesonotum and scutellum, lateral view **24** wing.



Figures 25–28. *Thressa foliacea* sp. n., male. **25** epandrium, posterior view **26** epandrium, lateral view **27** hypandrium and phallic complex, ventral view **28** hypandrium and phallic complex, lateral view. Scale bar = 0.05mm.

longer than wide, cylindrical; distiphallus cylindrical, longer than basiphallus, beyond lower margin of hypandrium, largely membranous but weakly sclerotized on apical end; phallapodeme long, extended near base of basiphallus, with basal stalk short and broad in lateral view. Hypandrium broad.

Female. Unknown.

Type material. Holotype ♂, Hainan: Baisha (19°11'N, 109°25'E, 430m), 19. X. 2007, Xingyue Liu. Male type specimen dry mounted on label laterally on right thorax; arista is missing.

Distribution. China: Hainan.

Remarks. The new species is somewhat similar to *T. punctifera* (de Meijere) in the wing with a brown spot near the wing apex and the abdomen shiny black. But it can be separated from the latter by the paratergite and dorsal portion of the anepisternum with one trapezoidal, bright yellow spot; the legs black except for the distal part of femora, entire tibiae and tarsi yellow; the surstylus short, leaf-shaped. In *T. punctifera*, the katepisternum has one narrow yellow spot; the legs are yellow except for the fore femora brownish; the surstylus is broad basally and narrow distally (de Meijere 1910; Nartshuk 1993).

Etymology. The specific name is from the Latin *foliaceus* (“leaf-shaped”), refers to the leaf-shaped surstylus.

***Thressa longimaculata* sp. n.**

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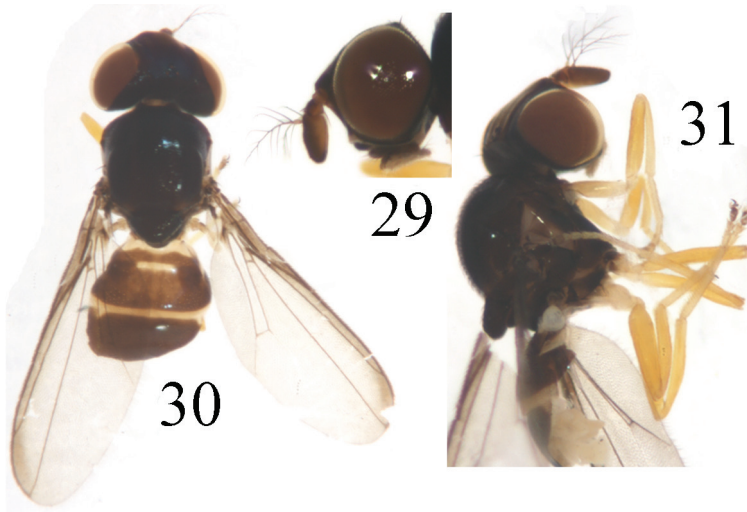
http://species-id.net/wiki/Thressa_longimaculata

Figs 29–36

Diagnosis. Thoracic pleuron brown except for katepisternum and katepimeron with black lower portion; paratergite and posterodorsal portion of anepisternum with a triangular yellow spot. Wing hyaline with a long brown spot near wing apex, costal cell and marginal cell somewhat tinged with brown. Cercus semicircular in dorsal view. Postgonite with basal 1/3 obviously narrowed.

Description. Male. Body length 2.6 mm, wing length 2.0 mm

Head (Fig. 29) black without microtomentum, about 0.85 times as long as high, wider than thorax; face sometimes concave in lateral view, bright brown with a yellow medial stripe more or less on dorsal 1/2; epistoma yellow; frons black, about as long as wide, projecting only slightly in front of eye, almost entirely occupied by broad ocellar triangle; gena narrow, about 1/10 times as high as postpedicel; vibrissal angle obtuse; parafacial black, linear; postgena black; clypeus light black. Ocellar triangle very large and broad, smooth, black, shiny metallic blue, reaching to anterior margin of frons with broad apex; ocellar tubercle black. Occiput black. Cephalic setae and setulae black, weakly developed; *if* extremely short, in 1 row on the surface of the triangle; *orb* very minute, upright; *oc* extremely small; *pvt* small hair-like, upright, convergent; *vte* short than *pvt* and *vti* indistinct. Antenna darkish brown with thick grayish microtomentum, but pedicel with yellow ventral surface, postpedicel yellow.

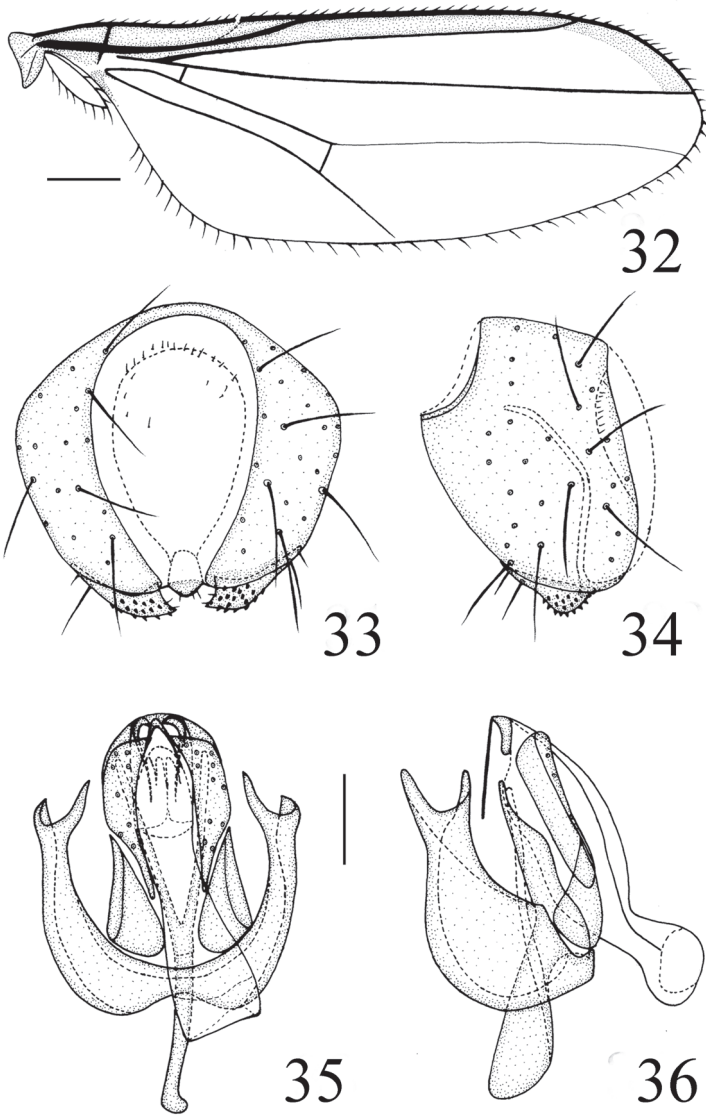


Figures 29–31. *Thressa longimaculata* sp. n., male. **29** head, lateral view **30** head and thorax, dorsal view **31** head and thorax, lateral view.

low at basoventral portion; postpedicel 2 times as long as wide, parallel-sided; arista pectinate, with 5 branches dorsally and 4 ventrally, apically with some short setulae, black except for basal segment yellow. Proboscis yellow with yellowish setulae and palpus black with black setulae.

Thorax (Figs 30, 31) shiny black without microtomentum, with granulated micro-sculpture, evenly covered with short setulae. Scutum strongly convex, almost as long as wide. Thoracic pleuron brown except for katepisternum and katepimeron with black lower portion; paratergite and posterodorsal portion of anepisternum with a triangular yellow spot. Scutellum about 0.5 times as long as wide; *ap sc* short, distinctly shorter than scutellum. Setae and setulae on thorax black. Legs yellow except for basal portion of mid coxae, tarsomere 5 brown. Setulae on legs yellow, but apical portion of tarsi with some brown setulae. Tibial organ distinct, oblong. Wing (Fig. 32) about 3.1 times as long as wide, hyaline with a brown spot near wing apex, costal cell and marginal cell somewhat tinged with brown; veins brown. Relative lengths of 2nd : 3rd : 4th costal sections = 5 : 2.5 : 1; discal cell narrow and long; crossveins r-m and m-m not approximate, r-m at basal 1/3 of discal cell. Halter pale yellow on knob, brown on stem.

Abdomen shiny blackish brown except tergite 5 yellow with a M-shaped black spot; venter yellow. Setulae on abdomen brown. Male genitalia (Figs 33–36): Epandrium short tubular, weakly sclerotized, yellow with long yellow setulae; surstylus basally broad with short spinous setulae, distally narrowed, attaching to epandrium anter-oventrally. Cercus semicircular in dorsal view. Gonites arranged in a row; postgonite gradually narrowed distad and slightly convergent, basal 1/3 obviously narrowed, with sensory setulae; pregonite shorter than postgonite, basally broad and round, distally narrowed; basiphallus longer than wide, cylindrical; distiphallus cylindrical, longer than basiphallus, beyond lower margin of hypandrium, largely membranous but weak-



Figures 32–36. *Thressa longimaculata* sp. n., male. **32** wing **33** epandrium, posterior view **34** epandrium, lateral view **35** hypandrium and phallic complex, ventral view **36** hypandrium and phallic complex, lateral view. Scale bar = 0.2mm (32), Scale bar = 0.05mm (33–36).

ly sclerotized on apical end; phallapodeme long, extended near base of basiphallus, with basal stalk broad in lateral view. Hypandrium narrow.

Female. Unknown.

Type material. Holotype ♂, Fujian: Wuyishan (26°54'N, 116°42'E, 850m), 17. VII. 2010, Xiaoyan Liu. Male type specimen was stored in 75% ethanol.

Distribution. China: Fujian.

Remarks. The new species is somewhat similar to *T. signifera* Walker in the wing with a brown spot near the wing apex, costal cell and marginal cell somewhat tinged with brown. But it can be separated from the latter by the katepisternum and katepimeron with the black lower portion; the paratergite and posterodorsal portion of the anepisternum with one triangular yellow spot; the femora entirely yellow. In *T. signifera*, the thoracic pleuron has a white band; the femora are black except yellow distally (Walker 1860, Nartshuk 1993).

Etymology. The specific name is from the Latin *longi*- (“long”) and *maculatus* (“maculate”), refers to the long brown spot near the wing tip.

***Thressa flavior* (Duda, 1934)**

http://species-id.net/wiki/Thressa_flavior

Figs 37–44

Chalcidomyia flavior Duda, 1934: 124. Type locality: Sumatra. (Holotypes deposited in Museum für Naturkunde, Berlin).

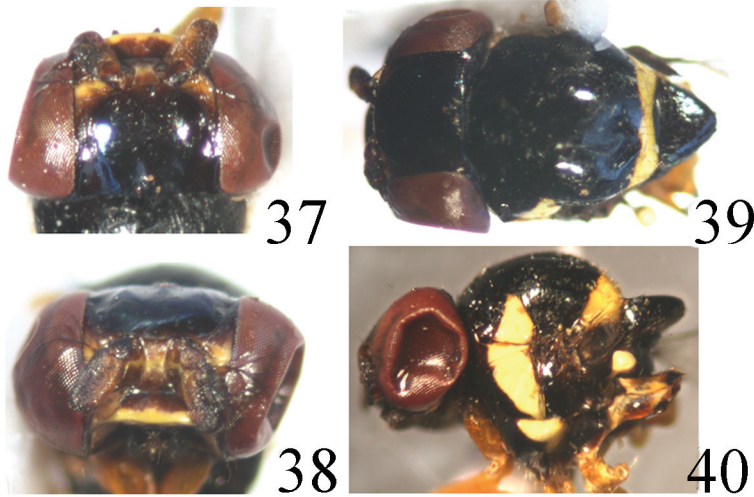
Thressa flavior (Duda): Sabrosky 1977: 319; Nartshuk 1993: 114.

Diagnosis. Scutum with a yellow transverse stripe anterior to scutellum, about 1/7 times as long as scutum. Paratergite and anepisternum with one oblique, wide, yellow stripe; dorsal portion of katepisternum with a small triangular yellow spot. Surstylus pipe-like. Cercus long, oblong in dorsal view.

Description. Male. Body length 3.0–3.5 mm, wing length 2.4–2.9 mm.

Head (Figs 37, 38) black without microtomentum, about 0.8 times as long as high, wider than thorax; face sometimes concave in lateral view, bright brown with a yellow transverse stripe below antenna; epistoma yellow; frons black except for anterior 1/8 yellow, about 0.75 times as long as wide, projecting only slightly in front of eye, almost entirely occupied by broad ocellar triangle; gena black, narrow, about 1/10 times as high as postpedicel; vibrissal angle obtuse; parafacial black, linear; postgena black; clypeus light black. Ocellar triangle very large and broad, shiny black, smooth, reaching to anterior margin of frons with broad apex; ocellar tubercle black. Occiput black. Cephalic setae and setulae black, weakly developed; *if* extremely short, in 1 row on the surface of the triangle; *orb* very minute, upright; *oc* extremely small; *pvt* small hair-like, upright, convergent; *vte* shorter than *pvt* and *vti* indistinct. Antenna black with thick grayish microtomentum, but postpedicel with yellowish brown ventral surface; postpedicel 2 times as long as wide, parallel-sided; arista pectinate with 4 branches dorsally and 3 ventrally, apically with some short setulae, black except for basal segment yellow. Proboscis and palpus light blackish brown with blackish setulae.

Thorax (Figs 39, 40) black without microtomentum, with granulated microsculpture, evenly covered with short setulae. Scutum strongly convex, almost as long as wide, with a yellow transverse stripe anterior to scutellum, about 1/7 times as long as scutum. Thoracic pleuron black except for paratergite and anepisternum with one oblique,



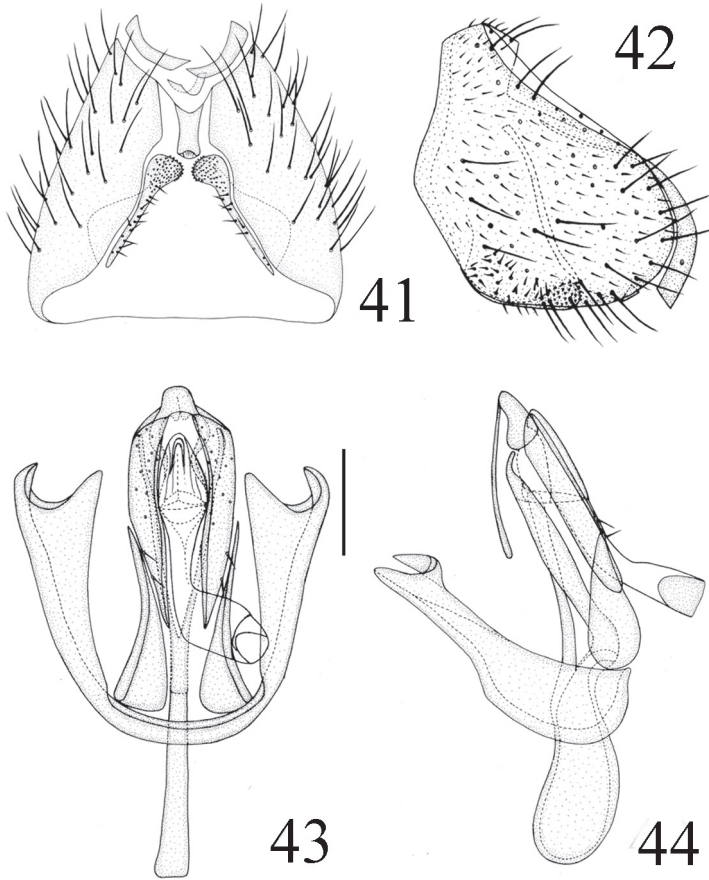
Figures 37–40. *Thressa flavior* (Duda), male. **37** head, dorsal view **38** head, facial view **39** mesonotum and scutellum, dorsal view **40** mesonotum and scutellum, lateral view.

wide, yellow stripe; dorsal portion of katepisternum with a small triangular yellow spot. Scutellum about 0.7 times as long as wide; *ap sc* short, distinctly shorter than scutellum. Setae and setulae on thorax black. Legs yellow except for tarsomere 5 brown. Setulae on legs yellow, but apical portion of tarsi with some brown setulae. Tibial organ distinct, oblong. Wing about 2.7 times as long as wide, hyaline without brown spot near wing apex, costal cell somewhat tinged with brown; veins brown. Relative lengths of 2nd: 3rd: 4th costal sections = 5: 2: 1; discal cell narrow and long; crossveins r-m and m-m not approximate, r-m at basal 0.4 of discal cell. Halter pale yellow on knob, brown on stem.

Abdomen mainly yellow, tergite 2 posteriorly with two narrow black lateral stripes, basal 1/2 of tergite 3 with a transverse black stripe, rest of tergite 3 and following tergites with a mid-longitudinal black stripe; venter yellow. Setulae on abdomen black. Male genitalia (Figs 41–44): Epandrium short tubular, weakly sclerotized, yellow with long yellow setulae, with 2 band-like sclerites along posterodorsal notch; surstylus pipe-like, basally broad with short spinous setulae, distally narrowed, attaching to epandrium anteroventrally. Cercus long, oblong in ventral view. Gonites arranged in a row; postgonite long with some sensory setulae; pregonite slightly shorter than postgonite, basally broad, distally narrowed; basiphallus longer than wide, cylindrical; distiphallus cylindrical, longer than basiphallus, reaching to dorsal margin of hypandrium, largely membranous but weakly sclerotized on apical end; phallapodeme long, extended near base of basiphallus, with basal stalk broad in lateral view. Hypandrium narrow.

Female. Unknown.

Specimens examined. Holotype ♂, Sumatra, 1924, E. Jacobson; 1 ♂, Yunnan: Menglun (21°55'N, 101°13'E, 630m), 10. III. 1999, Ding Yang; 1 ♂, Hainan: Wuzhishan



Figures 41–44. *Thressa flavior* (Duda), male. **41** epandrium, ventral view **42** epandrium, lateral view **43** hypandrium and phallic complex, ventral view **44** hypandrium and phallic complex, lateral view. Scale bar = 0.1mm.

(18°50'N, 109°42'E, 600m), 16. V. 2007, Kuiyan Zhang. Type specimen pinned thoracic pleuron, other specimens dry mounted on label laterally on right thorax.

Distribution. China: Yunnan, Hainan; Indonesia; Malaysia.

Remarks. The species is somewhat similar to *T. polita* (de Meijere) in the scutum with a yellow transverse stripe anterior to the scutellum. But it can be separated from the latter by the abdomen being mainly yellow, tergite 2 posteriorly with two narrow black lateral stripes, basal 1/2 of tergite 3 with a transverse black stripe, rest of tergite 3 and following tergites with a mid-longitudinal black stripe; the legs entirely yellow. In *T. polita*, the abdomen is mostly black except for the basal portion and posterior margin yellow; the legs are yellow except the femora partly black (de Meijere 1910; Nartshuk 1993).

***Thressa beckeri* (de Meijere, 1913)**

http://species-id.net/wiki/Thressa_beckeri

Hemisphaerisoma politum Becker, 1911: 47. Type locality: Taiwan (Syntypes deposited in Hungarian Natural History Museum, Budapest)

Chalcidomyia beckeri de Meijere, 1913: 292.

Thressa beckeri (de Meijere): Sabrosky, 1977: 319; Spencer 1986: 609; Nartshuk, 1993: 117.

Diagnosis. Postpedicel narrow and elongate, 3 times longer than wide. Legs yellow, but entire femora yellow in male; black centrally in female. Wing hyaline with a brown spot near wing apex. Abdomen entirely dark, bluish black.

Distribution. China: Taiwan; Indonesia; Philippines; Australia.

Remarks. Becker (1911) firstly described *Hemisphaerisoma politum* from Taiwan and gave the figure of the head. De Meijere (1913) transferred it to *Chalcidomyia*, and gave the new name, *Chalcidomyia beckeri* (*C. politum* preoccupied by *C. polita* de Meijere (1910)). *Thressa beckeri* (de Meijere) was treated as synonymy with *T. punctifera* (de Meijere) from Java by Duda (1934), but Sabrosky (1977) accepted them as two distinct species.

***Thressa cyanescens* (Becker, 1916)**

http://species-id.net/wiki/Thressa_cyanescens

Chalcidomyia cyanescens Becker, 1916: 440. Type locality: Taiwan (Holotypes deposited in Hungarian Natural History Museum, Budapest).

Thressa cyanescens (Becker): Sabrosky 1977: 319; Kanmiya 1983: 236; Nartshuk 1993: 114.

Diagnosis. Thorax entirely shiny black. Legs yellow except fore coxae black, in male fore femora black except distal part yellow; in female, all femora black except distal part yellow. Wing hyaline without a brown spot near wing apex. Epandrium with 2 narrow bands of sclerite along posterodorsal notch. Cercus small with a concavity on ventral margin.

Distribution. China: Taiwan; Japan.

Remarks. Becker (1916) firstly described *Chalcidomyia cyanescens* from Taiwan. Sabrosky (1977) transferred it to *Thressa*. Kanmiya (1983) newly recorded *Thressa cyanescens* from Japan, and gave the figures of male genitalia and abdomen lateral view.

***Thressa spuria* (Thomson, 1869)**

http://species-id.net/wiki/Thressa_spuria

Geomyza spuria Thomson, 1869: 599. Type locality: China (Holotypes deposited in Naturhistoriske Riksmuseet, Stockholm).

Thressa spuria (Thomson): Sabrosky 1977: 319; Nartshuk 1993: 114.

Diagnose. Frons slightly longer than wide (33:28). Femora black, tibiae and tarsi entirely yellow. Wing hyaline without a brown spot near wing apex. Surstylus short, nearly triangular. Pregonite as long as postgonite.

Distribution. China; Pakistan.

Remarks. Thomson (1869) firstly described *Geomyza spuria* from China. Sabrosky (1977) transferred it to *Thressa*. Nartshuk (1993) gave the figures of male genitalia. I examined the photos of the holotype in the Naturhistoriske Riksmuseet.

Thressa guizhouensis Yang, 1992

http://species-id.net/wiki/Thressa_guizhouensis

Thressa guizhouensis Yang, 1992: 315. Type locality: China (Syntypes deposited in Entomological museum of China Agricultural university).

Diagnosis. Legs black except for distal part of femora, entire tibiae and tarsi yellow. Wing hyaline without a brown spot near wing apex. Abdomen shiny black. Surstylus short, triangular. Pregonite about 0.7 times as long as postgonite.

Specimens examined. Holotype ♂, Allotype ♀, Guizhou: Guiyang, 25. VII. 1987, Jikun Yang; 2 ♂♂, Fujian: Wuyishan, 2. VII. 2009, Li Shi; 6 ♀♀, 3 ♂♂, Fujian: Nanping, 18. VII. 2009, Xiaoyan Liu; 1 ♂, 1 ♀, Fujian: Wuyishan, 27. IX. 2009, Weina Cui; 2 ♂♂, Fujian: Wuyishan, 30. IX. 2009, Tingting Zhang; 3 ♂♂, 2 ♀♀, Fujian: Wuyishan, 18. VII. 2010, Xiaoyan Liu; 8 ♂♂, 3 ♀♀, Fujian: Wuyishan, 21–23. VII. 2010, Xiaoyan Liu.

Distribution. China: Guizhou, Fujian.

Remarks. Yang (1992) firstly described *Thressa guizhouensis* from China and gave the figures of male genitalia.

Thressa maculata Yang, 1992

http://species-id.net/wiki/Thressa_maculata

Thressa maculata Yang, 1992: 315. Type locality: China (Holotypes deposited in Entomological museum of China Agricultural university).

Diagnose. Leg yellow, except for fore and mid coxae black, fore femora blackish with yellow distally. Wing hyaline with a brown spot near wing apex. Abdomen shiny yellow except tergites 1–3 black. Surstylus short, incurved distally. Pregonite shorter, about 0.3 times as long as postgonite.

Specimens examined. Holotype ♂, Yunnan: Jinghong, 12. IV. 1981, Fasheng Li.

Distribution. China: Yunnan.

Remarks. Yang (1992) firstly described *Thressa maculata* from China and gave the figures of male genitalia.

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The genus *Diolcogaster* Ashmead, 1900 (Hymenoptera, Braconidae, Microgastrinae) from China

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Abstract

The genus *Diolcogaster* Ashmead, 1900 (Hymenopteran, Braconidae, Microgastrinae) from China is revised and keyed, with nine new species, namely *D. bifurcifossa* **sp. n.**, *D. brevivena* **sp. n.**, *D. grammata* **sp. n.**, *D. ineminens* **sp. n.**, *D. laetimedia* **sp. n.**, *D. pluriminitida* **sp. n.**, *D. praritas* **sp. n.**, *D. punctatiscutum* **sp. n.** and *D. translucida* **sp. n.** described and illustrated, and one species, *D. pernicios*a (Wilkinson, 1929) recorded for the first time from China. A key to the Chinese species of this genus is provided.

Keywords

Hymenoptera, Braconidae, Microgastrinae, *Diolcogaster*, new species, China, key

Introduction

The genus *Diolcogaster* (Braconidae, Microgastrinae) was proposed by Ashmead (1900) based on the type species, *Microgaster melligaster* Provancher, 1886, that was later trans-

ferred into the genus *Hygroplitis* Thomson, 1895 (Mason 1981). Mason (1981) placed the bulk of those species grouped by Nixon (1965) under *Protomicroplitis* Ashmead, 1898 in this genus, excluding the species of the *calceata*-, *marginata*-, *lepelleyi*-, *calliptera*-, *schunkei*- group and some New World species not known to Nixon, and synonymized *Zadiolcogaster* with *Diolcogaster*. Saeed et al. (1999) revised the Australasian *Diolcogaster*, and described more than 20 species.

At present, this genus includes 66 described species widespread in the world (Ashmead 1900; Viereck 1913; Muesebeck 1922; Wilkinson 1929, 1930; Granger 1949; Muesebeck and Walkley 1951; Telenga 1955; Nixon 1965; Tobias 1971, 1976; You et al. 1990; Saeed et al. 1999; Luo and You 2003, 2005; Chen and Song 2004; Yu et al. 2005), of which only four species, *D. alvearia* (Fabricius, 1798), *D. facetosa* (Weed, 1888), *D. chaoi* (Luo & You) and *D. spreata* (Marshall, 1885), were once reported to occur in China (Fahringer 1935; You et al. 1990; Luo and You 2003, 2005; Chen and Song 2004). However, the Nearctic species *D. facetosa* was obviously misidentified by Chen and Song (2004) in China because Nixon (1965) stated that this species has the ovipositor sheath with 2–3 blackened setae at its apex and apical segment of front tarsus with a less well developed lateral spine while Chen and Song (2004) described this species with the ovipositor sheath only with setae at apex, and apical segment of front tarsus without a lateral spine.

Species of this genus are parasitoids of Lepidoptera hosts that include the family Arctiidae, Geometridae, Lasiocampidae, Limacodidae, Lymantriidae, Noctuidae, Notodontidae, Plutellidae, Pyralidae, Tenthredinidae, and Thaumetopoeidae (Marshall 1885; Muesebeck 1922; Wilkinson 1929; Granger 1949; Hedwig 1950; Telenga 1955; Nixon 1965; Tobias 1971, 1976; Saeed et al. 1999), some of which are important pests causing damages on agricultural production.

Recently nine new species and a newly recorded species, *Diolcogaster perniciososa* (Wilkinson, 1929) of this genus were founded from China when we examined specimens of Parasitic Hymenoptera Collection of Zhejiang University (ZJUH) during an on-going project on the revision of the Chinese Microgastrinae.

Material and methods

Specimens studied are deposited in the Parasitic Hymenoptera Collection of Zhejiang University, Hangzhou, China (ZJUH). Descriptions and measurements were made under a stereomicroscope (Zeiss Stemi 2000-C). All photographs were made with a Leica DFC425 Camera attached to a stereomicroscope (Leica M205 A, Germany) and Leica Application Suite version 3.60 software.

Terminology and measurement follows Nixon (1965) and Mason (1981), veins follows the modified Comstock-Needham system (van Achterberg 1979). Abbreviations used in this paper are as follows: POL = postocellar line, OOL = ocular-ocellar line, OD = ocellar diameter; T1 = the 1st tergite of metasoma, T2 = the 2nd tergite of metasoma, T3 = the 3rd tergite of metasoma; L = length, W = width.

Taxonomy

Genus *Diolcogaster* Ashmead, 1900

<http://species-id.net/wiki/Diolcogaster>

Diolcogaster Ashmead 1900, 23(1206): 132; Viereck 1913, 46: 366; Viereck 1914, 83: 46; Viereck (1916)1917, 22: 202; Lyle 1918 51: 104, synon. by Szépligeti; Mason 1981 115: 113; Marsh et al. 1987 13: 32; Austin and Dangerfield 1992, 6(1): 5, 25; Whitfield 1997, No. 1: 337; Chen and Song 2004: 175. Type species: *Microgaster brevicaudus* Provancher, 1886. Designated by Viereck 1914.

Zadiolcogaster Viereck 1913, 46: 366; Viereck 1921, 59: 147, synon. by Muesebeck and Walkley 1951. Type species: *Zadiolcogaster anomus* Viereck, 1913.

Diagnosis. Areolet of fore wing present, large or small, quadrangular or triangular; vannal lobe with margin usually convex and setose but sometimes varying to straight and setose and exceptionally concave and without setae. Side of pronotum always with ventral groove, rarely with dorsal groove. Propodeum usually rugose but occasionally smooth; median longitudinal carina strong and complete.

First tergite of metasoma bearing a sharp median longitudinal groove through most of its length; but varying from short and expanded apically to strongly narrowed, lorate. Second tergite with well- or ill-defined median field. Third tergite smooth, but strongly rugose when the second one is similarly sculptured. Hind coxa large, inner hind tibial spurs usually long.

Hypopygium short and inflexible. Ovipositor sheaths short, usually with dense setae near the apex; sheaths of most species with a few modified strong setae.

Key to species of the genus *Diolcogaster* Ashmead, 1900 from China

- 1 Tip of scutellum polished, not interrupting posterior, polished band of scutellum at middle; vein r-m of fore wing arising from vein r+3-SR so that areolet is 4-sided **2**
- Rugose tip of scutellum interrupting posterior, polished band of scutellum at middle; areolet of fore wing various in shape..... **5**
- 2 Metacarp short, shorter than twice as long as its distance from apex of marginal cell; T2 highly polished, shorter than T3 ***D. brevivena* Zeng & Chen, sp. n.**
- Metacarp longer, at least twice as long as its distance from apex of marginal cell; T2 more or less rugose to rugulose, slightly longer than T3 **3**
- 3 Propodeum with a weak and incomplete median keel ***D. alvearia* (Fabricius, 1798)**
- Propodeum with a strong and complete median keel **4**
- 4 Vein r of fore wing as long as or slightly shorter than vein 2-SR; disc of scutellum finely, discretely punctate; T2 with a shiny and feebly longitudinally striated raised median field, irregularly shaped but distinctly narrowed behind;

- the lateral fields striate-rugose, but reduced toward lateral margin.....
.....*D. praritas* Zeng & Chen, sp. n.
- Vein r of fore wing much longer than vein 2-SR; disc of scutellum with dense punctures, larger laterally; T2 transverse, shortened medially, with a raised pentagonal median field, shiny but densely rugulose all over.....
.....*D. punctatiscutum* Zeng & Chen, sp. n.
- 5 Antennae of female very short, segments 10–12 being hardly longer than wide; metacarp short, shorter than 1.5× as long as its distance from apex of marginal cell; T2 divide by two curved, more or less rugose and][-shaped grooves into three fields of which the middle one is triangular and narrowest behind *D. spreata* Marshall, 1885
- Antennae of female long, all segments distinctly longer than wide; metacarp longer, at least twice as long as its distance from apex of marginal cell; T2 never that sculptured 6
- 6 Vein r-m of fore wing arising from vein r+3-SR so that the areolet is 4-sided; vein 1-CU1 much shorter than 2-CU1 7
- Vein r-m of fore wing more or less interstitial with vein r (1st abscissa of the radius) so that the areolet is virtually 3-sided; relative length of vein 1-CU1 variable 8
- 7 T2 as long as T3; T3 with traces of rugosity; vein r arising from distal 1/2 of pterostigma, far behind the middle *D. laetimedia* Zeng & Chen, sp. n.
- T2 distinctly shorter than T3; T3 highly polished; vein r arising from distal 1/2 of pterostigma, but only slightly behind the middle.....
.....*D. pernicioso* (Wilkinson, 1929)
- 8 T3 as heavily sclerotised as T2, the two tergites together forming a sculptured carapace, beneath which the more apical tergites are completely or partially hidden; fore wing marked with brown patches at apex..... 9
- T3 usually smooth, polished and never forming a carapace with T2 such as above; fore wing without patches at apex 10
- 9 Ovipositor sheath with a thickened seta; T1 distinctly widened posteriorly; posterior margin of T3 rounded, emarginated medially; forewing with apical spot dark brown..... *D. chaoi* (Luo & You, 2003)
- Ovipositor sheath without trace of apical, modified setae; T1 slightly widened posteriorly; T3 subrectangular, with posterior margin straight, not emarginated medially; forewing with apical spot slightly infusate
.....*D. bifurcifossa* Zeng & Chen, sp. n.
- 10 T2 without trace of median field, rugose more or less all over; vein 1-CU1 distinctly shorter than 2-CU2; mesoscutum shiny, with very dense and evenly discrete punctures *D. ineminens* Zeng & Chen, sp. n.
- T2 with a more or less distinct median field that varies in shape but is never triangular or widened posteriorly, though sometimes is widened anteriorly; vein 1-CU1 slightly longer than 2-CU2; sculptures of mesoscutum variable..... 11

- 11 T1 linear, very long and narrow, more than thrice as long as its width; propodeum with weak median keel; T2 with a distinctly raised pentagonal median field that is sharply-sided and with smooth and shiny surface, area beside median field setose and also smooth and shiny; pterostigma brown, except basal pale spot..... ***D. grammata* Zeng & Chen, sp. n.**
- T1 not linear, not more than 2.5× as long as its width; propodeum with strong complete median keel; T2 without such a raised pentagonal median field; pterostigma without a basal pale spot..... **12**
- 12 T2 with an elongated median field that is not triangularly widened behind; vein 1-R1 more than four times as long as its distance from the apex of the marginal cell; POL much longer than OD; vertex and frons densely rugose; face at upper half with very indistinct median longitudinal carina..... ***D. translucida* Zeng & Chen, sp. n.**
- T2 with an ill-defined median field, only slightly swollen; vein 1-R1 with distal end almost reaching to apex of marginal cell; POL about 1.5× as long as OD. Vertex finely transversely striate; frons polished and without setae in large part but densely rugulose and setose adjacent to eye margin; face without any trace of median keel ***D. pluriminitida* Zeng & Chen, sp. n.**

***Diolcogaster alvearia* (Fabricius, 1798)**

http://species-id.net/wiki/Diolcogaster_alvearia

Ichneumon alevarius Fabricius 1798: 232. Holotype female, pinned with labels as follows: “Galliae.” (Kiel)-Zimson 1964 Type Material Fabricius: 369.

Cryptus alvearius Fabricius 1804, 2: 90.

Microgaster alvearius(-ia): Spinola 1808: 149; Curtis 1830, 6: 321; Haliday 1834: 240; Nees von Esenbeck 1834: 174; Ratzeburg 1852: 50; Ruthe 1860, 4: 153; Fitch 1883, 16: 167; Marshall 1885: 240; Marshall 1890: 516; Lyle 1918: 107; Fahringer 1935, 27A(12)(1934): 6; Fahringer 1937, 4(4–6): 331; Telenga 1955, 5(4): 184; Papp 1959, 51:399; Papp 1960, 12: 119.

Protomicroplitis alevarius: Nixon 1965: 250.

Diolcogaster alvearia: Mason 1981: 114; Chen and Song 2004: 175.

Host. *Alcis repandata*; *Croesus septentrionalis*; *Hypomecis* [*Clematis*]; *Menophra abruptaria*; *Opisthograptis luteolata*; *Ourapteryx sambucaria*; *Peribatodes rhomboidaria* (Yu & van Achterberg, 2004).

Distribution. China (Gansu, Fujian); Austria, Bulgaria, Czechoslovakia, France, Germany, Hungary, Italy, Moldova, Netherlands, Romania, Russia, Slovakia, Slovenia, Spain, Switzerland, Turkey, United Kingdom, Yugoslavia.

Remarks. No specimens were available for this study. However, the description of this species by Chen and Song (2004) based on the specimens collected from Fujian is obviously different from that by Telenga (1955). Telenga described this species with

mesoscutum coriaceous-rugose, dull; areolet 4-sided; and T1 parallel-sided while Chen & Song stated that this species has the mesoscutum with fine punctures anteriorly but almost smooth posteriorly; areolet 3-sided; and T1 broadening posteriorly. Therefore, the specimens identified by Chen & Song (2004) need further examination.

***Diolcogaster bifurcifossa* Zeng & Chen, sp. n.**

urn:lsid:zoobank.org:act:C726589D-4248-47EA-A0C1-BCC08D81B09D

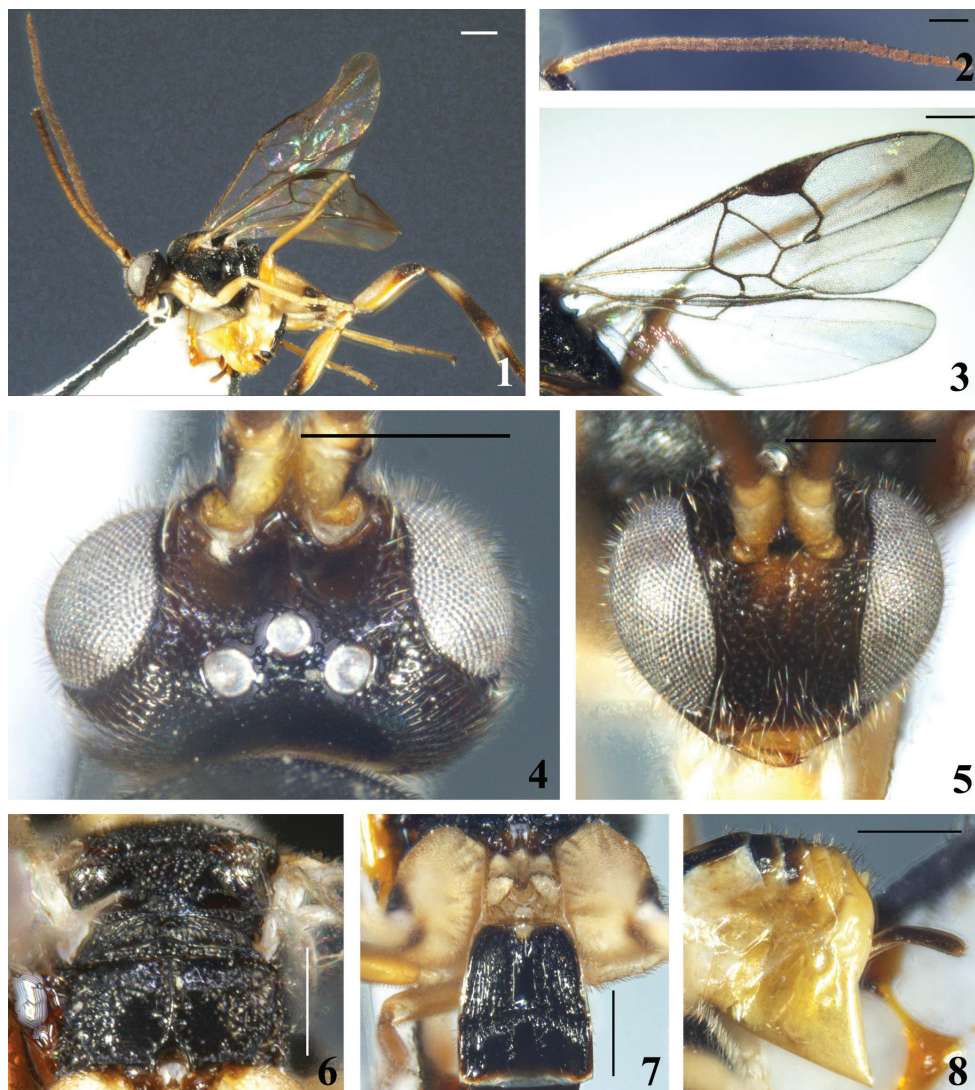
http://species-id.net/wiki/Diolcogaster_bifurcifossa

Figs 1–8

Description. Female. Body length 3.4 mm, fore wing length 3.8 mm.

Head. Rather large, oval in frontal view, with antennal sockets high above middle level of eyes; transverse in dorsal view, $1.6\times$ as wide as long and as wide as mesoscutum, with short white setae all over, including eyes. Ocelli in a very low triangle, the posterior transverse tangent to the anterior ocellus cutting the posterior pair. POL:OD:OOL=7.1:5.0:6.0. Vertex shiny but densely and shallowly punctate, strongly convex, and sharply constricted to occiput; frons virtually without sculpture; face shiny but shallowly rugose, slightly convex, upper half with indistinct median longitudinal carina which is triangularly widened downwards and forms a subtriangular shiny area; width of face $0.6\times$ as high as eye and clypeus combined (19.8:32.2); eyes very large, inner margin of eyes slightly constricted at antennal sockets, widening upwards and downwards, $1.7\times$ as high as wide (30.0:17.9); temple and gena also shiny but shallowly rugose, densely setose. Mouth opening wide, clypeus feebly rugose; tentorial pits of moderate size, distance between tentorial pits $3.6\times$ as long as distance from pit to eye margin (11.0:3.1); malar space very short, $0.2\times$ as long as eye height. Antennae normal, long, with the preapical segment about $2.3\times$ as long as wide; flagellomeres long, thick, with bristly setosity, all flagellomeres with placodes arranged regularly in 2 ranks; apical segment longer than preapical one. Flagellomere proportion: $2\text{ L/W}=2.6$, $8\text{ L/W}=2.6$, $14\text{ L/W}=2.2$; $L\text{ }2/14=1.4$; $W\text{ }2/14=1.2$.

Mesosoma. Pronotum shiny but sparsely punctate, with a strongly indicated, foveate, ventral furrow laterally. Mesoscutum shiny, evenly and densely punctate, with sparse short setae all over; notauli not impressed. Disc of scutellum shiny, also evenly punctate, its rugose (punctate) tip at middle widely interrupting the posterior, polished band of scutellum, with sparse short setae. Lateral part of the polished band at least distinctly convex anteriorly. Anterior margin of the postscutellum closely applied to the posterior margin of the scutellum so that, laterally, the phragma of scutellum is completely hidden. Scutellar sulcus deep, with few strong longitudinal short carinae, its width $1.3\times$ as long as scutellum (25.0:20.0). Propodeum short, with a strong median keel, shiny beside the median keel on posterior half and anteriorly just behind anterior margin; the area behind the anterior polished area and posterolaterally strongly setigerous punctate; spiracles enclosed by strong costulae. Mesopleuron polished posteriorly and above precoxal sulcus polished; precoxal sulcus long, broad, shallow, punctate.



Figures 1–8. *Diolcogaster bifurcifossa* Zeng & Chen, sp. n. **1** habitus, lateral view **2** antennae **3** fore wing **4** head, dorsal view **5** head, frontal view **6** scutellum and propodeum, dorsal view **7** T1–3, dorsal view **8** hypopygium and ovipositor sheaths, lateral view. Scale line = 0.5 mm.

Wings. Forewing with vein r-m reduced to a hyaline point; areolet 3-sided; vein r (1st abscissa of radius) arising from distal 1/2 of pterostigma, far behind the middle, very obliquely placed on the pterostigma; meeting vein 2-SR at a 150 degree angle. Vein 1-R1 (metacarp) with distal end sharply defined, $5.5\times$ as long as its distance from the apex of the marginal cell and $1.1\times$ as long as pterostigma; pterostigma $3.3\times$ as long as wide; r:2-SR:length of pterostigma=14.5:6.0:40.0. Width of 1st discal cell:height of 1st discal cell =31.5:38.0; 1-CU1:2-CU1:m-cu=13.0:12.5:12.5. Hind wing narrow, with edge of vanal lobe beyond its widest part very slightly concave and without trace of a fringe of setae.

Legs. Long. Hind coxa large, flattened on outer side, closely covered with deep punctures, the interspaces very shiny, hardly reaching past posterior margin of T3. Hind tibia swollen toward apex and $0.9\times$ as long as hind tarsus (70.0:80.0). Inner hind tibial spur much longer than outer one, about $0.7\times$ as long as hind basitarsus (23.0:33.0); fourth tarsal segment shorter than fifth tarsal segment (9.0:12.0); apical segment of the front tarsus without a spine. Tarsal claws long, simple.

Metasoma. Shorter than mesosoma. T1 strongly sclerotised, slightly widened posteriorly, with a complete deep and broad median groove which bifurcates apically into two strongly foveate grooves, with smooth surface but setigerous punctate distal to the middle, $1.4\times$ as long as its width and $1.2\times$ as long as T2. T2 with a polished elongated, narrow, parallel-sided median field that is separated from the strongly striate-rugose lateral surface by two broad, deeply foveate grooves; $0.7\times$ as long as its greatest width and $1.2\times$ as long as T3. T3 as heavily sclerotised as T2, the two tergites together forming a sculptured carapace, beneath which the more apical tergites are completely or partially hidden. T3 subrectangular, with middle of anterior margin slightly arched; very shiny, with surface aciculate, coarsely laterally and weakly medially; the weak but distinct polished median field slightly widened posteriorly and open apically; separated from T2 by a deep foveate groove that is margined along posterior edge of T2. Tergites posterior to T3 membranous, smooth and shiny with very few fine setae. Ovipositor sheath thin and decurved, with sparse long setae posteriorly, without trace of apical, modified setae. Hypopygium large, evenly sclerotised, smooth and without setae, slightly surpassing the last tergite.

Colour. Body bright yellow to black; head brown, except the yellow mouthparts; mesosoma black, but brownish. Flagellum yellowish brown at basal half and darkened to brown apically, scape and pedicel bright yellow, even with antennal socket lightened to yellowish apically. Apex of mandible brown; palpi whitish yellow. Tegula yellow. Fore and mid legs bright yellow. Hind coxa, trochanter and femur also bright yellowish, except the extreme apex of coxa and distal $1/4$ of femur brown; hind tibia and tarsi brown except the area distal to the extreme base to the middle of the tibia, the base of basitarsus and the tibial spurs whitish yellow. T1 bright yellow, somewhat transparent, T2 and T3 black, the other tergites and ovipositor sheaths light brown, with posterior margin of tergites more or less transparent, whitish. Wings hyaline but forewing with a faint apical spot; veins brown, vein 1-R1 (metacarp) lightened to yellow, pterostigma evenly brown with extreme base yellowish.

Variation. Body length 2.7–4.2mm, sometimes few tergites posterior to T3 with pale colour. Some individuals from Hainan with pale-colored head and some other individuals with T1 darkened posteriorly.

Male. Same as female.

Host. Unknown.

Material examined. Holotype: ♀, Mt. Diaoluo (109°53'–109°58'E, 18°39'–18°42'N), Lingshui, Hainan, 2006. VII. 16–17, Liu Jingxian, No. 200802405. Paratype: 1♀, Mt. Diaoluo (109°53'–109°58'E, 18°39'–18°42'N), Lingshui, Hainan, 2006. VII. 16–17, Weng Liqiong, No. 200802525; 4♂♂, Mt. Diaoluo

(109°53'~109°58'E, 18°39'~18°42'N), Lingshui, Hainan, 2006. VII. 16–17, Liu Jingxian, No. 200802161, 200802163, 200802289, 200802419; 1♀, Mt. Jianfengling (108°48'~108°49'E, 18°41'~18°42'N), Ledong, Hainan, 2007. VI. 5–7, Xiao Bin, No. 200806874; 2♀♀, Tianchi, Mt. Jianfengling (108°48'~108°49'E, 18°41'~18°42'N), Ledong, Hainan, 2007. X. 22–23, Liu Jingxian, No. 200810501, 200810789; 1♀, Hongmao, Mt. Yinggeling (109°31'E, 19°04'N), Baisha, Hainan, 2007. V. 23–25, Zeng Jie, No. 200804476; 1♀1♂, Mt. Yinggeling (109°31'E, 19°04'N), Baisha, Hainan, 2007. X. 18, Liu Jingxian, No. 200709927, 200709723; 1♀, Mt. Yinggeling (109°11'~109°34'E, 18°49'~19°08'N), Baisha, Hainan, 2008. XI. 17, Wang Manman, No. 200805450; 1♂, Mt. Bawangling (109°02'~109°04'E, 19°05'~19°08'N), Changjiang, Hainan, 2008. XI. 26, Wang Manman, No. 200805645; 1♀, Mt. Chebaling (114°14'~114°16'E, 24°43'~24°44'N), Shixing, Guangdong, 2003. VIII. 21, Xu Zaifu, No. 20052280; 1♀, Mt. Nanling (112°59'~113°05'E, 24°53'~24°56'N), Ruyuan, Guangdong, 2004. VIII. 4, Xu Zaifu, No. 20049754; 1♀, Mt. Jiuwandashan (108°12'~108°32'E, 24°52'~25°03'N), Pingying, Guangxi, 2003. VII. 30, Wang Yiping, No. 20037539; 1♀, Shiwandashan Forest Park (107°53'~107°55'E, 21°53'~24°55'N, 310m), Guangxi, 2001. XI. 29, Ma Yun, No. 20021577; 1♀, Letu (117°13'~117°14'E, 24°53'~24°54'N), Nanjing, Fujian, 1991. V. 23, Liu Changming, No. 20006068; 1♀, Xianrending, West Mt. Tianmu (119°23'~119°24'E, 30°20'N), Linan, Zhejiang, 1999. VI. 30, Zhao Mingshui, No. 996522; 2♀♀, Mt. Gutian (118°07'~118°10'E, 29°14'~29°16'N), Kaihua, Zhejiang, 2005. VII. 3, Zhang Hongying, No. 200616206, 200617220.

Etymology. The specific name “*bifurcifossa*” derives from the Latin adjective “bifurcus” and noun “fossa”, referring to median groove of T1 bifurcate apically.

Distribution. China (Zhejiang, Fujian, Guangdong, Guangxi, Hainan).

Remarks. This species is similar to *Diolcogaster eclectic* (Nixon, 1965), but can be distinguished by the almost smooth surface of T3 beside the median field (the latter has T3 sculptured except for a median, polished area) and the ovipositor sheath without a modified apical seta (the latter with one).

***Diolcogaster brevivena* Zeng & Chen, sp. n.**

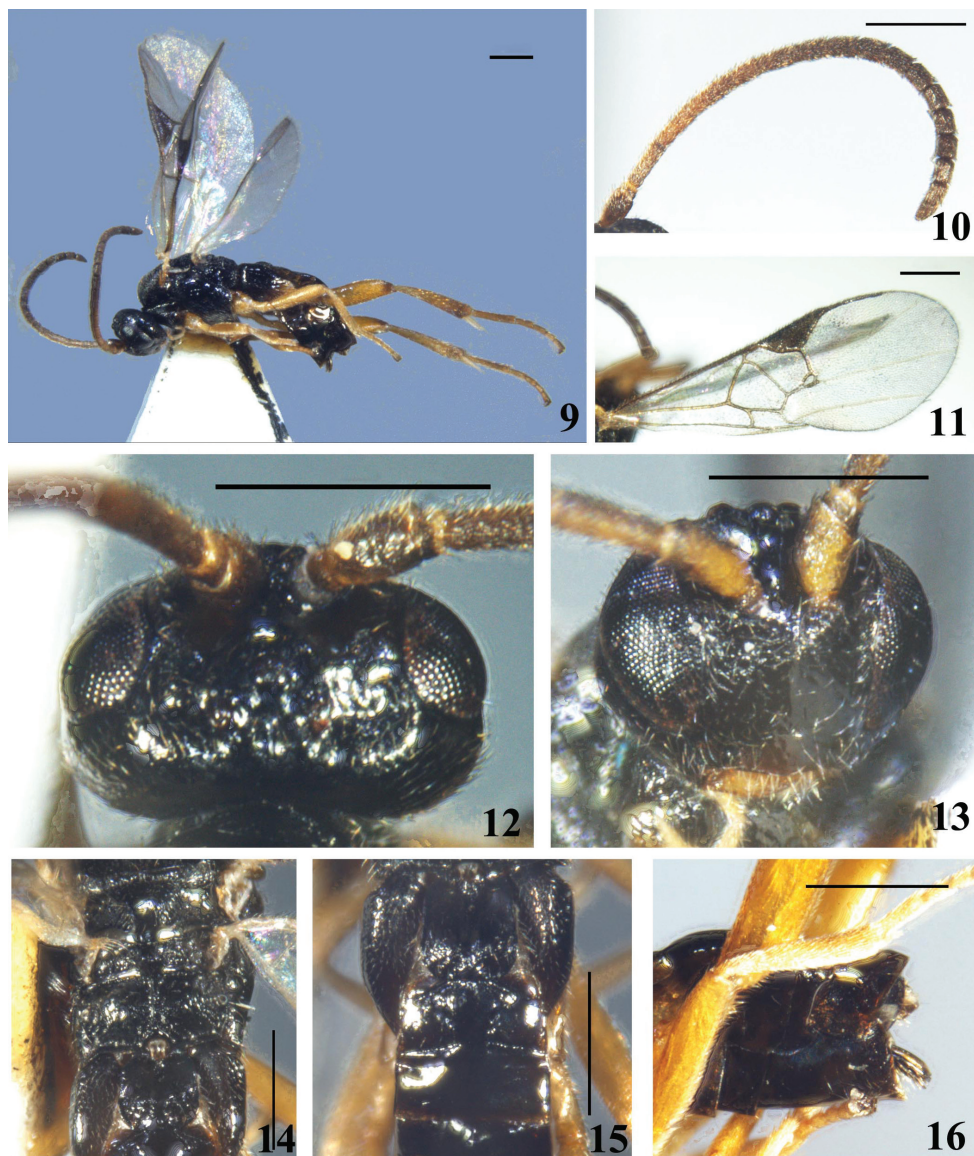
urn:lsid:zoobank.org:act:86E56FF6-ECA7-421E-93E4-FBF455E82352

http://species-id.net/wiki/Diolcogaster_brevivena

Figs 9–16

Description. Female. Body length 2.7mm, fore wing length 2.8mm.

Head. Small, subquadrate in anterior view, with antennal sockets high above middle level of eyes; strongly transverse in dorsal view, 1.6× as wide as long and almost as long as mesoscutum, with very short fine setae except the sharply constricted and highly polished area behind lateral ocelli. Ocelli small, in a low triangle, but the transverse, posterior tangent to the anterior ocellus not cutting the posterior pair. POL:OD:OOL=4.0:3.0:7.0. Vertex very shiny, flattened; frons polished, virtually with-



Figures 9–16. *Diolcogaster brevivena* Zeng & Chen, sp. n. **9** habitus, lateral view **10** antennae **11** fore wing **12** head, dorsal view **13** head, frontal view **14** scutellum and propodeum, dorsal view **15** T1–3, dorsal view **16** hypopygium and ovipositor sheaths, lateral view. Scale line = 0.5 mm.

out sculpture; face convex, also very shiny, with sparse fine punctures, feebly transverse striate on upper half, without any trace of median keel, width of face $0.8\times$ as high as eye and clypeus combined ($16.6:20.0$); eyes small, inner margin of eyes parallel, $1.6\times$ as high as wide ($18.0:11.0$); temple and gena shiny, densely and finely striate, with appressed longer setae. Clypeus separated from face by a fine curved line linking the tentorial pits, slightly convex and as finely and sparsely punctate as face; tentorial pits

small, distance between tentorial pits $2.7\times$ as long as distance from pit to eye margin; malar space short, $0.3\times$ as long as eye height. Antennae much shorter than body, with the preapical segment only $1.2\times$ as long as wide; flagellomeres slightly thickened apically, with bristly setosity, with placodes arranged regularly in 2 ranks; apical segment longer than preapical one. Flagellomere proportion: $2\text{ L/W}=3.0$, $8\text{ L/W}=1.5$, $14\text{ L/W}=1.4$; $L\text{ 2/14}=1.8$; $W\text{ 2/14}=0.6$.

Mesosoma. Pronotum shiny, with a broad ventral furrow laterally. Mesoscutum very shiny, very densely but finely punctate, with posterior margin distinctly rimmed, with dense short fine setae all over; notauli not impressed, only slightly depressed on the posterior imaginary course. Disc of scutellum polished, shiny and at most weakly punctate, with sparse fine setae; polished at tip, so the posterior, polished band of scutellum is continuous. Lateral part of the polished band distinctly convex anteriorly. Anterior margin of the postscutellum closely applied to the posterior margin of the scutellum so that, laterally, the phragma of scutellum is completely hidden. Scutellar sulcus shallow, with few indistinct longitudinal carinae, its width as long as scutellum (13.0:13.0). Propodeum short, shiny, with a strong complete median keel, smooth with very sparse fine punctures, except for very short transverse carina each side along the median keel and dense rugulosity around spiracles. Mesopleuron polished, area behind anterior margin setigerous-punctate; precoxal sulcus only indicated medially by a very shallow depression.

Wings. Forewing with areolet more or less 4-sided, vein r-m reduced to a transparent point and received onto vein r+3-SR, vein r much longer than vein 3-SR, arising from distal 1/2 of pterostigma, far behind the middle, placed at almost right angles to the pterostigma; meeting vein 2-SR at a 160 degree angle. Vein 1-R1 (metacarp) with distal end sharply defined, $1.9\times$ as long as its distance from the apex of the marginal cell and $0.8\times$ as long as pterostigma; pterostigma short and broad, $2.8\times$ as long as wide; r:2-SR:length of pterostigma=8.0:7.0:28.0. Width of 1st discal cell: height of 1st discal cell = 20.5:17.5; 1-CU1:2-CU1:m-cu = 7.0:11.0:6.0. Hind wing with vannal lobe evenly convex, fringed with long setae throughout.

Legs. Long and thin. Hind coxa with dense fine punctures with interspaces smooth and shiny, with dense short fine setae medially and on posterior 1/3; dorsal surface also with dense fine punctures and dense short fine setae. Hind tibia swollen apically and only $0.7\times$ as long as hind tarsus (38.0:49.7), outer surface without spines. Inner hind tibial spur longer than outer one, $0.6\times$ as long as hind basitarsus (13.0:21.9); fourth tarsal segment much shorter than fifth tarsal segment (5.0:7.0); apical segment of the front tarsus without a spine. Tarsal claws simple.

Metasoma. Longer than mesosoma. T1 parallel-sided but roundly constricted distally, surface shiny with anterior 3/4 smooth and posterior 1/4 shallowly rugulose, with sparse fine setae dorsally and laterally; $1.1\times$ as long as its width and $1.5\times$ as long as T2; the percurrent median groove reduced on apex. T2 trapezoid, polished, with a slightly convex median field separated from other parts by two lateral sulci sharply narrowed on anterior half and parallel on posterior half, $0.5\times$ as long as wide and $0.8\times$ as long as T3. Tergites posterior to T2 more membranous, highly polished with a row of short

fine setae before posterior margin, except the last two segments scattered with short fine setae. Ovipositor sheath slightly widened apically, decurved, with 2–3 blackened setae at apex. Hypopygium large, evenly sclerotised, polished, with very few long fine setae, apex not surpassing the last tergite.

Colour. Body black, metasoma brownish. Antennae yellowish brown at base and darkened toward apex to brown, pedicel brown. Mouthparts brownish yellow with palpi lighter. Tegula also brownish yellow. Legs almost virtually brownish yellow, except basal 4/5 of hind coxa, apex of hind femur and tibia and apex of claws brown. Tergites of abdomen evenly dark brown, basal sternites transparent and yellowish. Wings hyaline; veins brown, pterostigma, 1-R1 (metacarp), submarginal vein and r vein darker.

Variation. Paratype with the same characteristics as holotype, but slightly different in colour pattern.

Male. Unknown.

Host. Unknown.

Material examined. Holotype: ♀, Natural Park of Mt. Gaoligong (98°46'E, 24°49'N), Lujiangba, Baoshan, Yunnan, 2009. V. 10–11, legs. Wang Manman, No. 200903858. Paratype: 1♀, Natural Park of Mt. Gaoligong (98°46'E, 24°49'N), Lujiangba, Baoshan, Yunnan, 2009. V. 10–11, legs. Wang Manman, No. 200903862.

Etymology. The specific name “brevivena” derives from the Latin prefix “brevi-” and noun “vena”, referring to the distinctly short metacarp.

Distribution. China (Yunnan).

Remarks. This species is similar to *Diolcogaster minuta* (Reinhard, 1880), but can be distinguished by T2 highly polished (the latter with T2 strongly rugose) and vein 1-R1 much longer than its distance from the apex of the radial cell (the latter with 1-R1 vein at most a little longer than its distance from the apex of the radial cell).

***Diolcogaster chaoi* (Luo & You, 2003)**

http://species-id.net/wiki/Diolcogaster_chaoi

Figs 41–48

Caracallatus chaoi Luo and You 2003: 121. Holotype female, pinned with labels as follows: “1♀, Huishui, Guizhou, 1100M, 2001-X-24, legs. Luo Qinghui” in Guizhou Normal University, Guiyang, China.

Diolcogaster chaoi: Luo and You 2005, 27: 50.

Material examined. 1♀, Wanjia, Mayanghe (108°13'–108°21'E, 28°35'–28°41'N), Guizhou, 2007. IX. 27–30, legs. Zhu Lanlan, No. 200708137; 1♀, Huangguatuo, Mayanghe (108°13'–108°21'E, 28°35'–28°41'N), Guizhou, 2007. X. 1, legs. Liu Jingxian, No. 200709045; 1♀, Nanxi (103°50'–103°57'E, 22°35'–22°40'N), Hekou, Yunnan, 2003. VII. 20–21, legs. Xu Zaifu, No. 20055292; 1♀, Mt. Jianfengling (108°48'–108°49'E, 18°41'–18°42'N), Ledong, Hainan, 2007. VI. 5–7, light trap, legs. Liu Jingxian, No. 200703638; 1♂, Mt. Wuzhi (109°39'–109°41'E, 18°51'–18°54'N),

Shuiman, Hainan, 2007. V. 15–20, legs. Weng Liqiong, No. 200804008; 1♀, Mt. Bawangling (109°02'–109°04'E, 19°05'–19°08'N), Changjiang, Hainan, 2007. VI. 9–10, legs. Liu Jingxian, No. 200703588; 1♀, Mt. Yinggeling (109°11'–109°34'E, 18°49'–19°08'N), Baisha, Hainan, 2008. XI. 18, legs. Tan Jiangli, No. 200805272; 1♂, Mt. Yinggeling (109°11'–109°34'E, 18°49'–19°08'N), Baisha, Hainan, 2008. XI. 18, legs. Tan Jiangli, No. 200805265; 1♀, Mt. Yinggeling (109°31'E, N19°04'N), Baisha, Hainan, 2007. V. 28–VI. 3, legs. Weng Liqiong, No. 200804192; 1♀, Mt. Yinggeling (109°11'–109°34'E, 18°49'–19°08'N), Baisha, Hainan, 2008. XI. 17, legs. Wan Manman, No. 200805447; 2♂♂, Mt. Yinggeling (109°11'–109°34'E, 18°49'–19°08'N), Baisha, Hainan, 2008. XI. 17, legs. Wan Manman, No. 200805453, 200805481; 1♂, Mt. Diaoluo (109°53'–109°58'E, 18°39'–18°42'N), Lingshui, Hainan, 2006. VII. 16–17, legs. Liu Jingxian, No. 200802233; 1♂, Yacheng (109°09'–109°31'E, 18°09'–18°26'N), Sanya, Hainan, 2008. XI. 21, legs. Wang Manman, No. 200805044; 1♀, Mt. Qingyun (118°54'–119°01'E, 25°43'–25°48'N), Yongtai, Fujian, 2002. IX. 18, legs. Yu Xiaoxia, No. 20023506.

Host. Unknown.

Distribution. China (Fujian, Hainan, Guizhou, Yunnan).

***Diolcogaster grammata* Zeng & Chen, sp. n.**

urn:lsid:zoobank.org:act:5F33B360-090C-4A81-9872-B094EB0DB884

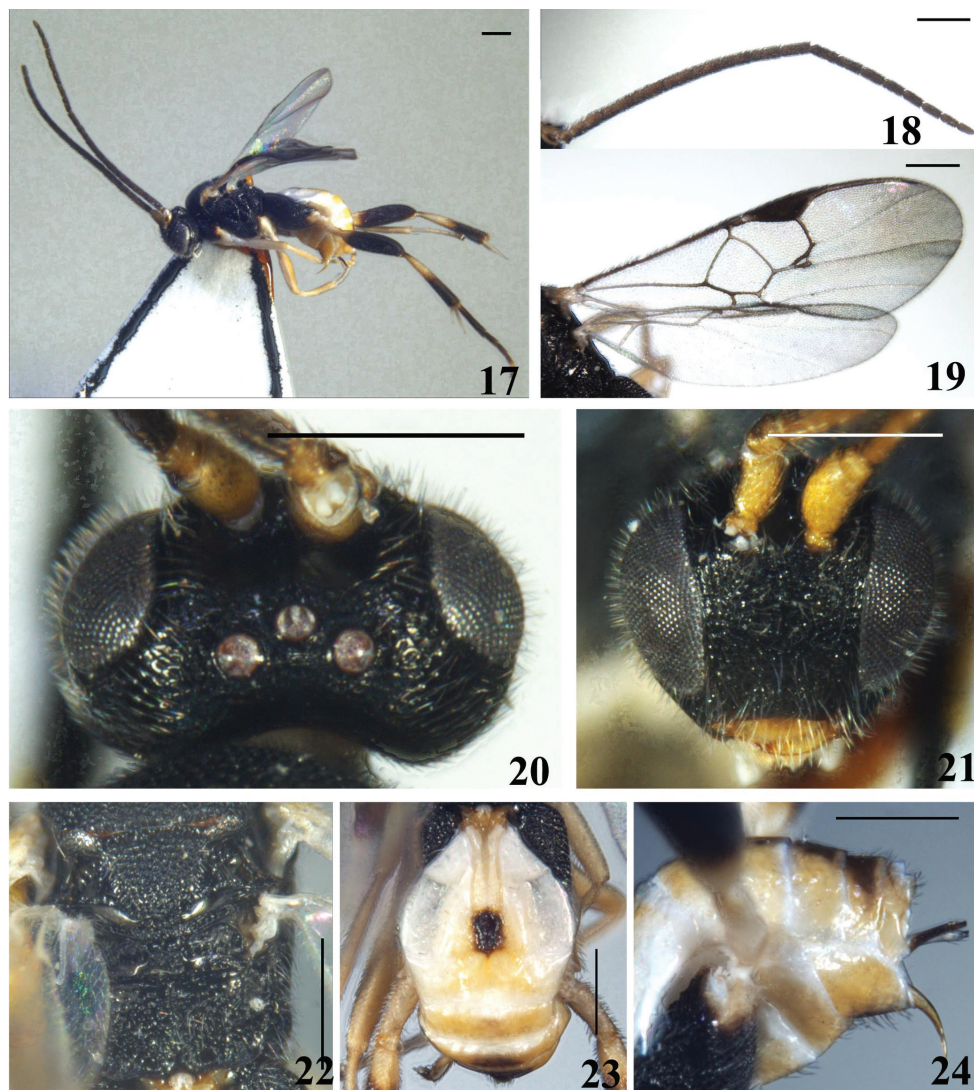
http://species-id.net/wiki/Diolcogaster_grammata

Figs 17–24

Description. Female. Body length 3.0 mm, fore wing length 3.1 mm.

Head. Rather large. Oval in anterior view, with antennal sockets high above middle level of eyes; transverse in dorsal view, 1.5× as wide as long and shorter than that of mesoscutum, shiny with dense short setae all over. Ocelli small in a low, very wide triangle, the transverse, posterior tangent to the anterior ocellus just cutting the posterior pair. POL:OD:OOL=5.0:3.8:7.7. Vertex strongly convex, and sharply constricted to occiput, densely rugose-punctate; frons densely rugose-punctate except the polished area behind scape and pedicel; face coarsely rugose-punctate, without median keel; its width 1.4× as high as eye and clypeus combined (25.6:18.0); eyes of moderate size, inner margins of eyes parallel, 1.8× as high as wide (23.8:13.1); temple and gena striate-punctate. Mouth opening wide; clypeus densely rugose; tentorial pits small, distance between tentorial pits 3.4× as long as distance from pit to eye margin (10.8:3.2); malar space short, 0.2× as long as eye height. Antennae long and with the preapical segment fully 2.5× as long as wide; scape short; flagellomeres thinner, tapered distally, with bristly setosity, with placodes arranged regularly in 2 ranks; apical segment slightly longer than preapical one. Flagellomere proportion: 2 L/W=3.1, 8 L/W=3.2, 14 L/W=2.0; L 2/14=1.7; W 2/14=1.1.

Mesosoma. Pronotum shiny, with a distinct foveate ventral furrow laterally. Mesoscutum shiny, with uneven, dense punctures or rugose-punctures, more in evidence an-



Figures 17–24. *Diolcogaster grammata* Zeng & Chen, sp. n. **17** habitus, lateral view **18** antennae **19** fore wing **20** head, dorsal view **21** head, frontal view **22** scutellum and propodeum, dorsal view **23** T1–3, dorsal view **24** hypopygium and ovipositor sheaths, lateral view. Scale line = 0.5 mm.

teriorly and along imaginary course of the notauli, with dense short setae all over. Disc of scutellum shiny but densely rugose-punctate, also with dense short setae all over; its rugose tip at middle widely interrupting the posterior, polished band of scutellum, separated from disc by a short transverse keel, with dense short setae. Lateral part of the polished band distinctly broadened anteriorly. Anterior margin of the postscutellum closely applied to the posterior margin of the scutellum so that, laterally, the phragma of scutellum is completely hidden. Scutellar sulcus shallow, with a few short longitudinal carinae, its width 1.1× as long as scutellum (18.0:15.9). Propodeum shiny,

coarsely reticulate-rugose except anterior area behind the anterior margin, with a weak median keel. Mesopleuron polished medially, with dense punctures but interspaces shiny; precoxal sulcus broad, indistinct, shallow with few punctures.

Wings. Forewing with areolet virtually 3-sided; r (1st abscissa of radius) arising from distal 1/2 of pterostigma, far behind the middle, placed more nearly at right angles on the pterostigma, meeting vein 2-SR at a 145 degree angle. Vein 1-R1 (metacarp) with distal end sharply defined and almost reaching to apex of marginal cell, $7.0\times$ as long as its distance from the apex of the marginal cell and as long as pterostigma, pterostigma $2.8\times$ as long as wide; $r:2-SR$: length of pterostigma=12.0:12.0:34.0. Width of 1st discal cell:height of 1st discal cell =27.0:22.0; 1-CU1:2-CU1:m-cu=10.5:9.5:11.5. Hind wing narrow, with vannal lobe beyond its widest part convex, fringed with long setae throughout.

Legs. Long and thin. Hind coxa large, shiny with densely punctate surface anteriorly and coarsely reticulate-punctate surface posteriorly, reaching to posterior margin of T3. Hind tibia gradually swollen toward apex and about $0.8\times$ as long as hind tarsus (53.0:69.5). Inner hind tibial spur much longer than outer one and $0.8\times$ as long as hind basitarsus (23.0:30.0); fourth tarsal segment shorter than fifth tarsal segment (9.0:12.0); apical segment of the front tarsus without a spine. Tarsal claws long, simple.

Metasoma. Longer than mesosoma. T1 very long and narrow, linear, parallel-sided, with complete longitudinal groove that is reduced apically, smooth on anterior 1/3 and setigerous punctate on posterior 2/3, $3.1\times$ as long as its width and $2.5\times$ as long as T2. T2 strongly transverse, with a distinctly raised pentagonal median field that is sharply-sided and with smooth and shiny surface, $0.5\times$ as long as its greatest width and $0.7\times$ as long as T3; area beside median field setose, smooth and shiny. Tergites posterior to T2 smooth and shiny, more membranous; only last 3 tergites with a few short fine setae. Ovipositor sheath thin, decurved, with 2–3 blackened setae at apex, long, spatulate. Hypopygium small, evenly sclerotised, smooth and densely setose posteriorly, not surpassing the last tergite.

Colour. Body bright yellow to black; head and thorax black, metasoma almost bright yellow, except the median field of T2 and ovipositor sheaths brown, last 4 tergites light brown medially. Flagellum yellowish brown basally, thickened toward apex, scape and pedicel bright yellow, brownish laterally. Mouthparts yellow, ventral margin of clypeus and mandible brownish; palpi whitish. Tegula whitish yellow. Fore and mid legs bright yellow, whitish basally. Hind coxa and femur black, except the extreme apex of coxa and basal area of femur yellow, trochanter also yellow; hind tibia and tarsus brown except that basal half of tibia and tibial spurs are bright yellow and apical tarsus is yellowish. Wings hyaline; veins brown but greyish on basal half and on metacarp, pterostigma brown, with basal spot grey.

Variation. Paratype with the same characteristics as holotype, but more or less transparent.

Male. Unknown.

Host. Unknown.

Material examined. Holotype: ♀, Mt. Wuzhi (109°39'–109°41'E, 18°51'–18°54'N), Shuiman, Hainan, 2007. V. 16–20, Liu Jingxian, No. 200703126. Paratype: 1♀, Mt. Nankun (113°51'–113°53'E, 23°37'–23°38'N), Longmen, Guangdong, 2003. VII. 14–15, Xu Zaifu, No. 20050313.

Etymology. The specific name “*grammata*” derives from the Latin adjective “grammatus”, referring to the narrow, linear T1.

Distribution. China (Hunan, Guangdong, Hainan).

Remarks. This species is similar to *Diolcogaster xanthaspis* (Ashmead, 1900), but can be distinguished by the well-defined median field on T2 (the latter with poorly defined median field on T2+T3); 1-CU1 slightly longer than 2-CU1 (the latter with 1-CU1 as long as 2-CU1); and the ovipositor sheath with modified apical setae (the latter without).

***Diolcogaster ineminens* Zeng & Chen, sp. n.**

urn:lsid:zoobank.org:act:65742BCC-8FF2-44C8-8011-660622E13D61

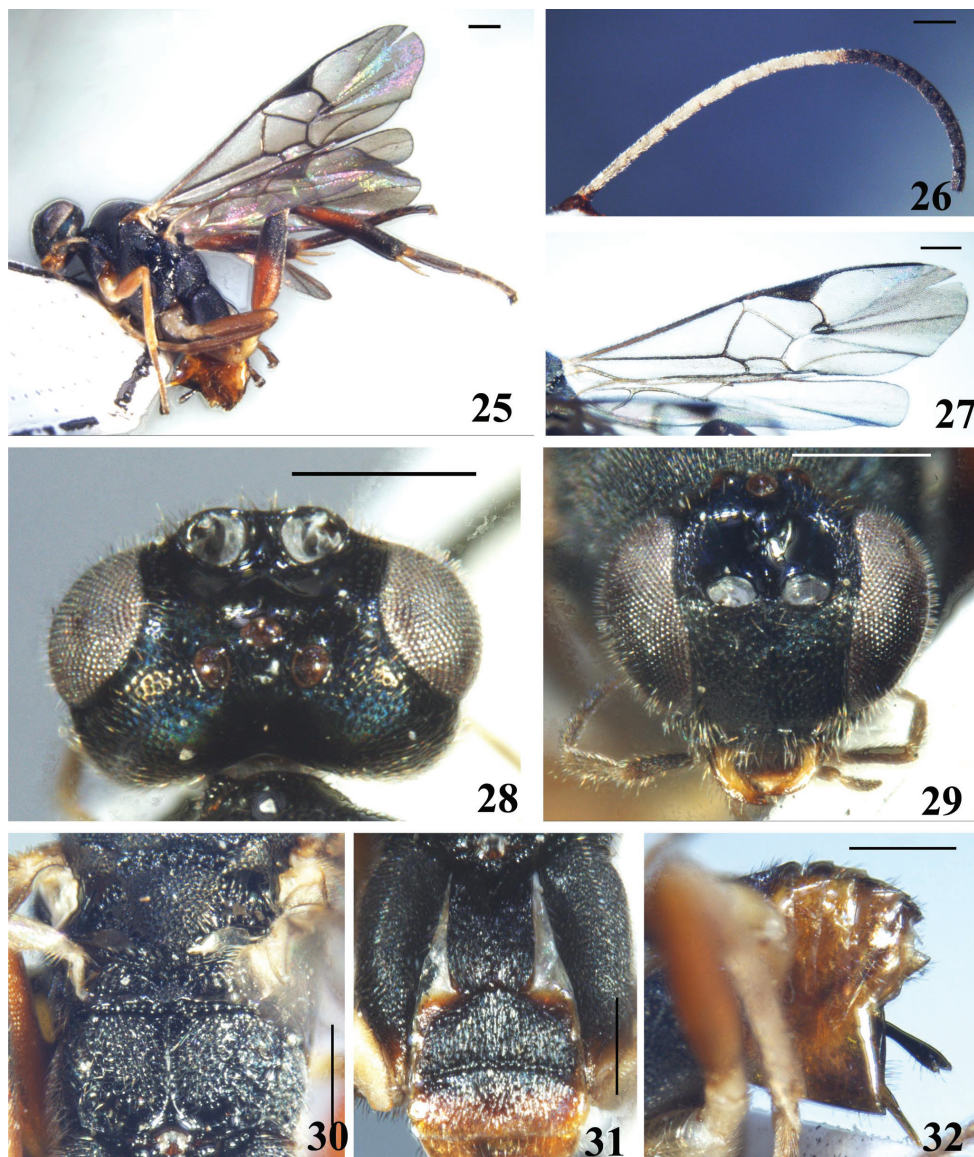
http://species-id.net/wiki/Diolcogaster_ineminens

Figs 25–32

Description. Female. Body length 3.8 mm, fore wing length 4.5 mm.

Head. Oval in anterior view, with antennal sockets high above middle level of eyes; transverse in dorsal view, 1.5× as wide as long and almost as long as mesoscutum, with very dense short setae except the sharply constricted and highly polished area behind lateral ocelli. Ocelli small, in a low triangle, the transverse, posterior tangent to the anterior ocellus just cutting the posterior pair. POL:OD:OOL=6.8:5.0:6.0. Vertex shiny, convex, with distantly discrete large punctures out of ocular area; frons polished and without setae in large part but densely rugose-punctate and setose adjacent to eye margin; face slightly convex, also shiny, densely setigerous-punctate, with an indistinct longitudinal median keel that neither extend to dorsal margin of face nor extend to clypeus, width of face 0.7× as high as eye and clypeus combined (22.7:33.3); eyes large, inner margin of eyes parallel, 1.6× as high as wide (30.0:18.5); temple and gena shiny, densely but finely transversely striate-punctate, with appressed setae. Clypeus densely rugulose, slightly convex; tentorial pits large, distance between tentorial pits 2.5× as long as distance from pit to eye margin; malar space short, 0.2× as long as eye height. Antennae long and thin with the preapical segment more than 1.75× as long as wide; flagellomeres not thickened apically, without bristly setosity, with placodes arranged regularly in 2 ranks; apical segment broken. Flagellomere proportion: 2 L/W=4.6, 8 L/W=2.6, 14 L/W=1.8; L 2/14=2.1; W 2/14=0.5.

Mesosoma. Pronotum flattened, shiny, with a broad and deep foveate ventral furrow laterally, densely setigerous-punctate above. Mesoscutum shiny, with very dense and evenly departed punctures, more or less rugose-punctate posteromedially, with dense short setae all over; notauli not impressed. Disc of scutellum also shiny, convex, more densely punctate than mesoscutum, setose; its rugose tip at middle widely inter-



Figures 25–32. *Diolcogaster inemineus* Zeng & Chen, sp. n. **25** habitus, lateral view **26** antennae **27** fore wing **28** head, dorsal view **29** head, frontal view **30** scutellum and propodeum, dorsal view **31** T1–3, dorsal view **32** hypopygium and ovipositor sheaths, lateral view. Scale line = 0.5 mm.

rupting the posterior, polished band of scutellum. Lateral part of the polished band distinctly convex anteriorly. Anterior margin of the postscutellum closely applied to the posterior margin of the scutellum so that, laterally, the phragma of scutellum is completely hidden. Scutellar sulcus deep and broad, with few strong longitudinal carinae, its width almost as long as scutellum (24.0:25.0). Propodeum strongly and coarsely rugose, with strong costulae around spiracles, with a strong complete median keel.

Mesopleuron polished above precoxal sulcus, with very shallow and distantly discrete punctures on ventral half, with setigerous-punctures anteriorly and below precoxal sulcus; precoxal sulcus very shallow, indistinct, densely and shallowly punctate.

Wings. Forewing with a large 3-sided areolet; vein r arising from distal 1/2 of pterostigma, far behind the middle, very obliquely placed on the pterostigma, meeting vein 2-SR at 110 degree angle. Vein 1-R1 (metacarp) with distal end sharply defined, $5.8\times$ as long as its distance from the apex of the marginal cell and $1.4\times$ as long as pterostigma, pterostigma $3.4\times$ as long as wide; $r:2-SR:\text{length of pterostigma}=15.0:11.0:37.0$. Width of 1st discal cell:height of 1st discal cell $=37.0:26.0$; $1-CU1:2-CU1:m-cu=10.0:20.0:13.0$. Hind wing with vannal lobe evenly convex, fringed with long setae throughout.

Legs. Long and strong. Hind coxa large, shiny, with outer and dorsal surface very densely rugulose-punctate, evenly setose all over; just reaching to anterior margin of T3. Hind tibia swollen medially and then slightly narrowed apically, $0.9\times$ as long as hind tarsus (85.0:93.5), outer surface without spines. Inner hind tibial spurs longer than outer one, $0.5\times$ as long as hind basitarsus (22.0:42.5); fourth tarsal segment shorter than fifth tarsal segment (9.0:14.0); apical segment of the front tarsus without a spine. Tarsal claws simple.

Metasoma. Shorter than mesosoma. T1, T2 and anterior half of T3 strongly sclerotised. T1 parallel-sided, roundly constricted at apex, longitudinally strigous-punctate all over; scattered with appressed setae, denser on posterior 1/4; bearing a distinct median groove with smooth edges; $1.9\times$ as long as its width and $1.2\times$ as long as T2. T2 longitudinally aciculate with interspaces rugose and without setae, without trace of median field, with anterior margin back off each side out of the middle, $0.8\times$ as long as wide and twice as long as T3. T3 subrectangular, with posterior half less sclerotised, also longitudinally aciculate but more finely than T2. Tergites posterior to T3 membranous, polished, sparsely setose. Ovipositor sheath with even width, slightly decurved, without modified apical setae. Hypopygium large, evenly sclerotised, polished with sparse long fine setae apically, apex not surpassing the last tergite.

Colour. Body black, metasoma mostly yellowish brown, more or less transparent. Antennae with scape, pedicel, apical 1/3 of flagellum and outer surface of basal 1/3 of flagellum brown, middle 1/3 and outer surface of basal 1/3 of flagellum white. Labrum dark brown and lightened downwards, labium bright yellow with brown margin, palpi brown. Tegula yellowish brown. Fore and middle legs yellow at base, darkened apically to brown. Hind coxa black, except the reddish apex; trochanter yellow; femur and tibia dark brown except the reddish basal halves; tarsi brown, gradually and slightly lightened apically; tibial spurs whitish yellow. T1 and T2 dark brown, T3 also dark brown anteriorly, then gradually lightened apically to yellowish brown and more or less transparent; apical segment and ovipositor sheaths also brown. Wings hyaline; veins and pterostigma brown, except the basal pale spot of pterostigma.

Variation. Individuals from Fujian with basal 1/3 of flagellum brown just like inner surface.

Male. Unknown.

Host. Unknown.

Material examined. Holotype: ♀, Mt. Nanling (112°59'–113°05'E, 24°53'–24°56'N), Ruyuan, Guangdong, 2004. VIII. 4, legs. Xu Zaifu, No. 20049886. Paratype: 2♀♀, Mt. Longqi (117°37'–117°39'E, 26°15'–26°16'N), Jiangle, Fujian, 1991. VII. 8, legs. Liu Changming, No. 20006911, 20006940; 1♀, Mt. Gutian (118°07'–118°10'E, 29°14'–29°16'N), Kaihua, Zhejiang, 2005. VII. 3, legs. Chen Xuexin, No. 200616278; 1♀, Mt. Gutian (118°07'–118°10'E, 29°14'–29°16'N), Kaihua, Zhejiang, 2005. VII. 2, legs. Wu Qiong, No. 200616765; 1♀, Mt. Gutian (118°07'–118°10'E, 29°14'–29°16'N), Kaihua, Zhejiang, 2005. VII. 3, legs. Wu Qiong, No. 200616991.

Etymology. The specific name “ineminens” derives from the Latin prefixion “in-” and adjective “eninens”, referring to T2 without a raised median field.

Distribution. China (Zhejiang, Fujian, Guangdong).

Remarks. This species is similar to *Diolcogaster abdominalis* (Nees, 1834), but can be distinguished by the ovipositor sheath without modified seta (the latter has ovipositor sheath with a row of four fine black setae, arising from the lower margin); pterostigma emitting radius much distal to middle (the latter with pterostigma emitting radius at most slightly beyond middle); and radial cell of fore wing normal (the latter with radial cell abruptly narrowed apically).

***Diolcogaster laetimedia* Zeng & Chen, sp. n.**

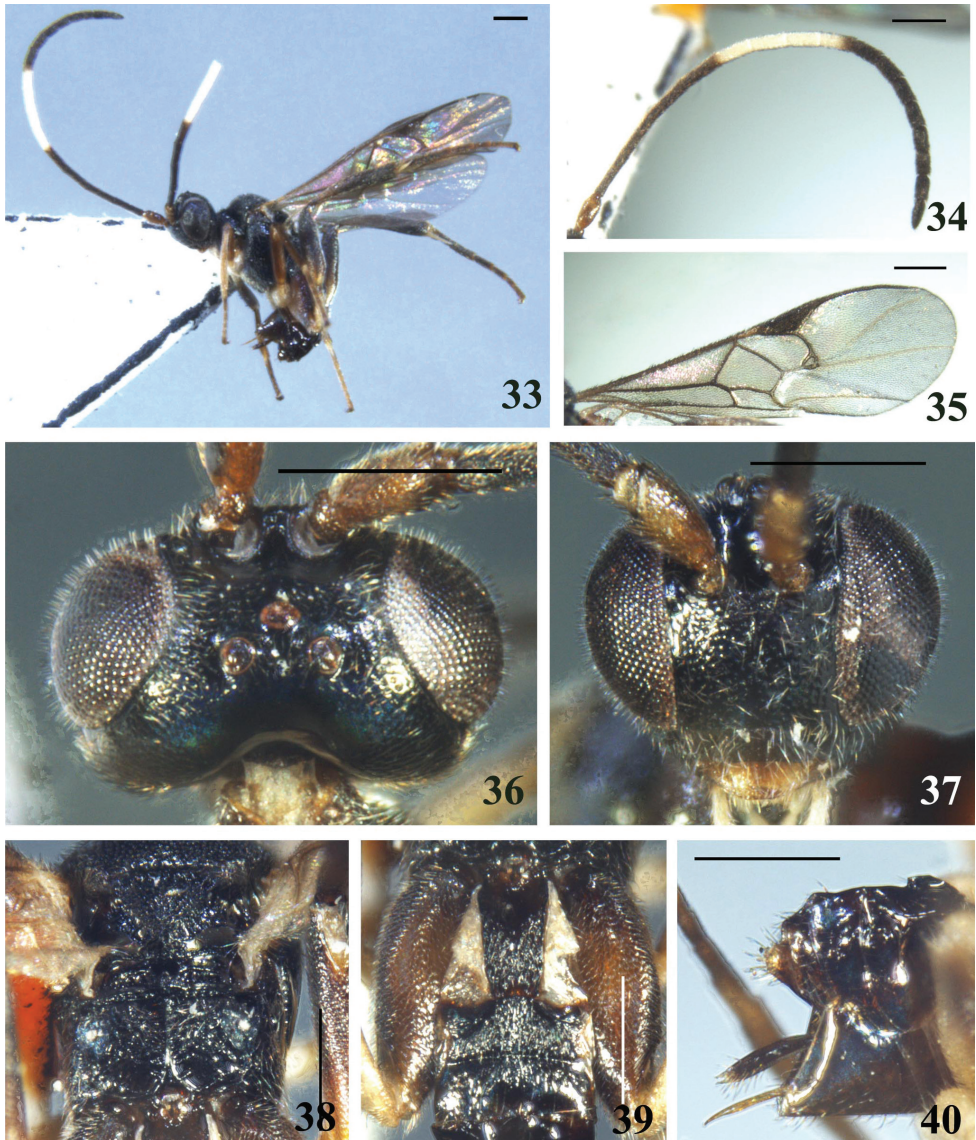
urn:lsid:zoobank.org:act:09B64969-36A6-405B-9B9D-0ACEDC6C6F05

http://species-id.net/wiki/Diolcogaster_laetimedia

Figs 33–40

Description. Female. Body length 2.9 mm, fore wing length 3.3 mm.

Head. Rather large, subtriangular in anterior view, with antennal sockets high above middle level of eyes; oval in dorsal view, 1.5× as wide as long and a little longer than mesoscutum, strongly concave behind ocular area, scattered with very short setae except the sharply constricted and highly polished area behind lateral ocelli. Ocelli small, in a low triangle, but the transverse, posterior tangent to the anterior ocellus a little before the posterior pair. POL:OD:OOL=5.3:3.4:4.7. Vertex shiny, convex, ocular area polished, with distantly discrete fine punctures out of ocular area; frons polished and without setae in large part but densely rugulose and setose adjacent to eye margin; face slightly convex, also shiny, densely but shallowly punctate, longitudinal median keel only indicated on dorsal 1/4, width of face 0.7× as high as eye and clypeus combined (19.0:26.8); eyes rather large, inner margin of eyes parallel, 1.6× as high as wide (28.0:17.8); temple and gena shiny, densely but feebly transversely striate-punctate, with dense appressed setae. Clypeus densely rugulose, slightly convex; tentorial pits of moderate size, distance between tentorial pits 2.4× as long as distance from pit to eye margin; malar space very short, only 0.2× as long as eye height. Antennae long and thin, with the preapical segment fully 2.5× longer than wide; flagellomeres



Figures 33–40. *Diolcogaster laetimedia* Zeng & Chen, sp. n. **33** habitus, lateral view **34** antennae **35** fore wing **36** head, dorsal view **37** head, frontal view **38** scutellum and propodeum, dorsal view **39** T1–3, dorsal view **40** hypopygium and ovipositor sheaths, lateral view. Scale line = 0.5 mm.

not thickened apically, without bristly setosity, with placodes arranged regularly in 2 ranks; apical segment distinctly longer than preapical one. Flagellomere proportion: 2 L/W=5.0, 8 L/W=2.4, 14 L/W=1.8; L 2/14=2.1; W 2/14=0.4.

Mesosoma. Pronotum shiny, with a shallowly striate ventral furrow laterally, densely and discretely punctate above. Mesoscutum shiny, with very dense and evenly discrete punctures, with dense short setae all over; notauli not impressed. Disc of scutellum

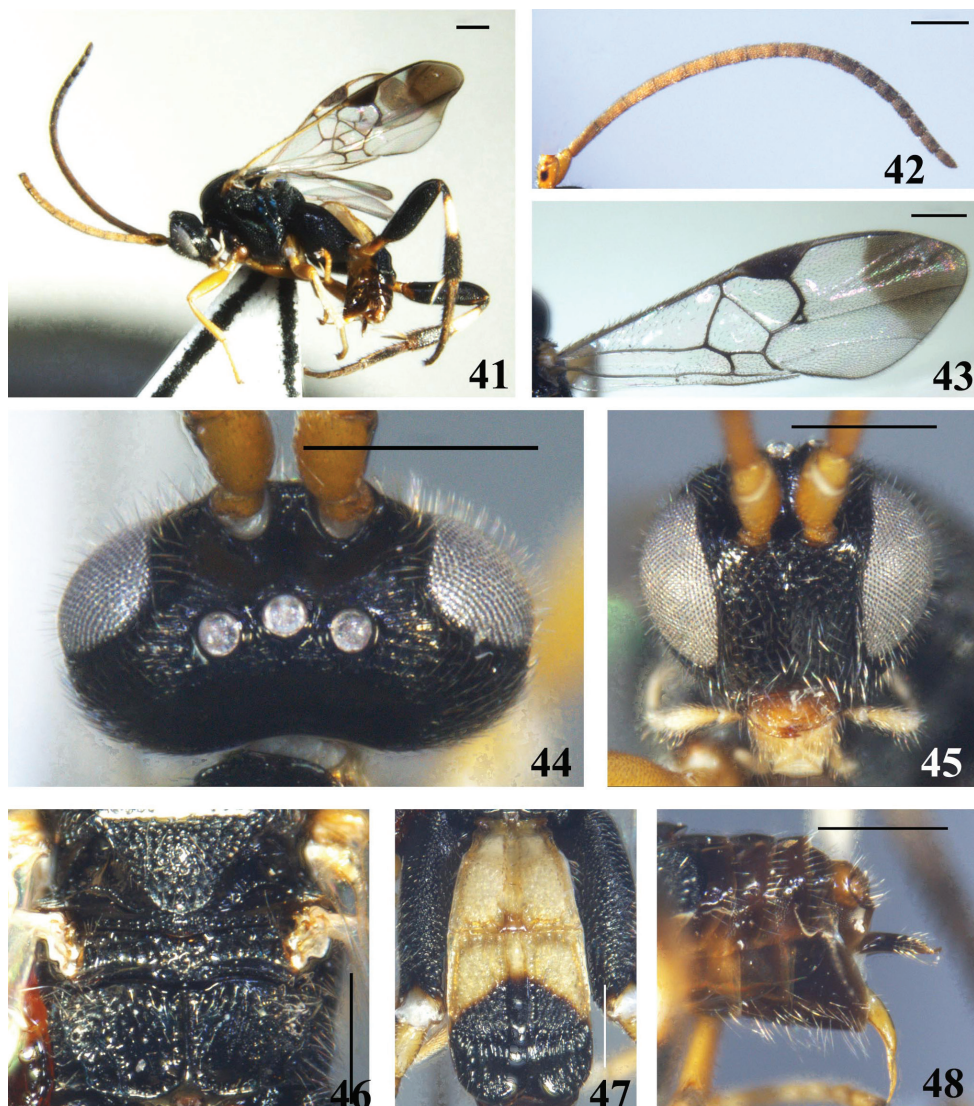
also shiny, convex, as densely punctate as mesoscutum; its rugose tip at middle widely interrupting the posterior, polished band of scutellum. Lateral part of the polished band distinctly convex anteriorly. Anterior margin of the postscutellum closely applied to the posterior margin of the scutellum so that, laterally, the phragma of scutellum is completely hidden. Scutellar sulcus deep but narrow, with few strong longitudinal carinae, its width as long as scutellum (16.0:16.0). Propodeum with surface coarsely rugose on anterior 2/3 and polished on posterior 1/3, with strong costulae around spiracles and dull inside, with a very strong complete median keel. Mesopleuron polished above precoxal sulcus but with dense setigerous-punctures anteriorly and below precoxal sulcus; precoxal sulcus indicated by a shallow depression, with few punctures.

Wings. Forewing with the areolet is 4-sided, vein r (1st abscissa of the radius) much longer than vein 3-SR (2nd abscissa of the radius), arising from distal 1/2 of pterostigma, far behind the middle, very obliquely placed on the pterostigma, meeting vein 2-SR at 110 degree angle. Vein 1-R1 (metacarp) with distal end sharply defined, 4.8× as long as its distance from the apex of the marginal cell and 1.2× as long as pterostigma; pterostigma 3.0× as long as wide; r:2-SR:length of pterostigma=10.5:7.0:31.0. Width of 1st discal cell:height of 1st discal cell=27.0:19.0; 1-CU1:2-CU1:m-cu=8.2:16.0:10.5. Hind wing with vannal lobe evenly convex, fringed with long setae throughout.

Legs. Long and strong. Hind coxa large, reaching to posterior margin of T3, shiny, with dense and evenly discrete punctures, evenly setose all over. Hind tibia swollen apically, 0.8× as long as hind tarsus (58.0:76.0), outer surface with very sparse fine spines. Inner hind tibial spur longer than outer one, 0.5× as long as hind basitarsus (18.0:34.5); fourth tarsal segment shorter than fifth tarsal segment (6.9:10.0); apical segment of the front tarsus without a spine. Tarsal claws simple.

Metasoma. Shorter than mesosoma. T1 slightly narrowed toward apex, shiny, finely rugulose and with distinct median groove on anterior 3/5, densely rugose and with appressed setae on posterior 2/5, 2.0× as long as its width and twice as long as T2. T2 transverse, narrowed apically, anterior corner distinctly projecting anteriorly, longitudinally aciculate with interspaces rugose and without setae, without trace of median field, with very sparse short fine setae, 0.7× as long as wide and as long as T3. T3 subrectangular, very finely longitudinally aciculate, also with very few fine setae. Tergites posterior to T3 membranous, polished, sparsely setose. Ovipositor sheath slightly widened apically, straight, without modified setae at apex. Hypopygium large, evenly sclerotised, polished with sparse long fine setae, apex not surpassing the last tergite.

Colour. Body black, somewhat brownish; metasoma dark brown, lighter and more or less transparent ventrally. Antennae brown except for 3–4 white middle flagellomeres with scape and pedicel transparent ventrally. Mouthparts brownish yellow, ventral margin and apex of labium brown, palpi whitish yellow. Tegula brown. Legs almost brown, with fore and middle legs lighter, except the trochanters, fore and middle coxae and ventral part of hind coxa pale yellow; hind femur yellow at base; tibial spurs whitish yellow. Wings hyaline; veins and pterostigma brown, except the basal pale spot of pterostigma.



Figures 41–48. *Diolcogaster chaoi* (Luo & You, 2003) **41** habitus, lateral view **42** antennae **43** fore wing **44** head, dorsal view **45** head, frontal view **46** scutellum and propodeum, dorsal view **47** T1–3, dorsal view **48** hypopygium and ovipositor sheaths, lateral view. Scale line = 0.5 mm.

Variation. Some individuals from Hainan Island with legs and metasoma lighter coloured, indicated by yellow colour.

Male. Unknown.

Host. Unknown.

Material examined. Holotype: ♀, Mt. Nanling (112°59'–113°05'E, 24°53'–24°56'N), Ruyuan, Guangdong, 2004. V. 8, legs. Xu Zaifu, No. 20049497. Paratype: 1♀, Mt. Nanling (112°59'–113°05'E, 24°53'–24°56'N), Ruyuan, Guangdong,

2004. V. 8, legs. Xu Zaifu, No. 20049461; 2♀♀, Mt. Chebaling (114°14'–114°16'E, 24°43'–24°44'N), Shixing, Guangdong, 2002. IV. 19, legs. Xu Zaifu, No. 20050439, 20050825; 2♀♀, Mt. Chebaling (114°14'–114°16'E, 24°43'–24°44'N), Shixing, Guangdong, 2003. VIII. 21, legs. Xu Zaifu, No. 20051996, 20052381; 1♀, Mt. Gutian (118°07'–118°10'E, 29°14'–29°16'N), Kaihua, Zhejiang, 2005. VII. 2, legs. Wu Qiong, No. 200616858; 1♀, Mt. Gutian (118°07'–118°10'E, 29°14'–29°16'N), Kaihua, Zhejiang, 2005. VII. 3, legs. Wu Qiong, No. 200616985; 1♀, Mt. Gutian (118°07'–118°10'E, 29°14'–29°16'N), Kaihua, Zhejiang, 2005. VII. 3, legs. Chen Xuexin, No. 200616274; 1♀, Mt. Diaoluo (109°53'–109°58'E, 18°39'–18°42'N), Lingshui, Hainan, 2007. V. 28–VI. 1, legs. Zeng Jie, No. 200806652; 1♀, Tianchi, Mt. Jianfengling (108°48'–108°49'E, 18°41'–18°42'N), Ledong, Hainan, 2006. VII. 12–15, legs. Weng Liqiong, No. 200803277; 1♀, Tianchi, Mt. Jianfengling (108°48'–108°49'E, 18°41'–18°42'N), Ledong, Hainan, 2008. XI. 24, legs. Tan Jiangli, No. 200806060; 1♀, Letu (117°13'–117°14'E, 24°53'–24°54'N), Nanjing. Fujian, 1991. V. 23, legs. Liu Changming, No. 20006002.

Etymology. The specific name “laetimedia” derives from the Latin adjective “laetus” and noun “media”, referring to middle of antennae with bright white color.

Distribution. China (Zhejiang, Fujian, Guangdong, Hainan).

Remarks. This species is similar to *Diolcogaster connexus* (Nees, 1834), but can be distinguished by the pterostigma emitting radius much distal to middle (the latter with pterostigma emitting radius at most slightly beyond middle); T2 as long as T3 (the latter with T2 much shorter than T3); and tergites posterior to T3 only sparsely setose (the latter with metasoma with dense setae, especially on T3).

Diolcogaster perniciosus (Wilkinson, 1929)

http://species-id.net/wiki/Diolcogaster_perniciosus

Figs 81–88

Microgaster perniciosus Wilkinson 1929, 77: 122. Holotype female, pinned with labels as follows: “Australia: Victoria” undated (London, ♀, 3.c. 1310).

Protomicroplitis perniciosus: Nixon 1965: 248.

Material examined. 1♀, Mt. Longqi (117°37'–117°39'E, 26°15'–26°16'N), Jiangle, Fujian, 1991. VII. 1, legs. Liu Changming, No. 20006438; 1♀, West Mt. Tianmu (119°23'–119°24'E, 30°20'N), Linan, Zhejiang, 1995. V. 9, legs. Du Yuzhou, No. 977839; 1♀, Mangkuan (98°51'–98°53'E, 25°26'–25°27'N), Baoshan, Yunnan, 2006. VII. 18, legs. Zeng Jie, No. 200801846; 1♀, Shaba (98°42'–98°43'E, 25°23'–25°24'N), Jietou, Tengchong, Yunnan, 2009. V. 13, legs. Wang Manman, No. 200904443; 1♀, Langsu, Tongbiguan (97°38'E, 24°37'N), Yingjiang, Yunnan, 2009. V. 16, legs. Wang Manman, No. 200905077; 1♀, Langsu, Tongbiguan (97°38'E, 24°37'N), Yingjiang, Yunnan, 2009. V. 16, legs. Zeng Jie, No. 200904674; 1♀, Mulianhua-tang (97°39'E, 24°36'N), Tongbiguan, Yingjiang, Yunnan, 2009. V. 20, legs. Zeng Jie,

No. 200905319; 1♀, Mt. Cangshan (100°10'E, 25°38'N), Dali, Yunnan, 2009. V. 25, legs. Wang Manman, No. 200904181; 1♀, Xiangshuwan (107°13'E, 28°12'N), Kuankuoshui Natural Reserve, Suiyang, Guizhou, 2010. VI. 3, legs. Chai Hongfei, No. 201004207; 3♀♀, Xiangshuwan (107°13'E, 28°12'N), Kuankuoshui Natural Reserve, Suiyang, Guizhou, 2010. VI. 4, legs. Tan Jiangli, No. 201002737, 201002748, 201002749; 2♀♀, Kuankuoshui Natural Reserve (107°14'–107°15'E, 28°22'N), Suiyang, Guizhou, 2010. VI. 5, legs. Tang Pu, No. 201001371, 201001662; 1♀, the core area of Kuankuoshui Natural Reserve (107°15'E, 28°22'N), Suiyang, Guizhou, 2010. VI. 6–7, legs. Tan Jiangli, No. 201000857; 1♀, Shilingou (107°15'E, 28°22'N), Kuankuoshui Natural Reserve, Suiyang, Guizhou, 2010. VI. 9, legs. Tan Jiangli, No. 201005532; 1♀, Jiulongshan (106°35'E, 26°08'N), Huishui, Guizhou, 2010. VI. 11, legs. Zeng Jie, No. 201003863.

Host. *Nyctemera amica*, *Nyctemera annulata*, *Nyctemera* [*Senecio jacobaea*]; *Spilosoma glatignyi* (Arctiidae) (Yu & van Achterberg, 2004).

Distribution. China (Zhejiang, Fujian, Guizhou, Yunnan); Australia, New Zealand.

Remarks. This species is record from China for the first time.

Diolcogaster plurimitida Zeng & Chen, sp. n.

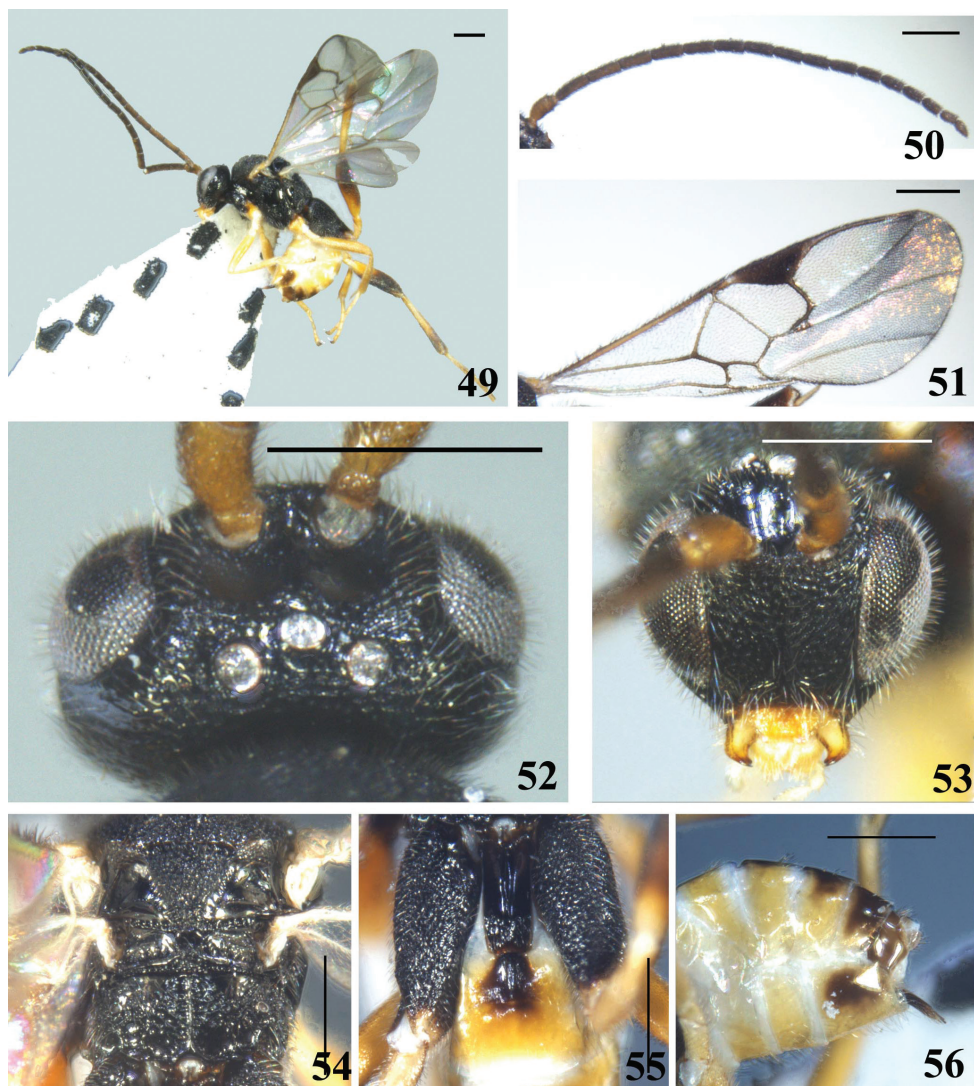
urn:lsid:zoobank.org:act:C0DCEB36-9910-42F3-9668-A4A48A807250

http://species-id.net/wiki/Diolcogaster_plurimitida

Figs 49–56

Description. Female. Body length 3.0 mm, fore wing length 2.9 mm.

Head. Oval in anterior view, with antennal sockets high above middle level of eyes; transverse in dorsal view, 1.5× as wide as long and almost as long as mesoscutum, with very dense short fine setae except for the sharply constricted and highly polished area behind lateral ocelli. Ocelli small, in a low and wide triangle, the transverse, posterior tangent to the anterior ocellus deeply cutting the posterior pair. POL:OD:OOL=6.2:4.0:6.7. Vertex vey shiny, strongly convex, finely transversely striate; frons polished and without setae in large part but densely rugulose and setose adjacent to eye margin; face slightly convex, also very shiny, densely strigose-punctate, transversely striate just below antennal sockets, without any trace of median keel, width of face 0.8× as high as eye and clypeus combined (17.8:23.7); eyes of moderate size, inner margin of eyes parallel, 1.8× as high as wide (22.3:12.7); temple and gena very shiny, sparsely transversely striate, with appressed long setae. Clypeus slightly convex, densely rugulose, with ventral margin slightly excavated medially; tentorial pits small, distance between tentorial pits 2.5× as long as distance from pit to eye margin; malar space very short, 0.2× as long as eye height. Antennae long and thin, with the preapical segment about 1.3× as long as wide; flagellomeres not thickened apically, with bristly setosity, with placodes arranged regularly in 2 ranks; apical segment also as long as preapical one. Flagellomere proportion: 2 L/W=3.2, 8 L/W=3.7, 14 L/W=2.2; L 2/14=1.6; W 2/14=0.6.



Figures 49–56. *Diolcogaster pluriminitida* Zeng & Chen, sp. n. **49** habitus, lateral view **50** antennae **51** fore wing **52** head, dorsal view **53** head, frontal view **54** scutellum and propodeum, dorsal view **55** T1–3, dorsal view **56** hypopygium and ovipositor sheaths, lateral view. Scale line = 0.5 mm.

Mesosoma. Pronotum shiny, with a broad and shallowly foveate ventral furrows laterally. Mesoscutum shiny, with dense but discrete punctures that denser and so that duller in the middle, with dense short fine setae all over; notauli not impressed. Disc of scutellum also shiny, as densely and discretely punctate as mesoscutum; its rugose tip at middle widely interrupting the posterior, polished band of scutellum. Lateral part of the polished band distinctly convex anteriorly. Anterior margin of the postscutellum closely applied to the posterior margin of the scutellum so that, laterally, the phragma of scutellum is completely hidden. Scutellar sulcus shallow, with few longitudinal cari-

nae, its width $1.3\times$ as long as scutellum (21.0:16.3). Propodeum very shiny, with a strong complete median keel, smooth with very few discrete large punctures, with very short transverse carina each side along the median keel and dense rugulosity around spiracles. Mesopleuron polished in large part, setigerous-punctate anteriorly and below precoxal sulcus; precoxal sulcus shallow, indistinct, setigerous-punctate.

Wings. Forewing with the very small slit-like areolet, 3-sided; vein r-m united with vein 2-SR at a considerable distance from the junction of vein 2-SR and the vein r+3-SR; vein r arising from distal $1/2$ of pterostigma, far behind the middle, very obliquely placed on the pterostigma; meeting vein 2-SR at a right angle. Vein 1-R1 (metacarp) with distal end sharply defined, $4.4\times$ as long as its distance from the apex of the marginal cell and as long as pterostigma; pterostigma broad, $2.7\times$ as long as wide; r:2-SR:length of pterostigma=11.5:10.0:32.0. Width of 1st discal cell:height of 1st discal cell =25.0:22.0; 1-CU1:2-CU1:m-cu=11.0:10.0:9.5. Hind wing with vannal lobe evenly convex, fringed with long setae throughout.

Legs. Long and thin. Hind coxa with outer surface densely and discretely punctate with interspaces very shiny, dorsal surface densely rugulose and striate-rugulose, reaching to the middle of T3, setose all over. Hind tibia swollen apically and only $0.8\times$ as long as hind tarsus (48.5:63.8), outer surface without spines. Inner hind tibial spur longer than outer one, $0.7\times$ as long as hind basitarsus (20.0:28.0); fourth tarsal segment almost as long as fifth tarsal segment (7.8:8.0); apical segment of the front tarsus without a spine. Tarsal claws simple.

Metasoma. Longer than mesosoma. T1 strongly sclerotised, narrow, parallel-sided but slightly narrowed distally on posterior half, with few long setae laterally; surface with anterior $3/4$ polished and posterior $1/4$ rugulose with fine setae, the distinct median groove reduced on posterior $1/4$; $2.4\times$ as long as its width and $2.4\times$ as long as T2. T2 polished and without setae, with a slightly swollen median field, ill-defined, $0.4\times$ as long as wide and $0.7\times$ as long as T3. Tergites posterior to T2 membranous, highly polished with a row of short fine setae before posterior margin, except the last segment scattered with short fine setae. Ovipositor sheath with even width, slightly decurved, with 2 blackened setae at apex. Hypopygium of moderate size, evenly sclerotised, polished, with dense short setae all over, apex not surpassing the last tergite.

Colour. Body black, metasoma mostly bright yellow. Antennae evenly brown except scape and pedicel yellow. Mouthparts yellow with palpi whitish. Tegula bright yellow. Fore and middle legs virtually bright yellow. Hind coxa wholly black; trochanter yellow, base of femur and basal $3/4$ of tibia also yellow but gradually darkened to brown apically; tarsi and tibial spurs whitish brown. T1 dark brown, the indistinct median field of T2 also brown but lightened outwards to bright yellow, apical 3 segments and ovipositor sheaths also brown, T5, T6 and lateral part of hypopygium brownish. Wings hyaline; veins and pterostigma light brown, somewhat pale.

Variation. Some individuals from Zhejiang and Guizhou have ovipositor sheath only finely setose, without apical modified seta; metasoma mostly yellow, but size of brownish part of dorsal surface and hypopygium variable; the ill-defined median field of T2 hardly impressed in some specimens.

Male. Unknown.

Host. Unknown.

Material examined. Holotype: ♀, Wanjia, Mayanghe (108°13'–108°21'E, 28°35'–28°41'N), Guizhou, 2007. IX. 27–30, legs. Liu Jingxian, No. 200708869. Paratype: 1♀, Mt. Huping (110°45'–110°55'E, 30°02'–30°07'N), Shimen, Hunan, 2009. VII. 12, legs. Ma Li, No. 200901491; 1♀, Mt. Huping (110°45'–110°55'E, 30°02'–30°07'N), Shimen, Hunan, 2009. VII. 12, legs. Zeng Jie, No. 200900730; 1♀, Mt. Tongledashan (111°20'–111°29'E, 23°07'–23°14'N), Yunan, Guangdong, 2003. VIII. 12–13, legs. Xu Zaifu, No. 20054555; 1♀, Mt. Leigong (118°03'–118°15'E, 26°21'–26°25'N), Fangxiang, Guizhou, 2005. VI. 2–3, legs. Liu Jingxian, No. 200605872; 1♀, West Mt. Tianmu (119°23'–119°24'E, 30°20'N), Linan, Zhejiang (Malaise trap), 1998. IX. 26, legs. Zhao Mingshui, No. 20002719.

Etymology. The specific name “pluriminitida” derives from the Latin adjective “plurimus” and adjective “nitidus”, referring to large part of T1 polished.

Distribution. China (Zhejiang, Hunan, Guangdong, Guizhou).

Remarks. This species is similar to *Diolcogaster xanthaspis* (Ashmead, 1900), but can be distinguished by the T2 with only ill-defined slightly swollen median field that with even width (the latter T2+3 with distinct but rather poorly defined median field that is slightly wider in front than behind); and propodeum smooth with very few discrete large punctures except very short transverse carina each side along the median keel and dense rugulosity around spiracles (the latter with propodeum coarsely rugose).

***Diolcogaster praritas* Zeng & Chen, sp. n.**

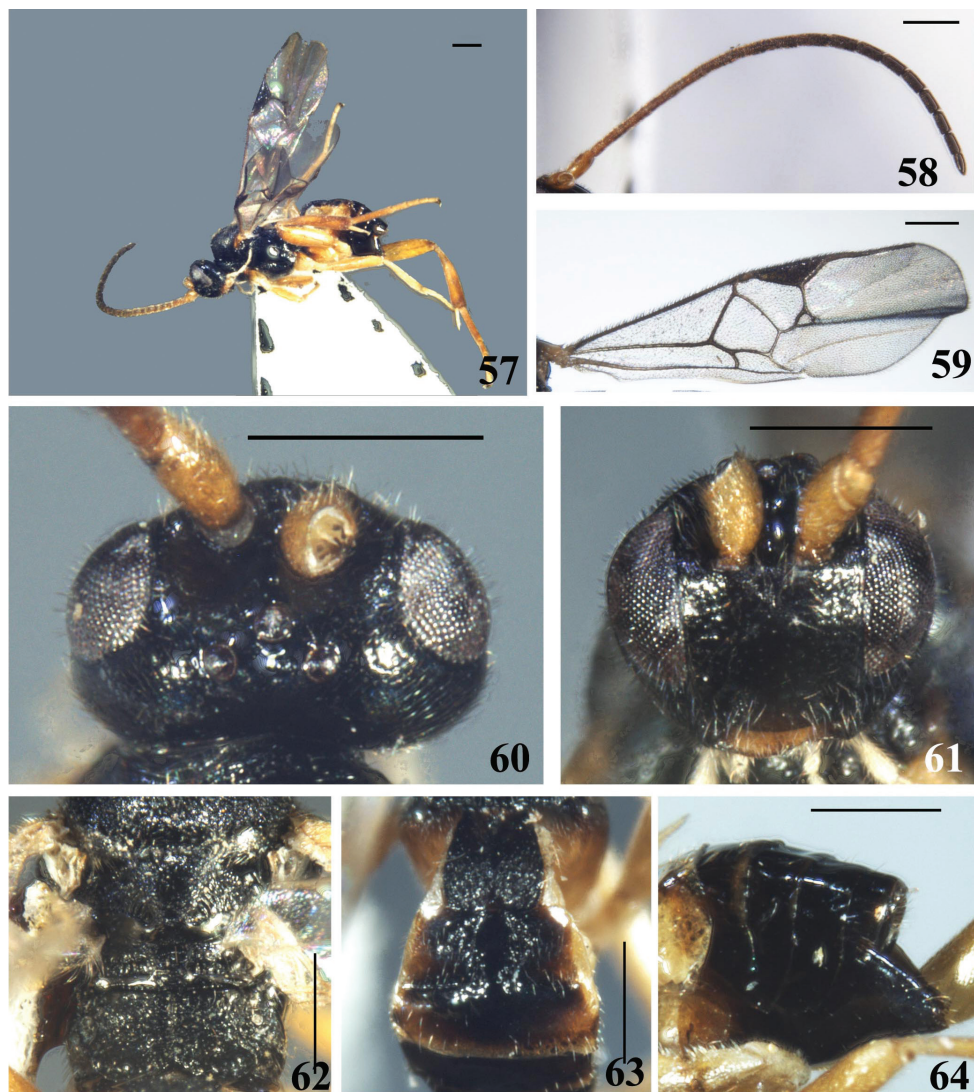
urn:lsid:zoobank.org:act:CD345F6F-2076-4B67-9A1F-EC1323648030

http://species-id.net/wiki/Diolcogaster_praritas

Figs 57–64

Description. Female. Body length 3.2 mm, fore wing length 3.5 mm.

Head. Oval in anterior view, with antennal sockets high above middle level of eyes; transverse in dorsal view, 1.6× as wide as long and slightly narrower than mesoscutum, with sparse and short setae except the sharply constricted and highly polished area behind lateral ocelli. Ocelli of moderate size, in a low, very wide triangle, the transverse, posterior tangent to the anterior ocellus just cutting the posterior pair. POL:OD:OOL=6.0:3.4:7.0. Vertex and frons smooth and shiny, only between the ocelli and the eye-margin very sparsely punctate; vertex strongly convex; face slightly convex, feebly and transversely striate-punctate, without any trace of median keel, width of face 0.9× as high as eye and clypeus combined (20.0:23.2); eyes small, inner margin of eyes adjacent to face parallel, 1.6× as high as wide (20.5:13.0); temple and gena feebly rugose-punctate and shiny, densely setose. Clypeus slightly swollen, feebly rugose; tentorial pits of moderate size, distance between tentorial pits 2.6× as long as distance from pit to eye margin (10.4:4.0); malar space short, 0.3× as long as eye height. Antennae a little shorter than the body, with the preapical segment about 1.5×



Figures 57–64. *Diolcogaster praritas* Zeng & Chen, sp. n. **57** habitus, lateral view **58** antennae **59** fore wing **60** head, dorsal view **61** head, frontal view **62** scutellum and propodeum, dorsal view **63** T1–3, dorsal view **64** hypopygium and ovipositor sheaths, lateral view. Scale line = 0.5 mm.

longer than wide; scape short; flagellomeres long, thick, without bristly setosity, with placodes arranged regularly in 2 ranks except the distal 6 or 7 segments; apical segment slightly longer than preapical one. Flagellomere proportion: 2 L/W=3.6, 8 L/W=2.5, 14 L/W=2.1; L 2/14=1.4; W 2/14=0.8.

Mesosoma. Pronotum with a very indistinct ventral furrow laterally. Mesoscutum with dense rugose-punctures but interspaces shiny, with short setae all over; notauli not impressed, but indicated by a band of broad depression posteriorly. Disc of scutellum finely, discretely punctate, very shiny, with normal setosity, polished at tip, so the

posterior, polished band of scutellum continuous. Lateral part of the polished band at least distinctly convex anteriorly. Anterior margin of the postscutellum closely applied to the posterior margin of the scutellum so that, laterally, the phragma of scutellum is completely hidden. Scutellar sulcus shallow, with few longitudinal carinae, its width almost as long as scutellum (15.0:15.5). Propodeum short, shiny, finely reticulate-rugose all over, with a well-defined median keel. Mesopleuron in large part polished. Precoxal sulcus very short, indicated by a shallow depression with dense but shallow punctures.

Wings. Forewing with rather large 4-sided areolet; vein r(1st abscissa of the radius) much longer than 3-SR(2nd abscissa of the radius), arising from distal 1/2 of pterostigma, far behind the middle, placed at right angles to the pterostigma, meeting vein 2-SR at a 150 degree angle. Vein 1-R1 (metacap) with distal end sharply defined, 3.5× as long as its distance from the apex of the marginal cell and 1.2× as long as pterostigma; pterostigma 2.7× as long as wide; r:2-SR:length of pterostigma=9.0:10.0:31.0. Width of 1st discal cell:height of 1st discal cell =26.5:23.0, 1-CU1:2-CU1:m-cu=9.0:13.6:10.0. Hind wing with vannal lobe convex, fringed with long setae throughout.

Legs. Long and thin. Hind coxa very feebly punctate, almost polished. Hind tibia swollen apically and about 0.8× as long as hind tarsus (55.0:68.2), outer surface without distinct spines. Inner hind tibial spur much longer than outer one, 0.6× as long as hind basitarsus (17.0:30.0); fourth tarsal segment shorter than fifth tarsal segment (7.2:10.0); apical segment of the front tarsus without a spine Tarsal claws simple.

Metasoma. T1 almost parallel-sided, with a shallow median groove over basal 2/3 that with ill-defined sides; dull and coarsely rugose, with long setae laterally and sparse short setae dorsally, 1.4× as long as its width and 1.5× as long as T2. T2 trapezoidal, with a shiny and feebly longitudinally striated raised median field, irregularly shaped but distinctly narrowed behind; the lateral fields striate-rugose, but sculptures reduce toward lateral margin, 1.5× times as wide as long and 1.1× as long as T3. Tergites posterior to T2 highly polished and smooth, more membranous, with short fine setae posterolaterally; setae of metasoma very sparse, almost absent on T3. Ovipositor sheath with 2–3 blackened setae at apex. Hypopygium large, evenly sclerotised, smooth and shiny, with fine setae subapically, with apex a little surpassing the last tergite.

Colour. Body almost black, metasoma yellow on anterior half ventrally and brown dorsally. Antennae light brown at base and darkened toward apex to brown. Clypeus brownish, mouthparts brownish yellow, with ventral margin of mandible brown; palpi whitish yellow. Tegula light brown. Legs almost virtually yellow, except hind coxa brown at extreme base and hind tibia and tarsuli slightly brownish. Tergites dark brown, except lateral margin of T2 and posterolateral corner of T3 yellowish. Tergites posterior to T2 somewhat transparent. Wings hyaline; veins and pterostigma brown, somewhat transparent.

Variation. Paratype distinctly smaller than holotype; T3 yellowish on posterior half and pterostigma broader.

Male. Unknown.

Host. Unknown.

Material examined. Holotype: ♀, Tongbiguan (97°38'E, 24°37'N), Yingjiang, Yunnan, 2009. V. 17, legs. Zeng Jie, No. 200904237. Paratype: 1♀, Mt. Fengyang (119°12'–119°14'E, 27°55'–27°56'N), Longquan, Zhejiang, 2007. VII. 28, legs. Liu Jingxian, No. 200802854.

Etymology. The specific name “*praritas*” derives from the Latin noun “*praritas*”, referring to the irregular median field of T2.

Distribution. China (Zhejiang, Yunnan).

Remarks. This species is similar to *Diolcogaster austrina* (Wilkinsonellus, 1929), but can be distinguished by the disc of scutellum finely, discretely punctate (the latter with disc of scutellum smooth and highly polished); pterostigma shorter than 1-R1 vein (the latter with pterostigma just longer than 1-R1 vein); and TII with surface of the lateral fields besides median field striate-rugose, but reduced toward lateral margin (the latter with the lateral fields besides median field unsculptured).

***Diolcogaster punctatiscutum* Zeng & Chen, sp. n.**

urn:lsid:zoobank.org:act:F470CE60-B6AF-406A-955C-59EE33E1E73E

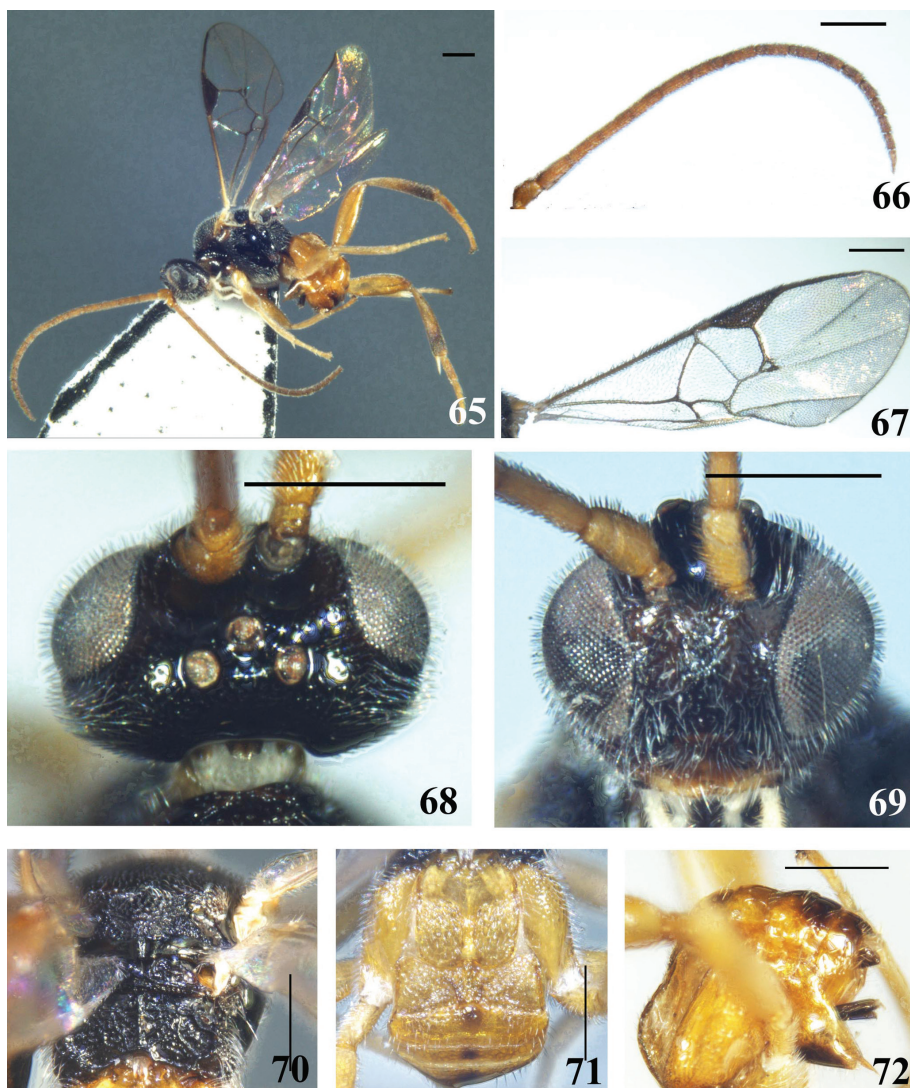
http://species-id.net/wiki/Diolcogaster_punctatiscutum

Figs 65–72

Description. Female Body length 2.8 mm, fore wing length 3.2 mm.

Head. Oval in anterior view, with antennal sockets high above middle level of eyes; transverse in dorsal view, 1.6× as wide as long and almost as long as mesoscutum, with dense short fine setae except the sharply constricted and highly polished area behind lateral ocelli. Ocelli of moderate size, in a low, very wide triangle, the transverse, posterior tangent to the anterior ocellus just cutting the posterior pair. POL:OD:OOL=5.8:4.2:7.5. Vertex very shiny, with very sparsely discrete punctures, strongly convex; frons polished, virtually without sculpture; face slightly convex, also very shiny, finely but densely punctate, with denser setae, without any trace of median keel, width of face 1.1× as high as eye and clypeus combined (26.8:24.1); eyes small, inner margin of eyes slightly widened downwards, 1.6× as high as wide (22.0:14.0); temple and gena shiny with denser and deeper punctures than vertex, and with longer setae. Clypeus indistinct, slightly convex and as finely and densely punctate as face; tentorial pits large, distance between tentorial pits 3.0× as long as distance from pit to eye margin; malar space short, 0.2× as long as eye height. Antennae longer than body, with the preapical segment fully twice as long as wide; scape short; flagellomeres thinner, tapered distally, without bristly setosity, with placodes arranged regularly in 2 ranks; apical segment longer than preapical one. Flagellomere proportion: 2 L/W=2.5, 8 L/W=3.1, 14 L/W=2.0; L 2/14=2.1; W 2/14=1.0.

Mesosoma. Pronotum shiny, with a very broad foveate ventral furrow laterally. Mesoscutum very shiny, evenly and densely punctate, with short fine setae all over; notauli not impressed. Disc of scutellum with denser punctures, larger laterally, with interspaces shiny, very densely setose; polished at tip, so the posterior, polished band of



Figures 65–72. *Diolcogaster punctatiscutum* Zeng & Chen, sp. n. **65** habitus, lateral view **66** antennae **67** fore wing **68** head, dorsal view **69** head, frontal view **70** scutellum and propodeum, dorsal view **71** T1–3, dorsal view **72** hypopygium and ovipositor sheaths, lateral view. Scale line = 0.5 mm.

scutellum is continuous. Lateral part of the polished band distinctly convex anteriorly. Anterior margin of the postscutellum closely applied to the posterior margin of the scutellum so that, laterally, the phragma of scutellum is completely hidden. Scutellar sulcus deep and broad, with few longitudinal carinae, its width as long as scutellum (15.0:15.0). Propodeum short, shiny, reticulate-rugose all over, coarsely rugose laterally and with strong rugae around spiracles, with a strong complete median keel. Mesopleuron in large part polished (including area below precoxal sulcus posteriorly), the other part with setigerous-punctures. Precoxal sulcus only indicated on anterior half

of mesopleuron, shallow and broad, feebly and largely foveate anteriorly and polished behind.

Wings. Forewing with areolet 4-sided; vein r (1st abscissa of the radius) much longer than 3-SR (2nd abscissa of the radius), arising from distal 1/2 of pterostigma, slightly behind the middle, placed at almost right angle to the pterostigma, meeting vein 2-SR at a 160 degree angle. Vein 1-R1 (metacarp) with distal end sharply defined, $3.9\times$ as long as its distance from the apex of the marginal cell and as long as pterostigma; pterostigma $3.1\times$ as long as wide; $r:2-SR:\text{length of pterostigma}=12.5:5.0:32.5$. Width of 1st discal cell:height of 1st discal cell = $24.3:24.0$; $1-CU1:2-CU1:m-cu=6.0:14.0:10.0$. Hind wing with edge of vannal lobe beyond its widest part straight and without trace of a fringe of setae.

Legs. More or less stout. Hind coxa very shiny, with fine and very sparse punctures and dense short fine setae, inner surface with much shorter setae; rather small, not reaching to T3. Hind tibia swollen apically and $1.1\times$ as long as hind tarsus ($49.0:46.3$), outer surface with darkened but very indistinct spines. Inner hind tibial spur longer than outer one, $0.8\times$ as long as hind basitarsus ($13.0:17.0$); fourth tarsal segment much shorter than fifth tarsal segment ($5.4:8.9$); apical segment of the front tarsus without a spine. Tarsal claws simple.

Metasoma. Broad. T1 parallel-sided or slightly swollen medially, with anterior half surface smooth and shiny and sharply separated from coarsely and strongly reticulate-rugose posterior half surface by a strong carina on each side of median groove; the percurrent median groove indistinct on anterior half and sharply rimmed on posterior half, with few long setae in the middle laterally, $1.1\times$ as long as its width, and almost twice as long as T2; T2 transverse, shortened medially, with a raised pentagonal median field, shiny but densely rugulose all over; $2.8\times$ times as wide as long and $1.2\times$ as long as T3. T3 transverse with anterior margin curved, shiny with very fine rugulosity and a few short fine setae. Tergites posterior to T3 more membranous, highly polished with a row of short fine setae bordering anterior margins except for the last two segments which only have sparse short fine setae. Ovipositor sheath with even width, with a fine modified apical seta. Hypopygium large, evenly sclerotised, smooth and shiny, with long fine setae, apex slightly surpassing the last tergite.

Colour. Body dark brown to black, except metasoma yellow with brown apex. Antennae light brown at base and darkened toward apex to brown. Mouthparts lighter with mandible yellow and palpi white. Tegula whitish yellow. Legs almost virtually yellow, except apical 1/3 of hind tibia and apex of claws brown and hind basitarsus slightly brownish. Tergites almost yellow and somewhat transparent, except middle of T3 to T6 and hypopygium, T7, posterior half of T8, the last tergite and ovipositor sheaths brown. Wings hyaline; veins brown, pterostigma dark.

Male. Unknown.

Host. Unknown.

Material examined. Holotype: ♀, Fengxi ($116^{\circ}15' \sim 116^{\circ}17'E$, $24^{\circ}31' \sim 24^{\circ}32'N$), Meizhou, Guangdong, 2003. VII. 29, legs. Chen Jujian, No. 20048449.

Etymology. The specific name “punctatiscutum” derives from the Latin adjective “punctate” and noun “scutum”, referring to disc of scutellum with large punctures.

Distribution. China (Guangdong).

Remarks. This species is similar to *Diolcogaster austrina* (Wilkinsonellus, 1929), but can be distinguished by the disc of scutellum with dense punctures, larger laterally (the latter with disc of scutellum smooth and highly polished); vein 1-CU1 much shorter than vein 2-CU1 (the latter with vein 1-CU1 and vein 2-CU1 of equal length); and antennae normal, long and thin (the latter with antennae short and stout).

***Diolcogaster spreta* (Marshall, 1885)**

http://species-id.net/wiki/Diolcogaster_spreti

Microgaster spreta Marshall 1885: 259. Holotype female, United Kingdom. Marshall 1890: 547; Fahringer 1937: 329; Telenga 1955: 195.

Protomicropplitis spreta: Nixon 1965: 255; You et al. 1990: 47.

Host. *Dioryctria palumbella*; *Euzophera consociella*.

Distribution. China (Shaaxi); Czechoslovakia, Hungary, Moldova, United Kingdom.

Remarks. No specimens were available for this study.

***Diolcogaster translucida* Zeng & Chen, sp. n.**

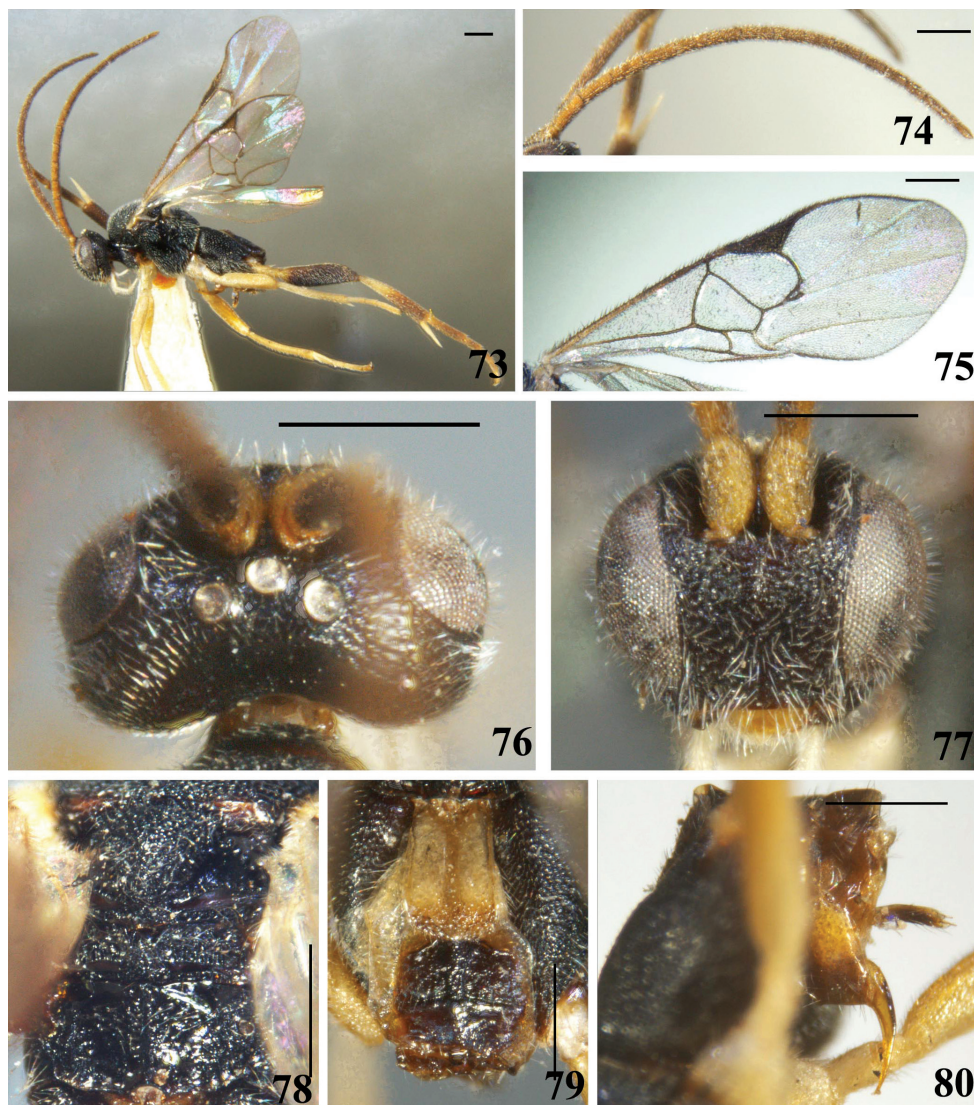
urn:lsid:zoobank.org:act:468601AA-83BF-4DCD-995E-4C091996C016

http://species-id.net/wiki/Diolcogaster_translucida

Figs 73–80

Description. Female. Body length 3.0 mm, fore wing length 3.4 mm.

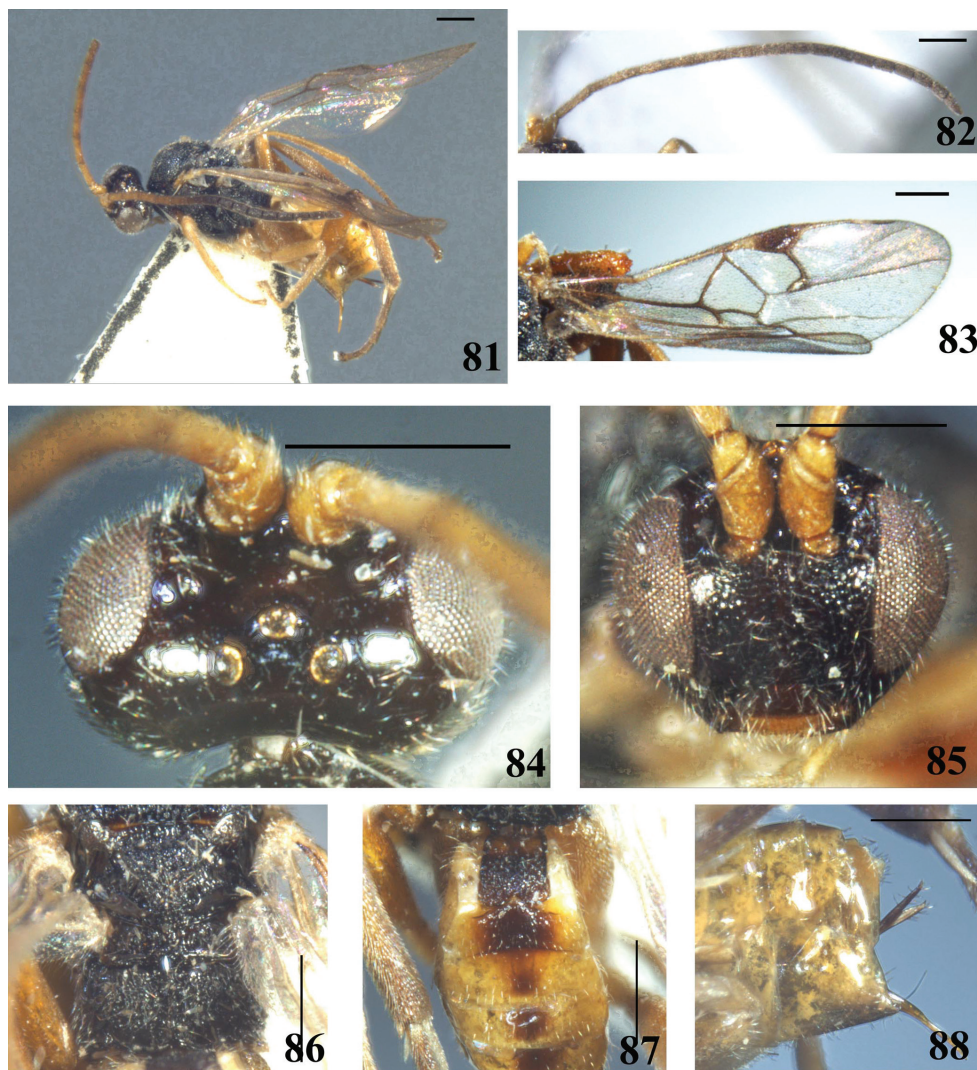
Head. Rather large, oval in anterior view, with antennal sockets high above middle level of eyes; strongly transverse in dorsal view, 1.4× as wide as long and 0.8× as long as that of mesonotum, with short white setae including eyes. Ocelli in a low, very wide triangle, the transverse, posterior tangent to the anterior ocellus just cutting the posterior pair. POL:OD:OOL=7.1:3.8:8.0. Vertex densely rugose, strongly convex and sharply constricted to occiput, with very short dense fine setae; frons also densely rugose; face slightly convex, rugose and setose, upper half with very indistinct median longitudinal carina, width of face 0.8× as high as eye and clypeus combined (15.0:27.2); eyes of moderate size, inner margins of eyes slightly narrowed downwards, 1.8× as high as wide (27.2:15.0); temple and gena feebly rugose-punctate and shiny, densely setose. Clypeus also rugose and setose; tentorial pits small, distance between tentorial pits 2.8× as long as distance from pit to eye margin (12.8:4.6); malar space short, 0.2× as long as eye height. Antennae slightly longer than body, with the preapical segment about thrice as long as wide; flagellomeres with bristly setosity, with placodes arranged regularly in 2 ranks except the apical one; apical segment subequal



Figures 73–80. *Diolcogaster translucida* Zeng & Chen, sp. n. **73** habitus, lateral view **74** antennae **75** fore wing **76** head, dorsal view **77** head, frontal view **78** scutellum and propodeum, dorsal view **79** T1–3, dorsal view **80** hypopygium and ovipositor sheaths, lateral view. Scale line = 0.5 mm.

to preapical one in length. Flagellomere proportion: 2 L/W=2.9, 8 L/W=2.5, 14 L/W=2.3; L 2/14=1.6; W 2/14=1.3.

Mesosoma. Pronotum with two weakly indicated but distinct foveate furrows laterally. Mesoscutum shiny, evenly and densely rugose-punctate, with short setae all over; notauli not impressed. Disc of scutellum as strongly sculptured as the mesoscutum, with normal setosity, its rugose tip at middle widely interrupting the posterior, polished band of scutellum. Lateral, polished field reduced to a thin, parallel-sided strip. Ante-



Figures 81–88. *Diolcogaster perniciosus* (Wilkinson, 1929) **81** habitus, lateral view **82** antennae **83** fore wing **84** head, dorsal view **85** head, frontal view **86** scutellum and propodeum, dorsal view **87** T1–3, dorsal view **88** hypopygium and ovipositor sheaths, lateral view. Scale line = 0.5 mm.

rior margin of the postscutellum closely applied to the posterior margin of the scutellum so that, laterally, the phragma of scutellum is completely hidden. Scutellar sulcus deep, with few longitudinal carinae, its width 0.9× as long as scutellum (19.0:20.4). Propodeum shiny, with a complete median keel; surface on each side of the median propodeal keel almost smooth, with dense obsolescent punctures, only with very short transverse ridging on immediate vicinity of longitudinal carina. Mesopleuron polished posteriorly and above precoxal sulcus, depressed below and there densely setigerous-punctate; precoxal sulcus long, broad, shallow with shallow longitudinal carina.

Wings. Forewing with vein r-m reduced to a mere hyaline point and more or less interstitial with vein r so that the areolet is virtually 3-sided, very small, slit-like. Vein r arising from distal 1/2 of pterostigma, far behind the middle, very obliquely placed on the pterostigma, meeting vein 2-SR at a 100 degree angle. Vein 1-R1 (metacarp) with distal end almost reaching to apex of marginal cell, $2.4\times$ as long as pterostigma, pterostigma $2.1\times$ as long as wide; r:2-SR:length of pterostigma=14.0:9.5:21.0. Second discoidal cell setose almost everywhere. Width of 1st discal cell:height of 1st discal cell =23.0:24.5. 1-CU1:2-CU1:m-cu=12.0:10.2:10. Hind wing broad, with vannal lobe beyond its widest part straight and fringed with short setae throughout.

Legs. Long and thin. Hind coxa large, just reaching past posterior margin of T3, with evenly and closely punctate surface, the interspaces very shiny. Hind tibia swollen toward apex and about $0.9\times$ as long as hind tarsus (57.0:66.2), with rather sparse fine spines. Inner hind tibial spurs much longer than outer ones, about $0.8\times$ as long as hind basitarsus (24.0:30.0); fourth tarsal segment shorter than fifth tarsal segment (9.2:10.0); apical segment of the front tarsus without a spine. Tarsal claws rather long, simple.

Metasoma. Slightly shorter than mesosoma. Tergites with short fine setae all over. T1 almost parallel-sided, roundly constricted at apical 1/5, with complete longitudinal groove; smooth, except for rugosity at posterior corners, $1.4\times$ as long as its width, $1.6\times$ as long as T2. T2 strongly transverse, anterior margin oblique each side besides the middle, with a more or less distinct parallel-sided median field that elongated and smooth, the lateral fields are not transverse and more or less aciculate-rugose, $0.5\times$ as long as its width and $1.4\times$ as long as T3. T3 also transverse, membranous, polished, separated from T2 by a deep groove. Tergites posterior to T3 more membranous; setae of metasoma very sparse, almost absent on T3. Ovipositor sheath with 2–3 strong and blackened modified setae at apex. Hypopygium small, evenly sclerotised, smooth with sparse fine setae, not surpassing the last tergite.

Colour. Body black, more or less brownish, except that metasoma yellow to brown. Antennae light brown, slightly darkened toward apex. Mouthpart yellow, palpi paler. Tegula whitish yellow. Fore and mid legs uniformly bright yellow; hind coxa black but brownish marginally, trochanter yellow, femur brown with the extreme base yellow; hind tibia lighter than femur but on basal half bright yellow, hind spurs bright yellow. T1 bright yellow, somewhat transparent, T2 and T3 brown; other tergites light brown. Wings hyaline; veins and pterostigma light brown, transparent.

Variation. Some individuals with head and hind coxa yellow.

Male. Unknown.

Host. Unknown.

Material examined. Holotype: ♀, Yiliping (117°40'–117°42'E, 27°43'–27°44'N), Fujian, 1981. V. 5, legs. Huang Juchang, No. 20004177. Paratype: 1♀, Tianbaoyan, Yongan (117°17'–117°27'E, 25°54'–26°02'N), Fujian, 2001. VII. 15–18, legs. Xu Zaifu, No. 20020245; 1♀, Mt. Longqi, Jiangle (117°11'–117°21'E, 26°23'–26°43'N), Fujian, 1991. VII. 16, legs. Liu Changming, No. 20007159; 1♀, Mt. Tongledashan (111°20'–111°29'E, 23°07'–23°14'N), Yunan, Guangdong, 2003. VIII. 12–13,

legs. Xu Zaifu, No. 20054526; 1♀, Fengxi (116°15'–116°17'E, 24°31'–24°32'N), Meizhou, Guangdong, 2003. VII. 29, legs. Chen Jujian, No. 20048755; 1♀, Mt. Nanling (112°59'–113°05'E, 24°53'–24°56'N), Ruyuan, Guangdong, 2003. VII. 23, legs. Xu Zaifu, No. 20049030; 1♀, Mt. Gutian (118°07'–118°10'E, 29°14'–29°16'N), Zhengjiang, 2005. V. 2, legs. Wu Qiong, No. 200616757; 1♀, West Mt. Tianmu (119°23'–119°24'E, 30°20'N), Linan, Zhejiang, 1998. V. 25, legs. Zhao Mingshui, No. 20003376; 3♀♀, Baotianman (111°55'–111°58'E, 33°29'–33°32'N), Neixiang, Henan, 1998. VII. 14, legs. Chen Xuexin, No. 988345, 988654, 988701; 1♀, Mt. Huping (110°45'–110°55'E, 30°02'–30°07'N), Shimen, Hunan, 2009. VII. 9, Zeng Jie, No. 200901332.

Etymology. The specific name “*translucida*” derives from the Latin adjective “*translucidus*”, referring to the colour of the whole body more or less transparent.

Distribution. China (Henan, Zhejiang, Fujian, Hunan, Guangdong).

Remarks. This species is similar to *Diolcogaster xanthaspis* (Ashmead, 1900), but can be distinguished by the ovipositor sheath with a modified apical seta (the latter without); and propodeum with surface on each side of the median propodeal keel smooth-looking, its sculpture reduced to coarse, obsolescent punctuation (the latter with propodeum coarsely rugose).

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