



On the genus *Diadocidia* (Diptera, Sciaroidea, Diadocidiidae) in Australia

MATHIAS JASCHHOF¹ & CATRIN JASCHHOF²

¹University of Greifswald, Zoological Institute and Museum, Bachstrasse 11/12, D-17489 Greifswald, Germany.

E-mail: mjaschhof@yahoo.de

²Jahnstrasse 7, D-17489 Greifswald. E-mail: c.jaschhof@gmx.de

Abstract

The first two Australian species of the genus *Diadocidia* Ruthe, *macrosetigera* sp. n. and *queenslandensis* sp. n., are described from Queensland. Both species are assigned to the subgenus *Adidocidia* Laštovka & Matile. As structures of the male terminalia suggest, the two Australian species are only distantly related to one another, whereas *queenslandensis* shows definite affinities to *D. (A.) papua* Ševčík from Papua New Guinea.

Key words: taxonomy, morphology, Diadocidiidae, *Diadocidia*, new species, Australia

Introduction

Diadocidiidae make up a small family of fungus gnats which comprises 23 extant and two fossil species classified in three genera, *Diadocidia* Ruthe, *Palaeodocidia* Sasakawa, and †*Docidiadia* Blagoderov & Grimaldi (Blagoderov 2007, Jaschhof & Jaschhof 2007). The genus *Diadocidia* includes the majority of species, 22 extant and one fossil, and is subdivided into three subgenera, *Diadocidia* s. str., *Adidocidia* Laštovka & Matile, and *Taidocidia* Papp & Ševčík. While most described *Diadocidia* species fit into one of the subgenera as defined by Laštovka and Matile (1972) and Papp and Ševčík (2005), other species do not (Papp & Ševčík 2005, Jaschhof & Jaschhof 2007), indicating that the present subgeneric classification is premature.

Extant *Diadocidia* species are known to occur in each of the world biogeographic regions except for the Afrotropics. Their occurrence and morphology in Australasia is scarcely documented, though. The only species hitherto named are those three described recently by Ševčík (2003) from Papua New Guinea. The presence of *Diadocidia* in Australia has been known since Tonnoir (1929), who reported on an apparently uncommon but widespread species in Tasmania. The wing photograph published of that species (l. c.: pl. XXII, fig. 3) leaves no doubt that the generic affiliation was correct, but this species has never been named or described. Matile (1989), in a reference to Colless (1963), remarked on a second unidentified species from Australia.

Here we describe two new *Diadocidia* species from the Australian continent and discuss their relationships. The specimens studied were found among Malaise trap material of minor extent, which indicates that *Diadocidia* is not as uncommon in Australia as the little information available on it from the literature might suggest. This genus can be identified readily by its distinctive wing venation figured (Fig. 2A) here for a single purpose: to encourage dipterists working in Australian woodlands to keep an eye out for *Diadocidia* and keep apart any specimens for taxonomic study. Almost 80 years after Tonnoir's (1929) first mention, our paper is the first descriptive one on members of the family Diadocidiidae in Australia—high time to do some justice to the intriguing and diverse fungus gnat fauna down under.

Material and methods

Specimens were picked from Malaise samples taken by Drs Michael E. Irwin and Steve D. Gaimari in Queensland in 1995/96, and since then deposited with the Irwin laboratory at the National Soybean Research Center, University of Illinois, Urbana-Champaign. During a visit to the Irwin lab in February 2005 we screened a total of 10 samples for various Sciaroidea, of which five, from three different sites, yielded specimens of *Diadocidia* spp. Of the nine specimens found, we did not study three females from a sample lacking males. Specimens were mounted on microscope slides in Canada balsam. Type specimens are deposited in the Australian National Insect Collection, Canberra. For light microscope study and the preparation of drawings we used an Olympus BX50 microscope in combination with the U-DA drawing unit. Morphological terminology follows Sølvi (1997).

Taxonomy

Diadocidia (*Adidocidia*) *macrosetigera* sp. n.

(Fig. 1)

Description. Male. Body length 3.0 mm. **Head.** Antennal flagellum bearing short non-socketed setae intermingled with a few sensory spines; longest setae as long as flagellomere width; first to third flagellomeres bearing dorsally a few short socketed setae. First flagellomere 4.1 times as long as wide. Fourth flagellomere 2.4 times as long as wide. Maxillary palpus 5-segmented; third segment elongate, not swollen, bearing mesially a few short hyaline sensilla apart from ordinary setae elsewhere; fourth and fifth segments elongate cylindrical.

Thorax. Anepisternum bearing about 10 setae in upper portion, other pleura non-setose. **Legs.** Antero-apical depression of fore tibia with distinct semicircular rim, bearing numerous non-socketed, stiff setae; apical setae arranged in line. **Wing.** Sc entering C well before level of ta. Sc-r very weak. R1 entering C well beyond level of M-furcation. A1 reaching wing margin. A2 absent.

Terminalia. Fig. 1A. Tg 9 a little shorter than wide, tapering towards and rounded on apex, bearing setae of various sizes. Gonocoxites ventrally with deep U-shaped emargination partly filled by membrane, or membranous lobe; bearing setae of various sizes except a non-setose portion ventrobasally. Gonostylus rather stout, bearing mesially 6 large, pointed macrosetae (at least 4 discernible in ventral view) and 2 small denticles (situated dorsosubapically and thus hardly discernible in ventral view), otherwise setae of various sizes (Fig. 1B). Aedeagus with rod-like apodeme and largely membranous widening apically, the membranous portion two-pointed, bearing numerous short trichia (Fig. 1C). Parameres partly fused to form tegmen; tegmen a little shorter than gonocoxites, apical portion sclerotized and medially separate, with two short processes with finely serrate lateral margins; parameral apodemes strong (Fig. 1C). Hypoproct weak, bearing 1 large seta on either side (Fig. 1A). Cerci bearing setae of various sizes (Fig. 1A).

Female. Body length 3.3 mm. **Head.** First flagellomere 4.2 times as long as wide. Fourth flagellomere 2.6 times as long as wide.

Thorax. Anepisternum bearing 6 setae. **Legs.** Fore tarsus not enlarged; four distal tarsomeres bearing sole of dense, stiff setae.

Terminalia. Cercus not widened subapically, bearing 4 very small spines dorsosubapically (Fig. 1D).

Discussion. This species shows the characters diagnostic of the subgenus *Adidocidia*, including the long first antennal flagellomere and the setose anepisternum, and is classified accordingly. This affiliation is supported by characters of the male terminalia, like the ninth tergite lacking apical spine-like setae and the large aedeagus. On first glimpse the striking vestiture on the gonostylus seems aberrant, but becomes plausible if the two small subapical denticles present in *megasetigera* are considered homologous to the large two-pointed

tooth present in most other *Adidocidia* species. Further, in *macrosetigera* miniaturization of the double-tooth is practically compensated by the opulence of macrosetae, which is a phenomenon that can be observed similarly in various other sciaroids. The tegmen in *macrosetigera*, with its sclerotized bifurcate apex, is unparalleled among the species of *Diadocidia*. The female cercus in *macrosetigera* bears dorsally several small spines that are similarly found in *D. (A.) borealis* Coquillett and *nigripalpis* Edwards, but in our species the cercus is subapically not widened as is found in *nigripalpis* and the *Adidocidia* species, including *borealis*, studied by Laštovka and Matile (1972).

Etymology. From Latin, *macrosetiger*, macroseta-bearing, referring to the abundant macrosetae on gonostylus.

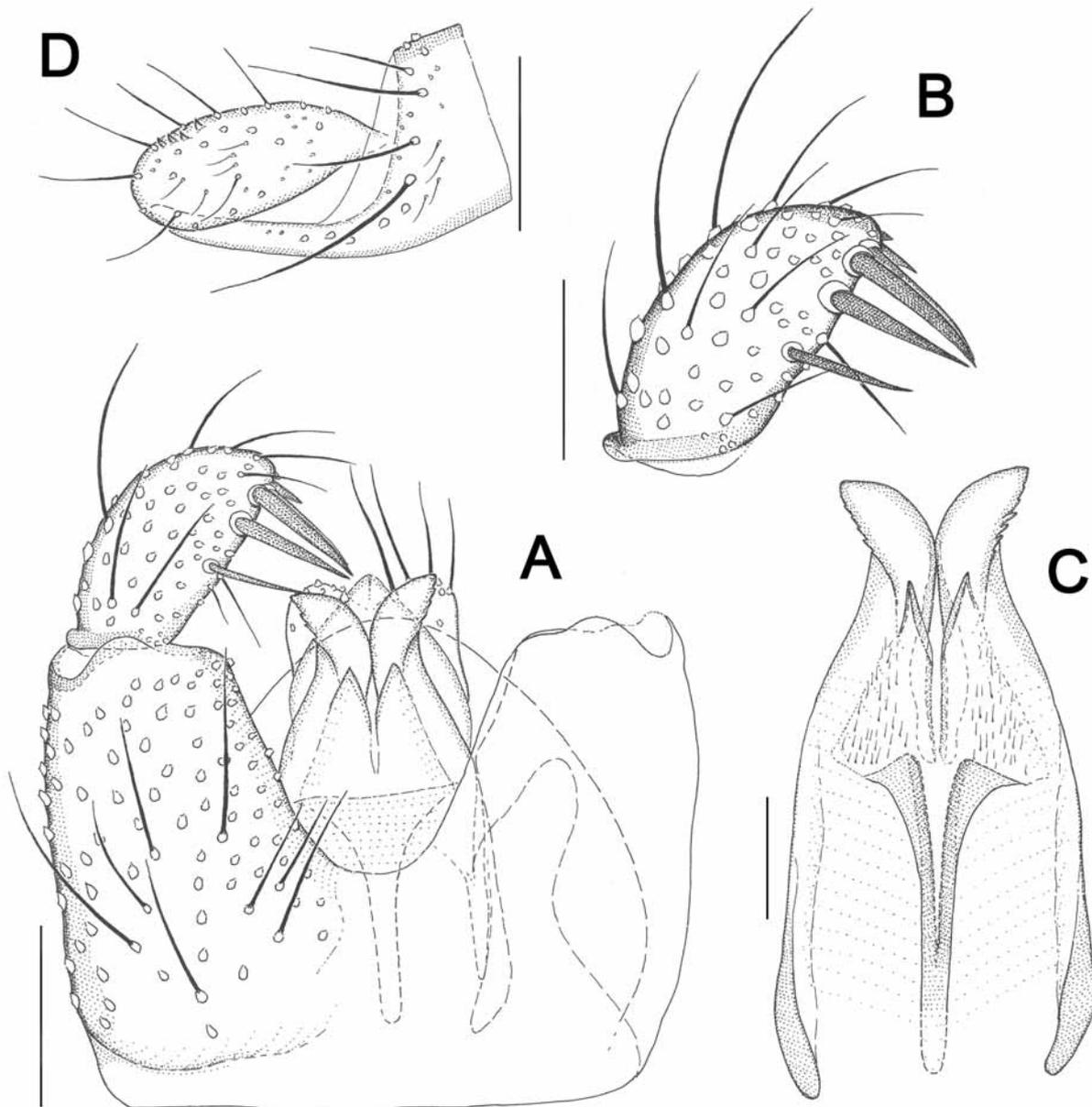


FIGURE 1. *Diadocidia (Adidocidia) macrosetigera* sp. n. **A:** Male terminalia, ventral view (holotype). **B:** Gonostylus, ventral view (holotype). **C:** Aedeagus and tegmen, ventral view (holotype). **D:** Apex of ovipositor, lateral view (paratype). Scale = 0.05 mm (B and C) and 0.1 mm (A and D).

Types. *Holotype.* Male (on slide). Australia, Queensland, Mt Glorious, Tony Hiller property (27°20'07''S, 152°45'30''E), alt. 720 m, in dense tropical rainforest, 19 Jan.–2 Feb. 1996, by Malaise trap, M.E. Irwin & S.D. Gaimari. *Paratype.* 1 female, same data as the holotype.

***Diadocidia (Adidocidia) queenslandensis* sp. n.**
(Fig. 2)

Description. Male. Body length 2.7 mm. **Head.** Compound eyes almost meeting on vertex, intermediate space less than one ommatidium wide. Antennal flagellum bearing short non-socketed setae intermingled with a few sensory spines; longest setae shorter than flagellomere width; first to fourth flagellomeres bearing dorsally a very few short socketed setae. First flagellomere 3.7–4.1 times as long as wide. Fourth flagellomere 2.2–2.3 times as long as wide. Maxillary palpus 5-segmented; third segment elongate, not swollen, bearing mesially a few short hyaline sensilla apart from ordinary setae elsewhere; fourth and fifth segments elongate cylindrical.

Thorax. Anepisternum bearing 5–6 setae in upper portion, other pleura non-setose. **Legs.** Anteroapical depression of fore tibia with distinct semicircular rim, bearing numerous non-socketed, stiff setae; apical setae arranged in semicircular line. **Wing.** Fig. 2A. Sc entering C well before level of ta. Sc-r weak. R1 entering C well beyond level of M-furcation. A1 reaching wing margin. A2 absent.

Terminalia. Tg 9 much shorter than wide, with broadly rounded apical margin, bearing setae of various sizes. Gonocoxites ventrally with wide, shallow emargination; bearing setae of various sizes except a non-setose portion ventrobasally (Fig. 2B). Gonostylus slender; bearing enormous tooth apically and large, pointed macroseta ventrally at base of tooth, otherwise setae of various sizes (Fig. 2B). Aedeagus with narrow rod-like apodeme and large membranous cap apically, the latter merged dorsally with tegmen and bearing ventrally numerous tiny denticles (Fig. 2C). Tegmen longer than gonocoxites, tapering towards apex; lateral portions lacking distinct contours; parameral apodemes strong, exceeding beyond proximal margin of gonocoxites (Figs 2B, C). Hypoproct weak, bearing 1 large seta on either side. Cerci bearing setae of various sizes.

Female. Unknown.

Discussion. This species is classified with the subgenus *Adidocidia* for the same characters as referred to under *macrosetigera*. The male terminalia of *queenslandensis* are much different from that of *macrosetigera*, but very similar to *D. (A.) papua* Ševčík from Papua New Guinea. In both *papua* and *queenslandensis* the gonostylus apex is not really bifid, as quoted by Ševčík (2003: 63), but made of an one-pointed tooth accompanied by a macroseta, which is unusual among the species known of *Adidocidia* (see Discussion below). The gonostylus tooth in *papua* is finely serrate at its base, but not so in *queenslandensis*. As another difference, the gonostylus body in *papua* is narrow and parallel-sided along its full length (Ševčík 2003: fig. 1), while in *queenslandensis* it is wider basally than apically.

Colless (1963: 307) remarks on the *Diadocidia* sp. referred to by Tonnoir (1929) that its eye bridge, even though incomplete, was of great extent (“greater than in some species of *Heterotricha*”), which applies also to our *queenslandensis*.

Etymology. From the type locality, Queensland, where this species is apparently widespread.

Types. *Holotype.* Male. Australia, Queensland, Mt Glorious, Tony Hiller property (27°20'07''S, 152°45'30''E), alt. 720 m, in dense tropical rainforest, 14–22 Nov. 1995, by Malaise trap, M.E. Irwin & S.D. Gaimari. *Paratypes.* 2 males, Queensland, Lamington National Park, O'Reilly's Green Mountain (28°13'25''S, 153°07'30''E), alt. 920 m, in dense tropical rainforest, 1–25 Feb. 1996, by Malaise trap, M.E. Irwin & S.D. Gaimari; 1 male, Queensland, Brisbane Forest Park, Enoggera Creek at Scrub Road crossing (27°25'42''S 152°50'33''E), 7–27 Dec. 1995, by Malaise trap, M.E. Irwin & S.D. Gaimari.

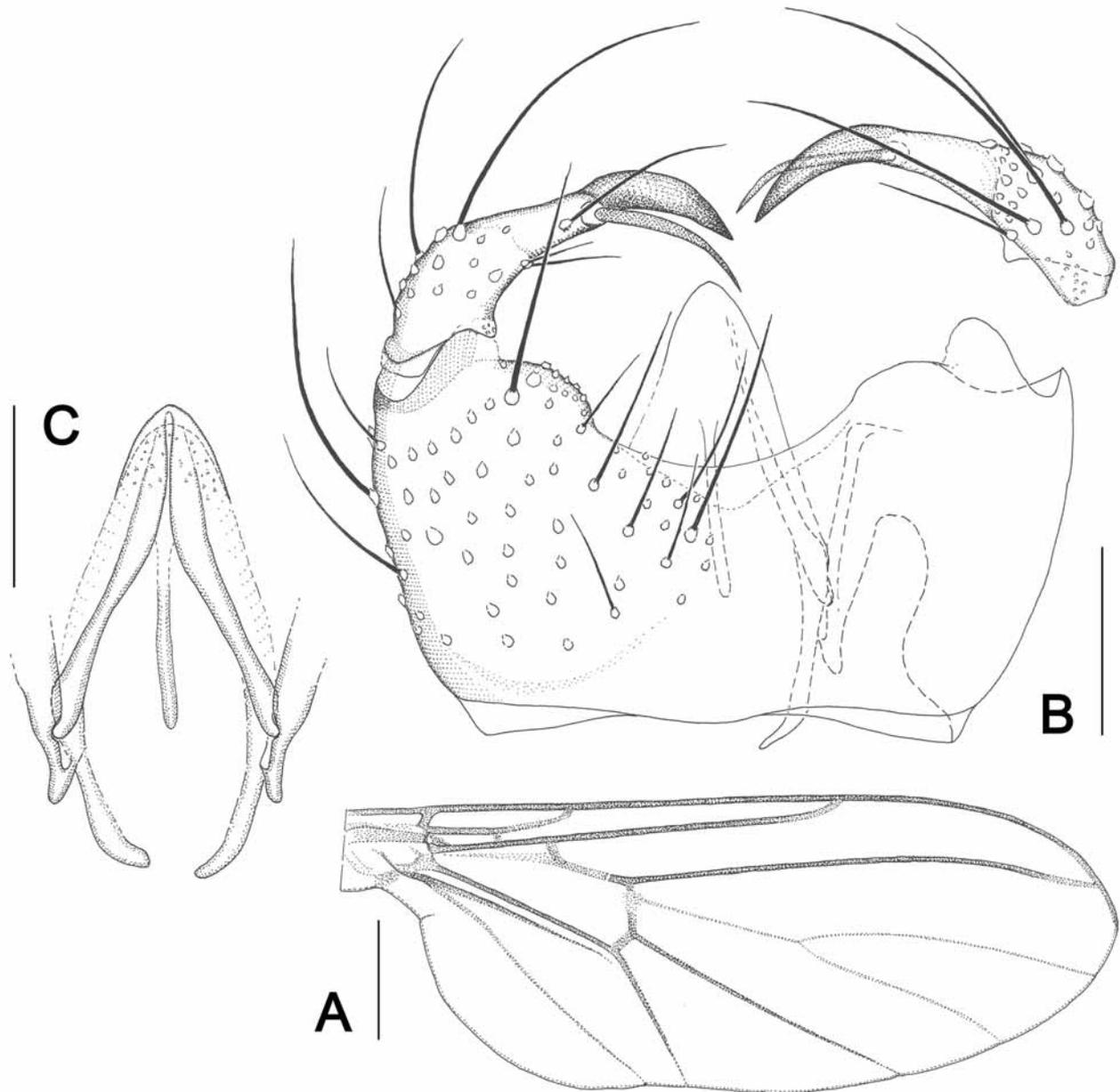


FIGURE 2. *Diadocidia (Adidocidia) queenslandensis* sp. n. **A:** Wing, setae omitted, dorsal view (holotype). **B:** Male terminalia, dorsal parts omitted, ventral view, with right gonostylus separate and in dorsal view (holotype). **C:** Aedeagus and tegmen, dorsal view (holotype). Scale = 0.05 mm (B and C) and 0.5 mm (A).

Discussion

With respect to the male terminalia of *Adicocidia* spp., the new species from Australia are very dissimilar from one another as well as from the species known from the Holarctic region. Further, *stanfordensis* Arnaud & Hoyt deviates strongly from the other Holarctic species by the structure of its gonostyli and ninth tergite (Laštovka and Matile 1972: figs 6 and 12). Altogether, we recognize four different types of male terminalia among the nine known species of *Adidocidia*, which indicates that this subgenus is quite heterogenous. These four subgroups of *Adidocidia* are as follows (their diagnostic characters in parentheses): *macrosetigera* subgroup (apical tooth of the gonostylus bipartite, reduced in size and accompanied by several macrosetae;

aedeagal apodeme apically with a large, trichiose widening; tegmen apically separate and sclerotized; includes *macrosetigera* only); *queenslandensis* subgroup (apical tooth of the gonostylus one-pointed and accompanied by one macroseta; aedeagal apodeme with a membranous cap bearing tiny denticles; tegmen largely membranous and exceeding basally the gonocoxites; includes *papua* and *queenslandensis*); *stanfordensis* subgroup (gonostylus deeply split into two lobes each bearing a tooth and, not obligatory, one macroseta; aedeagal apodeme apically with a large, trichiose widening; tegmen largely membranous; includes *stanfordensis* only); and *valida* Mik subgroup (apical tooth of the gonostylus large, two-pointed and usually accompanied by one or more macrosetae; otherwise similar to *stanfordensis*; includes *borealis*, *fissa* Zaitzev, *nigripalpis*, *trispinosa* Polevoi, and *valida*). From what we know, the subgenus *Diadocidia* s. str. is obviously as heterogenous as *Adidocidia*. Considering that the taxonomic study of extra-Holarctic Diadocidiidae has just begun, we may anticipate that as more taxa are found, because of unusual characters and character combinations, we will alter our current concepts of genera and hypotheses on their interrelationships.

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