

A NEW SPECIES OF *MEGASTIGMUS* (HYMENOPTERA: TORYMIDAE: MEGASTIGMINAE) FROM BRAZIL

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ABSTRACT

In this paper a new parasitoid *Megastigmus* Dalman, 1820 (Hymenoptera: Chalcidoidea: Torymidae: Megastigminae) species was described in the subgenus *Torymus*, associated with the gall-forming *Leptocybe invasa* Fisher & La Salle (Hymenoptera: Eulophidae) in eucalypt plantations in Brazil.

Key Words: Chalcidoidea, *Eucalyptus camaldulensis*, Brazil, galls, gall wasp entomophagous

RESUMEN

En este artículo una nueva especie del parasitoide *Megastigmus* Dalman, 1820 (Hymenoptera: Chalcidoidea: Torymidae: Megastigminae) fue descrito como subgénero *Torymus*, asociado con *Leptocybe invasa* Fisher & La Salle (Hymenoptera: Eulophidae) en las plantaciones de eucaliptos en Brasil.

Palabras Clave: Chalcidoidea, *Eucalyptus camaldulensis*, Brazil, galerías, entomófago

Megastigmus (Hymenoptera: Chalcidoidea: Torymidae) was described by Dalman (1820) as the subgenus *Torymus* Dalman with its type species being *Pteromalus bipunctatus* Swederus, 1795. Later, *Megastigmus* was recorded as a valid genus by several authors (Curtis 1829; Walker 1833; Dalla-Torre 1898; Ashmead 1900; 1904). Crosby (1913) designated its type species as *P. bipunctatus*.

Boucek (1988) keyed out *Megastigmus* in the Subfamily Megastigminae, and provided the diagnostic characters of the genus, stated that the genus contains 44 species in Australia, 35 spp. from Holarctic region in America south only to Mexico, but about 3 spp. are present in the Old World in eastern and southern Africa, while South Asia has at least 15 spp., and 1 species is found on Fiji. Grissell (1999) listed 133 world species with 5 subspecies of *Megastigmus* including 9 species of *Bootanomyia*, and gave their synonyms, distributions and literature references, and stated that 19 keys to the species of *Megastigmus* were provided by several authors in the world.

Roques & Skrzypczynska (2003) studied the native and introduced species of the European phytophagous *Megastigmus*, and provided an identification key to the species. Grissell (2006) described a new species, *Megastigmus zebrinus* Gissell that galls seed capsules of *Eucalyptus camaldulensis* Dehnhardt (Myrtales: Myrtaceae) from South Africa and Australia.

Noyes (2012) listed 140 world species of *Megastigmus* and gave their synonyms, distributions and literature lists. Doğanlar & Hassan (2010) studied the species of *Megastigmus* related with *Eucalyptus* from all over the world, described some new species from the Palearctic region and Australia, and provided an identification key for the species of *Megastigmus* associated with *Eucalyptus*.

Up to now, only one species, *Megastigmus transvaalensis* (Hussey), has been recorded from Brazil and Argentina by several works (Grissell & Hobbs 2000; Grissell & Prinsloo 2001; Roques & Skrzypczynska 2003; Scheffer & Grissell 2003; Noyes 2012), and Scheffer & Grissell (2003) stated that *M. transvaalensis* had been reared from seeds of *Eucalyptus camaldulensis* in Brazil.

A second species of *Megastigmus* was obtained from the galls formed by *Leptocybe invasa* Fisher & La Salle (Hymenoptera: Eulophidae), on *Eucalyptus camaldulensis* in Brazil by Zaché et al. (2013), and sent to the first author for identification, and it was described as a new species.

MATERIAL AND METHODS

The type specimens of the new species were obtained from mature galls of *L. invasa* on *E. camaldulensis* leaves and stems, which were collected in Paulinia, São Paulo State, Brazil by Zaché et al. (2013). Morphological terminology follows

Roques & Skrzypczynska (2003) and Doğanlar & Hassan (2010).

One of the male and female paratypes was slide-mounted in Canada balsam. The examined specimens were deposited in the Insect Collection of Mustafa Kemal University (MKUI), and in the Museum of São Paulo State University (UNESP), Campus of Botucatu. Photographs of diagnostic characters of the new species were taken by a digital camera attached to a stereo-microscope.

Megastigmus brasiliensis sp. nov. (Fig. 1 a-f)

Material Examined

HOLOTYPE female, BRAZIL: Paulinia, Sao Paulo State, 09-I-2012, leg. Dr. Bruno Zaché. The holotype and 4 females and 5 males (paratypes) are deposited in the Entomological Museum of School of Agronomic Sciences of UNESP (Sao Paulo State University), Campus of Botucatu,

(Botucatu, Brazil), and 1 female and 1 male (paratypes) slide mounted are deposited in the Insect Collection of Mustafa Kemal University (MKUI) (Turkey).

Female

Length (body + ovipositor): 1.2 ± 0.8 mm. Body (Fig. 1a) yellow, except around ocelli, some sutures of mesosoma black, anterior margin of propodeum black, first tergum of metasoma dorsally and laterally with brown spots, ovipositor black. Wigs hyaline, veins yellow, prestigma and stigma dark brown. Pilosity of body and pretarsi black.

Head with fine longitudinal striae, face smooth. Antennae inserted slightly above lower ocular line (Fig. 1 a); Relative measurements: head width 37, height 31, dorsal length 24, frons width 22; eye in frontal view 9; MOL 4; OOL 5, POL 9, Odia 4, eye 17: 15, malar space 7; TO 13, TCly 12; Temple 3, eye in dorsal view 24; flagellum with pedicel 39.

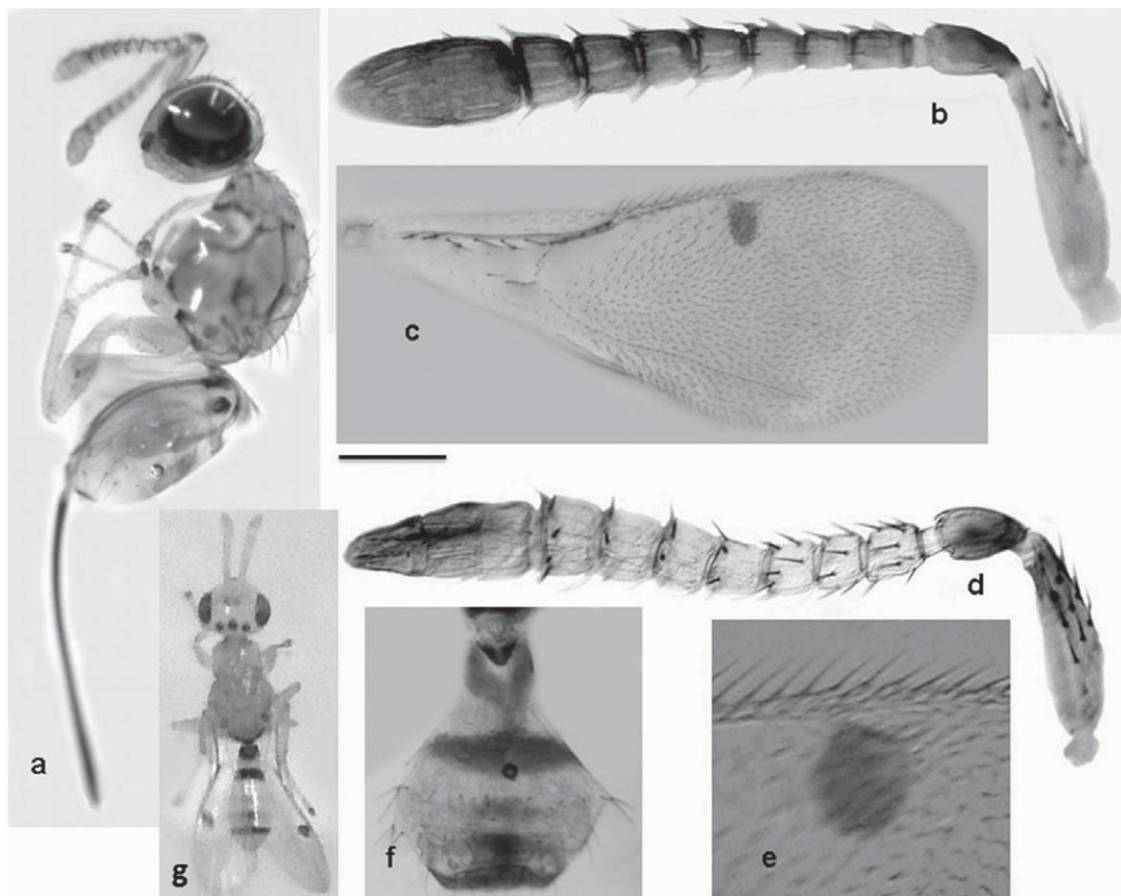


Fig. 1. *Megastigmus brasiliensis* sp. nov. a-c. female. a. body, in lateral view; b. antenna; c. forewing; d-g. male. d. antenna; e. stigma; f. metasoma; g. body, in dorsal view. (Scale bar: for a,f= 0.3 mm; b,d = 0.25 mm; c = 0.15 mm; e = 0.05 mm; g = 0.25 mm).

Antennae (Fig. 1b) clavate, flagellar segments transverse, in same length, except first 1.3 × longer than broad, and distinctly widening, 7th twice broader than F₁; flagellum with pedicellus slightly longer than width of head and 2.6 × transverse diameter of eye.

Scape with 3 rows of setae dorsally, nearly cylindrical, 3.3 × as long as broad, and as long as transverse diameter of eye. Relative measurements of antenna (l:w): scape 15: 4.5, pedicel 6: 4, anellus 1.0: 2.5, F1 4: 3; F2 3: 3.6; F3 3: 4; F4 3: 4.3; F5 3: 5; F6 3.5: 5.2; F7 3: 6, club 12: 7 (C1 5, C2 4, C3 3). Sensillae on flagellum long and dense, F1 with 2 longitudinal sensilla, F2 with 3, F3 - F7 4-5 linear sensillae in a row. Club slightly shorter than 4 preceding segments combined, 1.7 × as long as broad, ventrally with broad micropilosity on C2 and C3.

Mesosoma (Fig. 1a) 1.6 × as long as mesoscutum broad, slightly broader than height (32:34); pronotum about 0.5 × as long as broad; mesonotum about 1.4 × as broad as long, with fine transverse striae, 3 pairs of setae, along deep notauli; scutellum as long as broad, with fine transverse striae, frenal groove indistinct, frenum almost smooth, scutellum with 3 pairs of setae on each sides. Forewing (Fig. 1c) 2.4 × as long as broad, costal cell bare in basal half, apically with 4 rows of hairs, speculum broad, closed below, basal and cubital veins with 3-4 hairs, basal cell bare, almost closed in apical half. Relative measurements of forewing: costal cell 20: 2.5; parastigma 7.5, marginal vein 9, post marginal vein 9, stigmal vein 1.5, stigma (l:w) 9: 6, uncus 2. Hind wing 4.6 × as long as broad. Hind coxae dorsally with 3-4 setae.

Propodeum 0.4 × as long as scutellum, 0.5 × as long as distance between inner edges of spiracles, median carina and plicae absent, and transversally reticulated between spiracles, the latter almost touching to posterior margin of metanotum.

Metasoma almost as long as mesosoma, broad, 1.8 × as long as broad, its dorsal surface finely striated. Ovipositor sheath 1.4 × as long as metasoma, 2.6 × as long as hind tibia.

Male

Similar to female except as follows: body mostly pale yellow except sutures of mesosoma, metasoma (Fig. 1f) with first tergite black, a black band dorsally on posterior margin of second tergite and anterior margin of 3rd tergite, the latter medially black; 4th tergite black.

Relative measurements: head width 33, height 31, dorsal length 15, frons width 20; eye in frontal view 6; MOL 3; OOL 4, POL 10, Oda 3.5, eye 14: 12, malar space 6; temple 3, eye in dorsal view 12; flagellum with pedicel 41. Antenna (Fig. 1d) filiform, having pedicellus with flagellum 1.2 × as long as wide of head. Relative measurements of antenna (l:w): scape 12: 4, pedicel 6: 3.2, anellus

1.0: 2, F1 3.2: 3; F2-F7 3: 4, club 12: 5 (C1 5, C2 4, C3 3). Flagellum with erect setae. Club as long as 4 preceding segments combined, 2.4 × as long as broad. Metasoma 0.8 × as long as mesosoma and 2.1 × as long as hind tibia.

Host

Megastigmus brasiliensis emerged from galls of *Leptocybe invasa* as noted by B. Zaché.

Comments

Megastigmus brasiliensis is similar to *M. zebrinus* Grissell in having a pedicel plus flagellum 1.1 × as long as width of head, ovipositor at most as long as up to hind margin of pronotum, and ovipositor 1.4 × as long as metasoma and 2.6 × as long as hind tibia, but *M. brasiliensis* differs from *M. zebrinus* by costal cell 8 × as long as broad, bare basally on underside (in *M. zebrinus* costal cell 12 × as long as broad, with a complete row of hairs on underside); F7 twice as wide as F1 (in *M. zebrinus* F7 1.8x as wide as F1); club slightly shorter than 4 preceding segments combined, 1.7 × as long as broad, (in *M. zebrinus* club as long as 3 preceding segments combined, twice as long as broad); in male: head 2.2 × as broad as length (in *M. zebrinus* head 1.4 × as broad as length); forewing 2.1 × as long as broad, hindwing 4.3 × as long as broad (in *M. zebrinus* forewing 2.3 × as long as broad, hindwing 4.8 × as long as broad).

The Brazilian species, *M. transvaalensis* and *M. zebrinus* are phytophagous species in seeds of *E. camaldulensis*, and *M. transvaalensis* with the following different characters: thoracic dorsum showing some brown or black areas; funicular segments distinctly longer than broad with two rows of longitudinal sensilla 2 preceding segments, forewing with basal cell open below (Roques & Skrzypczynska 2003). However, *M. brasiliensis* has apparently parasitic behavior, because the adults were obtained only in stems and leaves of *E. camaldulensis* from in large galls infested by *L. invasa*. Insects of this species were not collected in healthy plant material of trees in the same area. Also another parasitic *Megastigmus* were found in India parasitizing *L. invasa*, but it was referred to only as *Megastigmus* sp. (Kulkarni et al. 2010). Further studies are necessary to determine the life cycle of this parasitoid and its parasitization rates under laboratory and field conditions, as part of the effort to determine whether its use in a biocontrol program against *L. invasa* in eucalyptus plantations in Brazil is feasible.

REFERENCES CITED

- BOUCEK, Z. 1988. Australasian Chalcidoidea (Hymenoptera). A biosystematic revision of genera of fourteen

- families, with a reclassification of species. CAB International, Wallingford, Oxon, U.K., Cambrian News Ltd; Aberystwyth, Wales. 832 pp..
- DOĞANLAR, M., AND HASSAN, E. 2010. Review Of Australian Species of *Megastigmus* Hymenoptera: Torymidae Associated with *Eucalyptus*, with Descriptions of New Species. Australian J. Basic Appl. Sci. 4(10): 5059-5120.
- GRISSELL, E. E. 2006. A new species of *Megastigmus* Dalman (Hymenoptera: Torymidae), galling seed capsules of *Eucalyptus camaldulensis* Dehnhardt (Myrtaceae) in South Africa and Australia. African Entomol. 14(1): 87-94.
- GRISSELL, E. E. 1999. An annotated catalog of World Megastigminae (Hymenoptera: Chalcidoidea: Torymidae). Contrib. American Entomol. Inst. 31(4): 1-92.
- GRISSELL, E. E., AND HOBBS, K. . 2000. *Megastigmus transvaalensis* (Hussey) (Hymenoptera: Torymidae) in California: methods of introducing and evidence of host shifting, pp. 267 In A. D. Austin and M. Downton [eds.], Hymenoptera Evolution, Biodiversity and Biological Control CSIRO Publishing, Collingwood, Australia.
- GRISSELL, E. E., AND PRINSLOO, G. L. 2001. Seed-feeding species of *Megastigmus* (Hymenoptera: Torymidae) associated with Anacardiaceae. J. Hymenoptera Res. 10(2): 271-279.
- KULKARNI, H., KAVITHA-KUMARI, N., VASTRAD, A. S., AND BASAVANAGAUD, K. 2010. Release and recovery of parasitoids in eucalyptus against gall wasp, *Leptocybe invasa* (Hymenoptera: Eulophidae) under green house. Karnataka J. Agric. Sci. 23(1): 91-92.
- NOYES, J. 2012. The Natural History Museum. Universal Chalcidoidea Database. <http://www.nhm.ac.uk/research-curation/research/projects/chalcidooids/database>.
- ROQUES, A., AND SKRZYPZYNSKA, M. 2003. Seed-infesting chalcids of the genus *Megastigmus* Dalman, 1820 (Hymenoptera: Torymidae) native and introduced to the west Palaearctic region: taxonomy, host specificity and distribution. Journal of Natural History 37: 215.
- SCHEFFER, S. J., AND GRISSELL, E. E. 2003. Tracing the geographical origin of *Megastigmus transvaalensis* (Hymenoptera: Torymidae): an African wasp feeding on a South American plant in North America. Mol. Ecol. 12(2): 417.
- ZACHÉ, B., ZACHÉ, R. R. C., LA SALLE, J., DOĞANLAR, M., PEREIRA, R. A., AND WILCKEN, C. 2013. Occurrence of *Megastigmus brasiliensis* (Hymenoptera: Torymidae) Parasitizing the Eucalyptus Gall Wasp, *Leptocybe invasa* (Hymenoptera: Eulophidae) in Brazil, and effect of different temperatures and food sources on parasitoid survival. Phytoparasitica, (in press).