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A New Species of *Embolemus* Westwood from the Mata Atlântica of Brazil (Hymenoptera: Embolemidae)

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ABSTRACT

A new species of the genus *Embolemus* Westwood is described from the Mata Atlântica of the state of São Paulo. This is the second species of embolemid recorded from Brazil.

INTRODUCTION

The family Embolemidae is a group of small aculeate wasps belonging to the superfamily Chrysidoidea. The biology of Embolemidae is little known, but one Nearctic species, *Ampulicomorpha confusa*, has been reared as a koinobiont parasitoid of nymphs of the achilid *Epiptera floridiae* (Bridwell, 1958; Wharton, 1989). Krombein (1979: 1251) recorded another achilid species, *E. pallida*, as a host, and Olmi (1996: 90) cited circumstantial evidence that achilid species in the genus *Cixidia* are hosts of the Euro-

pean species *Embolemus ruddii*. Other hosts may be fulgoroids in the family Cixiidae (Rasnitsyn and Matveev, 1989). The use of Homoptera as hosts is a trait shared with Dryinidae, the sister group of Embolemidae (Carpenter, 1986; Brothers and Carpenter, 1993).

Few species of Embolemidae are described. The most recent revision, by Olmi (1996), recognized 16 extant species and two fossil species; Olmi (1998) added descriptions of 13 new species. The increasing use of mass-collecting techniques such as Malaise traps has led to the accumulation of

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specimens representing new species from far-flung localities. We are reporting here the second species known from Brazil.

We are engaged in a survey of the ants and social wasps at the Estação Biológica de Boracéia, a field station of the Museu de Zoologia da Universidade de São Paulo in the Mata Atlântica of Brazil. The field station is in the state of São Paulo, south of the town of Salesópolis, about 80 km E of the city of São Paulo at 23°39'S, 45°53'W, at about 900 m elevation and about 12 km from the Atlantic coast. It lies within the 16,450 hectare reserve of the "Companhia de Saneamento Básico do Estado de São Paulo," which has preserved the watershed of the Serra do Mar east of the city of São Paulo, and which now forms the largest intact stand of Southern Mata Atlântica.

The narrow coastal plain adjacent to Boracéia runs east to west and is bordered by a steep escarpment rising 2–3 km to a hilly plateau (ca. 900 m) that slopes gradually to the north. The station sits on the crest of the escarpment. The area is among the wettest in Brazil (average annual rainfall from 1925 to 1944 was 3058 mm). The forest in Boracéia is continuous except for the breaks formed by the narrow dirt roads, the aqueduct line, several small rivers, and the small man-made clearings around the station itself. Although the elevation is low, the topography, wind, high moisture, and vegetation have combined to produce a mist forest or cloud forest. The forest has a low, continuous canopy, averaging ca. 5–10 m, highest in the valley bottoms so that the canopy smooths the topography (Heyer et al., 1990).

We have employed Malaise traps to survey the social wasps in Boracéia, which yielded several specimens of Embolemidae. These have proved to be males of a new species in the genus *Embolemus*, which we are describing now, in order to call the attention of other biologists to the fauna of this remarkable site.

TAXONOMIC BACKGROUND

The family Embolemidae presently comprises two genera, *Ampulicomorpha* Ashmead, 1893, and *Embolemus* Westwood, 1833. These two genera are readily distin-

guished by the pronotum: elongate, with a pronounced longitudinal median groove, and with the hind margin transverse in *Ampulicomorpha*, versus short, without a pronounced median groove, and with the hind margin strongly concave in *Embolemus*. Both sexes are winged in *Ampulicomorpha*, but the female is micropterous or brachypterous in *Embolemus*. According to Olmi (1996), the first subdiscal cell of the forewing is closed [by nebulous veins] in *Ampulicomorpha* but open in *Embolemus*. Synonyms of *Embolemus* include *Myrmecomorphus* Westwood, 1833, *Formila* de Romand, 1846, and *Pedinomma* Foerster, 1856; another possible synonym is *Polypanus* Nees, 1834 (Olmi, 1996). *Embolemus* and *Myrmecomorphus* were described as different because they were based on different sexes of the same species (Richards, 1936).

Ampulicomorpha contains 12 extant species (Olmi, 1996, 1998): *confusa* Ashmead, 1893, from the United States and Canada; *hachijoensis* (Hirashima and Yamagishi, 1975), from Japan, Taiwan, and Russia; *schajovskoyi* De Santis and Vidal Sarmiento, 1977, from Argentina; *wilkersoni* Olmi, 1998, from Colombia; *gilli* Olmi, 1998, from Venezuela; *suavis* Olmi, 1998, from Costa Rica; *australis* Olmi, 1996, from Australia; *gressiti* Olmi, 1998, from New Guinea; *collinsi* Olmi, 1996, from Southeast Asia; *nepalensis* Olmi, 1998, from Nepal; and *magna* Olmi, 1996, and *pecki* Olmi, 1998, from southern Africa. A fossil species, *succinalis* Brues, 1933, has been described from Baltic amber. *Embolemus* contains 17 extant species: *ruddii* Westwood, 1833, from Europe to Japan; *angustipennis* (Kieffer, 1912), from Chile, Argentina, and the Bahamas (questionably from Barbados); *nearcticus* (Brues, 1922), from Canada to Colombia; *africanus* (Risbec, 1957), from Central and Southern Africa, and Madagascar and Mauritius; *sarborni* Olmi, 1998, and *capensis* Olmi, 1998, from South Africa; *harteni* Olmi, 1998, from Yemen; *huberi* Olmi, 1998, from Iran; *krombeini* Olmi, 1996, from India to the Philippines; *pecki* Olmi, 1998, from Japan, Taiwan, and Indonesia; *notogeicus* Olmi, 1996, from Australia and New Guinea; *zealandicus* Olmi, 1996, from New Zealand; *andersoni* Olmi, 1998, from Guatemala; *stangei* Olmi,

1996, from Honduras; *neotropicus* Olmi, 1996, from Ecuador; *subtilis* Olmi, 1996, from Bolivia, Peru and, Brazil; and *bestelmeyeri* Olmi, 1998, from Argentina. A fossil species, *breviscapus* Brues, 1933, has been described from Baltic amber.

***Embolemus boraceia*, new species**

Figures 1, 2

DIAGNOSIS: Recognizable by the large size (nearly 4 mm), coloration (reddish brown, strongly contrasting with the orange-yellow legs), forewing with first submarginal, discal, and first subdiscal cells posteriorly and apically delimited by nebulous veins, antennae with scape slightly shorter than first flagellomere, propodeum dorsally with large central areola and smaller lateral ones, genitalia with aedeagus apically smoothly attenuate, and head and mesosoma dull with short, dense tomentum, but metasoma shining, with longer hairs.

DESCRIPTION: **Male:** length 3.4–3.9 mm. **Structure** – Elongate head with height (apex of clypeus to occiput) 0.89–0.98 times the width (across eyes); eyes bulging, with very short sparse erect microtrichiae; sides of lower front strongly convergent beneath; integument of head punctate throughout; clypeal free margin slightly reflected; mandibular dorsal surface with a carina running from base to near the teeth, separating a dorsal and an outer face; with an apical and three smaller subapical teeth (all teeth sharply pointed); malar space long; apical maxillary palpomere as long as preceding segment; subantennal sclerite almost straight, perpendicular to upper part of head; head from above subtriangular, flat between posterior margin of toruli and anterior ocellus; small marked depression before the anterior ocellus; vertex meets occiput in a gentle angle, not marked by carinae; occipital carina present, complete, uniformly produced, not meeting the hypostomal carina; antenna filiform, rather elongate, scape slightly shorter than flagellar segments; basal tubercle set from a produced rim, about two times as wide as long.

Thoracic dorsum entirely delicately punctate, the pronotal collar strongly so; pronotal collar with a weakly defined median groove; notauli curved outward, marked anteriorly;

parapsidal lines straight, strongly carved; scutellum rectangular; axillae triangular, partially fused to surrounding sclerites; groove between scutum and scutellum not as deep as in other species seen, weakly scrobiculate; mesopleuron grooved anteriorly; upper half of mesopleura separated from lower half by an ill-defined groove, lower half more delicately punctate, smooth ventrally; forewing (fig. 1) with large stigma; 2r-m, Cu, and 1m-cu nebulous; hind femur extending almost to apex of abdomen; hind coxa flat above; tarsal claw with a tiny preapical tooth on inner margin; dorsal surface of propodeum as long as posterior face, the propodeum vermiculate through, posterior surface abruptly declivous, the faces meeting in a 120° angle; propodeum meeting metapleura laterally in a curved suture, propodeum dorsally with large central areola and smaller lateral ones; first and second metasomal terga smooth and shining.

Male genitalia (fig. 2) with the aedeagus rounded apically; distal apex of the proximal membranous process of the parameres hairy, without papillae; distal unidentate process of the distivosella long.

Color – Antennae, head, and mesosoma reddish brown, with the antennae and varying amounts of the head and scutum lighter reddish; ocellar triangle darker than head; legs entirely orange-yellow, coxae slightly paler.

Vestiture – Head and mesosoma dorsally covered with dense tomentum, but cuticle shining beneath this; lower half of subantennal sclerite, clypeus and malar space clothed with suberect, flexuous white hairs; flagellar segments clothed with moderately dense, small, golden, erect microsetae; anterior areas of propleura and mesopleura and dorsum of scutum with dense whitish microsetae; legs covered by dense, short, appressed golden hairs with few scattered longer erect hairs; metasoma with first and second tergites glabrous, succeeding terga clothed with subdecumbent pale hairs.

Variation – The specimen collected in June to July is decidedly smaller than the ones collected later. This is why we chose one of the males collected in the second period as the holotype. Besides the size, the smaller paratype has the paler areas more ex-

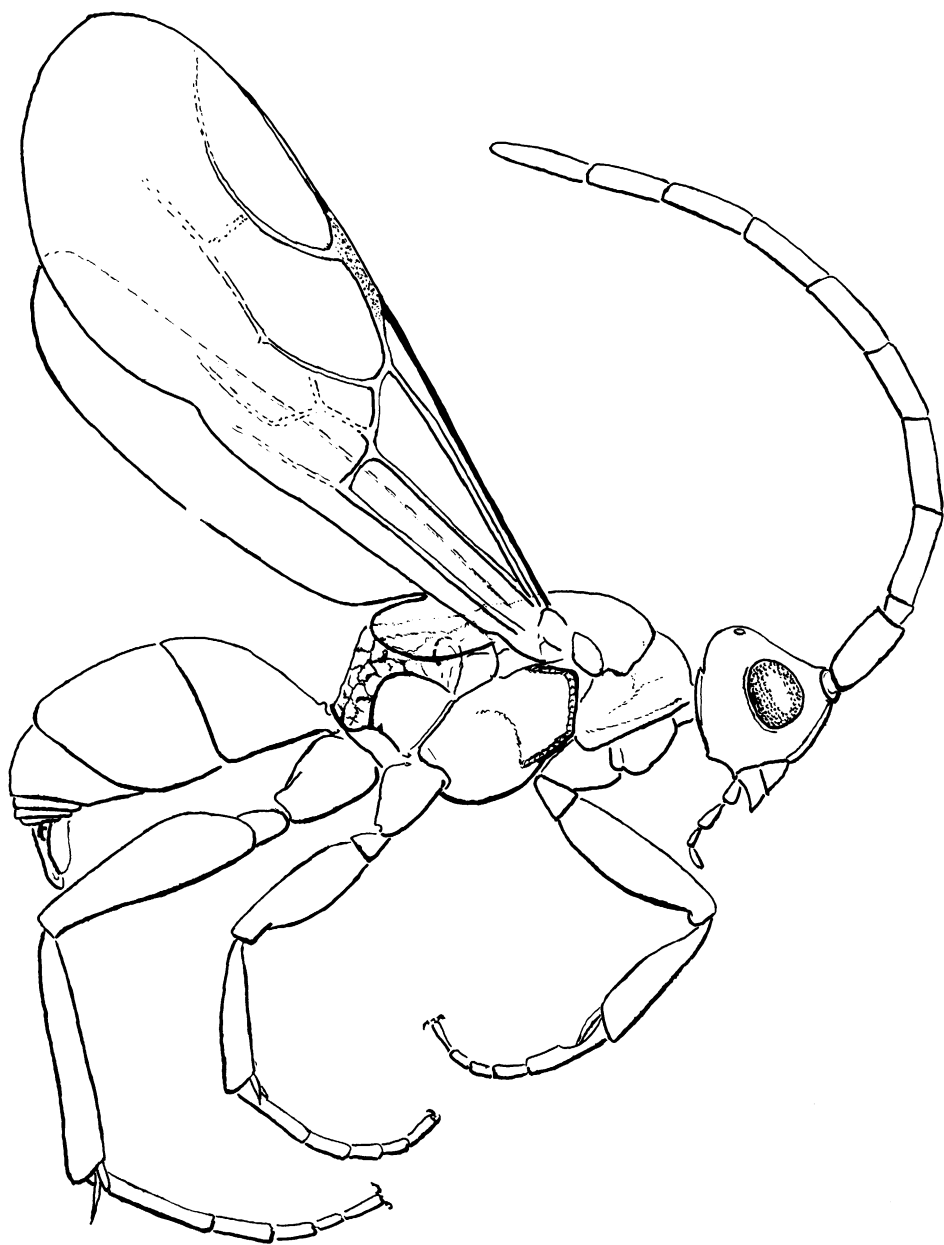


Fig. 1. Habitus of *E. boraceia* n. sp. (holotype male).

tensive; the head is more rounded and the vertex more convex; the clypeus is proportionately bigger; the axillae are completely fused to the dorsum and the thorax is less robust.

FEMALE: Unknown.

BIOLOGY: Unknown.

TYPE MATERIAL: Holotype male, Brazil:

SP, Salesópolis, E. B. B., 5.vii.6.ix.1997, Malaise – laboratório, C. I. Yamamoto col. Paratypes: five males, same locality and collector, 17.vi–5.vii.1997 (one); 5.vii–6.ix.1997 (four).

Holotype and three paratypes deposited in the collection of the Museu de Zoologia da Universidade de São Paulo. One paratype de-

posited in the American Museum of Natural History, and one paratype in the collection of Massimo Olmi.

DISTRIBUTION: Known only from the type locality.

ETYMOLOGY: The specific name *boraceia* is a reference to the locality where this species was collected, and is to be treated as a noun in apposition.

REMARKS

The revision of Embolemidae by Olmi (1996) listed only one species from Brazil, out of five Neotropical species (three of them newly described). *Embolemus boraceia* does not appear to be any of those species, nor, on the basis of distribution, one of the two Neotropical species described from females only by Olmi (1998). In Olmi's (1996: 129) key to Neotropical species, the first species keyed, *E. subtilis*, is recorded from Brazil (Guanabara, now the state of Rio de Janeiro), as well as Bolivia and Peru. This species has the petiole longer than the hind trochanters, a condition very different from the other species, including *boraceia*. The remainder of Olmi's (1996) key relies mostly on male genitalia. The critical couplets in the rest of that key, as well as Olmi's (1998: 145–146) world key to males, are whether the proximal membranous process of the parameres has the distal apex hairy or not, and if so (as is the case for *boraceia*, fig. 2), then whether the distal unidentate process of the distivossella is long or short. This process is elongate in *boraceia* (fig. 2), the condition found in *E. angustipennis* (cf. Olmi, 1996: fig. 29B), a species we have not seen. That species is recorded from Chile, Argentina, the Bahamas, and (questionably) Barbados. The size and coloration described for *E. angustipennis* overlap with those of *boraceia*, as do length of the scape and pronotal sculpture (both variable in *E. angustipennis*). But *boraceia* differs in other respects. The figures of the genitalia of *E. angustipennis* (Olmi, 1996: fig. 29B; De Santis and Vidal Sarmiento, 1977: fig. 8, as *Embolemus valentinae*) show an apically transverse aedeagus. The aedeagus of *boraceia* is rounded apically (fig. 2). The head is stated to be shiny, without sculpture, in *E. angustipennis* (Olmi, 1996: 131); it is



Fig. 2. Male genitalia of paratype of *E. boraceia* n. sp.

punctate in *E. boraceia*. The notauli are stated to be hardly visible near the anterior margin of the scutum in *E. angustipennis*; they are marked anteriorly in *boraceia*. *Embolemus angustipennis* occurs primarily in southern Argentina and Chile in localities covered by extremely different vegetation than the Mata Atlântica (the specimens from the Bahamas and Barbados appear to differ from others assigned to this species).

Embolemus boraceia is immediately distinguishable from the other described New World species on the basis of size alone, the length of some 4 mm in the male being much greater than that of other species. The axillae of *E. boraceia* are triangular and partially fused to the surrounding sclerites, while in

the other species that we have seen axillae are elongate and distinct from other sclerites. The coloration is also different. Some contrast between a dark body and paler legs occurs in *E. ruddii* and *E. nearcticus*, but is not nearly as pronounced as in *E. boraceia*. *Embolemus boraceia* has the apical maxillary palpomere as long as the preceding one, different from these other species, where the apical palpomere is much longer than the preceding ones. The curved suture between the propodeum and metapleura in *E. boraceia* is more arched than in these other species.

The description of this new species results from employing a specialized mass-collecting technique, the Malaise trap, in a place otherwise considered relatively well collected, and emphasizes the need for extending similar efforts to other localities. Olmi (1996, 1998) listed numerous records for other species taken in Malaise traps, and the remarkable results of the sustained use of these traps in Costa Rica (Hanson and Gauld, 1995) likewise urge the widespread use of the technique.

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