

Systematics, Morphology and Biogeography

## Taxonomic notes on social wasps of the groups of *Mischocyttarus wagneri* (Buysson 1908) and *M. barbatus* Richards 1945 (Hymenoptera, Vespidae, Polistinae)

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## ABSTRACT

Taxonomic revisionary notes and identification keys are presented for two species-groups of wasps of the genus *Mischocyttarus*, subgenus *Phi*. Material of the *M. wagneri* and *M. barbatus* groups, including types, was examined in several collections, resulting in description of one new species for the first mentioned group (*M. camanducaia* sp. nov.), and several new synonymies for both groups as follows (senior synonym in bold): [***Mischocyttarus mourei* Zikán 1949** = *Mischocyttarus lanei* Zikán 1949 = *Mischocyttarus plaumanni* Zikán 1949]; [***Mischocyttarus declaratus* Zikán 1935** = *Mischocyttarus confirmatus* Zikán 1935 = *Mischocyttarus brackmanni* Zikán 1949 = *Mischocyttarus alternatus* Zikán 1949 = *Mischocyttarus cabauna* Zikán 1949]; [***Mischocyttarus barbatus* Richards 1945** = *Mischocyttarus ecuadorensis* Zikán 1949 = *Mischocyttarus peduncularius* Zikán 1949]. In addition, several cases are demonstrated of changing in group content, with species being moved into and out of groups as required. Both groups are distributed on the highlands of Central and South America, with the *M. wagneri* group being endemic to southeastern areas of the continent.

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## Introduction

This paper is about two species-groups of independent founding social wasps of the genus *Mischocyttarus* de Saussure 1853 – subgenus *Phi* de Saussure 1854. The first group is founded on the species *M. wagneri* (du Buysson 1908), and it involved nine specific names when created by Richards (1978). The second is based on *M. barbatus* Richards 1945, and was first referred as a group by Silveira (2008) in the context of a phylogenetic study of the genus. However, this author misidentified *M. barbatus* treating exemplars of this species under the designation “group of *M. hirsutus*”. After visiting the Vespidae collection in the London Natural History Museum (NHM; in 2010 and 2013), it became clear that previously examined specimens actually referred to *M. barbatus* (and that *M. hirsutus* Richards 1945 is a different species close to *M. hirtulus* Zikán 1949).

Species-level taxonomy in *Mischocyttarus* is still largely based on the works of Zikán (1935, 1949) and Richards (1940, 1941, 1945, 1978). Both authors described a large number of species, but only the second produced internal supraspecific classifications, either by formally creating subgenera, or informally by

indicating species-groups. For the subgenus *Phi* (= *Monocyttarus* Richards 1978), Richards (1978) recognized four species-groups: *flavitaris*; *wagneri*; *alfkenii-consimilis*; and *cassununga*. This subdivision was mainly supported on just two characters, (1) shape of the anterior margin of the pronotum, and (2) relative length of the first metasomal tergum, respectively steps 1 and 46 in his key (Richards, 1978, pg. 308). Silveira (2008) indeed found that the first of these characters is of considerable importance in signaling of relationships within *Phi*, but in the manner applied by Richards it resulted in inconsistent group assignments in many cases. Using combinations of a larger number of characters, Silveira (2008) proposed a reformed set of species-groups for *Phi*, mainly differing in the splitting of the group of *flavitaris* with recognition of three additional groups: *tarmensis*; *mexicanus*; and *barbatus* (incorrectly referred in that paper as “hirsutus group”). The “alfkenii-consimilis” group of Richards (1978) was also subdivided by Silveira (2008), with recognition of a separate “itatiayaensis and costalimai” group. However, Silveira (2013) discovered that these two names are junior synonyms of *M. paraguayensis* Zikán 1935; so, the latter name is to be considered the valid name of that species-group.

The database studied by Silveira (2008), while fairly representative of taxonomic diversity in *Mischocyttarus* (181 examined species, represented by 71 terminals in the analyzed matrix) was

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still far from exhaustive in a genus known to comprise more than 200 species. So, for several cases in the subgenus *Phi*, assignments of unexamined species to groups (pg. 540–41) were tentative, based on published descriptions. Since then, a lot of material was examined (and re-examined) on visits to several important collections (NHM, London; INC, Bogotá; IOC, Rio de Janeiro; MZSP, São Paulo; MPEG, Belém), and a clearer picture is now possible of the limits and content of *Mischocyttarus* species-groups (see Silveira, 2013; Silveira et al., 2015). Moreover, studies in progress of species in the subgenus *Phi* have suggested that several specific names created by Richards (1945, 1978) and Zikán (1949) are probably synonymous.

The groups of *M. wagneri* and *M. barbatus* are here treated together since in virtue of a problematic interpretation by Richards (1978) of the two characters mentioned above, particularly the excessive importance given to the length of first metasomal tergum, that author envisioned a too heterogeneous group of *M. wagneri* which erroneously included *M. barbatus*, and other very similar forms with relatively longer metasomal petioles, like *imeldai*, *ecuadorensis* and *peduncularius*, all created by Zikán (1949). In most of the phylogenetic analyses (using both unweighted and weighted parsimony) performed by Silveira (2008, figs. 173, 176, 177, 178, 179, 180, 181) a terminal representing *M. barbatus* (referred there as “hirsutus group”) resulted related to *M. tarmensis* + group of *M. flavitarsis* (in a narrower sense), but never appeared in a position indicative of closer relation with *M. wagneri*.

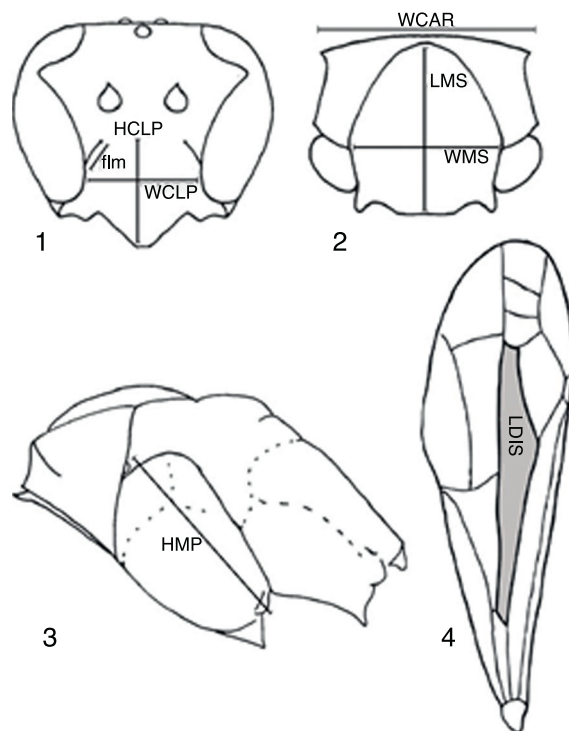
The aim of this paper is to present and discuss some decisions taken about content of these two species-groups, as well as on the status of some species-level taxa proposed earlier, mostly by Zikán.

## Material and methods

**Source collections and curators.** American Entomological Institute, Gainesville (AEIC; Dr. David Wahl); Bohart Museum, University of California at Davis, Davis (UCDC; Dr. S. L. Heydon); Estación de Biología Chamela, San Patricio, México (EBCC; Dra. Alicia Rodríguez-Palafox †, Dr. Ricardo Ayala-Barajas); Fundação Instituto Oswaldo Cruz, Rio de Janeiro (IOC; Dr. Marcio Félix, Dra. Jane Costa); Instituto Nacional de Biodiversidad, Santo Domingo (INBC; Dr. Jesus Ugalde, Dr. Jorge Carvajal Alfaro); Museo Fairchild, Universidad de Panama (GBFM; Dr. Roberto Cambra T.); Museu Paraense Emílio Goeldi, Belém (MPEG); Museu de Zoologia da Universidade do Estado de São Paulo, São Paulo (MZSP; Dr. Carlos R. F. Brandão); Museum Für Naturkunde Humboldt-Universität, Berlin (ZMB; Dr. Koch Wessel); Natural History Museum, London (NHM; Dr. Gavin Broad); Universidad Nacional de Colombia, Bogotá (ICN; Dr. Carlos Sarmiento).

The present study benefited from loans from the institutions mentioned above, and especially from visits to Fundação Oswaldo Cruz (Rio de Janeiro, December/2009, November/2011, and December 2016), Museu de Zoologia da Universidade de São Paulo (December/2009), and the Natural History Museum (London, April/2010; October/2013).

**Morphological study.** The specimens were examined under dissecting stereomicroscopes. Most micrograph images were obtained by using a photomontage system upon photographs taken with LEICA cameras (DFC-420 and MC-170HD) coupled to LEICA stereomicroscopes (MZ-16 and M-205C). However, some photographs (i.e. Figs. 27–28; 33; 37–38; 40–41) were obtained during visits to museums (NHM and IOC) by using a camera CANON-EOS simply juxtaposed to stereomicroscope oculars, and do not have the same quality of the other images. Male genitalia were not investigated, as previous observations (Silveira, 2008) did not reveal significant variations among species-groups of the subgenus *Phi*. The terminology here is the same used by Silveira (2008, 2013).



**Figs. 1–4.** Measurements. (1) Clypeus: height (HCLP) and width (WCLP), and free upper element of lateral margin (flm); (2) pronotal carina width (WCAR), and mesoscutum length (LMS) and width (WMS); (3) mesopleuron height (HMP); (4) front wing discal cell length (LDIS).

**Measurements.** The following measurements were obtained from observed specimens using a ZEISS SV-11 stereomicroscope with an ocular micrometer (see Figs. 1–4): HCLP – height of clypeus; WCLP – width of clypeus; flm – free upper part of lateral margin of clypeus (Fig. 1); WCAR – width of pronotal carina from above; LMS – length of mesoscutum; WMS – width of mesoscutum; HMP – height of mesopleuron from secondary spiracular entrance to articulation of mid coxa (Fig. 3); LDIS – length of discal cell of fore wing (Fig. 4); LSI – length of first metasomal segment from the ligament aperture to the apex; WSI – width of first metasomal segment at the apex; wSI – width of the basal petiole of first metasomal segment.

**Ratios.** H/WCL – aspect ratio of clypeus; WCAR/WMS – ratio between the width of pronotal carina and the width of mesoscutum; L/WMS – aspect ratio of mesoscutum; LDIS/HMP – ratio between the length of discal cell and height of mesopleuron; LSI/HMP – ratio between the length of first metasomal segment and height of mesopleuron; LSI/LMS – ratio between the length of first metasomal segment and length of mesoscutum; W/wSI – ratio between the apical and basal width of first metasomal segment.

**Geographic distribution.** Species distributions (mostly based on the material actually examined) were obtained from the locality information on specimen labels; then, coordinates were estimated through consults with program Google Earth (version 5.2.1.1588). Maps for the species were produced with GIS software QGIS 2.18.11 (see Figs. 46–47).

## Results and discussion

The two groups here studied can be separated with the key in Silveira (2008: 544). Steps 7–11 are presented below with a few additions.

7(6)- Pronotal anterior secondary margin absent, anteromedian lamella narrow not raised; pronotal carina reduced, without remnants at sides.....8  
(leads to groups of *M. flavitarsis* and *M. tarmensis*)

7'- Pronotal secondary margin present, obtuse or sharp, anteromedian lamella wider; pronotal carina reduced or not.....9

9(7)- Apex of male antenna pointed, hook-like; female pronotal carina medially (most often) completely absent.....10

9'- Apex of male antenna with articles broad and short, not tapering; female pronotal carina medially reduced but often with a traceable remnant.....12  
(leads to groups of *M. mexicanus*, *M. alfkenii*, and *M. paraguayensis*)

10(9)- Pronotal anterior secondary margin low, obtuse, not strongly projecting over anteromedian lamella (Figs. 5–6; 8–9); basal inner margin of fore coxa with the lamella only moderately elevated and less strongly reflexed (Fig. 11); body hairs long and conspicuous especially on head and mesosoma, erect hairs on frons and mesoscutum measuring nearly two ocellar diameters; sculpture a little stronger; black species commonly with diffuse lateral reddish marks on mesosoma . . . . .

group of *M. barbatus* Richards.

10'- Pronotal secondary margin sharp and strongly projecting over anteromedian lamella (Figs. 7; 10); basal inner margin of fore coxa with the lamella more strongly elevated and reflexed (Fig. 12); sculpture weaker; black or dark brown species often with variable patterns of yellow marks; if reddish color is present then extensive body regions are colored this way.....11

11(10)- Hairs on posterior ventral part of gena moderately long and conspicuous; female clypeus with apex narrowly truncate or roundly truncate; male clypeus covered with very conspicuous dense silvery pubescence; propodeal median furrow wide and shallow; metasomal first tergum as long or longer than hind femur + trochanter; apex of inner hind tarsal claw rather narrow but never definitely acute (Fig. 14). . . . .

group of *M. wagneri* (du Buysson).

11'- Hairs on posterior ventral part of gena short and inconspicuous; female clypeus with apex narrowly truncate or narrowly rounded; male clypeus with silvery pubescence much less conspicuous; propodeal median furrow longer and deeper; metasomal first tergum shorter than femur + trochanter; apex of inner hind tarsal claw acute..... group of *M. cassununga* (von Ihering) and *M. consimilis* Zikán.

#### The group of *M. wagneri* (du Buysson)

Buysson (1908) described *Megacanthopus wagneri* from Rio de Janeiro (Serra dos Órgãos), and Zikán (1935) described *Mischocyttarus pedunculatus* from that same Brazilian state (Itatiaia, RJ). In a subsequent paper, Zikán (1949) also mentioned from the same locality a supposed closely related social parasite of *M. pedunculatus*, creating for it the name *M. pedunculatoides*. Both names were synonymized to *M. wagneri* by Richards (1945, 1978).

The “group of *M. wagneri*” was first presented by Richards (1978), having as the main diagnostic character a very elongated first metasomal tergum. Silveira (2008), working on the higher-level phylogeny in the genus, observed the incongruences between the distributions of the first tergum length and several other characters, noting otherwise that other character combinations would better specify some well-delineated species-groups. With respect

to the “*wagneri* group”, it became clear that several species should be removed while others could well be included, the latter situation mostly referring to forms described by Zikán (1935, 1949; i.e. *M. declaratus*, *M. confirmatus*, *M. alternatus*, *M. cabauna*, *M. lanei*) and designated by Richards (1978) to the *alfkenii* group (further examination of these specific taxa showed that most are synonyms; see below). Regarding the species to be removed from the *wagneri* group, besides *M. barbatus* Richards 1945 (and the synonyms *M. ecuadorensis* Zikán 1949 and *M. peduncularius* Zikán 1949; see below), it is now clear that the species *M. petiolatus* Richards 1978 and *M. transandinus* Richards 1978 are better considered as members of the group of *M. mexicanus* (de Saussure 1854) (see Silveira, 2008).

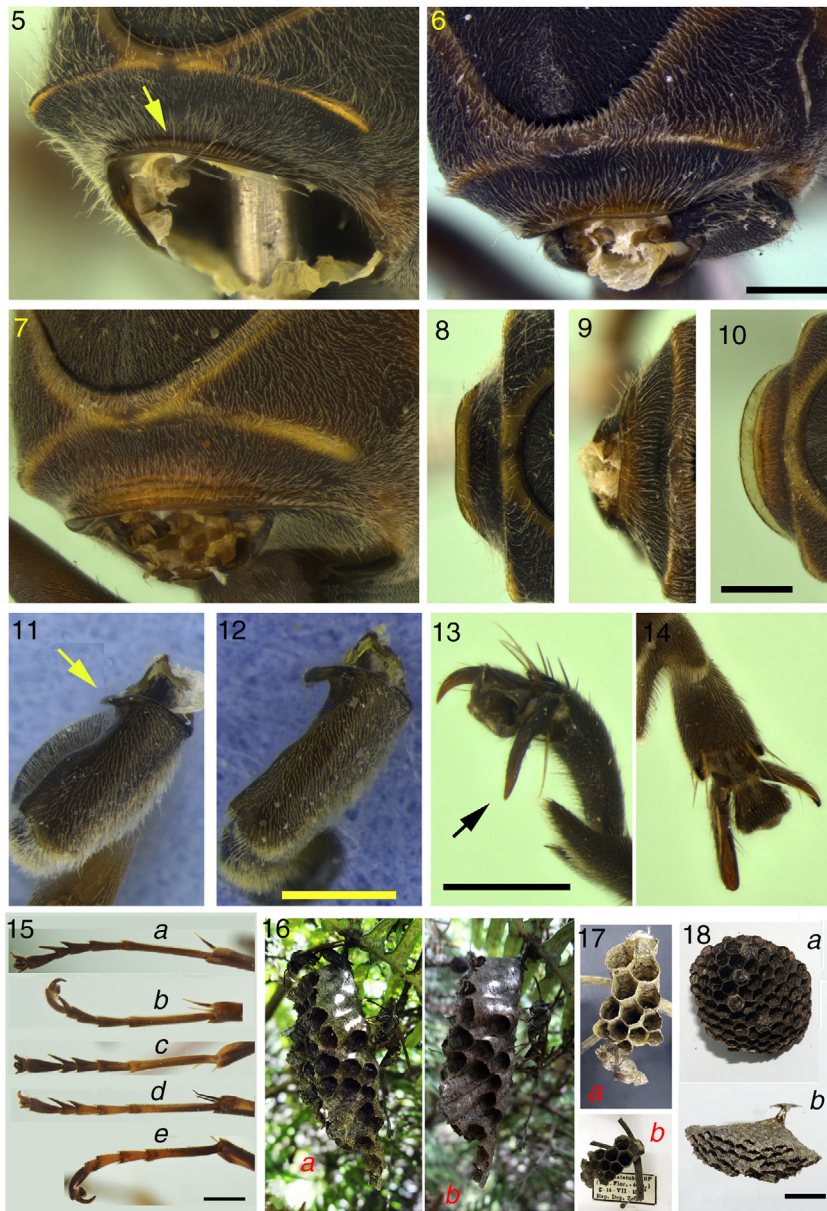
The diagnosis presented by Silveira (2008: 540) for the *wagneri* group is as follows: pronotal anterior secondary margin sharp and projecting over anteromedian lamella (Figs. 7; 10); female clypeal apex narrowly truncate; male mandible and gena normal (not enlarged); apex of male antenna hook like (Figs. 39; 41–43); male clypeus touching eyes, covered with very conspicuous dense silvery pubescence; pronotal carina centrally (completely) reduced; metanotum rather convex; metasomal first tergum as long or longer than hind femur + trochanter. It is further useful to remark that in this group the basal inner margin of fore coxa has the lamella very strongly elevated and reflexed (Fig. 12). This condition is different of that observed in the *barbatus* group (Fig. 11). On the other hand, in an important way, the females of the *wagneri* group can be immediately distinguished from those of the *alfkenii* and *paraguayensis* groups by showing the pronotal carina with the central part completely reduced, while in the latter groups a central remnant can still be clearly noted.

In the sense of the present paper, the group of *M. wagneri* is thus composed of just five species (one new) as diagnosed in the following identification key.

#### Key to species of the *M. wagneri* group (females)

1. Propodeum dorsally with paired elongated yellow spots (Figs. 19; 21)..... 2
- Propodeum dorsally without yellow spots (rarely with faint short posterior indications of marks)..... 4
2. Propodeal dorsal cavity comparatively deep and elongate, approaching the propodeal anterior margin; metasomal tergum 1 very elongate and slender, length always greater than 1.3× height of mesopleuron (see Fig. 44), and nearly always more than 3.30× width at apex (except in two of 15 examined specimens); wings comparatively short, length of discal cell of fore wing nearly always less than 2.20× height of mesopleuron (except in one of 15 specimens) (see Fig. 44); hind leg mainly dark, yellow mark only at tip of femur; hind tibial distal pad concolor with adjacent anterior area; tarsal segments dark brown above and below (Fig. 15a); propodeal valves relatively broadly rounded . . . . .
- ..... *M. wagneri* (du Buysson)
- Propodeal dorsal cavity shorter and variably deep, oval or triangular in shape; length and width of first metasomal tergum variable; wings relatively longer, discal cell longer than 2.20× height of mesopleuron; hind leg more yellow marked, hind tibial distal pad variable, tarsal segments lighter brown, often with a transition pattern darkening toward apex; propodeal valves variable. . . . . 3
3. Ground color of entire mesosoma mainly reddish brown; hind tibia distal pad and adjacent anterior area concolor, light orange brown, rarely with a preapical yellow spot; tarsal segments more uniformly brown (Fig. 15b), lighter beneath . . . . .
- ..... *M. mourei* Zikán
- Ground color of dorsal area of propodeum black or blackish; hind tibia distal pad light orange brown, adjacent anterior area very light brown or yellowish, with a preapical yellow spot; tarsal segments with a transition pattern darkening toward apex, hind tarsomeres 1–4 largely yellowish, only 5 entirely dark brown or black (Fig. 15d) . . . . .
- ..... *M. camanducaia* sp. nov 4
- First metasomal tergum shorter and wider, its length rarely reaching 1.3× height of mesopleuron, often much less than this value (ca. 1.25) and rarely larger than 3.0× apical width; propodeal cavity normally very shallow, triangular, often without a median carinate ridge; clypeus often mostly black; mesoscutum never with median paired yellow stripes; propodeum entirely dark; anterior (outer) and posterior (inner) faces of hind femora with elongate yellow marks; hind tarsomeres 1–4 largely yellowish, 5 entirely dark brown or black (Fig. 15e) . . . . .
- ..... *M. declaratus* Zikán





**Figs. 5–18.** 5–7: frontal–dorsal view of anterior face of pronotum showing secondary margin (arrow) in *M. barbatus* (5), *M. mixtus* (6), *M. wagneri* (7); 8–10: same structures and species in dorsal view; 11–12: mesial view of fore coxa showing raised basal margin (arrow) in *M. mixtus* (11), *M. wagneri* (12); 13–14: inner (larger) hind tarsal claw (arrow) in *M. mixtus* (13, lateral) and *M. barbatus* (14, ventral); 15: hind tarsus of *M. wagneri* (a), *M. mourei* (b), *M. proximus* (c), *M. camanducaia* sp. nov. (d), *M. declaratus* (e); 16–18: nests of *M. proximus* (16), *M. wagneri* (17), *M. barbatus* (18); all scales = 0.50 mm, except in Fig. 18 (= 10 mm); groups of figs. (5–7), (8–10), (11–12), (13–14) share the same scale.

- First metasomal tergum a little longer and slender, its length more than  $1.3 \times$  height of mesopleuron, always larger than  $3.0 \times$  apical width; propodeal cavity deeper, often with a median keel; clypeus often with more or less extensive light brown and or yellow marks; propodeum normally dark brown or black, rarely with faint very short posterior yellow marks; mesoscutum dark brown or black; posterior (inner) face of hind femur without elongate yellow mark; hind tarsomeres not yellowish (except to some degree the basal segment), color varying in gradual manner from lighter to darker brown at apex (Fig. 15c)..... *M. proximus* Zikán.

#### Descriptions of species

*Mischocyttarus wagneri* (du Buysson 1908)  
(Figs. 7; 10; 12; 15a; 17; 19; 20)

*Megacanthopus wagneri* R. du Buysson 1908: 219. Holotype: female, Brazil, Rio de Janeiro, “Serra dos Órgãos” (Portuguese name of that locality; ca. 1.000 m) (MNHN); [photographs examined].

*Mischocyttarus pedunculatus* Zikán 1935: 159, figs. 9–10, 14. Lectotype: female, Brazil, Rio de Janeiro, Itatiaia, ii/1933, J.F. Zikán

(MZSP); designated by Richards (1978); [examined]; Synonymy by Richards (1945).

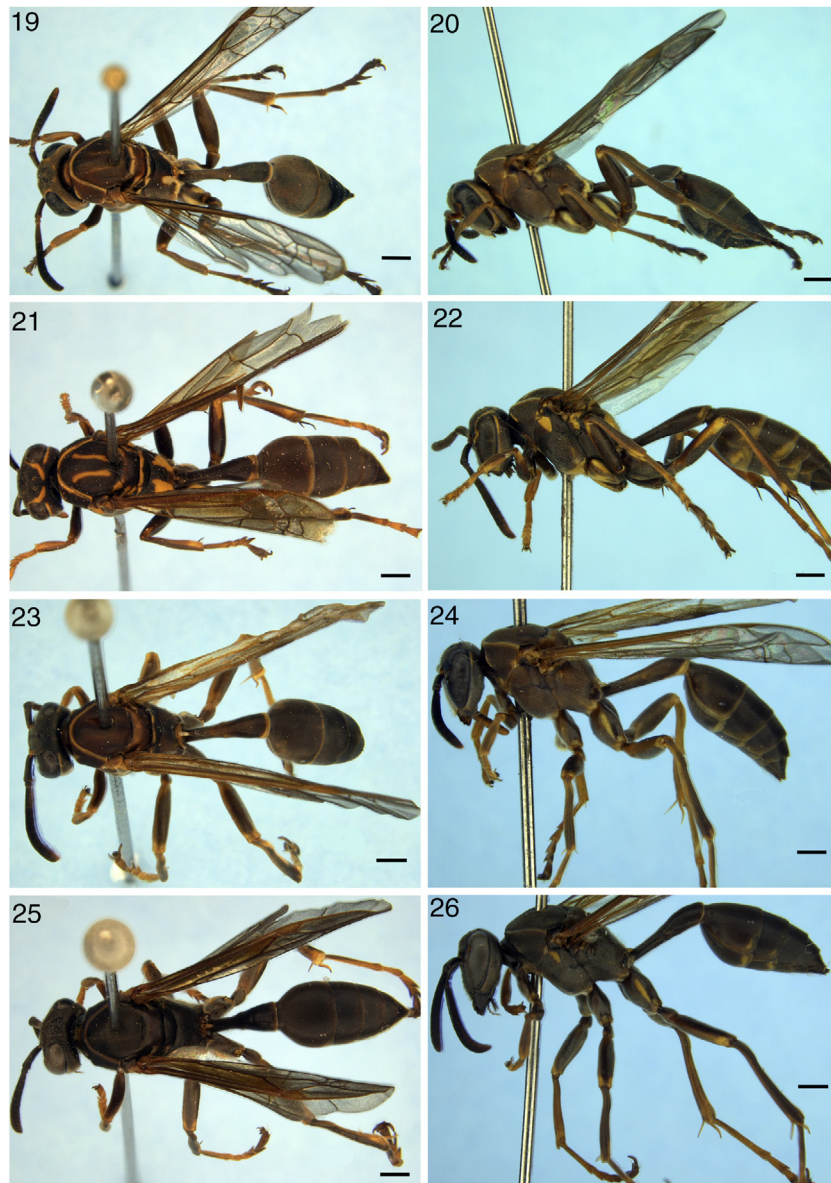
*Mischocyttarus pedunculatooides* Zikán 1949: 236. Lectotype: female, Brazil, Rio de Janeiro, Itatiaia, ii/1933, J.F. Zikán (IOC); designated by Richards (1978); [examined]; Synonymy by Richards (1978).

*Mischocyttarus wagneri*: Richards (1945: 371, 1978: 334); Zikán (1949: 150); Silveira (2008: 517, 541, 546); Souza et al. (2010: 25, 28); Togni et al. (2014: 12, 13).

*Mischocyttarus pedunculatus*: Zikán (1949: 149, figs. 92–93, 232, 327, 381, 418–419).

#### Female

Length of fore wing 8–10.5 mm; clypeus wider than high, H/WCLP about 0.93 (min–max: 0.88–0.96), apex narrowly truncate, clypeus not so extensively in contact with eye, free upper part of lateral



**Figs. 19–26.** General dorsal and lateral body views (females; all from Brazil). 19–20: *M. wagneri* (RS, Sta. Cruz do Sul; MPEG); 21–22: *M. camanducaia* sp. nov. (holotype: MG, Camanducaia; MPEG); 23–24: *M. proximus* (SP, Campos do Jordão; MPEG); 25–26: *M. declaratus* (MG, Barroso; MPEG); all scales = 1.0 mm.

margin relatively long, a little more than 0.3 times the clypeus height at middle; malar space narrow; tentorial pit a little closer to eye margin than to antennal socket; ocelli as in an equilateral triangle; occiput rounded, carina absent; gena just narrower than the upper lobe of the eye; pronotum with lateral fovea, central part of the anterior margin of pronotum with the lamella wide and rather raised but not reflexed, region immediately behind produced into a secondary margin which is acute and projecting over the lamella (Figs. 7; 10); humeral angle poorly developed, total humeral width nearly equal to that of mesoscutum, sides of the pronotum as seen from above distinctly converging; pronotal carina completely absent at center, poorly salient at sides, not forming true lobes and not at all reflexed, with a very narrow translucent lamellar portion at the extremity, mesoscutum about as long as wide, L/WMS around 1.0, lateral margin adjacent to tegula well demarcated and prominent; fore wing comparatively short for this group, LDIS/HMP nearly always below 2.20 (only one of fifteen specimens

above this value) (mean 2.12; min–max: 2.00–2.27); basal inner (posterior side) margin of fore coxa raised and strongly reflexed (Fig. 12); inner claw of hind tarsus with the apex narrowly pointed, but not acute; propodeal dorsal cavity comparatively deep and elongate, almost reaching propodeal anterior margin, propodeal valve rather broadly round, lamellar margin behind not distinctly oblique, not conferring to valve a triangular shape; first segment of metasoma very elongate and slender (Figs. 19; 20), its length always larger than 1.3× height of mesopleuron (mean LSI/HMP 1.39; min–max: 1.34–1.50), and nearly always more than 3.30× width at apex (except in two of 15 examined specimens), about 2.12× wider at apex than at base (min–max: 2.00–2.25), spiracles moderate to distinctly prominent (Fig. 20).

Sculpture: head and mesosoma with rather fine sculpture of granulated aspect; clypeus with minute dense punctation (diameter ca. 0.015 mm), with moderately shining interstices measuring about one puncture diameter, and also with shallow sparser larger



punctures (diameter 0.030–0.037 mm), apical central area very finely reticulate, appearing almost smooth, shining, with a few interspersed large shallow punctures (diameter 0.037–0.44 mm); frons with similarly sized punctures, but deeper and a little more dense; mesopleuron with pattern similar to clypeus, but with the small-sized punctures a little closer; humeral area of pronotum with slightly larger and denser punctures (diameter ca 0.022 mm); mesoscutum with punctures slightly larger and less dense, diameter 0.022–0.030 mm, interstices mostly of 0.5 puncture diameter; propodeum with punctures a little larger and sparser.

Vestiture: eyes bare; most body parts covered by fine appressed shining pubescence, dense to the point of obscuring the pattern of micropunctures underneath; clypeus with sparser erect longer setae especially near apical margin, shorter erect setae also on frons and vertex, setae on pronotum and mesoscutum strongly decumbent and often not outstanding at all; gena beneath with distinctly longer hairs; propodeum dorsolaterally with very long fine hairs with recurved tip.

Color (see Figs. 19 and 20): Black, largely suffused with dark reddish brown (but propodeum dorsum distinctly darker, blackish to black); mandibles pitchy red with a yellow longitudinal mark (sometimes indistinct); antennae with segments 3 and 9–12 reddish (to pale yellowish) beneath (but sometimes indistinct); clypeus (except actual ventral margins, black dorsal sides and large discal red brown spot) [sometimes practically whole clypeus brown, leaving only the ventral marginal area yellow], inner orbits to top of eye, antennal segments 1–2 beneath (sometimes indistinct), small spots above and below antennal sockets (sometimes indistinct), malar space and narrow genal stripe (outer orbit) [often interrupted or absent below], two dots behind ocelli, pronotum ventral corner (near fovea) and tubercle [sometimes indistinct], pronotal carina and hind margin of pronotum, pair of discal streaks on mesoscutum (sometimes evanescent), axillae and scutellum except disk, anterior margin of metanotum, valves and two elongate spots on propodeum, scrobal spot (sometimes very small), spot on upper metapleural plate, hind margin of mesosternum (sometimes only around coxal articulation), apex of fore coxa (sometimes indistinct), one dorsolateral stripe on mid coxa, and two stripes on hind coxa, posterior spot at apex of fore femur (sometimes indistinct), distal spots on mid and hind femora, narrow posterior bands on gastral terga 1–2 (or -4) extending forward at sides (sometimes indistinct), on sterna 2–3 (or -4) [but often indistinct], yellow; tibiae and tarsi brown, hind tarsus articles 2–4 blackish; inner side of hind tibia darker before apical pad which is paler; tegula brown; wings hyaline, venation brown.

#### Male

Length of fore wing 9.0 mm; mandible with four teeth; clypeus touching eyes, a little wider than high, ventral angle obtuse, apical margin almost rounded; antenna with the scape relatively shorter and wider, ventral surface of the flagellum with tyloids reduced or fragmented, apex of the antenna just rolled, hook like, antennomere 13 about 4–5× longer than wide; clypeus with very conspicuous dense shining pubescence.

Color: similar to female; face below antenna, antenna beneath, proepisternum posteriorly, mesosternum widely, fore and mid coxae ventrally, anterior stripes on all femora, posterior band on metasomal sternum 4, a posterior dot on tegula, yellow.

#### Variation

The specimens examined of *M. wagneri* are remarkably homogeneous in color, even when comparing representatives of populations of distantly separated localities from different

states, like Minas Gerais and Rio Grande do Sul. The length of the first metasomal segment, while varying to considerable extent, remains always above a certain lower limit (i.e. larger than 1.30× height of mesopleuron), longer than most of the specimens examined of the remaining species in this group (see Fig. 44).

#### Nest

Buysson (1908) did not see the nest of *M. wagneri*. Only Zikán (1935) described it from Itatiaia (RJ) as the nest of *M. pedunculatus*, saying . . . (translated from German) *three nests were attached to plant roots hanging from the ground, two nests to dry fern leaves and another one to a rock (creek edge). This species builds its nests preferably on the edges and slopes of roads and landslides, attached to thin plant roots coming off the ground. The nest which was attached to rock was of a light reddish-brown color; that hanging from plant roots was of gray color, with a reddish-brown admixture, and the nest on dry fern was of dark brown color with a gray admixture. What they all have in common is an irregular, wavering shape in which full and half-finished cells succeed each other in rows, irregularly juxtaposed, thus resembling parts of dead plants, or dry ragged leaves, in excellent adaptation to the environment. Especially the two nests attached to ferns achieve this to a great extent – they resemble in shape the small still unfinished nests of (Mischocyttarus) declaratus and confusus. The largest (of 17/ii) has 66 cells, arranged as an irregular triangle, with a somewhat eccentric peduncle. Two males and 8 females were found on this nest and subsequently another 4 females and 7 males emerged of the cells until 5/iii. Zikán (1949, fig. 381) also presents a photo of a nest of this species, showing an elongated comb with the irregular profile described above, and it has a very eccentric pedicel.*

Fig. 17 presents two views of a nest from Caraguatatuba (São Paulo) which was mentioned in Richards (1978). It has suffered a little damage, but the comb preserves an elongated shape as mentioned in published descriptions.

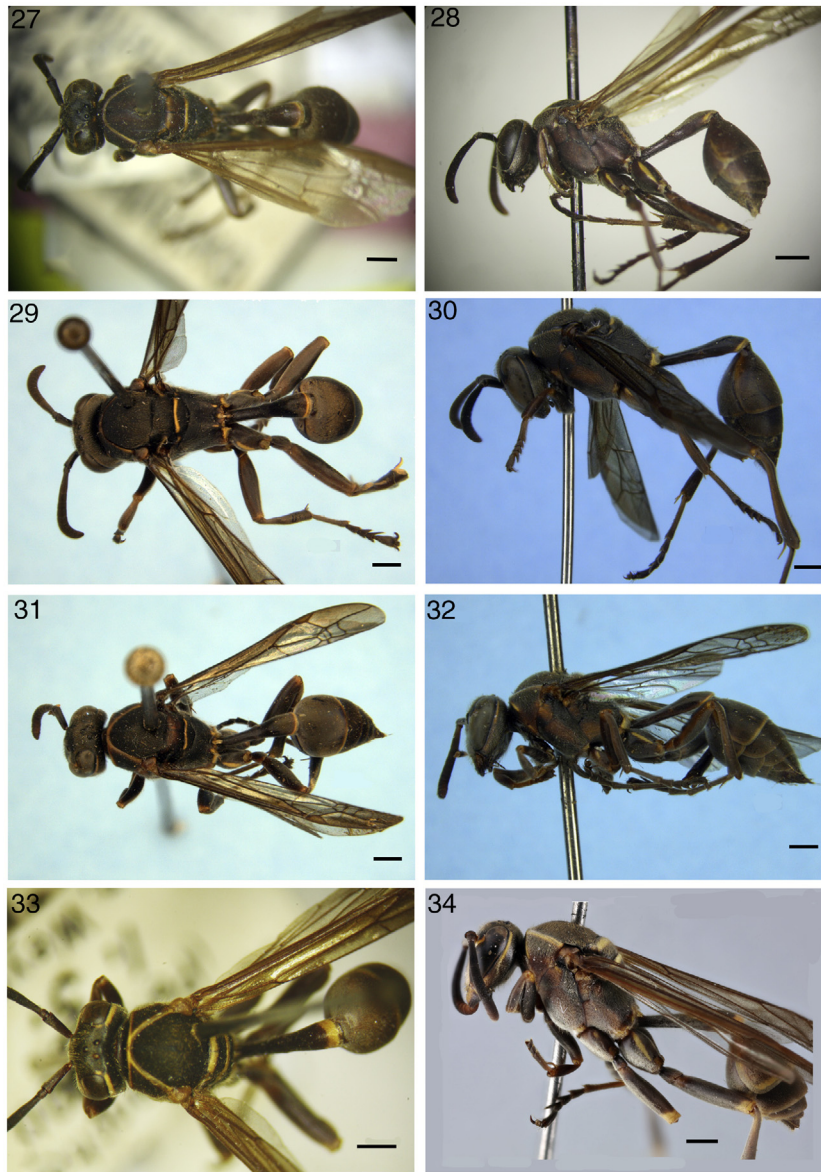
#### Distribution

Brazil: Minas Gerais; Rio de Janeiro; São Paulo; Rio Grande do Sul (see Fig. 47).

#### Remarks

Richards (1978) compared Zikán's type series to a specimen previously checked with the MNHN Buysson's type. Photographs of this type-specimen were made available by staff of the MNHN, and are sufficient to confirm that Richards's concept of this species is correct. Furthermore, *M. wagneri* is reasonably differentiated by some typical characters, like the very elongated first metasomal segment, and dense whitish pilosity on the face. The synonymy of *M. pedunculatoides* Zikán 1949 is also undoubtedly correct. All records of this species come from localities in (or very close to) the highlands of the Brazilian "Serra do Mar" or related mountain ranges. Records from Rio Grande do Sul extend the range of this species for nearly 1000 km southward (Figs. 46–47).

Examined material: **Brazil.** Minas Gerais: Cambuquira, 1 female 12/ix, 1 female xii/1933, J.F. Zikán (IOC); Barroso, 1 female 11/x/2003, 2 females 10/iv/2004, Souza M.M., Nascimento M.A., Silva M. & Silva M.A.; Tiradentes, 1 female 15/iii/2008, Souza M.M., Ladeira T. & Assis N. (MPEG); Rio de Janeiro: Itatiaia, 3 females 3/ii, 550 m Faz. Valparaíso ("zu Bau 5"), 1 female 13/iii, 2 females 17/ii, 1 female 26/iii/1933, 1 female 15/v/1934, J. F. Zikán (paralectotypes of *M. pedunculatus*; IOC); São Paulo: Caraguatatuba (Res. Flor. 40 m), 4females, 14/vii/1965, Exp. Dep. Zool. (MZSP); Ubatuba, Floresta



**Figs. 27–34.** General dorsal and lateral body views (females). 27–28: *M. mourei* (Brazil, PR, Curitiba, paralectotype, IOC); 29–30: *M. barbatus* (Colombia: Antioquia, MPEG); 31–32: *M. mixtus* (Mexico: Chiapas, EBCC); 33–34: *M. imeldai* (33 dorsal – holotype, Peru, IOC) (34 lateral – Bolivia, NHM); all scales = 1.0 mm; scales in figs. (27–28), (33–34) are estimates.

Angelim, 1 female, viii/2007, O. Togni (UNESP/RC); Rio Grande do Sul: Santa Cruz do Sul, Cinturão verde, 2 females 12/xii/2004, M. Hermes; Venâncio Aires, 1 female 08/vi/2006, A. Somavilla (MPEG).

*Mischocyttarus mourei* Zikán 1949  
(Figs. 15b; 27; 28)

*Mischocyttarus mourei* Zikán 1949: 126, figs. 72–73, 211–212, 314, 373. Lectotype: male, Brazil, Paraná, Curitiba (IOC); designated by Richards (1978); [examined].

*Mischocyttarus lanei* Zikán 1949: 127, figs. 74, 213. Lectotype: female, Brazil, São Paulo, Campos da Serra (MZSP); designated by Richards (1978); [examined]; **N. Syn.**

*Mischocyttarus plaumanni* Zikán 1949: 167, figs. 104, 383. Lectotype: female, Brazil, Santa Catarina, Nova Teutônia (IOC); designated by Richards (1978); [examined]; **N. Syn.**

*Mischocyttarus mourei*: Richards (1978: 346); Silveira (2008: 541).

*Mischocyttarus lanei*: Richards (1978: 347); Silveira (2008: 541).  
*Mischocyttarus plaumanni*: Richards (1978: 333); Silveira (2008: 541).

Female

Length of fore wing 10–10.5 mm; clypeus wider than high, H/WCLP: 0.91–0.94, apex narrowly truncate, clypeus not so extensively in contact with eye, free upper part of lateral margin relatively long, a little more than 0.3 times the clypeus height at middle; malar space narrow; tentorial pit a little closer to eye margin than to antennal socket; ocelli as in an equilateral triangle; occiput rounded, carina absent; gena just narrower than the upper lobe of the eye; pronotum with lateral fovea, central part of the anterior margin of pronotum with the lamella wide and rather raised but not reflexed, region immediately behind produced into a secondary margin which is acute and projecting over the lamella; humeral angle poorly developed, total humeral width nearly equal to that

of mesoscutum, sides of the pronotum as seen from above distinctly converging; pronotal carina completely absent at center, poorly salient at sides, not forming true lobes and not at all reflexed, with a very narrow translucent lamellar portion at the extremity, mesoscutum about as long as wide, L/WMS around 1.0, lateral margin adjacent to tegula well demarcated and prominent; fore wing only moderately elongate (mean LSI/HMP 2.31; min–max: 2.21–2.50); basal inner (posterior side) margin of fore coxa raised and strongly reflexed; inner claw of hind tarsus with the apex narrowly pointed, but not acute; propodeal dorsal cavity shorter and variably deep, oval or triangular in shape, propodeal valve variable often roughly triangular in shape, with lamellar margin behind distinctly oblique; first segment of metasoma moderately elongate, its length a little larger than  $1.3\times$  height of mesopleuron (mean LSI/HMP 1.33; min–max: 1.31–1.37), and more than  $3.30\times$  width at apex, about  $2.20\times$  wider at apex than at base, spiracles not prominent to moderately so.

Sculpture: head and mesosoma with rather fine sculpture of granulated aspect; clypeus with minute dense punctation (diameter ca. 0.015 mm), with moderately shining interstices measuring about one puncture diameter, and also with shallow sparser larger punctures (diameter 0.030–0.037 mm), apical central area very finely reticulate, appearing almost smooth, shining, with a few interspersed large shallow punctures (diameter 0.037–0.44 mm); frons with similarly sized punctures, but deeper and a little more dense; mesopleuron with pattern similar to clypeus, but with the small-sized punctures a little closer; humeral area of pronotum with slightly larger and denser punctures (diameter ca 0.022 mm); mesoscutum with punctures slightly larger and less dense, diameter 0.022–0.030 mm, interstices mostly of 0.5 puncture diameter); propodeum with punctures a little larger and sparser.

Vestiture: eyes bare; most body parts covered by fine appressed shining pubescence, but not dense to the point of obscuring the pattern of micropunctures underneath; clypeus with sparser erect longer setae especially near apical margin, shorter erect setae also on frons and vertex, setae on pronotum and mesoscutum often outstanding; gena beneath with distinctly longer hairs; propodeum dorsolaterally with very long fine hairs with recurved tip.

Color (see Figs. 27 and 28): Black, largely suffused with dark reddish brown (including propodeum dorsal surface) [sometimes practically entire body reddish brown]; mandibles reddish with a yellow longitudinal mark (sometimes distal region close to apical teeth also yellow); antennal flagellum reddish brown beneath; clypeus from nearly entirely brown (except apical region close to margin) to largely yellow with a central mark brown to blackish; inner orbits to top of eyes, malar space and genal stripe (outer orbit) [sometimes reduced], subspherical radicle of antennal scape and dorsal margin of antennal socket (sometimes as two definite spots, sometimes indistinct), two dots behind ocelli, marks on pronotum ventral corner and tubercle (sometimes indistinct), pronotal carina and hind margin of pronotum, two discal stripes on mesoscutum (sometimes evanescent or rarely absent; see Fig. 27), axillae and lateral spots on scutellum (sometimes merging to form a continuous transversal anterior yellow stripe), anterior margin and side plates of metanotum, valves (sometimes dark) and large spots (sometimes narrower) on propodeum, scrobal spot (sometimes undefined), hind margin of meso and metasternum (especially close to coxal articulation), apical mark on fore coxa (sometimes undefined), one dorsolateral stripe on mid coxa, and two stripes on hind coxa, marks on apex of all femora, posterior bands on gastral terga 1 and 2 (on the latter extending anteriorly at sides), rarely also rather indistinct bands on terga 3–4 (and

on sterna laterally) [or without any well-defined bands on any segment], yellow; anterior ventral stripe on femora and tibiae light reddish brown; hind tibia distal pad and adjacent anterior area concolor, light orange brown, rarely with a preapical yellow spot; tarsal segments rather uniformly brown (distal ones slightly darker; see Fig. 15b), lighter beneath; tegula brown, wings hyaline, venation brown.

#### Male

Length of fore wing 9.0 mm; mandible with four teeth; clypeus touching eyes, a little wider than high, ventral angle obtuse, apical margin almost rounded; antenna with the scape relatively shorter and wider, ventral surface of the flagellum with tyloids reduced or fragmented, apex of the antenna just rolled, hook like, antennomere 13 about  $4\times$  longer than wide; clypeus with very conspicuous dense shining pubescence.

Color: similar to female; mandibles, antenna beneath, face to a little above antennal sockets, anterior margin of scutellum, proepisternum, mesosternum widely, fore coxa, mid and hind coxae beneath, stripes on femora, bands on metasomal terga 1–5 and sterna 2–4, wide base of sternum 2, yellow. Condyles of mid and hind coxae pale, inner side of hind tibia with a yellow spot before the apical pad.

#### Variation

A few specimens of Zikán's type series of *M. mourei* are relatively darker, with clypeus black and without the two mesoscutal yellow stripes (Fig. 27), but the propodeal spots are always present, even if sometimes a little narrower (the holotype of *M. lanei* is precisely like this). On the other hand, the pattern observed in "*M. plaumanni*" is paler, with clypeus mostly yellow, extra mesopleural yellow marks and with very large propodeal spots. *M. mourei* differs from *M. proximus* mainly on color, the latter never presenting the paired propodeal yellow spots. Both species shows the length of the first metasomal segment intermediate between *M. wagneri* and *M. declaratus* (see Fig. 44).

#### Nest

Zikán (1949) did not make a description but presented photos of nests of *M. mourei* and of *M. plaumanni* (figs. 373 and 383, respectively). The first nest is smaller with an oval elongated shape and eccentric pedicel (Richards, 1978, says the pedicel is central), while the second one (*plaumanni*, from Santa Catarina) has a more circular shape and is attached to a twig but the nest pedicel is not apparent. Both nests seem to present the pattern produced by alternation of adjacent short and full (complete) cells, like the nest of *M. proximus* in Fig. 16, and also described for *M. wagneri*.

#### Distribution

Brazil: São Paulo; Paraná; Santa Catarina (see Fig. 47).

#### Remarks

Interestingly, after describing *M. mourei* (mostly) from specimens from Curitiba (Paraná state), Zikán (1949) also mentioned records of his new species from Campos da Serra (São Paulo), precisely the type locality of *M. lanei* (described next in the same paper, pg. 127), and from Nova Teutônia (Santa Catarina), the type locality of *M. plaumanni* also described in that paper but, contrary to *M. lanei*, treated by Zikán as an unrelated (?) species in a different section of the work on page 167. The keying of these forms by



Zikán's criteria is not so easy to evaluate because his key is for the entire (and taxonomically “unstructured”) genus *Mischocyttarus*. However, the unavailability to Zikán of the male of his *plaumanni* seems to have been responsible for his treating of this new species together with those in which the male has the antenna with apical articles very short and “obtuse” (i.e. *M. alfenii*, *M. paraguayensis*, *M. mexicanus*, etc.), a condition quite different of that in *M. mourei*, of which Zikán knew the male.

Richards (1978), on the other hand, treated *M. plaumanni* as a member of his “*wagneri* group”, but strangely considered *M. mourei* as related to *M. paraguayensis* (!). So, we have here just the opposite situation because, as mentioned above (and in the descriptions section), the male antenna in *M. mourei* is just similar to that of the male in *M. wagneri* (and other related species; see Figs. 39; 41–43), and very different from that observed in *M. paraguayensis* (and Richards was certainly aware of this). Richards's misinterpretation was certainly caused by the excess of importance given to the length of the first metasomal segment. On this respect, within this species-group, *M. mourei* is in an intermediate position as one can see in Fig. 44 and, on the other hand, specimens of *M. plaumanni* are not those with the highest values. So, designations by Richards (1978) of both *plaumanni* and *mourei* to species-groups were inconsistent regarding his own criterion.

Examined material: **Brazil**. Paraná: Curitiba, 3 females 7/x, 1 female 26/xi/1938, 2 females v/1939, 1 female x/1939, 1 female 5/iii, 1 female iv/1940 (paralectotypes of *M. mourei*) (IOC); “near” Curitiba, Campina Grande, 1 female 15/ii/1966, H. & M. Townes (AEIC); Santa Catarina: Nova Teutônia, 1 female, F. Plaumann (paralectotype of *M. mourei*), 1 female 28/iii/1933, F. Plaumann (paralectotype of *M. plaumanni*) (IOC).

*Mischocyttarus camanducaia* sp. nov.

(Figs. 15d; 21; 22; 35)

Holotype: female, Brazil, Minas Gerais, Camanducaia, Monte Verde, 24/xi/2013 (MPEG) Souza, M.M. & Albuquerque, C. (MPEG).

*Mischocyttarus wagneri*: Souza et al. (2015: 176); misidentification.

#### Female

Length of fore wing 10–10.5 mm; clypeus distinctly wider than high, H/WCLP 0.89, apex narrowly truncate (Fig. 35), clypeus not so extensively in contact with eye, free upper part of lateral margin relatively long, about 0.35 times the clypeus height at middle; malar space narrow; tentorial pit almost as close to eye margin than to antennal socket; ocelli as in a nearly equilateral triangle; occiput rounded, carina absent; gena a little narrower than the upper lobe of the eye; pronotum with lateral fovea, central part of the anterior margin of pronotum with the lamella wide and rather raised but not reflexed, region immediately behind produced into a secondary margin which is acute and projecting over the lamella; humeral angle poorly developed, total humeral width nearly equal to that of mesoscutum, sides of the pronotum as seen from above distinctly converging; pronotal carina completely absent at center, poorly salient at sides, not forming true lobes and not at all reflexed, with a very narrow translucent lamellar portion at the extremity, mesoscutum about as long as wide, L/WMS around 1.0, lateral margin adjacent to tegula well demarcated and prominent; fore wing relatively more elongate for this group, LDIS/HMP about 2.50 (see Fig. 44); basal inner (posterior side) margin of fore coxa raised and strongly reflexed; inner claw of hind tarsus with the apex narrowly pointed, but not acute; propodeal dorsal cavity shorter and deep, triangular in shape, propodeal valve relatively narrow, shaped as

a high triangle, lamellar margin behind distinctly oblique; first segment of metasoma only moderately elongate, its length hardly larger than 1.30× height of mesopleuron, and about 3.30× width at apex, about 2.20× wider at apex than at base, spiracles scarcely prominent.

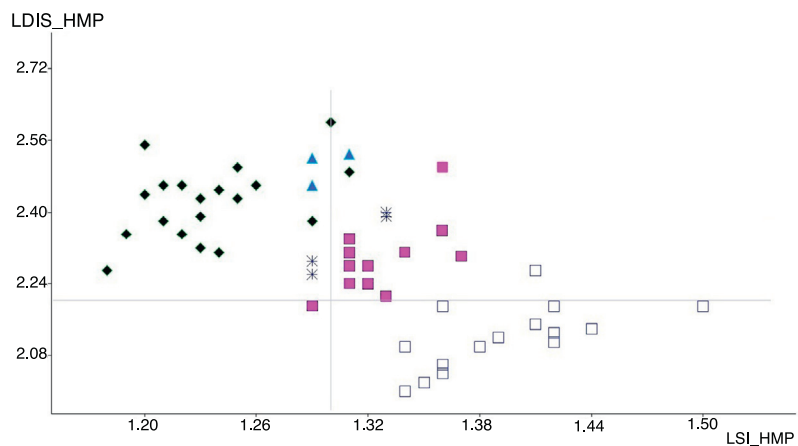
Sculpture: head and mesosoma with rather fine sculpture of granulated aspect; clypeus with minute dense punctation (diameter ca. 0.015 mm), with moderately shining interstices measuring about one puncture diameter, and also with shallow sparser larger punctures (diameter 0.030–0.037 mm), apical central area very finely reticulate, appearing almost smooth, shining, with a few interspersed large shallow punctures (diameter 0.037–0.44 mm); frons with similarly sized punctures, but deeper and a little more dense; mesopleuron with pattern similar to clypeus, but with the small-sized punctures a little closer; humeral area of pronotum with slightly larger and denser punctures (diameter ca. 0.022 mm); mesoscutum with punctures slightly larger and less dense, diameter 0.022–0.030 mm, interstices mostly of 0.5 puncture diameter); propodeum with punctures a little larger and sparser.

Vestiture: eyes bare; most body parts covered by fine appressed shining pubescence, not so dense to the point of obscuring the pattern of micropunctures underneath; clypeus with sparser erect longer setae especially near apical margin, shorter erect setae also on frons and vertex, setae on pronotum and mesoscutum erect and outstanding; gena beneath with distinctly longer hairs; propodeum dorsolaterally with very long fine hairs with recurved tip.

Color (see Figs. 21; 22; 35): Black on most parts, relatively few areas reddish brown on sides of head, mesosoma and some of metasomal terga and sterna; mandibles reddish, with yellow area near apical teeth and a variably large proximal mark; clypeus reddish to darker brown, except for yellow ventral area close to apical margin (sometimes whole clypeus dark brown); antennal segments 1–2 beneath black; antennal flagellum beneath (or only articles 8–12) reddish; part of subspherical radicle of antennal scape and part of dorsal margin of antennal socket yellow to yellowish brown; diffuse marks on proximal half of femora (gradually connecting to distal yellow counterparts), reddish brown; mid and hind tibiae ventrolaterally light yellowish brown gradually changing to a subapical yellow mark (dorsal surface darker brown), hind tibia distal pad light orange brown; inner orbits to vertex, fusing with the postocellary marks (these sometimes as separate spots), malar space and genal stripe (sometimes interrupted or absent below), mark on pronotum tubercle (sometimes indistinct), pronotal carina and hind margin of pronotum, discal stripes on mesoscutum, part of axillae, anterior transversal stripe on scutellum (sometimes absent), side plates and anterior margin of metanotum; valves (sometimes dark) and two elongate spots on propodeum, large scrobal spot, rather large spot on upper metapleural plate, large posterior area and margin of mesosternum and hind margin of metasternum (in both cases extending to coxal articulation), large spot on apex of fore coxa (almost the distal half), large ventral mark and one dorsolateral stripe on mid coxa, two stripes on hind coxa, distal margin of all trochanters, triple pattern of distal longitudinal marks on fore femur (sometimes obscured), double pattern of distal longitudinal marks on mid and hind femora, narrow posterior distal bands on gastral terga 1–2 (or -3) extending forward at sides, but sometimes indistinct; rather wide areas near distal margin of sterna 2–4 (or -5), yellow; also yellow is most of fore tibia (except for an anterior dorsal dark mark) and all of fore tarsus including claws; mid and hind tarsi with articles 1–4 largely yellowish (only tarsomere 5 entirely dark brown or black); tegula brown with a small posterior yellow spot (sometimes absent); wings hyaline, venation brown.



**Figs. 35–43.** 35–38: frontal view of female head (35: *M. camanducaia* sp. nov., holotype, Brazil, MG, Camanducaia, MPEG; 36: *M. declaratus*, MG, Barroso, MPEG; 37: *M. imeldai*, holotype, Peru, IOC; 38: *M. imeldai*, Bolivia, NHM); 39 and 42: general lateral body view of males (39: *M. proximus*, SP, Campos do Jordão, MPEG; 42: *M. declaratus*, MG, Barroso, MPEG); 40–41: male *M. imeldai* (Peru, NHM) showing mandibles, clypeus and lower face (40) and antennal flagellum (41); 43: anterior-ventral view of face of male *M. declaratus* (MG, Barroso; MPEG); all scales = 0.50 mm, except Figs. 39 and 42 (= 1.0 mm); scales in figs. (37–38), (40) are estimates.



**Fig. 44.** Scattergram of ratio variables for species of the group of *M. wagneri*: x axis – LSI\_HMP (length of first metasomal segment over height of mesopleuron); y axis – LDIS\_HMP (length of fore wing discal cell over height of mesopleuron); open squares: *M. wagneri*; pink filled squares: *M. mourei*; black asterisks: *M. proximus*; blue filled triangles: *M. camanducaia* sp. nov.; black filled diamonds: *M. declaratus*.



**Male**

Unknown.

**Variation**

The three known specimens come from just two localities distant by mere 160 km, and are remarkably uniform in color and form, while being reasonably distinct from other species in this group.

**Nest**

Unknown.

**Distribution**

Brazil: Minas Gerais (Fig. 47).

**Etymology**

The specific epithet is a reference to the type locality “Camanducaia”, a name originating in the indigenous “Tupi” language.

**Remarks**

In spite of the yet low number of specimens available, this species seems now so markedly distinct, and clearly deserving of the status of species.

Examined material (paratypes): **Brazil**. Minas Gerais: Camanducaia, Monte Verde, 1 female 24/xi/2013 (MPEG) Souza M.M. & Albuquerque C.; Parque Estadual da Serra do Papagaio, 1 female 25/vii/2013, Milani L. (MPEG).

*Mischocyttarus proximus* Zikán 1949

(Figs. 15c; 16; 23; 24; 39)

*Mischocyttarus proximus* Zikán 1949: 127, figs. 74, 213. Holotype: female, Brazil, São Paulo, Campos da Serra, xi/1940, F. Lane (MZSP); designated by Richards (1978); [examined].

*Mischocyttarus proximus*: Richards (1978); Silveira (2008: 541).

**Female**

Length of fore wing 10–10.5 mm; clypeus wider than high, H/WCLP about 0.91 (min–max: 0.89–0.92), apex narrowly truncate, clypeus not so extensively in contact with eye, free upper part of lateral margin relatively long, more than 0.3 times the clypeus height at middle; malar space narrow; tentorial pit a little closer to eye margin than to antennal socket; ocelli as in an equilateral triangle; occiput rounded, carina absent; gena just narrower than the upper lobe of the eye; pronotum with lateral fovea, central part of the anterior margin of pronotum with the lamella wide and rather raised but not reflexed, region immediately behind produced into a secondary margin which is acute and projecting over the lamella; humeral angle poorly developed, total humeral width nearly equal to that of mesoscutum, sides of the pronotum as seen from above distinctly converging; pronotal carina completely absent at center, poorly salient at sides, not forming true lobes and not at all reflexed, with a very narrow translucent lamellar portion at the extremity, mesoscutum about as long as wide, L/WMS around 1.0, lateral margin adjacent to tegula well demarcated and prominent; fore wing well elongate for this group (mean LSI/HMP 2.36; min–max: 2.26–2.49); basal inner (posterior side) margin of fore coxa raised and strongly reflexed; inner claw of hind tarsus with the apex narrowly pointed, but not acute; propodeal dorsal cavity shorter and deeper, oval to subtriangular, often with a median keel, propodeal valve well expanded behind, but low and angular, more triangular in shape than round; first segment of metasoma not so elongate for

this group, its length just a little larger than  $1.3 \times$  height of mesopleuron (LSI/HMP min–max: 1.29–1.33), variably wide at apex, from  $2.00$ – $2.30 \times$  wider than at base, spiracles scarcely prominent.

Sculpture: head and mesosoma with rather fine sculpture of granulated aspect; clypeus with minute dense punctation (diameter ca. 0.015 mm), with moderately shining interstices measuring about one puncture diameter, and also with shallow sparser larger punctures (diameter 0.030–0.037 mm), apical central area very finely reticulate, appearing almost smooth, shining, with a few interspersed large shallow punctures (diameter 0.037–0.44 mm); frons with similarly sized punctures, but deeper and a little more dense; mesopleuron with pattern similar to clypeus, but with the small-sized punctures a little closer; humeral area of pronotum with slightly larger and denser punctures (diameter ca 0.022 mm); mesoscutum with punctures slightly larger and less dense, diameter 0.022–0.030 mm, interstices mostly of 0.5 puncture diameter); propodeum with punctures a little larger and sparser.

Vestiture: eyes bare; most body parts covered by fine appressed shining pubescence, not so dense to the point of obscuring the pattern of micropunctures underneath; clypeus with sparser erect longer setae especially near apical margin, shorter erect setae also on frons and vertex, setae on pronotum and mesoscutum oblique but often outstanding; gena beneath with distinctly longer hairs; propodeum dorsolaterally with very long fine hairs with recurved tip.

Color (see Figs. 23; 24): Black, largely suffused with dark reddish brown, especially on sides of mesosoma (and including propodeum dorsum); mandibles dark brown with a proximal yellow (or light reddish) longitudinal mark; antennal flagellum reddish brown beneath (becoming lighter toward apex); narrow area adjacent to clypeal apical margin (sometimes orange or reddish yellow); inner orbits to top of eyes (becoming very narrow or interrupted near vertex), malar space and genal stripe (outer orbit) [often reduced], subspherical radicle of antennal scape yellowish (sometimes indistinct), two very small dots behind ocelli (often evanescent or absent), marks on pronotum ventral corner near fovea (often absent) and tubercle (sometimes indistinct), pronotal carina and hind margin of pronotum (often only at sides, i.e. light brown at center), narrow axillar mark (scutellum dark brown with a diffuse lighter reddish brown band anteriorly, or entirely light reddish brown), anterior margin very narrowly (and fading at sides) of metanotum, sometimes small faint (posterior) traces of propodeal spots (normally propodeum darkly colored), hind margin of meso and metasternum (extending laterally to border of coxal articulation), apical mark on fore coxa (sometimes undefined), one dorsolateral stripe on mid coxa (often very small), and an outer dorsal stripe on hind coxa (sometimes with traces of an inner one), marks on apex of all femora, small mark bordering apex of all tibiae (sometimes indistinct), very narrow (often interrupted or evanescent) posterior bands on gastral terga 1 and 2 (on the latter extending anteriorly at sides), equally poorly defined bands on sterna 2–3 (or without well-defined bands on any segment), yellow; anterior dorsal elongated marks on all femora, anterior and ventral elongated marks on all tibiae, light reddish brown; hind tibia distal pad light orange brown, adjacent anterior area slightly more yellowish (rarely with a faint yellow mark in between), all tarsi with articles brown above (tarsomeres 4–5 darker), lighter beneath; tegula brown, wings hyaline, venation brown.

Male (see Fig. 39)

Length of fore wing 9.5 mm; mandible with four teeth; clypeus touching eyes, a little wider than high, ventral angle obtuse; antenna with the scape relatively shorter and wider, ventral surface of the flagellum with tyloids reduced or fragmented, apex of the antenna just rolled, hook like, antennomere 13 about  $4.12 \times$

longer than wide; clypeus with very conspicuous dense shining pubescence; also frons, gena beneath, most of mesosomal areas, and first metasomal sternum presenting quite long fine outstanding hairs.

Color: much more yellow marked than female; mandibles, antenna beneath, face to a little above antennal sockets, narrow axillar mark and anterior transversal band on scutellum, largely interrupted mark along anterior margin of metanotum, mark on metanotal side plate, proepisternum, mesosternum and metasternum widely, nearly all of fore coxa, anterior ventral face of mid and hind coxae and of all trochanters, anterior ventral stripes on femora, very narrow (rather indistinct) bands on metasomal terga 1–3 (or –4), only distal lateral margins of sternum 1, narrowly, base of sternum 2, and distal bands on sterna 2–4, yellow; fore tarsus entirely yellow (as in female), mid and hind tarsus with just articles 1–2 yellow or yellowish, more distal tarsomeres dark brown.

#### Variation

The five additional specimens reported here agree reasonably well with the holotype, described 70 years ago from a place distant ca. 180 km. All the specimens are relatively darker, lacking mesoscutal stripes and propodeal spots.

#### Nest

The nest (Fig. 16) is very similar to those of *M. wagneri* and *M. mourei*.

#### Distribution

Brazil: São Paulo (Fig. 47)

#### Remarks

This species is very similar to *M. mourei*, and its holotype was actually collected at the same place where Zikán also recorded a specimen of *M. mourei* proper, and in the very same locality of the holotype of *M. lanei* (a synonym of *M. mourei*). *Mischocyttarus proximus* is darker, without the propodeal yellow spots typical in this species-group. Further collecting in the region could well show that it is just a darker color variant of *M. mourei*.

Examined material: **Brazil**. São Paulo: Campos do Jordão, 1 female 24/viii/, 1 female 16/xi/2013, 1 male 25/iii, 1 female 26/iii/2014, 1 female 8/ii/2015, Locher G. A. (MPEG).

*Mischocyttarus declaratus* Zikán 1935

(Figs. 15e; 25; 26; 36; 42; 43)

*Mischocyttarus declaratus* Zikán 1935: 162, figs. 17–19, pl. 3, fig. 9. Lectotype: male, Brazil, Rio de Janeiro, Itatiaia 20/ii/1932, J. F. Zikán (MZSP); designated by Richards (1978); [examined].

*Mischocyttarus confirmatus* Zikán 1935: 164. Lectotype: male, Brazil, Rio de Janeiro, Itatiaia, 14/iv/1934, J.F. Zikán (IOC); designated by Richards (1978); [examined]; **New Synonymy**.

*Mischocyttarus brackmanni* Zikán 1949: 129, figs. 76, 374. Lectotype: male, Brazil, Rio de Janeiro, Mury (Nova Friburgo), 3/i/1941, J.F. Zikán (IOC); designated by Richards (1978); [examined]; **New Synonymy**.

*Mischocyttarus alternatus* Zikán 1949: 130. Lectotype: female, Brazil, Rio de Janeiro, Itatiaia, 13/ii/1933, J.F. Zikán (IOC); designated by Richards (1978); [examined]; **New Synonymy**.

*Mischocyttarus cabauna* Zikán 1949: 139, fig. 224. Lectotype: female, Brazil, Rio de Janeiro, Itatiaia, 15/v/1945, J.F. Zikán (IOC); designated by Richards (1978); [examined]; **New Synonymy**.

*Mischocyttarus brackmannoides* Zikán 1949: 236. Lectotype: male, Brazil, Rio de Janeiro, Mury, 4/iii/1941, J.F. Zikán (IOC); designated by Richards (1978); [examined]; Synonymy by Richards (1978).

*Mischocyttarus confirmatoides* Zikán 1949: 236. Lectotype: male, Brazil, Rio de Janeiro, Itatiaia, 30/iv/1942, J.F. Zikán (IOC); designated by Richards (1978); [examined]; Synonymy by Richards (1978).

*Mischocyttarus brackmanni*: Richards (1978: 335); Silveira (2008: 541).

*Mischocyttarus declaratus*: Zikán (1949: 125, figs. 70–71, 210); Richards (1978: 348); Silveira (2008: 541).

*Mischocyttarus confirmatus* subsp. *confirmatus*: Richards (1945: 376).

*Mischocyttarus confirmatus* Zikán (1949: 128, figs. 75, 214, 215, 293, 377); Silveira (2008: 541).

*Mischocyttarus cabauna*: Richards (1978: 348); Silveira (2008: 541).

*Mischocyttarus alternatus*: Richards (1978: 349); Silveira (2008: 541).

#### Female

Length of fore wing 9–10.5 mm; clypeus wider than high, H/WCLP about 0.91 (min–max: 0.86–0.94), apex narrowly truncate, clypeus not so extensively in contact with eye, free upper part of lateral margin relatively long, more than 0.3 times the clypeus height at middle; malar space narrow; tentorial pit a little closer to eye margin than to antennal socket; ocelli as in an equilateral triangle; occiput rounded, carina absent; gena just narrower than the upper lobe of the eye; pronotum with lateral fovea, central part of the anterior margin of pronotum with the lamella wide and rather raised but not reflexed, region immediately behind produced into a secondary margin which is acute and projecting over the lamella; humeral angle poorly developed, total humeral width nearly equal to that of mesoscutum, sides of the pronotum as seen from above distinctly converging; pronotal carina completely absent at center, poorly salient at sides, with a very narrow (low) and very short translucent lamellar portion at the extremity, not forming true lobes and not at all reflexed, mesoscutum about as long as wide, L/WMS around 1.0, lateral margin adjacent to tegula well demarcated and prominent; fore wing more elongate for this group (mean LSI/HMP 2.41; min–max: 2.27–2.50) (see Fig. 44); basal inner (posterior side) margin of fore coxa raised and strongly reflexed; inner claw of hind tarsus with the apex narrowly pointed, but not acute; propodeal dorsal cavity shorter and distinctly shallower than in other species of this group, subtriangular; propodeal valve well expanded behind, but rather low and more often triangular in shape; first segment of metasoma short for this group, its length nearly always less than 1.3 × height of mesopleuron (LSI/HMP about 1.23, min–max: 1.18–1.31) (see Fig. 44), also wider at apex, from 2.6–3.0 × wider than at base, spiracles not prominent to moderately so.

Sculpture: head and mesosoma with rather fine sculpture of granulated aspect; clypeus with minute dense punctation (diameter ca. 0.015 mm), with moderately shining interstices measuring about one puncture diameter, and also with shallow sparser larger punctures (diameter 0.030–0.037 mm), apical central area very finely reticulate, appearing almost smooth, shining, with a few interspersed large shallow punctures (diameter 0.037–0.44 mm); frons with similarly sized punctures, but deeper and a little more dense; mesopleuron with pattern similar to clypeus, but with the small-sized punctures a little closer; humeral area of pronotum with slightly larger and denser punctures (diameter ca. 0.022 mm); mesoscutum with punctures slightly larger and less dense, diameter 0.022–0.030 mm, interstices mostly of 0.5 puncture diameter; propodeum with punctures a little larger and sparser.



Vestiture: eyes bare; most body parts covered by fine appressed shining pubescence, not so dense to the point of obscuring the pattern of micropunctures underneath; clypeus with sparser erect longer setae especially near apical margin, shorter erect setae also on frons and vertex, setae on pronotum and mesoscutum oblique but often outstanding; gena beneath with distinctly longer hairs; propodeum dorsolaterally with very long fine hairs with recurved tip.

Color (see Figs. 25; 26; 36): Black, comparatively less tinged of reddish brown on most areas; mandibles black to dark brown (sometimes lighter) with a proximal yellow (or light reddish) longitudinal mark; antennal flagellum reddish brown beneath (becoming lighter toward apex); narrow area adjacent to clypeal apical margin either black or reddish (rarely lighter); inner orbits not reaching top of eyes, sometimes malar space and genal stripe (outer orbit) in very interrupted way (often with just a dorsal streak), subspherical radicle of antennal scape reddish (sometimes indistinct), rarely two very small dots behind ocelli, rarely any marks on pronotum ventral corner near fovea and tubercle, rarely pronotal carina (at its lateral tip) and hind margin of pronotum (often only at sides, i.e. light brown at center), rarely a narrow axillar mark, side plates of scutellum and metanotum [scutellum dark brown with a diffuse reddish brown band anteriorly, or entirely reddish brown], sometimes more or less interrupted mark along anterior margin of metanotum, conspicuous scrobal spot, propodeum never with any spots, hind margin of meso and metasternum extending laterally to border of coxal articulation (sometimes indistinct), apical mark on fore coxa (sometimes poorly defined), sometimes an anterior basal spot on mid coxa, sometimes an dorsolateral stripe on mid coxa, one outer dorsal stripe (sometimes absent) on hind coxa and sometimes also with an incomplete inner stripe, posterior side of distal margin of trochanters very narrowly, marks on apex of all femora, that on mid femur connecting to an elongated mark along the anterior face, that on hind femur connecting to elongated marks along both anterior (sometimes absent) and posterior face (always), all tibiae ventrolaterally (yellow to yellowish), often only lateral elements of posterior bands on metasomal terga 1–3, equally poorly defined lateral marks on sterna 2–4, yellow; fore tarsus entirely yellow or yellowish brown; mid and hind tarsi with distal half or article 1 and articles 2–4 yellow (or yellowish), only tarsomere 5 dark brown; anterior dorsal elongated marks on all femora (except when such marks are actually yellow), light reddish brown; hind tibia distal pad light orange brown, adjacent anterior area with a small yellow mark, tegula brown, wings hyaline, venation brown.

#### Male (see Figs. 42; 43)

Male: length of fore wing 9.5 mm; mandible with four teeth; clypeus touching eyes, a little wider than high, ventral angle obtuse; antenna with the scape relatively shorter and wider, ventral surface of the flagellum with tyloids reduced or fragmented, apex of the antenna just rolled, hook like, antennomere 13 about 3.5× longer than wide; clypeus with very conspicuous dense shining pubescence; also frons, gena beneath, most of mesosomal areas, and first metasomal sternum presenting quite long fine outstanding hairs.

Color: much more yellow marked than female; mandibles, antenna beneath, face to a little above antennal sockets, narrow axillar mark and anterior transversal band on scutellum, largely interrupted mark along anterior margin of metanotum, mark on metanotal side plate, proepisternum, mesosternum and metasternum widely, nearly all of fore coxa, anterior ventral face of mid and hind coxae and of all trochanters, anterior ventral stripes on femora, very narrow bands on metasomal terga 1–2, nearly all of sternum 1, base of sternum 2, and distal bands on sterna 2–3,

yellow.

#### Variation

Despite some variation in apical width of the first metasomal segment (which strongly influences the impression one may have of the slenderness of the petiole), the proportion between its length and the height of the mesopleuron is typically quite low in comparison to the other species in this group. Quite a few specimens approach or slightly surpass a reference value of 1.3 (see Fig. 44). The color is almost invariably dark, with a few yellow marks on mesepisternum, legs and tarsi (Figs. 15e; 25; 26; 36).

#### Nest

The nest is similar to those of other species treated here, as one may understand from original descriptions by Zikán (1935). In page 164 for *declaratus* he says... (translated from German) *the nest has the shape of a dry, torn leaf [and looks very similar to that of artifex Ducke]. It is 8 cm long, reddish-brown in color and attached to the tip of a dry twig beneath a dry leaf.* His description of the nest of “*M. confirmatus*” (1935: 165) stresses a different more compact shape of the comb, which led him to consider it as a species distinct from *M. declaratus*... (translated from German) *As much as the two species are similar, their nests are fundamentally different. The one of declaratus [is similar to that of artifex] and has the long form of a torn, dry leaf with [similar] attachment to a thin branch. In confirmatus it... has the shape of an irregular elongated hexagon, on which four sides are fairly straight lines, while the two last built sides have irregular contours. The pedicel is short and wide and is eccentric... The nest is dark brown, was attached to the top of an orange leaf and was at a height of about 3 m on an orange tree close to the edge of the forest.* A photo of this nest specimen is presented in Zikán (1949, fig. 377). The extent of architectural variation (i.e. difference from “elongated roughly triangular” to “elongated roughly hexagonal” shapes) and the number of nests seen by Zikán do not seem to be sufficient to support specific distinctiveness between assemblages of specimens that cannot be diagnosed on the basis of body morphology.

#### Distribution

Brazil: Minas Gerais; Rio de Janeiro; São Paulo (see Fig. 47).

#### Remarks

The problems related to the specific names synonymized under *M. declaratus* are similar to those treated in my 2013 paper dealing with *M. paraguayensis*, and very illustrative of the difficulties one may find to identify the *Mischocyttarus* fauna from southeastern Brazil. A look on the section of the key of Zikán (1949) treating those named forms related to *M. declaratus* shows such a refinement in treatment of a few characters of which no good correspondence is found in actual examination (and measurement) of specimens under the microscope; e.g. on the silvery tomentum on frons of the male (couplet 94, pg. 25), it is said to be... (translated from Portuguese) “*extending to base of antennae in declaratus*” opposed to “*extending to median ocellus in other species*”. This does not quite apply, and Richards (1978: 315) indeed said of the males of *declaratus*, *alternatus* and *confirmatus*... “*not readily separable in a key*” (curiously, on maintaining the valid status of these specific names, he designated males as lectotypes!). So, it is indeed possible that future studies (e.g. molecular based) demonstrate some taxonomic structure in these short-petiole forms of the *wagneri* species-group. However, the old nomenclatural framework created by Zikán seems on the basis of current knowledge of morphological variation to be overdetailed and unfounded.

Examined material: **Brazil**. Minas Gerais: Barroso, 1 female, 2 males 1/xi/2003, Souza M.M., Nascimento M.A., Silva M. & Silva M.A.; Aiuruoca, Parque Estadual da Serra do Papagaio, 1 female 12/x/2013 (MPEG); Rio de Janeiro: Itatiaia, 3 females 6/ii/, 1 male 14/ii/1932 (paralectotypes of *declaratus*) 1 female 6/ii/1933, 1 female 14/iii, 1 female 16/iii, 2 females 27/iii, 1 female 5/iv/1935 (paralectotypes of *alternatus*) 1 female Lago Azul 8/v/1942 (paralectotype of *confirmatoides*) 3 females 15/v/1945 (paralectotypes of *cabauna*); Mury, 1 female 3/iii/1941 (paralectotype of *brackmannoides*), J.F. Zikán (IOC); São Paulo: Pindamonhangaba, 1 female 11/iii/2014, Locher G.A. (MPEG).

#### The group of *M. barbatus* Richards

In his first revisional work on the genus *Mischocyttarus*, Richards (1945) described *M. barbatus*, with *M. barbatus cisandinus* as a “variety”, both from Colombia. These taxa were assigned by the author to his “group of *M. flavitarsis*” which then included several species that later were removed by him to other groups, like *M. extinctus* Zikán 1935, *M. wagneri* (du Buysson 1908), or *M. cassununga* (v. Ihering 1903) (see Richards, 1978).

As already mentioned, Silveira (2008) misidentified *M. barbatus* and treated exemplars of this species under the designation “group of *M. hirsutus*”. Further study of material in the London Natural History Museum, made clear that those specimens actually referred to *M. barbatus*. Such studies also showed that several specific names created by Richards (1945) and Zikán (1949) to forms related to *M. barbatus* would probably be synonymous, so the task of leading with these identity problems is here being handled.

The diagnosis presented by Silveira (2008: 540) for the group of *M. barbatus* (referred there as “group of *M. hirsutus*”) has proved to be effective to separate it from other species-groups in the subgenus *Phi*: pronotal anterior secondary margin present, obtuse, not strongly projecting over anteromedian lamella (Figs. 5; 6); female clypeal apex narrowly truncate; male mandible (not enlarged and robust) and gena normal (not as wide as in female); apex of male antenna hook-like (Fig. 41); body hairs long and conspicuous especially on head and mesosoma, erect hairs on frons and mesoscutum measuring nearly two ocellar diameters; sculpture strong; black species commonly with diffuse reddish marks on mesosoma. To this set of features, one can add the basal inner margin of fore coxa with the lamella only moderately elevated and less strongly reflexed (Fig. 11) (character 24, state 1 in the character list of Silveira, 2008: 522).

The group of *M. barbatus* is here treated as consisting of three species, separable by the following key.

#### Key to species

- 1- Apex of inner hind tarsal claw just narrow or roundly pointed, never definitely acute (Fig. 14); pronotal anterior secondary margin a little higher, adjacent sulcus in front quite distinct (Figs. 5; 8); pronotal carina often with vestiges of translucent lamella at sides; scutellum black, at times with yellow marks ..... 2
- 1'- Apex of hind tarsal claw strongly sharp (Fig. 13); pronotal anterior secondary margin poorly raised, its border more obtuse (Figs. 6; 9); pronotal carina more strongly reduced at sides, without distinct vestiges of lamella; scutellum tinged of reddish brown ..... *M. mixtus* Richards 1978 (Figs. 31; 32).
- 2- Pronotum from above with small but definite humeral projecting lobes; mesoscutum lateral margin adjacent to tegula well demarcated and laterally prominent; clypeus mostly black with narrow yellow or reddish apical stripe; scutellum most often black, rarely with an interrupted anterior yellow band ..... *M. barbatus* Richards 1945 (Figs. 29; 30).

- 2'- Pronotum without projecting humeral lobes; mesoscutum lateral margin adjacent to tegula poorly demarcated and hardly prominent; clypeus largely tinged of yellow, with central dark mark (Figs. 37; 38); scutellum black with anterior yellow band ..... *M. imeldai* Zikán 1949 (Figs. 33; 34)

#### Descriptions of species

##### *Mischocyttarus barbatus* Richards 1945

(Figs. 5; 8; 14; 17; 29; 30)

*Mischocyttarus barbatus* Richards 1945: 373, figs. 51, 59; Holotype: Female, Colombia (Valle), Cordillera Occidental 2000 m, Rio Aguacatal, Fassl col. (MNHU). [examined]

*Mischocyttarus barbatus* var. *cisandinus* Richards 1945: 374; Holotype: Female, Colombia, Bogotá, Lindig col. (MNHU); [examined]; Synonymy by Richards (1978).

*Mischocyttarus ecuadorensis* Zikán 1949: 156; Holotype: Female, Ecuador, “Balza Mba” (probably Balzapamba, Bolivar) (MZSP; no. 17.088); [examined]; **New Synonymy.**

*Mischocyttarus peduncularius* Zikán 1949: 151, figs. 223, 224, 294; Lectotype: Male, Peru, Vale Chanchamayo 800–1200 m (IOC); designated by Richards (1978); [examined]; **New Synonymy.**

*Mischocyttarus barbatus*: Zikán (1949: 225, in key); Richards (1978: 337); Silveira (2008: 540).

*Mischocyttarus barbatus* var. *barbatus*: Richards (1945: 374); Zikán (1949: 225, in key).

*Mischocyttarus barbatus* var. *cisandinus*: Zikán (1949: 225, in key).

*Mischocyttarus ecuadorensis*: Richards (1978: 336); Silveira (2008: 540).

*Mischocyttarus peduncularius*: Richards (1978: 337); Silveira (2008: 540).

#### Female

Length of fore wing 7.5–10 mm; clypeus wider than high, H/WCLP about 0.89 (min–max: 0.83–0.94), apex narrowly truncate, clypeus not so extensively in contact with eye, free upper part of lateral margin relatively long, more than 0.3× height of clypeus at middle; malar space narrow; tentorial pit a little closer to eye margin than to antennal socket; ocelli as in an equilateral triangle; occiput rounded, carina absent; gena narrower than the upper lobe of the eye; pronotum with lateral fovea, central part of the anterior margin of pronotum with the lamella wide and poorly raised not at all reflexed, region immediately behind produced into a secondary margin which is obtuse and not projecting over the lamella; humeral angle well developed and projecting laterally, total humeral width about 1.08× that of mesoscutum (min–max: 1.03–1.12), sides of the pronotum as seen from above little converging; pronotal carina completely absent at center, developed at sides as an obtuse roundish ridge having at top a narrow (low) translucent lamellar portion, whose extremity is not backwardly reflexed, mesoscutum about as long as wide, L/WMS around 1.0, lateral margin adjacent to tegula well demarcated and laterally prominent; fore wing relatively short (mean LSI/HMP 2.15; min–max: 2.00–2.23); basal inner (posterior side) margin of fore coxa raised but comparatively less reflexed; inner claw of hind tarsus with the apex narrowly pointed, never definitely acute; propodeal dorsal cavity elongate and considerably deep, shaped as high triangle, less often with more linear form; propodeal valve variable moderately expanded in a uniform way so that it has a roughly round shape; first segment of metasoma moderately elongate, its length a little less than 1.3× height of mesopleuron (LSI/HMP about 1.28, min–max: 1.22–1.34), distinctly slender but variably wide at apex, from 1.91–2.45× wider than at base, spiracles often distinctly prominent.



Sculpture: head and mesosoma with moderately course sculpture; clypeus with minute dense punctation (diameter ca. 0.015 mm), with moderately shining interstices measuring about one puncture diameter, and also with shallow sparser larger punctures (diameter 0.030–0.037 mm), apical central area very finely reticulate, appearing almost smooth, shining, with a few interspersed large shallow punctures (diameter 0.037–0.44 mm); frons with a stronger pattern of slightly larger and deeper punctures (diameter 0.022–0.030 mm) separated by interstices of 0.5–1 puncture diameter; humeral area of pronotum with a strong pattern of subcoalescent small punctures (0.022 mm); mesoscutum with similar pattern but with punctures slightly less dense and larger (diameter mostly 0.022 mm or a little larger, interstices of 0.5–1 diameter); mesopleuron with a rather uniform pattern of dense and deep punctures, diameter 0.022–0.030 mm) separated by interstices of 0.5–1 puncture diameter; propodeum dorsally similar with punctures a little larger and more sparse.

Vestiture: eyes bare; clypeus covered by fine appressed shining (silvery) pubescence, not so dense to the point of obscuring the pattern of micropunctures underneath; clypeus with sparser erect longer setae especially near apical margin (length ca. equal to one median ocellus diameter; mod), most of head (including posterior surfaces) and mesosoma covered by very long fine hairs, length on mesoscutum ca. 1.3 mod, on mesopleuron ca. 1.6 mod, on propodeum still longer, ca. 2.0 mod; hairs on metasomal sterna also relatively long, ca. 1 mod, on the first sternum a little longer, ca. 1.3 mod.

Color (see Figs. 29; 30): Black; anterior half of mandible (sometimes more) light reddish brown (rarely yellow), margins darker; antennal articles 9–12 light reddish beneath sometimes all of flagellum beneath); narrow ventral strip of clypeus reddish yellow (rarely yellow); inner orbits to more or less center of ocular sinus, short dorsal genal streak (rarely also with ventral a one), small mark on pronotum ventral corner (sometimes reddish, or entirely absent), tubercle (sometimes reddish, or entirely absent), carina discontinuously (sometimes fairly continuously) and hind margin of pronotum (sometimes indistinct or reddish), rarely a narrow anterior transversal stripe on scutellum, front margin of metanotum (sometimes absent), propodeal valves (sometimes dark) and paired propodeal dorsal spots (sometimes only small dots, or entirely absent) a small scrobal spot (sometimes reddish, often absent), posterior margin of meso and metasternum extending laterally to border of coxal articulation (sometimes indistinct), one dorsolateral stripe on mid coxa (sometimes reddish, or absent), one outer dorsal stripe on hind coxae (sometimes reddish, or absent), sometimes also an inner dorsal incomplete streak; sometimes posterior side of distal margin of trochanters; small apical mark on all femora; distal lateral marks on metasomal sternum 1 (sometimes absent), narrow distal bands on metasomal terga 1–2 (or –5, somewhat indistinctly, or without any metasomal bands) and sterna 2–3 (or –5, somewhat indistinctly, or without any metasomal bands), yellow (sometimes whitish yellow); red suffused areas on mesepisternum and lower metapleural plate (sometimes absent); elongate marks on anterior face of mid and hind femora; most of fore tibia and elongate marks on anterior face of mid and hind tibiae, light reddish brown to yellowish brown; hind tibia with distal pad concolorous with adjacent area; tegula brown with posterior yellow spot (sometimes absent); wings hyaline or a little infuscate, costal region a little yellowish, venation brown.

#### Male

Length of fore wing 8–8.5 mm; mandible with four teeth; clypeus touching eyes, a little wider than high, ventral angle obtuse; antenna with the scape relatively shorter and wider, ventral surface of the flagellum with tyloids reduced or fragmented, apex

of the antenna just rolled, hook like, antennomere 13 about 3.5× longer than wide; clypeus with very conspicuous dense shining pubescence; also frons, gena beneath, most of mesosomal areas, and first metasomal sternum presenting quite long fine outstanding hairs.

Color: similar to female; clypeus more extensively yellow close to lateral and apical margins; antenna with articles 8–13 yellow beneath.

#### Variation

This species shows considerable variation in the length and slenderness of the first metasomal tergum, as well as regarding the occurrence and extension of yellow marks over the body. However, neither these structural and color characters correlate reciprocally, nor they do with geography. In Fig. 45 is a scatterplot of two morphometric variables representing respectively the proportional length of first segment (mesoscutum width was used as size reference in this case, to benefit from measurements of the types of *barbatus* and *cisandinus* obtained from photographs) and the first segment width at apex. The graph shows wide overlapping of clusters of specimens from very different locations.

#### Nest

Zikán (1949) did not see nests of *M. ecuadorensis* and *M. peduncularius*, and Richards (1978) mentioned several nests of *M. barbatus* from Colombia, Valle, Anchicayá, the largest of them with 20 cells. Carton was dark gray-brown and cocoon-caps were also dark and largely covered with carton. The combs tended to be elongated, two or three cells wide, with a pedicel (3–4 mm long) at one end. In the MPEG collection, a nest (Fig. 18) from Parque Nacional Tatamá (Risaralda, Rio San Rafael, 2150 m, 4/i/1993, C. Sarmiento) some 200 km north of Anchicayá, corresponds well to Richards's description, but it is in a much more advanced stage of growth, with 91 cells, and the comb is roughly circular (ca. 3.3 × 3.0 cm). It was attached to a rock, some 20 cm from the ground.

#### Distribution

Central and Northwestern South America: Panamá; Venezuela; Colombia; Ecuador; Peru (Fig. 46).

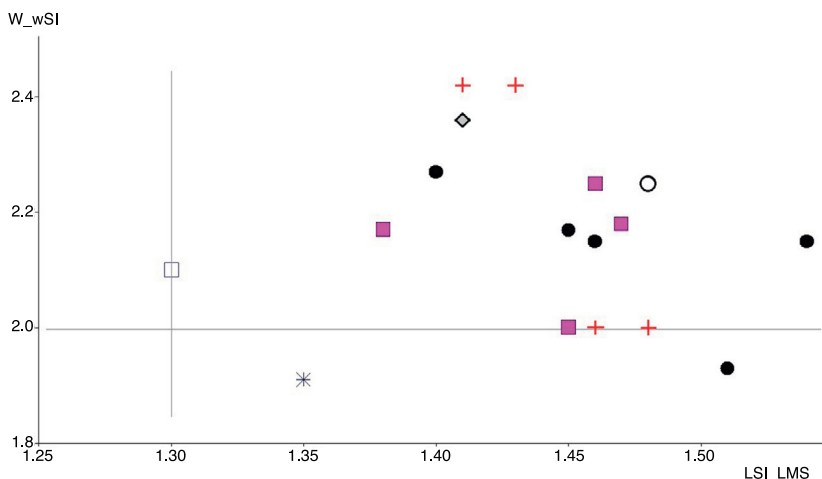
#### Remarks

Zikán (1949) apparently did not see types or identified specimens of *M. barbatus* (short key diagnoses were presented on pages 225 and 226, as parts of Richards's key for the "group of *flavitaris*" included there as supplement), and his new species *M. ecuadorensis* (only the holotype) and *M. peduncularius* (2 males and 1 female) seem to be just southern occurrences of *M. barbatus* in Ecuador and Peru.

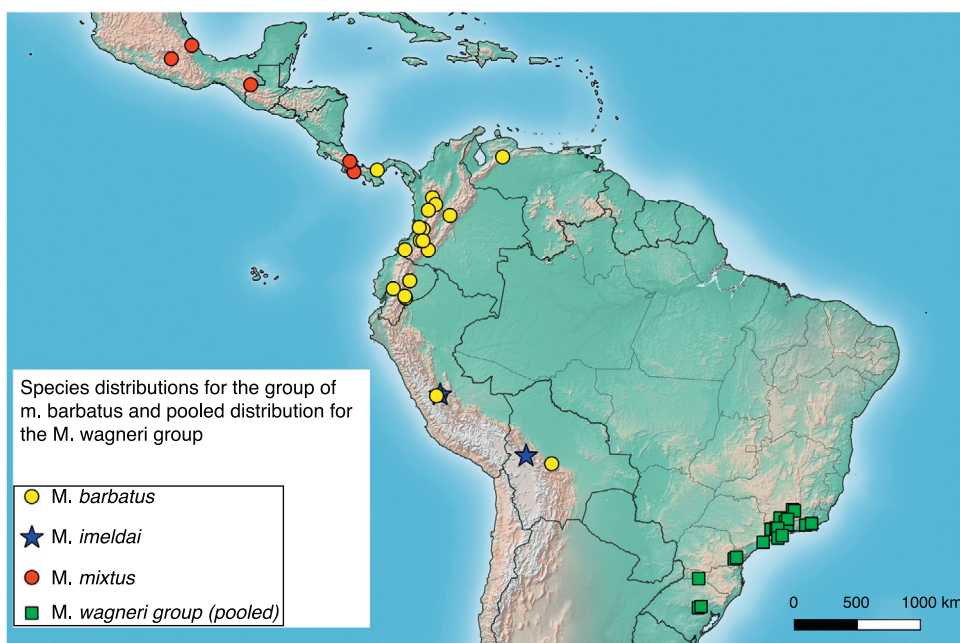
#### Examined material

Paratypes of *M. barbatus*: **Colombia**: Valle, Cordillera Occidental, 1 male (allotype), Tocota (not "Tocoto" as in Richards, 1978) [examined], 1 female, Aguacatal [examined] (MNHU), 1 female, Aguacatal [examined] (NHM); Paratypes of *M. peduncularius*: **Peru**: Vale Chanchamayo 800–1200 m, 1 male, 1 female (IOC) [examined].

Ordinary specimens. **Panama**: El Cope, Coclé, 1 female 2/ii/1990, R. Cambra (GBFM) **Colombia**: Antioquia, El Roble, 1 female 1/x/1996, Y. Vargas; San Antonio, Roble, 1 female 23/iv/1997, H. Moreno; Caldas, Aguadas, La Herencia 2170 m, 1 female 23/i/1996, C. Sarmiento (MPEG); Cauca, El Tambo "1200–900 m:ö. h.", 1 female, 1 male, 15/v/1936, Sneidern, K.j.v. (Bohart Museum-UCDC), Popayán, 1800 m, 1 male, nest 226, 4 females, nest 227, 10/x/1974,



**Fig. 45.** Scattergram of ratio variables for two species of the group of *M. barbatus*. X axis – LSI\_LMS (length of first metasomal segment over length of mesoscutum); Y axis – W\_wSI (apical width over basal width of first metasomal segment); black filled circles are *M. mixtus*; all other symbols are *M. barbatus*: gray asterisk (Panama); open circle (northwestern Venezuela); red crosses (northwestern Colombia); pink filled squares (southwestern Colombia); gray filled diamond (western Colombia, Pacific slope); open square (midwestern Colombia).



**Fig. 46.** Partial truncated map for Central and South America with species distributions for the *M. barbatus* group, and with the pooled distribution of the group of *M. wagneri* (see next figure for detailed representation of distributions of species of this group).

*M. Cooper (NHM)*; Huila, 1 male, Las Cuevas de Los Guacharos, *M. Cooper (NHM)*; Nariño, Barbaçoas, Cgto. Altaquer. Reserva Natural Privada Ñambi, 1200 m, 1 female, 1 male, 22/vii/1995, C. Sarmiento (MPEG); Risaralda, Parque Nacional Tatamá, Rio San Rafael, 1 female (with nest) 4/i/1993, C. Sarmiento (MPEG); Valle, Anchicayá, Hidroeléctrica bajo Anchicayá El Engano 260 m, 2 females 24/iii/1995, C. Sarmiento (MPEG), Anchicaya, 3 females, 15/i/1972, near Buenaventura, 1 female 13–14/i/1972, 1 female 16/i/1977, nest 173, *M. Cooper (NHM)*; **Venezuela**: Lara, 1 female, 1 male, Cubiro, 6/v/1981, Townes, H.K. (AEIC); **Peru**: Chanchamayo, San Ramon, 1400 m, 2 females, 26.vii.1970 (R. Garcia); **Ecuador**: Napo, 500 m, 2 females 15–18/xii/1971; Morona-Santiago, 1 female, Rio Upano east of Sucua 720 m, 31/viii/1981, *M. Cooper*; **Bolivia**: Cochabamba, 2 females, Palmar, 30 km NE Tiraque, 3–6.vi.1979, note 84, *M. Cooper (NHM)*.

#### *Mischocyttarus mixtus* Richards 1978

(Figs. 6; 9; 11; 13; 31; 32)

*Mischocyttarus mixtus* Richards 1978: 319, Holotype: female, Panama, Bugaba 800–1500 ft., Champion col. (NHM); [examined]. *Mischocyttarus mixtus*: Silveira (2008: 540).

#### Female

Length of fore wing 9–10 mm; clypeus wider than high, H/WCLP about 0.87 (min–max: 0.85–0.91), apex narrowly truncate, clypeus not so extensively in contact with eye, free upper part of lateral margin relatively long, more than 0.3 times the clypeus height at middle; malar space narrow; tentorial pit a little closer to eye margin than to antennal socket; distance between posterior ocelli distinctly larger than between one of these and the anterior median ocellus, in a proportion of ca 1.6; occiput rounded, carina absent;

gena distinctly narrower than the upper lobe of the eye; pronotum with lateral fovea, central part of the anterior margin of pronotum with the lamella wide and poorly raised not at all reflexed, region immediately behind produced into a secondary margin which is very low and obtuse, and does not even come close to projecting itself over the lamella; humeral angle poorly developed and not projecting laterally, total humeral width about equal that of mesoscutum, sides of the pronotum as seen from above distinctly converging; pronotal carina completely absent at center, and very low at sides scarcely having a translucent lamellar portion, mesoscutum slightly wider than long, L/WMS mean 0.97 (min–max: 0.95–1.00), lateral margin adjacent to tegula poorly demarcated, less prominent; fore wing relatively short (mean LSI/HMP 2.16; min–max: 2.03–2.26); basal inner (posterior side) margin of fore coxa raised but comparatively less reflexed; inner claw of hind tarsus with the apex definitely acute; propodeal dorsal cavity considerably deep and wide, more round than triangular in shape; propodeal valve variable moderately expanded in an uniform way so that it has a roughly round shape; first segment of metasoma well elongate, its length a little more than  $1.3 \times$  height of mesopleuron (LSI/HMP about 1.36, min–max: 1.31–1.41), distinctly slender but variably wide at apex, from  $1.93\text{--}2.27 \times$  wider than at base, spiracles moderate to strongly prominent.

Sculpture: head and mesosoma with moderately course sculpture; clypeus with minute dense punctation (diameter ca. 0.015 mm), with moderately shining interstices measuring about one puncture diameter, and also with shallow sparser larger punctures (diameter 0.030–0.037 mm), apical central area very finely reticulate, appearing almost smooth, shining, with a few interspersed large shallow punctures (diameter 0.037–0.44 mm); frons with a stronger pattern of slightly larger and deeper punctures (diameter 0.015–0.022 mm) separated by interstices of 0.5–1 puncture diameter; humeral area of pronotum with slightly larger punctures, diameter mostly 0.022 mm, rarely 0.030 mm; mesoscutum with quite similar pattern, slightly less dense; mesopleuron also with such a pattern of 0.022 mm punctures, but also presenting more or less regularly spaced sparser larger 0.030 mm punctures; propodeum presenting higher proportion of the larger punctures, the pattern being less dense than mesoscutum.

Vestiture: eyes bare; clypeus covered by fine appressed shining (silvery) pubescence, not so dense to the point of obscuring the pattern of micropunctures underneath; clypeus with sparser erect longer setae especially near apical margin (length ca. equal to one median ocellus diameter; *mod*), most of head at sides and behind and mesosoma covered by very long fine hairs, length on mesoscutum ca. 1.3 *mod*, on mesopleuron ca. 1.6 *mod*, on propodeum still longer, ca. 2.0 *mod*; hairs on metasomal sterna 2–6 not noticeably long and outstanding.

Color (see Figs. 31; 32): Black; mandible anteriorly and basally mostly yellow gradually turning to reddish brown at apex; antennal articles 9–12 yellowish to light reddish beneath; apical area of clypeus reddish yellow to light reddish brown (in north of Mexico specimens, the ventral half of clypeus and a dorsal spot are yellow, separated by a blackish area); inner orbits to about center of ocular sinus, genal stripe (outer orbit), yellow to reddish yellow, sometimes interrupted or blurred below; small mark on pronotum ventral corner (sometimes reddish, or entirely absent), tubercle (sometimes reddish, or entirely absent), carina (sometimes discontinuously), and hind margin of pronotum (sometimes indistinct or reddish), front margin of metanotum narrowly (sometimes absent), propodeal valves (sometimes dark), and paired propodeal posterior dorsal spots (sometimes only small dots, or fading reddish, or entirely absent), one dorsolateral stripe on mid coxa (sometimes just a dot, or absent), one outer dorsal stripe on hind coxae (sometimes absent), none inner stripe on hind coxa; small apical mark on all femora; distal lateral marks

on metasomal sternum 1 (sometimes absent), narrow distal bands on metasomal terga 1–2 (or –4, somewhat indistinctly, or without any tergal bands) and sterna 2 (or –4, somewhat indistinctly, or without any sternal bands), yellow; axillar spot and most of disc of scutellum light reddish brown; other red suffused areas on lateral (sometimes hind margin) of pronotum, mesepisternum and upper and lower metapleural plate; posterior margin of meso and metasternum extending laterally to border of coxal articulation (sometimes indistinct), anterior ventral face of fore and mid coxae (hind coxae only distally very narrowly), and all trochanters, elongate marks on anterior face of all femora (interrupted on fore femur) and tibiae, light reddish brown to yellowish brown; hind tibia with distal pad concolorous with adjacent area; all tarsi dark brown to black, paler below; tegula brown; wings hyaline, venation brown.

#### Male

Unknown

#### Variation

There is relatively small variation in size and color, especially regarding specimens from the north of Mexico which are a little larger and darker.

#### Nest

Unknown

#### Distribution

Mexico and Central America: Costa Rica; Panamá (Fig. 46)

#### Remarks

Richards (1978) described *M. mixtus* based only on the holotype female from Panamá, and apparently did not see any further specimens (e.g. O. W. Richards, unpublished manuscript prepared as a supplement to his 1978 book). Thus, all the material cited here is new, and the range of the species is greatly expanded northward up to Puebla and Vera Cruz states, in Mexico. Two northernmost Mexican specimens are a little larger and darker, otherwise matching every character of this species, including the typical reddish-brown scutellum. Unfortunately, the male and nest remain unknown.

Examined material: **México**: Chiapas, 1 female, Lagunas de Montebello, 20/iv/1993, Ayala, R. & Noguera, F.A. (Chamela); Puebla, 1 female, Huehuetlan, Clemente, M.; Vera Cruz, 1 female, Xalapa, Clemente, M. (MPEG); **Costa Rica**: Puntarenas, 2 females, P.N. Amistad, Est. Las Melizas, Fca. Cafrosa, 1300 m, iv/1989, Ramirez, M. & Mora, G. (INBIO).

*Mischocyttarus imeldai* Zikán 1949

(Figs. 33; 34; 37; 38; 40; 41)

*Mischocyttarus imeldai* Zikán 1949: 152, figs. 235, 295. Holotype: female, Peru, Valle Chanchamayo, 1,400 m, 1/x/1939, W. Weyrauch (IOC).

*Mischocyttarus imeldai*: Richards (1978: 333); Silveira (2008: 541).

#### Female

Length of fore wing 9.5 mm; clypeus a little wider than high, H/WCLP about 0.94, apex very narrowly truncate (more rounded in the Bolivian specimen), not so extensively in contact with eye, free upper part of lateral margin relatively long, more than 0.3 times the clypeus height at middle; malar space not so narrow; tentorial



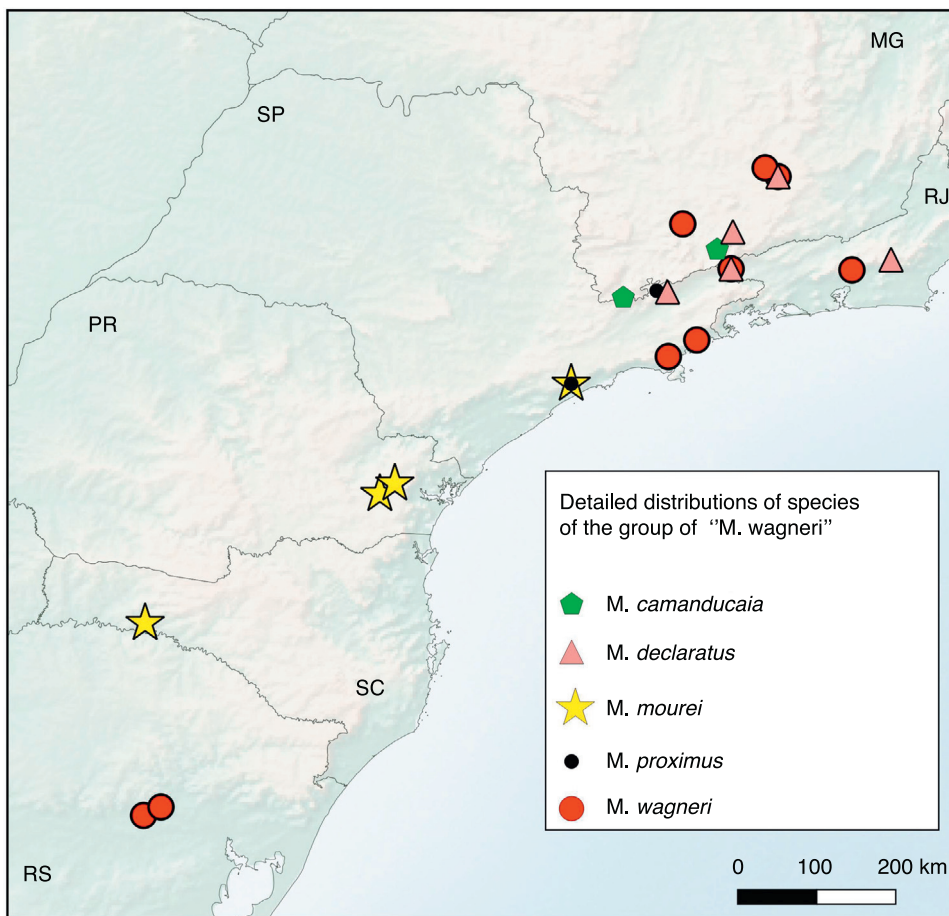


Fig. 47. Map detail of southeastern South America (with partial view of some Brazilian states) with species distributions for the *M. wagneri* group. MG: Minas Gerais, RJ: Rio de Janeiro, SP: São Paulo, PR: Paraná, SC: Santa Catarina, RS: Rio Grande do Sul.

pit distinctly closer to eye margin than to antennal socket, the first distance only about 60% of the second; ocelli nearly as in an equilateral triangle, posterior ocelli only slightly more spaced; occiput rounded, carina absent; gena distinctly narrower than the upper lobe of the eye; pronotum with lateral fovea, central part of the anterior margin of pronotum with the lamella not so wide and poorly raised, not at all reflexed, region immediately behind produced into a secondary margin which is fairly acute but does not strongly project itself over the lamella; humeral angle poorly developed and not strongly projecting laterally, total humeral width about equal that of mesoscutum, sides of the pronotum as seen from above distinctly converging; pronotal carina absent at center, and very low at sides having a narrow translucent lamellar portion, mesoscutum about as wide as long, lateral margin adjacent to tegula poorly developed; fore wing relatively well elongate LDIS/HMP ca. 2.3; basal inner (posterior side) margin of fore coxa raised but less reflexed; inner claw of hind tarsus with the apex pointed but not definitely acute; propodeal dorsal cavity considerably deep and wide, developed along ca. two-thirds of length of dorsal face at middle; propodeal valve well developed on top and bottom, uniformly expanded, but rather angular below; first segment of metasoma well elongate, its length more than  $1.3 \times$  height of mesopleuron (LSI/HMP about 1.4 or slightly more), and distinctly slender, only about  $1.86\text{--}2.00 \times$  wider at apex than at base, spiracles not strongly prominent.

Sculpture: (following Richards, 1978) "surface of clypeus slightly shining, very finely punctured with scattered larger ones, pubescence longer and more outstanding on upper part; propodeum with more punctate sculpture".

Vestiture: (following Richards, 1978) "clypeus covered with rather dense silvery pubescence; most of head at sides and behind, and mesosoma covered by very long fine hairs, especially long on dorsum of propodeum".

Color (see Figs. 33; 34; 37; 38): Black; most of mandible anteriorly yellow, gradually turning to reddish at apex; antennal articles 9–12 yellowish to light reddish beneath; antennal scape (including radicle) beneath, reddish yellow; clypeus largely (except for large discal area and, sometimes, a narrow area adjacent to upper lateral margin), sometimes diffuse marks on supra-clypeal area, narrow streak adjacent to dorsal margin of antennal socket, malar space and inner orbits to top of ocular sinus, genal stripe (outer orbit), sometimes (nearly continuous to orbital mark) two paired very small dots on vertex by the inner side of eye upper lobe, small mark on pronotum ventral corner, tubercle, carina, and hind margin of pronotum, axillar mark, anterior transversal stripe and side plates of scutellum, anterior transversal stripe and side areas of metanotum, propodeal valves, and paired propodeal posterior dorsal spots (sometimes reduced), one dorsolateral stripe on mid coxa, two dorsal stripes on hind coxae; apical mark on all femora; distal bands on metasomal terga 1–3 (–4, somewhat indistinctly), and sterna 2–3 (–4, somewhat indistinctly), yellow (somewhat reddish hue); reddish suffused areas on lateral of pronotum, mesepisternum and upper and lower metapleural plate, and disc of metasomal tergum 2; base of mid and hind femora with a reddish anterior spot; elongate mark on anterior face of hind tibiae, reddish brown; first article of all tarsi light reddish brown, remaining articles black; tegula light brown; wings hyaline, venation brown.

Male (see Figs. 40; 41) (largely following Richards, 1978)

“Length of fore wing 8.5 mm; clypeus wider than long, apex shaped as an obtuse angle, clypeus with dense silvery hairs; antennal apex just rolled, hook like, article 13 elongate 3.22× longer than wide.

Color: Black; antennal articles 8–13 yellowish brown beneath; mandibles except large proximal triangular area, clypeus and face to just above antennal sockets, inner orbits to top of ocular sinus, malar space and genal stripe (outer orbit), pronotum laterally with a spot around fovea, carina and hind margin, axillae and anterior transversal stripes on scutellum and metanotum, propodeum valves and elongate paired posterior spots, anterior ventral face of fore and mid coxae, dorsolateral stripe on mid coxa and two stripes on hind coxa, apical mark on all femora, posterior bands on gastral terga 1–2, yellow; sides of pronotum, two large spots on mesopleuron, lower metapleural plate, suffusion on all tibiae, reddish brown; tegula brown; wings hyaline, venation brown.

#### Variation

Besides the male specimen in the NHM, from the same series of the holotype from Peru (Chanchamayo), but only much later described by Richards (1978), there is only one additional more recently collected female specimen from Bolivia (also in NHM) (Figs. 34; 38). Richards identified this specimen as *M. imeldai* (1982; unpublished manuscript, pg. 57), but the collection identification label actually says “*Mischocyttarus* sp. near *imeldai*”. It is a little larger (wing length 10 mm) and agrees with the holotype female in most characters, except for a somewhat trivial difference in the length of the first metasomal tergum (relatively shorter), and for a small difference in the shape of the apex of the clypeus which seems narrower (compare Figs. 37 and 38).

#### Nest

Unknown

#### Distribution

Peru and Bolivia (Fig. 46)

#### Remarks

*M. imeldai* matches the other two species regarding the main characters defining this group, but it is otherwise intermediate with respect to the *M. tarmensis* group in some aspects of the shape of the pronotum, and reduction of the lateral margin of the mesoscutum (see below).

Examined material: **Peru:** Valle Chanchamayo, 1 male, W. Weyrauch (NHM); **Bolivia:** La Paz, Chulumani, 1700 m, 1 female, 25/iii/1979, M. Cooper (NHM).

#### Concluding remarks

The new data presented for the two species-groups studied here reaffirm them as assemblages of species from the Central and South American highlands (see Fig. 46). In the case of the *M. barbatus* group, most records are from localities above 500 m, and the highest

in Colombia reach a little more than 2000 m. For the *M. wagneri* group, all records are from southeastern South America (in Brazil), at localities on the “Serra do Mar” formation and other associated mountain ranges located further inland.

As explained in Silveira (2008), no support was found in that work for the monophyly of several of the species-groups in *Mischocyttarus* (especially in *Phi*), but such informal groups would be useful provisory working units in a very large genus like *Mischocyttarus*, with respect to solving small scale taxonomic problems (related to species identity) and in making easier the systematization of detailed information on the variation of characters. In the present study, no new morphological characters were found that could be envisioned as synapomorphies supporting the monophyly of both groups of *M. wagneri* and *M. barbatus*. Actually, in the case of the latter group, the inclusion of *M. imeldai* makes it more heterogeneous, since this species seems to be intermediate in respect of the group of *M. tarmensis*. Silveira (2008) followed Richards (1978) in assigning *M. imeldai* to the *M. wagneri* group. However, contrary to the views of the first author, in *M. imeldai* the secondary margin of the pronotum does not strongly projects medially over the anterior lamella as in the *M. wagneri* group, but is a much lower border just behind the lamella, as in *M. barbatus*. It also shares with *M. barbatus* and *M. mixtus* a condition of the basal inner margin of the fore coxa that is intermediate (see Fig. 11; also fig. 49 in Silveira, 2008) between the primitive state in the genus *Mischocyttarus* (very low and not reflexed; see fig. 48 in Silveira, 2008) and the state commonly found in most subgenera and species-groups including the *M. wagneri* group (margin high and strongly reflexed; Fig. 12; also fig. 50 in Silveira, 2008). However, in *M. imeldai* the anterior face of the pronotum is a little more vertical, and the carina is a little more raised than in *M. barbatus* and *M. mixtus*. The lateral margin of the mesoscutum adjacent to the tegula also seems less developed in *M. imeldai* than in the other two species, a condition more like that in *M. tarmensis* Richards 1945 and *M. commixtus* Richards 1945. In contrast, the group of *M. wagneri* looks much more homogeneous, and the similarities regarding the irregular aspect of the nest comb seem remarkable in these species (see Figs. 16; 17).

Table 1 summarizes current ideas on the composition of *Phi* species-groups ten years after Silveira (2008), based on long-term studies of material of several important collections (INBIO; IOC; NHM; UNC; ZMB). Taking as reference the work of Richards (1978), several names were created (and several synonymized as well) in the groups of *M. alfenii*, and *M. paraguayensis* (Silveira, 2013), and several new synonymies are also being proposed in the present paper for both groups of *M. barbatus* and *M. wagneri* (with *M. camanducaia* as the only new species), so that the number of species is now 63 for the subgenus *Phi* (75 was the number presented in Silveira, 2008). In Table 1, the *Phi* species-groups are numbered (1–8), and these numbers eventually reappear (in parentheses after a species name) to indicate the group (in Richards, 1978) from which a species was transferred to its present one. In many cases, changes resulted from a different interpretation on the importance of a few characters, like the shape of the anterior margin of the pronotum, the length of the first metasomal segment, and the shape of the male antenna.

**Table 1**  
Composition of the species-groups of subgenus *Phi* of *Mischocyttarus*, numbers in parentheses after the author of a species name indicate the group (in Richards, 1978) from which a species was transferred to its present one.

1 – <i>alfkenii</i>	2 – <i>paraguayensis</i>	3 – <i>mexicanus-angulatus</i>	4 – <i>cassununga</i>
<i>alfkenii</i> (Ducke 1904) <i>flavicornis</i> Zikán 1935	<i>bahiae</i> Richards 1945 <i>catharinaensis</i> Zikán 1949	<i>angulatus</i> Richards 1945 (8) <i>ang. colombianus</i> Richards 1945 (8) <i>ang. ictericus</i> Richards 1945 (8) <i>costaricensis</i> Richards 1945 (8) <i>cubensis</i> (Saussure 1854) (8) <i>mexicanus</i> (Saussure 1854) (8) <i>mexican. cubicola</i> Richards 1978 (8) <i>phthisicus</i> (F. 1793) (8) <i>petiolatus</i> Richards 1978 (5) <i>transandinus</i> Richards 1978 (5)	<i>cassununga</i> (Ihering 1903) <i>cearensis</i> Richards 1945 <i>consimilis</i> Zikán 1949 (2) <i>crypticus</i> Zikán 1949 <i>cryptobius</i> Zikán 1935 <i>extinctus</i> Zikán 1935 <i>haywardi</i> Willink 1954 <i>mimicus</i> Zikán 1935 <i>lilae</i> Willink 1954 (2) <i>lules</i> Willink 1954 (2)
<i>basimacula</i> (Cameron 1906) <i>achagua</i> Silveira 2013 <i>arawak</i> Silveira 2013 <i>awa</i> Silveira 2013 <i>baconi</i> Starr 2011 <i>embera</i> Silveira 2013 <i>muisca</i> Silveira 2013 <i>trinitatis</i> Richards 1945 <i>uniformis</i> Silveira 2013 <i>waunan</i> Silveira 2013	<i>flavoniger</i> Zikán 1949 <i>paraguayensis</i> Zikán 1935 <i>suzanna</i> Silveira 2013 <i>tayacaja</i> Silveira 2013		
5 – <i>wagneri</i>	6 – <i>barbatus</i>	7 – <i>tarmensis</i>	8 – <i>flavitaris</i>
<i>camanducaia</i> sp. nov. <i>declaratus</i> Zikán 1935 (2) <i>mourei</i> Zikán 1949 (2) <i>proximus</i> Zikán 1949 <i>wagneri</i> (Buysson 1908)	<i>barbatus</i> Richards 1945 <i>imeldai</i> Zikán 1949 (5) <i>mixtus</i> Richards 1978	<i>tarmensis</i> Richards 1945 (8) <i>commixtus</i> Richards 1945 (8) (= <i>spadiceus</i> Zikán 1949) <i>rufomaculatus</i> Richards 1945 (8)	<i>barbatulus</i> Richards 1978 <i>bruneri</i> Bequaert & Salt 1931 <i>campestris</i> Raw 1985 <i>chapadae</i> (Fox 1898) <i>duidensis</i> Richards 1945 <i>fisheri</i> Snelling 1970 <i>flavitaris</i> (Saussure 1854) <i>hirsutus</i> Richards 1945 <i>hirtulus</i> Zikán 1949 <i>inca</i> Zikán 1949 <i>marginatus</i> (Fox 1898) <i>oreophilus</i> Zikán 1949 <i>pallidipectus</i> (Smith 1857) <i>rufipes</i> Zikán 1949

## Conflicts of interest

The author declares no conflicts of interest.

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