



## Two new species and taxonomic notes on the Neotropical spiny orb-weaving spiders *Micrathena* and *Chaetacis* (Araneae: Araneidae), with remarks on the development of *Micrathena excavata*

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### Abstract

In this paper, *M. yanomami* n. sp., from Brazilian Amazonia, *Chaetacis bandeirante* n. sp., from Central Brazil, and the males of *M. gaujoni* Simon, 1897 and *M. ruschii* (Mello-Leitão, 1945) n. comb., respectively from Ecuador and Brazil, are described and illustrated for the first time. An ontogenetic series of the last development stages of both sexes of *Micrathena excavata* (C. L. Koch, 1836) is illustrated and briefly described. Adult females are larger and have longer legs and larger abdomens than adult males. Probably females undergo at least one additional moult before adulthood, compared to males. *Micrathena ornata* Mello-Leitão, 1932 is considered a junior synonym of *M. plana* (C. L. Koch, 1836), and *M. mastonota* Mello-Leitão 1940 is synonymized with *M. horrida* (Taczanowski, 1873). *Acrosoma ruschii* Mello-Leitão, 1945 is revalidated, transferred to *Micrathena* and considered a senior synonym of *M. cicuta* Gonzaga & Santos, 2004. *Chaetacis necopinata* (Chickering, 1960) is recorded for Brazil for the first time. *Chaetacis incisa* (Walckenaer, 1841) is considered a *nomen dubium*.

**Key words:** taxonomy, Brazil, ontogenetic series, sexual dimorphism, abdominal spines

### Introduction

The spiny orb-weaving spider genera *Chaetacis* Simon, 1895 and *Micrathena* Sundevall, 1833, currently with 10 and 105 species respectively (Platnick 2011), are predominantly Neotropical, with only three species of the latter occurring as far as the northeastern United States (Levi 1985), and considered to be sister taxa (Scharff & Coddington 1997). *Micrathena* includes some of the most common and well-studied New World orb-weavers, with special reference to *M. gracilis* (Walckenaer), which has been used as a model for physiological (Bukowski & Christenson 1997a), natural history (Bukowski & Christenson 1997b), behavioral (Uetz & Hartssock 1987) and ecological (Vanderhoff *et al.* 2008) studies, among others. Both genera are usually found in forests and woodlands and are well-known for the presence of abdominal spines in females and their often bright, eye-catching coloration (Levi 1985).

As most American araneid genera, *Micrathena* and *Chaetacis* have been subject of an exhaustive revisionary work by Levi (1985). Since then, the taxonomy of *Chaetacis* has remained untouched, while that of *Micrathena* has received attention sporadically, with papers such as the description of males of three species previously known only from females (Bonaldo 1990; Lise 1995; Nogueira & Brescovit in press), a new synonymy at the genus level (Scharff 1991) and a new synonymy at the species level and the description of a single new species (Gonzaga & Santos 2004).

*Micrathena* and *Chaetacis* are also well-known for the marked differences between males and females in body size and in general morphology, and both genera have been included in studies about the evolution of sexual dimorphism (see Elgar *et al.* 1990; Hormiga *et al.* 2000). Levi (1985: 444) stated that “it would be instructive to raise young [*Micrathena*] from different species groups from egg-sacs” to understand how males differentiate from females over the course of several instars. Despite that, little has been done on describing ontogenetic series of *Micrathena* species; hence, in this paper we illustrate and describe part of the ontogenetic series of *M. excavata* (C. L. Koch, 1836) to try to improve the knowledge of the basic biology of these organisms.

Recently, searching for specimens for a phylogenetic analysis of the two genera (Magalhães & Santos in prep.), we came across some undescribed material, including the previously unknown male of *M. gaujoni* Simon, 1897 and new species of *Micrathena* and *Chaetacis*. Additionally, a recent checklist of the type material deposited in Museu Nacional do Rio de Janeiro (Moreira–Silva *et al.* 2010) reported that some supposedly lost types of species of *Micrathena* described by Mello-Leitão have been found and became available for examination; thus, *M. mastonota* Mello-Leitão, 1940 and *Acrosoma ruschii* Mello-Leitão, 1945, which could not be determined by Levi (1985) and remained, respectively, as a doubtful species and a doubtful synonymy of *M. triangularis* (C. L. Koch, 1836), could be correctly identified.

## Material and methods

All specimens were examined completely immersed in 75% ethanol. For examination of internal structures of the genitalia, female *Chaetacis* were dissected with entomological pins and their genitalia were cleaned in a pancreatin solution, as described in Álvarez–Padilla & Hormiga (2008), and examined immersed in 75% ethanol. Drawings were made on a Motic K400 stereoscopic microscope equipped with a *camera lucida*, or based on series of photographs taken using a Leica M205C stereoscopic microscope equipped with a digital camera and mounted as a single, multifocal image with the software Leica Application Suite. Material for scanning electron microscopy was cleaned in a pancreatin solution, dried at room temperature, sputter coated with 10nm of gold and photographed in a Quanta 2000 scanning electron microscope at Centro de Microscopia da UFMG. The format of the species descriptions follows that of Levi (1985) with the following modifications: femora from all left legs have been measured and patella and tibia lengths were given separately, instead of joined together. For the *M. excavata* ontogenetic series, the following measurements were taken from each of the specimens: carapace length, carapace width, abdomen length, abdomen width, and length of the femora and tibia of all left legs. All measurements are expressed in millimeters and were taken preferentially on the left side of the specimens. Specimen lots without geographic coordinates data were georeferenced using Google Earth© or the geoLoc tool of speciesLink (<http://smlink.cria.org.br/geoloc>) based on the nearest city. Coordinates taken using those programs are indicated between brackets rather than in parentheses. Collecting altitude is indicated as meters above sea level.

Specimens of *Micrathena excavata* were preliminarily separated by instar based on the length of the carapace. Sexing of the individuals was done based on the degree of development of the pedipalps. To test instar limits, a Principal Components Analysis (PCA) was performed using PAST ver. 2.04 (Hammer *et al.* 2001) based on the measurements taken.

Examined specimens were borrowed from or deposited in the following arachnological collections (abbreviations and curators in parenthesis): Coleções Taxonômicas da Universidade Federal de Minas Gerais, Belo Horizonte (UFMG; A. J. Santos); Instituto Butantan, São Paulo (IBSP; I. Knysak); Instituto Nacional de Pesquisas da Amazônia, Manaus (INPA; A. L. Henriques); Museu Nacional do Rio de Janeiro, Rio de Janeiro (MNRJ; A. B. Kury); Museu Paraense Emílio Goeldi, Belém (MPEG; A. B. Bonaldo); Museu de Zoologia da Universidade de São Paulo, São Paulo (MZSP; R. Pinto da Rocha), all in Brazil; and Muséum National d'Histoire Naturelle, Paris, France (MNHN; Christine Rollard).

## Results and discussion

**Development.** Three instars were identified for male (Figs. 1–3) and four instars for female *M. excavata* (Figs. 4–7). This suggests that females undergo at least one more moult than do males and is reflected in the fact that adult females are larger than adult males in respect to most measurements taken. The smallest, youngest instars (here referred to as postjuveniles) analysed certainly do not represent the earliest stages of *M. excavata* development, which should correspond to the prelarva and larva stages mentioned by Foelix (2011). As postjuvenile, males (Fig. 1) and females (Fig. 4) are only distinguishable by the male palps, which are slightly incrassated. Such incrassation of the male palps prior to the penultimate instar had already been observed by Bartos (1997) for *Pholcus phalangoides* (Fuesslin). In this stage, both sexes have only an anterior pair of spines in the abdomen, but no strong macrosetae in tibia I or II, nor a sclerotized ring around spinnerets. On the subadult stage, males (Fig. 2) have swollen, rounded palps, but with no evidence of sclerites; the anterior spines are still present, but there is no sign of a stron-

ger spinulation of the legs. Females (Fig. 5) start developing lateral and posterior spines on this instar, but they start as indistinct outgrowths of the abdomen cuticle. On the next instar, males are fully mature (adult stage; Fig. 3), with completely developed palps, tibia I and II armed with rows of strong macrosetae and a spineless abdomen. Females, however, are still not mature (subadult stage II; Fig. 6), with only an indistinct bulge next to the genital groove; nevertheless, the abdominal spines are fully developed by then, having the same conformation as in adult females. Also, the sclerotized ring around the spinnerets begins to form as three separate plates, one posterior and two lateral to the spinnerets area. This is consistent with observations of Scharff & Coddington (1997), who ordered their character for spinneret sclerotized ring based on a similar observation for *Gasteracantha* from Africa (see references therein). On the next instar (adult stage; Fig. 7), females are mature, with fully formed epigyna and spinneret rings. In addition to the mentioned differences, adult males of *M. excavata* differ from females by the abdomen with less dorsal sclerotized apodemes, by the shorter legs (relative to carapace length), by the coloration with two dark lateral bands on the carapace and on the dorsum of the abdomen, and by having much narrower abdomens, even in relation to juvenile males and females.

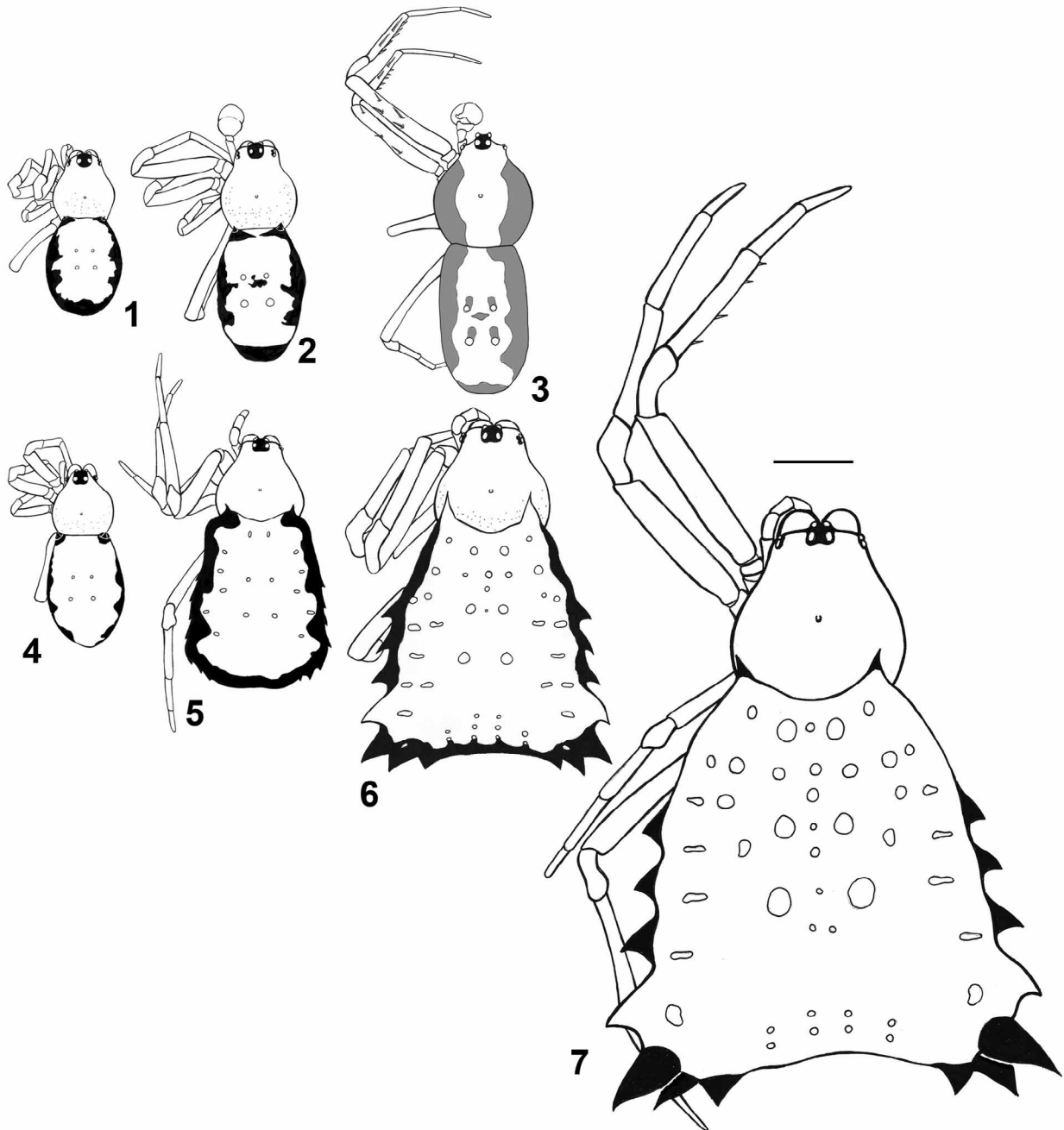
The PCA of *M. excavata* ontogenetic series (Fig. 8) grouped individuals by instar and sex, except for the postjuvenile stage, in which males and females are undistinguishable (Figs. 1, 4). The first three components accounted for 98.12%, 1.49% and 0.21% of the variance, respectively. Abdomen length and width and fourth femur length had the highest loadings for Principal Component 1. Although for most instars there were insufficient individuals for estimation of 95% confidence intervals, it is possible to notice that, although males and females are virtually undistinguishable in the first two instars analysed, later instars differ markedly between the sexes. It is also noticeable that adult males are more akin to juvenile specimens than adult females.

The fact that females are larger than males in *M. excavata* was expected, since this appears to be the rule for orb-weaver spiders in general and araneid spiders in particular (Elgar *et al.* 1990). It is noticeable that females seem to undergo one more moult than males. There is evidence for both insects (Esperk *et al.* 2007) and spiders (Levy 1970; Head 1995; Vollrath & Parker 1997; Legrand & Morse 2000; Foelix 2011) that sexual size dimorphism (SSD) is frequently achieved through different maturation times, reflected in the number of instars, for each sex (but see Lång 2001 for a case in which male-biased SSD in the linyphiid spider *Linyphia triangularis* (Clerck) is achieved through higher growth rates in males).

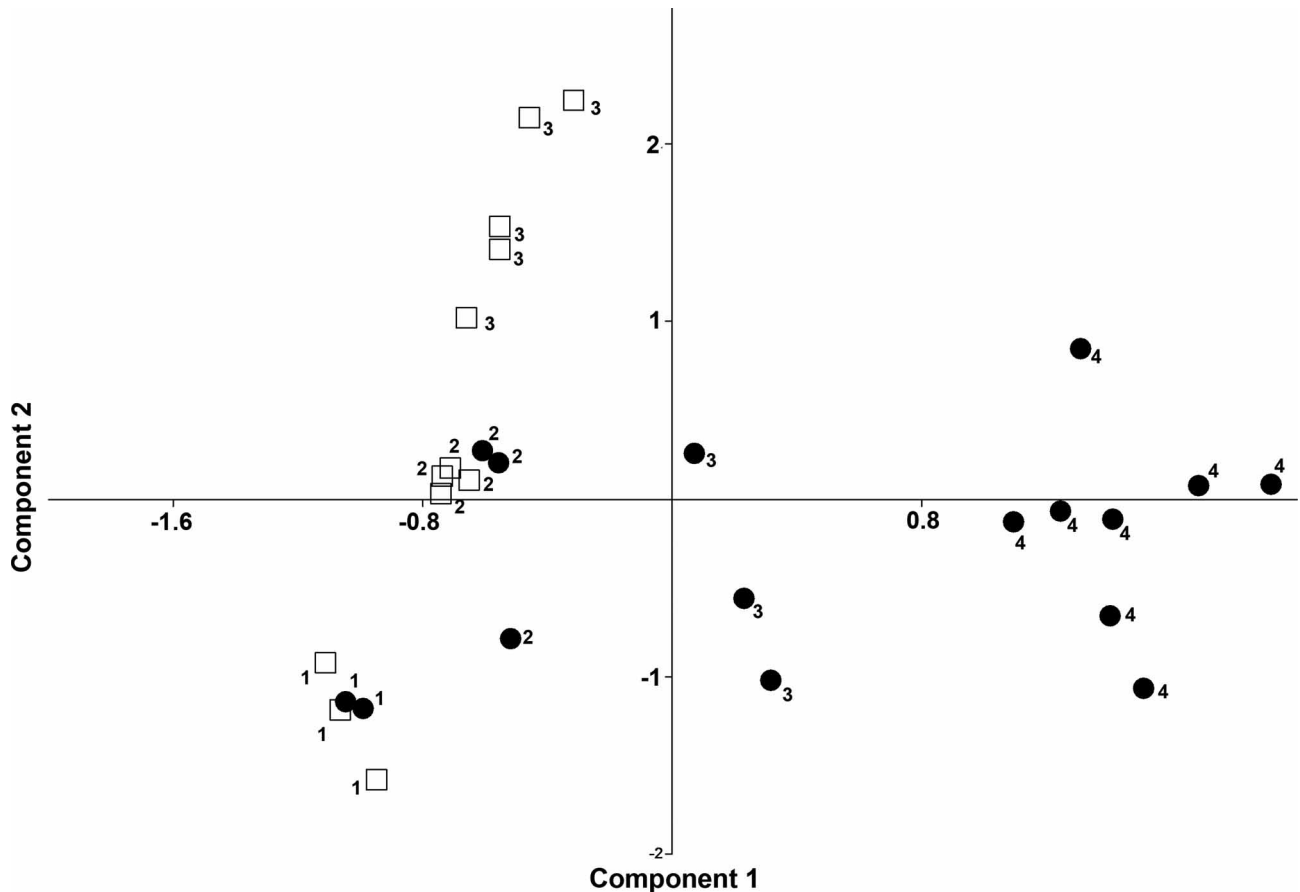
The smaller femur (or tibia) length/carapace length ratio in male *M. excavata* was expected, since it had already been observed by Elgar *et al.* (1990) that male *Micrathena* have relatively shorter legs than do females. The differences in male and female abdomen size are very marked and probably related to the lifestyles that the different sexes have as adults: while adult males do not feed (hence, to our best knowledge, are never collected in their own capture webs) and devote most of its mature existence to searching and courting females, the latter have to eat in order to deal with the costs of producing a large clutch of eggs. Hence, in araneoid spiders females often have larger abdomens than do males, and larger abdomens are frequently associated with higher fecundity (Prenter *et al.* 1995, 1999; Lång 2001; Higgins 2002). In *Metellina segmentata* (Clerck) (Tetragnathidae) (Prenter *et al.* 1995) and in *L. triangularis* (Linyphiidae) (Lång 2001), females have larger abdomens than males, despite being smaller in respect to other characteristics such as carapace width and leg length.

More enigmatic is the absence of abdominal spines, so characteristic of female and juvenile *Micrathena* and *Chaetacis*, in adult males. The fact that males develop one pair of spines and then lose it by the time of maturation is by no means exclusive of *M. excavata*. In several other *Micrathena* species for which juveniles were available for examination (namely *M. acuta* (Walckenaer), *M. fissispina* (C. L. Koch), *M. flaveola* (Perty), *M. triserrata* F.O.P.-Cambridge, *M. vigorsi* (Perty) and *C. aureola* C. L. Koch), juvenile males have spines in the same number and pattern as adult females, which are lost only by the last moult (I.L.F. Magalhães, pers. obs.). The only species in which adult males have spines like those of females are *M. swainsoni* (Perty), which is also one among the less dimorphic in respect to size, and some *Chaetacis* species such as *C. necopinata* (Chickering), *C. cornuta* (Taczanowski) and *C. bandeirante* **new species** (I.L.F. Magalhães, pers. obs.). Perhaps the function of the spines, if there is any, is only of use for the sedentary females and juveniles, which hang onto their orb-webs; perhaps these spines are a burden for the roaming males to carry while in the search for females, and natural selection favored spineless males which had less extra weight to carry. These questions can only be answered by means of carefully designed experiments to determine the costs and benefits of spines for both males and females. Some *Chaetacis* species could be useful models, since in some species males have spines while in others they do not. *Micrathena* and *Chaetacis* should certainly receive more attention in the future in studies concerning sexual dimorphism.

**Material examined.** *Micrathena excavata*. BOLIVIA. Espíritu Santo, 3♀ (MNHN 15701). BRAZIL. **Minas Gerais.** Belo Horizonte, Estação Ecológica da UFMG (19°58'S 43'58"W), I.L.F. Magalhães coll., 24/IV/2009, 1♀ (UFMG 990); ditto, B.T. Faleiro coll., 11/IX/2009, 1♀ (UFMG 3349); Cataguases, Estação Ecológica Água Limpa (21°22'22"S 42°42'53"W), V.B. Rodrigues & D.C. Cavalari coll., IV/2010, 1♀ 7 juveniles (UFMG 4131); ditto, V/2010, 1♀ 8 juveniles (UFMG 4132); Marliéria, Parque Estadual do Rio Doce (19°48'S 42°38'W), Equipe Biota coll., 1–10/IX/2003, 2♂ (IBSP 94952). **Pará.** Melgaço, Estação Científica Ferreira Penna [1°48'S 50°43'W], A.B. Bonaldo, 25/III/2002, 1♂ 1♀ (MPEG 2774); Novo Progresso, Serra do Cachimbo (9°16'49'S 54°56'32"W), D.D. Guimarães coll., 15/IX/2003, 1♂ (MPEG 4151). **Santa Catarina.** Paulo Lopes, Parque Estadual da Serra do Tabuleiro (27°77'S 48°63'), Equipe Biota coll., 10–20/II/2002, 1♂ (IBSP 96551).



**FIGURES 1–7.** *Micrathena excavata* (C.L. Koch, 1836), ontogenetic series. 1–3, male: 1, postjuvenile; 2, subadult; 3, adult; 4–7, female: 4, postjuvenile; 5, subadult I; 6, subadult II; 7, adult. All figures drawn to scale. Scale bar: 1mm.



**FIGURE 8.** First two components of a PCA of the measurements taken from *Micrathena excavata* individuals in different developmental stages. Males are represented by open squares and females by closed circles. The number close to each symbol indicates the instar. 1=postjuveniles, 2=subadults, 3=adults (males), subadults II (females), 4=adults (females).

## Taxonomy

### Family Araneidae Clerck, 1757

### Subfamily Micratheninae Simon, 1895 (*sensu* Scharff & Coddington, 1997)

### Genus *Micrathena* Sundevall, 1833

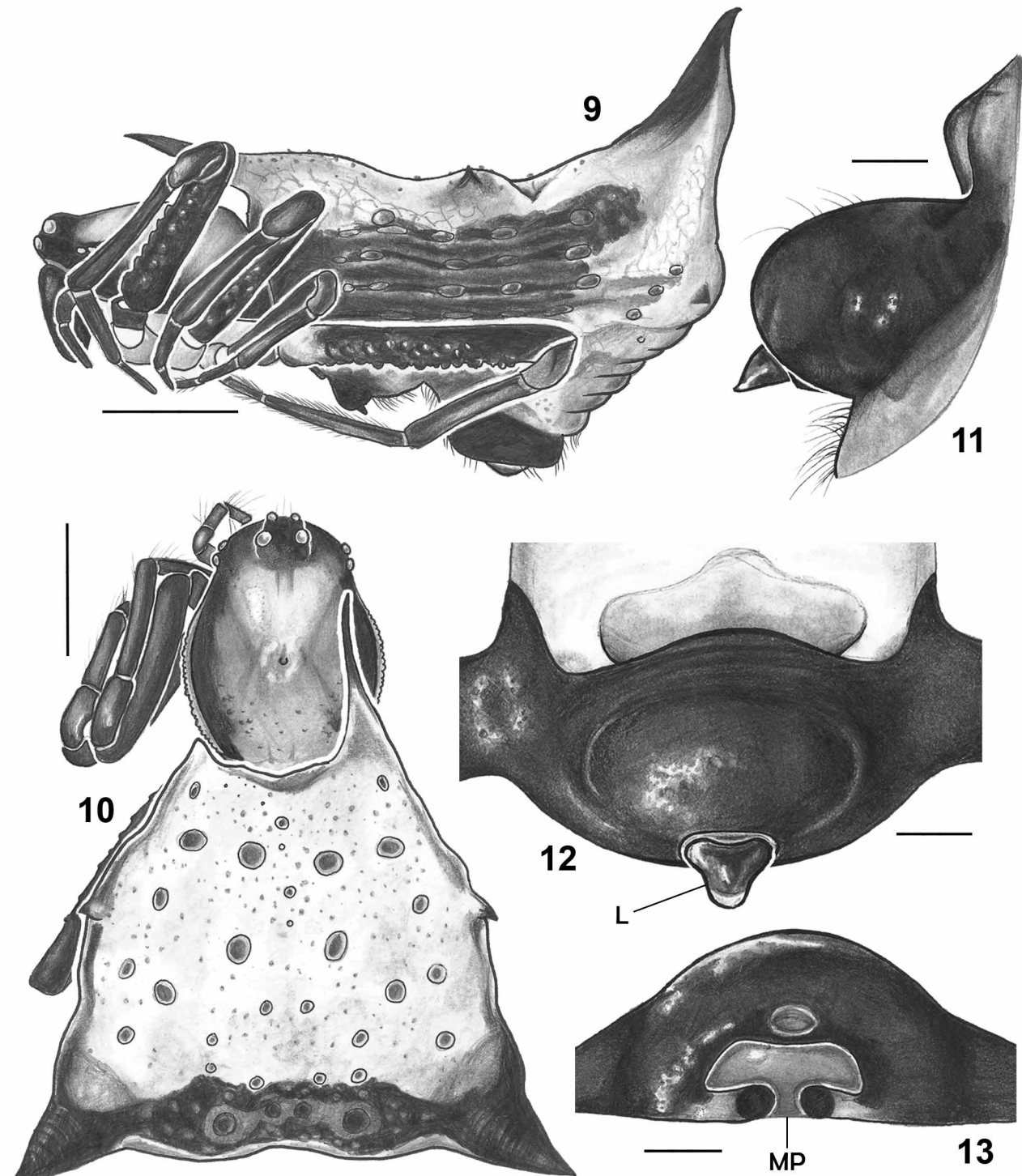
#### *Micrathena yanomami* new species

Figures 9–13, 41

**Type material.** Holotype female and paratype female, both from Bebedouro Novo, Parque Nacional do Pico da Neblina, São Gabriel da Cachoeira, Amazonas, Brazil (00°44'53.88"N, 65°58'31.80"W, 860 m), A.A. Nogueira coll., deposited in INPA 6286 and INPA 6287, respectively.

**Etymology.** The specific name honors the Yanomami, a group of native American people whose territory includes the Pico da Neblina, the type locality.

**Diagnosis.** *Micrathena yanomami* females differ from the other species of the *triangularispinosa* group by the coloration pattern of the carapace, with a black band along its entire edge, by the granulation in the carapace edges and by the setal bases of the femora, which are more projected and domed (Figs. 9, 10). The epigynum is similar to that of *M. triangularispinosa* (De Geer) (Levi 1985: figs. 474–476) but differs by the more robust lobe, which is also more detached from the bulge (Fig. 11, 12), and by the median plate of the epigynum in posterior view, which is wider than long and has a mushroom-shaped clear area embracing two dark spots (Fig. 13).



**FIGURES 9–13.** *Micrathena yanomami* new species, female holotype. 9–10, habitus: 9, lateral view; 10, dorsal view. 11–13, epigynum: 11, lateral view; 12, ventral view; 13, posterior view. Abbreviations: L=lobe, MP=posterior median plate. Scale bars: 9–10, 1mm; 11–13, 0.1mm.

**Description.** Female (holotype). Carapace orange brown, with a black band along its entire edge and around the eyes (Fig. 9). Chelicerae dark brown. Endites and labium orange brown. Sternum yellowish white. Coxae orange brown, legs dark brown, darkest in the femora. Dorsum of abdomen yellow, sides dark brown, venter pale yellow; spines red, with a black band extending from one posterior spine to the other; sclerotized ring around spin-

nerets black. Carapace dome-shaped, almost glabrous, with fine granulation on the edges of the thoracic area, and without dimples; thoracic fovea an indistinct circular marking; median ocular area slightly projected. Abdomen trapezoidal, widest posteriorly. Four pairs of spines on the abdomen, the first and the third the longest; the fourth only an indistinct and sclerotized nipple below the large posterior spines (Figs. 9, 10). Total length, 5.13. Carapace 2.02 long, 1.62 wide at its widest point. Abdomen 3.19 long. Length of first femur, 1.66; patella, 0.63; tibia, 1.18; metatarsus, 0.92; tarsus, 0.59. Second femur, 1.5; patella, 0.57; tibia, 1.05. Third femur, 1.13; patella, 0.41; tibia, 0.72. Fourth femur, 2.09; patella, 0.57; tibia, 1.14; metatarsus, 1.13; tarsus, 0.65. **Epigynum** with a domed bulge, from which a lobe projects posteriorly (Figs. 11, 12). Posterior median plate wider than long, mushroom-shaped and embracing two dark spots that correspond to the region where the copulatory openings lie (Fig. 13).

Male. Unknown.

**Relationships.** *Micrathena yanomami* belongs to the *triangularispinosa* group *sensu* Levi (1985), based on the domed carapace, projected median eyes and similar morphology of the abdomen and genitalia.

**Variation.** The holotype has one of the anterior spines shorter than the other; the paratype has both of them long, but they are twisted like a goat's horn (in the first case, probably an abnormality; in the second case, probably an artifact of the process of preservation). Females (N=2) vary in total length from 5.13 to 5.26; carapace length varies from 2.02 to 2.04.

**Distribution.** Examined specimens come only from the type locality (Fig. 41). According to the collector of the type specimens, the species occurs at two other localities in Pico da Neblina: Cachoeira do Tucano (00°39'54.00"N, 65°56'09.60"W, 100 m) and Bebedouro Velho (00°41'54.96"N, 65°55'40.44"W, 400 m) (A.A. Nogueira, pers comm.). I. Cizaukas (pers. comm.) reports examining material of this species from the following locality: BRAZIL. **Amazonas:** Manaus [Projeto Dinâmica Biológica de Fragmentos Florestais, Reserva do Km 41, 2°24'26"S, 59°43'40"W]. However, these specimens have been lost in the fire that affected the arachnological collection of Instituto Butantan in May, 2010 before they could be examined by the authors of the present study.

**Material examined.** Only the types.

### *Micrathena gaujoni* Simon, 1897

Figures 14–16, 41

*Micrathena gaujoni* Simon, 1897: 466. Five female syntypes from Loja, Ecuador, deposited in MNHN 7832, not examined. Levi 1985: 478.

**Diagnosis.** Males of *M. gaujoni* differ from all other *Micrathena* with a coxal hook by having an extremely long embolus projecting above the terminal apophysis and lying in a very large conductor, which occupies most of the tegulum in mesal view (Fig. 16). This species is most similar to *M. pilaton* Levi (Levi 1985: fig. 24), from which it differs by having a much larger terminal apophysis. For the female diagnosis see Levi (1985: 478).

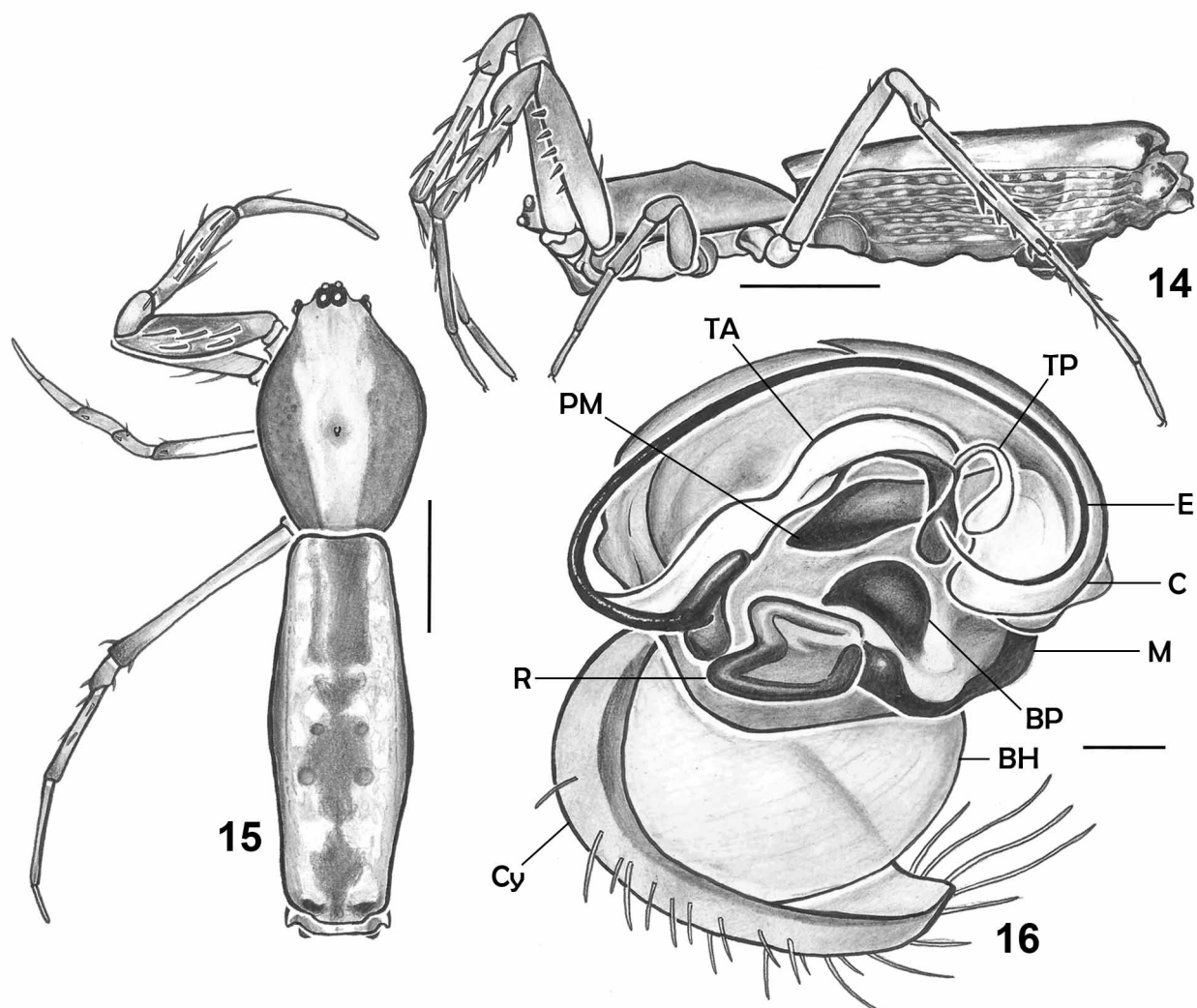
**Description.** Male from Estación Biológica Yanayacu, Ecuador, (UFMG 3355). Carapace light brown, with a dark brown band on each side (Fig. 14). Chelicerae, endites, labium and sternum brown. Legs yellow proximally, brown distally. Dorsum of abdomen white with a median pattern of dark brown markings (Fig. 14); venter dark brown. Carapace with oval thoracic region, narrowest behind, a circular fovea and no dimples (Fig. 14). First coxa with hook and second femur with corresponding prolateral groove. Tibiae and femora I and II markedly ornamented with macrosetae on the dorsal surface; tibia II with two ventral rows of robust macrosetae, femur II with a single, median, ventral row of macrosetae (Fig. 15). Abdomen rectangular, elongated, with slightly convex sides and six tiny posterior lobes (Fig. 14). Total length, 5.07. Carapace 2.02 long, 1.37 wide at widest point. Abdomen 3.11 long. Length of first femur, 1.75; patella, 0.61; tibia, 1.29; metatarsus, 1.13; tarsus, 0.59. Second femur, 1.61; patella, 0.55; tibia, 1.09. Third femur, 1.02; patella, 0.35; tibia, 0.57. Fourth femur, 1.88; patella, 0.5; tibia, 1.11; metatarsus, 1.13; tarsus, 0.55. **Palp** with a large, undulated, twisted terminal apophysis, from which a drop-shaped membranous projection hangs. Embolus extremely long and filiform, projecting over the tegulum. Conductor very large, serving as a bed to the embolus, and attached to a pointed, sclerotized paramedian apophysis. Median apophysis comprised of three parts: a large, inverted U-shaped, basal projection, a lobe and a bended rim (Fig. 16). Paracymbium large and bilobed, otherwise unmodified.

Female. Described by Levi (1985: 478).

**Notes.** The described male has both palps with fully expanded basal hematodochae. The described male and three other sub-adult, apparently co-specific males were collected in the same expedition and in the same area as many adult and juvenile females of *M. gaujoni* were. No other *Micrathena* of the *kirbyi* or *guerini* groups were collected in the same expedition. This represents a new record for this species (Fig. 41).

**Natural history.** The specimens were collected in an area of tropical rainforest, in the understory vegetation.

**Material examined.** ECUADOR. Napo: Cosanga, Estación Biológica Yanayacu (0°35'57S 77°53'26"W, 2128m ASL), A. J. Santos coll., 24–30/XI/2009, 1♂, 8♀, 5 juveniles (UFMG 3355).



**FIGURES 14–16.** *Micrathena gaujoni* Simon, 1897, male (UFMG 3355). 14–15, habitus: 14, lateral view; 15, dorsal view. 16, left palp, mesal view. Abbreviations: BH= basal hematodocha, BP=basal projection of the median apophysis, C= conductor, Cy= cymbium, E=embolus, M= median apophysis, PM= paramedian apophysis, R= radix, TA= terminal apophysis, TP= terminal apophysis projection. Scale bars: 14–15, 1mm; 16, 0.1mm.

***Micrathena ruschii* (Mello-Leitão, 1945), revalidated, new combination**

Figures 17–19, 41

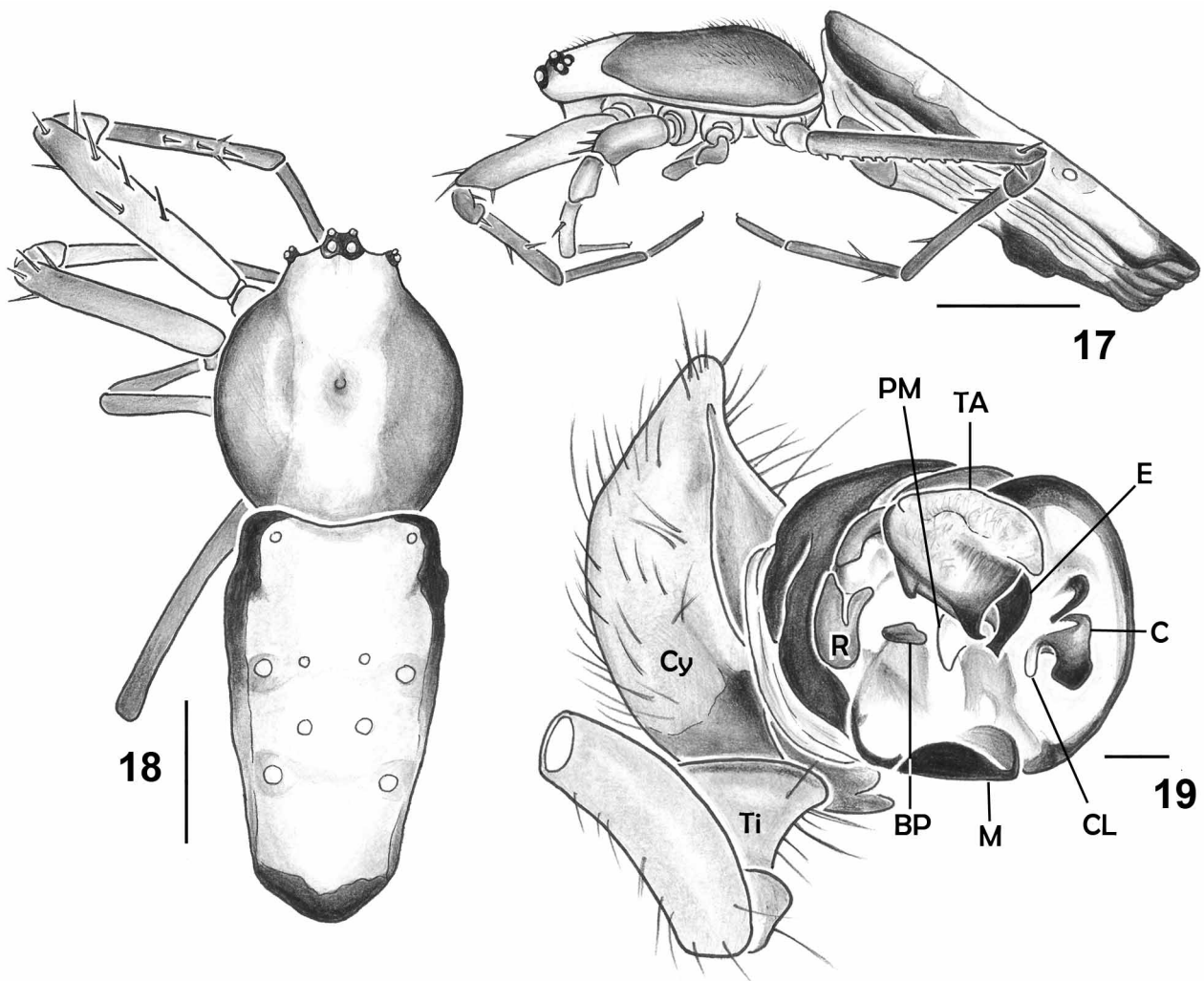
*Acrosoma ruschii* Mello-Leitão, 1945: 266, figs. 7–9. Female lectotype and three female paralectotypes, here designated, from Santa Tereza [19°55'S 40°35'W, 655 m], Espírito Santo, Brazil, deposited respectively in MNRJ 2566 and MNRJ 4255. First synonymized with *Micrathena triangularis* by Levi 1985: 512.

*Micrathena cicuta* Gonzaga & Santos, 2004: 332–334, figs. 1–5. Female holotype from Área de Relevante Interesse Ecológico Floresta da Cicuta, Volta Redonda [22°31'S 44°7'W, 390 m], Rio de Janeiro, Brazil, deposited in IBSP 36322, not examined, nor found after the Butantan fire of May 2010. **NEW SYNONYMY.**



**Synonymy.** As many of Mello-Leitão's type specimens, that of *A. ruschii* was not available to H.W. Levi at the time of his *Micrathena* revision. Based on the original description by Mello-Leitão, Levi placed *A. ruschii* as a doubtful synonym of *M. triangularis*. Examination of the type specimens revealed that this species is, in fact, a senior synonym of the recently described *M. cicuta*. It comes from a locality which represents the northernmost record for the species, but is nonetheless not far away from the known range of *M. cicuta*. It is noteworthy, however, that Mello-Leitão's (1945) original illustrations and descriptions are not quite adequate for identifying the species, and that Gonzaga & Santos (2004) description should be used for this purpose.

**Diagnosis.** The palp morphology is most similar to that of *M. brevispina* Keyserling (Levi 1985: fig. 393), with whom it shares a squared median apophysis. It differs by having the terminal apophysis with a distal, sclerotized tooth that points towards the apex of the embolus, by the conductor apex divided in two sclerotized parts, by the lightly sclerotized paramedian apophysis that points posteriorly and by the wider margin of the tegulum (Fig. 19). For the diagnosis of the female, see Gonzaga & Santos (2004: 332).



**FIGURES 17–19.** *Micrathena ruschii* (Mello-Leitão, 1945), male (UFMG 4987). 17–18, habitus: 17, lateral view; 18, dorsal view. 19, mirror image of right palp, mesal view. Abbreviations: BP= basal projection of the median apophysis, C= conductor, CL= conductor lobe, Cy= cymbium, E=embolus, M=median apophysis, PM= paramedian apophysis, R= radix, TA= terminal apophysis, Ti= tibia. Scale bars: 17–18, 1mm; 19, 0.1mm.

**Description.** Male from Parque Nacional do Itatiaia, Itatiaia, Rio de Janeiro, Brazil (UFMG 4987). Carapace yellow, with two light brown bands on the sides (Fig. 18). Chelicerae, endites, labium and sternum yellow. Legs yellow proximally, brown distally. Abdomen dorsally white, bordered with black on the sides of the anterior half and in the posterior margin (Fig. 18); venter whitish gray, with a median black band extending from the posterior margin of the spinnerets to the end of the abdomen. Carapace with rounded thoracic region, a circular fovea and no

dimples (Fig. 18), slightly dorsoventrally flattened in lateral view (Fig. 17). First coxa with hook and second femur with corresponding prolateral groove. Tibiae and femora I and II and tibia IV ornamented with macrosetae on the dorsal surface, strongest in femur I (Fig. 18). Abdomen rectangular, elongated, narrowest behind and with slightly undulated sides (Fig. 18). Total length, 4.95. Carapace 2.17 long, 1.81 wide at widest point. Abdomen 3.19 long. Length of first femur, 1.91; patella, 0.65; tibia, 1.35; metatarsus, 1.13; tarsus, 0.48. Second femur, 1.64; patella, 0.54; tibia, 1.07. Third femur, 0.99; patella, 0.41; tibia, 0.61. Fourth femur, 1.83; patella, 0.46; tibia, 1.03; metatarsus, 1.14; tarsus, 0.50. **Palp** with a large, membranous, flattened terminal apophysis with a distal sclerotized tooth, covering the embolus. Embolus thick, curved and with a truncate, almost bifid, apex. Conductor composed of two sclerotized parts, the larger posteriorly directed, and a membranous digitiform lobe. Paramedian apophysis lightly sclerotized, not attached to the conductor, posteriorly directed. Median apophysis comprised of three parts: a small basal projection located between the paramedian apophysis and the radix, a lobe and a bended rim (Fig. 19). Paracymbium large and bilobed, otherwise unmodified.

Female. Described by Gonzaga & Santos (2004: 333).

**Notes.** The male was collected at the periphery of a female's orb-web, in one of the supporting threads, in an area where two other females had been collected. The collecting site is 50 km away from Floresta da Cicuta, Volta Redonda, the type locality of *M. cicuta*. The specimen was collected with the left palp missing and the right one slightly expanded. To facilitate comparisons with other species, we illustrate the mirror image of this palp, as it was the right one (Fig. 19). The species is recorded for the first time for Parque Nacional do Itatiaia, Itatiaia, Rio de Janeiro; and Juiz de Fora, Minas Gerais (both localities in Brazil; Fig. 41).

**Natural history.** Specimens were collected by visual searching in the understory vegetation of montane Atlantic rainforest.

**Material examined.** BRAZIL. Minas Gerais: Juiz de Fora, Reserva Biológica Municipal Poço D'Anta (21°45'37.84''S 43°19'10.24''W, 810 m), G.H.F. Azevedo & A.J. Santos coll., 02/IV/2011, 1 ♀ (UFMG 5224). Rio de Janeiro: Itatiaia, Parque Nacional do Itatiaia (12°27'17''S 44°36'29.8''W, 720 m), G.H.F. Azevedo *et al.* coll., 15–22/II/2011, 1 ♂, 3 ♀ (UFMG 4987).

### *Micrathena plana* (C. L. Koch, 1836)

*Acrosoma planum* C.L. Koch, 1836: 81, fig. 228. Female holotype from Brazil, deposited in Zoologische Staatssammlung, Munich, destroyed.

*Micrathena plana*, Levi 1985: 509, figs. 311–325; Platnick 2011 (complete synonymic list).

*Micrathena ornata* Mello-Leitão, 1932: 86, fig. 4. Female holotype from Niterói, Rio de Janeiro, Brazil [22°53'S 43°5'W, 5m ASL], deposited in MNRJ 18276, examined. Levi 1985: 546, figs. 521–524. **NEW SYNONYMY.**

**Synonymy.** The type of *M. ornata* was examined by H.W. Levi some time before he started his revision of the genus (Levi 1985). He did not illustrate the carapace of the specimen in lateral view and thought it to be dome-shaped, when it is actually sculptured, with a high thorax. Thus it was inadequately placed in the *triangularispinosa* group. When Levi redescribed *M. plana*, he did not realize it was the same species as *M. ornata*, which is known only from the holotype, and did not account for the synonymy. It can be clearly seen, both from the specimen and from Levi's illustrations, that *M. ornata* possess the convex transverse bar, small epigynal lobe and abdominal spine pattern that diagnose *M. plana*.

### *Micrathena horrida* (Taczanowski, 1873)

*Acrosoma horridum* Taczanowski, 1873: 281, fig. 31. Female holotype from Cayenne, French Guiana [4°55'N 52°19'W, 8m ASL], deposited in Polska Akademia Nauk, Warszawa, not examined.

*Micrathena horrida*, Levi 1985: 596, figs. 774–783; Platnick 2011 (complete synonymic list).

*Micrathena mastonota* Mello-Leitão 1940: 209. Female holotype from Colatina, Espírito Santo, Brazil [19°31'S 40°37'W, 38m ASL], Mario Rosa coll., deposited in MNRJ 58345, examined. Levi 1985: 446 (*nomen dubium*). **NEW SYNONYMY.**

**Synonymy.** The holotype of *M. mastonota* was not available to Levi (1985) at the time of his revision and he regarded it as being lost. He could not identify the species from the original description and considered it as a *nomen*

*dubium*, suggesting the possibility that it could be a synonym of *M. triangularis*. The type was located at MNRJ and is an adult female of *M. horrida*, with all the diagnostic characters of the species reported by Levi (1985: 598, figs. 774–780). This represents the first record of this species for the state of Espírito Santo, Brazil.

## Genus *Chaetacis* Simon, 1895

### *Chaetacis bandeirante* new species

Figures 20–41

**Type material. Holotype:** male from Usina Hidrelétrica Engenheiro Sérgio Motta, Presidente Epitácio [21°45'S 52°05'W, 310 m], São Paulo, Brazil, Equipe IBSP coll., 16/I–13/II/1999, deposited in IBSP 23255. **Paratypes:** female from the same locality (IBSP 160897); two males and four females from the same locality (IBSP 160898); one male and two females from Base de Pesquisa do Instituto Brasileiro de Desenvolvimento Florestal, Poconé [16°15'S 56°37'W, 142 m], Mato Grosso, Brazil, U.A. Drumond coll., 16/II/1984 (MZSP 11443); two males and two females from Passo do Lontra, Corumbá [19°0'S 57°39'W, 118 m], Mato Grosso do Sul, Brazil, J. Raizer *et al.* coll, IV/1998 (UFMG 4889); one female from Nhecolândia [19°14'S 57°02'S, 86 m], S. Haris coll., 11/XI/1987 (MNRJ 14587).

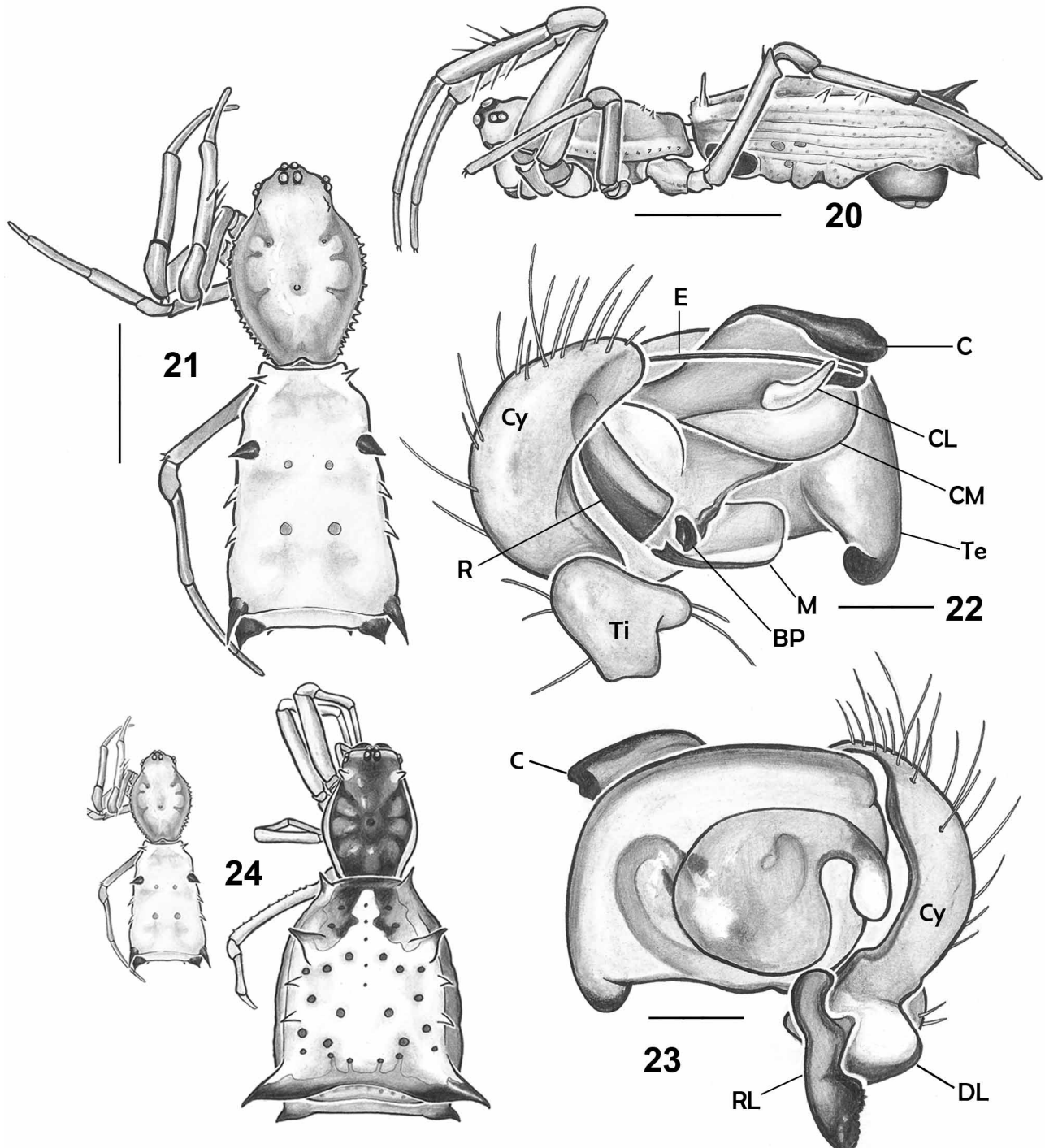
**Etymology.** The specific name honors the *bandeirantes*, scouts responsible for exploring the interior of Brazil between the 16<sup>th</sup> and 18<sup>th</sup> centuries, particularly the regions where *C. bandeirante* has been recorded.

**Diagnosis.** Males differ from other species of the genus by the structure of the palp: the tegular projection is strongly bent towards the tibia, almost at a square angle relative to the embolus (Figs. 22, 39), and the paracymbium retrolateral lobe is large and undulated, with a distinct shape (Figs. 23, 40). Males also differ from those of *C. picta* (C.L. Koch) and *C. aureola*, but not from those of *C. necopinata*, by having a straight tibia I and seven pairs of abdominal spines (Figs. 20, 21). Females differ from sympatric *C. aureola* and *C. picta* by the shape of the abdomen, which is more trapezoidal and elongated (Fig. 25), rather than squarish, and by the cephalic tubercles, which are more spiniform (Figs. 25, 26, 33, 34), rather than a low tubercle with denticles; it differs from these two species and from *C. necopinata* by the structure of the epigynum in posterior view (Figs. 29, 31, 37), which has the sides slightly indented laterally, and by the spermathecae, which are straight with a posterior bend, almost L-shaped (Figs. 30, 32, 38). Also, *C. picta* is 12-spined, whereas *C. bandeirante* is 14-spined (Fig. 26).

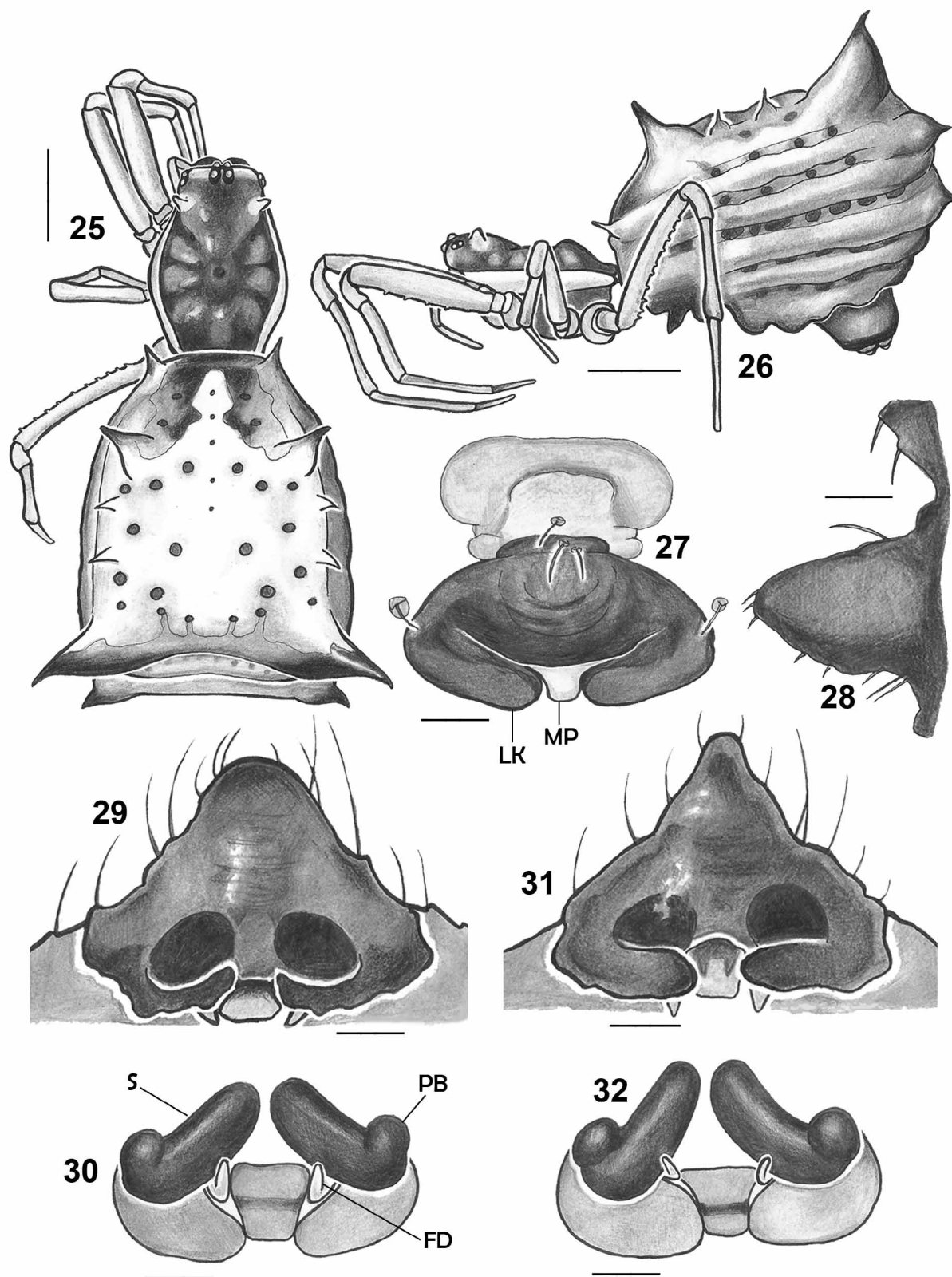
**Description.** Male (holotype). Carapace, chelicerae, legs and abdomen orange brown. Endites, labium and sternum orange brown, darker than carapace. Carapace with a round thoracic groove, one pair of dimples, two pair of sulci, two faint tubercles posterior to the eyes and tiny denticles on the edge of the thoracic area (Fig. 21). First coxa without hook. First tibia straight and with some strong macrosetae, not otherwise modified; other legs without strong macrosetae (Fig. 20). Abdomen rectangular, widest posteriorly, with seven pairs of spines. First, third and fourth pairs of spines orange brown, the remaining black (Fig. 21). Total length, 3.52. Carapace 1.51 long, 1.0 wide at its widest point. Abdomen 1.96 long. Length of first femur, 1.11; patella, 0.42; tibia, 0.9; metatarsus, 0.89; tarsus, 0.42. Second femur, 1.11; patella, 0.37; tibia, 0.81. Third femur, 0.78; patella, 0.26; tibia, 0.46. Fourth femur, 1.24; patella, 0.33; tibia, 0.74; metatarsus, 0.78; tarsus, 0.37. **Palp** without terminal or paramedian apophysis. Embolus long, sclerotized and slightly curved posteriorly. Conductor with a sclerotized apex, a membranous, digitiform lobe that holds the embolus, and a membranous basal projection. Median apophysis lightly sclerotized, except for a basal sclerite next to the radix, which is dark and tooth-shaped. Tegular projection short and strongly bent towards the tibia (Figs. 22, 39). Paracymbium with a rounded dorsal lobe and a bifid retrolateral lobe which is highly sclerotized and has a scaly surface (Figs. 23, 40).

Female (paratype, IBSP 160897). Carapace, chelicerae, labium and sternum dark brown. Endites light brown. Clypeus and legs yellow. Carapace almost glabrous, with a few setae on denticles, a pair of short, yellowish white, spiniform tubercles posterior to the eyes, a circular thoracic fovea, a pair of dimples, two pair of sulci and a high thoracic region (Figs. 25, 33, 34). Abdomen orange brown with dark markings, subtrapezoidal in form and with seven pairs of spines. Second, fifth, sixth and seventh abdominal spines with dark-colored apices (Figs. 25, 26). Abdominal setae with wide and excavated bases (Fig. 35). Total length, 5.81. Carapace 2.18 long, 1.57 wide at its widest point. Abdomen 3.85 long. Length of first femur, 1.7; patella, 0.63; tibia, 1.29; metatarsus, 1.22; tarsus, 0.54. Second femur, 1.62; patella, 0.59; tibia, 1.11. Third femur, 1.2; patella, 0.39; tibia, 0.68. Fourth femur, 2.28;

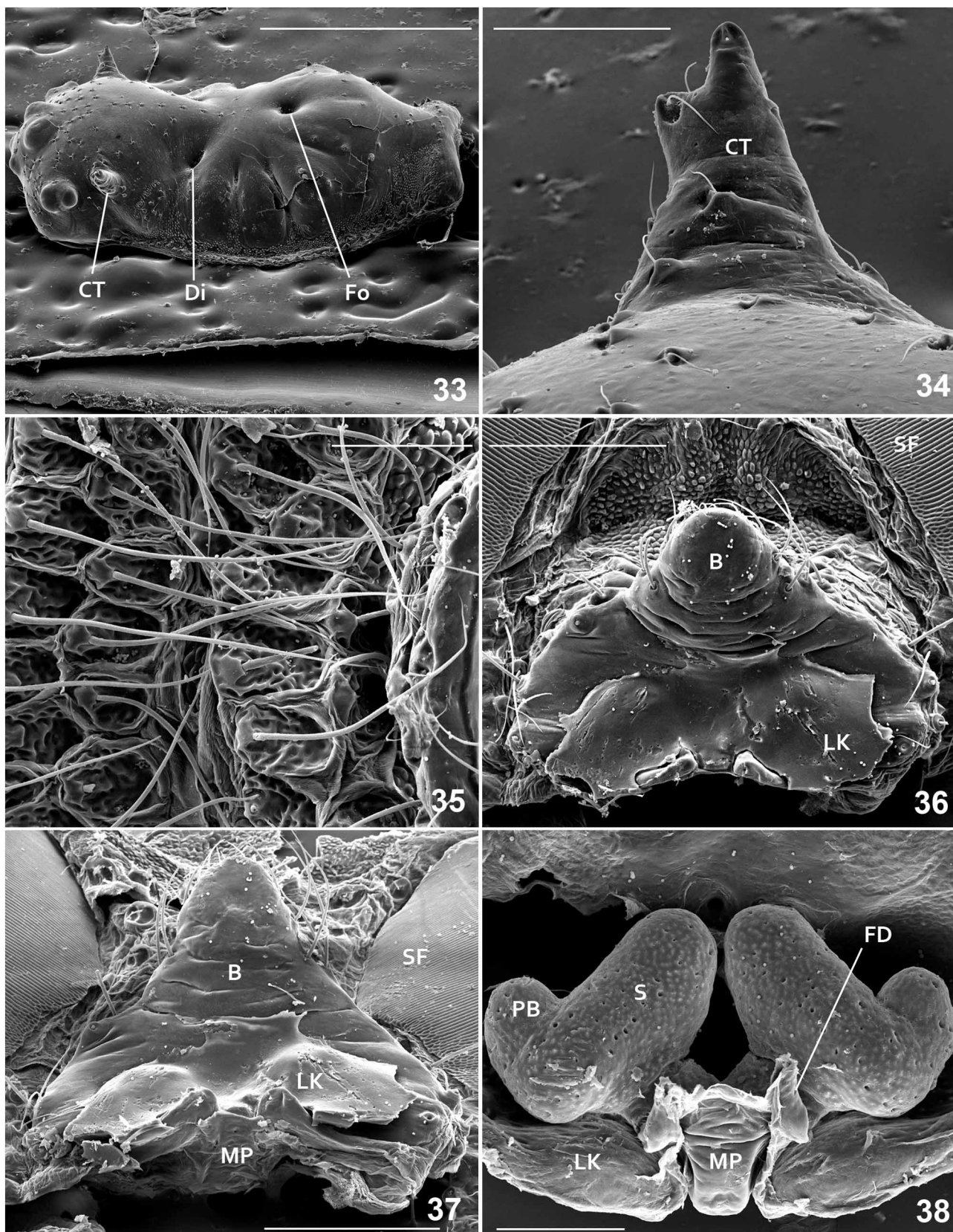
patella, 0.50; tibia, 1.2; metatarsus, 1.29; both tarsi IV are missing. **Epigynum.** Epigynal bulge a conical structure, drawn out ventrally (Figs. 28, 36, 37), slightly indented on sides (Figs. 29, 31, 37). Copulatory openings small and concealed beneath the lateral plates, which are drawn out posteriorly, forming two keels (Figs. 36, 37). Fertilization ducts short and anteriorly directed, united by a membrane (Fig. 38). Spermathecae reniform, with a short bend on the posterior end (Figs. 30, 32, 38), and covered with tiny holes, probably glandular openings, visible only under scanning electron microscopy (Fig. 38).



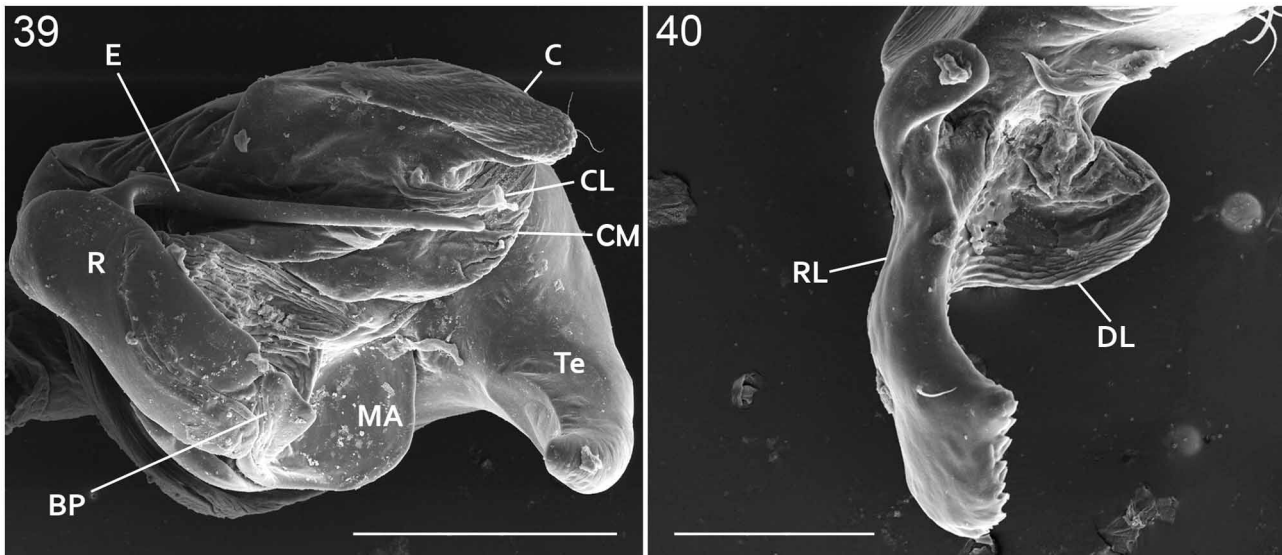
**FIGURES 20–24.** *Chaetacis bandeirante* new species. 20–23, male holotype. 20–21, habitus: 20, lateral view; 21, dorsal view. 22–23, left palp: 22, mesal view; 23, retrolateral view. 24, male holotype and female paratype (IBSP 160897) drawn to scale to show sexual dimorphism. Abbreviations: BP=basal projection of the median apophysis, C=conductor, CL=conductor lobe, CM= conductor basal membrane, Cy= cymbium, DL= dorsal lobe of the paracymbium, E= embolus, M= median apophysis, R= radix, RL= retrolateral lobe of the paracymbium, Te= tegular projection, Ti= tibia. Scale bars: 20–21, 1mm; 22–23, 0.1mm.



**FIGURES 25–32.** *Chaetacis bandeirante* new species. 25–30, female paratype (IBSP 160897). 25–26, habitus: 25, dorsal view; 26, lateral view; 27–30, epigynum: 27, ventral view; 28, lateral view; 29, posterior view; 30, dorsal view, cleared. 31–32, female paratype (IBSP 29905). 31–32, epigynum: 31, posterior view; 32, dorsal view, cleared. Abbreviations: FD= fertilization ducts, LK= epigynum lateral keels, MP= posterior median plate, PB= spermathecae posterior bend, S= spermathecae. Scale bars: 24–26, 1mm; 27–32, 0.1mm.



**FIGURES 33–38.** *Chaetacis bandeirante* new species. 33–37, female paratype (UFMG 4889). 33, female carapace, dorsolateral view; 34, cephalic tubercle, dorsolateral view; 35, abdominal setal bases, ventral view; 36–37, epigynum: 36, ventral view; 37, posterior view; 38, female (IBSP 48980), spermathecae, dorsal view. Abbreviations: B=epigynal bulge, CT=cephalic tubercle, Di=dimple, FD=fertilization ducts, Fo=thoracic fovea, LK=epigynum lateral keels, MP=posterior median plate, PB=spermathecae posterior bend, S=spermathecae, SF=stridulating files of the booklung cover. Scale bars: 33, 1mm; 34, 35, 38, 0.1mm; 36, 37, 0.2mm.



**FIGURES 39–40.** *Chaetacis bandeirante* new species, male paratype (UFMG 4889). 39, male left palp, mesal view; 40, paracymbium, retrolateral view. Abbreviations: BP=basal projection of the median apophysis, C= conductor, CL= conductor lobe, CM= conductor basal membrane, DL= dorsal lobe of the paracymbium, E= embolus, M= median apophysis, R= radix, RL= retrolateral lobe of the paracymbium, Te= tegular projection. Scale bars: 39, 0.2mm; 40, 0.1mm.

**Variation.** Some females, especially the ones coming from Xavantina, Mato Grosso, have only six pairs of spines, the third one lacking. These specimens from Xavantina are probably members of this species, but no males have been found to confirm the identification. The shape of the epigynal bulge, especially in posterior view, is variable, but always laterally indented; spermathecae shape is slightly variable. Most males have abdomen homogeneously colored, others have a pattern of dark, dorsal markings resembling that of the females. Males (N=10) vary in total length from 3.3 to 3.59 (mean=3.48); carapace length varies from 1.44 to 1.66 (mean=1.52). Females (N=17) vary in total length from 5.04 to 5.79 (mean=5.45); carapace length varies from 1.86 to 2.19 (mean=2.06).

**Notes.** Males and females were collected together in three localities: Presidente Epitácio, São Paulo; Poconé, Mato Grosso; and Corumbá, Mato Grosso do Sul. This species appears to be very abundant wherever it occurs, with many individuals collected from each locality.

**Natural history.** This species has been collected in *pantanal* (Central Brazil's floodplains) areas in Poconé, Mato Grosso and Corumbá, Mato Grosso do Sul; it seems to inhabit low elevation habitats (below 400 m).

**Distribution.** Central Brazil, in states of Mato Grosso, Mato Grosso do Sul and western São Paulo (Fig. 41).

**Additional material examined.** BRAZIL. **São Paulo:** Presidente Epitácio [21°45'S 52°05'W, 310 m], Usina Hidrelétrica Engenheiro Sérgio Motta, São Paulo, Brazil, Equipe IBSP coll., 16/I–13/II/1999, 5♀ (IBSP 23262); ditto, 4♂ (IBSP 23245); ditto, 1♂ (IBSP 23246) ditto, 4m 1♀ 1 juvenile (IBSP 23095); Rosana, Primavera [22°34'S 53°03'W, 236 m], Usina Hidrelétrica Engenheiro Sérgio Motta, Equipe IBSP coll., I–II/2000, 11♀ (IBSP 29792); ditto, 10♀ (IBSP 29905); ditto, 3♀ (IBSP 29986). **Mato Grosso:** Diamantino [14°25'S 56°27'W, 296 m], Paraguai River Spring, H.F. Japyassú coll., 10/III/2002, 1♀ (IBSP 48633); Indiauí [15°29'S 58°34'W, 215 m], Sítio Dona Júlia, Rio Sepotuba, J. Raizer coll., 01/III/2002, 2♀ (IBSP 49980); ditto, 4♀ (IBSP 48984); Tapirapé River, 1♀ (MNRJ 986); Xavantina [14°40'S 52°50'W, 300 m], H. Sick coll., X/1946, 2♀ (MZSP 1230). **Mato Grosso do Sul:** Corumbá [19°0'S 57°39'W, 118 m], Passo do Lontra, J. Raizer *et al.* coll., IV/1998, 1♂ 3♀ 1 juvenile (IBSP 70752); ditto, 1♂ 2♀ (IBSP 70763); ditto, 1♂ 6♀ (IBSP 70765); ditto, 2♂ 1♀ (IBSP 70773); ditto, 3♂ (IBSP 70783); ditto, 5♀ (IBSP 70803); ditto, 3♂ 4 juveniles (IBSP 70843); Ivinhema [22°18'S 53°48'W, 362 m], K. Anjos & F. Fattori coll., 2007–2008, 1♂ (IBSP 119947).

## New records

### *Chaetacis necopinata* (Chickering, 1960)

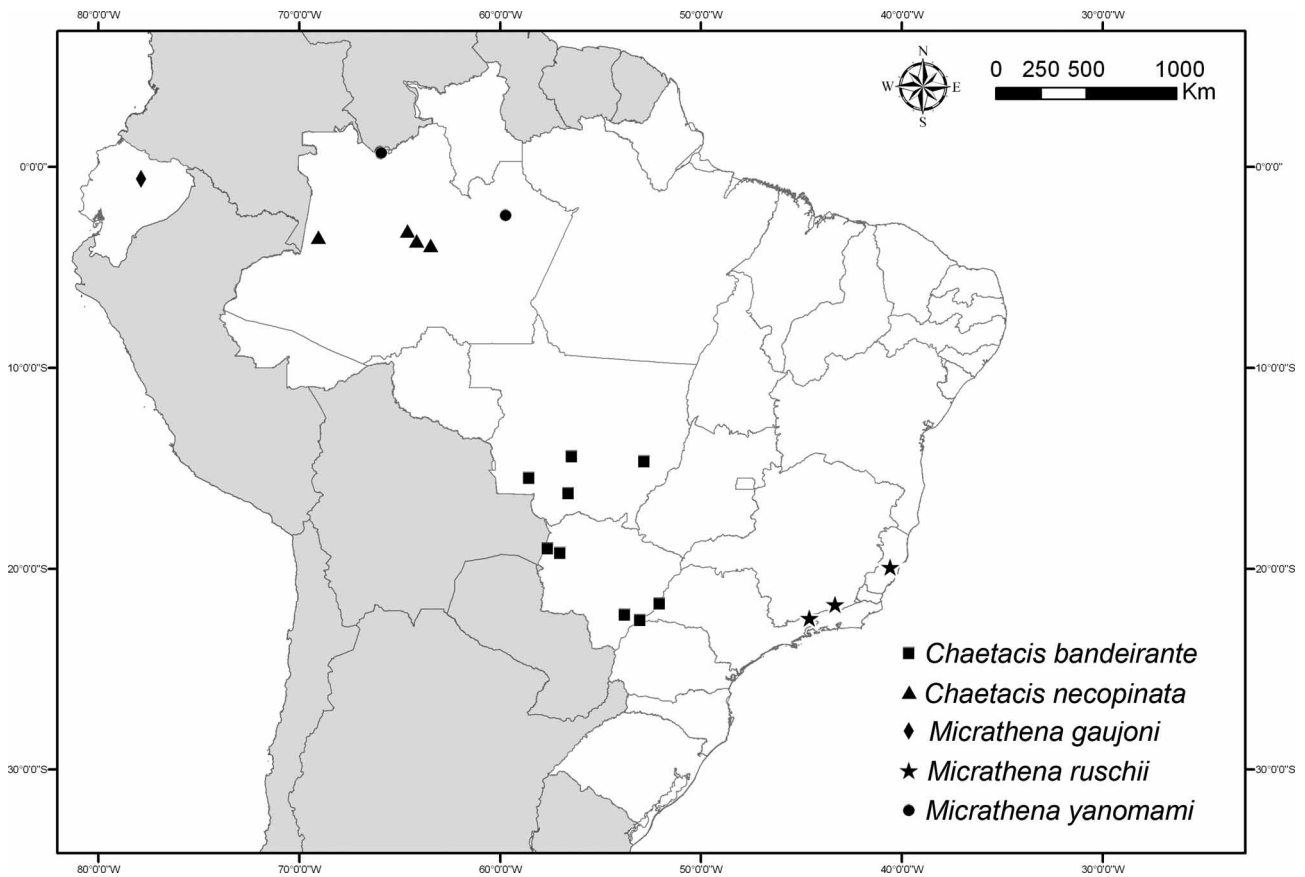
Figure 41

*Micrathena necopinata* Chickering, 1960: 84, figs. 71–73. Male from Peru deposited in Hope Entomological Collections, Oxford, not examined.

*Chaetacis necopinata*, Levi 1985: 612, figs. 853–861.

**Remarks.** *C. necopinata* was first described by Chickering (1960) based on specimens from Peru, although the exact type locality is unknown. All the records provided for this species by Levi (1985) are within this same country. Here, we present the first records of this species for Brazil, in the state of Amazonas (Fig. 38).

**New records.** BRAZIL. **Amazonas:** Bom Sucesso, São Paulo de Olivença, Rio Camatiã (3°28'37"S 69°02'60"W), F.N.A.A. Rego & C.A. Rheims coll., 12/IX/2003, 1♀ (IBSP 81874); São Francisco do Capivara, Tefé, Lago Jatuarana (3°10'41"S 64°36'53"W), F.N.A.A. Rego & C.A. Rheims coll., 21/IX/2003, 1♀ (IBSP 81871); São Francisco do Laranjal, Coari, Lago Apaurá (3°53'31"S 63°27'21"W), F.N.A.A. Rego & C.A. Rheims coll., 24/IX/2003, 1♀ (IBSP 81872); São João do Catuá, Tefé, Guariba-Solimões (3°39'50"S 64°10'12"W), F.N.A.A. Rego & C.A. Rheims coll., 22/IX/2003, 1♀ (IBSP 81873).



**FIGURE 41.** Geographic distribution records for *Micrathena yanomami* new species and *Chaetacis bandeirante* new species, and new records for *M. gaujoni*, *M. ruschii* and *C. necopinata*.

## Doubtful species

### *Chaetacis incisa* (Walckenaer, 1841)

*Plectana incisa* Walckenaer, 1841: 195. Female from Brazil deposited in MNHN, Paris, lost.

*Chaetacis incisa*, Mello-Leitão 1932: 97; Platnick 2011 (complete nomenclatural history).



This species, as all *Plectana* species described by Walckenaer in his *Histoire Naturelle des Insectes* (1841), was not illustrated. The holotype could not be found in MNHN in Paris (A.J. Santos, pers. obs.). Levi (1985) stated only that it is unrecognizable except that it is not a *Chaetacis*. Nevertheless, Platnick (2011) continues to count the species as valid. The original description is confusing, but the excavated abdomen with paired spines, the brown carapace with yellow borders and the fourth leg longer than the first make it fairly certain that *C. incisa* either belongs to *Chaetacis* or, more likely, since there is no mention to cephalic tubercles or spines, to *Micrathena*. Nevertheless, both the description and the reported type locality (Brazil) are too unspecific to allow the correct identity of the species. Hence, we consider it as a *nomen dubium*.

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