

Taxonomic revision of *Camarochilus* Harris (Hemiptera: Pachynomidae)

CHRISTIANE WEIRAUCH,¹ DIMITRI FORERO,² AND RANDALL T. SCHUH³

ABSTRACT

The Neotropical genus *Camarochilus* Harris, 1930 (Hemiptera: Pachynomidae) was described based on two species from Panama and Brazil. The genus has not been revised since its original treatment, and specimens beyond the original type series have remained undocumented. Based on examination of 57 specimens, including holotypes or paratypes of the previously described species, we here revise *Camarochilus* and recognize 10 species, with eight described as new: *C. fasciatus*, n. sp., *C. gilli*, n. sp., *C. globosus*, n. sp., *C. harrisi*, n. sp., *C. medius*, n. sp., *C. picturatus*, n. sp., *C. robustus*, n. sp., and *C. tenuis*, n. sp. Habitus images are provided for all species, male and female genitalic structures are documented, and various morphological characters are illustrated using digital photography. Measurements are included for all species. Male genitalic characters including the degree of asymmetry and type of ornamentation of the pygophore and shape of parameres constitute important species-diagnostic features, in addition to coloration and measurements. Distribution maps illustrate that species occur from Bolivia to Honduras, a considerable expansion of the previously known species distribution ranges in this genus.

¹Department of Entomology, University of California, Riverside, California.

²Departamento de Biología, Pontificia Universidad Javeriana, Bogotá, Colombia.

³Division of Invertebrate Zoology, American Museum of Natural History, New York.

INTRODUCTION

Pachynomidae are a small family of cimicomorphan Heteroptera, or true bugs, that comprise five genera with 23 described species (Harris, 1931; Carayon and Villiers, 1968; Schuh et al., 2015; Chen et al., 2019). *Aphelonotus* Uhler (15 species) has highest species diversity in the Neotropics (continental South and Central America with 12 species and one species each from Cuba and Puerto Rico), but also includes one species from Africa (Schuh et al., 2015; Kment and Rédei, 2020) and is classified in the subfamily Aphelonotinae. The remaining four genera belong to the Pachynominae: *Pachynomus* Stål (three species), *Punctius* Stål (two species), and *Camarochiloides* Chen, Liu, Li, and Cai (one species) are restricted to the Old World, whereas *Camarochilus* Harris was erected for two species from the Neotropical Region (Harris, 1930; Carayon and Villiers, 1968). A key to genera was provided by Chen et al. (2019).

Originally described as a species of Reduviidae (Klug, 1830), Stål (1873) created the subfamily Pachynominae within the Nabidae, the damsel bugs, to accommodate the genus *Pachynomus*. Uhler (1894) described *Aphelonotus* as a close relative of *Pachynomus* within the Nabidae, Reuter (1908) moved the genus to the Reduviidae, but Harris (1931) returned it to the Nabidae. Carayon (1950) stated that Reduviidae and Pachynomidae are closely related and argued that the four genera of Pachynomidae should either be treated as a subfamily of Reduviidae or as a separate family. Carayon and Villiers (1968), based on a thorough morphological study of Pachynomidae, established the currently accepted classification of Pachynomidae that treats the group as a separate family within the Reduvioidea and recognizes two subfamilies. Among the synapomorphies for Reduvioidea are several morphological features that are unique among Heteroptera, including the Brindley's gland, trichobothria on the pedicel of the antenna, and lateral spermathecae on the median oviduct (Carayon and Villiers, 1968; Wygodzinsky and Lodhi, 1989; Schuh and Štys, 1991; Weirauch, 2008; Schuh et al., 2009). A combined morphological and molecular analysis of Heteroptera that included 10 species of Reduviidae and two species of Pachynomidae representing both subfamilies found high support for Reduvioidea (100% bootstrap in the likelihood analysis) and for Pachynomidae (98%) as well as Reduviidae (99%) (Weirauch et al., 2019). This result and the deep divergence that separates the pachynomid and reduviid lineages further corroborate the decision by Carayon and Villiers (1968) to recognize Pachynomidae as a family separate from the Reduviidae. Reduvioidea are unique among Heteroptera in uniting two families with drastically different species numbers: the extremely species poor Pachynomidae (fewer than 30 species including the eight new species described in this paper) strongly contrast with the Reduviidae (~6,800 described spp.), the second largest family-level clade of true bugs after the Miridae.

In addition to being species poor, Pachynomidae specimens are also rarely collected based on our examination of collection holdings in dozens of natural history collections around the world. For the taxonomic revision of what appears to be the most commonly collected genus, *Aphelonotus*, only 538 specimens from 12 institutions were examined (Schuh et al., 2015). Museum holdings for the remaining four genera are significantly smaller. This may in part be due to the fact that Pachynomidae specimens are occasionally misplaced in natural history

collections under either Nabidae or Reduviidae. Most Pachynomidae have been collected using light traps and some with leaf-litter extraction techniques (Heteroptera species pages <http://research.amnh.org/pbi/heteropterasespeciespage/>). Both methods are widely used by insect collectors in the Old and New World tropics, but entomologists may fail to collect or process specimens because most species are dull brown and of small to average size (between 2.1 and 10.4 mm for the species of *Aphelonotus* and *Camarochilus*). Only few specialists are capable of recognizing Pachynomidae in the field. The biology of Pachynomidae is unknown and immatures were only recently described for species of *Aphelonotus*, whereas those of the other genera remain undocumented (Schuh et al., 2015).

For the present project, we assembled 57 specimens of *Camarochilus*, with the majority of specimens representing undescribed species. We re-describe and rediagnose *Camarochilus* and the two described species and describe eight species as new. Male genitalic characters, including the degree of asymmetry of the pygophore, ornamentation of the lateral protuberances, and shape of the parameres, contribute important species-diagnostic features, but coloration and measurements also aid in species delimitation and recognition. We provide distribution maps that considerably extend the currently known distribution ranges for species of *Camarochilus*.

MATERIAL AND METHODS

SPECIMENS: We examined 57 specimens, including the holotype of *C. americanus* Harris and the paratype of *C. confusus*. One specimen was collected during a field trip by the Weirauch Lab to the Amazon basin in Perú and all other specimens were borrowed from and will be deposited in the following institutions:

- AMNH American Museum of Natural History, New York; R.T. Schuh and R. Salas
- BDGC Bruce D. Gill, personal collection, Ottawa, Canada
- BMNH Natural History Museum, London, UK; M. Webb
- CAS California Academy of Sciences, San Francisco; N.D. Penny and C.C. Grinter
- CEUA Colección de Entomología, Universidad de Antioquia, Medellín, Colombia; M. Wolff Echeverri
- CMNH Carnegie Museum of Natural History, Pittsburgh, Pennsylvania; J. Rawlins
- CNC Canadian National Collection, Ottawa, Canada; O. Lonsdale
- CUIC Cornell University Insect Collection, Ithaca, NY; J. Dombroskie
- FMNH Field Museum of Natural History, Chicago, IL; M. Thayer and R. Baquiran
- IAVH Colección Entomológica, Instituto Alexander von Humboldt, Villa de Leyva, Colombia; J.C. Neita-Moreno
- ICN Colección Entomológica, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá, Colombia; F. Fernández
- MPUJ Colección de Entomología, Museo Javeriano de Historia Natural Lorenzo Uribe, S.J., Pontificia Universidad Javeriana, Bogotá, Colombia; D. Forero
- UCB University of California, Berkeley, CA; C. Barr and P. Oboyski
- USNM National Museum of Natural History, Washington, D.C.; T.J. Henry

DATABASING: A specimen identifier matrix-code label (unique combination of an eight-digit number and the prefix “AMNH_ENT” or “UCR_ENT”) that also indicates the specimen depository was attached to each specimen. Specimens were databased using the PBI instance of the Arthropod Easy Capture database served from the AMNH (<https://research.amnh.org/pbi/locality/>).

DISSECTIONS: The pygophore was removed from the abdomen and slightly cleared through immersion into hot 10% KOH. For species with only one male specimen available, parameres were illustrated in situ; parameres were dissected where multiple males were available. Female external genitalia were illustrated in situ for selected species.

IMAGING: Dorsal and lateral habitus images as well as details of genitalia and other structures were taken using a Leica DFC 450 C Microsystems system with a Planapo 1.0× objective. Where the hemelytra did not obscure the posterior tip of the abdomen, pygophore and parameres were imaged in situ. To reveal the ornamentation on the anterolateral margin of the pygophore and to document both parameres, these structures were also imaged after dissection of the pygophore (with parameres in situ) and after dissection of the parameres. Multiple images were fused using the Leica LAS software.

SPECIES DESCRIPTIONS: A matrix of morphological characters was coded in Excel and descriptions for individual species exported and edited. The revised generic description was assembled from the species descriptions.

DIAGNOSES AND KEY: Male genitalia provide important diagnostic features and are used in both the diagnoses and the identification key to species where feasible. Sexual dimorphism in somatic features appears to be limited or virtually nonexistent in *Camarochilus*, judging from those species where males and females could be associated (e.g., *C. gilli*, n. sp., *C. medius*, n. sp., or *C. picturatus*, n. sp.). Females may be slightly smaller or larger or possess a slightly larger and stouter forefemur compared with males. Because differences between males and females are minor, we are confident that the single species that we here describe based on a unique female (*C. tenuis*, n. sp.) in fact represents a distinct species. The diagnosis of this female-based species highlights measurements and coloration characters; it is omitted from the male-based identification key.

MEASUREMENTS: Measurements were taken using the Leica DFC 450 C Microsystem, recording distances from images. Measurements are reported in table 1. Ratios were calculated for several measurements, e.g., length and height of the forefemur relative to the total body length, and are reported in the diagnoses, descriptions, and in the key.

MAPS: Specimens without geographic coordinates on the locality label were georeferenced using Google Earth or country level gazetteers. Maps for individual species were created with ArcMap 9.1 (Environmental Systems Research Institute [ESRI], 2005, Redlands, CA) using a shaded relief base map derived from a digital elevation model of the Shuttle Radar Topography Mission (SRTM) from NASA, by importing coordinates from the AEC database.

TERMINOLOGY: Terminology follows Carayon and Villiers (1968) and Schuh et al. (2015).

TAXONOMY

Camarochilus Harris, 1930

Figures 1–7, table 1

TYPE SPECIES: *Camarochilus americanus* Harris, 1930. By original designation.

REVISED DIAGNOSIS (figs. 1–6): Recognized among genera of Pachynomidae by the absence of ocelli, corium and membrane separated by a straight line, trichobothria on abdominal mediosternites 3–8 and the pygophore, medium to large body size in males (6.8–9.8 mm), and male genitalic characters including basal protuberances dorsally on the pygophore and the pygophore that range from symmetrical to strongly asymmetrical in different species. Closest in appearance to the three Old World genera *Camarochiloides*, *Pachynomus*, and *Punctius*, but differentiated by second labial segment about half as long as third (subequal in *Camarochiloides* and *Punctius*), the lateral margin of the pronotum slightly concave (convex in the other three genera), the sculpture of the pronotum with the anterior lobe smooth and the posterior rugose (both rugose in *Camarochiloides*, both glabrous in *Pachynomus*, and both finely rugose in *Punctius*), the metapleuron longer than high (as long as high in *Camarochiloides* and *Punctius*), the corium with six or seven longitudinal rows of punctures (six in *Camarochiloides*, four or five elevated rows of granules in *Punctius*, and two in *Pachynomus*), the line between the corium and membrane oblique (transverse in *Pachynomus*), and the absence of numerous free-ending veins in the membrane (present in *Pachynomus*).

REDESCRIPTION: *Male*: Total length between 6.8–9.8 mm, elongate ovoid with ratio total length to corium width 2.6–3.5, macropterous, hemelytron reaching or surpassing apex of abdomen. COLORATION: Ranging from dark brown with pale yellow marks on connexiva and bases of femora to combinations of castaneous, brown, and pale yellow, with or without pale yellow mark at base of membrane, and veins concolorous with remainder of membrane, slightly lighter, or with contrasting pale yellow coloration. SURFACE AND VESTITURE: Body surface dull to moderately shining, thoracic pleura rugose, labium and legs shiny. Body, antenna, labium, and legs with sparse covering of long setae, setation denser on distal pseudosegment of pedicel and antennal flagellomeres, ventral surfaces of forefemur and foretibia with rows of short and stout spinelike setae, interspersed with long, erect, and moderately stout setae. Small fossula spongiosa on tip of foretibia. Abdominal mediosternites 3–8 laterally with one pair of trichobothria, in submedian position on mediosternite 3 and more laterad on each subsequent segment, trichobothrium on segment 8 at level of trichobothrium 6, trichobothrium 9 dorsolaterally on pygophore (fig. 4H). STRUCTURE: Head moderately elongate, between 1.2 and 1.7× as long as wide, ratio head width to synthlipsis ~2.7–~4.3, with larger value indicating bigger eyes, reniform or globular in lateral view, dorsal eye margin not or barely reaching or surpassing dorsal head surface. Antenna with scape short, slightly curved, reaching or barely surpassing apex of head (fig. 3), (subdivided) pedicel more slender than scape, about as long as combined flagellomeres, flagellomeres slender. Labium (fig. 4B) stout and curved, reaching or slightly surpassing forecoxa, first segment triangular and stout, second about half as long as third, third with width decreasing

toward apex, fourth segment almost as long as third, tapering. Thorax lateral margin of pronotum straight or slightly concave, with rounded humeral angle, with distinct anterior collar, smooth calli occupying entirety of lobe, 5–8× longer than posterior lobe (at midline), longitudinal sulcus well developed, with or without sinuous rugosity, posterior lobe extremely narrow to moderately wide at midline, length greater at humeral angle, separated from anterior lobe by more or less deeply imprinted, slightly curved transverse sulcus, sulcus with more or less distinct rugosity, finely or coarsely punctate or rugose, posterior margin concavely excavated, leaving mesoscutum medially exposed; scutellum with anterolateral calli, median sulcus of variable depth, flattened apical area, and blunt, slightly knob shaped, slender, or acute tip. Forewings macropterous, corium with clavus, endocorium, and exocorium well developed, medial fracture long, costal fracture absent, with pitlike punctures along veins on clavus and corium (total of six or seven rows), membrane with two (e.g., fig. 2, *C. tenuis*) or three (fig. 1, *C. globosus*, n. sp.) closed cells, the two cells present in all species formed by M and Cu (anterior) and Cu and An1 (posterior), third cell by R and M; MCu cell as wide as or slightly wider than CuAn1 cell (figs. 1, 2). Legs with fore- and middle trochanters ventrally with spinelike setae apically; forefemur greatly swollen, flattened ventrally, anteroventrally with band of spinelike setae consisting of 2–3 adjacent rows, middle femur slender, ventrally with one band of spinelike setae along anterior margin consisting of 2 rows, and one row along posterior margin, hind femur slender, unarmed; fore- and middle tibiae slender, slightly curved, ventrally with single row of spinelike setae interspersed with setae, with small fossula spongiosa, slightly smaller on middle than on foretibia, hind tibia unarmed. Abdomen with spiracles on mediosternites 3–7 ventrad of ventral connexival suture, pairs of trichobothria on mediosternites 3–8, close to midline on segment 3 and gradually more lateral on subsequent segments. Genitalia with pygophore and parameres symmetrical or almost so to strongly asymmetrical, pygophore with anterolateral protuberances, parameres inserted in posterior half of pygophore, with blade-shaped distal portion of parameres pointing mediad and crossed, trichobothrium on dorsolateral margin of pygophore.

Female: Similar to male in coloration, body shape, and size, macropterous or submacropterous. Genitalia as in figure 5K, L, with clearly separated mediotergites 9 and 10, flanked laterally by paratergite 9, platelike gonocoxa 8, hook-shaped apices of gonapophyses 8 and 9 visible even when ovipositor is almost closed, and gonoplares visible externally as horizontally ovoid sclerites ventral to tergite 10.

DISCUSSION: Harris (1930) created *Camarochilus* as a subgenus of *Pachynomus* and differentiated it from the nominal subgenus based on the following characters: the sides of the pronotum constricted (evenly convex in *Pachynomus* and *Punctius*); hemelytra longer with more extensive corium, the apex of which is less transverse (hemelytron does not surpass tip of abdomen, corium shorter and with wider angle); metapleuron flat and longer than high (fig. 4C); and mid and hind leg with tarsomeres 2 and 3 subequal (fig. 4G). We add a character that describes the sculpture of the pronotum to the diagnoses (sculpture of the pronotum with the anterior lobe smooth and the posterior rugose) and that we believe is diagnostic at the genus level, and we follow Chen et al. (2019) in also using the length of the second and third labial segments as part of the diagnosis.

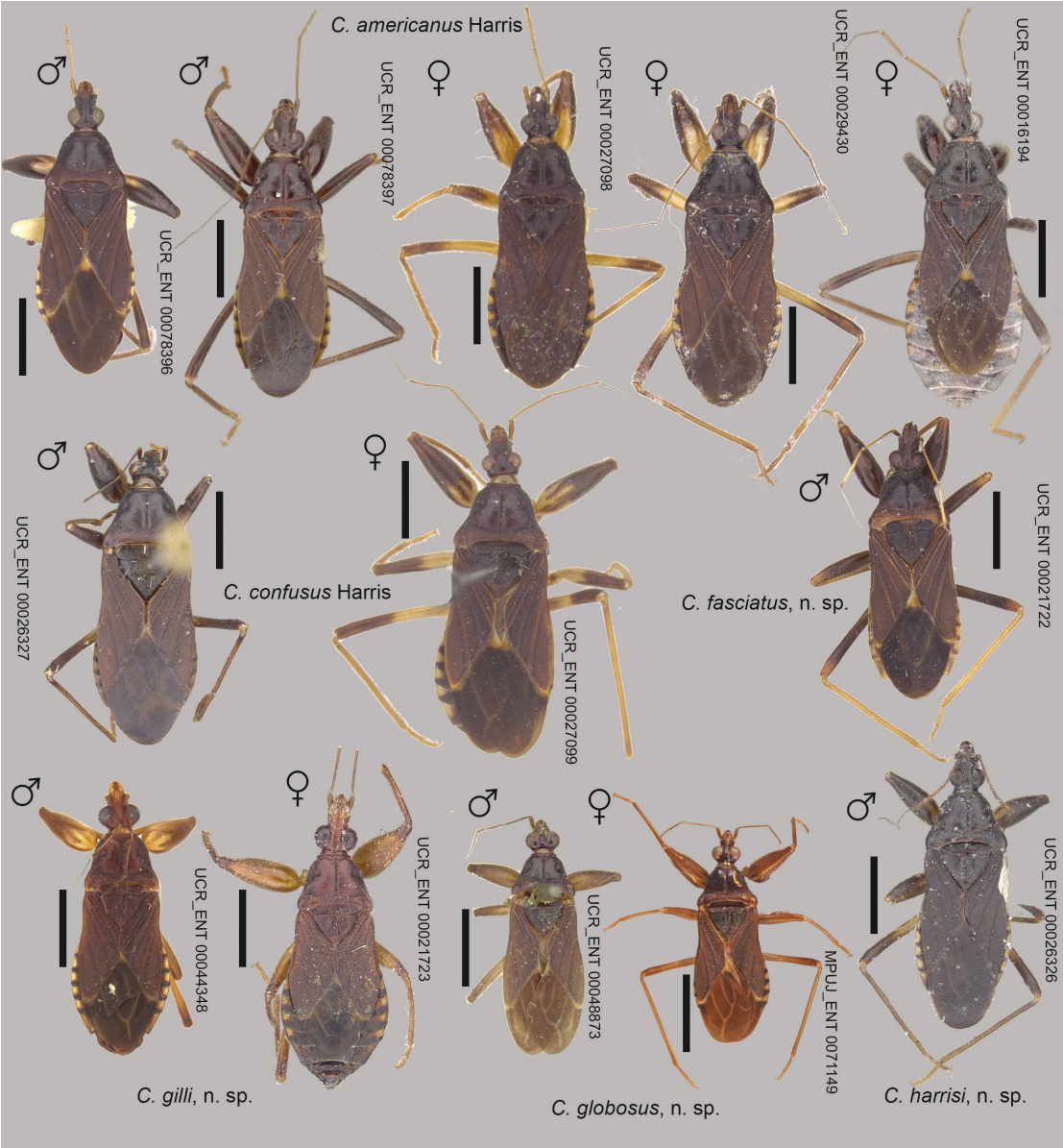


FIGURE 1. Dorsal habitus of *Camarochilus* spp. Multiple male and female specimens are documented for *C. americanus* Harris to visualize intraspecific variation; one male and one female specimen (where available) are illustrated for other species. Scale bars = 2 mm.

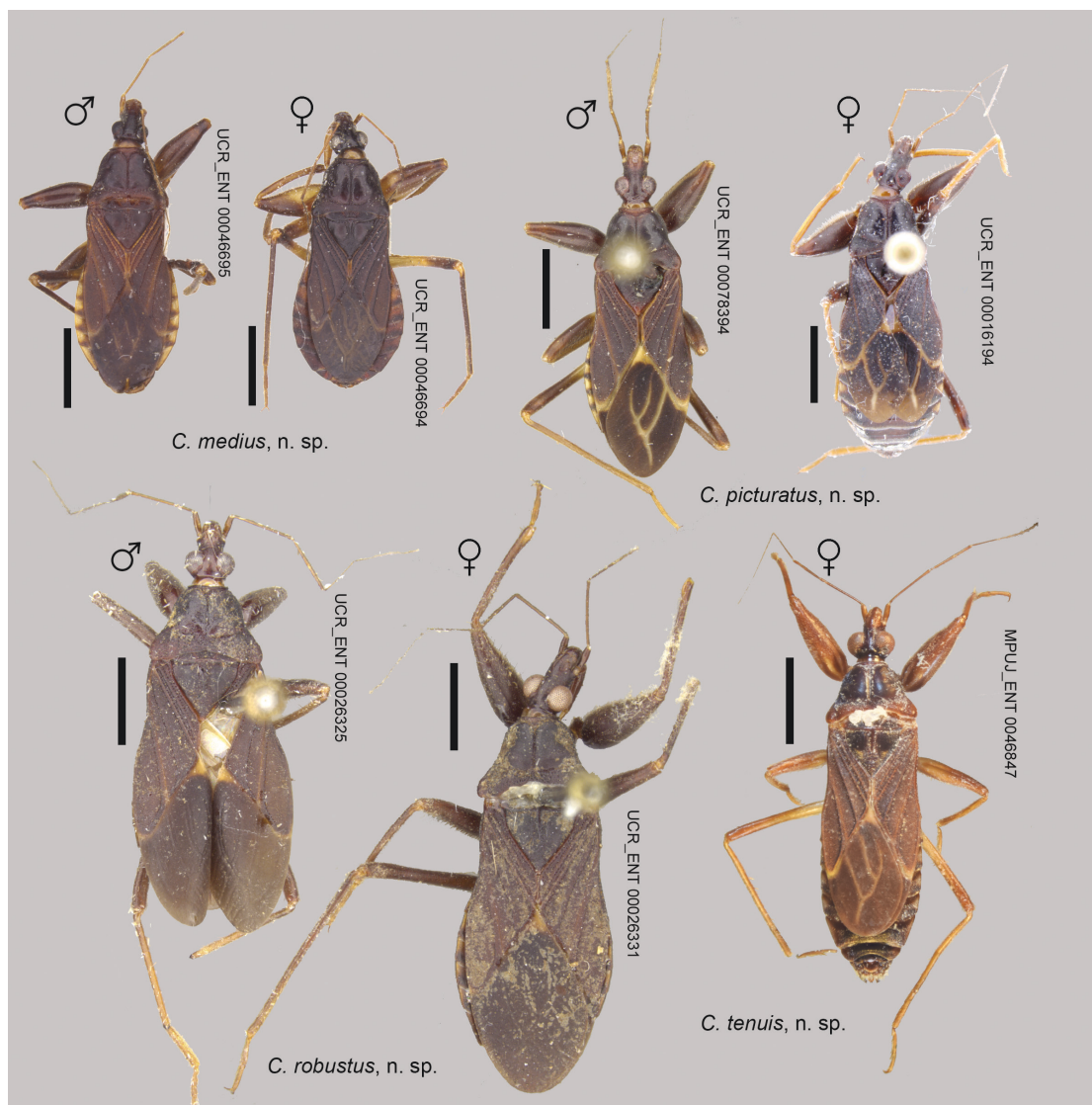


FIGURE 2. Dorsal habitus of *Camarochilus* spp. Scale bars = 2 mm.

Camarochilus is part of the Pachynominae that are diagnosed, among other characters, by the lack of ocelli (present in Aphelonotinae) and by corium and membrane separated along a straight line (sinuous in Aphelonotinae). The arrangement of abdominal trichobothria is diagnostic for the two subfamilies, with Pachynominae possessing pregenital abdominal trichobothria on segments 3 to 8 and Aphelonotinae having trichobothria only on segments 6, 7, and 8. Carayon and Villiers (1968) also indicated that the lateral margin of the pygophore in Pachynominae is ornamented with two protuberances that carry denticles, but did not illustrate them. We show below that these denticles provide excellent species-level diagnostic characters within *Camarochilus* in terms of size, degree of asymmetry, and ornamentation. We have examined

one male specimen of *Punctius alutaceus* (Stål) where the protuberances are small, symmetrical, and ornamented with a few denticles. Future research on Old World Pachynomidae should document the pygophore protuberances to evaluate whether they also provide species-diagnostic characters for *Pachynomus* and *Punctius*. According to Carayon and Villiers (1968), *Camarochilus* is differentiated from the two Old World genera of Pachynominae by the absence of a costal fracture (present in *Pachynomus* and faint in *Punctius*) and the absence of numerous free-ending veins in the membrane that are characteristic for *Pachynomus*. The key provided by Chen et al. (2019) now allows for straightforward identification of the four described pachynomine genera.

We examined two specimens of *Camarochilus* on loan from the BMNH that were both mutilated (e.g., one missing the pygophore) and we were unable to identify these specimens to species. Given current knowledge on species distribution ranges, the fact that both specimens were collected in Guyana, and overall size and coloration, these specimens likely belong to *C. americanus*. Specimen information details are: GUYANA: Demerara-Mahaica: Phi Cane Grove N. Diamond, 6.62425°N 57.91007°W, 3 m, 12.6.46, H.C. James, 1 ♂ (UCR_ENT 00048875) (BMNH). East Berbice-Corentyne: New River, 1.9642°N 57.92168°W, 223 m, 03 May 1938, C.A. Hudson, 1 ♀ (UCR_ENT 00048874) (BMNH).

KEY TO SPECIES OF *CAMAROCHILUS* BASED ON MALE SPECIMENS

1. Total length 7 mm or less 2
- 1'. Total length more than 7 mm 3
2. Femur brown contrasting with pale yellow tibia (figs. 1, 3; *C. fasciatus*); medium-sized eyes with ratio of head width to synthlipsis ~3.3 *C. fasciatus*
- 2'. Legs pale yellow to light brown, with femora distally and two or three longitudinal stripes dorsally, tibiae, and tarsi slightly darker (figs. 1, 3); eyes large, with ratio of head width to synthlipsis ~3.9 *C. gilli*
3. Total length more than 9 mm 4
- 3'. Total length between 7.2 and 8.7 mm 5
4. Uniform coloration with concolorous veins; symmetrical pygophore with right and left protuberances of similar size and setation (figs. 2, 3, 5, 6; *C. robustus*) *C. robustus*
- 4'. Brown, castaneous, and pale yellow coloration with faintly contrasting veins; strongly asymmetrical pygophore with right protuberance long and conical (figs. 1, 3, 5, 6; *C. confusus*) *C. confusus*
5. Pygophore symmetrical with right and left protuberances of similar size and setation (figs. 1, 3, 5, 6; *C. medius* and *C. globosus*) 6
- 5'. Pygophore strongly asymmetrical with rounded right protuberance much larger and much larger spinelike setae (figs. 1, 3, 5, 6; *C. americanus*, *C. harrisi*, *C. picturatus*) 7
6. Eyes fairly small (fig. 2); right paramere with capitate apex, left with tapering apex (fig. 6) ... *C. medius*
- 6'. Eyes large (fig. 1); both parameres with tapering apex (fig. 6). *C. globosus*
7. Membrane with strongly contrasting pale veins *C. picturatus*
- 7'. Membrane with veins either concolorous (*C. harrisi*) or faintly contrasting (*C. americanus*) ... 8
8. Coloration blackish brown, veins concolorous (fig. 1; *C. harrisi*) *C. harrisi*
- 8'. Coloration brown, castaneous, and pale yellow, with faintly contrasting veins (fig. 1; *C. americanus*) *C. americanus*

Camarocheilus americanus Harris

Figures 1, 3, 5–7, table 1

Pachynomus (Camarochilus) americanus Harris, 1930: 242 (n. sp.).*Camarocheilus americanus* Harris: Carayon and Villiers, 1968: 732 (n. comb).

HOLOTYPE: PANAMA: Panama: La Chorrera, 8.8803°N 79.7833°W, 69 m, 12 May 1912, collector unknown, 1 ♀ (UCR_ENT 00027098) (USNM).

REVISED DIAGNOSIS (figs. 1, 3, 5, 6): Recognized by the medium body size, medium-sized eyes, brown, castaneous, and pale yellow coloration with faint veins, and strongly asymmetrical pygophore with rounded right protuberance much larger, and with much larger spinelike setae. Similar in overall appearance to *C. confusus*, but smaller and distinguished by the pygophore armature of rounded protuberances in *C. americanus* and a conical right protuberance in *C. confusus*. The strongly asymmetrical pygophore and its armature resemble those in *C. harrisi*, n. sp., and *C. picturatus*, but these species are distinguished by their distinct coloration.

REDESCRIPTION: *Male*: total length between 7.6–8.7 mm, ratio total length to corium width ~3.2–3.3, macropterous, hemelytron reaching or barely surpassing apex of abdomen. COLORATION: dorsum brown with castaneous corium, membrane brown with concolorous to slightly lighter veins, with or without pale yellow mark at base of membrane, dorsal laterotergites brown with triangular pale yellow marks; head brown with anteocular area lighter brown in some specimens, labium brown or first labial segment lighter brown, remaining segments pale yellow, antenna dark pale yellow or brown, foreleg coxa proximally brown, coxa distally, trochanter, and femur proximally pale yellow, femur distally brown, tibia and tarsus light brown, mid and hind leg with coxa, trochanter, and femur proximally pale yellow, femur distally brown, tibia and tarsus light brown, or legs brown with femora slightly darker than remaining segments, tibia proximally with narrow lighter band, pleura brown, abdominal mediosternites brown, ventral laterotergites 2–6 with pale yellow patches. SURFACE AND VESTITURE: As in generic description. STRUCTURE: Head ~1.2–1.7× as long as wide, eyes in dorsal view moderately large to large, shallow semiglobular, ratio head width to synthlipsis ~2.9–~3.3, reniform in lateral view, dorsal eye margin not or barely reaching dorsal head surface. Antenna as in generic description, proximal pseudosegment of pedicel ~2× as long as scape. Labium as in generic description. Thorax as in generic description, anterior pronotal lobe ~6× longer than posterior lobe, posterior lobe narrow, finely punctate; scutellum with knob-shaped tip. Wings as in generic description with two clearly delimited cells in membrane. Legs as in generic description with ratio forefemur height to length ~0.35 (0.31–0.38). Abdomen as in generic description. Genitalia with pygophore strongly asymmetrical, protuberances laterally rounded and dorsally flattened, right much larger than left, spinelike setae on right much stouter than on left, right with ~40 and left with ~30 conical, spinelike setae; parameres stout, right much larger than left, sickle-shaped with proximal and distal area of similar length, proximal area with dense, stout, and relatively long setae, distal area flattened into blade, tapering to apex.

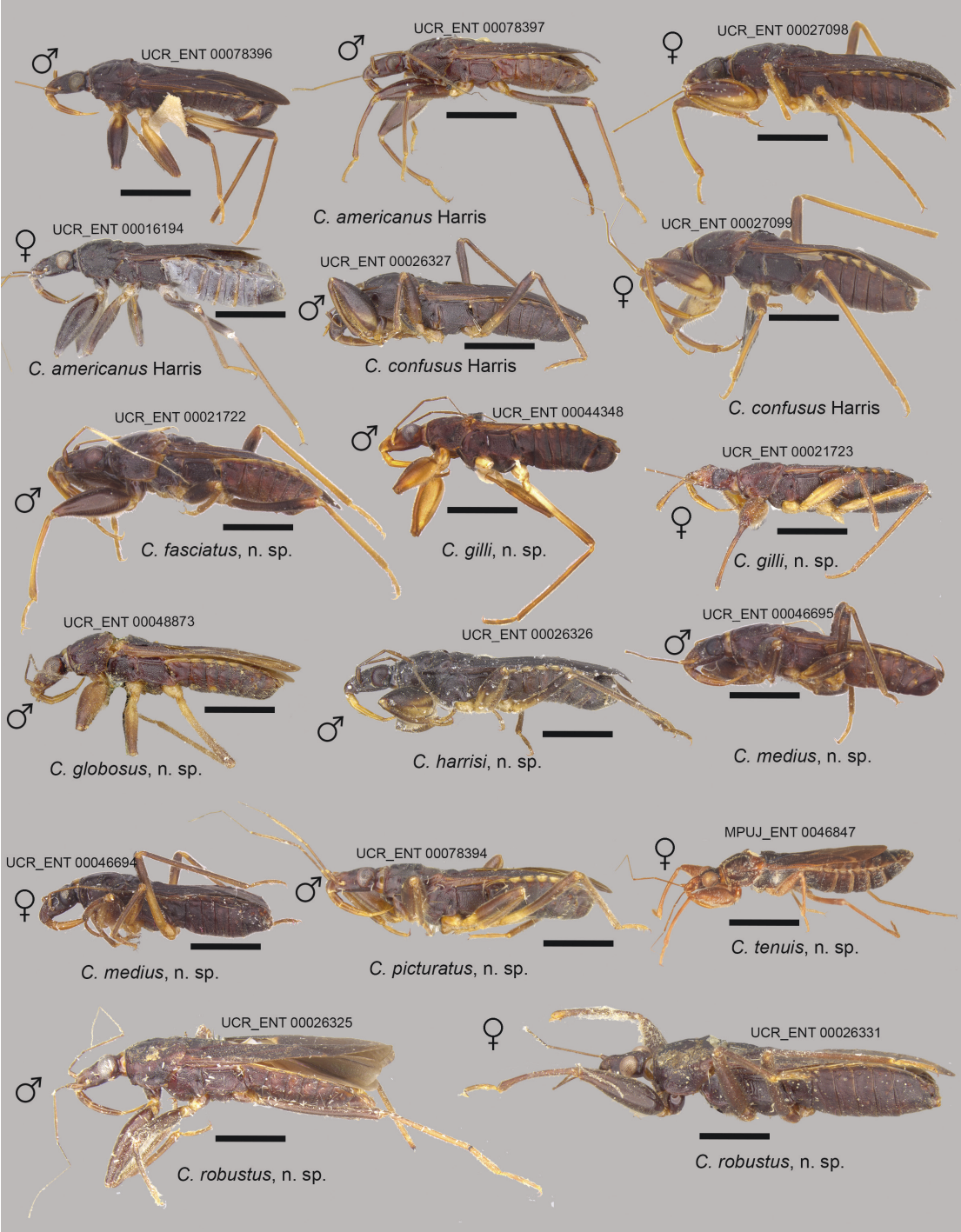


FIGURE 3. Lateral habitus of *Camarochilus* spp. Scale bars = 2 mm.

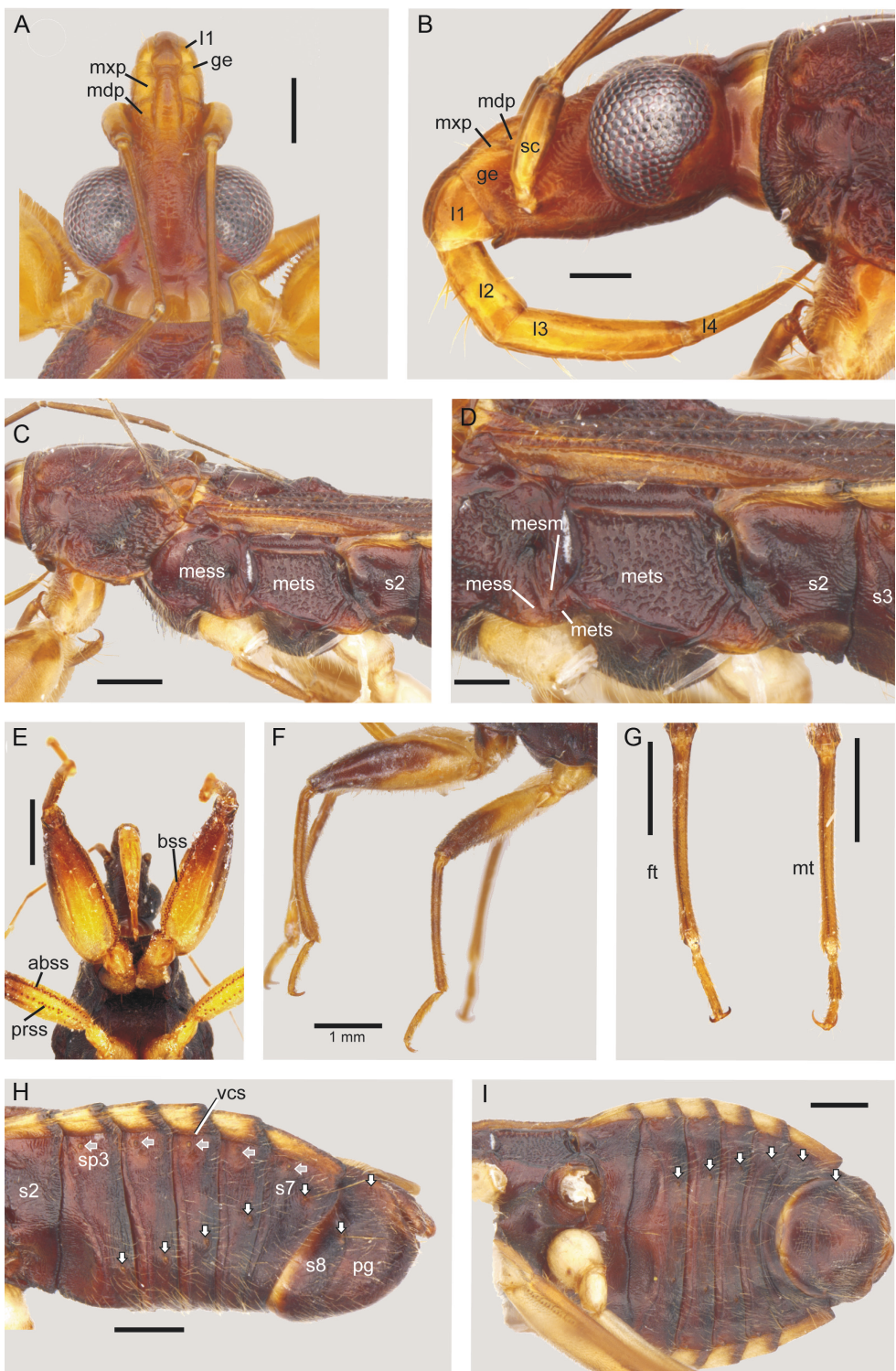
Female: As in generic description, macropterous or submacropterous, total length 8.1–9.5 mm, ratio total length to corium width ~3.0–3.5, ratio forefemur height to length ~0.34–0.37. Genitalia as in generic description.

DISTRIBUTION: Ranges from Central America (Costa Rica, Panama) to northern South America (Colombia, French Guiana, Guyana, and Venezuela). All specimens were collected at low elevation (between 15 and 229 m) and most localities are primary or secondary rainforest (e.g., La Selva Biological Station in Costa Rica or Kaw Mountains in French Guiana).

DISCUSSION: In the description of this species, Harris (1930) labeled the holotype as “male, La Chorrera, Panama, May 12, 1912.” The specimen loaned from the USNM with these label data and a “holotype” label by Harris is actually a female. Our measurements of this specimen (total length: 8.57 mm; corium width: 3.27 mm) are consistent with Harris’s measurements (“Length, 8.6 mm.; width, 3 mm.”) and we therefore assume that Harris mistakenly referred to this specimen as a male. Our concept of this species allows for intraspecific variability with respect to leg coloration and wing type. Harris (1930) indicated that the forefemur in this species is “yellowish testaceous” with the exception of a “wide apical ring, which is prolonged basally on anterior and posterior sides into broad stripes,” that is brown. We observed this exact color pattern in the holotype from Panama (UCR_ENT 00027098) and other specimens, e.g., AMNH_ENT 00029430, that were collected in the Canal Zone in Panama. In other specimens, the forefemur is entirely brown (e.g., UCR_ENT 00016194 from the Canal Zone in Panama and UCR_ENT 00021720 from Colon, Panama), whereas the coloration is intermediate in other specimens (e.g., UCR_ENT 00078396 from Guyana). All males are macropterous as are most females, but specimen UCR_ENT 00016194 (Canal Zone, Panama) is submacropterous. We failed to identify characters that would allow us to further subdivide this taxon into multiple species. Longer series including males from across the distribution range should further test this species hypothesis.

OTHER SPECIMENS EXAMINED: COLOMBIA: Cesar: Valledupar, 10.4769°N 73.2506°W, 175 m, 20 May 1968–24 May 1968, Borys Malkin, 1 ♀ (UCR_ENT 00078395) (AMNH). COSTA RICA: Heredia: Finca la Selva Verde, 12 km S Puerto Viejo, 10.4306°N 84.007°W, 152 m, 23 Sep 1986–26 Sep 1986, J.E. Eger, 2 ♀ (UCR_ENT 00040775, UCR_ENT 00040776) (BDGC). FRENCH GUIANA: unknown: Kaw Hwy Pk 37, 4.5151°N 52.0666°W, 147 m, 27 Aug 1989–30 Aug 1989, J.A. Chemsak, 1 ♀ (UCR_ENT 00038502) (UCB). GUYANA: Cuyuni-Mazaruni Region: Bartica, 5.78765°N 57.62801°W, 15 m, no date provided, B.G., 1 ♂ (UCR_ENT 00078396) (AMNH). Upper Demerara-Berbice Region: Linden (includes the communities of MacKenzie and Wismar), Demerara River, 6.01161°N 58.30896°W, 17 m, 22 Jun 1927, Unknown, 1 ♀ (UCR_ENT 00039071) (CUIC). PANAMA: Canal Zone: Barro Colorado Island,

FIGURE 4. Morphology of *C. gilli*, n. sp. (UCR_ENT 00044348; A–D, H, I) and *C. americanus* (AMNH_ENT 00029430; E–G): **A**, **B**, head in dorsal (A) and lateral (B) view; **C**, thorax in lateral view; **D**, close up of meso- and metapleuron and base of abdomen; **E**, head and prothorax, ventral view; **F**, fore- and mid legs, lateral view; **G**, close up of fore- and mid leg tibia and tarsus, ventral view; **H**, **I**, abdomen in lateral (H) and ventral (I) view. Abbreviations: **abss**, anterior band of spinelike setae on middle femur; **bss**, band of spinelike setae on forefemur; **ft**, foretibia; **ge**, gena; **ll–4**, labial segments 1–4; **mdp**, mandibular plate; **mesm**, mesepimeron; **mess**, mesepisternum; **met**, metepisternum; **mt**, mid tibia; **mxxp**, maxillary plate; **pg**, pygophore; **prss**, posterior row of spinelike setae on middle femur; **s3–8**, mediosternites 3–8; **sc**, scape; **sp3**, spiracle of abdominal segment 3; **vcs**, ventral connexival suture. Scale bars = 0.25 mm: A, B, D; 0.5 mm: C, H, I; 1 mm: E–G.



9.16667°N 79.85°W, 83 m, 18 May 1973, D. Engleman, 1 ♂ (UCR_ENT 00078397) (AMNH). Coco Solo Hospital, 9.35°N 79.85°W, 38 m, 09 May 1973, D. Engleman, Light Trap, 1 ♀ (AMNH_ENT 00029430) (AMNH). Parque Nacional Soberania, Pipeline Rd., 9.07429°N 79.65981°W, 88 m, 07 Aug 1983, L.N. Sorkin, 1 ♀ (UCR_ENT 00016194) (AMNH). Colon: Barro Colorado Island, Canal Zone, 9.15472°N 79.84806°W, 179 m, 22 Jul 1938, E.C. Williams, Jr., 1 ♂ (UCR_ENT 00021720) (FMNH). Panama: Madden Forest, Canal Zone, 9.08333°N 79.58333°W, 229 m, 09 Jan 1974, J.A. Slater and J. Harrington, 1 ♀ (AMNH_ENT 00029427) (AMNH). UNKNOWN: unknown: unknown Co.: Central America, 1938, Rev. Th. Heyde, 1 ♀ (UCR_ENT 00026329) (USNM). VENEZUELA: Bolivar: Cedeño Co.: 5 km E Caicara, 7.65348°N 66.10093°W, 38 m, 11 Jun 1996, B.D. Gill, Light Trap, 1 ♀ (UCR_ENT 00040738) (BDGC). 15 km E of Caicara, 7.65799°N 66.03281°W, 38 m, 12 Jun 1996, B.D. Gill, Light Trap, 6 ♀ (UCR_ENT 00040740–UCR_ENT 00040745) (BDGC); 12 Jun 1996–13 Jun 1996, H. Howden and A. Howden, Light Trap, 1 ♀ (UCR_ENT 00040739) (BDGC). Guarico: Hato Masaguaral (44 km S Calabozo), 8.52339°N 67.42735°W, 67 m, 03 May 1985–10 May 1985, Menke and Carpenter, 1 ♀ (UCR_ENT 00026330) (USNM).

Camarochilus confusus Harris

Figures 1, 3, 5–7, table 1

Pachynomus (*Camarochilus*) *confusus* Harris, 1930: p. 243 (n. sp.).

Camarochilus confusus Harris: Carayon and Villiers, 1968: p. 733 (n. comb).

HOLOTYPE: Not examined.

REVISED DIAGNOSIS (figs. 1, 3, 5, 6): Recognized by the large body size, medium-sized eyes, brown, castaneous, and pale yellow coloration with faint veins, and strongly asymmetrical pygophore with right protuberance long and conical. Similar to *C. americanus*, but larger and with unique pygophore armature.

REDESCRIPTION: *Male*: Total length ~9.3 mm. COLORATION: dorsum including corium castaneous, membrane brown with veins concolorous, dorsal laterotergites brown with triangular pale yellow marks; head brown with anteocular area lighter brown, first labial segment brown, remaining segments pale yellow, antenna darker yellow, legs light brown with femora dorso-distally and tibiae proximally suffused with brown, pleura brown, abdominal mediosternites brown, ventral laterotergites 2–6 with small pale yellow patches. SURFACE AND VESTITURE: as in generic description. STRUCTURE: Head ~1.6× as long as wide, eyes in dorsal view moderately large, shallow semiglobular, ratio head width to synthlipsis ~3.1, reniform in lateral view, dorsal eye margin barely reaching dorsal head surface. Antenna as in generic description, proximal pseudosegment of pedicel ~2× as long as scape. Labium as in generic description. Thorax as in generic description, anterior pronotal lobe ~5.6× longer than posterior lobe, posterior lobe narrow, finely punctate; scutellum with knob-shaped tip. Wings as in generic description with two clearly delimited cells in membrane. Legs as in generic description with ratio forefemur height to length ~0.39. Abdomen as in generic description. Genitalia with pygophore strongly asymmetrical, right protuberance conical and long, left laterally rounded and dorsally flattened, right much larger than left,

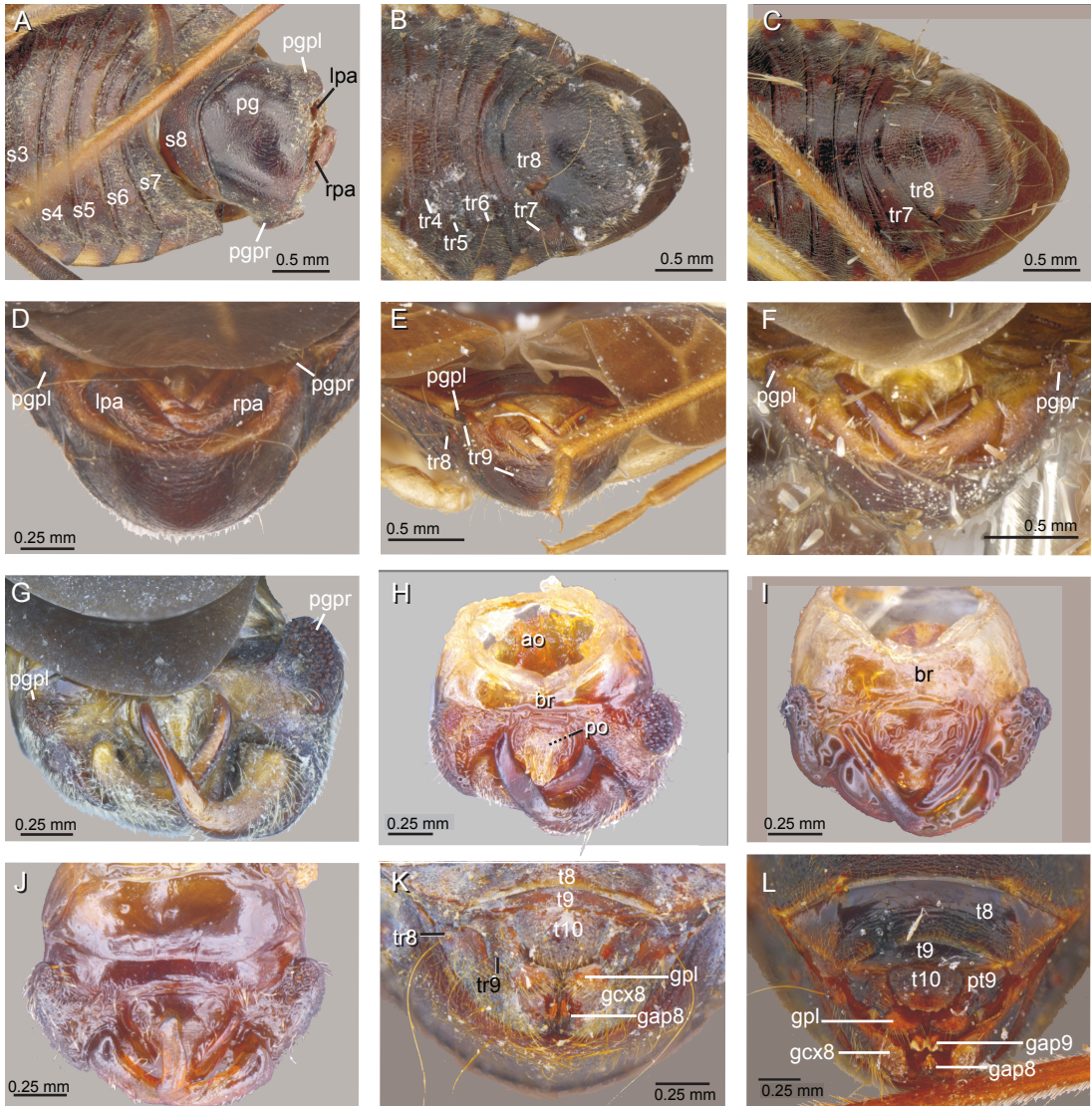


FIGURE 5. Male and female genitalia of *Camarochilus* spp.: **A–C**, male abdomen and pygophore, ventral view; **D–G**, pygophore in situ, caudal (**D–F**) or dorsal (**G**) view; **H–J**, dissected pygophore, dorsal view. **A**, *C. americanus* (UCR_ENT 00021720); **B**, *C. harrisi*, n. sp. (UCR_ENT 00026326); **C**, *C. picturatus*, n. sp. (UCR_ENT 00078394); **D**, *C. gilli*, (UCR_ENT 00044348); **E**, *C. picturatus* (UCR_ENT 00078394), **F**, *C. robustus*, n. sp. (UCR_ENT 00026325); **G**, *C. americanus* (UCR_ENT 00021720); **H**, *C. harrisi* (UCR_ENT 00027097); **I**, *C. globosus*, n. sp. UCR_ENT 00021721); **J**, *C. medius*, n. sp., UCR_ENT 00046695. Abbreviations: **ao**, anterior opening of pygophore; **br**, sclerotized bridge between anterior and posterior opening of pygophore; **gap8, 9**, gonapophyses 8 and 9 (= valvula 1 and 2); **gcx8, 9**, gonocoxa 8 and 9 (valvifer 1 and 2); **gpl**, gonoplac (= styloid, valvula 3); **lpa**, left paramere; **pg**, pygophore; **pgpl**, left protuberance on pygophore; **pgpr**, right protuberance on pygophore; **po**, posterior opening of pygophore (hidden beneath proctiger); **pt9**, paratergite 9; **pt**, proctiger; **s3–8**, mediosternites 3–8; **sc**, scape; **rpa**, right paramere; **t8–10**, mediotergites 8 to 10; **tr3–9**, trichobothria on abdominal segments 3–9.

spinellike setae on right and left of similar size, right and left with less than 10 elongate spine-like setae; parameres stout, right larger than left, sickle-shaped with proximal area shorter than distal, proximal area with dense, stout, and short setae, distal area narrow, slowly tapering to apex.

Female: As in generic description, macropterous, total length ~9.5 mm, ratio total length to corium width ~3.5, ratio forefemur height to length ~0.38. Genitalia: as in generic description.

DISTRIBUTION: Known from the states of Minas Gerais and Pará in Brazil.

DISCUSSION: The two specimens examined by Harris (1930) are syntopic ("Santarem, Brazil"). Harris provided measurements as "Length, 9.2–9.8 mm; width, 3.3–3.42 mm." We assume that the smaller number refers to the male holotype, the larger to the female paratype, which would be fairly consistent with the measurements we have taken. Harris (1930) separated this species from *C. americanus* based on the slightly larger size, longer forefemora with dark coloration extending over most of the femur, a deeper median pronotal groove with a "distinct zigzag line along its bottom" and a longer posterior pronotal lobe. Our measurements indicate that the forefemur is indeed somewhat longer (ratio height to length) than in *C. americanus*; given the subtlety of this feature, we do not use it as one of the main diagnostic features to separate the two species. We failed to identify solid diagnostic features from the shape and ornamentation of the median groove of the anterior pronotal groove (considerable variability within species) and discourage its use in identifying species of *Camarochilus*. Similarly, the relative dimensions of the anterior and posterior pronotal lobes are too similar in *C. americanus* and *C. confusus* to be of species diagnostic value (see table. 1 for details). Males are easily distinguished by the strikingly different pygophore protuberances and their ornamentation. Based on the examined specimens, the distribution ranges of the two species are also distinct (fig. 7).

PARATYPE: BRAZIL: Pará: Santarem, 2.4333°S 54.7°W, Acc. No. 2966, Unknown, 1 ♀ (UCR_ENT 00027099) (USNM).

OTHER SPECIMENS EXAMINED: BRAZIL: Minas Gerais: Ponte Nova, 20.41174°S 42.897°W, 442 m, Nov 1965, M. Alvarenga, 1 ♂ (UCR_ENT 00026327) (USNM). Pará: unknown, no date provided, Baker, 1 ♀ (UCR_ENT 00046696) (CAS).

Camarochilus fasciatus, n. sp.

Figures 1, 3, 5–7, table 1

HOLOTYPE: COLOMBIA: Cundinamarca: Anolaima, 4.7633°N 74.4683°W, 1604 m, 15 Apr 1992, I. Garcia, 1 ♂ (UCR_ENT 00021722) (MPUJ).

DIAGNOSIS (figs. 1, 3, 5, 6): Recognized by the medium body size, medium-sized eyes, brown, castaneous, and pale yellow coloration with posterior pronotal lobe lighter than anterior lobe (figs. 1, 3). Similar to *C. picturatus* in the contrasting femur (brown) and tibia (pale yellow), but distinguished by the smaller size, concolorous membrane veins, and light-colored posterior pronotal lobe.

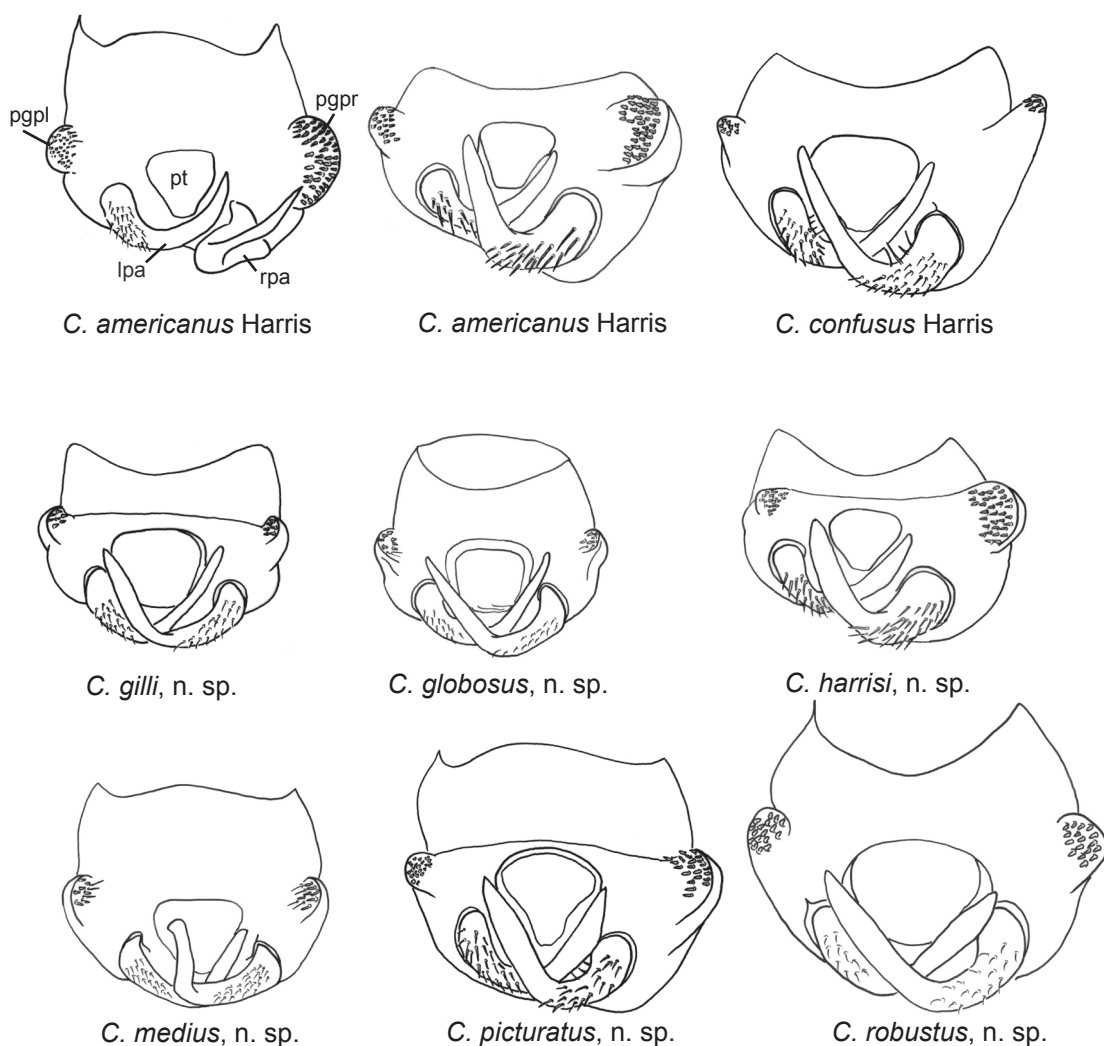


FIGURE 6. Pygophore of *Camarochilus* spp. in dorsal view, illustrating species-diagnostic differences in pygophore symmetry, size, shape, and degree of asymmetry of pygophore protuberances, and ornamentation as well as paramere shape for all species with known males. Abbreviations: **lpa**, left paramere; **pgpl**, left protuberance on pygophore; **pgpr**, right protuberance on pygophore; **pt**, proctiger; **rpa**, right paramere.

DESCRIPTION: *Male*: Total length ~7.0 mm, ratio total length to corium width ~2.6. **COLORATION:** Dorsum brown with posterior pronotal lobe graded from lighter brown to pale yellow, corium castaneous, membrane brown with veins slightly lighter, dorsal laterotergites pale yellow with narrow brown band posteriorly; head and first labial segment brown, remaining segments lighter brown, scape and proximal pseudosegment of pedicel brown, remaining segment pale yellow, legs with coxae and femora brown, femora somewhat lighter distally, trochanters, tibiae, and tarsi light brown, pleura brown with posterior margin of propleuron lighter brown, abdominal mediosternites castaneous, ventral laterotergites 2–6

pale yellow with light brown posterior margins. SURFACE AND VESTITURE: As in generic description. STRUCTURE: Head $\sim 1.3\times$ as long as wide, eyes in dorsal view moderately large, shallow semiglobular, ratio head width to synthlipsis ~ 3.3 , reniform in lateral view, dorsal eye margin barely reaching dorsal head surface. Antenna as in generic description, proximal pseudosegment of pedicel $\sim 2.7\times$ as long as scape. Labium as in generic description. Thorax as in generic description, anterior pronotal lobe $\sim 6.6\times$ longer than posterior lobe, posterior lobe narrow, rugose; scutellum with knob-shaped tip. Wings as in generic description with two clearly delimited cells in membrane. Legs as in generic description with ratio forefemur height to length ~ 0.33 . Abdomen as in generic description. Genitalia: pygophore missing.

Female: Unknown.

ETYMOLOGY: Named for the contrasting coloration of the pronotum, with dark anterior and lighter posterior lobe, after Latin *fasciatus*, meaning “with stripe or band.”

DISTRIBUTION: Only known from the type locality in the department of Cundinamarca in Colombia. Compared with all other congeners, this species was collected at fairly high elevation (~ 1600 m) in the Cordillera Oriental west of Bogotá.

DISCUSSION: We are confident in establishing this new species based on the male holotype that lacks the pygophore for two reasons: coloration and size of the holotype and the high-elevation type locality set this species apart from other here recognized species of *Camarochilus*. Colombia has the greatest diversity of *Camarochilus* species among all Central and South American countries (*C. americanus*, *C. fasciatus*, *C. gilli*, *C. globosus*, *C. harrisi*, and *C. tenuis*). However, *C. americanus* has only been collected in the extreme northern region of Colombia (south of the Sierra Nevada de Santa Marta), whereas *C. gilli*, *C. globosus*, and *C. tenuis* are known only from lowland Amazonian rainforest localities. The origin of *C. harrisi* in Colombia remains unknown because all known specimens were intercepted at Miami airport from an airplane that originated in Colombia.

Camarochilus gilli, n. sp.

Figures 1, 3, 5–7, table 1

HOLOTYPE: PERÚ: Madre de Dios: Los Amigos Biol. Sta., 12.56922°S 70.1°W, 268 m, 23 Dec 2010, C. Weirauch, 1 ♂ (UCR_ENT 00044348) (UCR).

DIAGNOSIS (figs. 1, 3, 5, 6): Recognized by the small body size, large eyes, brown, castaneous, and pale yellow coloration with faint veins, and symmetrical pygophore with right and left protuberances of similar size and with similar setation. Similar in coloration to *C. americanus* and *C. confusus*, but much smaller and with larger, more globose eyes. Pygophore most similar to those in *C. globosus*, *C. medius*, and *C. robustus*, n. sp., in being symmetrical, but distinguished by size and coloration.

DESCRIPTION: *Male*: Total length 6.8 mm, ratio total length to corium width ~ 3.1 , macropterous, hemelytron reaching apex of abdomen. COLORATION: Dorsum castane-

ous, with small pale yellow mark at base of membrane, membrane veins slightly to distinctly lighter, dorsal laterotergites brown with triangular pale yellow marks; head castaneous with anteocular area lighter than posterior, first labial segment light castaneous, with remaining segments reddish pale yellow, antenna castaneous, with scape somewhat lighter than remaining segments, legs pale yellow to light brown, with femora distally and two or three longitudinal stripes dorsally, tibiae, and tarsi slightly darker, pleura castaneous, abdominal mediosternites brown, ventral laterotergites 2–6 with small pale yellow patches. SURFACE AND VESTITURE: As in generic description. STRUCTURE: Head $\sim 1.4\times$ as long as wide, eyes in dorsal view large, strongly semiglobular, ratio head width to synthlipsis ~ 3.9 , globular in lateral view, dorsal eye margin surpassing dorsal head surface. Antenna as in generic description, proximal pseudosegment of pedicel $\sim 2.4\times$ as long as scape. Labium as in generic description. Thorax as in generic description, anterior pronotal lobe $\sim 6.5\times$ longer than posterior lobe, posterior lobe narrow, coarsely punctate; scutellum with acute tip. Wings as in generic description with two clearly delimited cells in membrane. Legs as in generic description with ratio forefemur height to length ~ 0.35 ($0.33\text{--}0.37$). Abdomen as in generic description. Genitalia with pygophore symmetrical, protuberances laterally rounded and dorsally flattened, right and left of similar size, spine-like setae on right and left of similar size, right and left with less than 10 conical spinelike setae; parameres slender, right slightly larger than left, rounded sickle-shaped with proximal area slightly shorter than distal, proximal area with sparse, slender, and short setae, distal area flattened into blade, broader on right than on left paramere, tapering to apex.

Female: As in generic description, submacropterous, total length 6.6–7.2 mm, ratio total length to corium width $\sim 2.8\text{--}3.4$, ratio forefemur height to length ~ 0.36 . Genitalia: as in generic description.

ETYMOLOGY: Named for Bruce D. Gill, who has collected and made available to us from his personal collection (BDGC) the single largest assemblage of *Camarochilus* specimens.

DISTRIBUTION: Known from lowland Amazonian rainforest in Peru, Colombia, and Venezuela. This species was collected at the same locality as *C. americanus* in Venezuela. The two species are clearly separated by size and other diagnostic features.

DISCUSSION: This is one of the smallest species of *Camarochilus* and stands out by its large eyes and relatively stout forefemur. Both female paratypes are submacropterous. Additional specimens would need to be examined to test if this is a species diagnostic feature. The holotype was nondestructively DNA-extracted and the sequences were incorporated into a phylogenetic analysis of Heteroptera (Weirauch et al., 2019).

PARATYPES: COLOMBIA: Amazonas: Leticia, Comunidad indigena Monifue Amena, km 9.8 via Leticia-Tarapacá, 4.14166°S 69.92326°W, 70 m, May 2002, Mora et al., MPUJ_ENT 0046846, 1 ♀ (MPUJ). Monilla Amena. Bosque alto, 4.20316°S 69.93591°W, 60 m, 03 May 2002, Salinas, 1 ♀ (UCR_ENT 00021723) (MPUJ). VENEZUELA: Bolivar: Cedeño: 15 km E of Caicara, 7.65799°N 66.03281°W, 38 m, 12 Jun 1996, B.D. Gill, Light Trap, 2 ♂ (UCR_ENT 00040760, UCR_ENT 00040761), 8 ♀ (UCR_ENT 00040758, UCR_ENT 00040759, UCR_ENT 00040737, UCR_ENT 00040746–UCR_ENT 00040750) (BDGC).

TABLE 1 continued

	PBIUSI	TL	CC	SL	PPL	PDL	PL	APLL	PPLL	ScL	FH	FL	HW	Syn	APLW	PPLW	ScW	CW	AW
<i>confusus</i>																			
male (n=1)	UCR_ENT 00026327	9.32	1.86	0.64	1.34	1.25	1.57	1.30	0.28	1.24	0.99	2.55	1.18	0.37	2.01	2.56	1.60	2.79	2.99
female (n=2)	UCR_ENT 00046696	9.45	1.97	0.58	1.42	1.24	1.65	1.38	0.27	1.32	1.02	2.72	1.18	0.36	2.18	2.71	1.65	2.93	3.36
	UCR_ENT 00027099	9.50	1.53	0.49	1.27	1.26	1.46	1.29	0.17	1.24	0.96	2.53	1.13	0.37	1.98	2.44	1.53	2.68	3.04
<i>fasciatus</i>																			
male (n=1)	UCR_ENT 00021722	7.01	1.53	0.51	1.38	1.44	1.48	1.26	0.22	1.20	0.86	2.61	1.19	0.36	1.94	2.54	1.46	2.70	2.88
<i>gilli</i>																			
male (n=3)	UCR_ENT 00044348	6.84	1.52	0.49	1.20	1.07	1.26	1.08	0.19	0.98	0.76	2.22	1.11	0.28	1.59	1.96	1.14	2.23	2.54
	UCR_ENT 00040761	7.19	1.56	0.39	1.04	0.91	1.19	0.95	0.25	0.99	0.72	1.94	1.01	0.37	1.54	1.93	1.14	2.07	2.15
	UCR_ENT 00040760	7.09	1.49	0.41	1.02	0.87	1.19	0.97	0.22	1.02	0.69	2.07	1.02	0.37	1.52	1.93	1.23	1.99	2.23
female (n=3)	UCR_ENT 00021723	6.66	1.58	0.48	1.18	-	1.27	1.09	0.17	0.93	0.86	2.36	1.15	0.31	1.67	2.01	1.12	2.37	2.76
	UCR_ENT 00040758	7.21	1.39	0.46	1.03	0.95	1.20	1.01	0.20	1.02	0.76	2.11	1.06	0.37	1.58	2.02	1.25	2.15	2.54
	DF-Colombia	6.61	1.50	0.43	1.17	1.07	1.21	1.03	0.17	0.95	0.76	2.09	1.07	0.37	1.51	1.85	1.08	2.30	2.65
<i>globosus</i>																			
male (n=4)	UCR_ENT 00026328	7.22	1.35	0.46	1.21	1.10	1.20	0.99	0.21	1.06	0.68	2.18	1.07	0.25	1.66	2.24	1.19	2.46	2.31

TABLE 1 continued

	PBIUSI	TL	CC	SL	PPL	PDL	PL	APLL	PPLL	ScL	FH	FL	HW	Syn	APLW	PPLW	ScW	CW	AW
	UCR_ENT 00048873	7.37	1.44	0.37	0.88	0.88	1.16	0.94	0.24	0.96	0.69	1.96	1.03	0.24	1.48	1.93	1.14	2.39	-
	UCR_ENT 00021721	7.34	1.36	0.45	1.12	0.95	1.18	0.97	0.22	1.05	0.70	2.14	1.03	0.25	1.56	2.04	1.18	2.53	2.03
	DF-Colombia	7.25	1.18	0.44	1.19	0.97	1.13	0.90		1.14		1.58	1.07	0.25	1.42	1.99	1.24	2.27	
female (n=1)	DF-Colombia	7.70	1.32	0.43	1.12	0.80	1.24	0.97	0.27	1.22	0.57	1.89	1.07	0.25	1.65	2.23	1.39	2.51	2.77
<i>harrisi</i>																			
male (n=1)	UCR_ENT 00026326	7.91	1.36	0.49	0.98	1.18	1.30	1.06	0.24	1.07	0.82	2.22	1.03	0.29	1.72	2.28	1.33	2.39	2.67
<i>medius</i>																			
male (n=1)	UCR_ENT 00046695	7.54	1.53	0.51	1.02	1.08	1.30	1.14	0.15	1.09	0.82	2.26	0.96	0.35	1.78	2.07	1.72	2.21	2.63
female (n=1)	UCR_ENT 00046694	7.18	1.66	0.54	1.07	1.10	1.31	1.11	0.19	0.96	0.77	2.15	1.02	0.36	1.63	1.97	1.15	2.08	2.76
<i>picturatus</i>																			
male (n=1)	UCR_ENT 00078394	8.39	1.70	0.60	0.97	-	1.39	1.18	0.24	1.18	0.77	2.65	1.08	0.32	1.73	2.23	1.27	2.56	2.70
female (n=1)	UCR_ENT 00040763	8.11	1.81	0.63	1.11	1.13	1.57	1.27	0.27	1.09	0.96	2.45	1.12	0.25	1.86	2.25	1.30	2.92	2.94
<i>robustus</i>																			
male (n=1)	UCR_ENT 00026325	9.86	1.85	0.57	1.58	1.47	1.61	1.29	0.32	1.32	0.88	2.84	1.23	0.31	2.02	2.72	1.55	3.23	3.27

TABLE 1 continued

	PBIUSI	TL	CC	SL	PPL	PDL	PL	APLL	PPLL	ScL	FH	FL	HW	Syn	APLW	PPLW	ScW	CW	AW
female (n=2)	UCR_ENT	10.41	1.87	0.62	1.50	1.43	1.54	1.25	0.29	1.49	0.80	2.82	1.23	0.34	2.11	2.75	1.67	3.26	3.58
	00026331																		
<i>tenuis</i>	UCR_ENT	9.81	1.80	0.64	1.65	1.42	1.55	1.23	0.32	1.18	0.88	2.83	1.23	0.25	1.92	2.63	1.55	3.14	3.36
	00040762																		
female (n=1)	MPUJ_ENT	8.25	1.20	0.43	1.14	1.04	1.10	0.82	0.24	1.05	0.62	1.97	1.05	0.25	1.48	2.04	1.25	2.17	2.26
	0046847																		

Camarochilus globosus, n. sp.

Figures 1, 3, 5–7, table 1

HOLOTYPE: BOLIVIA: El Beni: Vaca Diez Co.: 2 km NW Tumichucua, 11.14617°S 66.16517°W, 142 m, 12 Aug 1990, P. Parrillo, 1 ♂ (UCR_ENT 00021721) (FMNH).

DIAGNOSIS (figs. 1, 3, 5, 6): Recognized by the small body size, large eyes, brown coloration with contrasting veins with third membranal vein typically visible, and symmetrical pygophore with right and left protuberances of similar size and setation. This species does not closely resemble any of its congeners.

DESCRIPTION: *Male*: Total length 7.2–7.3 mm, ratio total length to corium width ~2.9–3.1, macropterous, hemelytron surpassing apex of abdomen. COLORATION: Dorsum brown with corium and membrane lighter brown, with pale yellow mark at base of membrane and pale yellow lines on membrane tracing corium margin and veins, dorsal laterotergites brown with triangular pale yellow marks; head brown with anteocular area lighter than posterior, labium and antenna light brown, with first labial segment darker in some specimens, legs pale yellow to light brown, with femora darker in distal half, pleura brown to castaneous, abdominal mediosternites brown to castaneous, ventral laterotergites 2–6 with large pale yellow patches. SURFACE AND VESTITURE: As in generic description. STRUCTURE: Head ~1.4× as long as wide, eyes in dorsal view large, strongly semiglobular, ratio head width to synthlipsis ~4.0–4.3, globular in lateral view, dorsal eye margin surpassing dorsal head surface. Antenna as in generic description, proximal pseudosegment of pedicel ~2.5× as long as scape. Labium as in generic description. Thorax as in generic description, anterior pronotal lobe ~5.4× longer than posterior lobe, posterior lobe narrow, coarsely punctate; scutellum with knob-shaped tip. Wings as in generic description with three cells in membrane. Legs as in generic description with ratio forefemur height to length ~0.30. Abdomen as in generic description. Genitalia with pygophore symmetrical, protuberances laterally rounded and dorsally flattened, right and left of similar size, spinelike setae on right and left of similar size, right and left with less than 10 slightly elongate spinelike setae; parameres slender, right slightly larger than left, sickle shaped with proxi-

mal area shorter than distal, proximal area with sparse, slender, and short setae, distal area narrow, slowly tapering to apex.

Female: As in generic description, macropterous, total length ~7.7 mm, ratio total length to corium width ~3.1, ratio forefemur height to length ~0.30. Genitalia: as in generic description.

ETYMOLOGY: Named for the large eyes, after Latin *globosus*, meaning “spherical, globular.”

DISTRIBUTION: Known from Bolivia, Colombia, and Perú. The localities in Bolivia and Colombia are both in Amazonian rainforest lowland, whereas the exact localities of the two remaining examined specimens are unknown.

PARATYPES: COLOMBIA: Amazonas: Amacayacu, 3.81482°S 70.24712°W, 79 m, Feb 1989, M. Kelsey, 1 ♂ (IAvH), 1 ♀ (ICN), MPUJ_ENT 0046845, 1 ♂ (MPUJ). PERÚ: unknown locality and collector: 20 Mar 1961, 1 ♂ (UCR_ENT 00026328) (USNM). UNKNOWN locality including country, date, and collector: Beaz? (62 57), 1 ♂ (UCR_ENT 00048873) (BMNH).

Camarochilus harrisi, n. sp.

Figures 1, 3, 5–7, table 1

HOLOTYPE: COLOMBIA: Stowaway on airplane, intercepted in Miami, 15 May 1938, J. Bache-Wiic, 1 ♂ (UCR_ENT 00026326) (USNM).

DIAGNOSIS (figs. 1, 3, 5, 6): Recognized by the medium body size, medium-sized eyes, blackish brown coloration with concolorous veins, and strongly asymmetrical pygophore with rounded right protuberance much larger and with much larger spinelike setae. Most similar to *C. americanus* in shape and armature of pygophore, but distinguished by the distinctive blackish brown coloration.

DESCRIPTION: *Male*: Total length 7.9 mm, ratio total length to corium width ~3.3, macropterous, hemelytron surpassing apex of abdomen. COLORATION: Dorsum blackish brown, membrane veins concolorous, dorsal laterotergites brown with triangular pale yellow marks; head and first labial segment blackish brown, remaining segments pale yellow, antenna light brown, legs with coxae, trochanters, and base of femora pale yellow to light brown, remainder of femora blackish brown, tibiae and tarsi brown, pleura brown, abdominal mediosternites brown, ventral laterotergites 2–6 with large pale yellow patches. SURFACE AND VESTITURE: As in generic description. STRUCTURE: Head ~1.3× as long as wide, eyes in dorsal view moderately large, shallow semiglobular, ratio head width to synthlipsis ~3.6, reniform in lateral view, dorsal eye margin barely reaching dorsal head surface. Antenna as in generic description, proximal pseudosegment of pedicel ~2× as long as scape. Labium as in generic description. Thorax as in generic description, anterior pronotal lobe ~5.4× longer than posterior lobe, posterior lobe narrow, finely punctate; scutellum with knob-shaped tip. Wings as in generic description with two clearly delimited cells in membrane. Legs: as in generic description with ratio forefemur height to length ~0.37. Abdomen as in generic description. Genitalia with pygophore asymmetrical, protuberances laterally rounded and dorsally flattened, right larger than left, spinelike setae on right much stouter than on left, right and left with ~30 conical,

spinellike setae; parameres stout, right larger than left, sickle shaped with proximal area shorter than distal, proximal area with dense, stout, and short setae, distal area flattened into blade, tapering to apex.

Female: Unknown.

ETYMOLOGY: Named for the late Halbert M. Harris (Slater et al., 2002), who described the two initial species of *Camarochilus*.

DISTRIBUTION: The distribution of this species is unknown; the two examined specimens were intercepted on an airplane from Colombia.

DISCUSSION: Based on the degree of asymmetry and ornamentation of the pygophore protuberances, we suspect that this species may be closely related to *C. americanus* and *C. picturatus*. Both species also occur in Colombia, but *C. harrisi*, is clearly separated from all remaining species by the very dark coloration of the dorsum.

PARATYPE: COLOMBIA: Stowaway on airplane, intercepted in Miami, 15 May 1938, J. Bache-Wiic, 1 ♂ (UCR_ENT 00027097) (USNM).

Camarochilus medius, n. sp.

Figures 2, 3, 5–7, table 1

HOLOTYPE: HONDURAS: Choluteca: 14 mi NW Choluteca, 13.45508°N 87.31686°W, 185 m, 17 Jun 1974, O'Briens and Marshall, 1 ♂ (UCR_ENT 00046695) (CAS).

DIAGNOSIS (figs. 1, 3, 5, 6): Recognized by the medium body size, fairly small eyes, fairly uniformly brown and castaneous coloration with faint veins, and symmetrical pygophore with right and left protuberances of similar size and with similar setation, right paramere with capitate apex. This species does not closely resemble any of its congeners.

DESCRIPTION: *Male*: Total length 7.5 mm, ratio total length to corium width ~3.4, macropterous, hemelytron reaching apex of abdomen. **COLORATION**: Dorsum brown with castaneous corium, claval commissure lighter brown, membrane veins concolorous to slightly lighter, dorsal laterotergites brown with large triangular pale yellow marks; head brown with anteocular area lighter brown, first labial segment light brown, remaining segments pale yellow, antenna light brown, legs with coxae, trochanters, femora proximoventrally light brown, distal margin of femora, and proximal margin of tibiae light brown, remainder of femora, tibiae and tarsi brown, pleura brown to castaneous, abdominal mediosternites brown to castaneous, ventral laterotergites 2–6 with large pale yellow patches. **SURFACE AND VESTITURE**: As in generic description. **STRUCTURE**: Head ~1.6× as long as wide, eyes in dorsal view moderately large, shallow semi-globular, ratio head width to synthlipsis ~2.7, reniform in lateral view, dorsal eye margin not reaching dorsal head surface. Antenna as in generic description, proximal pseudosegment of pedicel ~2× as long as scape. Labium as in generic description. Thorax as in generic description, anterior pronotal lobe ~8.4× longer than posterior lobe, posterior lobe extremely narrow, finely punctate; scutellum with knob-shaped tip. Wings as in generic description with two clearly delimited cells in membrane. Legs as in generic description with ratio forefemur height to length ~0.36. Abdomen as in generic description. Genitalia with pygophore symmetrical, protuberances later-

ally rounded and dorsally flattened, right and left of similar size, spinelike setae on right and left of similar size, right and left with less than 10 conical spinelike setae; parameres moderately stout, right larger than left, angled between proximal and distal area, proximal area longer than distal, proximal area with sparse, slender, and short setae, distal area flattened into blade, only slightly tapering, apex of right paramere capitate, of left acute.

Female: As in generic description, macropterous, total length ~7.2 mm, ratio total length to corium width ~3.5, ratio forefemur height to length ~0.36. Genitalia: as in generic description.

ETYMOLOGY: Named for the intermediate size relative to its congeners, after Latin *medius*, meaning “middle, moderate.”

DISTRIBUTION: Known only from the type locality in Honduras. This species has the northernmost distribution among its congeners, although not among New World Pachynomidae: *Aphelonotus simplex* Uhler is known from extreme southwest Texas (Schuh et al., 2015).

DISCUSSION: This species is unique among *Camarochilus* spp. in the angular shape of the paramere and the capitate apex of the right paramere. This situation is reminiscent of the distribution of paramere shapes in *Aphelonotus*, where the tip of the paramere is acute in the majority of the species, whereas it is capitate in *Aphelonotus africanus* Carayon and Villiers, and *Aphelonotus xenos* Schuh, Weirauch, and Grillo.

PARATYPE: HONDURAS: Choluteca: 14 mi NW Choluteca, 13.45508°N 87.31686°W, 185 m, 17 Jun 1974, O'Briens and Marshall, 1 ♀ (UCR_ENT 00046694) (CAS).

Camarochilus picturatus, n. sp.

Figures 2, 3, 5–7, table 1

HOLOTYPE: BOLIVIA: Cochabamba: Chapare: Rio Mamore, 2 km N. mouth of Rio Chapare, 16.33576°S 64.97551°W, 193 m, 20 Jul 1965–31 Jul 1965, J.K. Bouseman, 1 ♂ (UCR_ENT 00078394) (AMNH).

DIAGNOSIS (figs. 1, 3, 5, 6): Recognized by the medium body size, medium-sized eyes, contrasting brown, castaneous, and pale yellow coloration of body and legs with strongly contrasting veins, and strongly asymmetrical pygophore with rounded right protuberance much larger and with larger spinelike setae. Most similar to *C. americanus* in shape and armature of the pygophore but is distinguished by the strongly contrasting pale membranous veins.

DESCRIPTION: *Male*: Total length 8.3 mm, ratio total length to corium width ~3.3, macropterous, hemelytron surpassing apex of abdomen. COLORATION: Dorsum brown with castaneous corium, membrane brown with pale yellow lines tracing corium margin and veins, dorsal laterotergites brown with triangular pale yellow marks; head brown with anteocular area lighter brown, labium brown, with distal margins of first, second, and third labial segments lighter brown, fourth segment pale yellow, antenna brown to pale yellow, legs pale yellow to light brown with forefemur brown, and middle and hind femora brown in distal 3/4, pleura brown to castaneous, abdominal mediosternites brown to castaneous, ventral laterotergites 2–6 with large pale yellow patches. SURFACE AND VESTITURE: As in generic description. STRUCTURE: Head ~1.6× as long as wide, eyes in dorsal view moderately large, shallow semiglobular, ratio head width to synthlipsis

~3.3, reniform in lateral view, dorsal eye margin barely reaching dorsal head surface. Antenna as in generic description, proximal pseudosegment of pedicel $\sim 1.6\times$ as long as scape. Labium as in generic description. Thorax as in generic description, anterior pronotal lobe $\sim 5.8\times$ longer than posterior lobe, posterior lobe narrow, finely punctate; scutellum with slender tip. Wings as in generic description with two clearly delimited cells in membrane. Legs as in generic description with ratio forefemur height to length ~ 0.29 . Abdomen as in generic description. Genitalia with pygophore slightly asymmetrical, protuberances laterally rounded and dorsally flattened, right larger than left, spinelike setae on right stouter than on left, right and left with 20–25 conical, spinelike setae; parameres moderately stout, right slightly larger than left, sickle shaped with distal area longer than proximal, proximal area with dense, stout, and short setae, distal area flattened into blade, tapering to apex.

Female: As in generic description, submacropterous, total length ~ 8.1 mm, ratio total length to corium width ~ 2.8 , ratio forefemur height to length ~ 0.39 . Genitalia: as in generic description.

ETYMOLOGY: Named for the contrasting coloration of body, legs and hemelytron, after Latin *picturatus*, meaning “decorated with color.”

DISTRIBUTION: Known from low elevation Amazonian rainforest sites in Bolivia, Colombia, and Perú.

DISCUSSION: This species is very similar to *C. americanus* in general appearance and pygophore ornamentation. We nevertheless treat it as a distinct taxon, because the distribution ranges for the two species appear to be distinct and because of the strikingly contrasting pale membrane veins that set apart this species. We realize that this is another species hypothesis that will benefit from the examination of additional specimens of all species with strongly asymmetrical and similar pygophores (i.e., *C. americanus*, *C. harrisi*, and *C. picturatus*; *C. fasciatus*, [pygophore missing] possibly belongs to this complex of species as well).

PARATYPES: COLOMBIA: Vaupes: Corregimiento Pacoa, Río Pira-Paraná, comunidad Santa Isabel Nyaba soa, 0.11853°S 70.18733°W, 04 May 2006–10 May 2006, J. Gonzales, 1 ♂ (CEUA). PERÚ: Loreto: Explorama Inn, 40 Km NE of Iquitos on Amazon River, 3.49346°S 72.99765°W, 97 m, 22 Aug 1992–24 Aug 1992, J. Castner and P. Skelley, 1 ♀ (UCR_ENT 00040774) (BDGC).

Camarochilus robustus, n. sp.

Figures 2, 3, 5–7, table 1

HOLOTYPE: ECUADOR: Pastaza: Puyo, 1.48625°S 78.00673°W, 800 m, 01 Feb 1976–07 Feb 1976, Spangler, et al., 1 ♂ (UCR_ENT 00026325) (USNM).

DIAGNOSIS (figs. 1, 3, 5, 6): Recognized by the large body size, fairly large eyes, uniform coloration with concolorous veins, and symmetrical pygophore with right and left protuberances of similar size and setation. Larger than all other congeneric species.

DESCRIPTION: *Male*: Total length 9.8 mm, ratio total length to corium width ~ 3.1 – 3.3 , macropterous, hemelytron reaching apex of abdomen. COLORATION: Dorsum brown with corium brown to castaneous, claval commissure and base of membrane somewhat paler, veins

concolorous with membrane, dorsal laterotergites brown with small triangular pale yellow marks; head and first labial segment brown, remaining labial segments lighter brown, antenna light brown, legs brown with forefemur except narrow band basally and in distal 3/4 mid- and hind femora darker brown, pleura brown, abdominal mediosternites brown, ventral laterotergites 2–6 with small pale yellow patches. SURFACE AND VESTITURE: As in generic description. STRUCTURE: Head $\sim 1.6\times$ as long as wide, eyes in dorsal view fairly large, semiglobular, ratio head width to synthlipsis ~ 3.9 – 4.0 , globular in lateral view, dorsal eye margin surpassing dorsal head surface. Antenna as in generic description, proximal pseudosegment of pedicel $\sim 2.8\times$ as long as scape. Labium as in generic description. Thorax as in generic description, anterior pronotal lobe $\sim 5\times$ longer than posterior lobe, posterior lobe moderately wide, coarsely punctate; scutellum with slender tip. Wings as in generic description with two clearly delimited cells in membrane. Legs as in generic description with ratio forefemur height to length ~ 0.31 . Abdomen as in generic description. Genitalia with pygophore symmetrical, protuberances laterally rounded and dorsally flattened, right and left of similar size, spinelike setae on right and left of similar size, right and left with 15–20 conical, spinelike setae; parameres moderately stout, right slightly larger than left, sickle-shaped with distal area longer than proximal, proximal area with few, slender, and short setae, distal area flattened into blade, tapering to apex.

Female: As in generic description, macropterous, total length 9.8–10.4 mm, ratio total length to corium width ~ 3.1 – 3.2 , ratio forefemur height to length ~ 0.28 – 0.31 . Genitalia: as in generic description.

ETYMOLOGY: Named for the large size of this species, after Latin *robustus*, meaning “solid, robust.”

DISTRIBUTION: The male holotype was collected at mid elevation (800 m) in the eastern foothills of the Andes; the female paratype is from an unknown locality in Bolivia.

DISCUSSION: We associate the two known specimens based on the large size and drab coloration, despite the two localities being distant from each other. Only the examination of additional specimens will allow for further testing of this species hypothesis. This species is closest in total length to *C. confusus*, but males are differentiated by the shape of the pygophore protuberances (almost symmetrical in *C. robustus*, n. sp., right protuberance conical in *C. confusus*).

PARATYPES: BOLIVIA: unknown locality (not mapped), 29 Mar 1946, Zischka, 1 ♀ (UCR_ENT 00026331) (USNM).

Camarochilus tenuis, n. sp.

Figures 2, 3, 5–7, table 1

HOLOTYPE: COLOMBIA: Guainía: Inírida: resguardo indígena La Ceiba, 40 km SO de Inírida, 3.62836°N 67.88268°W, 70 m, 02 Nov 1997–09 Nov 1997, C. Rendon, MPUJ_ENT 0046847, 1 ♀ (MPUJ).

DIAGNOSIS BASED ON FEMALE (figs. 1, 3, 5, 6): Recognized by the large body size, slender habitus, and brown coloration with contrasting pale yellow veins.

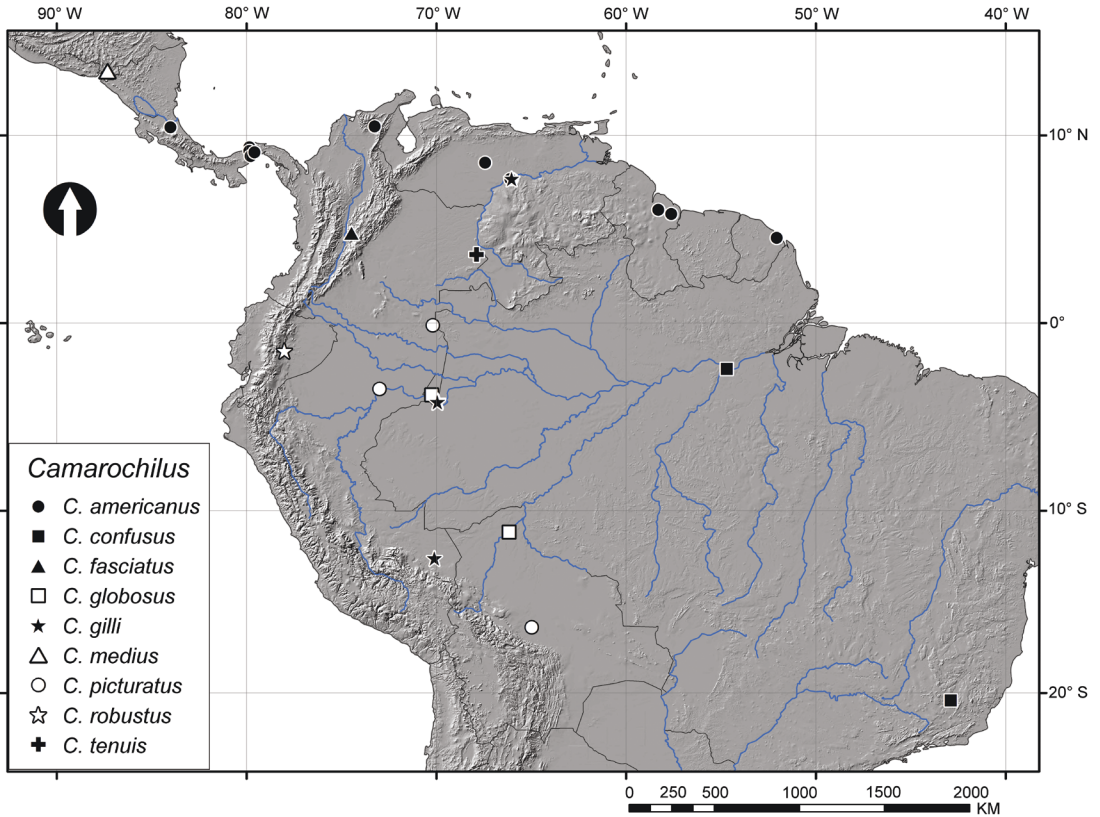


FIGURE 7. Distribution records of *Camarochilus* spp. examined. Some specimens were not mapped due to ambiguous localities. *Camarochilus harrisi* not mapped.

DESCRIPTION: *Female:* Total length 8.25 mm, ratio total length to corium width ~ 3.8 , macropterous, hemelytron not reaching apex of abdomen (possibly an artifact, because abdomen somewhat drawn out). **COLORATION:** Dorsum brown and castaneous, with pale yellow mark at base of membrane and pale yellow lines on membrane tracing corium margin and veins, dorsal laterotergites brown with triangular pale yellow marks; head brown with anteocular area lighter than posterior, labium and antenna light brown, legs light brown, pleura brown to castaneous, abdominal mediosternites brown to castaneous, ventral laterotergites 2–6 with pale yellow patches. **SURFACE AND VESTITURE:** As in generic description. **STRUCTURE:** Head $\sim 1.1\times$ as long as wide, eyes in dorsal view fairly large, semiglobular, ratio head width to synthipsis ~ 4.1 , globular in lateral view, dorsal eye margin surpassing dorsal head surface. Antenna as in generic description, proximal pseudosegment of pedicel $\sim 2.7\times$ as long as scape. Labium as in generic description. Thorax as in generic description, anterior pronotal lobe $\sim 4.6\times$ longer than posterior lobe, posterior lobe moderately wide, finely punctate; scutellum with slender tip. Wings as in generic description with two clearly delimited cells in membrane. Legs as in generic description with ratio forefemur height to length ~ 0.31 . Abdomen and genitalia as in generic description.

Male: Unknown.

ETYMOLOGY: Named for the elongate body shape, after Latin *tenuis* meaning “thin.”

DISTRIBUTION: Known only from the type locality in lowland Amazonian rainforest in Colombia.

DISCUSSION: We recognize this species based on the slender habitus. The total length may be somewhat misleading, because the abdomen of the holotype is somewhat drawn out. However, the width of the posterior pronotal lobe is distinctly smaller than in other species of similar size (table 1), supporting our decisions to treat this specimen as distinct from other species in the same general geographic area, including *C. picturatus* or *C. globosus*.

CONCLUSIONS

Our taxonomic revision of *Camarochilus* led to a fivefold increase of species numbers in this genus. Given that most species are represented by less than a handful of specimens from very few locations, we predict that additional leaf litter sampling and light trapping across forested lowland sites in Central and South America will likely reveal additional species. We found that several morphological structures, particularly the male pygophore and parameres, provide excellent species-diagnostic characters.

ACKNOWLEDGMENTS

For help with specimen loans, we thank curators, collection managers, and research staff at the institutions listed in the Material and Methods section. We especially acknowledge Bruce D. Gill (CNC), who has collected and loaned to us almost half of the examined specimens. We thank Rochelle Hoey-Chamberlain for assistance with specimen imaging, databasing, and measurements.

REFERENCES

- Carayon, J. 1950. Caractères anatomiques et position systématique des hémiptères Nabidae (Note préliminaire). *Bulletin de Muséum National d'Histoire Naturelle Paris* 22: 95–101.
- Carayon, J., and A. Villiers. 1968. Étude sur les Hémiptères Pachynomidae. *Annales de la Société Entomologique de France (N.S.)* 4 (3): 703–739.
- Chen, Z., Y. Liu, H. Li, and W. Cai. 2019. *Camarochiloides weiweii* gen. n. and sp. n., the first representative of Pachynomidae (Hemiptera: Heteroptera) from Borneo. *European Journal of Entomology* 116: 330–340.
- Harris, H.M. 1930. XVIII. Notes on some South American Nabidae, with description of new species (Hemiptera). *Annals of the Carnegie Museum* 14: 241–248.
- Harris, H.M. 1931. The genus *Aphelonotus* (Hemiptera, Nabidae). *Bulletin of the Brooklyn Entomological Society* 24: 13–20.
- Klug, J.C.F. 1830. *Symbolae physicae, seu icones et descriptiones insectorum, quae ex itinere per African borealem et Asiam*. In F.G. Hemprich and C.H. Ehrenberg (editors), *Symbolae physicae seu icones et descriptiones insectorum quae ex itinere per Africam borealem et Asiam occidentalem Friderici*

- Guilelmi Hemprich et Christiani Godofredi Ehrenberg medicinae et chirurgiae doctorum studio novae aut illustratae redierunt. Berolini [Berlin]: Ex Officina Academica.
- Kment, P., and D. Rédei. 2020. *Aphelonotus schuhi* sp. nov., the first species of the family Pachynomidae from Puerto Rico (Hemiptera: Heteroptera). *Zootaxa* 4748: 382–388.
- Reuter, O.M. 1908. Bemerkungen ueber die Nabiden nebst Beschreibung neuer Arten. *Memoirs de la Société Entomologique de Belgique*. 15: 87–130.
- Schuh, R.T., and P. Štys. 1991. Phylogenetic analysis of cimicomorphan family relationships. *Journal of the New York Entomological Society* 99: 298–350.
- Schuh, R.T., C. Weirauch, and W.C. Wheeler. 2009. Phylogenetic relationships within the Cimicomorpha (Hemiptera: Heteroptera): a total-evidence analysis. *Systematic Entomology* 34: 15–48.
- Schuh, R.T., C. Weirauch, and H. Grillo. 2015. Revision of *Aphelonotus* Uhler (Hemiptera: Heteroptera: Pachynomidae), with description of six new species and documentation of nymphal morphology for three species. *American Museum Novitates* 3829: 1–43.
- Slater, J.A., T.J. Henry, and A. Wheeler. 2002. Halbert Marion Harris (1900–2000): biographical sketch, described taxa, and list of publications on Heteroptera. *Proceedings of the Entomological Society of Washington* 104: 1074–1083.
- Stål, C. 1873. Enumeratio Hemipterorum. 3. Kongliga Svenska Vetenskapsakademiens Handlingar 11: 1–163.
- Uhler, P.R. 1894. On the Hemiptera-Heteroptera of the Island Grenada, West Indies. *Proceedings of the Zoological Society of London* 1894: 167–224.
- Weirauch, C. 2008. Cladistic analysis of Reduviidae (Heteroptera: Cimicomorpha) based on morphological characters. *Systematic Entomology* 33: 229–274.
- Weirauch, C., R.T. Schuh, G. Cassis, and W.C. Wheeler. 2019. Revisiting habitat and lifestyle transitions in Heteroptera (Insecta: Hemiptera): insights from a combined morphological and molecular phylogeny. *Cladistics* 35: 67–105.
- Wygodzinsky, P., and S. Lodhi. 1989. Atlas of antennal trichobothria in the Pachynomidae and Reduviidae (Heteroptera). *Journal of the New York Entomological Society* 97: 371–393.

All issues of *Novitates* and *Bulletin* are available on the web (<http://digitallibrary.amnh.org/dspace>). Order printed copies on the web from:

<http://shop.amnh.org/a701/shop-by-category/books/scientific-publications.html>

or via standard mail from:

American Museum of Natural History—Scientific Publications
Central Park West at 79th Street
New York, NY 10024

∞ This paper meets the requirements of ANSI/NISO Z39.48-1992 (permanence of paper).