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## Vespidae (Insecta: Hymenoptera) of Puerto Rico, West Indies

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# INSECTA MUNDI

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Vespidæ (Insecta: Hymenoptera) of Puerto Rico, West Indies

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## Vespidae (Insecta: Hymenoptera) of Puerto Rico, West Indies

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**Abstract.** The vespidae fauna of Greater Puerto Rico is reviewed (Hymenoptera: Vespidae). Three **new species** are described, *Ancistrocerus isla* Carpenter, *Euodynerus jeitita* Carpenter and Genaro, and *Omicron aridum* Carpenter and Genaro. *Polistes crinitus americanus* (Fabricius, 1775) and *P. crinitus multicolor* (Olivier, 1792) are both reduced to synonyms of nominotypical *P. crinitus* (Felton, 1765), **revised status**; *Zeta abdominale hispaniolae* (Bequaert and Salt, 1931) and *Zeta abdominale ornatum* (de Saussure, 1855) are both reduced to synonyms of nominotypical *Zeta abdominale* (Drury, 1770), **revised status**; and *Zethus rufinodus monensis* Bohart and Stange, 1965, and *Zethus rufinodus virginicus* Bohart and Stange, 1965, are both reduced to synonyms of nominotypical *Zethus rufinodus* (Latreille, 1806), **revised status**. *Parancistrocerus obliquus* (Cresson, 1865) is newly recorded from Puerto Rico. The presence of *Pachodynerus guadulpensis* (de Saussure, 1853) in Puerto Rico is confirmed. An analysis of the composition of the Puerto Rican vespidae fauna is presented.

**Key words.** Eumeninae, Polistinae, Vespidae, Hymenoptera, new species, new records, key.

**Resumen.** Se revisa la fauna de avispas de Puerto Rico e islas adyacentes (Hymenoptera: Vespidae). Se describen tres ESPECIES NUEVAS: *Ancistrocerus isla* Carpenter, *Euodynerus jeitita* Carpenter y Genaro, y *Omicron aridum* Carpenter y Genaro. *Polistes crinitus americanus* (Fabricius, 1775) y *P. crinitus multicolor* (Olivier, 1792) son reducidas a nombres sinónimos de la especie nominotípica *P. crinitus* (Felton, 1765), ESTADO REVISADO; *Zeta abdominale hispaniolae* (Bequaert and Salt, 1931) y *Zeta abdominale ornatum* (de Saussure, 1855) son reducidas a sinonimia de la especie nominotípica *Zeta abdominale* (Drury, 1770), ESTADO REVISADO; *Zethus rufinodus monensis* Bohart y Stange, 1965, y *Zethus rufinodus virginicus* Bohart y Stange, 1965, son reducidas a nombres sinónimos de la especie nominotípica *Zethus rufinodus* (Latreille, 1806), ESTADO REVISADO. *Parancistrocerus obliquus* (Cresson, 1865) se registra nuevamente para Puerto Rico. Se confirma la presencia de *Pachodynerus guadulpensis* (de Saussure, 1853) en Puerto Rico. Se analiza la composición de la fauna de véspidos de Puerto Rico.

**Palabras claves.** Eumeninae, Polistinae, Vespidae, Hymenoptera, especies nuevas, registros nuevos, clave.

### Introduction

Lists of the Vespidae of Puerto Rico have been compiled several times, but the fauna has remained imperfectly known. This is shown by the three new species we describe herein.

The family Vespidae contains both solitary and social wasps. In Puerto Rico the former are all species of Eumeninae, while the latter are all Polistinae. All of these wasps are predatory, primarily on Lepidoptera larvae, but these are the principal food of the larvae, while the adults feed on nectar.

Nests of Eumeninae are constructed using mud, which is obtained by imbibing water and then regurgitating it and mixing it with soil. Some species excavate burrows in horizontal or vertical surfaces, but most nest in pre-existing cavities, such as old beetle tunnels or abandoned nests of other Hymenoptera. Mud is used in lining, partitioning, and closing the nest. Other species build exposed nests of mud or plant material, and some of these make mud cells in the shape of pots or jugs, which may be quite elegant, and inspire the common name potter wasps. Eggs are laid within completed cells, before provisioning begins. Most eumenines provision the cells fully and seal them before the larva begins to develop.

Polistinae are much more commonly seen than potter wasps, as are their nests, which are constructed of masticated vegetable fiber and inspire the common name paper wasps. All paper wasps in Puerto Rico initiate new colonies by one or several queens acting without workers. They construct a single naked comb of cells, which is attached to the substrate by a tough pedicel. The nest may be located on the undersurface of a leaf, hanging from twigs or branches, under rock crevices, or on human habitations. Colonies are typically small, consisting of no more than a few dozen adults. As in other eusocial insects, there is a division of labor between reproductive (queen) and worker castes, although these castes are not morphologically distinct. Adult females hunt other arthropods and often extensively masticate the prey, and when returning to the nest they divide the food among both adults and larvae. Of course, social wasps can defend their nests by inflicting a painful sting, and so are among the most feared insects.

The geographical coverage of this review is as in recent publications by the junior author (e. g. Genaro and Franz 2008), that is Greater Puerto Rico, including Puerto Rico itself; the adjacent Puerto Rican islands Culebra, Desecheo, Mona, Monito, and Vieques; the United States Virgin Islands St. Croix, St. John, and St. Thomas; and the British Virgin Islands Anegada, Guana, Jost van Dyke, Tortola, and Virgin Gorda. We first review previous lists of the vespidae fauna, then provide a key to all the species, including the new taxa, followed by taxonomic notes for the previously known species and descriptions of the new ones. We conclude with a few general remarks on the composition of the fauna.

Specimens in the following Puerto Rican collections were studied: the Museum of Entomology and Tropical Biodiversity (collection coden **MEBT**) of the Agricultural Experiment Station, University of Puerto Rico at Mayagüez (located in Río Piedras); the Department of Biology, University of Puerto Rico at Mayagüez (**UPRM**) (located in Mayagüez); and the Juan Torres personal collection, now deposited in the MEBT.

Codens for other collections mentioned in this study are as follows: American Museum of Natural History, New York (**AMNH**); Academy of Natural Sciences of Philadelphia (**ANSP**); Gundlach collection, Instituto de Ecología y Sistemática, Ciudad de La Habana (**GUCO**); Museum of Comparative Zoology, Cambridge, MA (**MCZH**); Muséum d'Histoire Naturelle, Geneva (**MHNG**); Natural History Museum, London (**BMNH**); Museo Regionale di Scienze Naturali, Turin (**MZST**); Muséum National d'Histoire Naturelle, Paris (**MNHN**); Natural History Museum of Los Angeles County (**LACM**); United States National Museum of Natural History, Washington, DC (**USNM**); Universitets Zoologisk Museum, Copenhagen (**UZMC**); Zoologische Staatssammlung, Munich (**ZSMU**); personal collection of the junior author (**JAGA**). “[!]” indicate a misspelling, or a lapsus.

## Previous faunal lists

Early compilers (Dewitz 1881; Ståhl 1883; Gundlach 1887; Ashmead 1900) listed one species of *Polistes* Latreille, *P. americanus* (Fabricius) (= *P. crinitus* (Felton)) and one to three species of *Mischocyttarus* de Saussure, under the generic names *Polybia* Lepeletier, 1836 and *Megacanthopus* Chopard, 1929 (see details below). They listed no more than five species of Eumeninae: *Zethus rufinodus* (Latreille), *Zeta abdominale* (Drury) (as *Eumenes ornatus* Saussure), *Pachodynerus atratus* (Fabricius) (under several names), and two species of *Parancistrocerus* Saussure, *Par. bacu* (Saussure) and *Par. dejectus* (Cresson) (both in *Odynerus* Latreille, 1802). None of these species was endemic.

Wolcott (1924, 1936, 1941, 1951) provided the primary synthesis of the insect fauna of Puerto Rico during the last century. His first list (1924) included positive records for two species of *Polistes*, two of *Mischocyttarus* Saussure, 1853 (under the generic name *Megacanthopus*) plus a synonym for one of these species included as a separate taxon following earlier lists, and four of Eumeninae, plus two other eumenine taxa repeated from previous lists. The record for one of the eumenines, *Pach. tibialis* (as *Odynerus*) was only reference to a collection, namely the AMNH. His second list (1936) added a species of *Polistes*, *P. major* Beauvois, 1818, and a species of *Pachodynerus* Saussure, 1870, *Pach. nasidens* (Latreille, 1812), and gave locality records for another species of *Pachodynerus*, *Pach. atratus* (Fabricius, 1798) (in *Monobiella* Ashmead, 1900) that had only been repeated from previous work in his first list. His supplement to the second list (1941) indicated that his listing of *P. canadensis* (L., 1758) in his earlier publications was a misidentification for *P. crinitus*, and he cited Bequaert (1936) to the effect that *P. major* was adventive in Puerto Rico. He added records for five species of Eumeninae. He

also listed five species from Mona: *P. crinitus*, *P. major*, *Misch. cubensis* (Saussure), *Zethus rufinodus* (Latreille) and *Pach. tibialis* (Saussure). His final list (1951) included two species of *Polistes*, two of *Mischocyttarus*, and nine species of Eumeninae. He augmented his previous listings of the latter group by including the recently described *Monobia puertoricensis* Bequaert, and repeated the record of Ramos (1946) of “*Rygchium* sp.” for Mona. He also indicated that records of *Pach. tibialis* were all for Mona.

In addition to the treatments for Puerto Rico, lists have been compiled for several other islands. Beatty (1944) listed four species for St. Croix: *P. crinitus*, *Misch. phthisicus* (Fabricius), *Pachodynerus* [!] *cinerascens* Beatty, and “*Odynerus* sp.” Miskimen and Bond (1970) added *Pach. atratus* to this list (probably a misidentification; Menke 1986). Ramos (1946) listed six species for Mona: *P. crinitus*, *P. major*, *Mischocyttarus cubensis*, *Pachodynerus* [!] *tibialis*, and “*Rygchium* sp.” were under Vespidae; and *Zethus rufinodus* was under Eumenidae. Torres and Snelling (1992) listed five species for Mona, not mentioning *P. major*; their *Mischocyttarus* was *P. phthisicus* (they stated that *Misch. cubensis* of Wolcott was this species), and they included *Euodynerus apicalis* (Cresson), which they stated was probably the identity of the “*Rygchium* sp.” of Ramos (1946). García Tudurí et al. (1974) mentioned *P. crinitus* (as *P. americanus*) and *P. major* for Desecheo. Medina Gaud and Martorell (1974) listed four species for the islet Caja de Muertos: *Misch. cubensis*, *Pach. atratus*, *P. major* and *P. crinitus* (as *P. americanus*). Snelling (2005) listed four species for Guana: *Pach. atratus*, “*Stenodynerus* sp.”, *Misch. phthisicus*, and *P. crinitus*. Torres and Medina Gaud (1998) commented on the main insect groups and species from Puerto Rico, mentioning that *P. major* was once common but had become scarcer through the years, and was now difficult to find.

Aside from the foregoing faunal lists, some of the taxa have been included in more general works. The social wasps were all mentioned in Richards' (1978) monograph of Polistinae of the Americas. The eumenine genera *Monobia*, *Zeta* Saussure and *Zethus* Fabricius were treated in revisions (Willink 1982; Giordani Soika 1975; Bohart and Stange 1965, and Stange 2003, respectively). And in contrast to genera that have never been revised for the West Indies (e. g. *Euodynerus*, *Parancistrocerus*), the eumenine genus *Pachodynerus* has been the subject of no fewer than three publications in the space of a half a century (Bequaert 1948; Menke 1986; Willink and Roig-Alsina 1998).

### Key to the species of Vespidae occurring in Greater Puerto Rico

1. Scutum with parategula, a flattened lobe projecting from posterolateral corner (Fig. 1, 21, 23); claws bifid (cleft at tip; Fig. 5); clypeus ventrally emarginate or truncate (Fig. 6); solitary wasps ..... **Subfamily Eumeninae, 2**
- Scutum without parategula, with vertical lamella along posterolateral edge (Fig. 8, 34-35); claws simple (Fig. 9-10); clypeus ventrally pointed or rounded (Fig. 7); eusocial wasps..... **Subfamily Polistinae, 16**
  
- 2(1). Metasoma petiolate: width of segment I in dorsal view half or less that of II, and more than twice as long as wide (Fig. 4)..... **3**
- Metasoma not petiolate: width of segment I more than half that of II, much less than twice as long as wide (Fig. 14-15, 25, 27)..... **5**
  
- 3(2). Propodeal orifice narrowly acute dorsally (Fig. 19); propodeal valvula enlarged, free posteriorly from submarginal carina, extending posteriorly as a rectangular lamella (Fig. 19). Mona; Puerto Rico; Culebra; St. Thomas..... ***Zethus rufinodus* (Latreille)**
- Propodeal orifice broadly rounded dorsally (Fig. 13); propodeal valvula rounded and not extending posteriorly (Fig. 3)..... **4**
  
- 4(3). Pronotum with partial oblique humeral carina (Fig. 2), with complete pretegular carina (Fig. 2, 29, 30). Puerto Rico; St. Thomas; St. Croix. .... ***Zeta abdominale* (Drury)**
- Pronotum without oblique humeral carina (Fig. 18), without pretegular carina (Fig. 18, 29). Puerto Rico. .... ***Omicron aridum* Carpenter and Genaro n. sp.**



- 5(2). Anterior face of pronotum with two small, close set, deeply impressed medial foveae (Fig. 20); tegula abruptly expanded and broadly rounded posterolaterally (Fig. 21, 23)..... **Genus *Parancistrocerus*, 6**
- Anterior face of pronotum without two close set, deeply impressed foveae (Fig. 16); tegula longer than broad (Fig. 17). ..... 8
- 6(5). Pronotal carina absent; scutum without posteromesal yellow spot; legs black and yellow; punctation on disc of second metasomal tergum sparse with many punctures separated by more than a puncture diameter. Puerto Rico..... ***Parancistrocerus obliquus* (Cresson)**
- Pronotal carina present, even if interrupted; scutum with or without posteromesal yellow spot; legs reddish or black and yellow; punctation on disc of second metasomal tergum sparse or dense..... 7
- 7(6). Pronotal carina continuous; scutum without posteromesal yellow spot (Fig. 21); legs reddish and yellow (Fig. 22); punctation on disc of second metasomal tergum dense, with many punctures closer than a puncture diameter. Puerto Rico..... ***Parancistrocerus bacu* (de Saussure)**
- Pronotal carina medially interrupted; scutum with posteromesal yellow spot (Fig. 23); legs black and yellow (Fig. 24); punctation on disc of second metasomal tergum sparse with many punctures separated by more than a puncture diameter. Puerto Rico; Culebra. .... ***Parancistrocerus dejectus* (Cresson)**
- 8(5). Pronotum with complete oblique humeral carina (Fig. 30); male antenna with apical two flagellomeres not hooked, greatly reduced, buttonlike, fused (Fig. 31). .... **Genus *Pachodynerus*, 9**
- Pronotum without oblique humeral carina (Fig. 29); male antenna with apical two flagellomeres hooked, not greatly reduced and buttonlike (Fig. 28). ..... 13
- 9(8). First metasomal tergum with transverse carina at crest of anterior declivity (Fig. 15, 25-26). . ..... 10
- First metasomal tergum without transverse carina (Fig. 14, 27). ..... 11
- 10(9). Shiny black; punctation fine, sparse, punctures separated by their diameter, or more; first metasomal tergum carina conspicuous, distinct; forewing weakly infusate along costal margin; male clypeus yellow, at least medially. Puerto Rico; Culebra; Vieques; St. Thomas; St. John; Guana; Virgin Gorda; Anegada..... ***Pachodynerus atratus* (Fabricius)**
- Dull black; punctation dense, coalescent in part; first metasomal tergum carina inconspicuous, irregular; wings deeply infusate, with violaceous shine; male clypeus black. St. Croix; St. Thomas. .... ***Pachodynerus cinerascens* (Fabricius)**
- 11(9). First metasomal tergum without apical yellow band; inner margins of posterior ocelli ridged, forming a more or less deep longitudinal groove in the ocellar area. Puerto Rico; Culebra; St. Thomas. .... ***Pachodynerus nasidens* (Latreille)**
- First metasomal tergum with transverse apical yellow band; ocellar area without ridges or groove ..... 12
- 12(10). Pronotum with anterior and posterior yellow bands, or wholly yellow; posterolateral angles of propodeum not projecting; scrobal apophysis of mesopleuron finger-shaped. Puerto Rico. .... ***Pachodynerus gadulpensis* (de Saussure)**
- Dorsum of pronotum with anterior yellow band only; posterolateral angles of propodeum projecting into wedge-shaped process; scrobal apophysis of mesopleuron not finger-shaped. Mona. .... ***Pachodynerus tibialis* (de Saussure)**

- 13(8). First metasomal tergum with transverse carina at crest of anterior declivity (Fig. 25-26). Puerto Rico. .... ***Ancistrocerus isla* Carpenter n. sp.**  
 — First metasomal tergum without transverse carina (Fig. 27). .... **14**
- 14(13). Axillary fossa extremely narrow, slitlike; prestigma as long as pterostigma (measured along posterior border); second metasomal sternum without basomedian longitudinal sulcus. Puerto Rico. .... ***Monobia puertoricensis* Bequaert**  
 — Axillary fossa broad, not slitlike; prestigma little more than half the length of pterostigma; second metasomal sternum with basomedian longitudinal sulcus. .... **Genus *Euodynerus*, 15**
- 15(14). Clypeus wider than long; second metasomal tergum punctate throughout. Mona. .... ***Euodynerus apicalis* (Cresson)**  
 — Clypeus as wide as long; second metasomal tergum punctate only apically. Mona. .... ***Euodynerus jeitita* Carpenter and Genaro n. sp.**
- 16(1). First metasomal segment in dorsal view petiolate, longer than wide (Fig. 11); propodeum with orifice rounded dorsally (Fig. 13); pronotum with dorsal carina not extending into ventral angle (Fig. 12). .... **Genus *Mischocyttarus*, 17**  
 — First metasomal segment subsessile; evenly conical in dorsal view (Fig. 37-38, 40); propodeum with orifice dorsally acute (Fig. 32); pronotum with dorsal carina extending into ventral angle (Fig. 33). .... **Genus *Polistes*, 18**
- 17(16). Hind tarsi with inner claw only slightly longer and thicker than outer claw (Fig. 9); first metasomal segment largely black. Mona; Puerto Rico; Virgin Is. .... ***Mischocyttarus phthisicus* (Fabricius)**  
 — Hind tarsi with inner claw longer and much thicker than outer claw (Fig. 10); metasoma ferruginous and yellow. Mona?; Puerto Rico. .... ***Mischocyttarus mexicanus cubicola* Richards**
- 18(16). First metasomal segment about as broad apically as long (Fig. 40), anteriorly nearly angular in profile (Fig. 39). Desecheo; Puerto Rico. .... ***Polistes major* Palisot de Beauvois**  
 — First metasomal segment longer than broad apically (Fig. 37-38), smoothly sloping in profile (Fig. 36). .... **19**
- 19(18). Scutum black or with ferruginous spots (Fig. 34); metasomal terga with narrow apical yellow bands. Mona; Desecheo; Puerto Rico; Culebra; Vieques; St. Thomas; St. Croix; St. John; Tortola; Guana; Anegada. .... ***Polistes crinitus* (Felton)**  
 — Scutum ferruginous (Fig. 35); metasomal terga with very wide apical yellow bands, covering most of terga. Puerto Rico. .... ***Polistes minor* Palisot de Beauvois**

### Taxonomic Notes

Genera and species are listed alphabetically by subfamily. For the described species the original description, type material and type locality are given. Synonyms and later combination are listed chronologically. Selected literature citations are mostly records or reviews of the Puerto Rican fauna.

### SUBFAMILY EUMENINAE

The eight genera of Eumeninae recorded here all occur in both the Neotropical and Nearctic Regions, but *Omicron* and *Zeta* just reach the southern part of the Nearctic, construed here as in Mexico north of



the Isthmus of Tehuantepec, and are not found north of the Rio Grande, although *Zeta* is adventive in Florida (Menke and Stange, 1986). By far most of the species of *Omicron* and *Zeta*, as well as *Monobia*, *Pachodynerus* and *Zethus*, occur in the Neotropics. The situation is the opposite in *Ancistrocerus* and *Euodynerus*, where most American species are Nearctic, while the numbers of species in the Nearctic and Neotropics are about the same in *Parancistrocerus*. All the genera occur elsewhere in the Greater Antilles.

Recent generic keys including these genera are given in Carpenter (2004a), for America north of Mexico, and West-Eberhard et al. (1995), Carpenter and Garcete-Barrett (2003), and Sarmiento and Carpenter (2006) for the Neotropics.

There have been very few phylogenetic studies of eumenine genera. The analysis of Nearctic genera by Carpenter and Cumming (1985) included six of the Puerto Rican genera. *Zethus* was the sister-group of the other eumenine genera, with the petiolate genera split off from *Eumenes sensu antiquo* (which would include *Omicron* and *Zeta*) forming a monophyletic group, *Euodynerus* and *Pachodynerus* were closely related (with *Euodynerus* likely paraphyletic in terms of *Pachodynerus*), and *Ancistrocerus* and *Monobia* more closely related to these genera than *Parancistrocerus*.

### Genus *Ancistrocerus* Wesmael

This is a moderately large genus in the current taxonomic interpretation, with more than 100 described species. It is predominantly Holarctic, with species also occurring in the Ethiopian, Oriental and Neotropical Regions. In the Americas most of the species are Nearctic, with six species in the Neotropics. A key to the Nearctic species may be found in Bequaert (1944), although the nomenclature is out of date. Just one species has hitherto been known from the Caribbean, *A. cingulatus* (Cresson), described from Cuba. The new species most closely resembles it.

#### *Ancistrocerus isla* Carpenter, new species

(Fig. 25-26, 41)

**DIAGNOSIS.** Like *A. cingulatus*, and unlike other American *Ancistrocerus*, by having the punctation fine on the humeri and scutum, and nearly absent on metasoma; the metasomal pubescence is very reduced; the humeral angles are blunt; and the second metasomal sternum has a short longitudinal basomedian furrow. The two species are separated by metasomal terga I-II shiny, with superficial punctures, appearing almost impunctate in *A. isla* n. sp., while metasomal terga I-II are dull, with fine punctation in *A. cingulatus*. The transverse carina on the first metasomal tergum is blunt and thick in *A. isla* n. sp. (Fig. 26), while it is sharp and thin in *A. cingulatus*.

**DESCRIPTION.** *Female:* holotype forewing length 9.6 mm. *Structure* - clypeus shallowly emarginate apically; vertex lacking tubercles; tempora not projecting; gena narrower than eye below emargination; pronotal carina absent; humeral angles blunt; humeri and scutum with punctation fine; scutum slightly longer than wide, not noticeably flattened posteriorly; notauli obliterated anteriorly; parategula narrow, weakly hooked; propodeum with lateral angles weakly pointed and concavity enclosed by low carinae, sides and concavity punctate; metasomal tergum I with transverse carina blunt, thick, well developed dorsally, tergum I crenate behind carina; terga I-II shiny, with superficial punctures, appearing almost impunctate, tergum II crenate basally, with few, sparse, superficial punctures apically; terga II-III not reflexed apically; metasomal sternum II lacking basomedian furrow, in lateral view evenly convex posterior to transverse furrow, with short longitudinal basomedian furrow.

*Color* - black; yellow are most of clypeus except for rim, interantennal spot, antenna internally and most of base of scape, small spot on tempora, pronotum dorsally, parategula, tegula anteriorly and posteriorly, large mesepisternal spot dorsally, most of scutellum and metanotum, femora apically and most of tibiae, most of dorsal surface of metasomal tergum I, apical fascia on tergum and sternum II; wings hyaline, forewing narrowly infusate anteriorly, veins and pterostigma brown.

*Vestiture* - abundant setae on head and mesosoma, longer than an ocellus diameter; reduced, sparse setae on metasoma.

*Male:* unknown.

**DISTRIBUTION.** Known only from Puerto Rico. The holotype and one paratype were collected in a trap (for fruit flies?), while the label of the other paratypes, Río Abajo, could refer to a number of places in Puerto Rico.

**TYPE MATERIAL.** ♀ holotype **Puerto Rico:** Mayaguez, trap, 17 May 1937, San Juan No 6860, Lot no. 37-16754 [deposited in USNM]. Paratypes: ♀ same label data [AMNH]; 3 ♀♀ Río Abajo, 3 June 1985 (J. Torres), #67 [LACM].

**ETYMOLOGY.** From the Spanish word for island, to be treated as a noun in apposition.

### Genus *Euodynerus* Dalla Torre

This is a moderately large genus, with more than 100 described species. It is cosmopolitan, with the greatest number of species found in the Palearctic. The American species have not been revised. Most of the American species are Nearctic, with three hitherto known from the Caribbean. The new species is most similar to *E. haitiensis* (Bequaert and Salt), described from Haiti, but that species is ferruginous and yellow, not black and yellow with limited reddish markings. Genaro (2004) described a new species from Cuba.

#### *Euodynerus apicalis* (Cresson)

*Odynerus apicalis* Cresson, 1865: 161, male, female - “Cuba” (lectotype male ANSP). - Ashmead 1900: 312. - Cresson 1916: 103 (designation of lectotype).

*Odynerus spectabilis* de Saussure, 1870: 60 (in subgenus *Odynerus* division *Odynerus*) - “Cuba” (MHNG). - Ashmead 1900: 312. - van der Vecht 1977: 238, 242 (syn. of *E. apicalis* (Cresson)).

*Rygchium* sp.; Ramos 1946: 68. - Wolcott 1951: 862.

*Euodynerus apicalis*; Alayo 1971: 25. - Torres and Snelling 1992: 93.

This species was described from Cuba, and has been recorded only from Mona in Greater Puerto Rico. We have not verified the identification of the Mona specimens.

#### *Euodynerus jeitita* Carpenter and Genaro, new species

(Fig. 42)

**DIAGNOSIS.** In the nominotypical subgenus. Distinguished from the three other species in the Antilles by the punctuation of the second metasomal tergum, which is present only apically, and sparser, with many punctures separated by more than a puncture diameter. In *E. apicalis*, *E. haitiensis*, and *E. jimcarpenteri* Genaro the second metasomal tergum is punctate throughout (in *E. haitiensis* it is superficial on the disc of the tergum), and it is denser apically, with many punctures separated by less than a puncture diameter.

**DESCRIPTION.** *Female:* holotype forewing length 12.3 mm. *Structure* - clypeus about as long as wide, truncate apically, punctate throughout, punctures medially slightly larger than those of eye emarginations; vertex densely punctate with many small punctures, not tuberculate; cephalic foveae distinct, in narrow pit; tempora rounded, not produced; mesosoma densely punctate, metapleuron smooth, posterior face of propodeum striate; humeri not prominent; tegula short, posterior outer margin prominent, posterior lobe not distinct; parategula small, straight; scutellum not bituberculate; metanotum transversely irregularly cristate; lateral angles of propodeum rounded, not dentiform, not carinate nor raised above, not crenulate below; all metasomal terga flat, without swellings, not reflexed or membranous apically; first metasomal tergum impunctate, with narrow hyaline border apically, in lateral view evenly curved; second metasomal tergum punctate only apically, with punctures small and many separated by more than a puncture diameter, not in depressed apical zone; second metasomal sternum with distinct longitudinal basomedian sulcus, in lateral view smoothly curved basally.

*Color* - black with yellow markings; yellow are clypeus except for medial stripe, interantennal spot, most of eye emargination, most of gena, basal spot on mandible, anterior margin of pronotum broadly and posterior margin narrowly, pretegular carina, two longitudinal stripes on scutum, converging posteriorly, tegula largely, parategula, two spots on mesepisternum, two broad spots on scutellum, most of metanotum, lateral angles of propodeum, broad apical bands on metasomal terga I-II and sternum II, narrow bands on tergum III and sterna I and III, anterior face of coxae, apical spots on fore- and midfemora, outer face of tibiae; reddish are most of scape and pedicel, most of mandible, apical two metasomal segments, fourth metasomal sternum and tergum in part, forefemur and midfemur in part, inner face of tibiae, tarsi; forewing somewhat infuscate, yellowish anteriorly, anterior veins and pterostigma yellowish brown, other veins darker brown.

*Vestiture* - cephalic foveae without prominent tufts; with short brownish setae on mesosoma and posteriorly on metasoma; longer on head; hairs on scutellum about as long as ocellar diameter; metasomal terga I-II with dense tomentum only on disc.

*Male*: last antennal article narrowly fingerlike; clypeal punctation superficial; subapical tooth of mandible only slightly larger than basal teeth; midfemur not depressed beneath basally; clypeus yellow, scutum lacking the stripes found in the female; hindtarsus with last tarsomere not much darker than preceding segments.

**REMARKS.** The holotype has the metasoma detached and glued to the date-locality label.

**DISTRIBUTION.** Mona Island and Hispaniola (Dominican Republic).

**TYPE MATERIAL.** ♀ holotype **Hispaniola**, Dominican Republic: Puesto Escondido, Sierra de Baboruco, Nov. 2008 (J. A. Genaro) [deposited in AMNH]. Paratypes: 3 ♂♂ same label data as holotype [AMNH, JAGA]; 2 ♂♂ **Mona Island**, Puerto Rico: Punta Caigo o no Caigo, 22 Nov. 2007 (J. A. Genaro) [AMNH]; 3 ♂♂ Isla de Mona, Puerto Rico: Camino del Uvero, 23 Nov. 2007 (J. A. Genaro) [AMNH]; ♂ Mona Island (PR): near Playa Pájaros, general collecting, 18°03'52"N 67°52'06"W, 18 May 2008, 30 m (N. Franz) [UPRM]. One of the male paratypes from the Dominican Republic has an additional label "101-DR/barcoding". Its DNA sequence, under the name *Euodynerus haitiensis*, is in the Barcode of Life Data Systems (BOLD) database. BOLD is an online workbench that aids collection, management, analysis, and use of DNA barcodes.

**ETYMOLOGY.** Formed from two Taino words; jeiti meaning black and ita meaning red, referring to the metasomal colors (Fig. 42), and to be treated as a noun in apposition.

### Genus *Monobia* de Saussure

This is a moderately sized genus of somewhat more than 30 described species. Most are South American with a few species in North America. There are four species in the Greater Antilles, all part of the angulosa species group (Willink 1982).

#### *Monobia puertoricensis* Bequaert

*Monobia puertoricensis* Bequaert, 1941: 375, fig. 1, female - "PUERTO RICO: Cayey" (USNM). - Wolcott 1951: 862.

This species is endemic to Puerto Rico, and remains known only from the holotype, which was collected gathering clay.

### Genus *Omicron* de Saussure

This is moderately sized genus, with more than 50 described species, most of which are South American. Just one species has been previously described from the Antilles, *O. lacerum* Giordani Soika

from Santo Domingo (Giordani Soika 1978). We have seen the holotype of *O. lacerum* in the MNHN, and it has metasomal terga I-II strongly punctate, whereas the new species has these terga smooth.

***Omicron aridum* Carpenter and Genaro, new species**

(Fig. 43, 44A-H)

**DIAGNOSIS.** The new species fails at couplet 29 of Giordani Soika's (1978) key, coming closest to *O. procellosum* (Zavattari), which is known from Colombia and Venezuela. The male has the last antennal article robust, with the apex reaching base of article 11 when folded, as in *O. procellosum*, not as in *O. furiosum* Giordani Soika, which keys as the alternative. The female has the clypeus moderately emarginate, with the emargination deeper than in *O. procellosum*, however it is not as broad as the width of the interantennal space. The emargination in *O. furiosum* is shallower than in *O. procellosum*.

**DESCRIPTION.** *Female:* holotype forewing length 7 mm. *Structure* - punctuation of frons and mesosoma dense; vertex and tempora smooth; clypeus about as long as wide, moderately emarginate, with punctures small, superficial, sparse; pronotum with punctuation largely absent just behind carina; scutum and lower part of mesepisternum regularly convex, with punctuation uniform; scutellum weakly convex, with median impressed longitudinal line, coarsely punctate; metanotum with punctuation more superficial than that of scutellum; metasomal terga I-II and sternum II smooth, shiny, with small, scattered, nearly invisible punctures; tergum I narrow, more than three times as long as wide apically; tergum II conspicuously convex.

*Color* - black with yellow and reddish markings; yellow are two obscure spots dorsally on clypeus, interantennal spot, spots in ocular emarginations, tempora, anterior and posterior borders of pronotum, dorsal spots on mesepisternum, parategula, anterior border of scutellum, metanotum, propodeum laterally, apical fascia on metasomal terga I-II and partly developed on sternum II; pronotum, mesepisternum and propodeum tinged with reddish, tergum and sternum I extensively reddish; scape, pedicel and base of flagellum reddish brown; mandibles dark reddish brown apically; legs and metasoma becoming brownish apically; tegula brown; wings hyaline, forewing infusate anteriorly, veins and pterostigma dark brown (Fig. 43).

*Vestiture* - short, silvery setae, longer on propodeum, dense tomentum dorsolaterally on clypeus, frons, gena, mesepisternum and coxae, sparser tomentum on metasoma.

*Male:* last antennal article large, thick, not strongly arcuate, apex sharply pointed ventrally, reaching base of article 11 when antennal hook folded; clypeus yellow along dorsal margin.

*Variation:* many females have the clypeus entirely black, without yellow spots. Some of them have most of the clypeus covered with dense tomentum, indicating that the holotype has the clypeus rubbed. Some males have yellow spots on the femora and tibia.

**DISTRIBUTION.** Known only from Puerto Rico, occurring in the arid areas of the south.

**TYPE MATERIAL.** ♀ holotype **Puerto Rico:** Boquerón, 18°02'09"N 67°10'31"W, 28 Nov. 2008, 12 m (J. Carpenter & A. Davidson) [deposited in AMNH]. Paratypes: ♀ ♂ paratypes same label data; 5 ♀♀ 6 ♂♂ Guayanilla, Ventana, 6 Aug. 2005 (J. A. Genaro); 3 ♀♀ 3 ♂♂ same locality, Aug. 2005 (J. A. Genaro and A. Pérez-Asso); ♂ same locality, 7 June 2007 (Amador López); ♀ same locality, 10 Nov. 2007 (J. A. Genaro); ♀ ♂ Ponce, Central Mercedita, 6 Aug. 2005 (J. A. Genaro); ♀ Ponce, Guayanilla, May 2006 (J. A. Genaro); ♀ Coto Laurel, Real Anan, Carretera 511 Km 9.5, Ponce, May 2008 (J. A. Genaro); 2 ♂ Boquerón, near Punta Melones, 1 Nov. 2008 (J. A. Genaro); 2 ♀♀ 13 ♂♂ Guánica, Rta. 333, 17°56'55"N 66°52'36"W, 22-28 Nov. 2008, 50 m (J. Carpenter & A. Davidson); 6 ♀♀ 9 ♂♂ La Parguera, 17°58'41"N 67°03'06"W, 24 Nov. 2008, 17 m (J. Carpenter & A. Davidson); 2 ♂♂ Guayanilla, Boca, 17°58'00"N 66°48'34"W, 25 Nov. 2008, 1 m (J. Carpenter & A. Davidson); ♀ 6 ♂♂ Peñones de Melones, 18°00'06"N 67°11'25"W, 29 Nov. 2008, 31 m (J. Carpenter & A. Davidson); 4 ♀♀ 6 ♂♂ El Combate, Rta. 330, 17°58'46"N 67°11'37"W, 29 Nov. 2008, 5 m (J. Carpenter & A. Davidson); ♂ Rta. 511 N Coto Laurel, 18°06'49"N 66°34'37"W, 2 Dec. 2008, 237 m (J. Carpenter & A. Davidson) [all AMNH].



Additional specimens, not paratypes: Guayanilla, Loma Ventana, 23 Apr. 2008 (J. A. Genaro) [JAGA]; ♀ Campo Santiago, Salinas, Aug. 2010 (A. Sánchez) [JAGA]; ♀ La Rita, Ponce, Nov. 2010 (J. A. Genaro) [JAGA]; ♀ ♂ Lajas, laguna de Cartajena, 18°00'40.28"N 67°06'10.23"W, 10 m (Biol. 4446SN and N. Franz) [UPRM].

**ETYMOLOGY.** From the Spanish word for arid, dry.

**NESTING BEHAVIOR AND ECOLOGY.** Observations on nesting behavior were made in Ventana, Guayanilla (23 Apr. 2008; 24 Jan. 2009, 23 Feb. 2009); Real Anón, Coto Laurel, Ponce (5 Sept. 2010) and La Rita, Ponce (25 Nov. 2010).

The species was observed commonly in dry areas (Fig. 44A and B). Females constructed the nests between 18-63 cm above ground, consisting of one to three cells (Fig. 44C, E-H). Nests were attached to plant stems (Fig. 44F), concealed among spines of the cactus *Pilosocereus royerii* (L.) Byles and Rowley (Fig. 44E), or in altered habitats including the screen of a greenhouse (Fig. 44G) and a PVC plastic tube for water consumption (Fig. 44H). One columnar cactus had 13 nests attached to its spines. All cells were pear-shaped, and lacked partitions. Females provisioned with Microlepidoptera larvae (Fig. 44D). Open cells contained prey and small larvae, while closed cells contained pupae. One nest contained a small wasp larva and eight larvae belonging to two unidentified Microlepidoptera species (mean length= 3.80 mm; SD= 0.64; range: 3.00-4.10 mm). Some prey showed slight movements.

Dimensions of 14 nests: length, 6.90-8.92 mm (x=7.51 mm, SD=0.62); greatest width, 4.31-5.0 mm (x=4.80 mm, SD=0.27).

### Genus *Pachodynerus* de Saussure

This is a moderately sized genus, with 45 species recognized in the revision by Willink and Roig-Alsina (1998). These are mostly neotropical, with five species in the Nearctic Region, and *P. nasidens* now widely adventive on oceanic islands in the Pacific. Regarding the five species treated here, in the cladograms presented by Willink and Roig-Alsina (1998) *Pach. atratus* and *Pach. cinerascens* (Fabric.) are sister-species. They are part of a clade of mostly Caribbean species that also includes *Pach. tibialis*. The remaining two species, *Pach. guadulpensis* and *Pach. nasidens*, are part of a more distantly related clade.

#### *Pachodynerus atratus* (Fabricius)

(Fig. 45)

*Vespa atrata* Fabricius, 1798: 262 [female, male] - "Americae meridionalis insulis" (lectotype male UZMC). - Menke 1986: 655 (designation of lectotype, type locality restricted to St. Thomas).

*Rhynchium atratum*; Dewitz 1881: 200. - Gundlach 1887: 159.

*Monobiella atrata*; Ashmead 1900: 312. - Wolcott 1924: 41; 1936: 568. - Miskimen and Bond 1970: 109 [recorded from St. Croix, probably misidentification].

"*Odynerus aethiops* Cress."; Ståhl 1882: 201 (Puerto Rico). - Gundlach 1887: 160 (syn. of *R. atratum* (Fabricius)). *Nomen nudum*.

*Odynerus atratus*; Zavattari 1912: 192 (in subgenus *Ancistrocerus*, division *Euancistrocerus* Dalla Torre, but perhaps in subgenus *Pachodynerus*).

*Pachodynerus atratus*; Bequaert 1929: 558. - Wolcott 1941: 156 (*Pachodynerus* [!]; in subgenus *Monobiella* Ashmead); 1951: 861. - Medina Gaud and Martorell 1974: 270 (Caja de Muertos). - Menke 1986: 653 (key), 655 (Vieques; Guana; Virgin Gorda; Anegada). - Snelling 2005: 289.

Besides being widespread in Greater Puerto Rico, this species extends to Montserrat in the Lesser Antilles (Menke 1986). Wolcott (1941) recorded it nesting in a mud nest of the sphecid *Sceliphron caementarium* (Drury) auctt., and in 1951 presumed that this indicated that *Pach. atratus* was parasitic, which is certainly incorrect. Wolcott (1941, 1951) also published flower visiting records.

***Pachodynerus cinerascens* (Fabricius)**

*Vespa cinerascens* Fabricius, 1775: 369 [female] - “America” (lectotype female UZMC). - Menke 1986: 657 (designation of lectotype; type locality restricted to St. Croix).  
*Rhynchium carbonarium* de Saussure, 1857: 317, female - “Tranquebar” (MHNG). - Willink and Roig-Alsina 1998: 3, 53 (syn. of *P. cinerascens* (Fabricius)).  
*Odynerus cinerascens*; Zavattari 1912: 221, fig. 53 (in subgenus *Pachodynerus*).  
*Pachodynerus cinerascens*; Bequaert 1929: 558. - Beatty 1944: 171 (*Pachodynerus* [!]). - Miskimen and Bond 1970: 110.

This species is restricted to St. Croix and St. Thomas (Menke 1986). Beatty (1944) recorded it tunneling in limestone cliffs.

***Pachodynerus guadulpensis* (de Saussure)**

*Odynerus guadulpensis* de Saussure, 1853a: 154 (key), 182, female (in subgenus *Leionotus*) - “La Guadeloupe” (lectotype MNHN). - Willink and Roig-Alsina 1998: 69 (designation of lectotype).  
*Odynerus praecox* de Saussure, 1855: 254, pl. XI fig. 9, female (in subgenus *Odynerus* division *Epsilon*) - “L’Amerique du Sud depuis l’Uruguay jusqu’aux missions” (lectotype MNHN). - Willink and Roig-Alsina 1998: 69 (designation of lectotype), 70 (syn. of *O. guadulpensis* de Saussure).  
*Odynerus zonatus* de Saussure, 1870: 57, male (in subgenus *Odynerus* division *Pachodynerus*) - “Cayenna” (MHNG). - Willink 1972: 70, 72 (syn. of *P. praecox* (de Saussure)).  
*Odynerus sancti-vincenti* Ashmead, 1900: 233, 312 (list), female, male - “St. Vincent-Kingstown (Windward side)” (lectotype female USNM). - Menke 1986: 659 (designation of lectotype; syn. of *P. guadulpensis*).  
*Odynerus grenadensis* Ashmead, 1900: 234, 312 (list), female, male - “Grenada-St. Georges (Leeward side)” (lectotype female USNM). - Bequaert 1948: 108 (syn. of *P. guadulpensis* (de Saussure)). - Menke 1986: 659 (designation of lectotype).  
*Odynerus astraesus* Cameron, 1905: 390, female, male (in subgenus *Pachodynerus*) - “Mexico” (BMNH). - Willink 1972: 69, 72 (female *P. astraesus* syn. of *P. praecox* (de Saussure); male *P. astraesus* described by Cameron is not a *Pachodynerus*).  
*Pachodynerus praecox*; Brèthes 1906: 345, fig. 20, 24.  
*Pachodynerus zonatus*; Bertoni 1911: 113.  
*Odynerus clavilinus* Cameron, 1912: 222, male *non* female.  
*Pachodynerus guadulpensis*; Salt and Bequaert 1929: 258. - Snelling 1992: 13 (Puerto Rico).  
*Pachodynerus guadulpensis* var. *sancti-vincenti*; Bequaert 1948: 106 (key), 108.  
*Odynerus* sp. near *grenadensis*; Callan 1954: 18, female. - Menke 1986: 659 (apparently *P. praecox*).  
*Pachodynerus astraesus*; Davis 1964: 13. - Krombein 1967: 85-87.  
*Pachodynerus guadulpensis sancti-vincenti* [!]; Willink 1972: 70, 71.

Snelling (1992) first mentioned this species from Puerto Rico, in a collecting note without providing further detail. The junior author collected a female at Ventana, Guayanilla, 10 Nov. 2007. The senior author collected a female at Guánica, carretera 333, 17°56'55"N 66°52'36"W, 50 m, 27 Nov. 2008, and A. Davidson collected a male at the same locality on 29 Nov. 2008. The species is widespread in the Lesser Antilles, Central and South America (Menke 1986; Willink and Roig-Alsina 1998). It is perhaps rare in Puerto Rico, or recently established - or is another demonstration, along with the new species described herein, that Puerto Rico has been insufficiently collected.

This species has been recorded nesting in bagworm cases (Davis 1964), and Krombein (1967) has given an account of its biology in trap-nests.



***Pachodynerus nasidens* (Latreille)**

*Odynerus nasidens* Latreille, 1817: 112, pl. 15 fig. 1-2, female (MZST).

*Odynerus brevithorax*; de Saussure 1853a: pl. 17 fig. 9. Misidentification.

*Odynerus simplicicornis* de Saussure, 1855: 253, male (in subgenus *Odynerus*, division *Epsilon*) - “L’île de Cuba” (MNHN). - Willink 1972: 70, 72 (syn. of *P. nasidens* (Latreille)).

*Odynerus brachygaster*; Lucas in Guérin-Méneville 1857: 771, pl. 19 fig. 6 (Cuba). Misidentification.

*Odynerus auratus* de Saussure, 1858: 166, female (in subgenus *Odynerus*, division *Epsilon*) - “Le Mexique” (type depository unknown); 1875: 233 (syn. of *Odynerus nasidens*).

*Odynerus nasidens* var. *minor* de Saussure, 1875: 233, male, female (MHNG). - Bohart 1951: 892 (syn. of *P. nasidens* (Latreille)).

*Odynerus magdalenae* Kriechbaumer, 1900: 98, 105, pl. 1 fig. 8, female - “Columbien: Puerto Berrio am R. Magdalena” (ZSMU). - Schulz 1904: 260 (syn. of *Odynerus nasidens*).

*Pachodynerus nasidens*; Brèthes 1906: 345 fig. 21. - Wolcott 1936: 568 (*Pachodyneurus* [!]); 1941: 156 (*Pachodyneurus* [!]); 1951: 861.

*Pachodynerus simplicicornis*; Bertoni 1911: 112.

*Odynerus clavilinus* Cameron, 1912: 222, female *non* male - “British Guiana” (holotype female BMNH). - Willink 1972: 69, 72 (*O. clavilineatus* [!]; female type is syn. of *P. nasidens*).

This species is widespread, occurring throughout South and Central America, and widely adventive in the Pacific Basin (Menke 1986; Yamane et al. 1996; Willink and Roig-Alsina 1998). Numerous publications have dealt with the biology of this species, including detailed studies of population dynamics in Jamaica (Freeman and Jayasingh 1975a, b; Jayasingh and Taffe 1982). Its proclivity for nesting in pre-existing cavities is indicated by the common name “keyhole wasp” in Hawaii, and which has doubtless aided its spread by humans. Wolcott (1941, 1951) published some flower visiting records in Puerto Rico.

***Pachodynerus tibialis* (de Saussure)**

(Fig. 46)

*Odynerus tibialis* de Saussure, 1853a: 154 (key), 183, female (in subgenus *Leionotus*) - “La Colombie, Caracas” [corrected 1875: Venezuela] (MHNG); 1875: 230 (key), 241 (Venezuela label perhaps erroneous; Haiti). - Wolcott 1924: 42 (in subgenus *Pachodynerus*); 1936: 568 (in subgenus *Pachodyneurus* [!]). - Bequaert 1948: 109 (only Hispaniola and Mona). - Menke 1986: 663 (type locality restricted to Hispaniola).

*Pachodyneurus* [!] *tibialis*; Wolcott 1941: 156. - Ramos 1946: 68. - Wolcott 1951: 861 (*Pachodynerus*). - Torres and Snelling 1992: 93 (*Pachodynerus*).

*Pachodynerus tibialis* var. (or. subsp.) *barboursi* Bequaert, 1948: 107 (key), 109, female - “Bahamas: Great Inagua” (MCZH). - Willink and Roig-Alsina 1998: 3, 100 (syn. of *Pach. tibialis* (de Saussure)).

*Pachodynerus tibialis barboursi*; Menke 1986: 654 (key), 664.

Aside from Mona, this species is found in Hispaniola and the Bahamas (Menke 1986; Willink and Roig-Alsina 1998). The original description from Caracas is erroneous, as are records from Puerto Rico by Wolcott (1924; 1936); see Bequaert (1948), Wolcott (1951), and Menke (1986). The only published information on its biology is flower visitation records (Wolcott 1941, 1951).

**Genus *Parancistrocerus* de Saussure**

This is a moderately large genus, with nearly 100 described species. The majority of the species are New World, but there is a substantial number in the Oriental Region (see, e. g., Giordani Soika 1994). While there is a serviceable key to the species north of Mexico (Bohart 1952), the Neotropical species are unrevised. Genaro (2004) described a new species from Cuba.

***Parancistrocerus bacu* (de Saussure)**

*Odynerus bacu* de Saussure, 1853a: 154 (key), 185, male (in subgenus *Leionotus*) - “L’île de Cuba” (? MNHN).

*Odynerus bacuensis* de Saussure, 1855: 232 (unnecessary emendation; in subgenus *Odynerus*, division *Epsilon*). - Ståhl 1882: 201 (*P. bucuensis* [!]; Puerto Rico). - Gundlach 1887: 159 (*P. bucuensis* [!]). - Wolcott 1924: 42 (*P. bucuensis* [!]); 1936: 569 (*Odynerus bucuensis* [!]); 1951: 861 (*P. bucuensis* [!]).

*Ancistrocerus variornatus* Cameron, 1906: 283, male - “Havana” (? BMNH). - Bequaert 1925: 116 (type in coll. Pomona College); 1928: 172 (syn. of *A. bacu* (de Saussure) in subgenus *Parancistrocerus*).

*Ancistrocerus bacu*; Bequaert 1925: 110 (type possibly in Paris; should be placed in subgenus *Parancistrocerus*).

*Stenodynerus bacu*; Alayo 1976: 8 (key), 21.

*Parancistrocerus bacu*; Genaro 2004: 67.

This species was described from Cuba, and has also been recorded from Jamaica (Fox 1891), as well as Puerto Rico.

***Parancistrocerus dejectus* (Cresson)**

*Odynerus dejectus* Cresson, 1865: 164, female - “Cuba” (GUCO). - Dewitz 1881: 200 (Portorico). - Ståhl 1882: 201. - Gundlach 1887: 159. - Ashmead 1900: 312. - Wolcott 1924: 42.

“*Od. cressoni*, Sauss.”; Gundlach 1887: 159. *Nomen nudum*.

*Ancistrocerus dejectus*; Bequaert 1925: 112 (in subgenus *Parancistrocerus*). - Wolcott 1936: 569; 1941: 156; 1951: 861.

*Ancistrocerus atkinsi* Bequaert and Salt, 1931: 775, female (in subgenus *Parancistrocerus*) - “Cuba: La Milpa near Cienfuegos” (MCZH). - Alayo 1976: 21 (suspect only a syn. of *S. dejectus* (Cresson)).

*Stenodynerus dejectus*; Maldonado Capriles and Navarro 1967: 61.

*Parancistrocerus dejectus*; Genaro 2004: 67, 69.

This species was described from Cuba, and otherwise is known only from Puerto Rico and Culebra. The only published information on its biology concerns avian predation on this species (Wolcott 1924, 1951).

***Parancistrocerus obliquus* (Cresson)**

*Odynerus obliquus* Cresson, 1865: 163, female, male - “Cuba” (lectotype female ANSP). - Ashmead 1900: 312. - Cresson 1916: 105 (designation of lectotype).

*Nortonia obliquus*; Bequaert 1925: 117.

*Stenodynerus obliquus*; Alayo 1976: 8 (key), 21.

*Parancistrocerus obliquus*; Genaro 2004: 67, 69 (*P. obliquus* [!]).

This species was previously known only from Cuba. The junior author collected a female at La Rita, Ponce, in May 2008. It differs from Cuban specimens we have seen in being somewhat darker: it lacks lateral spots on the second metasomal tergum, the scape is black apically (not all yellow), the clypeus is black only at the very apical extremity (not most of apex), the gena has only small yellow spots (not mostly yellow), the mesepisternum lacks a small yellow spot below the large one, the fore- and mid-femora are largely black (not yellow), and the tarsi are black (not brownish).

**Genus *Zeta* de Saussure**

This is a small genus, with four described species. Two of them are endemic to the Antilles, *Zeta abdominale*, discussed below, and *Zeta confusum* (Bequaert and Salt), from Cuba. The other two species are respectively confined to Argentina (*Zeta mendozanum* (Schrottky)), and widespread from Argentina

to Mexico (*Zeta argillaceum* (Linnaeus)). The latter species is now adventive in Florida (Menke and Stange 1986).

### ***Zeta abdominale* (Drury)**

(Fig. 47)

*Sphex abdominalis* Drury, 1770: 108, pl. 45, fig. 2 - "Jamaica" (lost).

*Vespa attenuata* Fabricius, 1775: 372 - "Habitat in America" (lost). - de Saussure 1852: 70 (syn. of *Eumenes abdominalis* (Drury)).

*Sphex extensa* Christ, 1791: 321, pl. 32 fig. 7- "Jamaika" (lost). - de Saussure 1875: 106 (syn. of *Eumenes abdominalis* (Drury)).

*Polistes attenuata*; Fabricius, 1804: 279.

*Eumenes abdominalis*; Westwood 1837: 102, pl. 45 fig. 2. - Ashmead 1900: 312.

*Eumenes colona* de Saussure, 1852: 70, female - "La Jamaïque; La Colombie" (type depository unknown). - de Saussure 1875: 106 (syn. of *E. abdominalis* (Drury)). - Kirby 1884: 409.

*Eumenes ornatus* de Saussure, 1855: 147, pl. 8 fig. 3, female (in division *Zeta*) - "Les Antilles" (lectotype MNHN). - de Saussure 1875: 106 (syn. of *E. abdominalis* (Drury)). - Dewitz 1881: 200. - Ståhl 1883: 201. - Gundlach 1887: 159. - Ashmead 1900: 312 (*ornata*). - Wolcott 1924: 41; 1936: 568; 1941: 156; 1951: 860. - Giordani Soika 1975: 133 (designation of lectotype). REVISED STATUS.

*Eumenes abdominalis* var. *ornatus*; de Saussure 1875: 107 (in division *Zeta*).

*Eumenes abdominalis* var. *colona*; de Saussure 1875: 107 (in division *Zeta*).

*Eumenes colonus* var. *ornatus*; Zavattari 1912: 127 (in division *Zeta*).

*Eumenes abdominalis* var. *hispaniolae* Bequaert and Salt, 1931: 772, female, male - "Santo Domingo. Port-au-Prince, Haiti" (holotype female MCZH). REVISED STATUS.

*Zeta abdominale abdominale*; Giordani Soika 1975: 131 (key), 130.

*Zeta abdominale ornatum*; Giordani Soika 1975: 131 (key), 133.

*Zeta abdominale hispaniolae*; Giordani Soika 1975: 131 (key), 132, fig. 2-4, 7.

This species was described from Jamaica, and recorded from Hispaniola and Greater Puerto Rico, as well as Antigua (Giordani Soika 1975). In the revision by Giordani Soika (1975), it was treated as a polytypic species with three subspecies. *Zeta a. abdominale* is the form from Jamaica, while *Zeta abdominale ornatum* is that from Greater Puerto Rico and Antigua, and *Zeta abdominale hispaniolae* is that from Hispaniola. The case with these forms is similar to that of the other polytypic Antillean taxa treated here: the subspecies are distinguished by minor color differences, which show continuous variation. In this case, the subspecies are distinguished by the relative amounts of black *versus* ferruginous and yellow on the mesosoma and second metasomal segment. The senior author has previously (Carpenter 1988) studied the subspecies recognized by Giordani Soika (1975) for *Zeta argillaceum* (Linnaeus), all of which are based on color alone, and showed that the distinctions claimed for them did not hold up. All of the subspecies of *Zeta argillaceum* were accordingly synonymized, but the Antillean species were not studied at that time. They have been now, and also do not merit recognition.

It should be noted that Giordani Soika (1990: 166-170) took issue with Carpenter's (1988) paper, wishing to maintain the validity of his subspecies. As Carpenter (2003) showed, his arguments ranged from inconsistent to unintentionally ironic, and his taxonomic approach is simply outmoded. Subspecies have no place in a phylogenetic system, whether considered from the viewpoint of evolutionary taxonomy (Wilson and Brown 1953) or cladistics (Nixon and Wheeler 1990). Even if one were to argue that subspecies should be recognized so as to assist conservation efforts, the taxa in question here are not well distinguished.

Wolcott (1951) provided flower records and described the mud cells of the nest. The nesting behavior of this species has been extensively studied in Jamaica (Freeman and Taffe 1974; Taffe and Ittyeipe 1976; Taffe 1978, 1983).

**Genus *Zethus* Fabricius**

This is by far the largest genus of Eumeninae, with nearly 250 described species. The Puerto Rican species is placed in the subgenus *Zethusculus* Saussure, which presently contains 25 species. Bohart and Stange (1965) included *Zethus rufinodus* in their arietis species group, which contains several other Caribbean species, and one from Florida.

***Zethus rufinodus* (Latreille)**

(Fig. 48)

*Eumenes rufinoda* Latreille, 1806: Tab. 14 fig. 4; 1809: 137 - "in Americae insulis" (lectotype male MNHN). - Bohart and Stange 1962: 31 (designation of lectotype).

*Zethus rufinodis*; Lamarck 1817: 85.

*Zethus rufinodus*; Dewitz 1881: 200 (Portorico). - Ståhl 1882: 201. - Gundlach 1887: 158. - Ashmead 1900: 312. - Zavattari 1912: 11 (key), 23 (in division *Zethusculus*). - Wolcott 1924: 41; 1936: 568; 1941: 156; 1951: 860. - Torres and Snelling 1992: 93.

*Zethus rufinodus monensis* Bohart and Stange, 1965: 138 (key), 147, fig. 98, male, female (in subgenus *Zethusculus*) - "West Indies: Mona Island" (holotype male MCZH). REVISED STATUS.

*Zethus rufinodus virginicus* Bohart and Stange, 1965: 138 (key), 147, male (in subgenus *Zethusculus*) - "S. Thomas" (UZMC). REVISED STATUS.

Aside from Greater Puerto Rico, this species is recorded from Antigua (Bohart and Stange 1965). In the revision by Bohart and Stange (1965), it was treated as a polytypic species with three subspecies, two of them described in that revision. The subspecies *Zethus rufinodus monensis*, from Mona, and *Zethus rufinodus virginicus*, from St. Thomas, are very minor color variants, differing in relative amounts of pale markings on the scutellum and metanotum, and the shading of red and yellow. We see no useful reason to maintain these subspecies, and herewith synonymize them.

Wolcott (1941, 1951) has recorded this species nesting in rotten fenceposts, and provided flower records. According to Wolcott (1951) its burrows may be so numerous as to require replacement of the fencepost.

**SUBFAMILY POLISTINAE**

The two genera recorded here are each the only member of their respective tribe (Carpenter 1991). *Polistes* is cosmopolitan, but has more species described from the Neotropics than any other Region, while *Mischocyttarus* is primarily Neotropical, with a few species in the Nearctic Region. Species of the two genera form nearly the entirety of the social wasp fauna in the Caribbean.

A recent key to the polistine genera in the New World is provided by Carpenter (2004b), and species keys are to be found in Richards (1978).

The concept of the phylogenetic relationships among polistine genera has varied in recent analyses. In the analysis of adult morphology by Carpenter (1991), *Polistes* was the sister-group of all other polistine genera, with the position of *Mischocyttarus* not resolved relative to the tribes Ropalidiini and Epiponini. The position of both *Polistes* and *Mischocyttarus* was unresolved in the analysis of nest architecture by Wenzel (1993). *Polistes* was the sister-group of all other polistine genera, with *Mischocyttarus* sister-group of the remaining genera in turn in the combined analysis of adult and larval morphology and nest architecture by Wenzel and Carpenter (1994). With the addition of molecular data (Arévalo et al. 2004) *Polistes* was still the sister-group of all other polistine genera with the position of *Mischocyttarus* unresolved again. But the relationships of the tribes were different in the combined analysis of molecular and morphological data by Pickett and Carpenter (2010), with *Polistes* the sister-group of Epiponini, and *Mischocyttarus* the sister-group of this clade. The matter is far from settled.



## TRIBE MISCHOCYTTARINI

Genus *Mischocyttarus* de Saussure

This is the largest genus of social wasps, with nearly 250 described species, all from the New World. The two species occurring in Puerto Rico are both placed in the subgenus *Phi* Saussure, and are closely related, being part of the *mexicanus* group of Silveira (2008).

*Mischocyttarus mexicanus cubicola* Richards

*Polybia cubensis* var. *obscura*; Ståhl 1882: 201 (Puerto Rico). *Nomen nudum*.

*Polybia cubensis*; Ashmead 1900: 311 [*partim*]. Misidentification.

*Megacanthopus cubensis*; Wolcott 1924: 41. Misidentification.

*Mischocyttarus cubensis*; Bequaert 1933: 115 (key), 118 (nest), 135, fig. 4, pl. XXIX fig. 5-6. - Wolcott 1936: 568; 1941: 156. - Ramos 1946: 68 (Mona). - Wolcott 1951: 864. - Medina Gaud and Martorell 1974: 270 (Caja de Muertos). Misidentification.

*Mischocyttarus cubensis* var. *cubensis*; Bequaert 1933: 135, fig. 4, pl. 29 fig. 5-6. Misidentification.

*Mischocyttarus cubensis cubensis*; Bohart 1951: 880. Misidentification.

*Mischocyttarus mexicanus*; Litte 1977: 229-246.

*Mischocyttarus mexicanus cubicola* Richards, 1978: 309 (key), 318, female, male (in subgenus *Mono-cyttarus* Richards) - "Cuba: Mts near Guantanamo" (holotype male BMNH); also from elsewhere in Cuba; and U. S. A.: FL. - Hermann and Chao 1984: 516-520 (distr.; U. S. A.: SC, Puerto Rico).

This subspecies was described from Cuba, and recorded from the southeastern United States as well as Puerto Rico. It was previously misidentified as *Misch. cubensis* (de Saussure). Wolcott (1941) and Ramos (1946) recorded *Misch. cubensis* from Mona, but Torres and Snelling (1992) suggested this was actually *Misch. phthisicus*. However, Wolcott (1951) recorded both *Misch. phthisicus* and *Misch. cubensis* from Puerto Rico, and his brief description of the latter could correspond to *Misch. mexicanus cubicola*. Hermann and Chao (1984) have definitely recorded *Misch. mexicanus cubicola* from Puerto Rico.

Wolcott (1941, 1951, as *M. cubensis*) noted caterpillar prey, and cases of attack by *Cordyceps* fungus attaching wasps to citrus leaves. The biology of *Misch. mexicanus cubicola* has been extensively studied in Florida (e. g. Litte 1977; Clouse 1995, 1997, 2001).

*Mischocyttarus phthisicus* (Fabricius)

(Fig. 49)

*Vespa phthisica* Fabricius, 1793: 281 - "America" (UZMC).

*Polistes phthisica*; Fabricius 1804: 278.

*Polybia indeterminabilis* de Saussure, 1854: 201 (in division *My*) - "Amérique du Sud. Ile Sainte-Lucie" (lectotype female MNHN). - Ducke 1913: 331 (syn. of *M. phthisicus* (Fabricius)). - Richards 1978: 316 (designation of lectotype).

*Polybia phthisica*; Dewitz 1881: 199 (Portorico). - Gundlach 1887: 158. - Ashmead, 1900: 311. - Wolcott 1924: 41.

? *Polybia fulvofasciatus*; Ashmead 1900: 311. Misidentification.

*Polybia mexicana*; Ashmead 1900: 311. Misidentification.

*Megacanthopus indeterminabilis*; Ducke 1910: 540. - Wolcott 1924: 41; 1936: 568.

*Mischocyttarus phthisicus*; Ducke 1913: 331. - Bequaert 1933: 116 (key), 139. - Wolcott 1936: 568. - Beatty 1944: 171 (St. Croix). - Wolcott 1951: 864. - Miskimen and Bond 1970: 110. - Snelling 1992: 13 (Guana), 14 (Mona). - Torres and Snelling 1992: 93 (Mona). - Snelling 2005: 289 (Guana).

*Mischocyttarus indeterminabilis*; Overal 1978: 10.

This species is widespread in the Antilles, and is known from Florida, and there are dubious records from Central and South America. Wolcott (1951) mentioned caterpillar prey in Puerto Rico, but little has been published on the biology of this species.

## TRIBE POLISTINI

### Genus *Polistes* Latreille

There are more than 200 species in the genus, with more than 90 described from the New World. The three species recorded here are now placed in the subgenus *Aphanilopterus* Meunier in the broad sense (Carpenter 1996). In the subgeneric classification of Richards (1978), *P. major* was placed in a different subgenus, *Palisotius* Richards, from the other two species, which were both included in the same species group, the crinitus group, or Group 5, of the subgenus *Aphanilopterus* in the restricted sense. In the cladistic analysis by Pickett and Wenzel (2004), *P. major* and *P. crinitus americanus* were sister-groups, with *P. minor* distantly related. More recent analyses have shown *P. major* and *P. crinitus* as not closely related (Pickett et al. 2006; Pickett and Carpenter 2010), but *P. minor* was not included.

### *Polistes crinitus* (Felton)

(Fig. 50)

- Vespa crinita* Felton, 1765: 54, pl. VI right fig. - "Island of Jamaica" (lost).  
*Vespa tricolor* Fabricius, 1775: 369 - "Jamaica" (type depository unknown) [junior primary homonym of *Vespa tricolor* Pallas, 1771]. - de Saussure 1853a: 93 (syn. of *P. americanus* (Fabricius)).  
*Vespa americana* Fabricius, 1775: 370 - "America" (UZMC). REVISED STATUS.  
*Vespa multicolor* Olivier, 1792: 691 - "Cayenne" (type depository unknown). - de Saussure 1853a: 94 (syn. of *P. americanus* (Fabricius)). REVISED STATUS.  
 ? *Vespa dominicensis* Vallot, 1802: 168 - "Saint-Domingue" (probably lost). - de Saussure 1854: 103 (species dubiae; in subgenus *Polistes*, possibly *P. americanus*).  
*Polistes americana*; Fabricius, 1804: 275. - Dewitz 1881: 199 (*P. americanus*; Portorico). - Ståhl 1882: 201 (*P. americanus*). - Gundlach 1887: 158 (*P. americanus*). - Ashmead 1900: 311 (*P. americanus*). - Wolcott 1951: 862-864 (*P. americanus*). - García Tudurí et al. 1974: 130 (*P. americanus*; Desecheo). - Medina Gaud and Martorell 1974: 270 (*P. americanus*; Caja de Muertos).  
*Polistes media* Palisot de Beauvois, 1818: 207, pl. VIII fig. 2 - "Sainte-Domingue" (type depository unknown). - de Saussure 1853a: 94 (syn. of *P. americanus* (Fabricius)).  
*Polistes madoci* Kirby, 1884: 411, female - "St. Thomas" (BMNH). - Richards 1978: 515 (syn. of *P. crinitus americanus* (Fabricius)).  
*Polistes canadensis*; Wolcott 1924: 41; 1936: 567. Misidentification.  
*Polistes crinitus*; Wolcott 1924: 41; 1936: 567; 1941: 155 (record of *P. canadensis* from Puerto Rico belongs here). - Ramos 1946: 68. - Miskimen and Bond 1970: 109. - Snelling 1992: 13 (Guana), 14 (Mona); 2005: 289 (Guana).  
*Polistes crinitus* var. *americanus*; Salt 1927: 185.  
*Polistes crinitus* var. *insulicola* Bequaert and Salt, 1931: 793, female - "St. Kitts (or St. Christopher) ... Basseterre" (Cornell University, Ithaca). - Richards 1978: 515 (syn. of *P. crinitus multicolor* (Olivier)).  
*Polistes crinitus insulicola*; Beatty 1944: 171.  
*Polistes crinitus* var. *multicolor*; Richards and Richards 1951: 96.  
*Polistes crinitus crinitus*; Richards 1978: 471 (key), 514 (in subgenus *Aphanilopterus*).  
*Polistes crinitus americanus*; Wolcott 1951: 864  
*Polistes crinitus multicolor*; Richards 1978: 471 (key), 515 (in subgenus *Aphanilopterus*).  
*Polistes tricolor*; Overall 1978: 10.

This species was described from Jamaica, and is widespread in the Antilles. In the revision by Richards (1978), it was treated as a polytypic species with three subspecies. The forms concerned were



originally described as separate species, then synonymized by de Saussure (1853-1858). In the last century the names were revived as varieties, with another variety then described by Bequaert and Salt (1931), which later came to be treated as subspecies. In Richards' conception, *P. crinitus americanus* is the subspecies predominant in Greater Puerto Rico, with *P. c. crinitus* restricted to Jamaica, Hispaniola and Montserrat, while *P. crinitus multicolor* is found in St. Croix and the Lesser Antilles, as well as Montserrat. In Richards' key these subspecies differ in the relative amounts of black, ferruginous and yellow coloration. The differences are not large: there is more black on the metasoma and more yellow on the mesosoma in *P. crinitus americanus*, while the scutum is ferruginous in *P. crinitus crinitus* but is black or with reddish spots in *P. crinitus multicolor*. However, as his key stated of the latter "(specimens from Martinique approach *P. c. crinitus*).". These latter forms, then, are not well distinguished, nor is the form *Polistes crinitus* var. *insulicola*, which Richards treated as a synonym of *P. crinitus multicolor*. And in fact *P. crinitus americanus* is not as distinct as portrayed in the key: Richards gave "Humeri almost entirely yellow" for *P. crinitus americanus* versus "Humeri with only front and hind margins yellow, disk black and ferruginous," but *P. crinitus americanus* we have collected in Puerto Rico typically have the front and hind margins yellow, and just part of the dorsal surface black; the lateral surface is black with occasional reddish tinge. The variation among these forms is continuous, with the more melanistic extreme found in Puerto Rico. Dividing such variation into named subspecies is a poor way to treat it, and it does not work well in any case. We are therefore sinking these subspecies. Wolcott (1924) mentioned caterpillar prey, and avian predation on this species in Puerto Rico. Wolcott (1951) elaborated on the ethology of the species, and mentioned *Cordyceps* attack. There are otherwise just isolated description of nests from elsewhere in its range (Richards and Richards 1951).

### ***Polistes major major* Palisot de Beauvois**

*Polistes major* Palisot de Beauvois, 1818: 206, pl. VIII fig. 1 - "Sainte-Domingue" (type depository unknown). - Wolcott 1936: 567, fig.; 1941: 155. - Ramos 1946: 68 (Mona). - Wolcott 1951: 864. - García Tudurí et al. 1974: 130 (Desecheo). - Medina Gaud and Martorell 1974: 270 (Caja de Muertos).

*Polistes carnifex*; Ashmead 1900: 311. Misidentification.

*Polistes major* var. *major*; Bequaert 1937: 174.

*Polistes major* var. (or subsp) *bakeri* Bequaert, 1940: 15, male, female - U. S. A.: "San Antonio, Bexar Co., TEXAS" (MCZH). - Snelling 1974: 477 (syn. of *P. major* Palisot de Beauvois).

*Polistes major major*; Bohart 1951: 879.

*Polistes major bakeri*; Bohart 1951: 879.

This species was described from Hispaniola, and is widespread in mainland America. It has been considered to have been introduced into Puerto Rico (Bequaert 1936), as the first collecting record dates from 1930, after the hurricane of 1928 that was suggested to have brought it to Puerto Rico, as well as to Mona, where the first collecting record dates from 1939 (Wolcott 1951). Wolcott (1951: 864) stated: "It now occurs in all parts of Puerto Rico, but is not especially abundant" which is the case today (pers. obs. of the junior author). It is mentioned in the list for Mona by Ramos (1946) but not the later list by Torres and Snelling (1992), and the junior author did not observe the species on two trips to Mona, in 2000 and 2007. However, given our discovery of two undescribed endemic species of Vespidae, and confirmation of the occurrence of another species that is otherwise widespread in the Lesser Antilles, we must question the premise underlying the suggestion that the species is introduced, namely that previous collecting was really sufficient to establish absence. It could have been present all along, rare perhaps but in any case overlooked. We also think that the speculation that this species was blown in on the wind should be set aside.

Wolcott (1941, 1951) gave some details about nesting and prey. There is otherwise rather little published on the biology of this widespread species (e. g. Rau 1940, 1943).

### ***Polistes minor* Palisot de Beauvois**

*Polistes minor* Palisot de Beauvois, 1818: 207, pl. VIII fig. 3 - "Sainte-Domingue" (type depository unknown). - Ashmead 1900: 311.

*Polistes versicolor*; Ashmead 1900: 311. Misidentification.

*Polistes hertwigi* Schulz, 1903: 486, female - "Westindien ... Haiti" (ZSMU). - Richards 1978: 517 (syn. of *P. minor* Palisot de Beauvois).

This species was described from Hispaniola, and is recorded from Tortuga as well as Puerto Rico (Richards 1978).

The nest was figured by Palisot de Beauvois (1818: pl. VIII fig. 3) with the original description, but nothing has been published on the biology of this species since.

### Composition of the Fauna

Of the twenty species treated herein, three are endemic to Puerto Rico (15%) and one to St. Croix and St. Thomas (5%). Five other species are restricted to the Greater Antilles, i. e., also occur in Cuba, Jamaica or Hispaniola. Five others (25%) also occur in the Lesser Antilles, and another species extends into the Bahamas. That is, 75% of the species are precinctive in the West Indies. Just five species also occur in continental America. Two of these, the two species of *Mischocyttarus*, occur just in the southeastern U. S. A. The last three of the continental species are widespread, but are predominantly Neotropical, only occurring in the very southern part of the Nearctic Region.

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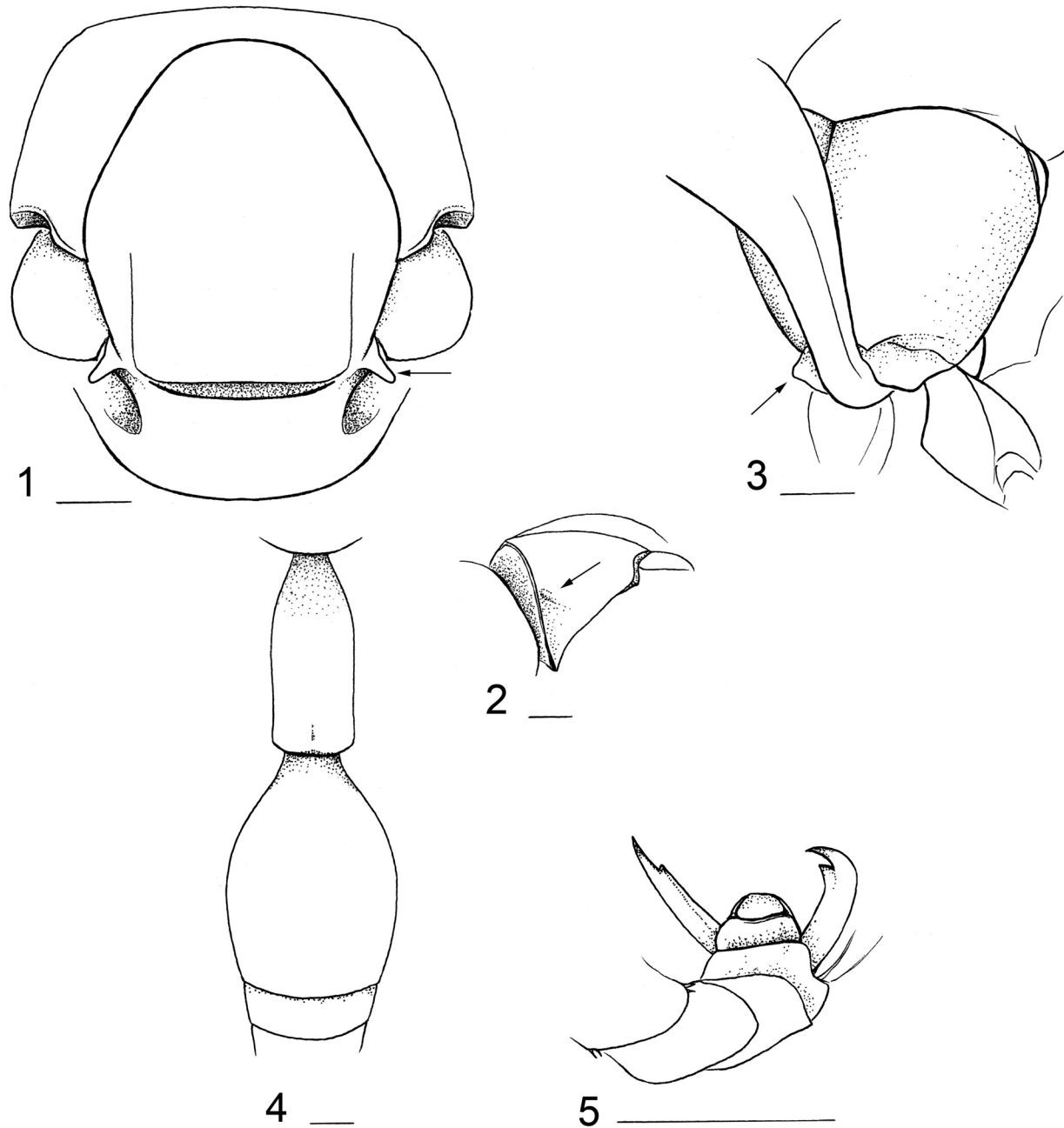
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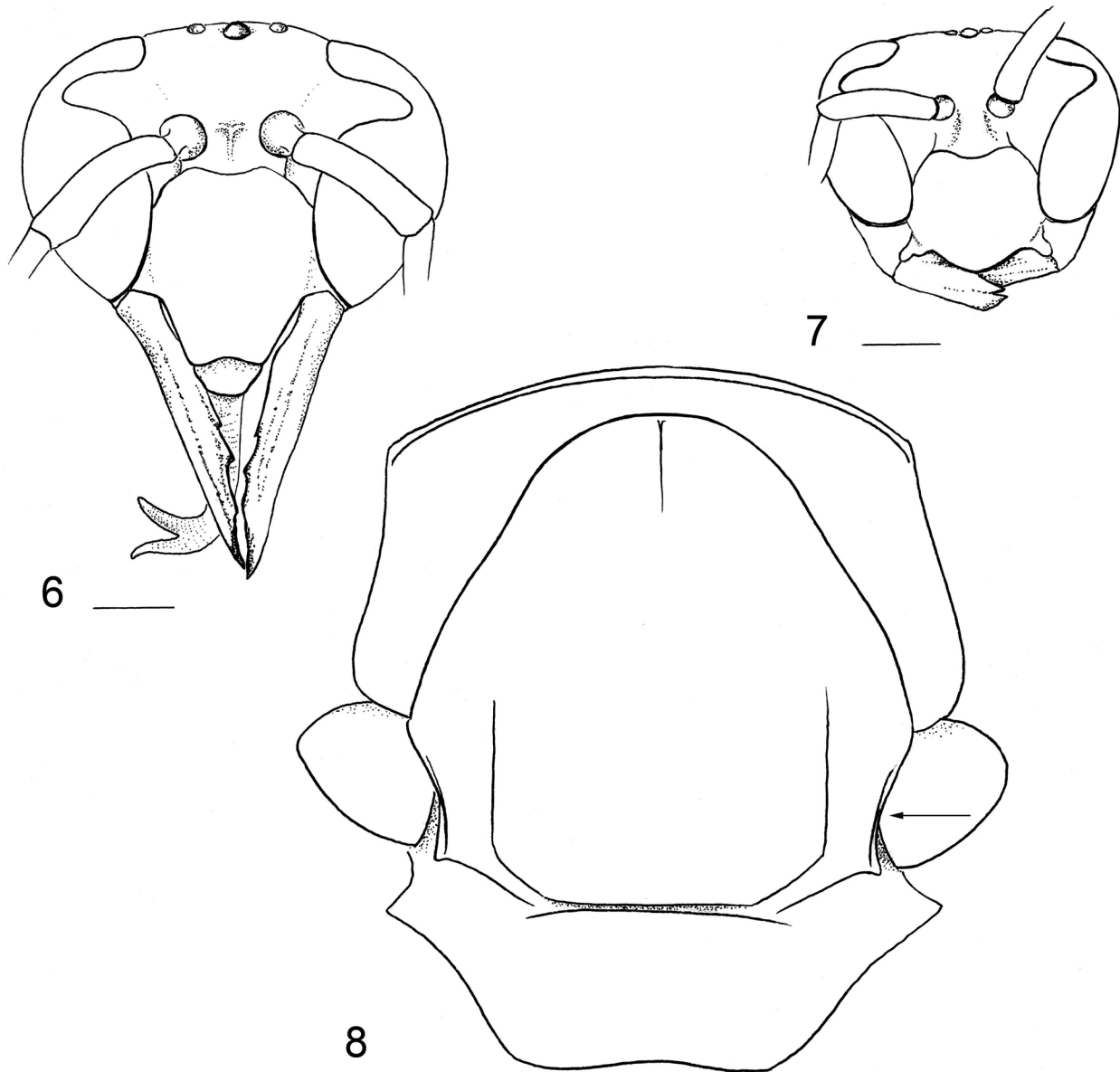
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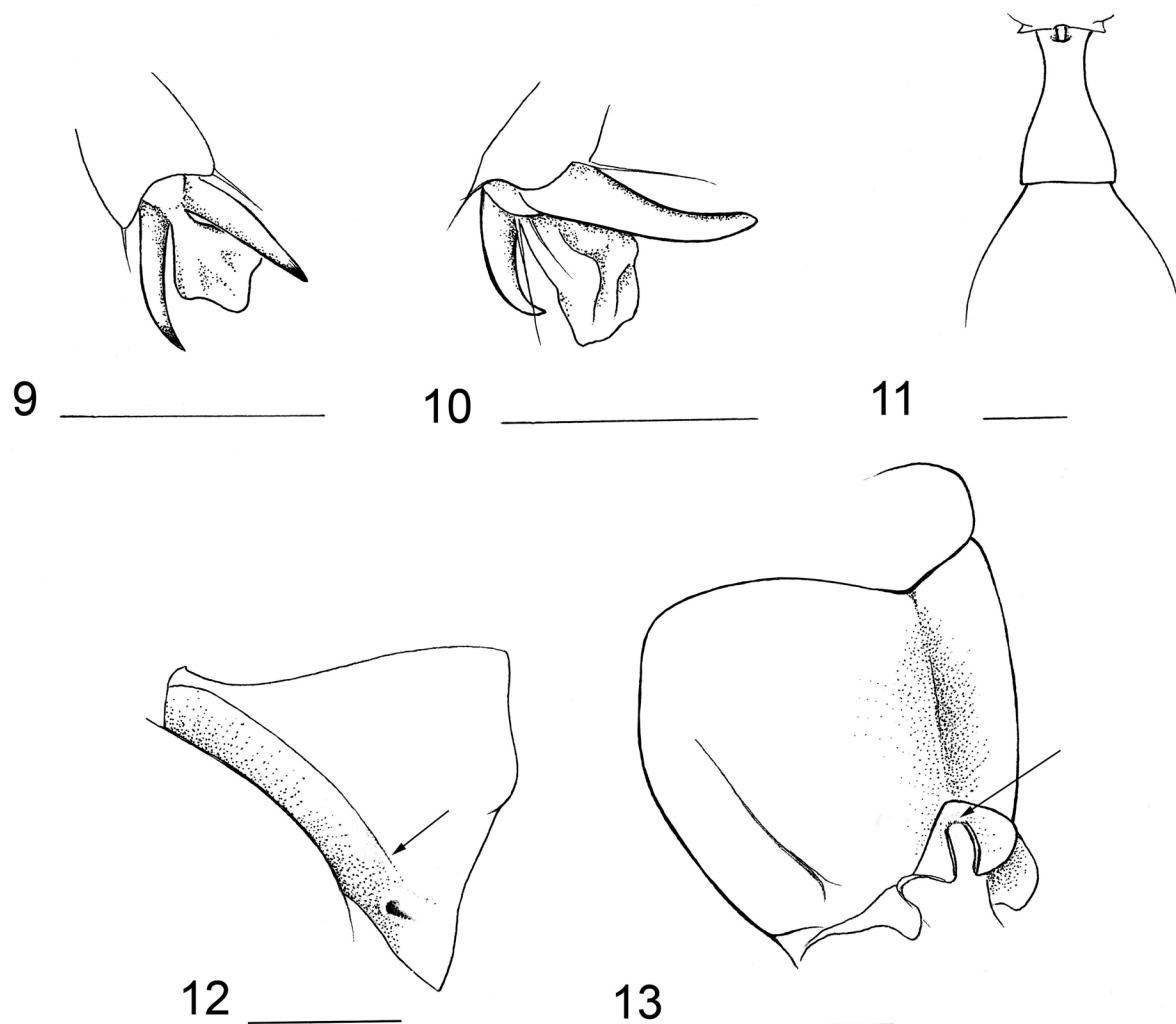
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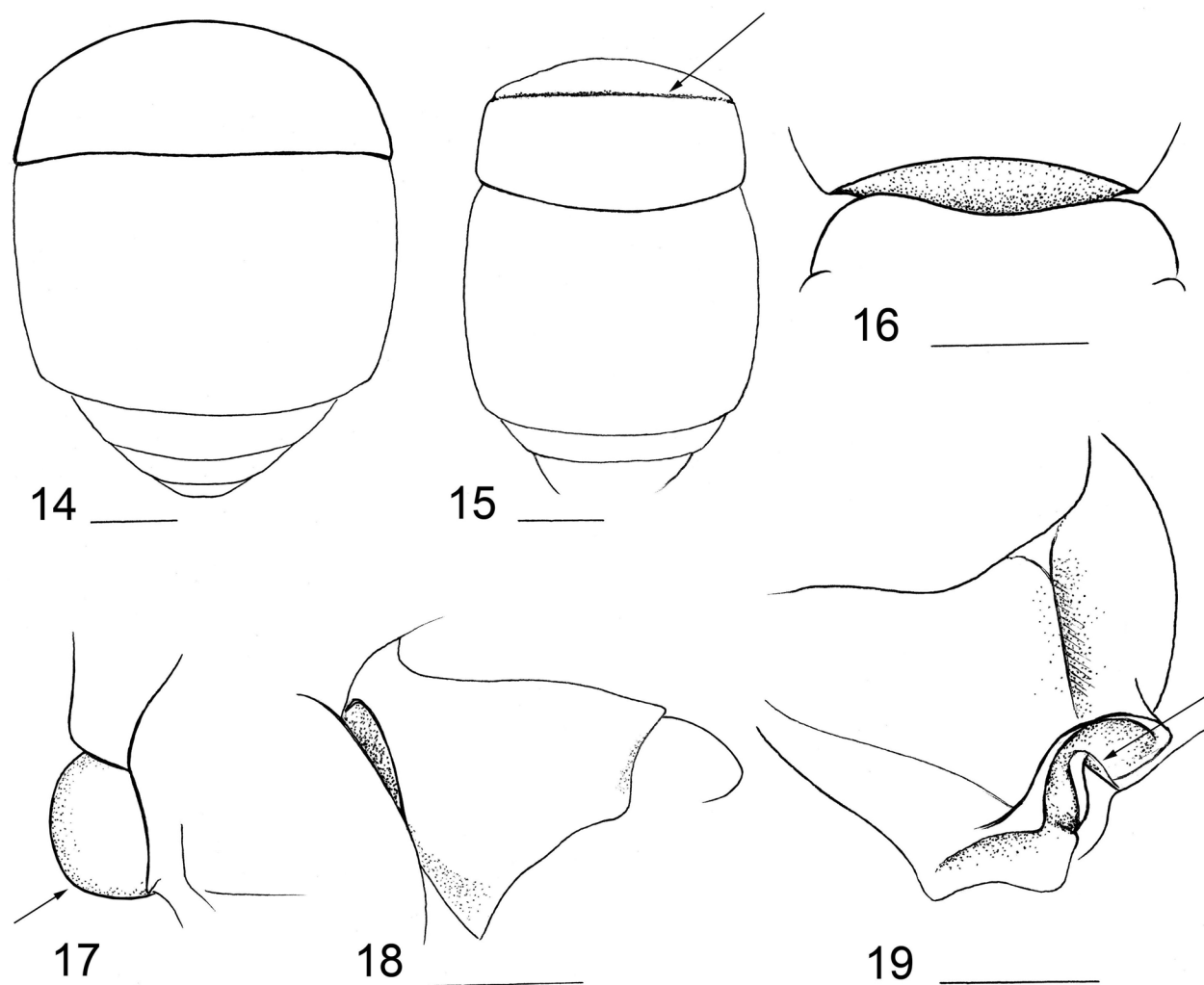
**Figures 1-5.** *Zeta abdominale* (Drury). **1)** Mesosoma in dorsal view. **2)** Pronotum in oblique lateral view. **3)** Propodeum in oblique posterior view. **4)** First metasomal tergum in dorsal view. **5)** Claws. Scale bars = 1 mm.



**Figures 6-7.** Head in frontal view. **6)** *Zeta abdominale* (Drury). **7)** *Polistes crinitus* (Felton). **8)** *Polistes minor* Palisot de Beauvois, mesosoma in dorsal view. Scale bars = 1 mm.

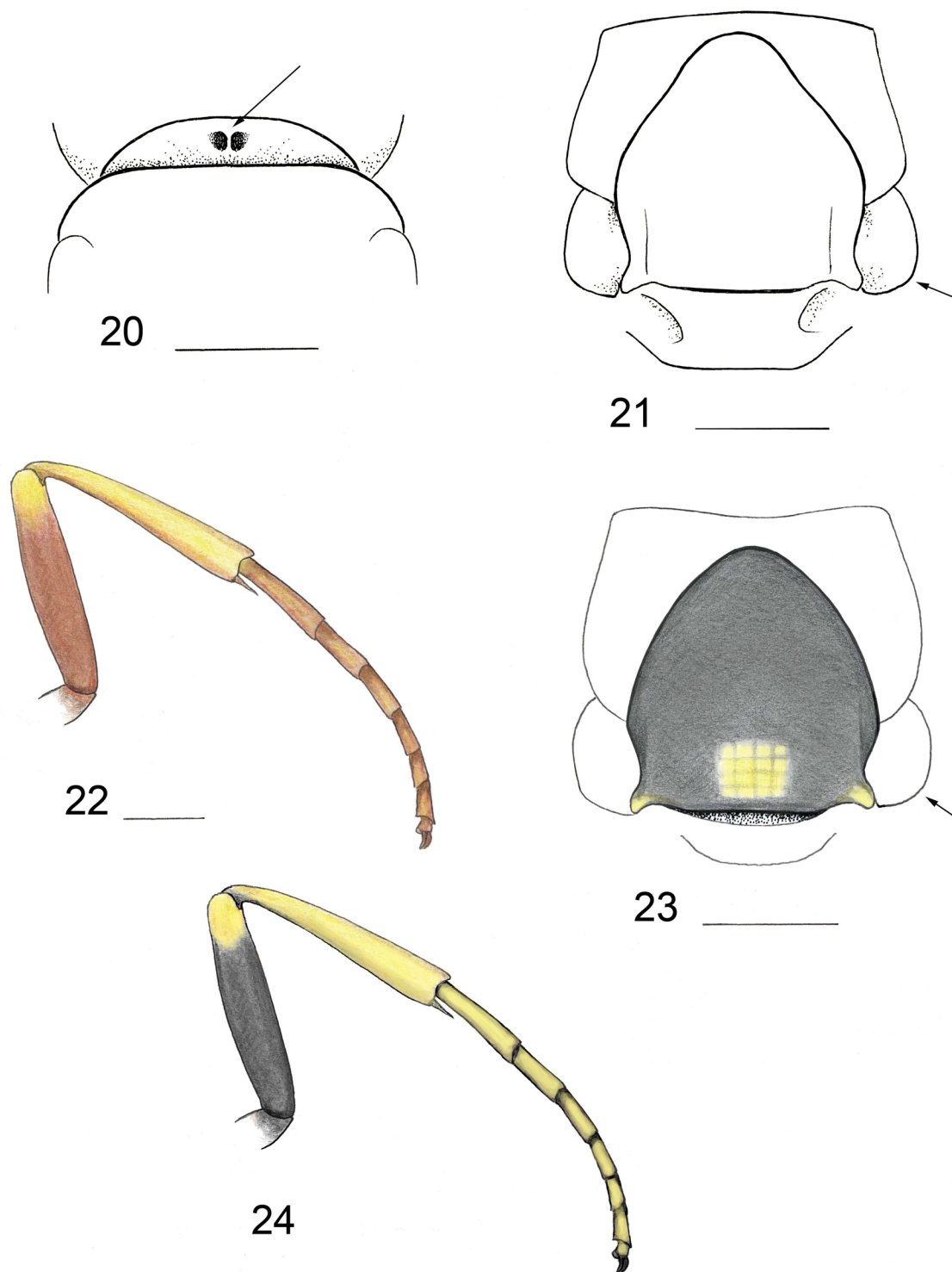


**Figures 9-13.** *Mischoctytarus*. **9-10)** Claws. **9)** *M. phthisicus* (Fabricius). **10)** *M. mexicanus cubicola* Richards. **11)** *M. phthisicus*, first metasomal tergum in dorsal view. **12-13)** *M. mexicanus cubicola*. **12)** Pronotum in oblique lateral view. **13)** Propodeum in oblique posterior view. Scale bars = 1 mm.

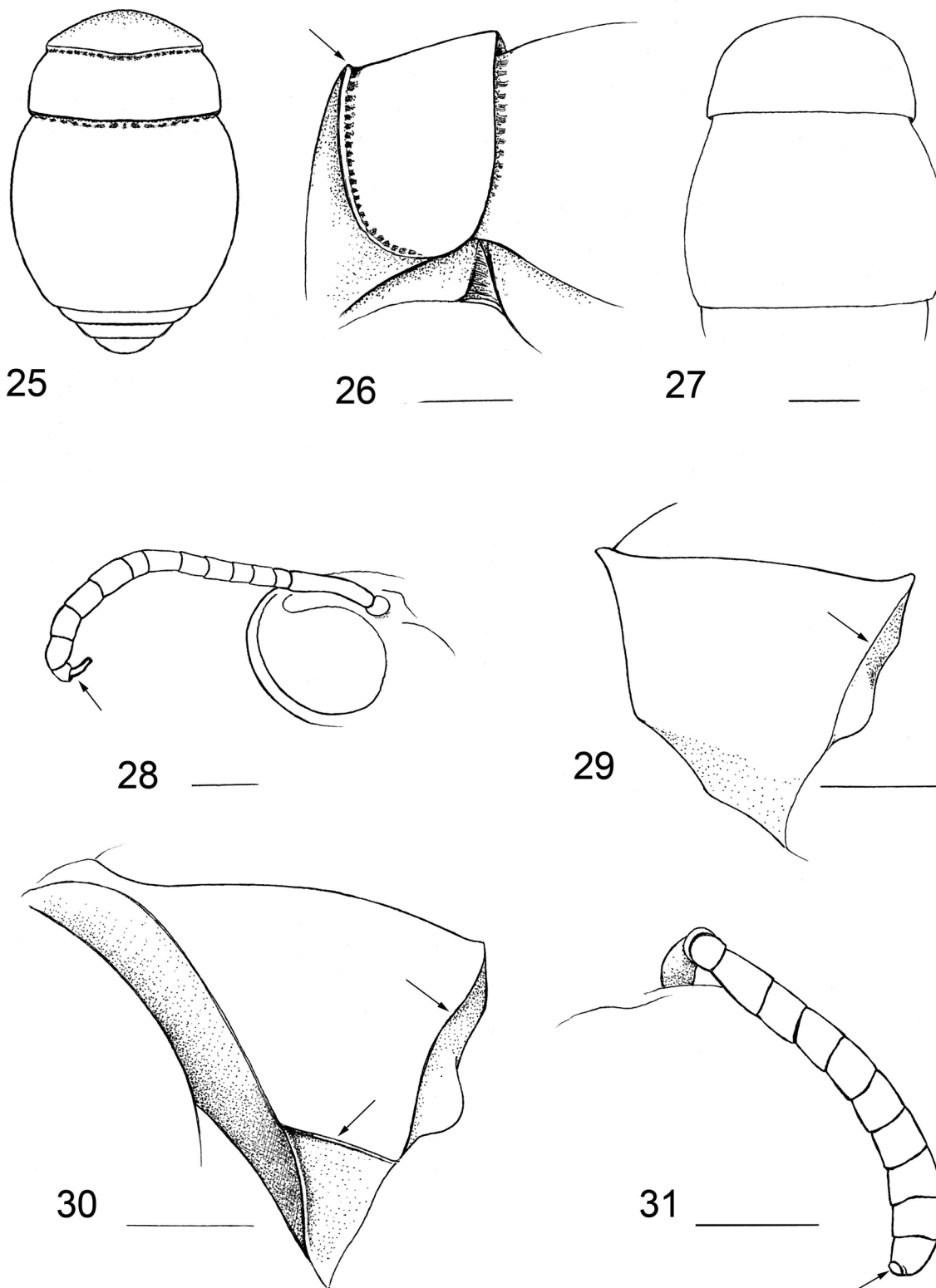


**Figures 14-19.** Eumeninae. **14-15)** First metasomal tergum in dorsal view. **14)** *Pachodynerus nasidens* (Latreille). **15)** *P. atratus* (Fabricius). **16-17)** *Pachodynerus nasidens*. **16)** Pronotum in antero-dorsal view. **17)** Tegula. **18)** *Omicron vexatum* Giordani Soika, pronotum in oblique lateral view. **19)** *Zethus rufinodus* (Latreille). Scale bars = 1 mm.

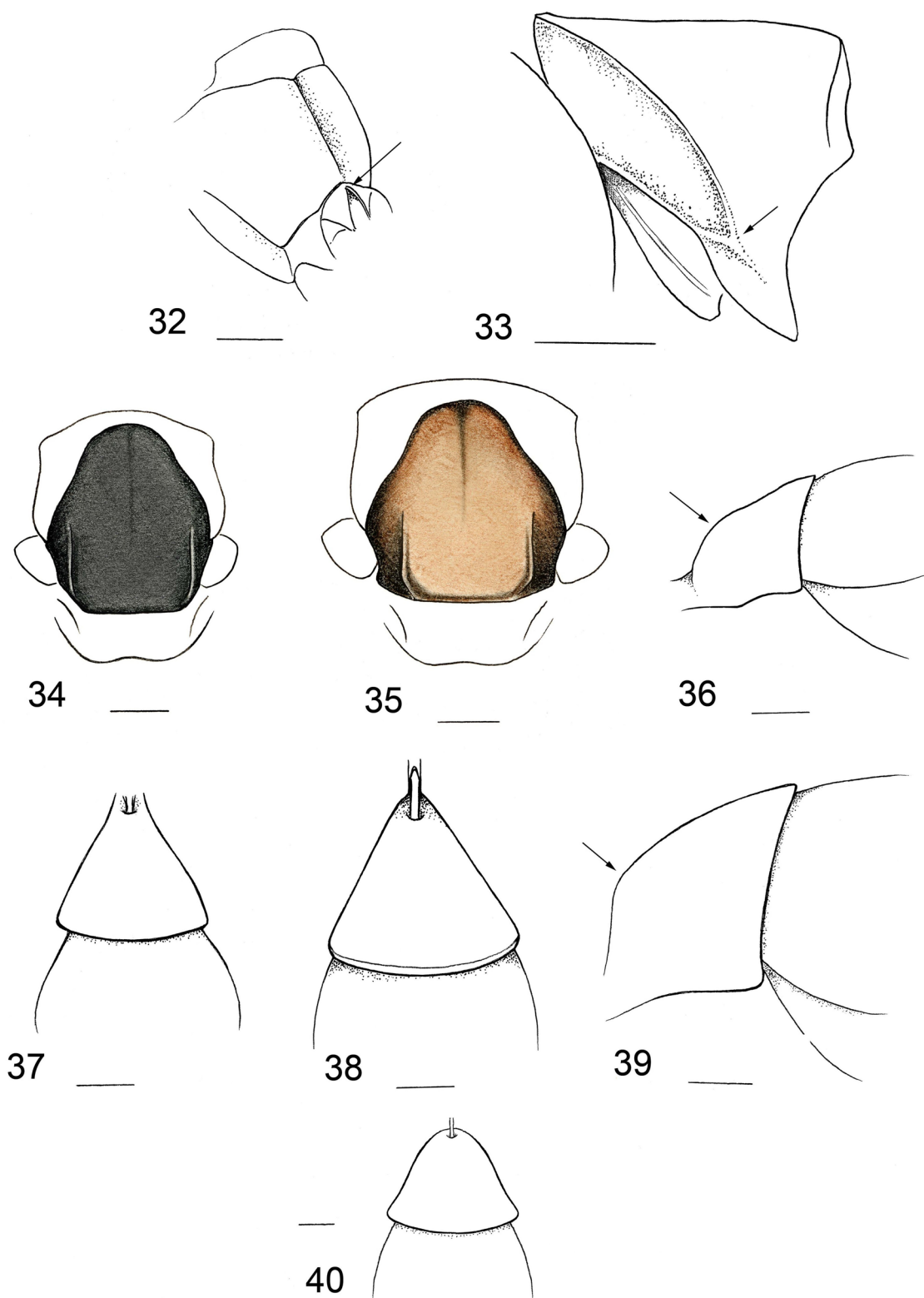




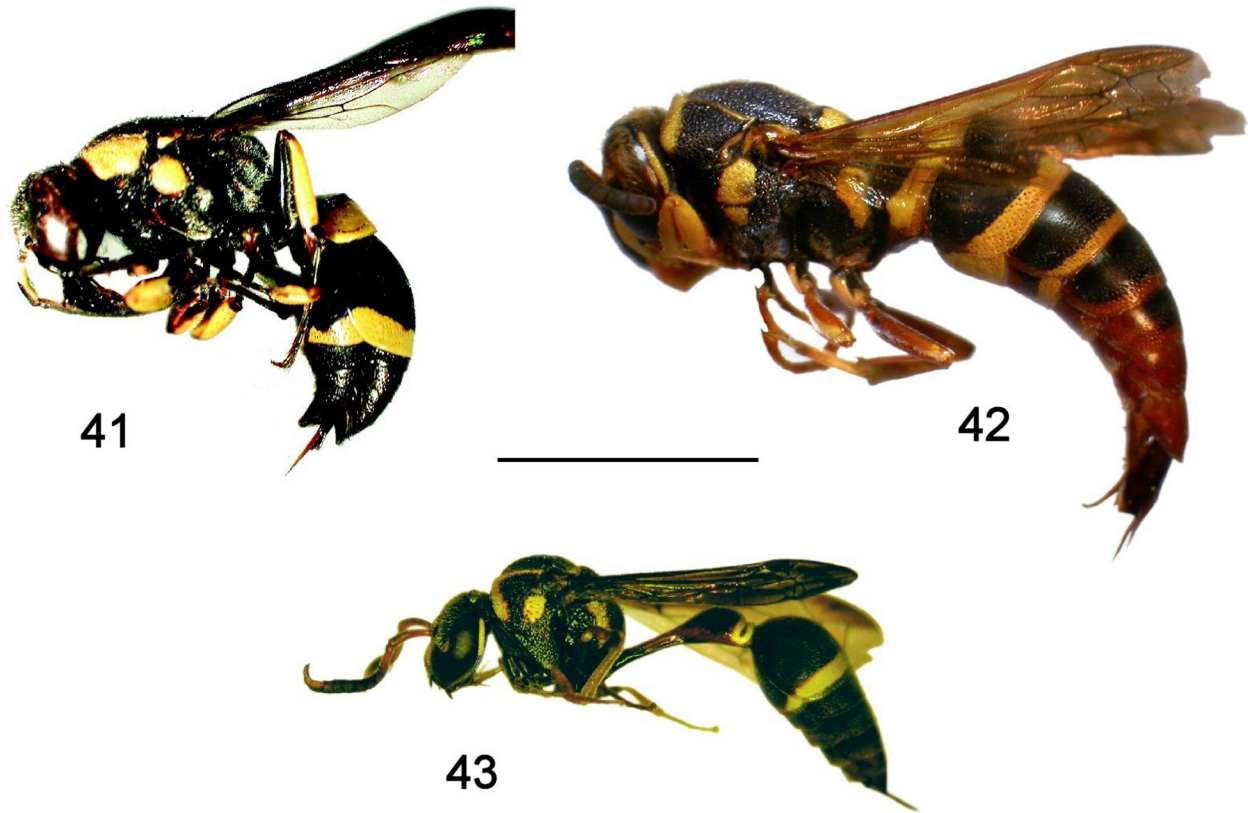
**Figures 20-24.** *Parancistrocerus*. 20-22) *P. bacu* (de Saussure). 20) Pronotum in antero-dorsal view. 21) Mesosoma in dorsal view. 22) Leg. 23-24) *P. dejectus* (Cresson). 23) Mesosoma in dorsal view. 24) Leg. Scale bars = 1 mm.



**Figures 25-31.** Eumeninae. **25-26)** *Ancistrocerus isla* Carpenter, n. sp. **25)** Metasoma in dorsal view. **26)** First metasomal tergum in lateral view. **27-29)** *Monobia proeta* (Cresson). **27)** First metasomal tergum in dorsal view. **28)** Male antenna. **29)** Pronotum in oblique lateral view. **30-31)** *Pachodynerus nasidens* (Latreille). **30)** Pronotum in oblique lateral view. **31)** Male antenna. Scale bars = 1 mm.

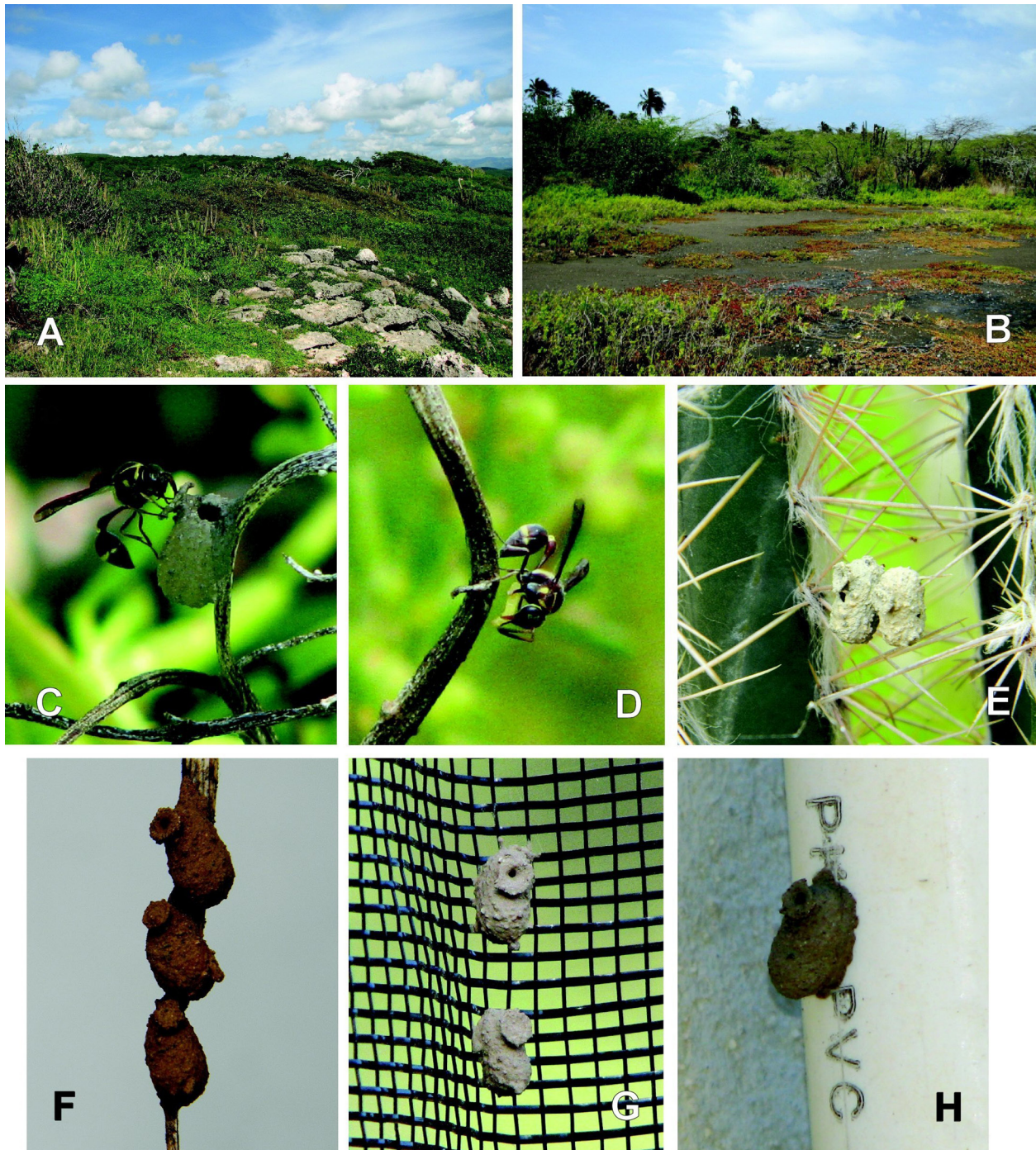


**Figures 32-40.** *Polistes*. **32)** *P. minor* Palisot de Beauvois, propodeum in oblique posterior view. **33)** *P. crinitus* (Felton), pronotum in oblique lateral view. **34-35)** Mesosoma in dorsal view. **34)** *P. crinitus* (Felton). **35)** *P. minor* Palisot de Beauvois. **36-37)** *P. crinitus*. **36)** First metasomal tergum in lateral view. **37)** First metasomal tergum in dorsal view. **38)** *P. minor*, first metasomal tergum in dorsal view. **39-40)** *P. major* Palisot de Beauvois. **39)** First metasomal tergum in lateral view. **40)** First metasomal tergum in dorsal view. Scale bars = 1 mm.



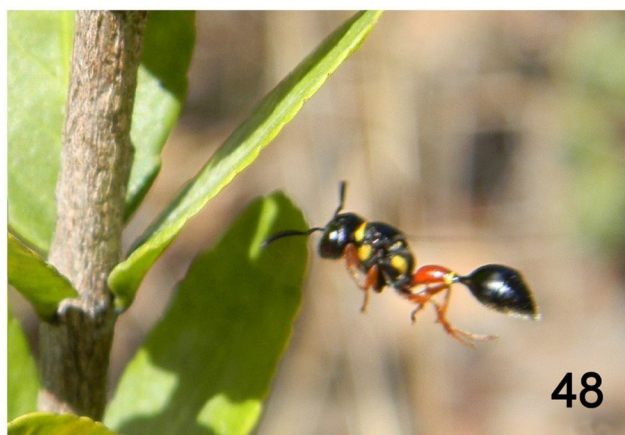
**Figure 41-43.** Habitus of new species of eumenines. 41) *Ancistrocerus isla*, female. 42) *Euodynerus jeitita*, male. 43) *Omicron aridum*, female. Scale bar = 7 mm.





**Figures 44.** *Omicron aridum* new species. **A-B)** habitat in Guayanilla. **C)** female inspecting an old nest. **D)** female transporting a moth larva for provisioning the nest. Nests attached to: **E)** cactus, *Pilosocereus royenii*; **F)** a plant stem; **G)** screen of a greenhouse; **H)** PVC tube.





**Figures 45-50.** Images from life of vespid wasps from Greater Puerto Rico. **45)** *Pachodynerus atratus* gathering mud up for nest construction on a path, Culebra Island. **46)** *Pachodynerus tibialis* involved in the same activity, Mona Island. **47)** *Zeta abdominale* with a mud ball ready for transportation to the nest, Puerto Rico. **48)** *Zethus rufinodus*, Puerto Rico. **49)** *Mischocyttarus phthisicus* on the nest, Puerto Rico. **50)** *Polistes crinitus* on the nest, Mona Island.

