

PARASITOIDS OF *COMSTOCKIELLA SABALIS* (HOMOPTERA:
DIASPIDIDAE) IN FLORIDA AND DESCRIPTION OF A NEW
SPECIES OF THE GENUS *COCCOBIUS* (HYMENOPTERA:
APHELINIDAE)

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ABSTRACT

Coccobius donatellae Pedata and Evans, spec. nov. is described and illustrated from specimens reared from *Comstockiella sabalis* (Comstock) on palmetto palm (*Sabal palmetto*) in Florida. *Coccobius donatellae* is the most common parasitoid that attacks this host in Florida and is believed to be the same species reported in the literature as "*Physcus* sp." that was introduced into Bermuda from Florida in the 1920's. Evidence suggests that earlier reports of *Encarsia portoricensis* (Howard) as a parasitoid of the palmetto scale are based on erroneous identifications of what were probably *Coccobius donatellae* males. Recent collections in Florida confirm *Aphytis diaspidis* (Howard), reported previously as *Aphytis fuscipennis*, and *Encarsia citrina*

(Craw) as parasitoids of *C. sabalis*. Intraspecific variation occurring in *C. donatellae* and in *Coccobius testaceus* (Masi), is discussed.

Key Words: *Coccobius*, Aphelinidae, Diaspididae, *Comstockiella*, armored scale, biological control, parasitoid

RESUMEN

Se describe y se ilustra *Coccobius donatellae* Pedata and Evans, spec. nov., criado de *Comstockiella sabalis* (Comstock) sobre la palma palmetto (*Sabal palmetto*) en Florida. *Coccobius donatellae* es el parasito más común que ataca este hospedero en Florida y se cree que es la misma especie reportada en la literatura como "*Phycus* sp. que fue introducida a Bermuda de Florida en los años 1920. Se presenta evidencia que indica que los informes anteriores de *Encarsia portoricensis* (Howard) como parasito de *C. sabalis* son basados sobre identificaciones erróneas de los machos de *Coccobius donatellae*. Se confirma *Aphytis diaspidis* (Howard), reportado anteriormente como, *Aphytis fuscipennis*, y *Encarsia citrina* (Craw) como parásitos de *C. sabalis* basado en las recolecciones recién hechas en Florida. Se incluye información sobre la variación intraespecífica que ocurre en *C. donatellae* y en *Coccobius testaceus* (Masi).

Comstockiella sabalis (Comstock) is an armored scale insect (Homoptera: Diaspididae) known from the southern United States, Mexico, several of the Caribbean Islands, and from greenhouses in Germany (Nakahara, 1982). Although it is commonly found on palm species, it rarely causes economic damage due to the severe attack of parasitoids on this species throughout its geographic range. However, this has not always been the case. *C. sabalis* invaded Bermuda in 1921 and quickly spread throughout the islands, severely damaging or killing *Sabal bermudana* Bailey trees (Russell 1934a). Parasitized *C. sabalis* specimens were collected in Florida and sent to Bermuda in 1926 and 1929. No mention was made of the specific identity of parasitoids introduced into Bermuda from Florida at that time; however, in a survey of the natural enemies of the palmetto scale in Bermuda conducted in 1933, *Phycus* sp., *Encarsia portoricensis* Howard, *Aphytis fuscipennis* Howard and two undetermined Hymenoptera were reported as being reared from this host (Russell, 1934b). The parasitoid referred to in the survey as "*Phycus* sp.", now placed in the genus *Coccobius*, was particularly effective against the scale. Russell (1934b) reported that "the palmettos on which this species was placed that were once badly infested, were later free from scale". Bennett and Hughes (1959) reared *Phycus* sp. and *Aphytis fuscipennis* from *C. sabalis* collected in Bermuda in 1956 and stated that "it would seem that *E. portoricensis* is no longer of importance as a control for this scale".

Recent collections of *C. sabalis* in Florida have helped to clarify our knowledge of the natural enemies of *C. sabalis* in Florida and provided insight as to the identity of the parasitoid species introduced into Bermuda from Florida in the 1920's. We suggest that specimens identified in the Bermuda survey as "*Phycus* sp." and *Encarsia portoricensis*, represent the female and male of *Coccobius donatellae*, respectively. This species is the most common parasitoid reared from *C. sabalis* in Florida, and undoubtedly plays a key role in its control. Evidence supporting our hypothesis that specimens reared from *C. sabalis* in the Bermuda survey that were identified as *Encarsia portoricensis* were actually males of *Coccobius donatellae* consists of: *Encarsia portoricensis* is a whitefly parasitoid that is not known to occur in Florida; males of *Coccobius donatellae* are similar to females of *E. portoricensis* in color, and in the number

of and relative lengths of antennal segments (6-segmented); and specimens deposited in the Museum of Natural History, London from the 1933 Bermuda survey, identified by Ferriere as *Encarsia* sp., were later identified as *Coccobius* males (A. Polaszek, personal communication).

The third species mentioned in the survey, *Aphytis fuscipennis* Howard, was synonymized with *Aphytis diaspidis* (Howard) by Rosen and DeBach (1979), who did not list *C. sabalis* as one of its hosts. We confirm the identity of *A. diaspidis* based on three specimens of *Aphytis diaspidis* reared from *C. sabalis* from the 1933 Bermuda survey and deposited in the Florida State Collection of Arthropods, Gainesville, Florida. Our collections in Florida confirm *Aphytis diaspidis* and *Encarsia citrina* (Craw) as parasitoids of *C. sabalis*; it appears that both of these species play minor roles in controlling populations of the scale.

The majority of the 79 described species of the genus *Coccobius* are parasitoids of diaspine scales; 10 species have been reported as parasitoids of soft scales (Coccidae), 1 species from a mealybug (Pseudococcidae), and 1 species from a lac scale (Kerridae). Hayat (1984) reviewed the 58 *Coccobius* species known worldwide at that time and provided a taxonomic key to 48 of those species. Since then, twenty-one species have been described; of these are, 7 from South Africa (Prinsloo, 1995), 10 from China (Huang, 1990), 1 from Japan (Tachikawa, 1988), 2 from Turkmenia (Myartseva, 1995) and 1 from Azerbaijan (Jasnosh and Mustafeva, 1992). Only 6 species are known to occur in the continental United States; of these, 2 species (*howardi*, *stanfordi*) were described from California, 1 species (*varicornis*) from Washington, DC, and 3 (*flaviventris*, *fulvus*, *testaceus*) are introduced species. *Coccobius donatellae* is the fourth species of this genus to be described from the continental United States.

Terminology follows that used by Hayat (1984). Figure 1 shows the mesosoma divided medially with the surface sculpturing on the left side and the setation on the right side. The metasoma is divided medially showing the dorsum on the left side and the venter on the right side.

Coccobius donatellae Pedata and Evans, **NEW SPECIES**
(Figs. 1-6)

Female (Figs. 1-4)

Length: 0.70-0.90 mm, mean of 5 specimens = 0.82 mm. Coloration: Body (Fig. 1) yellowish; basal half of head dark brown; pronotum, metanotum, metasomal tergites I-VI, fuscous; legs white with central portion of femora and basal two-thirds of tibiae, faintly fuscous; antennae yellowish, basal half of scape, dorsal margin of pedicel, F1 and club, grayish; fore wing hyaline. Structure: **Head** slightly wider than mesosoma. Antenna (Fig. 3) consists of radicle (R), scape (S), pedicel (P), 3 funicle segments (F1-F3) and 2 club segments (F4-F5), length:width ratio for each segment as follows: R:3.2, S:3.5, P:1.4, F1:1.5, F2: 1.7, F3:1.6, F4:1.4, F5:2.5; relative length of each segment to length of F1 segment: R:1.1, S:2.8, P:1.1, F1:1.0, F2:1.3, F3:1.3, F4:1.3, F5:2.2; flagellar segments F1-F6 with 2,2,2,2 and 5-6 linear sensilla, respectively. **Mesosoma** with broad mesoscutum, 1.8× as wide as long with approximately 40 setae and small, reticulate cells each with internal striations; scutellum with 3 pairs of setae, and sculpturing similar to that of mesoscutum; mesophragma reaching base of metasomal tergite II. **Fore wing** 2.6× as long as wide, discal setation uniformly distributed with narrow asetose area basally near posterior margin; marginal vein as long as costal cell with 10-12 marginal setae; submarginal vein with 6-7 setae; longest marginal cilia 0.2× as long as the maximum width of fore wing. **Metasoma** slender, 1.7× as long

as mesosoma, tergites I-VI with reticulate lateral margins, tergites V-VI with stipules, centrally; tergites I-VII with 1,4,4,4,3,6,6 pairs of setae, respectively; ovipositor arises at level of tergite II, slightly protruding from apex, 1.7-1.9× as long as tibia II (Fig. 2) and 4.1× as long as valvular III.

Male (Figs. 5-6)

Coloration: Head with occiput yellow and basal half, dark brown; mesoscutum, scutellum and axillae, light brown; pronotum, metanotum, metasoma and coxae, dark brown; femora, except for pale apices, and proximal two thirds of tibiae, brownish; tarsi yellow; antennae fuscous, fore wing hyaline. Differs structurally from the female primarily by the 6-segmented flagellum (Fig. 5) and by the scape which has a ventral, circular glandular area (Viggiani et. al., 1986) separated from the 6 medial pores. Length:width ratios of antennal segments R-F6 as follows: R:2.1, S:2.8, P:1.3, F1:1.4, F2:1.5, F3:1.5, F4:1.5, F5:1.6, F6:1.8; relative length of each segment to length of F1: R:0.8, S:2.1, P:0.9, F1:1.0, F2:1.1, F3:1.1, F4:1.1, F5:1.2, F6:1.2.

Morphological variation

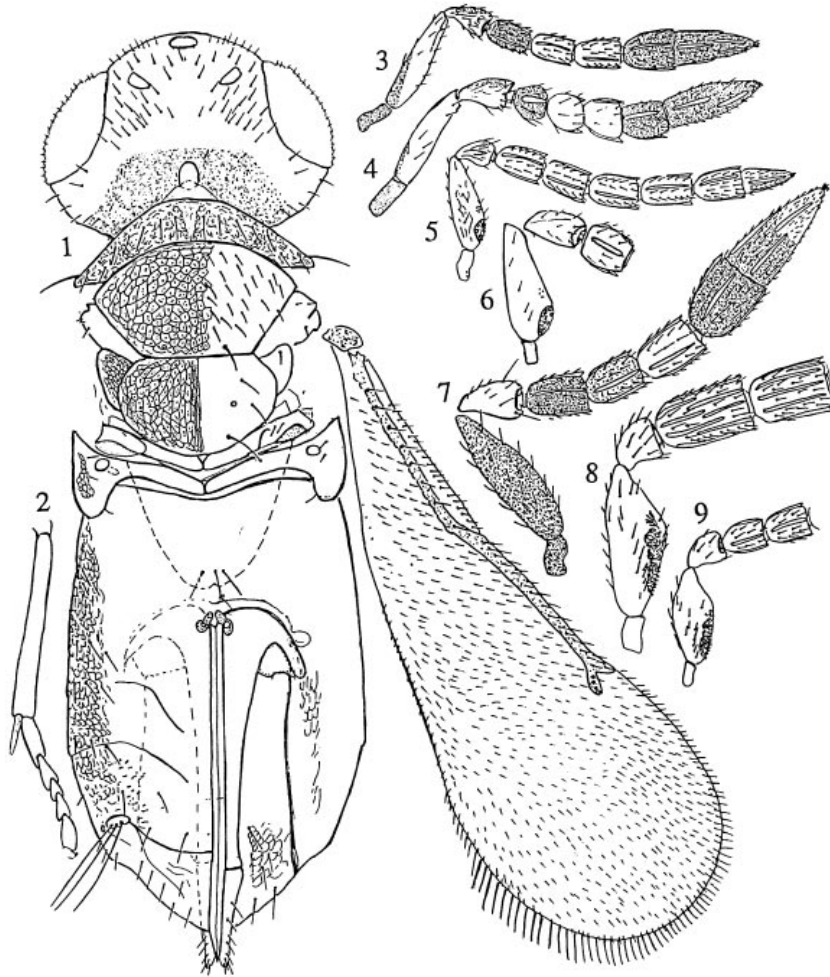
Individuals of *Coccobius donatellae* vary primarily in body size, number of mesoscutal setae, number and size of reticulated cells of the mesoscutum, relative lengths of the flagellar segments, and the relative length of the marginal fringe of the fore wing to its maximum width. In general, smaller individuals have fewer mesoscutal setae (30-36), larger and fewer reticulate cells on the mesoscutum, and longer marginal fringes (0.22-0.26× maximum width of fore wing) than do larger individuals (40-46 mesoscutal setae, marginal fringe = 0.12-0.16× maximum width of fore wing). The F1 antennal segment tends to be shorter (Figs. 4, 6) in smaller individuals, at times, almost quadrate, 1.1-1.4× as long as wide, and 0.8× as long as the F2; whereas in larger individuals, the F1 is usually more elongate, 1.5-1.7× as long as wide and approximately as long as the F2.

Relationships

The female of *Coccobius donatellae* can easily be distinguished from females of the other 3 species described from the continental United States by the coloration of its body which is almost entirely yellow; whereas the head, mesosoma and at least part of the metasoma of the other species are dark brown. *Coccobius donatellae* is most similar in coloration and structure to *Coccobius testaceus* (Masi), a European species introduced into California for the control of *Lepidosaphes ulmi* L. and *L. conchiformis* (Gmelin) (Flanders 1942). Females of *C. testaceus* can be distinguished from females of *C. donatellae* by the grayish F2 segment (Fig. 7), reported in the past as being pale, and the pale apical half of F5 segment and relative length of the ovipositor:tibia II (1.4-1.5:1). Males of *C. testaceus* differ from *C. donatellae* males by having the head completely dark brown, the length of the pedicel only about one half as long as the F1 segment, and by the larger, contiguous glandular area on the scape. Most *C. testaceus* males have 2 rows of linear sensilla on the F1 (Fig. 8); however in smaller individuals there may be a single row (Fig. 9).

Material examined

Female holotype (in Canada Balsam), 12♀, 6♂ paratypes (in Modified Hoyer's Mounting Medium), 7♀, 5♂ paratypes (in Canada Balsam), 10♀, 3♂ paratypes (card



Figures 1-9. (1-6) *Coccobius donatellae* 1) ♀ habitus 2) ♀ tibia II 3) ♀ antenna (normal) 4) ♀ antenna (small individual) 5) ♂ antenna (normal) 6) ♂ antennal segments R-F1 (small individual); (7-9) *Coccobius testaceus* 7) ♀ antenna 8) ♂ antennal segments R-F2 (normal) 9) ♂ antennal segments R-F2 (small individual).

mounted) as follows: United States, Florida, Levy County, Cedar Key, 18 VI 1988, by F. D. Bennett, reared from *Comstockiella sabalis* on *Sabal palmetto*. Additional collections: 4 ♀, Florida, Escambia Co., Pensacola, 10 III 1991, by F. D. Bennett, reared from *Comstockiella sabalis* on *Sabal palmetto*; 4 ♀, Florida, Osceola Co., Canoe Creek, 1 IV 1991, by F. D. Bennett, reared from *Comstockiella sabalis* on *Serenoa repens*; 7 ♀, Florida, Lee Co., Ft. Meyers, 23 XI 1991, by F. D. Bennett, reared from *Comstockiella sabalis* on *Sabal palmetto*; 2 ♀, 1 ♂, Florida, Alachua Co., Gainesville, 10 V 1996, by P.A. Pedata, reared from *Comstockiella sabalis* on *Sabal palmetto*.

Deposition

Female holotype and 5♀, 5♂ paratypes are deposited in the United States National Museum of Natural History, Washington, D.C.; remaining paratype specimens are deposited in Florida State Collection of Arthropods, Gainesville, Florida; the Natural History Museum, London, England; and the Dipartimento di Entomologia e Zoologia Agraria, Università di Napoli "Federico II", Portici, Italy.

Etymology

Coccobius donatellae is named in memory of Donatella Pedata.

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