

## Two new species of the genus *Coccobius* Ratzeburg, 1852 (Hymenoptera: Chalcidoidea: Aphelinidae) from Mexico

## Два новых вида рода *Coccobius* Ratzeburg, 1852 (Hymenoptera: Chalcidoidea: Aphelinidae) из Мексики

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*Coccobius barracas* Myartseva **sp. nov.** and *C. bacasur* Myartseva **sp. nov.** are described from the Mexican State Baja California Sur. A key to seven species of the genus *Coccobius* Ratzeburg, 1852 known from Mexico is provided.

Из мексиканского штата Нижняя Калифорния Южная описаны *Coccobius barracas* Myartseva **sp. nov.** и *C. bacasur* Myartseva **sp. nov.** Составлен определитель для семи видов *Coccobius*, известных из Мексики.

**Key words:** parasitoids, taxonomy, Mexico, Hymenoptera, Chalcidoidea, Aphelinidae, *Coccobius*, new species

**Ключевые слова:** паразитоиды, таксономия, Мексика, Hymenoptera, Chalcidoidea, Aphelinidae, *Coccobius*, новые виды

## INTRODUCTION

The known fauna of the genus *Coccobius* Ratzeburg, 1852 is comprised of 94 species and has a worldwide distribution (Noyes, 2015). The first taxonomic review of the world fauna of this genus was published by Hayat (1984). Fourteen South African species of *Coccobius* were then revised by Prinsloo (1995). Later, Hayat & Khan (2010) reviewed its 14 species from India, and more recently Wang et al. (2013) published a taxonomic review of 16 species of *Coccobius* from China. Some additional, random new species were described from Florida, USA (Evans & Pedata, 1997), India (Hayat & Khan, 2012), Georgia (Japoshvili & Karaca, 2010), China (Wang et al., 2014) and Mexico (Myartseva, 2000, 2015).

*Coccobius* is most speciose in the Oriental Region with 29 known species (Noyes,

2015). The Neotropical and Nearctic faunas of *Coccobius* are represented by seven species in each ecozone. In Mexico, the genus was recorded for the first time by Myartseva (2000) where it is comprised by five species (Myartseva et al., 2012; Myartseva, 2015).

The genus *Coccobius* is characterized by the following: in female, body yellow to black; antenna often bicolored; wings usually hyaline, rarely infuscate; antenna seven-segmented, with funicle three-segmented and club two-segmented; mandible with two teeth and one truncation; mesopleuron large, undivided; midlobe of mesoscutum with numerous setae; axilla small and with one seta; fore wing without a linea calva; submarginal vein with four or more setae; postmarginal vein absent or very short. Tarsal formula 5–5–5. Male differs from female mainly by the genitalia and in the following antennal characters: antenna 8-segmented; scape with one sensorial area; flagellum uniformly coloured.

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Some *Coccobius* species are known biological control agents used against armoured scale (Hemiptera: Dispididae), pests that were introduced into several countries. The polyphagous scale parasitoid *C. testaceus* (Masi, 1909) was introduced into California (USA) from Europe for control of the oystershell scale *Lepidosaphes ulmi* (Linnaeus, 1758) and the fig scale *L. conchiformis* (Gmelin, 1790) (Hayat, 1984). In California, *C. varicornis* (Howard, 1881) from China was used against San Jose scale *Diaspidiotus perniciosus* (Comstock, 1881), the coconut scale *Aspidiotus destructor* Signoret, 1869 and some other armoured scales on citrus (Peck, 1963). *Coccobius fulvus* (Compere et Annecke, 1961) was introduced from China into California (USA) against the purple scale, *Lepidosaphes beckii* (Newman, 1869) (Tachikawa, 1981). This species was also introduced into Japan to control the arrowhead scale *Unaspis yanonensis* (Kuwana, 1923) (Itioka et al., 1997). *Coccobius azumai* Tachikawa, 1988 was introduced from Japan into China for the biological control of *Hemiberlesia pitysophila* Takagi, 1969, a major scale pest on pine trees (Wang et al., 2013).

In Mexico, *C. donatellae* Pedata et Evans, 1997 successfully controlled *Comstockiella sabalis* (Comstock, 1883) on the palm *Sabal mexicana* Mart., 1845 (Gaona-García et al., 2001; Myartseva, 2000; Myartseva et al., 2003). *Coccobius donatellae* was also introduced from Florida into Bermuda as an effective natural enemy of same scales (Evans & Pedata, 1997).

## MATERIAL AND METHODS

This work is based on the specimens of Mexican Aphelinidae from the Entomological Research Museum, University of California, Riverside, California, USA (UCRC). All specimens of *Coccobius* were collected by Paul DeBach in pan traps at Las Barracas (~30 km E of Santiago, 23°28'02"N, 109°27'01"W, 50 m), in the south of Baja California Sur State, from 1984 to 1986.

Specimens were mounted on small card points and rectangular cards. In the Museum of Insects of the Autonomous University of Tamaulipas, Cd. Victoria, Mexico, this material was remounted on slides in Canada balsam. Ninety-five specimens on slides were studied using a compound microscope (Leica GME) with magnifications of 280× and 400×.

Many species of *Coccobius* show a remarkable degree of structural similarity, often making it difficult to separate them on a common morphological ground (Hayat, 1984; Prinsloo, 1995; Japoshvili & Karaca, 2010). For both new species, presence or absence of internal striations in reticulations of the mesosoma were used as a distinguishing character for the first time in *Coccobius* taxonomy. Comparisons of these morphological structures were previously used to separate two very similar species in the genus *Encarsia* (Schauff et al., 1996; Myartseva & Evans, 2008). For the identification, we used the keys of Hayat (1984, 1998), Hayat & Khan (2010), Prinsloo (1995), Myartseva (2000), and Wang et al. (2013).

The holotypes of *Coccobius barracas* sp. nov. and *C. bacasur* sp. nov., and most of the paratypes of both new species are deposited in UCRC, while some paratypes will be donated to the National Museum of Natural History, Washington, District of Columbia, USA (USNM), the Natural History Museum, London, UK (BMNH), and Zoological Institute of the Russian Academy of Sciences, St Petersburg, Russia (ZIN).

## TAXONOMIC PART

### Order HYMENOPTERA

### Superfamily CHALCIDOIDEA

### Family APHELINIDAE

### Genus *Coccobius* Ratzeburg, 1852

*Physcus* Howard, 1895

*Encyrtophyscus* Blanchard, 1948

*Physculus* Jasnosh, 1977

***Coccobius barracas* Myartseva, sp. nov.**  
(Figs 1–6)

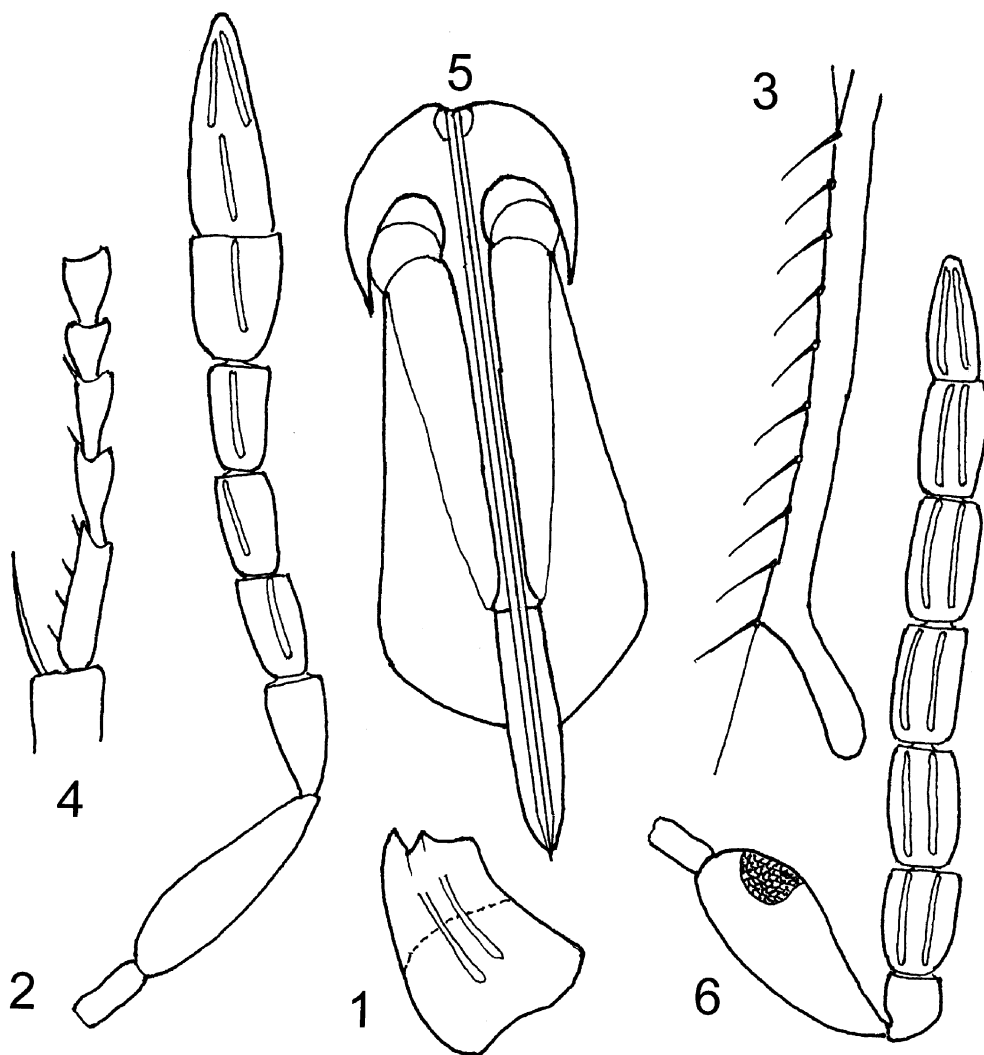
**Holotype.** Female on slide [UCRC], Mexico, Baja California Sur, Las Barracas, pan trap, 6.VI.1986, P. DeBach, UCRC ENT 54219.

**Paratypes.** Eleven females and 5 males, same data as for holotype but with different dates and numbers: 4 females (14.V.1984, 54210; 5–22.X.1984, 54208; 8.IV.1985, 54187; 17.V.1985, 54209) and 2 males (8.IV.1985, 54240; 11.IV.1986), UCRC; female (1.VI.1985, 54217) and male (6.VI.1986, 54192), USNM; 3 females (21.X.1985, 54201; 6.IV.1986, 54231; 7.IV.1986, 54228) and male (6.VI.1986, 54193), BMNH;

3 females (5.V.1986, 5422; 3.VII.1986, 54206; 19.VI.1986) and male (19.VI.1986, 54244), ZIN.

**Description.** Female (holotype and paratypes). Length of body 0.6–0.7 mm (holotype – 0.6 mm).

**Colouration.** Head black. Antenna yellowish white, radicle and first segment of funicle dark, club infusate. Mesosoma black. Fore wing hyaline. Legs black, proximal 0.25–0.35 of femora, base and proximal half of all tibiae and all tarsi whitish, apical segment of tarsi slightly infusate. Metasoma and ovipositor black.



**Figs 1–6.** *Coccobius barracas* sp. nov. (1–5, female; 6, male): 1, mandible; 2, 6, antenna; 3, marginal vein of fore wing; 4, basitarsus and tibial spur of middle leg; 5, ovipositor.

Structure. Head as wide as mesosoma, slightly wider than high. Frontovertex 0.6 times as wide as head width. Eye about 1.3 times as long as cheek. Mandible in Fig. 1. Antenna (Fig. 2) inserted immediately below lower eye margin level. Distance between toruli about 0.6 times as long as that from torulus to eye margin. Radicle 2.8 times as long as wide; rest of scape 4.5–4.9 times as long as wide. Pedicel about twice as long as wide. Pedicel, first to fourth funicular segments subequal in size, about twice as long as wide. Apical claval segment elongate, about 1.8 times as long as first claval segment. Club subequal in length to funicle or slightly longer. First to fourth segments of flagellum with one longitudinal sensillum each, fifth flagellar segment with two or three sensilla in two rows. Midlobe of mesoscutum about 1.7 times as wide as long, with many scattered short and slender setae and two long setae at base. Scutellum about 1.4 times as wide as long, with six slender setae. Sculpture on midlobe of mesoscutum irregularly reticulate, with slightly elongated cells without inclusions. Sculpture of scutellum lineolate aciculate medially and with elongate reticulate cells on sides, also without inclusions. Side lobe with two slender setae. Fore wing 2.5 times as long as wide, its marginal fringe about 0.2 times as long as wing width. Submarginal vein with six or seven very thin setae along anterior margin. Marginal vein (Fig. 3) slightly shorter and with seven to nine setae along anterior margin. Postmarginal vein absent. Marginal fringe of hind wing about 0.6 times as long as wing width. Midtibial spur (Fig. 4) slightly shorter than mesobasitarsus; the latter with some peg-like setae. Ovipositor (Fig. 5) exerted, 2.3–2.6 times as long as mesotibia. Third valvula 0.4–0.5 times as long as second valvifer.

Male (paratypes). Length of body 0.5–0.6 mm.

Colouration. As in female, but antenna with pedicel and first funicular segment infuscate, other segments dirty yellow; legs

black except fore and mesotibiae with whitish apices.

Structure. Frontovertex about 0.7 times as wide as head width. Eye about 1.3 times as long as cheek. Distance between toruli about as long as that from torulus to eye and to mouth margins. Antenna (Fig. 6) inserted at lower eye margin level. Radicle about twice as long as wide, rest of scape 2.3 times as long as wide, with one round sensorial plaque at base. Pedicel 1.2 times as long as wide. First funicular segment 1.4 times as long as wide. Club two-segmented, not wider than funicle and about as long as two preceding segments of funicle. All flagellar segments with four longitudinal sensilla each. Fore wing about 2.2 times as long as maximum width of the wing. Marginal fringe of hind wing about 0.9 times as long as wing width. Sculpture of midlobe of mesoscutum and scutellum as in female. Genitalia about 0.8 times as long as mesotibia.

*Etymology.* The species name is derived from that of the type locality.

***Coccobius bacasur* Myartseva, sp. nov.**  
(Figs 7, 8)

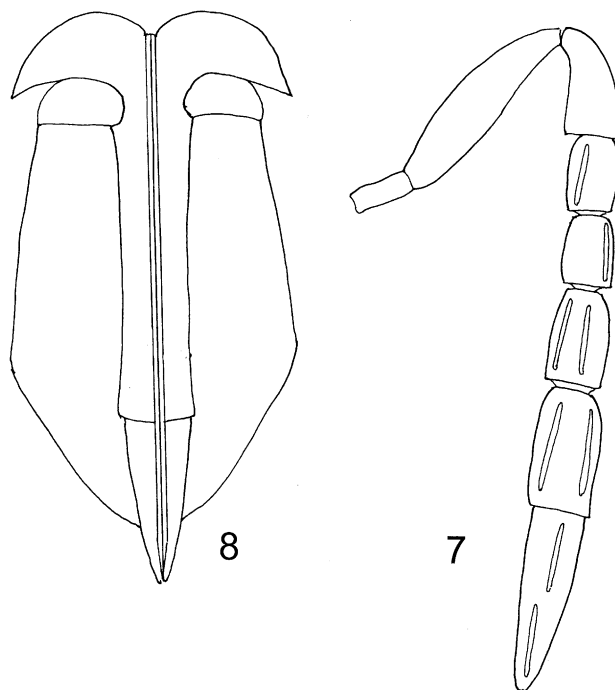
*Holotype.* Female on slide [UCRC], Mexico, State Baja California Sur, Los Cabos, Las Barracas, pan trap, 9.IV.1985, P. DeBach, UCRC ENT 54179.

*Paratypes.* 12 females and 6 males, same data as for holotype but with different dates and numbers: 5 females (8.IV.1985: 54180, 54185, 54222, 54173; 9.VI.1986, 54198) and 3 males (8.IV.1985: 54325, 54245, 54237), UCRC; female (6.VI.1984, 54156) and male (11.V.1985, 54243), USNM; 4 females (30.IV.1985, 54218; 5.IV.1986: 54188, 54182; 6.IV.1986, 54221) and male (6.IV.1986, 54194), BMNH; 2 females (5.V.1986, 54216; 6.VI.1986, 54203) and male (7.IV.1986, 54128), ZIN.

*Description.* Female (holotype and paratypes). Length of body 0.6–0.7 mm (holotype – 0.6 mm).

Colouration. Head black. Antennal radicle and first segment of funicle dark, scape whitish yellow, but its basal half infuscate; pedicel, second and third funicular segments yellowish white, club strongly infus-

**Figs 7, 8.** *Coccobius bacasur* sp. nov. (female): 7, antenna; 8, ovipositor.



cate. Mesosoma black. Fore wings hyaline. Legs black, apical part of femora, base and proximal half of tibiae and tarsi of all legs whitish. Metasoma and ovipositor black.

Structure. Head as wide as mesosoma, slightly wider than high. Frontoververtex 0.5–0.6 times as wide as head width. Eye about 1.3 times as long as cheek. Antennae (Fig. 7) inserted rather below lower eye margin level. Distance between toruli about 0.6 times as long as distance from torulus to eye. Antennal radicle 2.6 times as long as wide. Scape 4.3–4.7 times as long as wide. Pedicel about twice as long as wide. First and second funicular segments subequal in length and width and very weakly shorter than pedicel, each one about 1.5–1.7 times as long as wide. Third segment about 1.6–2.0 times as long as wide. Apical segment of club about 1.5 times as long as basal segment. Club longer than funicle. First and second segments of flagellum with one longitudinal sensilla, third and fourth segments with one or two sensilla, and fifth segment with two or three sensilla. Midlobe of mesoscutum

with scattered short slender setae, with two long setae on base. Scutellum with three pairs of slender setae. Sculpture of midlobe irregular reticulate with many rounded cells, all cells with inclusions. Sculpture of scutellum also irregular reticulate but elongate reticulate along sides and on base, cells with inclusions. Fore wing about 2.5 times as long as wide, its marginal fringe about 0.2 times as long as wing width. Submarginal vein with six–eight very slender setae along anterior margin. Marginal vein slightly shorter and with nine–eleven setae along anterior margin. Postmarginal vein absent. Marginal fringe of hind wing about 0.5 times as long as wing width. Midtibial spur slightly shorter than mesobasitarsus; the latter with some peg-like setae. Ovipositor (Fig. 8) exerted, about twice as long as mid tibia. Third valvula 0.4 times as long as second valvifer.

Male (paratypes). Length of body: 0.5–0.6 mm.

Colouration. As in female, but antenna whitish, pedicel and first segment of funi-

cle slightly infuscate; legs brownish black, sometimes fore and mid tibiae with whitish apices, tarsi white.

Structure. Frontoververtex about 0.6 times as wide as head width. Antennae inserted immediately below level of lower margin of eyes. Eye about 1.7 times as long as cheek. Distance from torulus to eye about 1.4 times as long as distance between toruli. Antennal radicle about twice as long as wide. Scape 2.7 times as long as wide, with one round sensorial plaque at base. Pedicel slightly longer than wide. First funicular segment 1.5 times as long as wide, very slightly shorter than other funicular segments, which are subequal in length and width. Club two-segmented, not wider than funicle and about as long as two preceding funicular segments. Segments of flagellum with six longitudinal sensilla, sixth segment with five sensilla. Sculpture of midlobe of mesoscutum and scutellum as in female. Fore wing about 2.5 times as long as wide, its marginal fringe about 0.5 times as long as wing width. Marginal fringe of hind wing about 0.5 times as long as wing width. Genitalia about 0.6 times as long as mid tibia.

**Etymology.** The species name is derived from that of the Mexican State of {Ba}ja {Ca}lifornia {Sur}.

#### Comparison of two new species with nearest species

Ecologically and morphologically, these new species are very similar to each other, and they were collected mostly from April to June. They are also similar to *C. stanfordi* (Howard, 1914), described from the USA (Howard, 1914), and determined as this species in the key by Hayat (1984). The morphological differences of *C. barracas*, *C. bacasur* and the latter species from each other are given in the key below (females):

1. Fore wing 3.0 times as long as wide. Scape entirely dark brown. Marginal vein with at least 14 setae along anterior margin. Third valvula 1.7 times as long as mesobasitarsus . . . . . *C. stanfordi* (Howard, 1914)
- Fore wing 2.5 times as long as wide. Scape entirely or partly yellow. Marginal vein with at most 11 setae along anterior margin. Third

valvula at least 2.0 times as long as mesobasitarsus . . . . . 2

2. Scape entirely yellowish white. Ovipositor at least 2.3 times as long as mesotibia. Third valvula 2.8 times as long as mesobasitarsus. Sculpture cells on mesoscutum without inclusions . . . . . *C. barracas* sp. nov.
- Scape infuscate in basal half and yellow in apical half. Ovipositor about 2.0 times as long as mesotibia. Third valvula 2.0 times as long as mesobasitarsus. Sculpture cells on mesoscutum with inclusions . . . . . *C. bacasur* sp. nov.

#### Key to Mexican species of *Coccobius* (females)

1. Gaster completely brown to black . . . . . 2
- Gaster with yellow markings . . . . . 6
2. Scape 3.3 times as long as wide . . . . . *C. juliae* Myartseva, 2000
- Scape at least 4.0 times as long as wide . . . 3
3. First segment of funicle about as long as pedicel . . . . . *C. donatellae* Pedata et Evans, 1997
- First segment of funicle longer or shorter than pedicel . . . . . 4
4. Scape and pedicel brown to black. Scape 4.0 times as long as wide . . . . . *C. averini* Myartseva, 2015
- Scape and pedicel yellowish white. Scape at least 4.3 times as long as wide . . . . . 5
5. Scape entirely yellowish white. Apical segment of club 1.8 times as long as basal segment. Ovipositor at least 2.3 times as long as mesotibia. Sculpture of midlobe of mesoscutum with all cells elongate and without inclusions . . . . . *C. barracas* sp. nov.
- Scape yellow but infuscate basally. Apical segment of club 1.5 times as long as basal segment. Ovipositor about 2.0 times as long as mesotibia. Sculpture of midlobe of mesoscutum with cells predominantly round and with inclusions . . . . . *C. bacasur* sp. nov.
6. Gaster brown, with basal tergites yellow. Scape at most 4.0 times as long as wide. First funicular segment shorter than pedicel and longer than second funicular segment . . . . . *C. mexicanus* Myartseva, 2015
- Gaster dark yellow, with brown bands on sides. Scape 4.8 times as long as wide. First funicular segment about as long as pedicel and shorter than second funicular segment . . . . . *C. mariae* Myartseva, 2015

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