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NEW SPECIES OF *COCCOPHAGUS* WITH DENSELY SETOSE AXILLA FROM MEXICO (HYMENOPTERA: APHELINIDAE)

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ABSTRACT

Two new species of the genus *Coccophagus* from Mexico, *neocomperei* **sp. nov.** and *debachi* **sp. nov.** are described and illustrated. The *redini* species-group is proposed for the genus *Coccophagus*, based on three species with unusual setation on the axillae. A key to identify both sexes of members of the *redini* group is provided.

Key Words: Mexico, Hymenoptera, Aphelinidae, *Coccophagus*, new species

RESUMEN

Se describen e ilustran dos especies nuevas del género *Coccophagus* de México, *neocomperei* y *debachi*. Se propone el grupo de especies *redini* para el género *Coccophagus*, basado en tres especies con una disposición inusual de setas en las axilas. Se incluye una clave para la identificación de ambos sexos de los miembros del grupo *redini*.

Translation provided by author.

Coccophagus Westwood is one of the largest genera in the family Aphelinidae. Species of this genus are endoparasitoids of Coccoidea, mainly soft scales (Coccidae), and rarely mealybugs (Pseudococcidae). Males are generally hyperparasitoids on primary parasitoids, including conspecific females. Species of *Coccophagus* have been used successfully in biological control of pestiferous soft scales worldwide (Clausen 1978; Rosen & De Bach 1991). Over 200 species have been described worldwide. Sixty species are known to occur in the New World, including 39 species distributed in the Neotropics and 32 species distributed in the Nearctic region (Woolley 1997; Noyes 2002). Ten species are known to occur in Mexico (Myartseva & Ruíz-Cancino 2000; Noyes 2002; Myartseva & Coronado-Blanco 2003). Most of the species from the New World were described by H. Compere and L. O. Howard.

Two new species of *Coccophagus* are described in this article, both with unusual setation of the axilla. Only one species, *Coccophagus redini* Girault, with densely setose axillae was previously known. Girault (1924) described this species from one female collected in Australia, and it was later redescribed by Compere (1931). Abbreviations for depositories of the material examined: BNMH—Natural History Museum, London, U.K.; UAT—Universidad Autónoma de Tamaulipas, Ciudad Victoria, Tamaulipas, México; UCRC—University of California, Riverside, California, USA; USNM—National Museum of Natural History, Washington, D.C., USA; ZISP—Zoological Institute of Academy of Sciences, Saint Petersburg, Russia.

Coccophagus neocomperei
Myartseva & Ruíz, **sp. nov.** (Figs. 1-8)

Description

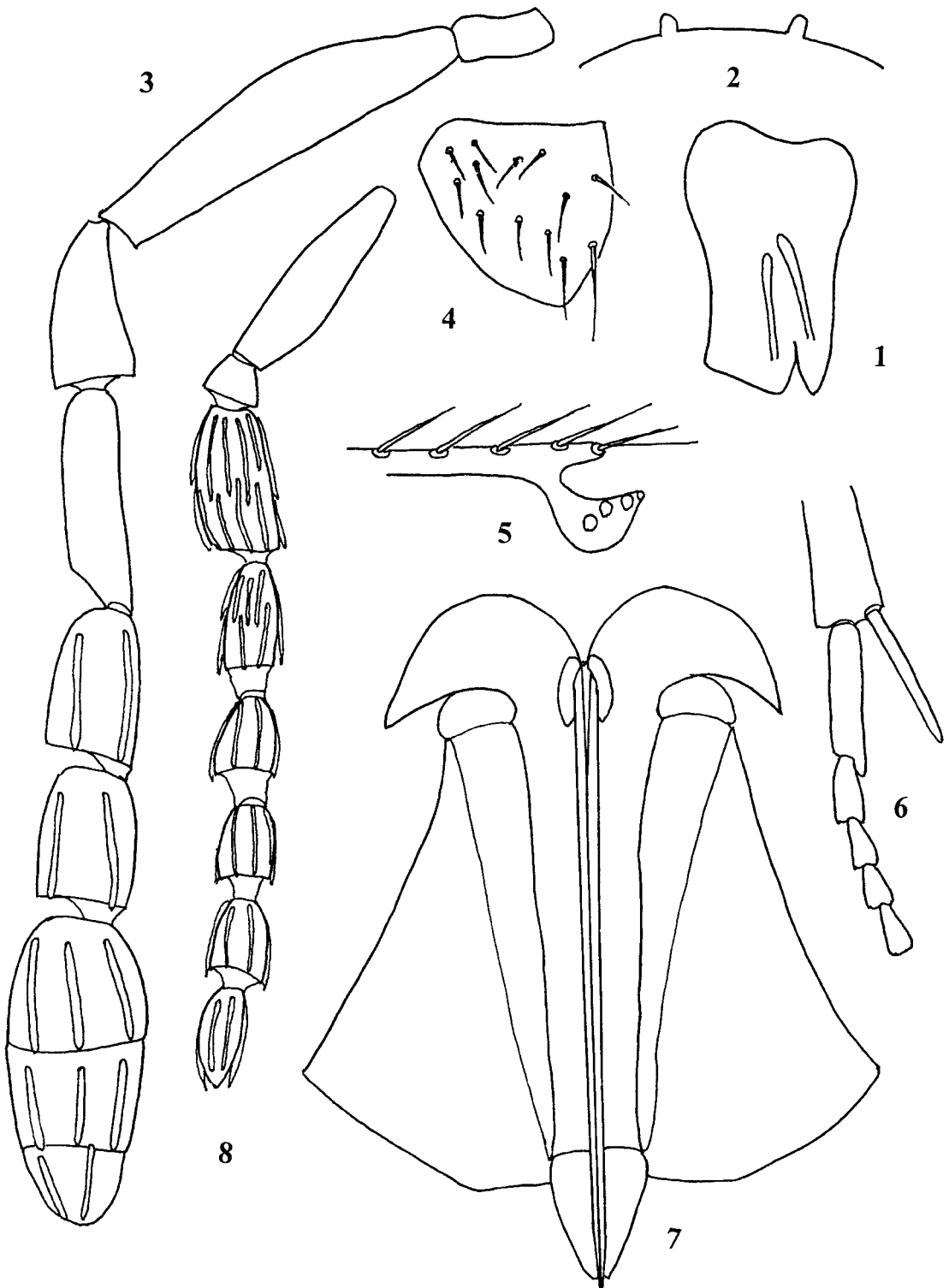
FEMALE. Length: 0.90-1.10 mm.

Coloration

Head light yellow, frontovertex yellow, occiput with black oval spots along foramen, antennal club and last two funicular segments very slightly infuscate. Mesosoma light yellow, pronotum black medially, mesoscutum with black anterior margin, outline of axillae black, propodeum black, on sides brownish-yellow (female from Campeche with white longitudinal stripe behind spiracle). Legs light yellow. Wings hyaline, venation of fore wing very slightly infuscate. Endophragma black. Metasoma whitish-yellow, third to seventh tergites black dorsally, ovipositor sheaths black.

Morphology

Head wider than mesosoma, slightly wider than high and less than 2× wider than length. Frontovertex slightly longer than wide, its width less than half of head width. Occipital margin straight. Ocelli in slightly obtuse triangle; hind ocelli subequal in distance from eyes and occipital margin. Eyes slightly more than 2× as long as cheeks. Mandible (Fig. 1) with one tooth and a broad dorsal truncation. Labial and maxillary palpi one- and two-segmented, respectively. Clypeus as in Fig. 2.



Figs. 1-8. *Coccophagus neocomperei*, **sp. nov.**, female: 1—mandible, 2—clypeus, 3—antenna, 4—axilla, 5—stigmal vein, 6—middle tarsus and tibial spur, 7—ovipositor; male: 8—antenna.

Antennae (Fig. 3) inserted lower than lower level of eyes. Distance between toruli very slightly longer than distance from torulus to eye. Radicula about 2× as long as wide. Scape slightly more than 4.5× as long as wide. Pedicel about 2× as long as wide. First funicular segment the longest, 3.7× as long as wide and 1.4× longer than pedicel. 2nd-3rd segments subequal in length, each 1.6-1.7× as long as wide. Club about 2× as long as wide and subequal in length to last two funicular segments combined. First funicular segment without sensilla, others with 2-3 sensilla each.

Mesoscutum wider than long. Midlobe of mesoscutum densely setose, each side lobe with 3 long setae, axillae (Fig. 4) with one long and 8-13 short setae. Scutellum shorter than mesoscutum, wider than long, with 3 pairs of long setae, 3rd pair the longest. Propodeum with short triangular prominence medially. Endophragma widely rounded on apex. Fore wing about 2.5× as long as wide, marginal fringe short, disk with thinner and shorter setae along apical margin (0.06× length of wing). Submarginal vein with 8 long setae, marginal vein about 1.7× longer than submarginal and with 8-10 long setae on lower margin. Stigmal vein as in Fig. 5. Hind wing about 4.5× as long as wide, marginal fringe about 0.3 of maximal width of wing; disk setation very short and thin. Midtibial spur (Fig. 6) slightly longer than basitarsus, which is shorter than remaining tarsal segments combined. Ovipositor (Fig. 7) about 0.7× as long as middle tibia; third valvula 0.2× as long as second valvifer.

MALE. Length: 0.8 mm.

Coloration

Similar to female, but head with frontovertex orange-yellow, antennae whitish-yellow and without infuscations, midlobe of mesoscutum blackish posteriorly, axillae and notauli black, scutellum blackish on posterior margin and sometimes on anterior margin also. Propodeum black, with white longitudinal curved stripe behind spiracle or more often with one white spot under spiracle. Hind coxae blackish near base.

Morphology

Frontovertex as long as wide, its width about half of head width. Ocelli larger and in more obtuse triangle. Eyes about 1.4× longer than cheeks. Antennae (Fig. 8) inserted at the level of lower margin of eyes. Scape about 3.7× as long as wide. Pedicel subtriangular, 1.3× wider than length. First funicular segment the longest and slightly swollen, about 2× as long as wide and 0.7× as long as scape. 2nd segment slightly shorter and about 2× as long as wide, 3rd segment 0.8× as long as second and about 1.5× as long as wide. Club 4× as

long as wide and longer than the last two funicular segments combined. All funicular and claval segments with many sensillae, situated on 1st segment in 2-3 rows, on 2nd in 1-2 rows, on 3rd-6th in one row. Axillae with reticulate sculpture and with one long and 5-7 short setae. Fore wing 2× as long as wide. Basitarsus of middle leg subequal to the next two tarsal segments combined. Genitalia 0.4× as long as middle tibia.

Comments. *Coccophagus neocomperei* **sp. nov.** is similar to the Australian species *Coccophagus redini* Girault, the only other species with densely setose axillae, but it can be easily distinguished from this species by characters given in the key (see below).

Etymology. This new species is named in honor of chalcidologist Harold Compere who worked in the University of California, Riverside, USA, and described many species of *Coccophagus*, and authored the first species revision of *Coccophagus* of the world.

Material examined. Holotype: Female, reared from soft scale on *Leucaena* sp., Mexico, Guerrero, Acapulco, 12-VI-2000, S. N. Myartseva. Paratypes: 16 females, 3 males (card mount), 3 females, 4 males (slide mount), same date as holotype; Campeche, Cd. del Carmen, one female on card, 30-VII-1984 (G. Gordh) (UCRC, No. 54587); Veracruz, 85 km. S of Veracruz, 180-200 m, one male on card, 31-VII-1984 (G. Gordh) (UCRC, No. 54596).

Specimen deposition. Holotype (mounted on slide) and paratypes, one female from Campeche, one male from Veracruz, 6 females and one male from Guerrero (on cards) deposited in UCRC; 5 paratype females and one paratype male (on cards) deposited in USNM; 2 paratype females and 2 paratype males (on slides) deposited in BMNH; 5 paratype females and one paratype male (on cards) deposited in ZISP; one paratype female and 2 paratype males (on slides) deposited in UAT.

Coccophagus debachi

Myartseva & Ruíz, **sp. nov.** (Figs. 9-12)

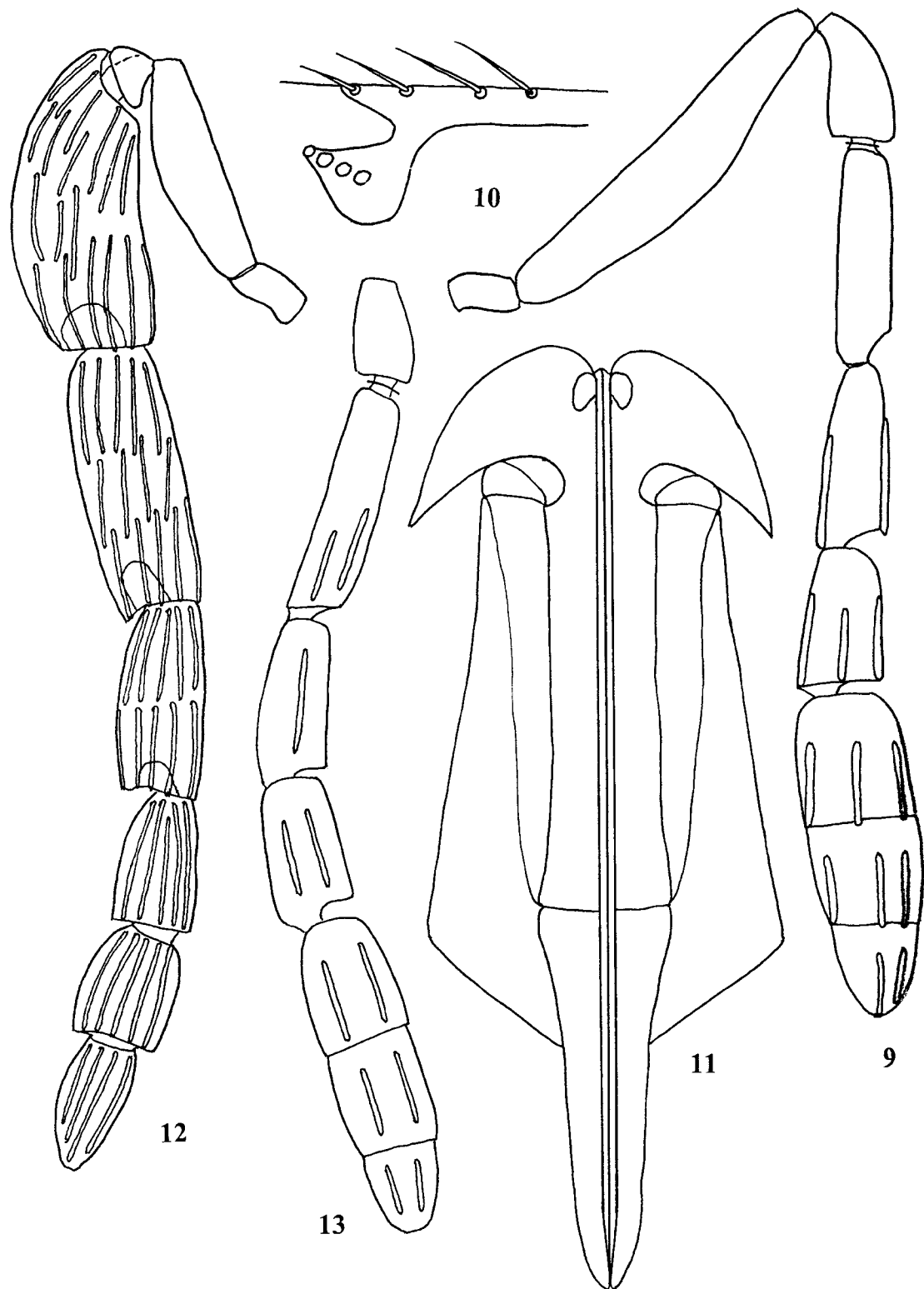
FEMALE. Length: 1.20-1.40 mm.

Coloration

Body coloration is very similar to *Coccophagus neocomperei* **sp. nov.**, but occiput without black oval spots along foramen, mesoscutum entirely light yellow, propodeum black with white longitudinal straight stripe behind spiracle on each side and metasoma with 4 to 6th tergites black dorsally.

Morphology

Head slightly wider than mesosoma and its own height and about 2× as wide as long. Fron-



Figs. 9-13. *Coccophagus debachi* sp. nov., female: 9—antenna, 10—stigmal vein, 11—ovipositor; male: 12—antenna. *Coccophagus redini*, female: 13—antenna (redrawn from Compere, 1931).

tovertex slightly wider than long, its width about half of head width. Ocelli in about rectangle triangle; hind ocelli separated from occipital margin by distance slightly longer than diameter of one ocellus and from eye margin by slightly longer distance. Eyes about $1.5\times$ as long as cheeks. Mandible and clypeus as in *C. neocompereii*. Antennal scape (Fig. 9) $5\times$ as long as wide. Pedicel $2\times$ as long as wide. First funicular segment $4\times$ as long as wide and $1.4\times$ as long as pedicel. 2nd segment $0.7\times$ as long as 1st and $2.5\times$ as long as wide. Third segment $0.8\times$ as long as 2nd and $1.5\times$ as long as wide. Club about $2.5\times$ as long as wide and slightly longer than two last funicular segments combined. First funicular segment without sensilla, others with 2-3 sensillae each. Axillae with 7-9 setae (one longer). Each side lobe with 3 long setae. Scutellum shorter than mesoscutum, wider than length, with 3 pairs of long setae. Propodeum with short triangular prominence medially. Endophragma widely rounded on apex. Fore wing $2.4\times$ as long as wide, disk with thinner and shorter setae along apical margin ($0.10\times$ length of wing). Submarginal vein with 10 long setae, marginal vein about $1.5\times$ longer than submarginal vein and with 10 long setae on lower margin. Stigmal vein as in Fig. 10. Hind wing about $4.5\times$ as long as wide, marginal fringe about $0.3\times$ of maximal width of wing; disk setation very short and thin. Midtibial spur slightly longer than basitarsus, which is subequal in length to all remaining tarsal segments combined. Ovipositor (Fig. 11) slightly exerted, $0.9\times$ as long as middle tibia; third valvula $0.7\times$ as long as second valvifer.

MALE. Length: 1.10-1.20 mm.

Coloration

Similar to female, but frontovertex yellow, occiput with black oval spots along foramen, antennae whitish-yellow and without infuscation, midlobe of mesoscutum widely blackish distad, scutellum blackish basally and apically. Hind coxae blackish. Metasoma with 3rd-7th tergites black dorsally.

Morphology

Frontovertex slightly wider than long, its width slightly more than half of head width. Ocelli larger than in female and in obtuse triangle; hind ocelli separated from eye margin by distance of diameter of one ocellus and slightly longer than that from occipital margin. Eyes $2.7\times$ as long as cheeks. Antennae (Fig. 12) inserted at the level of lower margin of eyes. Scape $3.4\times$ as long as wide. Pedicel about $1.6\times$ wider than long. First funicular segment the longest, swollen, about $2\times$ as long as wide and $1.3\times$ as long as scape, 2nd segment shorter and also $2\times$ as long as wide.

3rd segment $0.8\times$ as long as second and slightly less than $2\times$ as long as wide. Club $3.6\times$ as long as wide and shorter than the last two funicular segments combined. All flagellar segments with many sensillae. Axillae with reticulate sculpture and with 7-8 setae (one longer). Fore wing about $2.4\times$ as long as wide, disk setation as in female. Submarginal vein with 9 long setae. Marginal vein longer than submarginal. Midtibial spur slightly longer than basitarsus, which is subequal in length to next three tarsal segments combined. Genitalia $0.6\times$ as long as middle tibia.

Comments. *Coccophagus debachi*, **sp. nov.** is similar in coloration and morphology to the new Mexican species *C. neocompereii*. Females of both species can be distinguished by the following characters: *C. debachi* has occiput pale yellow, third gastral tergite pale yellow, propodeum with white longitudinal straight stripe behind spiracle on each side, second funicular segment $2.5\times$ as long as wide, third segment $0.8\times$ as long as the second, club about $2.5\times$ as long as wide, ovipositor $0.9\times$ as long as middle tibia, and third valvula $0.7\times$ as long as second valvifer (Fig. 11). *Coccophagus neocompereii* has occiput with black elongate spot on sides of foramen, third gastral tergite black dorsally, propodeum brownish-yellow on sides, second funicular segment $1.7\times$ as long as wide, third segment subequal to the second, club about $2\times$ as long as wide, ovipositor $0.7\times$ as long as middle tibia, and third valvula $0.2\times$ as long as second valvifer (Fig. 7). Males of both species can be distinguished by the following characters: *C. debachi* has the first funicular segment longer than scape, second to fifth flagellar segments decreasing in length distally (Fig. 12) and genitalia $0.6\times$ as long as middle tibia, whereas *C. neocompereii* has the first funicular segment shorter than scape, second to fifth flagellar segments subequal in length (Fig. 8), and genitalia $0.4\times$ as long as middle tibia.

Etymology. This species is named in honor of American entomologist Paul De Bach, who collected this new species in Mexico. His material for our study was loaned from the Entomological Research Museum, University of California, Riverside, USA, including specimens: NN 54579-54580, 54582-54586, 54588-54591, 54593-54595.

Material examined. Holotype: Female, collected in pan trap, Mexico, Baja California Sur, Las Barracas, ca. 30 km E of Santiago, 20-IV-1984 (coll. P. De Bach) (No. 54583), deposited in UCRC. Paratypes (same data as the holotype) are deposited: one female on slide, 23-IV-1984 (No. 54588), two females on cards, 5-II-1984 (No. 54585), 20-IV-1985 (No. 54582) and one male on card, 30-IV-1985 (No. 54590), one male on slide, 1-VI-1985 (No. 54592) (all UCRC); two females on cards, 4-VI-1985 (No. 54584), 15-VI-1985 (No. 54586) and one male on card, 27-V-1986 (No. 54591)—in USNM; one female and one male on cards, 21-IV-1986 (No. 54589), 12-VI-1986 (No. 54594)—in

BMNH; one female and one male on cards, 5-V-1986 (No. 54579), 12-VI-1986 (No. 54595)—in ZISP; one female and one male on cards, 5-V-1986 (No.54580), 1-VI-1985 (No.54593)—in UAT.

DISCUSSION

According to Compere (1931), Annecke and Insley (1994), and Hayat (1998), seven species-groups are recognized in the genus *Coccophagus*: *lycimnia*, *ochraceus*, *malthusi*, *pseudococci*, *tschirchii*, *varius*, and *zebratus*-groups. We propose a new species-group, the *redini*-group, for three species: *C. redini* Girault, 1924 from Australia

and the two new species from Mexico described herein, *C. neocompere*i and *C. debachi*. Species of this group differ from other known species-groups mainly by their unusual axillae, which are densely setose, including one longer seta. Species in the *redini*-group are similar to those of the *ochraceus*-group in that the funicle segments have excentric articulations, propodeum with median triangular prominence, stigmal vein swollen, body bicolored; but in species of the *redini*-group, females have the first funicular segment without sensillae, fore wing apically with thinner and shorter setae, and males have the first funicular segment swollen, curved and the largest.

KEY TO THE SPECIES OF *COCCOPHAGUS* OF THE *REDINI*-GROUP

- 1. Females 2
- Males 4
- 2. Pronotum entirely black, gaster entirely blackish. First funicular segment with sensilla (Fig. 13) *redini* Girault
- Pronotum and gaster partly pale yellow. First funicular segment without sensilla (Figs. 3, 9) 3
- 3. Occiput pale yellow. 3rd gastral tergite pale yellow. Propodeum with white longitudinal straight stripe behind spiracle on each side. 2nd funicular segment 2.5× as long as wide, 3rd segment 0.8× as long as 2nd. Club about 2.5× as long as wide. Ovipositor 0.9× as long as middle tibia, third valvula 0.7× as long as second valvifer (Fig. 11) *debachi* **sp. nov.**
- Occiput with black elongate spot on sides of foramen. 3rd gastral tergite black dorsally. Propodeum brownish-yellow on sides. 2nd funicular segment 1.7× as long as wide, 3rd segment subequal to 2nd. Club about 2× as long as wide. Ovipositor 0.7× as long as middle tibia, third valvula 0.2× as long as second valvifer (Fig. 7) *neocompere*i **sp. nov.**
- 4. First funicular segment longer than scape. 2nd-5th flagellar segments decreasing in length distally (Fig. 12). Genitalia 0.6× as long as middle tibia *debachi* **sp. nov.**
- First funicular segment shorter than scape. 2nd-5th flagellar segments subequal in length (Fig. 8). Genitalia 0.4× as long as middle tibia *neocompere*i **sp. nov.**

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