

A new hypogeal species of *Oregmopyga* Hoy (Hemiptera: Coccoidea: Eriococcidae) from southern California, U.S.A., and a key to species of the genus

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Abstract

A new species of hypogeal eriococcid, *Oregmopyga viscosa* Kondo **sp. nov.**, is described and illustrated based on the adult female and the second-instar male and female. This species is known from Inyo, Kern, Riverside, San Bernardino, and San Diego counties in southern California, where it lives just below the soil surface on the crown of its host, probably always *Hymenoclea salsola* Torr. & A. Gray (Asteraceae). A revised key to the adult females of all nine species of *Oregmopyga* is included.

Resumen

Una nueva especie de eriocóccido subterráneo, *Oregmopyga viscosa* Kondo **sp. nov.** (Hemiptera: Coccoidea), se describe e ilustra basándose en la hembra adulta y el segundo estadio de la hembra y el macho. Esta especie ha sido encontrada en los condados Inyo, Kern, Riverside, San Bernardino y San Diego en el sur de California. La especie vive cerca de la superficie en el tallo de su hospedero, siempre siendo probablemente *Hymenoclea salsola* Torr. & A. Gray (Asteraceae). Se incluye una clave revisada para las hembras adultas de todas las nueve especies de *Oregmopyga*.

Key words: California, eriococcid, *Hymenoclea*, new species, *Oregmopyga*

Introduction

The scale insect family Eriococcidae contains approximately 550 described species, of which 89 occur in the Nearctic region (Ben-Dov *et al.* 2004). In the Nearctic, four closely-related genera, *Cornoculus* Ferris, *Oregmopyga* Hoy, *Ovaticoccus* Kloet, and *Spiroporo-*

coccus Miller, constitute a group known as the ovaticoccins (Miller and McKenzie 1967). Ovaticoccins are rarely collected because they are cryptic, living under bark, on the roots, or in the crowns or basal sheaths of their host plants. Only 24 ovaticoccin species have been described (Miller and Gimpel 2000, 2003), mostly from the southwestern and southern regions of the United States, although many more species are predicted to occur in the southwest (Miller and McKenzie 1967). Here we describe a new species of *Oregmopyga* from southern California.

The genus *Oregmopyga* is known from eight species, of which four occur in the southwestern United States, one species in Baja California, Mexico, and three others in the southeastern United States (Miller and McKenzie 1967; Miller and Miller 1993). Individuals of the new *Oregmopyga* species have been collected only on the roots and crown of *Hymenoclea salsola* Torr. & A. Gray (Asteraceae), at or just below the soil at the junction of the stem and root of the plant. Adult females secrete and live enclosed in a sticky resinous material, to which sand grains attach. Thus we name the species '*viscosa*', after the Latin '*viscosus*', meaning sticky. We describe and illustrate the adult female and second-instar male and female, and provide a key to separate the adult female from those of the other eight species of *Oregmopyga*.

Materials and Methods

Descriptions of the adult female, second-instar female, and second-instar male are based on multiple slide-mounted specimens. Specimens were slide-mounted using the methods of Gullan (1984). The material studied is listed as the number of slides with the total number of specimens and the growth stage in parentheses. For example, one slide with three specimens, of which two are adult females and one second-instar male is represented as follows: 1(3: 2 adult females + 1 second-instar male). This is followed by the collection data, and the depositories in parentheses. Growth stages are not given when all specimens on the slide(s) are adult females. Measurements were made using an ocular micrometer in a compound microscope. The number of specimens measured for each instar is given in parentheses. Spiracle measurements are based on the width of the peritreme measured across the atrium. Drawings are generalizations of several specimens and were made with the assistance of a camera lucida attached to a compound microscope. Each figure shows an entire insect with the venter depicted on the right side of the illustration and the dorsum shown on the left. Special features of the specimen are enlarged to the side of each illustration. The terminology used to describe the eriococcids follows that of Miller and McKenzie (1967) and Williams (1985) with the modifications of Gullan and Vranjic (1991).

Specimen depositories

BME — Bohart Museum of Entomology, University of California, Davis, U.S.A.
CDFA – California Department of Food and Agriculture, Sacramento, U.S.A.
USNM – National Museum of Natural History Entomological Collection, Washington, DC., U.S.A. (Coccoidea collection held at USDA, Beltsville, Maryland 20705)

Taxonomy

Oregmopyga Hoy

Onceropyga Ferris, 1955: 208 (preoccupied by *Onceropyga* Turner, 1906)
Oregmopyga Hoy, 1963: (*nom. nov.* for *Onceropyga*); Miller and McKenzie, 1967: 489; Miller and Miller, 1993: 77.

Type species. *Eriococcus neglectus* Cockerell, 1895, by original designation.

Revised key to species of *Oregmopyga* Hoy based on adult females [adapted from partial keys in Gill (1993), Miller and McKenzie (1967) and Miller and Miller (1993)]

1. Anal ring non-cellular 2
- Anal ring cellular..... 4
2. Macrotubular ducts absent from dorsum..... *viscosa* Kondo **sp. nov.**
- Macrotubular ducts present on dorsum 3
3. Microtubular ducts absent from venter; anal ring horseshoe shaped; anal ring setae minute or hair-like..... *neglecta* Cockerell
- Microtubular ducts present on venter; anal ring entire or slightly open; anal ring setae hair-like *sanguinea* Miller
4. Hind coxae with pores on both surfaces..... 5
- Hind coxae with pores restricted to one surface 6
5. Antennae 6-segmented *erigoni* Miller
- Antennae 7-segmented *johnsoni* Miller
6. Bilocular pores confined to ventral margin..... *peninsularis* (Ferris)
- Bilocular pores present on both venter and dorsum 7
7. Multilocular pores mainly with 5 loculi..... *parvispina* (Chaffin)
- Multilocular pores mainly with 7–11 loculi 8
8. Mammiform setae wider than long, dome-shaped..... *tippinsi* Miller & Miller
- Mammiform setae longer than wide..... *strongyla* Miller & Miller

***Oregmopyga viscosa* Kondo sp. nov. (Figs. 1–5)**

Type material. Holotype, adult female. **UNITED STATES: California:** Kern County, Red Rock Canyon, 15-v-2004, coll. T. Kondo & P.J. Gullan, ex on roots of Asteraceae, prob. *Hymenoclea salsola*, 1(1) (BME). Paratypes: **UNITED STATES:** same data as holotype 6(6: 4 BME + 1CDFA + 1BMNH); **California:** Inyo Co., 4 mi. [6.4 km] S. Lone Pine, 30-i-1965, coll. D.R. Miller, ex *Hymenoclea salsola*, 2(second-instar males) #467 (BME); Kern Co., Inyokern, 7-iv-1966, coll. D.R. Miller, ex *Hymenoclea salsola*, 2(2) #530 (BME); Kern Co., nr. Mojave, 26-iv-1936, coll. G.F.F., ex *Hymenoclea*, 1(1) (BME); Riverside Co., 10 mi [16 km], W. Indio, 29-i-1965, coll. D.R. Miller, ex *Hymenoclea salsola*, 1(2: 1 second-instar female + 1 second-instar male) #465 (BME); Riverside Co., 5 mi. [8.1 km] N.E. Palm Springs, 28-XII-1970, coll. D.R. Miller, ex *Hymenoclea*, 3(7: 5 second-instar females + 2 second-instar males) #1857 (USNM); Riverside Co., Palm Canyon Rd., 2 mi. [3.2 km] S. Palm Springs, 6-iii-1967, coll. H.L. McKenzie, ex *Hymenoclea salsola*, 3(5: 4 adult females + 1 adult male) #67-3 (USNM); Riverside Co., Palm Springs, 18-iii-1966, coll. H.L. McKenzie, ex *Hymenoclea salsola*, 3(6: 2 adult females + 4 second-instar females)(BME); Riverside Co., Palm Springs, 21-iii-1966, coll. H.L. McKenzie, ex *Hymenoclea* sp., 2(2 second-instar females)(BME); Riverside Co., 2 mi. [3.2 km] S.W. Palm Springs, 24-xii-1964, coll. J.F. Miller, ex *Hymenoclea* sp., 1(2 second-instar males) #394 (BME); Riverside Co., White Water Canyon, 15-v-1973, coll. D.R. Miller, ex *Hymenoclea salsola*, 3(6) #2363 (USNM); Riverside Co., Palm Canyon, 2 mi. [3.2 km] S. Palm Springs, Date not given, coll. H.L. McKenzie, ex *Hymenoclea salsola*, 10(29: 24 adult females + 2 adult males + 2 pupal males + 1 second-instar male)(USNM); San Bernardino Co., Joshua Tree Natl. Mon., 8-iii-1967, coll. H.L. McKenzie, ex *Hymenoclea salsola*, 2(4: 2 adult females + 1 second-instar female + 1 second-instar male) #67-8 (USNM); San Bernardino Co., 1 mi. [1.6 km] W. Joshua Tree, 30-xi-1963, coll. D.R. Miller, ex *Hymenoclea salsola*, 5(7: 1 second-instar female + 6 second-instar males) #173 (BME); San Diego Co., Scissors Crossing, 26-i-1965, coll. D.R. Miller, ex *Hymenoclea salsola*, 1(2: 1 second-instar female + 1 second-instar male) #432 (BME).

Key to the instars of *Oregmopyga viscosa* Kondo sp. nov.

1. Insect with wings or wing budsadult male and male pupa respectively
 - Insect without wings 2
2. Antennae 6-segmented; dorsal macrotubular ducts absent 3
 - Antennae 7-segmented; dorsal macrotubular ducts present or absent 4
3. *Only 1 pore associated with each spiracular atrium first-instar nymph
 - Several pores associated with each spiracular atrium second-instar female
4. Vulva present; venter of last abdominal segments each with a broad transverse row of multilocular pores 3–6 pores wide; dorsal macrotubular ducts absent adult female

- Vulva absent; venter of last abdominal segments with a single transverse row of pores per segment; dorsal macrotubular ducts present second-instar male

* No first-instar nymphs of *O. viscosa* have been collected; therefore, first-instar nymphs of the closely related species *Ovaticoccus agavium* (Douglas) were used to produce the key.

Description of adult female (n= 48) (Fig. 1–2)

Unmounted material: Insect found inside a cryptic encasement attached to the crown and upper roots of its host. Encasement composed of a sticky translucent secretion incorporating plant material and sand grains (Fig. 1A & 2A). Dorsum of insect bare, shiny red, with segmentation clearly visible (Fig. 1B), and imprinted onto inner wall of encasement (Fig. 1A). Venter of insect covered in a white powdery wax secretion (Fig. 1C).

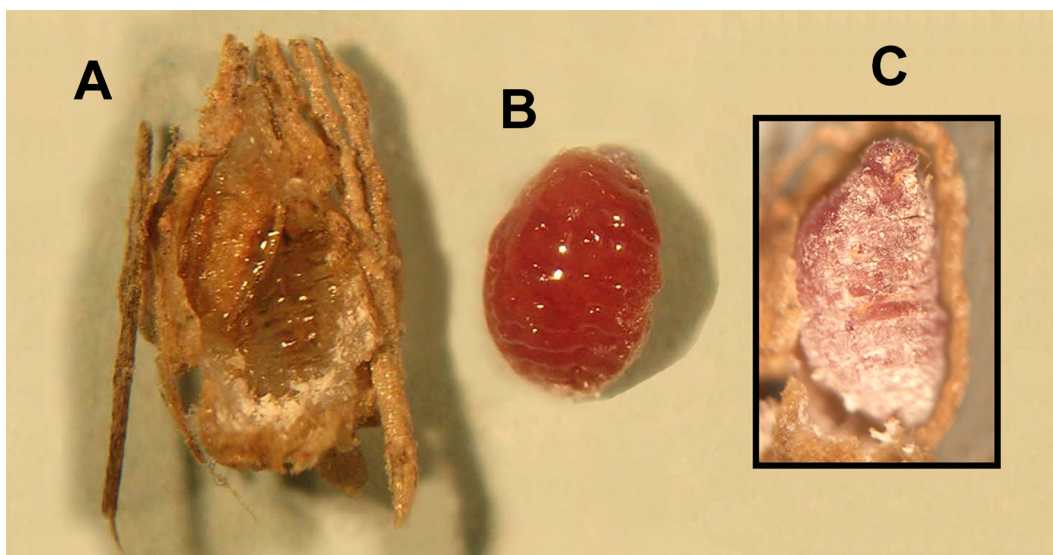


FIGURE 1. A, Encasement of *Oregmopyga viscosa* Kondo **sp. nov.** showing root fibers and imprinted abdominal segmentation; B, Dorsal view of insect, showing bare dorsum of shiny red color and abdominal segmentation; C, Live specimen inside encasement with venter covered with powdery wax.

Mounted material: Insects oval, elongate oval to pyriform, often with a constriction on head region in fully grown specimens (Fig. 2). Body 1.2–3.4 mm long, 0.4–2.0 mm wide; segmentation distinct on abdomen.

Dorsum: with two types of setae; slender hair-like setae (Fig. 2E) 12–30 µm long, distributed across all segments, longest on anal lobe, 20–58 µm long; mammiform setae (Fig.

2F) recessed, short, 7–10 μm long, found in transverse rows of about 6 setae on each abdominal segment; becoming fewer on head and thorax. Dorsal macrotubular ducts absent. Microtubular ducts (Fig. 2D) variable in number, often scarce, most common around setae; diameter of duct-rim about 2 μm . Multilocular pores 6–8 μm in diameter, with 3–8 (mostly 5) loculi (Fig. 2G); present only on abdomen, more abundant on posterior segments, usually limited to submargins, occasionally in a continuous transverse row on last 2–4 abdominal segments. Bilocular pores (Fig. 2B) elongate oval, 5–6 μm wide at widest point; number variable, usually 0–4 pores present marginally on head region, occasionally a few pores elsewhere around margin. Rarely 3-ocular pores mixed among bilocular pores.

Venter: Antennae (Fig. 2P) 175–225 μm long, with 7 segments; fleshy setae on segments 5–7, with 2 coeloconic sensilla (Fig. 2O) present on apical segment. Eyespots present marginally or submarginally on venter just posterolateral of antennal scape. Clypeolabral shield 145–190 μm long, 130–160 μm maximum width. Labium 3-segmented, 75–140 μm long, 75–120 μm wide across base; with 7 pairs of setae: 2 pairs on basal segment, 1 pair on median segment, and 4 pairs on apical segment, setae just anterior to apical setae longest. Legs (dorsal side Fig. 2L) well developed, trochanter + femur 100–150 μm long, tibia + tarsus 120–180 μm long; tarsal and claw digitules slender, knobbed; claw with a small denticle near apex, translucent pores present on hind coxae only, numerous on dorsal side, with none to several on ventral side. Spiracular peritremes: mesothoracic 40–60 μm wide; metathoracic 40–65 μm wide. Anal lobes either shallow or absent; apical seta 113–158 μm long. Anal ring (Fig. 2I) non-cellular (without wax pores), 30–50 μm in diameter, with 3 pairs of setae (Fig. 2I). Ventral setae (Fig. 2J) slender, hair-like, 17–33 μm long, in segmental rows on abdomen, scarce on mid-thorax, most abundant around legs and body margin. Microtrichia (not illustrated) present on all abdominal segments and on thorax up to area between mesothoracic legs; present on coxae also. Ventral macrotubular ducts (Fig. 2K) present or absent, when present of one type, usually restricted to abdominal region, with 0–3 macrotubular ducts per abdominal segment, rarely a pair just posterior to mouthparts on thorax, duct-rim 5–6 μm wide. Ventral microtubular ducts (Fig. 2M) scarce, duct-rim about 2 μm wide, most abundant on abdomen and body margin. Multilocular pores each 6–8 μm in diameter, with 3–8 (mostly 5) loculi (Fig. 2H); abundant on posterior abdominal segments, gradually becoming fewer on anterior abdomen, in clusters around spiracles, some around legs and antennae, with a line of pores on each side of mouthparts. Bilocular pores (Fig. 2N) same as those on dorsum; number variable, 2–12 pores present marginally on head region, often with few pores elsewhere around margin.

Morphological variation. Variation in the distribution of multilocular pores and the abundance of microtubular ducts was observed among the specimens studied. Specimens collected at Red Rock Canyon in Kern Co. have overall fewer pores and ducts than do those collected elsewhere in California.

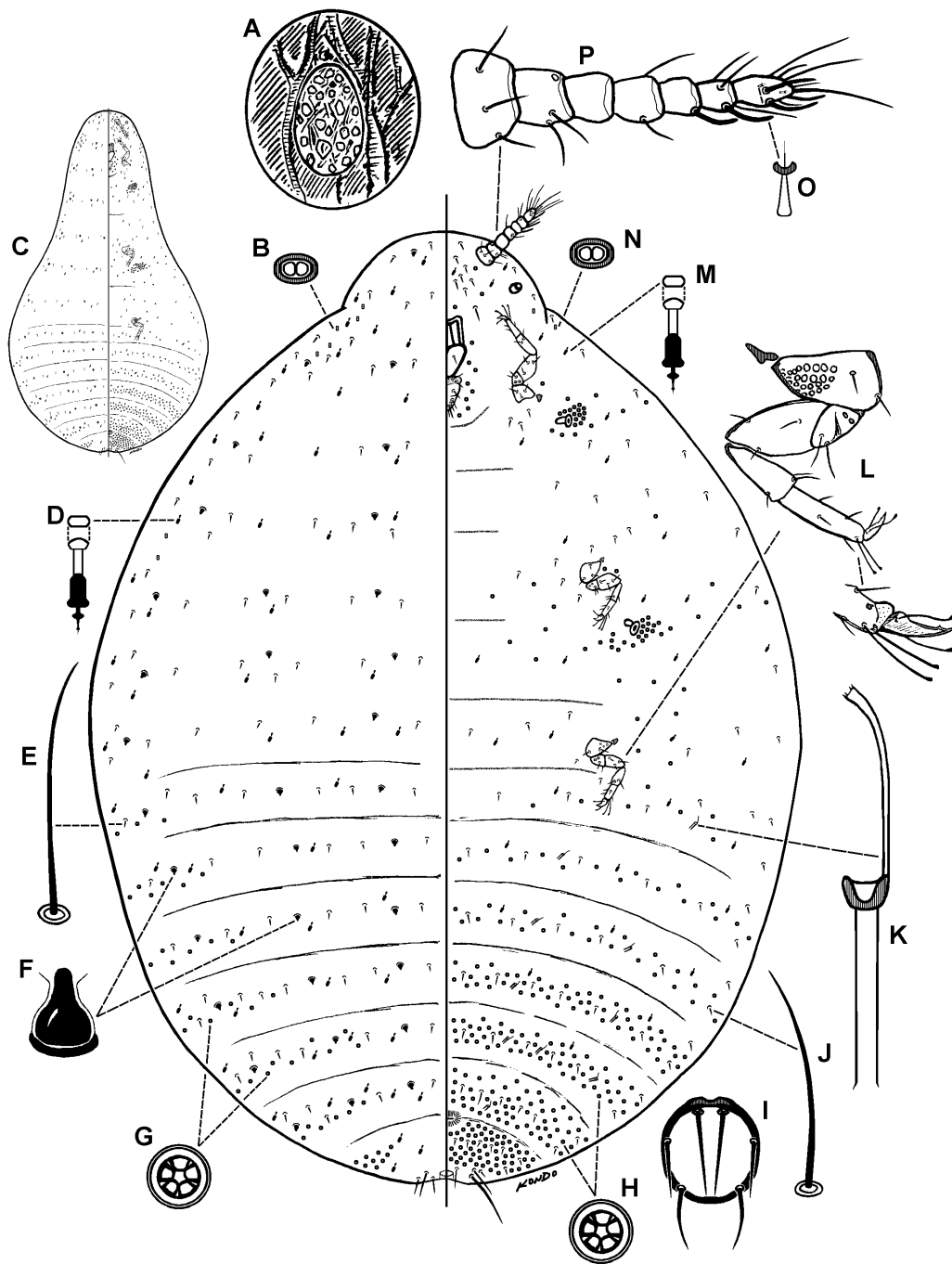


FIGURE 2. *Oregmopyga viscosa* Kondo **sp. nov.** adult female. A, Insect on root crown; B, Bilocular pore; C, Pyriform-shaped specimen; D, Microtubular duct; E, Dorsal seta; F, Mammiform seta; G & H, 5-locular pore; I, Anal ring; J, Ventral seta; K, Macrotubular duct; L, Leg; M, Microtubular duct; N, Bilocular pore; O, Coeloconic sensillum; P, Antenna.

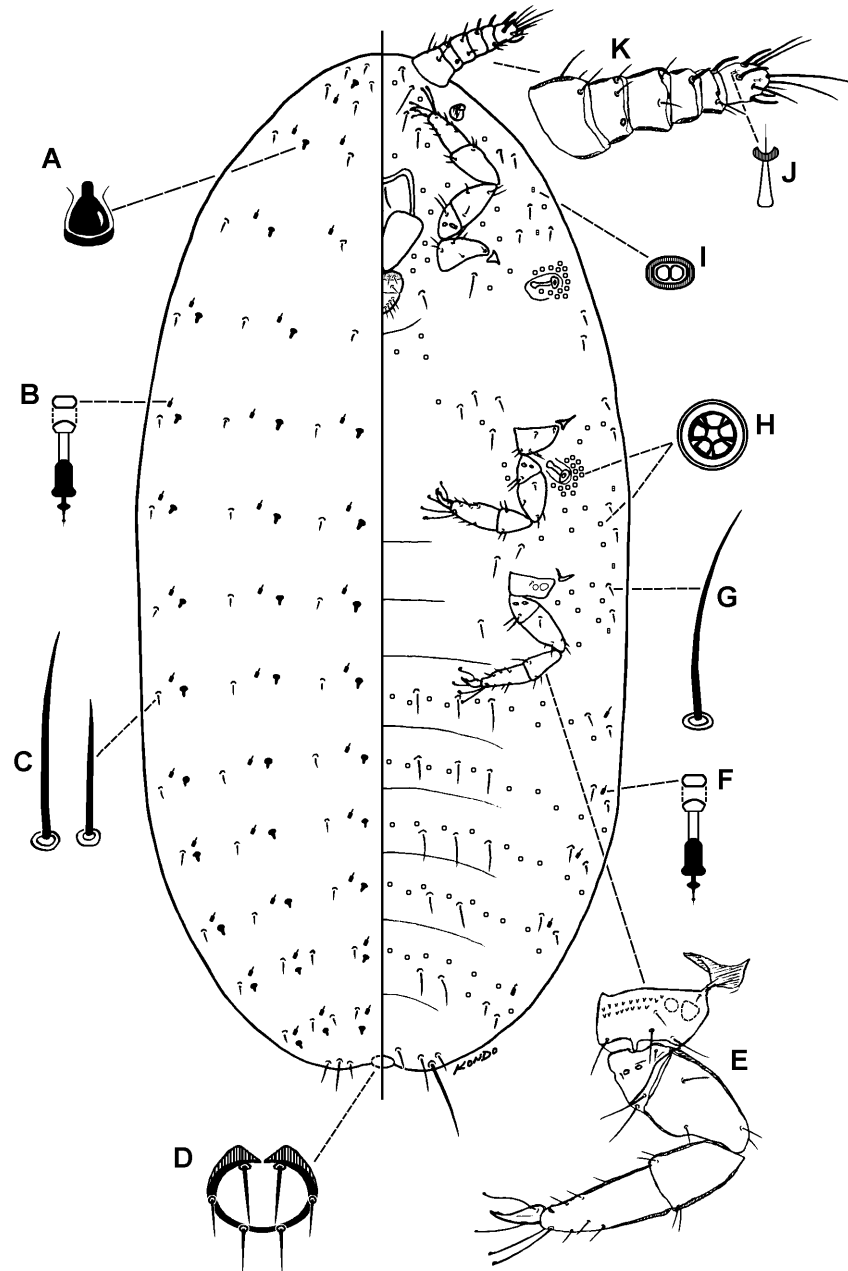
Description of second-instar female (n=15) (Fig. 3).**Unmounted material:** not seen.**Mounted material:** Insects elongate oval. Body 1.0–1.4 mm long, 0.6–0.8 mm wide; segmentation distinct on abdomen.

FIGURE 3. *Oregmopyga viscosa* Kondo **sp. nov.** second-instar female. A, Mammiform seta; B, Microtubular duct; C, Ventral setae; D, Anal ring; E, Leg; F, Microtubular duct; G, Ventral seta; H, 5-locular pore; I, Bilocular pore; J, Coeloconic sensillum; K, Antenna.

Dorsum: with two types of setae; slender hair-like setae (Fig. 3C) 12–15 μm long, distributed across all segments, longest on anal lobe, 17–35 μm long; mammiform setae (Fig. 3A) recessed, short, 7–10 μm long, found in transverse rows of about 6 setae on each abdominal segment; becoming fewer on head and thorax. Dorsal macrotubular ducts absent. Microtubular ducts (Fig. 3B) scarce, most common around setae; diameter of duct-rim about 2 μm . Dorsal bilocular and multilocular pores absent.

Venter: Antennae (Fig. 3K) 143–153 μm long, with 6 segments; fleshy setae on last 3 segments, 2 coeloconic sensilla (Fig. 3J) on apical segment. Eyespots present marginally to submarginally on venter just posterior to antennal scape. Clypeolabral shield 133–145 μm long, 110–138 μm maximum width. Labium 3-segmented, 88–98 μm long, 68–73 μm wide across base; same setal number and pattern as adult female. Legs (Fig. 3E) well developed, trochanter + femur 85–100 μm long, tibia + tarsus 113–133 μm long; tarsal and claw digitules slender, knobbed; claw with small denticle near apex; with pair of translucent pores on dorsal side of hind coxa only. Spiracular peritremes: mesothoracic 13–18 μm wide; metathoracic 14–18 μm wide. Anal lobes either shallow or absent; apical seta 90–118 μm long. Anal ring (Fig. 3D) non-cellular, 25–33 μm in diameter, with 3 pairs of setae. Ventral setae (Fig. 3G) slender, hair-like, 15–33 μm long, in segmental rows on abdomen, scarce on mid-thorax, most abundant around legs and body margin. Microtrichia (not illustrated) present on all abdominal segments and on thorax up to area between mesothoracic legs; present on coxae also. Ventral macrotubular ducts absent. Ventral microtubular ducts (Fig. 3F) scarce, duct-rim about 2 μm wide, present on abdominal margin. Multilocular pores each 5–6 μm in diameter, with 3–7 (mostly 5) loculi (Fig. 3H); in single transverse rows on abdominal segments, in clusters around spiracles, some around legs and antennae, with line of pores on both sides of mouthparts. Bilocular pores (Fig. 3I) elongate oval, 5–6 μm wide at widest point; number variable, 0–4 pores present marginally on head region, occasionally few pores elsewhere around margin.

Description of second-instar male (n=16) (Fig.4).

Unmounted material: not seen.

Mounted material: Insects elongate oval. Body 1.1–1.6 mm long, 0.5–0.8 mm wide; segmentation distinct on abdomen.

Dorsum: with two types of setae; slender hair-like setae (Fig. 4C) 12–35 μm long, distributed across all segments, longest on anal lobe, 13–35 μm long; mammiform setae (Fig. 4D) recessed, short, 7–10 μm long, found in transverse rows of about 6 setae on each abdominal segment, becoming fewer on head and thorax. Dorsal macrotubular ducts (Fig. 4B) present in irregular transverse rows of 8–10 ducts, duct-rim 5–6 μm wide. Microtubular ducts (Fig. 4A) scarce, most common around setae; diameter of duct-rim about 2 μm . Dorsal bilocular and multilocular pores absent.

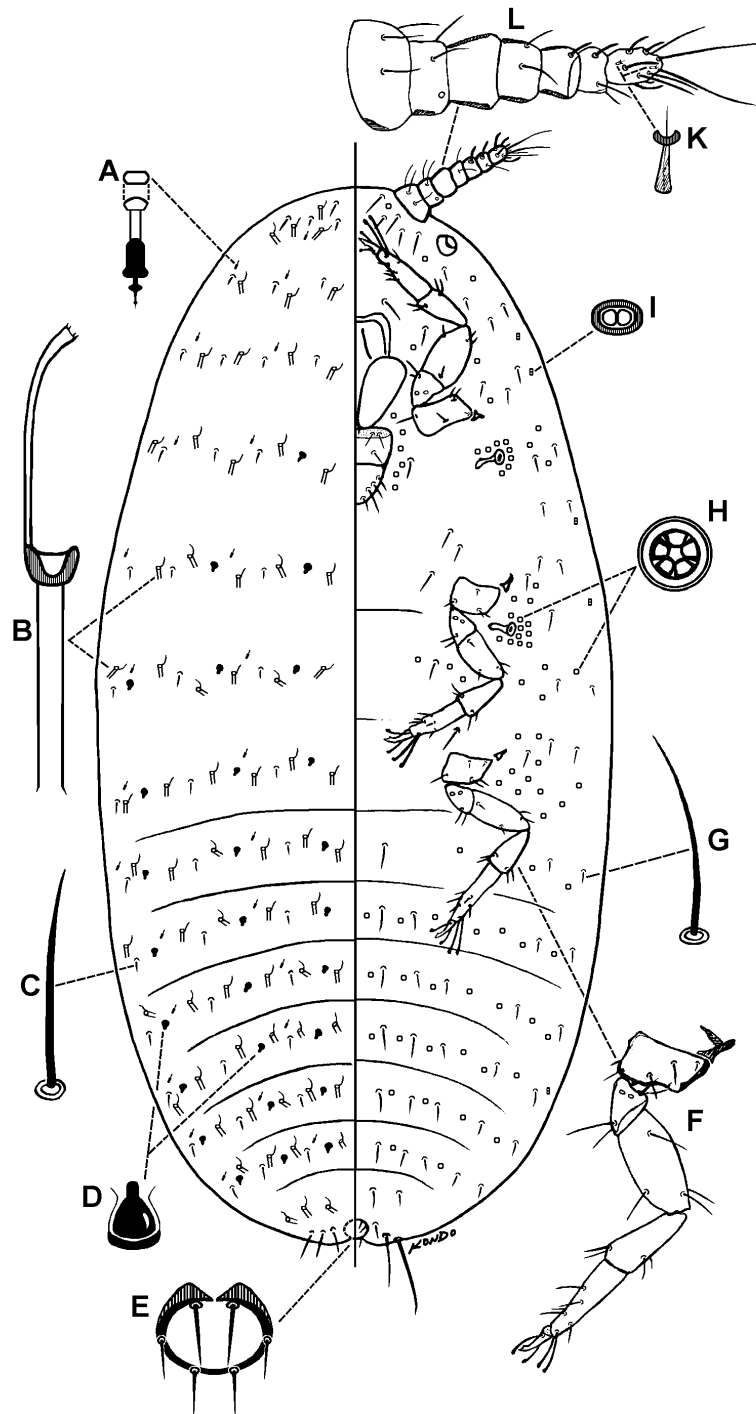


FIGURE 4. *Oregmopyga viscosa* Kondo **sp. nov.** second-instar male. A, Microtubular duct; B, Macrotubular duct; C, Dorsal seta; D, Mammiform seta; E, Anal ring; F, Leg; G, Ventral seta; H, 5-locular pore; I, Bilocular pore; J, Coeloconic sensillum; K, Antenna.

Venter: Antennae (Fig. 4K) 140–185 μm long, with 7 segments; fleshy setae on last 3 antennal segments, 2 coeloconic sensilla on apical segment (Fig. 4J). Eyespots present marginally to submarginally on venter just posterior to antennal scape. Clypeolabral shield 125–155 μm long, 115–130 μm maximum width. Labium 3-segmented, 85–100 μm long, 70–95 μm wide across base; same setal number and pattern as second-instar and adult female. Legs (Fig. 4F) well developed, trochanter + femur 155–135 μm long, tibia + tarsus 1125–150 μm long; tarsal and claw digitules slender, knobbed; claw with small denticle near apex; hind coxae without translucent pores. Anterior and posterior spiracular peritremes similar, 12–18 μm wide. Anal lobes either shallow or absent, apical seta 88–138 μm long. Anal ring (Fig. 4E) non-cellular, 33–38 μm in diameter, with 3 pairs of setae. Ventral setae slender, hair-like, longer on mid venter, 35–45 μm long, shorter around body margin, Ventral 15–25 μm long, present in segmental rows on abdomen, scarce on mid-thorax, most abundant around legs and body margin. Microtrichia (not illustrated) present on all abdominal segments and on thorax up to area between mesothoracic legs; present on coxae also. Ventral macrotubular and microtubular ducts absent. Multilocular pores each 4–6 μm in diameter, with 3–8 (mostly 5) loculi (Fig. 4H); in single transverse rows on abdominal segments, in clusters around spiracles, some around legs and antennae, with line of pores on both sides of mouthparts. Bilocular pores (Fig. 4I) elongate oval, 5–6 μm wide at widest point; some pores present marginally on head region, occasionally a few pores elsewhere around margin.

Discussion

Of the nine species of *Oregmomyga*, only the adult female of *O. viscosa* lacks dorsal macrotubular ducts, the ventral macroducts being scarce and confined to the abdomen. However, in one specimen, a pair of macrotubular ducts was found just posterolateral to the mouthparts. In the absence of dorsal macroducts, and because the bilocular pores are few and restricted to the body margin, the sticky material of the encasement is probably produced by the dorsal and ventral microtubular ducts. The 5-locular pores secrete the powdery white wax that covers the ventral side of the adult female of *O. viscosa*.

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