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A taxonomic review of the *Crypticerya* species (Hemiptera: Coccoidea: Monophlebidae) of the southwestern United States and Mexico, including description of a new species from Baja California

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Table of contents

Abstract

A recent phylogenetic study of the scale insect tribe Iceryini (Hemiptera: Coccoidea: Monophlebidae) based on morphological and molecular data led to a revised generic classification, including redefinition of three genera, one of which was *Crypticerya* Cockerell. The new concept of *Crypticerya* encompasses 22 described species, all of which are found in the New World. Nine species are scattered throughout the deserts of the southwestern United States and Mexico. Here these species are redescribed and one new species, *Crypticerya bursera* **sp.nov.** is described from Baja California, Mexico. The adult female and first-instar nymph are illustrated for nine of the 10 species. A key to the adult females of the southwestern species and morphologically similar species of *Crypticerya* is provided.

Key words: Iceryini, taxonomy, North America deserts, *Acacia* sp., *Bursera microphylla*, *Brethesiella* sp., *Crypticerya genistae*

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Introduction

The tribe Iceryini (Coccoidea: Monophlebidae) was revised recently and now comprises five newly-defined genera: *Crypticerya* Cockerell, *Echinicerya* Morrison, *Gigantococcus* Pesson & Bielenin, *Gueriniella* Fernald and *Icerya* Signoret (Unruh & Gullan, 2008a). Traditionally, these genera were classified according to the morphology associated with the egg-tending method of the adult female, but are now defined by cuticular features, such as pore and setal structure and distribution. Furthermore, taxa now reflect geographic distribution: specifically, *Gigantococcus* species are Afrotropical, *Gueriniella* species are Palaearctic, *Icerya* species are native almost entirely to the Indomalayan and Australasian regions, the monotypic *Echinicerya* is found in Central America, and *Crypticerya* species are distributed throughout the New World (Unruh & Gullan, 2008a). Thirteen of the 22 described *Crypticerya* species are native to Central and South America and most are found in Brazil and the Caribbean (the latter treated here as including the southern part of Florida). The remaining nine species, as well as a new species described here, are native to the southwestern United States and Mexico (Fig.1).

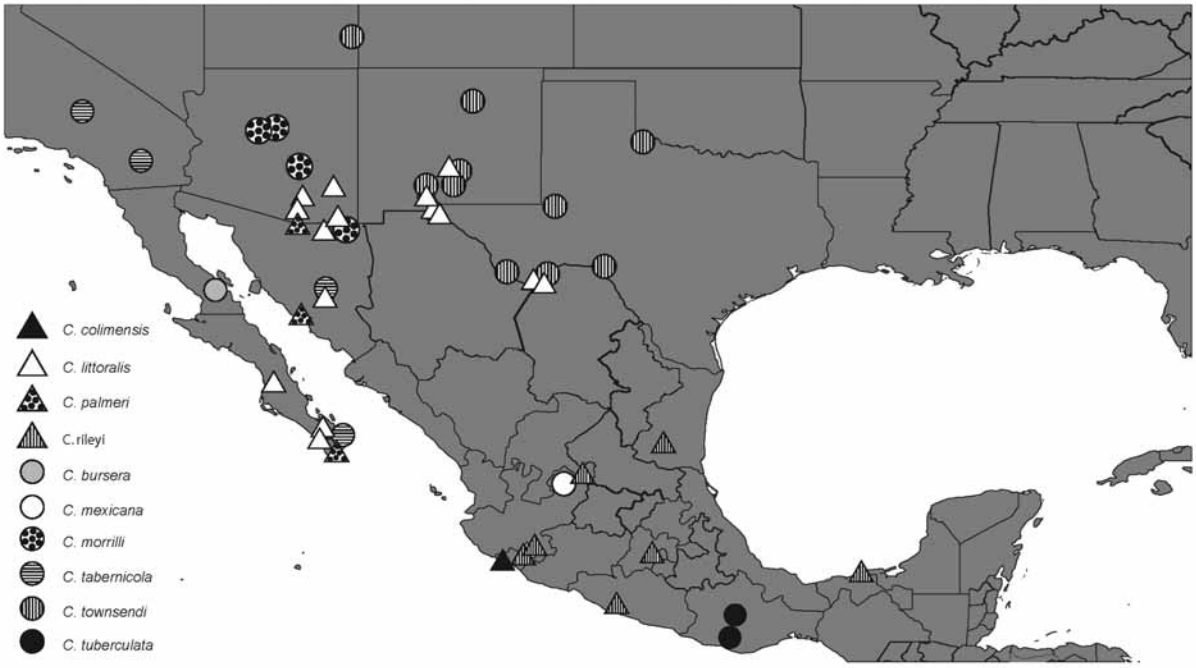

FIGURE 1. Distribution of native *Crypticerya* species in the southwestern United States and Mexico.

Southwestern North America is dominated by deserts and xeric shrublands which can be subdivided into four deserts: the Great Basin Desert, Mojave Desert, Sonoran Desert and Chihuahuan Desert (Brown, 1994; Ricketts *et al.*, 1999). Five *Crypticerya* species are found in the latter three deserts and typically feed on plants that dominate those regions, such as creosote bush (*Larrea tridentata*), mesquite (*Prosopis* spp.), various *Acacia* and *Mimosa* species, and broom snakeweed (*Gutierrezia sarothrae* Pursh). *Crypticerya tabernicola* (Ferris) (Fig. 2D) is found on legumes, composites and creosote bush in the Mojave Desert and Sonoran Desert in Baja California Sur, Mexico (Ferris, 1921; Trjapitzin & Triapitsyn, 2006). *Crypticerya morrilli* (Cockerell) (Fig. 2A, B) occurs in the northeastern Sonoran desert and surrounding uplands on legumes and creosote bush (Cockerell, 1914; Ferris, 1919, 1921). *Crypticerya townsendi* (Cockerell) (Fig. 2E) occurs in the Chihuahuan desert and only on composites, most often broom snakeweed (Cockerell, 1896; Gill, 1993; Richman & Thompson, 1999; Vayssière, 1926). *Crypticerya rileyi* (Cockerell) (Fig. 2F, G) is found across the Chihuahuan and Sonoran deserts, but apparently is absent from the Mojave, and feeds on composites, legumes and creo-

sote bush (Cockerell, 1902; Ferris, 1919; Foldi, 1995). A new species described in this paper, *C. bursera* sp.nov. (Fig. 2C), is found in Baja California on elephant tree (*Bursera microphylla* Gray).

Four species are native to the subtropical and tropical regions of Mexico (Cockerell, 1898, 1899a, b; Morrison, 1941). *Crypticerya littoralis* (Cockerell) is scattered throughout those areas, typically on legumes, especially *Acacia* and palo verde (*Parkinsonia* spp.). *Crypticerya tuberculata* (Morrison) is found on legumes throughout the state of Oaxaca and *C. mexicana* Cockerell and Parrott is found on *Acacia* spp. in Aguas Calientes (Cockerell, 1899a; Morrison, 1941). Very little is known about *C. colimensis* (Cockerell) as this species was described from a single adult female and undeveloped embryos collected in Manzanilla, Colima, Mexico, on an undetermined shrub (Cockerell, 1902).

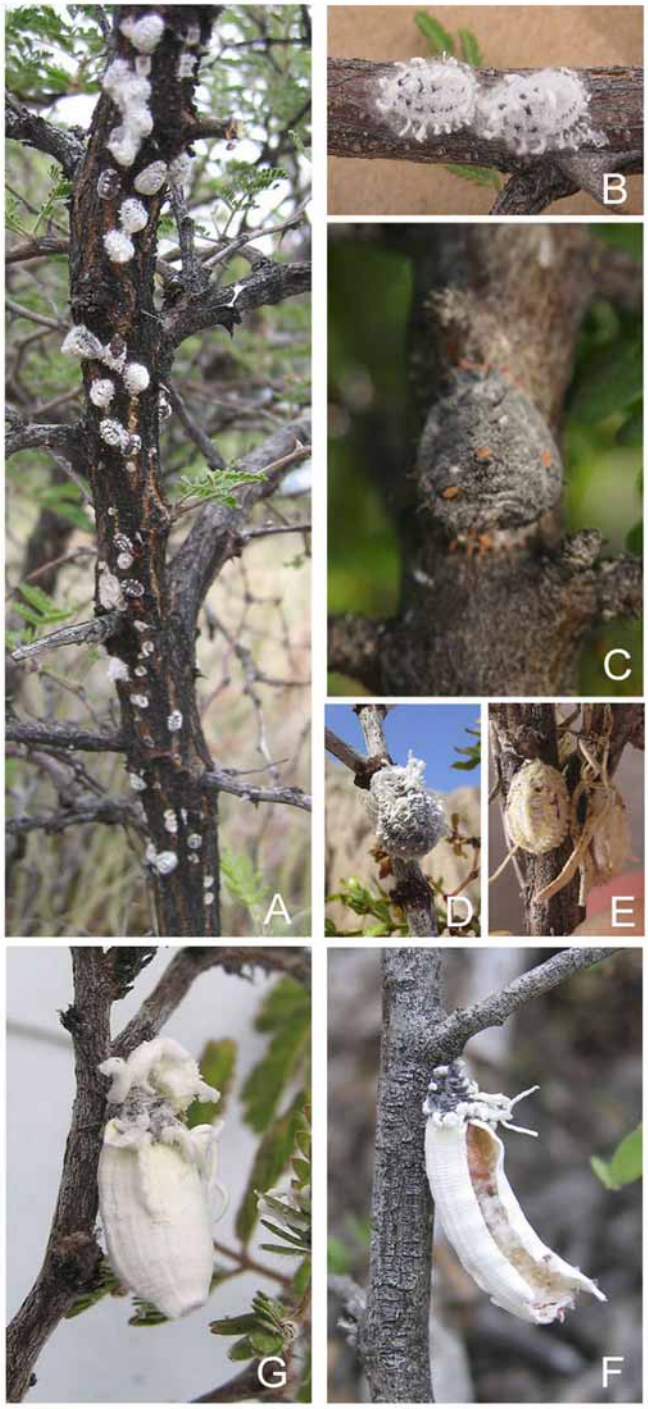

FIGURE 2. Photographs of various *Crypticerya* species *in situ*. A. *Crypticerya morrilli*; B. *Crypticerya morrilli*; C. *Crypticerya bursera*; D. *Crypticerya tabernicola*; E. *Crypticerya townsendi*; F. *Crypticerya rileyi*; G. *Crypticerya rileyi*.

The native range of *Crypticerya palmeri* (Riley & Howard) is unclear as it was described originally as a pest on grapevines in San Jose de Guaymas, Sonora, Mexico (Riley & Howard, 1890) and recorded later attacking alfalfa, grapevines and ornamentals in Chile (Porter, 1916). Adult females were collected also on ornamental plants at a U.S.-Mexico quarantine station. Refer to Table 1 for a list of hosts for each species.

The most commonly encountered iceryine species in North America is not a *Crypticerya* species, but the introduced pest *Icerya purchasi* Maskell, known also as the cottony-cushion scale (Gill, 1993). This species was first discovered in North America in Palo Alto, California, in 1868 and nearly destroyed the California citrus industry. This prompted the introduction of two biocontrol agents: the vedalia beetle, *Rodolia cardinalis* (Mulsant) and the parasitic fly *Cryptochaetum iceryae* Williston (Clausen, 1956; Doutt, 1958). It is polyphagous and found in horticultural and agricultural environments, but can be found in high populations in the wild (Gill, 1993). Other than *I. purchasi*, the only iceryine species found in the southwestern United States and Mexico belong to *Crypticerya*.

TABLE 1. Hosts of *Crypticerya* species in the southwestern United States and Mexico.

Species	Country	State	Host
C. bursera	Mexico	Baja California	**Burseraceae**: *Bursera microphylla* A. Gray
C. colimensis	Mexico	Colima	unknown
C. littoralis	Mexico	Mexico	**Euphorbiaceae**: *Codiaeum* sp.; **Fabaceae**: *Acacia* sp., *Mimosa pigra* L., *Mimosa* sp., *Persea* sp., *Prosopis laevigata* (Willd.) M. Johnston
C. mexicana	Mexico	Mexico	**Fabaceae**: *Prosopis* sp.
C. morrilli	U.S.	CA, AZ	**Fabaceae**: *Acacia greggii* Gray, *Pluchea sericea* Nutt., *Prosopis juliflora* (Sw.) DC, *Viborquia spinosa* (Kuntze) Cockerell; **Zygophyllaceae**: *Larrea* sp.
C. palmeri	Mexico	Sonora	**Fabaceae**: *Parkinsonia aculeata* L.;
			Vitaceae: grapevine
C. rileyi	U.S., Mexico	AZ, NM, TX, Chihuahua	**Asteraceae**: *Ambrosia* sp.; **Fabaceae**: *Acacia constricta* Benth., *Calliandra eriophylla* Benth., *Calliandra* sp., *Dalea frutescens* Gray, *Prosopis velutina* Woot., *Prosopis* sp.; **Zygophyllaceae**: *Larrea tridentata*, *Larrea* sp.
C. tabernicola	U.S., Mexico	CA, NV, Baja California Sur	**Asteraceae**: *Dyssodia porophylloides* Gray, *Gutierrezia* sp., *Peucephyllum schottii* Gray; **Fabaceae**: *Prosopis* sp.;
			Zygophyllaceae: *Larrea divaricata* Cav., *Larrea tridentata*, *Larrea* sp.
C. townsendi	U.S.	NM, TX, UT	**Asteraceae**: *Baccharis* sp., *Chrysothamnus* sp., *Gutierrezia sarothrae*, *Gutierrezia* sp., *Hymenopappus* sp., *Pluchea borealis* Gray, *Parthenium incanum* Kunth
C. tuberculata	Mexico	Oaxaca	**Fabaceae**: *Acacia pennatula* (Cham. & Schltdl.) Benth., *Caesalpinia coriaria* (Jacq.) Willd., *Mimosa* sp.

Records of natural enemies of North American *Crypticerya* species are scant, but a new species of hymenopteran parasitoid, *Brethesiella mojave* Trjapitzin and Triapitsyn (Encyrtidae) was described recently in association with *C. tabernicola* (Trjapitzin & Triapitsyn, 2006). A related parasitoid species, *Brethesiella latifrons* (Timberlake) was collected from an unidentified "*Icerya* sp." from Tamaulipas, Mexico (Olazarán Aguilar & Ruíz Cancino, 2001) and a third related parasitoid, *Brethesiella flava* (Timberlake) has been collected in association with *C. palmeri* in Frontera, Tabasco, Mexico (Timberlake, 1926). The vedalia beetle has been found also in association with *C. palmeri* (Bartlett, 1978). [Refer to Trjapitzin & Triapitsyn (2006) for a review of encyrtid parasitoids of Margarodidae *s.l.*]

Little is known of the biology and life cycle of *Crypticerya* species from the southwestern U.S. and Mexico, but related species generally have 2 or 3 generations per year (Morrison, 1928). Dr. Sally Hughes-Schrader studied the cytology of *C. littoralis* and *C. tuberculata* as well as several Central and South American *Crypticerya* species (Hughes-Schrader, 1930a, b; 1946). She found that these species have a haplodiploid sexual system and chromosome complement of 2n=4, which is identical to other iceryines.

Adult females of *Crypticerya* species employ three different egg-tending strategies, but Mexican and North American *Crypticerya* species exhibit only two of these. Adult females of *C. colimensis*, *C. littoralis*, *C. palmeri* and *C. rileyi* form a waxy ovisac that extends from the posterior abdomen. Eggs are laid in the ovisac and the first-instar nymphs (crawlers) hatch and exit the ovisac through small openings in the wax. In contrast, adult females of *C. bursera*, *C. mexicana*, *C. morrilli*, *C. tabernicola*, *C. townsendi* and *C. tuberculata* form an internal marsupium into which the eggs are laid. First-instar nymphs hatch and emerge through the marsupial opening located on the ventromedial abdomen. Males are rare in collections of North American *Crypticerya* species, although males of *C. morrilli*, *C. rileyi* and *C. tuberculata* are present in museum collections (C.M. Unruh, unpublished data).

Unruh and Gullan (2008b) identified informal species groups based on molecular and morphological data. *Crypticerya littoralis*, *C. genistae*, *C. minima* and *C. palmeri* belong the *C. littoralis* group. The *C. mexicana* group contains two species: *C. mexicana* and *C. tuberculata* (and will now also include *C. bursera*), and the *C. rileyi* group is made up of five species: *C. colimensis*, *C. morrilli*, *C. rileyi*, *C. tabernicola* and *C. townsendi*. Please refer to Unruh and Gullan (2008b) for discussion of the morphological similarities of species in those groups.

In this paper, I revise all *Crypticerya* species native to the United States and Mexico and describe a new species, *C. bursera*, from Baja California. I provide illustrations and descriptions of the adult female and first-instar nymph of these species, excluding *C. colimensis*. I provide a generic description based on all species of *Crypticerya* but include a key only to the adult females of the 10 species described in this paper and *Crypticerya genistae* (Hempel), which was introduced to Florida recently (Hodges, 2006) and *Crypticerya minima* (Morrison) which occurs in Argentina. The latter two species resemble several southwestern species [a key to all species of the genus is available in Unruh and Gullan (2008b)].

Material and methods

The following abbreviations are for institutions or collections where specimens are held or will be deposited: BME, Bohart Museum of Entomology, University of California, Davis, U.S.A.; CSCA, California State Collection of Arthropods, Plant Pest Diagnostics Branch, California Department of Food and Agriculture, Sacramento, U.S.A.; USNM, United States National Museum of Natural History, Entomological Collection, Washington, D.C., U.S.A. (Coccoidea collection held at United States Department of Agriculture, Beltsville, Maryland). The depository is indicated in parentheses after the collection data for specimens. One adult female specimen (♀) is mounted on each slide and several nymphs are mounted per slide, unless otherwise stated. North American states are abbreviated as follows: AZ, Arizona; CA, California; NM, New Mexico; NV, Nevada; TX, Texas; UT, Utah.

The slide-mounting and mensural techniques described by Gullan (1984) were used. Measurements were made using an ocular micrometer attached to a compound microscope. The measurements and figures of the adult female and first-instar nymph are based on more than one slide-mounted specimen, including type specimens. Measurements are expressed as the range and are given in millimeters (µm) and in micrometers (µm). Drawings of the adult female and first-instar nymph of each species represent a generalized individual based on all examined material. Illustrations were prepared using a drawing tube and modified in the Adobe programs Photoshop 6.0 and Illustrator CS. Illustrations follow the traditional format for scale insects with the

dorsal surface depicted on the right side of the central figure and ventral surface on the left. Special features are highlighted as enlargements around the main figure. Enlargements are not drawn to the same scale as each other. Measurements of length and width are maximum dimensions. Length of setae includes the setal base. Length of the thoracic spiracles includes the peritreme. Abdominal spiracles are drawn on either the dorsal or ventral surface depending on the maturity of the specimen (as females mature, the abdomen swells and spiracles are pushed to the dorsal surface).

The morphological terms for Iceryini described and illustrated by Unruh & Gullan (2008a,b) are used. Two types of setae are seen in *Crypticerya*: hair-like and flagellate. Hair-like setae are slender with an acute apex and have a basal collar, or socket, and vary greatly in length, from 25–1100 µm. Flagellate setae are shorter, finer with an acute apex and a rounded socket with an indistinct basal collar.

The four main pore types present in the tribe Iceryini were defined and illustrated by Unruh & Gullan (2008a,b). Of those, only simple multilocular pores occur on species of *Crypticerya*. Simple multilocular pores most commonly have a bilocular to trilocular centre (sometimes quadrilocular to quinquelocular) with 6–10 outer loculi. The pore centre can vary in shape and outer loculi vary in number. Simple multilocular pores with a round, bilocular or trilocular centre and 12–20 elongate outer loculi are found in the vulvar and anal regions of every iceryine species. These pores appear blue under acid fuchsin stain.

An ovisac band is present on the adult female of species that form an ovisac. The ovisac band is composed of simple multilocular pores and setae arranged in a large circle on the ventral abdomen; the anterior edge is posterior to the hind coxae and the lateral and posterior edges extend to the abdominal margin. A homologous structure called the marsupial band is present on species that form a marsupium, an internal pouch on the ventral abdomen into which eggs are laid. The marsupial band is composed of setae and multilocular pores, which, in *Crypticerya* species, are arranged in a circle on the ventromedial abdomen posterior to the hind coxae. The cuticle around the pores and setae in the marsupial band becomes sclerotized with age. The vulvar opening and cicatrices are present in the marsupium.

Cicatrices are minute to large structures with a papillose texture and a slightly sclerotized rim. In *Crypticerya*, cicatrices are located on the ventral surface in a transverse row posterior to the vulva. Nearctic species have one or three cicatrices but certain Neotropical species can have up to eleven. Tubercles are horn-like extensions of the derm found in longitudinal rows on the dorsal surface and margins of some species.

Full references for species names and taxonomic notes for all species except *C. bursera* can be found in Unruh & Gullan (2008b).

Crypticerya **Cockerell**

Description of adult female

Slide-mounted specimens. Body oval to elliptical, 2.2–7.2 mm long, 1.2–4.6 mm wide, often broadest across abdomen. Antennae 9 to 11 segmented, basal segment widest, apical segment elongate; each segment with varying number of hair-like setae. Eyes circular, at base of antennae. Labium 3 segmented, with spatulate setae on apex, hair-like setae anteriorly. Legs well developed; forelegs shorter than mid- and hindlegs; each trochanter with 4 campaniform sensilla on each face and long distal trochanteral seta; tibia with robust setae towards apex; tarsus curved ventrally, with a longitudinal band of robust setae; setae decreasing in length towards apex; claw with one pair of digitules, acute and shorter than claw apex. Thoracic spiracles each with elongate peritremes; multilocular pores absent from atrium, but sometimes clustered on derm at opening. Vulvar opening on ventromedial abdomen, surrounded by setae and multilocular pores, each with trilocular centre and 10–16 outer loculi; these pores appear bluish when stained in acid fuchsin. Cicatrices each circular to elliptical, on venter only, posterior to vulvar opening, 1–11 (usually 1 or 3) arranged in a transverse row or semicircle. Ovisac band either present or absent; when present, formed by setae and multilocular pores

arranged in a large circle on ventral abdomen, anterior edge of band posterior to hind coxae, lateral and posterior edge on submarginal abdomen; ovisac band with or without dense flagellate setae. Internal marsupium either present or absent; when present, opening located on ventral abdomen posterior to hind coxae, marsupial band composed of simple multilocular pores and sparse setae, derm becoming completely sclerotized and forming a complete circle; vulvar opening and cicatrices present in marsupium. Abdominal spiracles in 3 pairs on abdominal segments VI–VIII; multilocular pores absent from atrium but sometimes clustered on derm at each spiracular opening. Anal opening dorsal, with 2 lateral apodemes, surrounded by robust setae and multilocular pores similar to vulvar pores; anal ring simple, sclerotized. Elongate tubercles present in some species, if present, found marginally on ventral abdomen and on dorsum in longitudinal rows; each tubercle with robust setae and with or without simple multilocular pores, each pore with a bilocular centre and 6–10 outer loculi.

Dorsum. Hair-like setae scattered across all body segments, typically longest marginally, sometimes in clusters around margin. Flagellate setae scant, scattered. Simple multilocular pores, each with a bilocular or trilocular centre and 6–12 outer loculi, found over entire surface. Simple multilocular pores, each with a cruciform or star-shaped centre and 6–8 outer loculi, forming submedial clusters on head and thorax of some Neotropical species.

Venter. Hair-like setae scattered medially to submarginally on head and thorax, and marginally and submarginally on abdomen. Flagellate setae scattered. Simple multilocular pores, each with a bilocular or trilocular centre and 6–12 outer loculi, found over entire surface. Simple multilocular pores, each with a cruciform or star-shaped centre and 6–8 outer loculi, forming marginal clusters on head and thorax of some Neotropical species.

Description of first-instar nymph

Slide-mounted specimens. Body elliptical. Antennae 6 segmented, apical segment elongate; hair-like setae present on each segment, apical segment with long setae. Eyespots conical, near antennal bases. Sensory pores, each 5–6 µm in diameter, in a ventral cluster of 2 or 3 near each antennal base. Labium with spatulate setae at apex, hair-like setae anteriorly. Legs well developed; each trochanter with 2 campaniform sensilla on each face and a long trochanteral distal seta; claw with a pair of knobbed digitules extending beyond claw apex. Thoracic spiracles with elongate peritremes; pores absent from atrium, but usually with 1 or 2 pores positioned at opening. Cicatrix circular, on posteroventral abdomen, sometimes appearing as a protrusion. Abdominal spiracles in 3 pairs, pores absent from atrium. Anal tube with inner sclerotized ring of polygonal pores and external opening with ring of 0–8 multilocular pores each with circular centre and 5 or 6 outer loculi; opening surrounded by hair-like setae.

Dorsum. Each side of head, prothorax and mesothorax with: (i) scattered hair-like and flagellate setae; (ii) scattered multilocular pores, and (iii) 1 marginal pair of hair-like setae. Each side of metathorax and each abdominal segment with: (i) 1 marginal pair of hair-like setae (1 long, 1 short); (ii) 1 submarginal multilocular pore; (iii) a submarginal cluster of 3 setae – with one hair-like seta on either side of a flagellate seta, plus multilocular pore present on either side of cluster; (iv) 1 submedial multilocular pore, and (v) a medial group of 1 hair-like seta and 1 multilocular pore, with each group of setae and pore(s) closely abutting that on opposite side of body. *Crypticerya bursera* without hair-like setae, but with short, robust spine-like setae. Simple multilocular pores with a bilocular (very rarely trilocular) centre and 4–6 outer loculi.

Venter. Each side of head and thorax with: (i) sparsely scattered hair-like and flagellate setae; (ii) 1 marginal seta on each segment, and (iii) sparsely scattered multilocular pores. Each side of most abdominal segments with: (i) 1 marginal pair of hair-like setae (1 long, 1 short); (ii) 1 marginal multilocular pore; (iii) 1 submarginal short hair-like seta; (iv) 1 submarginal or submedial multilocular pore, and (v) 1 submedial short hair-like seta. Apex of abdomen with 2 or 3 pairs of long hair-like setae. Multilocular pores each with a bilocular centre and 2–4 outer loculi.

Key to the adult females of *Crypticerya* treated in this paper (including *C. genistae* and *C. minima*)

1 Marsupium present; ovisac band absent 2
- Ovisac band present; marsupium absent 7
2 Tubercles on derm very long, each covered with robust setae 3
- Tubercles on derm very reduced or absent, not covered with robust setae 4
3 Dorsal tubercles elongate, each with 3–7 robust setae on each apex and with several simple multilocular pores ..... *C. bursera*
- Dorsal tubercles short, stout, each with only 1 or 2 robust setae on each apex and lacking simple multilocular pores ..... *C. tuberculata*
4 Dorsal surface densely covered with robust hair-like setae ..... *C. mexicana*
- Dorsal surface scattered with slender hair-like setae 5
5 Anterior edge of marsupial band formed by a single sparse row of simple multilocular pores, without bare patches ..... *C. tabernicola*
- Anterior edge of marsupial band formed by 3 or 4 contiguous rows of multilocular pores with or without submedial bare patches 6
6 Anterior edge of marsupial band without submedial bare patches. Simple multilocular pores, each with a bilocular or trilocular centre of equal frequency, present on dorsal surface and in marginal clusters ..... *C. townsendi*
- Anterior edge of marsupial band with submedial bare patches. Simple multilocular pores, each with a bilocular centre (rarely with a trilocular centre), present on dorsal surface and in marginal clusters ..... *C. morrilli*
7 With 1 cicatrix present 8
- With 3 cicatrices present 9
8 Medial to submedial derm on head and thorax with clusters of hair-like setae ..... *C. colimensis*
- Derm on head and thorax lacking clusters of hair-like setae ..... *C. palmeri*
9 Body very small (length <2.5 mm). Setae and pores on dorsal surface very sparse; pores not forming a dorsal medial longitudinal row ..... *C. minima*
- Body not especially small (>2.5 mm). Setae and pores on derm not sparse; pores forming a dorsal medial longitudinal row 10
10 Simple multilocular pores, each with a bilocular (rarely trilocular) centre, forming outer ovisac band. Setae in ovisac band very fine, with slightly flattened bases (Fig. 5H) ..... *C. littoralis*
- Simple multilocular pores, each with a bilocular or trilocular centre, forming outer ovisac band. Setae in ovisac band robust, with very rounded, elongate bases 11
11 Hair-like setae and simple multilocular pores sparsely scattered on dorsal surface of head and thorax, forming a medial longitudinal row. Hair-like setae short (mostly 25–85 µm long) and scattered; longer setae (up to 250 µm long) restricted to marginal clusters. Setae in ovisac band with flattened to rounded bases and visible collars (Fig. 13F) ..... *C. rileyi*
- Hair-like setae and simple multilocular pores densely covering dorsal surface of entire body, pores and setae most densely distributed in medial and submarginal longitudinal rows. Hair-like setae around margin and on dorsal surface very long (up to 450 µm long). Setae in ovisac band with very rounded bases, collars not visible ..... *C. genistae*

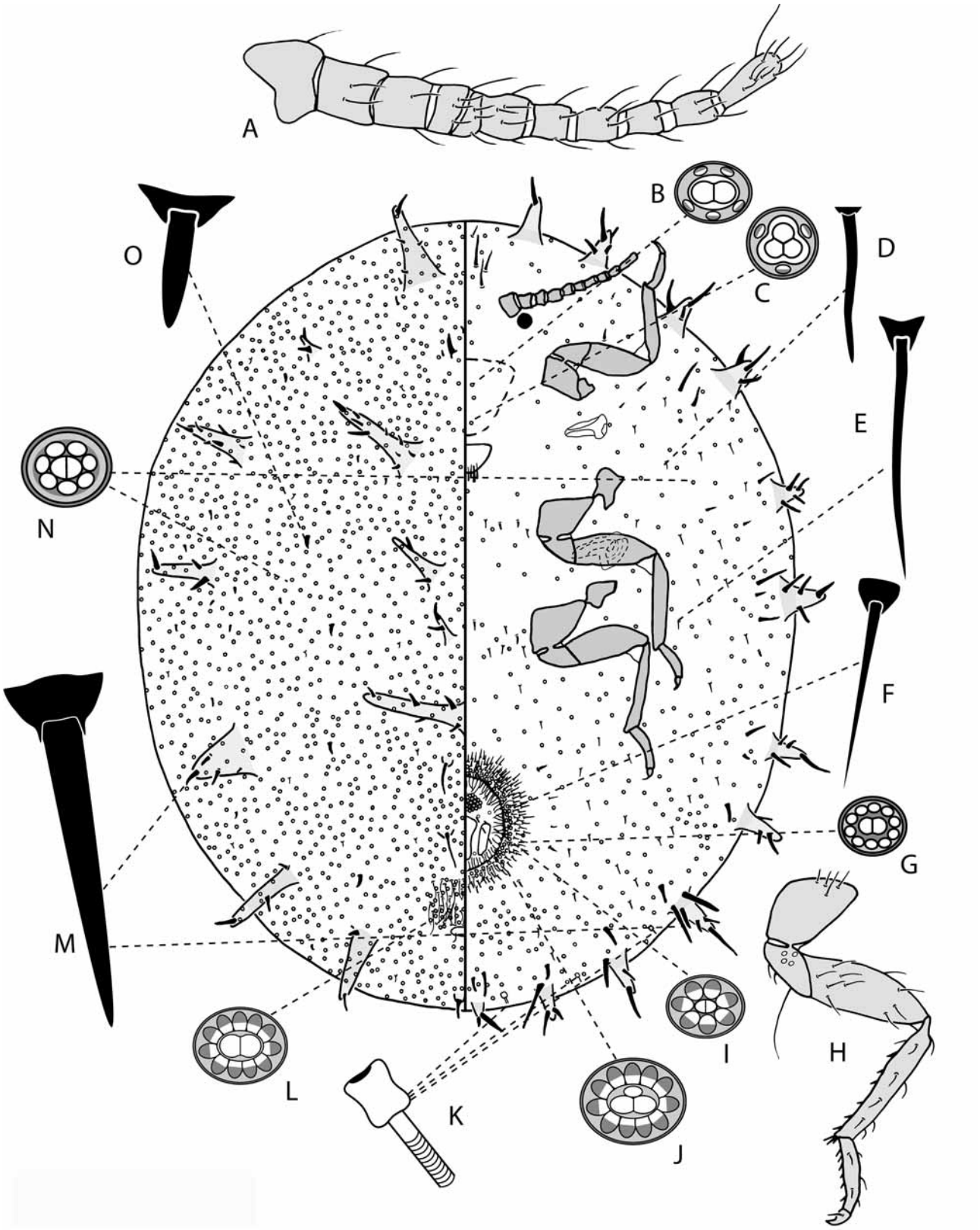

FIGURE 3. *Crypticerya bursera* sp.nov. adult ♀. A. Antenna; B. Simple multilocular pore with bilocular centre and five outer loculi; C. Simple multilocular pore with trilocular centre and three outer loculi; D. Flagellate seta; E. Hair-like seta; F. Short hair-like setae outside of marsupial band; G. Simple multilocular pores with bilocular centre and ten outer loculi; H. Hindleg; I. Simple multilocular pore, similar to vulvar pore, with bilocular centre and seven outer loculi; J. Vulvar multilocular pore; K. Abdominal spiracle; L. Anal multilocular pore; M. Robust hair-like seta; N. Simple multilocular pore with bilocular centre and seven outer loculi; O. Short, robust hair-like seta.

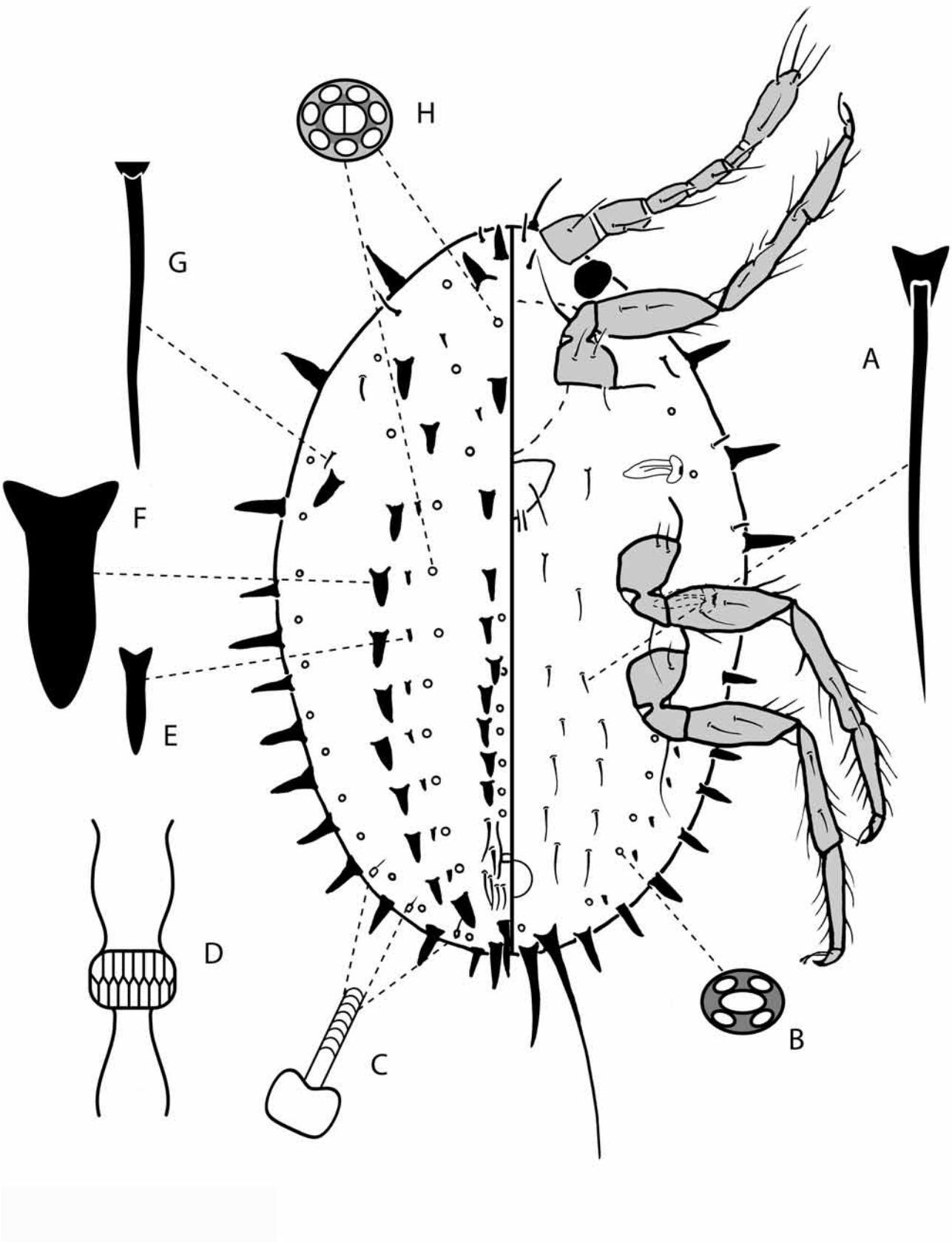

FIGURE 4. *Crypticerya bursera* sp.nov. first-instar nymph. A. Hair-like seta; B. Simple multilocular pore with bilocular centre and four outer loculi; C. Abdominal spiracle; D. Anal tube; E. Short spiniform seta; F. Large spiniform seta; G. Flagellate seta; H. Simple multilocular pore with bilocular centre and seven outer loculi.

***Crypticerya bursera* sp.n.**
(Figs 3, 4)

Description of adult female (based on holotype and 4 paratypes).

In life. Females collected from stems deep within canopy of plant and appearing very round against substrate. Adult females dark purplish gray, completely devoid of wax on dorsal surface, and dorsal tubercles coloured slightly yellow-orange at tips. First-instar nymphs collected from marsupium of adult female.

Slide-mounted specimens. Body oval to elliptical, 4.9–6.9 mm long, 4.4–5.2 mm wide (holotype 6.6 mm long, 5.0 mm wide). Antennae (Fig. 3A) 11 segmented, 850–1140 µm long, apical segment 110–160 µm long, 55–65 µm wide; setae on segments up to 150 µm long. Eyes 120–150 µm wide. Clypeolabral shield 500–600 µm long, 300–600 µm wide. Labium 350–410 µm long, 300–320 µm wide. Hindlegs (Fig. 3H) 2235–2530 µm long, trochanter+femur 840–950 µm long, tibia+tarsus 1040–1180 µm long; setae on leg segments 40–100 µm long; distal trochanteral setae 180–225 µm long; claw digitules acute. Mesothoracic spiracles each 250–285 µm long, atrium 150–180 µm wide; metathoracic spiracles each 295–350 µm long, atrium 210–245 µm wide; derm at atrial opening with 5–15 simple multilocular pores, each 10–11 µm in diameter with bilocular centre and 8–12 outer loculi. Marsupium present, shaped as for genus; marsupial band formed by hair-like and flagellate setae, 55–100 µm long, and multilocular pores (Fig. 3G), each 10–12 µm in diameter, with bilocular centre and 6–10 outer loculi; derm surrounding outside of marsupial band covered by dense straight hair-like setae (Fig. 3F) 75–120 µm long. Vulvar opening as for genus, surrounded by typical multilocular pores (Fig. 3J), each 14–16 µm in diameter, with trilocular centre and 8–12 outer loculi, and hair-like setae, 60–90 µm long. Cicatrices numbering 3; central cicatrix hourglass shaped 350–425 µm long, 225–310 µm wide; lateral cicatrices reniform, 275–305 µm long, 130–195 µm wide; one lateral cicatrix and central cicatrix of a paratype adult female connected to one another. Abdominal spiracles (Fig. 3K) with atrium 23–30 µm wide. Anal ring 130–150 µm wide; anal opening surrounded by hair-like setae, 50–200 µm long, and typical multilocular pores (Fig. 3L), each 12–13 µm in diameter, with bilocular centre and 8–12 outer loculi.

Dorsum. Robust, stout hair-like setae (Fig. 3O), 25–90 µm long, and flagellate setae (Fig. 3D), 25–35 µm long, very sparsely scattered across all body segments. Multilocular pores (Fig. 3G, N), each 12–13 µm in diameter, with bilocular centre and 8–10 outer loculi, scattered across all body segments. Elongate tubercles present in medial row and submarginal longitudinal row; each tubercle with several multilocular pores, similar to pores on derm, and several robust hair-like setae (Fig. 3M), 60–90 µm long.

Venter. Hair-like setae 50–150 µm long, scattered across all segments. Flagellate setae (Fig. 3D), 35–45 µm long, distributed as for genus. Simple multilocular pores (Fig. 3G), each 10–12 µm in diameter, with bilocular centre and 8–10 outer loculi, scattered on margin to submargin of head and thorax and across abdomen. Multilocular pores (Fig. 3B, C), each 10–12 µm in diameter, with bilocular or trilocular centre and 3–8 outer loculi, appearing slightly bluish when stained, scattered medially to submedially on head and thorax; similar pores (Fig. 3I), each 12–13 µm in diameter, with bilocular centre and 6–10 outer loculi, scattered within marsupium. Elongate tubercles present in marginal longitudinal band; each tubercle with simple multilocular pores, similar to pores on derm, and robust hair-like setae on tips, 105–325 µm long.

Description of first-instar nymph (based on 5 paratypes)

Slide-mounted specimens. Body elliptical, 850–950 µm long, 440–550 µm wide. Antennae 340–390 µm long, apical segment 110–150 µm long, 35–45 µm wide; hair-like setae on apical segment up to 125 µm long. Eyes 50–60 µm wide. Clypeolabral shield 125–188 µm long, 150–200 µm wide. Labium 100–113 µm long, 125–175 µm wide. Hindlegs 498–610 µm long; distal trochanteral setae 88–110 µm long, claw digitules 30–35 µm long. Thoracic spiracles each 58–75 µm long; atrium 28–38 µm wide. Cicatrix 38 µm in diameter. Abdominal spiracles (Fig. 4C) as for genus. Anal tube (Fig. 4D) 88–125 µm long, 23–30 µm wide at opening; multilocular pores absent from opening of anal tube; anal opening surrounded by robust hair-like setae, 45–58 µm long.

Dorsum. Shape and distribution of pores as for genus, except each abdominal segment lacking one submarginal pore and one medial pore. Distribution of setae as for genus, except hair-like setae absent, replaced by robust, stout, spine-like setae. Long, robust spine-like setae (Fig. 4F) 50–100 µm long, increasing in length towards abdominal apex; shorter, robust spine-like setae (Fig.4E) 12–20 µm long. Flagellate setae (Fig. 4G) 20–25 µm long, scattered across head and thorax, not present in submarginal cluster of setae as for other *Crypticerya* species. Multilocular pores (Fig. 4H), each 9–10 µm in diameter on head and thorax, each 8–9 µm in diameter on abdomen.

Venter. Pore shape and distribution as for genus. Hair-like setae (Fig. 4A) 35–95 µm long on most segments; a single pair of long hair-like setae 350–425 µm long at abdominal apex. Flagellate setae 18–23 µm long, distributed as for genus. Multilocular pores (Fig. 4B) each 5–6 µm in diameter on all body segments.

Type data. MEXICO, Baja California, Montevideo Canyon near Bahia de Los Angeles, ex *Bursera microphylla*, 31.xii.2004 (*C.M. Unruh*).

Type material. Holotype: ad ♀, data as above (BME). Paratypes: 4 ad ♀♀ (ad ♀ missing two legs=CMU121), dozens of first-instar nymphs (6 slides), data as above (BME).

Etymology. The specific name is derived from the host plant from which the insects were collected and is a noun in apposition.

Taxonomic notes. This species was collected while the author was on a field trip with the UC Davis Botany Club during a very wet December in 2004. The group was "botanizing" around the Montevideo wall paintings campground located 15 km northeast of Bahia de Los Angeles. We climbed to the top of the cliff overhanging the wall paintings and a fellow U.C. Davis graduate student, Shelah Morita, discovered adult females of this species while examining a small elephant tree (*Bursera microphylla*). The group crowded around the plant to get a good look at a scale insect and the author took photographs and collected several specimens.

First-instar nymphs were not visible on the stems of the plant, but were present in the marsupium of the adult female and were extracted during the slide-mounting process.

Diagnostic comparison. This species most closely resembles *C. tuberculata* and is here placed in the *C. mexicana* species group. The first-instar nymphal stage of *C. bursera* differs from all other known iceryine species by the presence of very stout robust setae on the margin and submarginal dorsum. The adult females of *C. bursera* and *C. tuberculata* can be separated by the size of the tubercles (*C. bursera* has much larger tubercles), the density of short hair-like setae surrounding the marsupial band (*C. bursera* has dense rows of setae outside the marsupial band), and the shape and distribution of the multilocular pores on the derm (*C. bursera* has multilocular pores, each with a bilocular centre and 10–12 outer loculi, that do not seem to form any distinctive arrangement and do not form marginal clusters).

Crypticerya colimensis (Cockerell)

Description of adult female (based on lectotype)

In life. Adult female plus ovisac about 10 mm long, ovisac 6 mm long, slightly striated, wax of inner ovisac light yellow; dorsal surface covered with white wax secretion; margin with short wax tassels (adapted from Cockerell, 1902).

Slide-mounted specimens. Body shape elongate to oval, lectotype 5.2 mm long, 3.8 mm wide. Apex of head, including antennae and eyes, missing from lectotype. Labium 200 µm long, 380 µm wide. Hindlegs 1623 µm long, trochanter+femur 650 µm long, tibia+tarsus 695 µm long, setae on leg segments 50–88 µm long; distal trochanteral setae broken; digitules broken. Mesothoracic spiracles each 215–225 µm long, atrium 175–185 µm wide; metathoracic spiracles each 230–250 µm long, atrium 240 µm wide; derm at atrial opening with 6–8 simple multilocular pores, each 9–10 µm in diameter with bilocular centre and 6–8 outer loculi. Ovisac band present, formed by robust, slender hair-like setae, 75–100 µm long, with visible sockets and flat-

tened bases, and multilocular pores of two types: (i) larger pores forming inner ovisac band 5–7 pores wide, each pore 10–11 µm in diameter, with trilocular (sometimes bilocular) centre and 6–8 outer loculi, and (ii) smaller pores forming outer ovisac band 2–5 pores wide, each pore 8–10 µm in diameter, with bilocular or trilocular centre and 4–8 outer loculi, appearing slightly bluish when stained. Vulvar opening as for genus, surrounded by typical multilocular pores, each 10–12 µm in diameter. Cicatrix round, 290 µm wide. Abdominal spiracles with atrium 30–33 µm wide. Anal ring and anal opening missing from specimen.

Dorsum. Hair-like setae, 88–125 µm long, distributed as for genus; longest setae, 350–600 µm long, found around margin; robust hair-like setae, similar to setae in ovisac band, in segmental clusters medially on thorax and margins of thorax and abdomen, 50–100 µm long. Flagellate setae, 50–90 µm long, distributed as for genus. Multilocular pores, each 10–12 µm in diameter, with bilocular (sometimes trilocular or quadrilocular) centre, scattered across all body segments.

Venter. Hair-like setae 60–135 µm long, scattered across all body segments. Flagellate setae, 30–50 µm long, distributed as for genus. Multilocular pores, each 10–12 µm in diameter, with bilocular or trilocular (rarely quadrilocular) centre, scattered on submargin to margin of head, thorax and abdomen. Multilocular pores, each 9–10 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi, scattered medially to submedially on head and thorax; similar pores, each 8–9 µm in diameter, with bilocular centre and 4 or 5 outer loculi, scattered on medial to submedial abdomen.

Type data. MEXICO, Colima, Manzanilla, ex undetermined shrub, 18.vii.1902 (*C.H.T. Townsend*).

Type material examined. Lectotype (designated by Unruh & Gullan, 2008b): ad ♀ (USNM). Paralectotypes: ad ♀, 1 embryo, dry material (USNM); ca. 28 embryos and eggs (BME).

***Crypticerya littoralis* (Cockerell)**
(Figs 5, 6)

Description of adult female (based on lectotypes of *I. littoralis mimosae*, *I. littoralis tonilensis*, *I.* (*Proticerya*) *littoralis* and 6 paralectotypes of *I.* (*Proticerya*) *littoralis*).

In life. Adult female becoming dark purple with maturity, dorsal surface almost denuded of wax, some waxy tassels projecting from anterior and posterior apices. Ovisac smooth, very long, about 2 or 3 times as long as body of female (adapted from Cockerell, 1898).

Slide-mounted specimens. Body elliptical, 3.9–5.4 mm long, 2.3–3.8 mm wide (lectotype of *I.* (*Proticerya*) *littoralis* 5.4 mm long, 3.8 mm wide; lectotype of *I. littoralis mimosae* 5.1 mm long, 3.3 mm wide; lectotype of *I. littoralis tonilensis* 3.9 mm long, 2.3 mm wide). Antennae (Fig. 5A) 9 segmented, apical segment 150–200 µm long, 70–90 µm wide; hair-like setae on apical segment up to 550 µm long. Eyes 90–110 µm wide. Clypeolabral shield 430–500 µm long, 325–475 µm wide, labium 260–315 µm long, 200–325 µm wide. Hindlegs (Fig. 5J) 1725–1905 µm long; trochanter+femur 640–740 µm long, tibia+tarsus 780–880 µm long; setae on leg segments 40–105 µm long; distal trochanteral setae 175–300 µm long; claw digitules 20–38 µm long. Mesothoracic spiracles each 155–190 µm long, atrium 105–140 µm wide; metathoracic spiracles each 205–275 µm long, atrium 145–185 µm wide; derm at atrial opening with 3–6 simple multilocular pores, 10–11 µm in diameter with bilocular centre and 9–12 outer loculi. Ovisac band present, formed by dense setae 75–100 µm long, with round to flattened bases (Fig. 5H) and multilocular pores of two types: (i) larger pores (Fig. 5G, I) forming inner band, 7–9 pores wide, each pore 11–13 µm in diameter, with bilocular or trilocular centre and 6–12 outer loculi, and (ii) smaller pores (Fig. 5E, F) forming outer band 3–5 pores wide, each pore 9–10 µm in diameter, with bilocular centre and 3–8 outer loculi, appearing slightly bluish when stained. Vulvar opening as for genus, surrounded by typical multilocular pores (Fig. 5K), each 12–13 µm in diameter. Cicatrices oval to round, numbering 3; central cicatrix 160–235 µm long, 90–155 µm wide, lateral cicatrices 110–220 µm long, 90–125 µm wide. Abdominal spiracles (Fig. 5M) with atrium 23–35 µm wide; multilocular pores (Fig. 5G, I) each 11–12 µm in diameter, with bilocular or trilocular centre and 6–9 outer loculi, clustered on derm surrounding opening. Anal ring 105–190 µm wide; anal opening surrounded by hair-like setae 138–225 µm long and typical multilocular pores (Fig. 5L), each 11–12 µm in diameter.

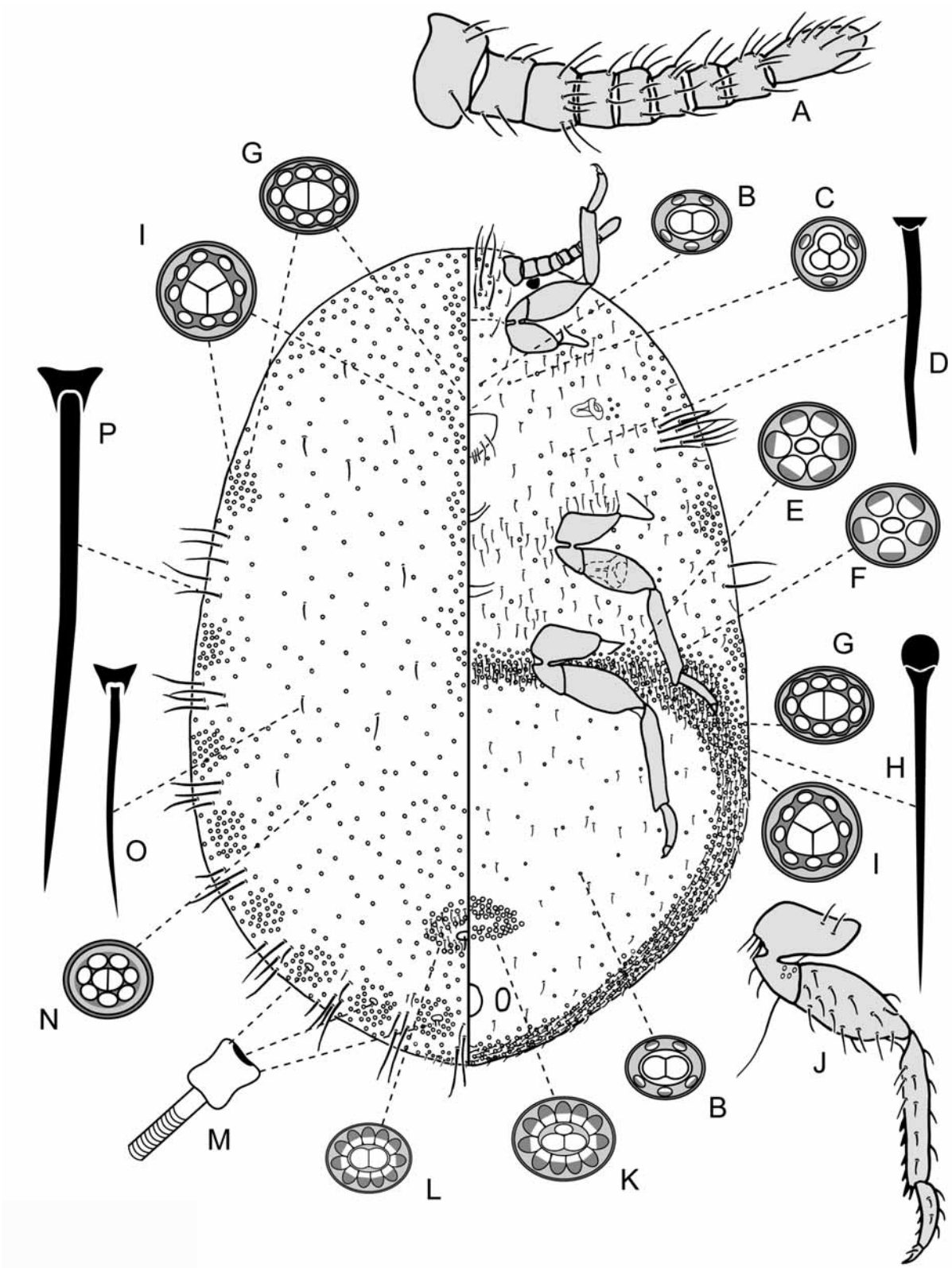

FIGURE 5. *Crypticerya littoralis* adult ♀. A. Antenna; B. Simple multilocular pore with bilocular centre and five outer loculi; C. Simple multilocular pore with trilocular centre and three outer loculi; D. Flagellate seta; E. Simple multilocular pore, similar to vulvar pore, with bilocular centre and six outer loculi; F. Simple multilocular pore, similar to vulvar pore, with bilocular centre and five outer loculi; G. Simple multilocular pore with bilocular centre and nine outer loculi; H. Flagellate seta present in ovisac band; I. Simple multilocular pore with trilocular centre and eight outer loculi; J. Hindleg; K. Vulvar multilocular pore; L. Anal multilocular pore; M. Abdominal spiracle; N. Simple multilocular pore with bilocular centre and seven outer loculi; O. Short hair-like seta; P. Long hair-like seta.

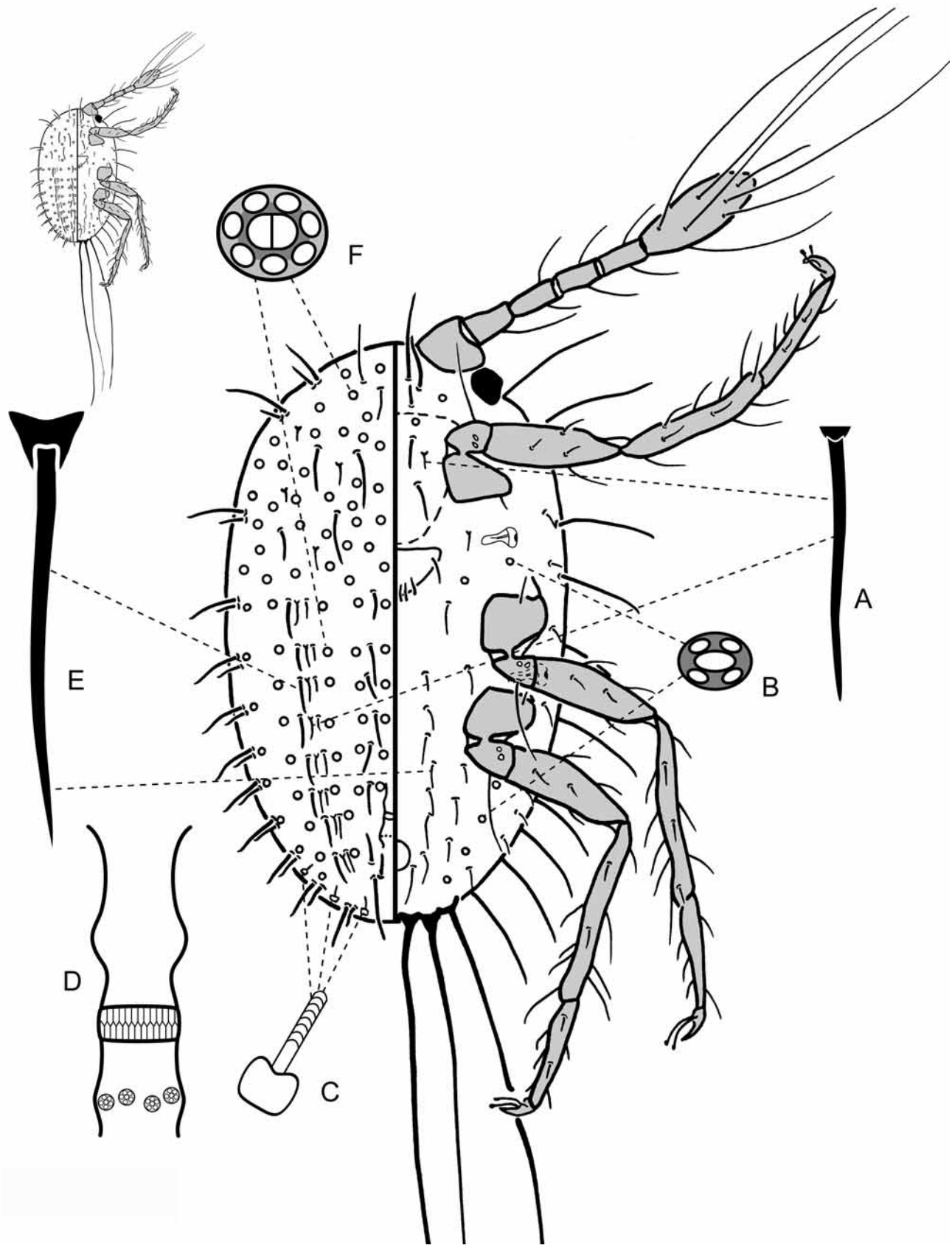

FIGURE 6. *Crypticerya littoralis* first-instar nymph. A. Flagellate seta; B. Simple multilocular pore with bilocular centre and four outer loculi; C. Abdominal spiracle; D. Anal tube; E. Long hair-like seta; F. Simple multilocular pore with bilocular centre and seven outer loculi.

Dorsum. Hair-like setae (Fig. 5O), 50–300 µm long, sparsely scattered; longest setae (Fig. 5P), 325–450 µm long, forming marginal clusters on each segment. Flagellate setae (Fig. 5D), 35–50 µm long, distributed as for genus. Simple multilocular pores (Fig. 5G, I), each 12–13 µm in diameter, with bilocular or trilocular centre, forming medial longitudinal row on head and thorax; similar pores (Fig. 5N), each 10–11 µm in diameter, with bilocular centre (less often trilocular) and 6–8 outer loculi, scattered on rest of derm.

Venter. Hair-like setae (Fig. 5O), 75–250 µm long, scattered medially to submedially across head and thorax; longest setae (Fig. 5P), 300–425 µm long, clustered between antennae. Flagellate setae (Fig. 5D), 35–50 µm long, distributed as for genus. Simple multilocular pores (Fig. 5G, I), each 10–12 µm in diameter, with bilocular or trilocular centre and 6–9 outer loculi, forming marginal clusters on all body segments and scattered on margins and submargins of head, thorax and abdomen. Multilocular pores (Fig. 5B, C), each 11–12 µm in diameter, with bilocular or trilocular centre and 2–5 outer loculi, scattered medially to submedially on head and thorax; similar pores (Fig. 5B), each 12–13 µm in diameter, with bilocular centre and 4–6 outer loculi, scattered medially to submedially across abdomen.

Description of first-instar nymph (based on 2 paralectotypes of *I. littoralis mimosae* and 3 paralectotypes of *I.* (*Proticerya*) *littoralis*)

Slide-mounted specimens. Body elliptical, 590–700 µm long, 350–400 µm wide. Antennae 375–450 µm long, apical segment 150–155 µm long, 50–60 µm wide; hair-like setae on apical segment up to 550 µm long. Eyes 45 µm wide. Clypeolabral shield 190 µm long, 155 µm wide. Hindlegs 648–678 µm long; trochanter+femur 200–213 µm long, tibia+tarsus 325–363 µm long; setae on legs 50–125 µm long; distal trochanteral setae 115 µm long; claw digitules 43–45 µm long. Thoracic spiracles each 38–53 µm long; atrium 28–30 µm wide. Cicatrix round, 13–18 µm in diameter. Abdominal spiracles (Fig. 6C) as for genus. Anal tube (Fig. 6D) 75–88 µm long, 30–33 µm wide at opening; multilocular pores inside anal tube 5–6 µm in diameter.

Dorsum. Shape and distribution of pores as for genus, except each abdominal segment with one submarginal pore, two submedial pores and one medial pore, and head and thorax with dense multilocular pores. Distribution of hair-like setae (Fig. 6E) and flagellate setae (Fig. 6A) as for genus. Long hair-like setae 43–50 µm long; short hair-like setae 22–30 µm long; long marginal setae 90–125 µm long. Flagellate setae 43–60 µm long. Multilocular pores (Fig. 6F), each 8–9 µm in diameter on head and thorax, 7–8 µm in diameter on abdomen.

Venter. Distribution of setae and pores as for genus. Hair-like setae (Fig. 6E) 30–45 µm long; long hair-like setae 650–900 µm long, in three pairs at abdominal apex. Flagellate setae (Fig. 6A) 22–25 µm long. Multilocular pores (Fig. 6B), each 7–8 µm in diameter on head and thorax, 6–7 µm in diameter on abdomen.

Type data. *Icerya* (*Proticerya*) *littoralis*: MEXICO, El Faro, near Frontera, “on the sea-beach, on the sandy ridges just beyond the reach of ordinary surf”, ex Croton [=*Codiaeum* sp.], 16.v.1897 (*Townsend*). *Icerya littoralis mimosae*: MEXICO, Las Minas, near Frontera, ex "Sarsa" [=*Mimosa* sp.], 4.vi.1897 (*Townsend*). *Icerya littoralis tonilensis*: MEXICO, Jalisco, Tonila, “on cultivated tree”, 2.viii.1902 (*Townsend*).

Type material examined. Lectotype of *Icerya* (*Proticerya*) *littoralis* (designated by Unruh & Gullan, 2008b): ad ♀ (USNM). Paralectotypes: 6 ad ♀♀, 6 first-instar nymphs (USNM); 2 ad ♀♀ (BME); dry material (USNM). Lectotype of *Icerya* (*Proticerya*) *littoralis mimosae* (designated by Unruh & Gullan, 2008b): ad ♀ (USNM). Paralectotypes: ad ♀, 12 first-instar nymphs (UNSM); dry material (USNM). Lectotype of *Icerya littoralis tonilensis* (designated by Unruh & Gullan, 2008b): ad ♀ (USNM). Paralectotypes: dry material (USNM).

***Crypticerya mexicana* Cockerell & Parrott**
(Figs 7, 8)

Description of adult female (measurements based 3 non-type ♀♀)

In life. Unknown.

Slide-mounted specimens. Body oval, 5.1–7.7 mm long, 3.6–5.5 mm wide. Antennae (Fig. 7A) 11 segmented. Eyes 150–180 µm wide. Clypeolabral shield 450 µm long, 500 µm wide; labium 400 µm long, 375 µm wide. Hindlegs (Fig. 7G) 2140–2410 µm long, trochanter+femur 800–900 µm long, tibia+tarsus 1000–1130 µm long; setae on leg segments 35–115 µm long; distal trochanteral setae 250–285 µm long; claw digitules acute, 45–50 µm long. Mesothoracic spiracles each 220–265 µm long, atrium 190–240 µm wide; metathoracic spiracles each 275–350 µm long, atrium 275–300 µm wide; derm at atrial opening with 5–15 multilocular pores with bilocular centre and 6–8 outer loculi. Marsupium present, shaped as for genus, marsupial band formed by dense, short, robust hair-like setae (Fig. 7D), 50–80 µm long, and simple multilocular pores (Fig. 7E, F), each 11–14 µm in diameter, with bilocular or trilocular centre and 6–9 outer loculi. Vulvar opening as for genus, surrounded by typical multilocular pores (Fig. 7I), each 12–13 µm in diameter, with trilocular centre and 8–12 outer loculi. Cicatrices oval to hourglass-shaped, numbering 3, subequal in size, 250 µm long, 125–175 µm wide. Abdominal spiracles (Fig. 7H) each with atrium 20–25 µm wide; derm around atrial opening with cluster of 6–10 multilocular pores (Fig. 7E, F), each 12–13 µm in diameter, with bilocular or trilocular centre and 6–10 outer loculi. Anal ring 160–163 µm wide; anal opening surrounded by typical multilocular pores (Fig. 7J) each 10–11 µm in diameter with elongate centre and 8–12 outer loculi and robust hair-like setae, 100–150 µm long.

Dorsum. Dense robust hair-like setae (Fig. 7M), 60–80 µm long, covering surface. Flagellate setae (Fig. 7D), 20–60 µm long, distributed as for genus. Multilocular pores (Fig. 7F, L), each 12–13 µm in diameter, with bilocular centre and 8–12 outer loculi, scattered across all body segments.

Venter. Robust hair-like setae, slightly finer than dorsal setae (Fig. 7C), 75–200 µm long, covering marginal to submarginal head and thorax, scattered across abdomen; longest hair-like setae (Fig. 7K), 275–600 µm long, forming marginal clusters and longest at posterior end. Flagellate setae (Fig. 7D), 20–60 µm long, distributed as for genus. Multilocular pores (Fig. 7E, F), each 13–14 µm in diameter, with bilocular or trilocular centre and 6–10 outer loculi, forming marginal clusters on each body segment and scattered on margins and submargins of head and thorax. Simple multilocular pores (Fig. 7B), each 10–11 µm in diameter, with bilocular (sometimes trilocular) centre and 4–6 outer loculi, scattered medially to submedially on head and thorax. Pores within marsupium not visible.

Description of first-instar nymph (based on 5 paralectotypes)

Slide-mounted specimens. Body elliptical, 790–950 µm long, 410–520 µm wide. Antennae 430–480 µm long; apical antennal segment 160–180 µm long, 50–60 µm wide; setae on segments up to 240 µm long. Eyes 45–60 µm wide. Clypeolabral shield 138–175 µm long, 100–190 µm wide. Labium 88–120 µm long, 120–163 µm wide. Hindlegs 650–810 µm long; hair-like setae 30–113 µm long; distal trochanteral seta 138–150 µm long; claw digitules 38–48 µm long. Thoracic spiracles each 58–80 µm long; atrium 25–35 µm wide. Cicatrix 25–30 µm in diameter. Abdominal spiracles (Fig. 8C) as for genus. Anal tube 73–83 µm long, 25–55 µm wide at opening; multilocular pores inside anal tube each 5–6 µm in diameter.

Dorsum. Shape and distribution of pores as for genus, except each abdominal segment with one submarginal pore, one submedial pore and one medial pore. Distribution of hair-like setae (Fig. 8E) and flagellate setae (Fig. 8A) as for genus. Long hair-like setae 45–125 µm long. Short hair-like setae 25–30 µm long. Long marginal setae 150–500 µm long. Flagellate setae 20–35 µm long. Multilocular pores (Fig. 8F), each 8–9 µm in diameter on head and thorax, each 7–8 µm in diameter on abdomen.

Venter. Distribution of setae and pores as for genus. Hair-like setae (Fig. 8E) 20–30 µm long. Flagellate setae (Fig. 8A) 20–25 µm long. Long hair-like setae at abdominal apex, two lateral pairs, 850–1000 µm long,

central pair 350–500 µm long. Multilocular pores (Fig. 8B), each 6–7 µm in diameter on head and thorax, each 5–6 µm (mostly 6 µm) in diameter on abdomen.

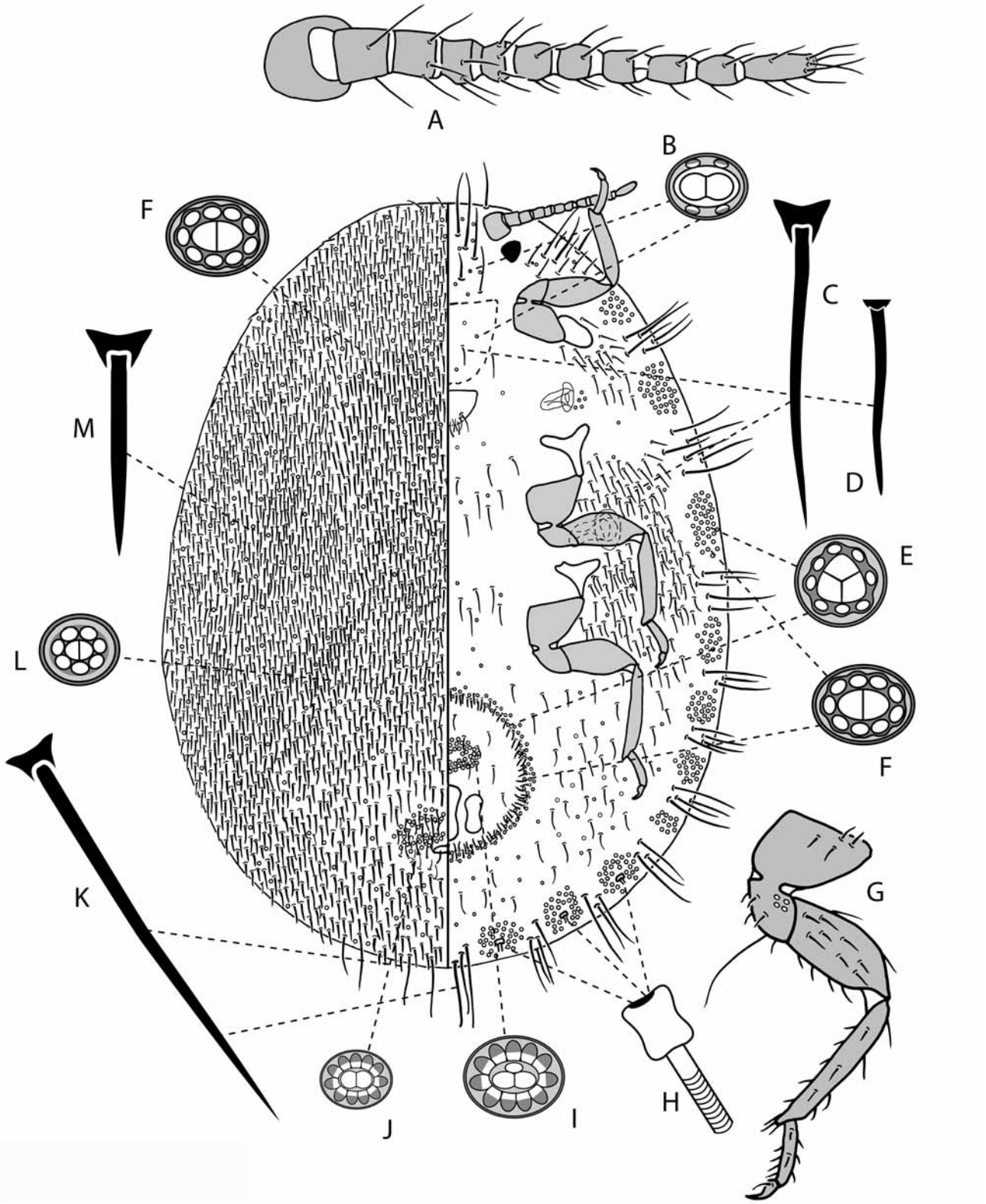

FIGURE 7. *Crypticerya mexicana* adult ♀. A. Antenna; B. Simple multilocular pore with bilocular centre and four outer loculi; C. Short hair-like seta; D. Flagellate seta; E. Simple multilocular pore with trilocular centre and eight outer loculi; F. Simple multilocular pore with bilocular centre and nine outer loculi; G. Hindleg; H. Abdominal spiracle; I. Vulvar multilocular pore; J. Anal multilocular pore; K. Long hair-like seta; L. Simple multilocular pore with bilocular centre and seven outer loculi; M. Short robust hair-like seta.

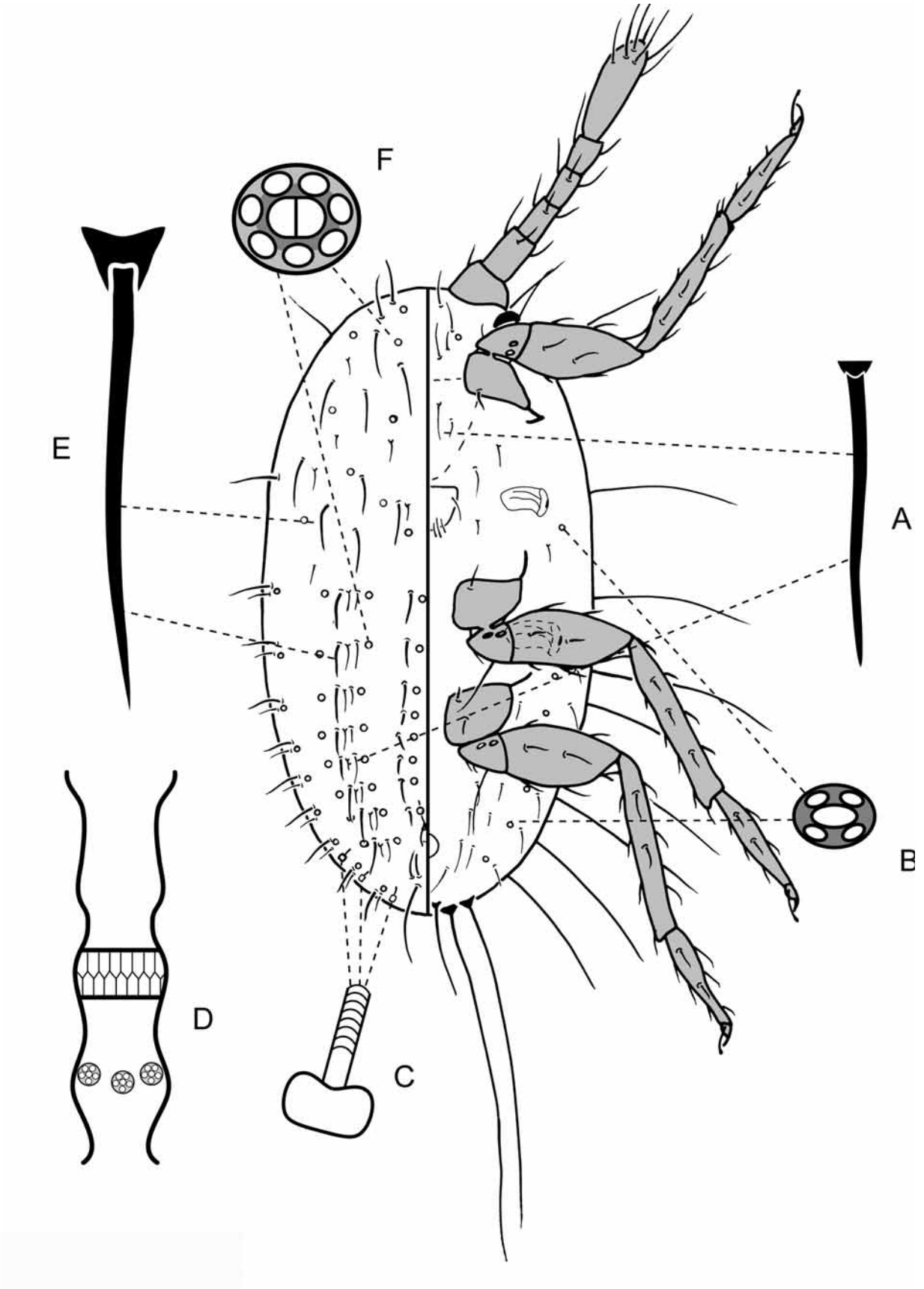

FIGURE 8. *Crypticerya mexicana* first-instar nymph. A. Flagellate seta; B. Simple multilocular pore with bilocular centre and four outer loculi; C. Abdominal spiracle; D. Anal tube; E. Long hair-like seta; F. Simple multilocular pore with bilocular centre and seven outer loculi.

Type data. MEXICO, Aguas Calientes, ex *Prosopis* sp., 1.v.1898 (*Townsend*).

Type material examined. Lectotype (designated by Unruh & Gullan, 2008b): third-instar nymph (USNM). Paralectotypes: 3 first-instar nymphs (same slide as lectotype), ca. 30 first-instar nymphs and embryos (USNM); 9 first-instar nymphs (BME).

Other material examined. ad ♀, third-instar nymph, second-instar nymph, MEXICO: Aguas Calientes, ex *Acacia* 12.ii.1909 (*E.A. Schwartz*) (ad ♀ at USNM, third-instar & second-instar at BME); ad ♀, Cusulta, ex *Mimosa* (Koebele Collection Coccidae, No. 1612) (BME).

***Crypticerya morrilli* (Cockerell)**
(Figs 9, 10)

Description of adult female (based on lectotype, paralectotype ad ♀ and 3 non-type ♀♀)

In life. Adult female dark red to purplish-gray; antennae, legs and eyes brownish-black; dorsal surface covered in mealy-white secretion; waxy tufts forming middorsal and marginal longitudinal rows (adapted from Cockerell, 1914).

Slide-mounted specimens. Body elliptical to oval, widest across abdomen, 6.8–7.4 mm long, 5.0–5.3 mm wide (imperfect lectotype 5.2 mm long, 4.6 mm wide). Antennae (Fig. 9A) 9 to 11 segmented, 900–1150 µm long, apical segment 140–200 µm long, 60–70 µm wide, setae present on each segment, longest on apical segment, up to 375 µm long. Eyes 130–180 µm wide. Labium 350–420 µm long, 300–320 µm wide. Hindlegs (Fig. 9F) 1820–2210 µm long; trochanter+femur 760–830 µm long; tibia+tarsus 960–1080 µm long; setae on leg segments 75–125 µm long; distal trochanteral setae 150–180 µm long; claw digitules 50–60 µm long. Mesothoracic spiracles each 185–240 µm long, atrium 80–135 µm wide; metathoracic spiracles each 225–300 µm long, atrium 125–195 µm wide. Marsupium present, marsupial band shaped as for genus except with two submedial bare patches on anterior edge, formed by sparse short hair-like setae and multilocular pores (Fig. 9D), each 10–12 µm in diameter, with trilocular (sometimes bilocular or quadrilocular) centre and 6–10 outer loculi, forming band, 7–9 pores wide. Vulvar opening as for genus, surrounded by hair-like setae and typical multilocular pores (Fig. 9I), each 13–15 µm in diameter, with bilocular centre and 10–12 outer loculi. Cicatrices, oval to reniform, numbering 3; central cicatrix hourglass shaped, 240 µm long, 175–200 µm wide, lateral cicatrices reniform, 160–205 µm long, 70–130 µm wide. Abdominal spiracles (Fig. 9H) each with atrium 28–33 µm wide. Anal ring 160–175 µm wide; anal opening surrounded by robust hair-like setae, 110–170 µm long, and typical multilocular pores (Fig. 9J), 12–13 µm in diameter, with trilocular centre and 8–10 outer loculi.

Dorsum. Derm with bare patches submedially on head and thorax. Hair-like setae (Fig. 9M) 40–140 µm long, sparsely scattered on dorsal surface. Flagellate setae (Fig. 9C), 60–75 µm long, distributed as for genus. Simple multilocular pores (Fig. 9E), each 12–13 µm in diameter, with bilocular centre and 8–12 outer loculi clustered in medial to submedial longitudinal row. Simple multilocular pores (Fig. 9K), each 11–12 µm in diameter, with bilocular centre and 6–8 outer loculi, scattered across all body segments. Very small tubercles present in submarginal longitudinal row on head and thorax; each tubercle with short, robust hair-like setae, 75–100 µm long.

Venter. Hair-like setae, 50–150 µm long, scattered across all body segments, longest setae (Fig. 9L), 200–500 µm long, forming clusters marginally and between antennae. Flagellate setae (Fig. 9C), 60–75 µm long, distributed as for genus. Simple multilocular pores (Fig. 9E), each 12–13 µm in diameter, with bilocular centre and 8–12 outer loculi, in marginal clusters of 6–10 on each body segment and scattered on margins to submargins of head and thorax and across abdomen. Simple multilocular pores (Fig. 9B), each 11–12 µm in diameter, with bilocular centre and 4–12 outer loculi and appearing slightly bluish when stained, scattered medially to submedially on head and thorax; similar pores (Fig. 9G), each 9–11 µm in diameter, with bilocular centre and 4–8 outer loculi, scattered within marsupium.

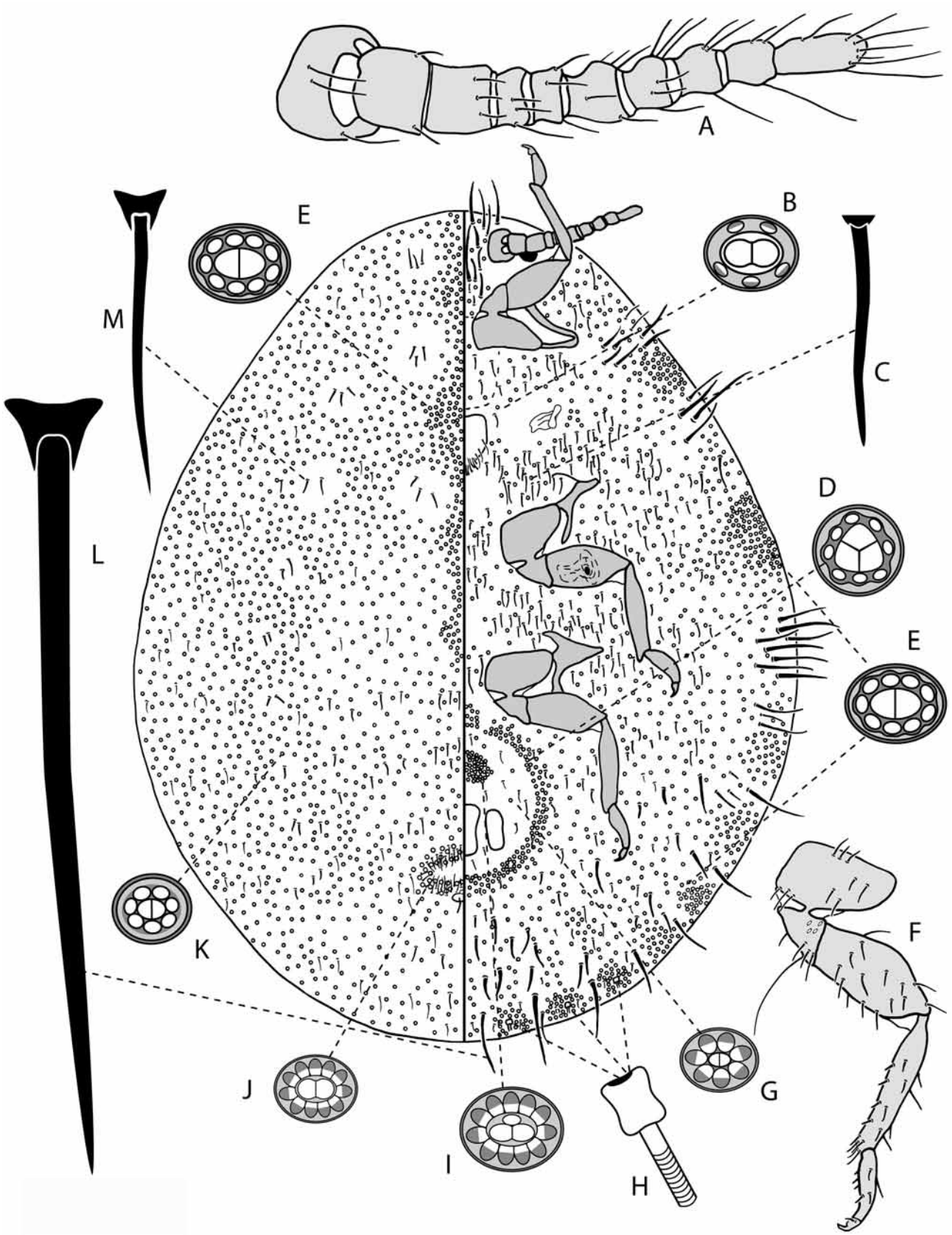

FIGURE 9. *Crypticerya morrilli* adult ♀. A. Antenna; B. Simple multilocular pore with bilocular centre and five outer loculi; C. Flagellate seta; D. Simple multilocular pore with trilocular centre and eight outer loculi; E. Simple multilocular pore with bilocular centre and nine outer loculi; F. Hindleg; G. Simple multilocular pore, similar to vulvar pore, with bilocular centre and seven outer loculi; H. Abdominal spiracle; I. Vulvar multilocular pore; J. Anal multilocular pore; K. Simple multilocular pore with bilocular centre and seven outer loculi; L. Long hair-like seta; M. Short hair-like seta.

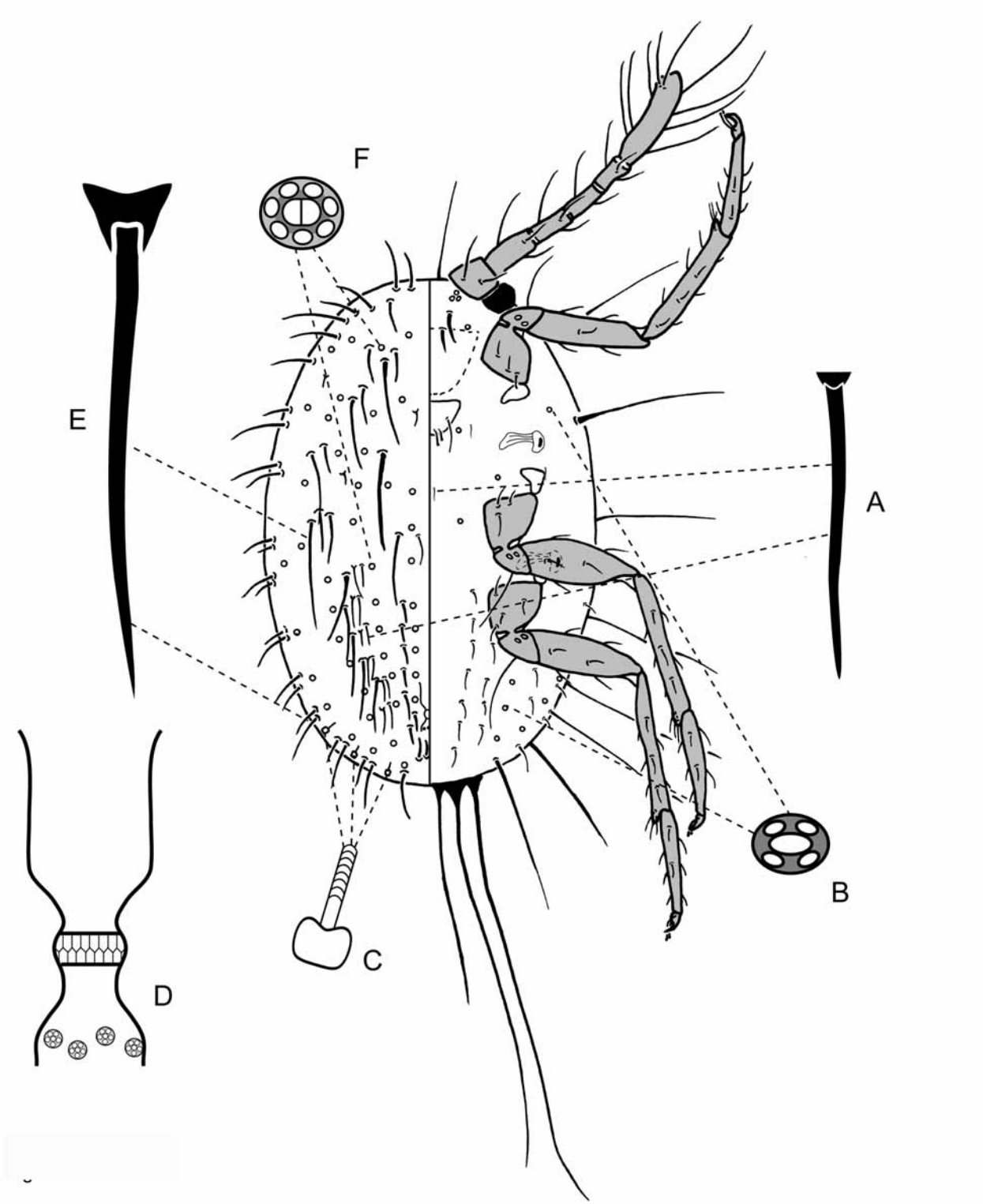

FIGURE 10. *Crypticerya morrilli* first-instar nymph. A. Flagellate seta; B. Simple multilocular pore with bilocular centre and four outer loculi; C. Abdominal spiracle; D. Anal tube; E. Long hair-like seta; F. Simple multilocular pore with bilocular centre and seven outer loculi.

Description of first-instar nymph (based on 5 paralectotypes)

Slide-mounted specimens. Body elliptical, 750–990 µm long, 430–640 µm wide. Antennae each 395–550 µm long; apical segment 160–190 µm long, 35–60 µm wide; setae up to 375 µm long. Eyes 55–65 µm wide. Labium 110–125 µm long, 150–170 µm wide. Hindlegs 776–851 µm long; trochanter+femur 238–263

µm long; tibia+tarsus 408–455 µm long; claw digitules 45–50 µm long. Thoracic spiracles each 53–75 µm long, atrium 15–30 µm wide. Abdominal spiracles (Fig. 10C) as for genus, with atrium 4–6 µm wide. Anal tube (Fig. 10D) 85–118 µm long, as for genus, except with 6 multilocular pores at opening.

Dorsum. Shape and distribution of pores as for genus, except each abdominal segment with one submarginal pore, one submedial pore and one medial pore. Distribution of hair-like setae (Fig. 10E) and flagellate setae (Fig. 10A) as for genus. Long hair-like setae in each submarginal cluster very long, 65–300 µm long; short hair-like setae 20–90 µm long. Flagellate setae 25–60 µm long. Simple multilocular pores (Fig. 10F), each 10–11 µm in diameter on head and thorax, each 7–9 µm in diameter on abdomen.

Venter. Distribution of setae and pores as for genus. Long hair-like setae, 725–1075 µm long, in 2 pairs at abdominal apex. Hair-like setae (Fig. 10E) on derm, 20–65 µm long. Flagellate setae (Fig. 10A) 25–60 µm long. Simple multilocular pores (Fig. 10B), each 8–10 µm in diameter on head and thorax, each 7–9 µm in diameter on abdomen.

Type data. U.S.A., AZ, Verde Valley, near Jerome, ex plant "superficially just like *Viborquia spinosa*" (*A.W. Morrill*).

Type material examined. Lectotype (designated by Unruh & Gullan, 2008b): ad ♀ (USNM). Paralectotypes: 1 adult ♀, 6 embryonic larvae, ca. 18 first-instar nymphs (USNM); ad ♀, 6 first-instar nymphs (BME).

Other material examined. U.S.A., AZ: ad ♀, Globe, ex *Prosopis juliflora*, 2.vii.1956, (*R.P. Allen*) (BME); 1 ad ♀, Santa Catalina Mountains, Sabino Canyon, 3 miles up canyon, ex cat claw (=*Acacia greggii*), 14.xii.1932 (*E.D. Ball*) (BME); 3 ad ♀♀, Yavapai County, Red Rock Crossing, 34º49' N, 111º48' W, 20.v.2004 (*C.M. Unruh & R.W. McCarthy*) (BME, same collection as CMU072). MEXICO: 2 ad ♀♀, Baja California, District Sur, San Pedro, ex *Haematophylen boriale*, 6.vii.1919 (*G.F. Ferris*) (BME).

***C. palmeri* (Riley & Howard)**
(Figs 11, 12)

Description of adult female (based on 6 non-type ♀♀)

In life. Unknown.

Slide-mounted specimens. Body elliptical, 3.7–6.2 mm long, 2.8–5.0 mm wide. Antennae (Fig. 11A) 9 segmented, 820–1100 µm long; apical segment elongate, 110–160 µm long, 50–70 µm wide; setae on each segment 140–310 µm long. Eyes 90–110 µm wide. Clypeolabral shield 450–625 µm long, 400–500 µm wide, labium 320–335 µm long, 240–305 µm wide. Hindlegs (Fig. 11I) 1610 µm long; trochanter+femur 490–670 µm long, tibia+tarsus 690–860 µm long; setae on leg segments 55–133 µm long; distal trochanteral setae 250–320 µm long; claw digitules 35–45 µm long. Mesothoracic spiracles each 165–200 µm long, atrium 125–175 µm wide; metathoracic spiracles each 225–300 µm long, atrium 175–250 µm wide. Ovisac band present, formed by setae 55–100 µm long with slightly flattened bases (Fig. 11H), and simple multilocular pores of two types: (i) larger pores (Fig. 11F, G) forming inner band 5–7 pores wide, each pore 10–12 µm in diameter, with bilocular or trilocular centre, and (ii) smaller pores (Fig. 11D, E) forming outer band 1–3 pores wide, each pore 8–10 µm in diameter, with bilocular or trilocular centre and 8–10 outer loculi and appearing slightly bluish when stained. Vulvar opening surrounded by typical multilocular pores (Fig. 11K), each 12–14 µm in diameter, with bilocular centre and 10–12 outer loculi, and hair-like setae 60–125 µm long. Cicatrix elongate to hour-glass shaped, 200–270 µm long, 140–200 µm wide. Abdominal spiracles (Fig. 11M) each with atrium 20–30 µm wide. Anal ring 115–155 µm wide; anal opening surrounded by robust hair-like setae, 100–138 µm long and typical multilocular pores (Fig. 11L), each 10–12 µm in diameter.

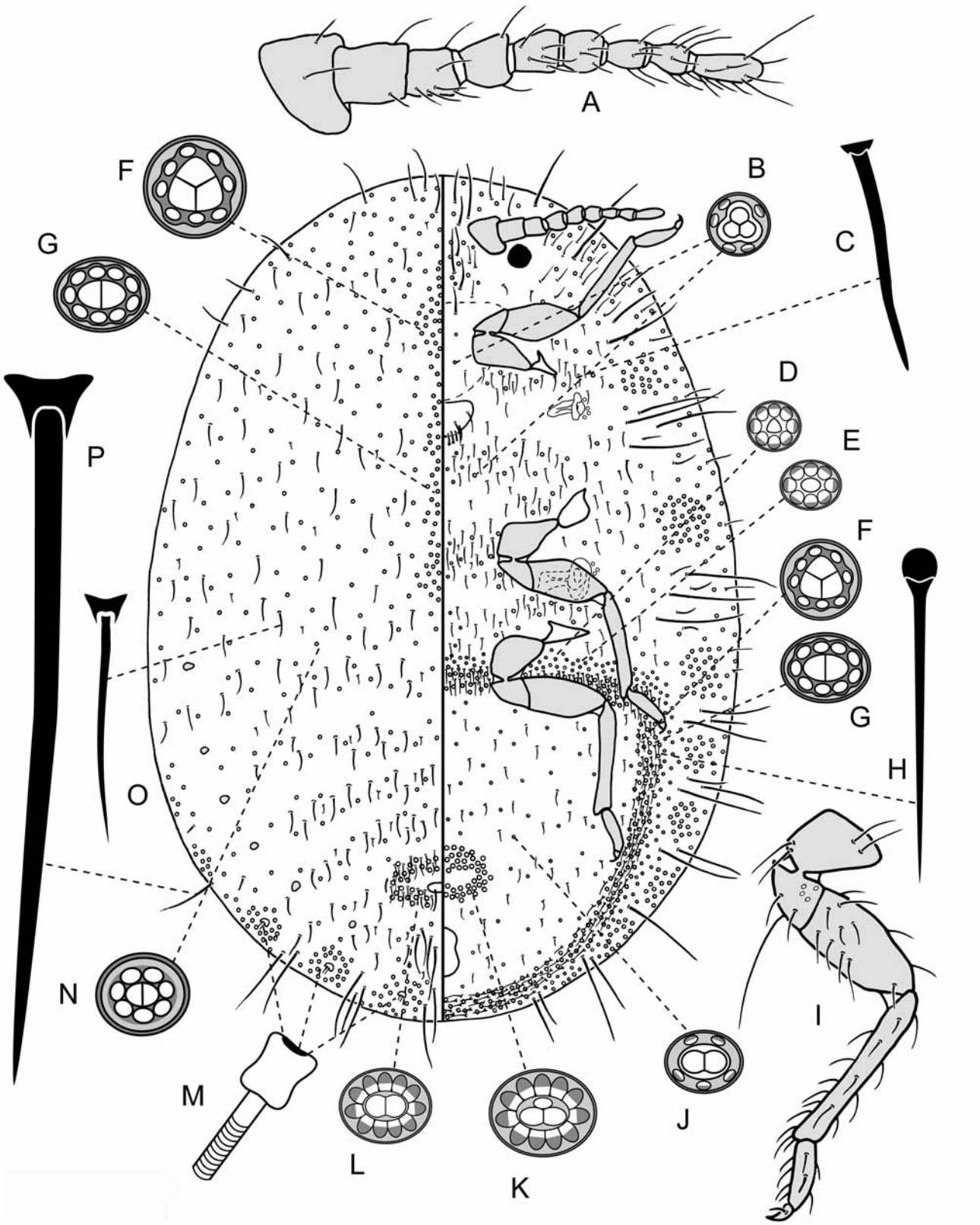

FIGURE 11. *Crypticerya palmeri* adult ♀. A. Antenna; B. Simple multilocular pore with trilocular centre and five outer loculi; C. Flagellate seta; D. Simple multilocular pore, similar to vulvar pore, with trilocular centre and eight outer loculi; E. Simple multilocular pore, similar to vulvar pore, with bilocular centre and eight outer loculi; F. Simple multilocular pore with trilocular centre and eight outer loculi; G. Simple multilocular pore with bilocular centre and seven outer loculi; H. Hair-like seta present in ovisac band; I. Hindleg; J. Simple multilocular pore with bilocular centre and five outer loculi; K. Vulvar multilocular pore; L; Anal multilocular pore; M. Abdominal spiracle; N. Simple multilocular pore with bilocular centre and nine outer loculi; O. Long hair-like seta; P. Short hair-like seta.

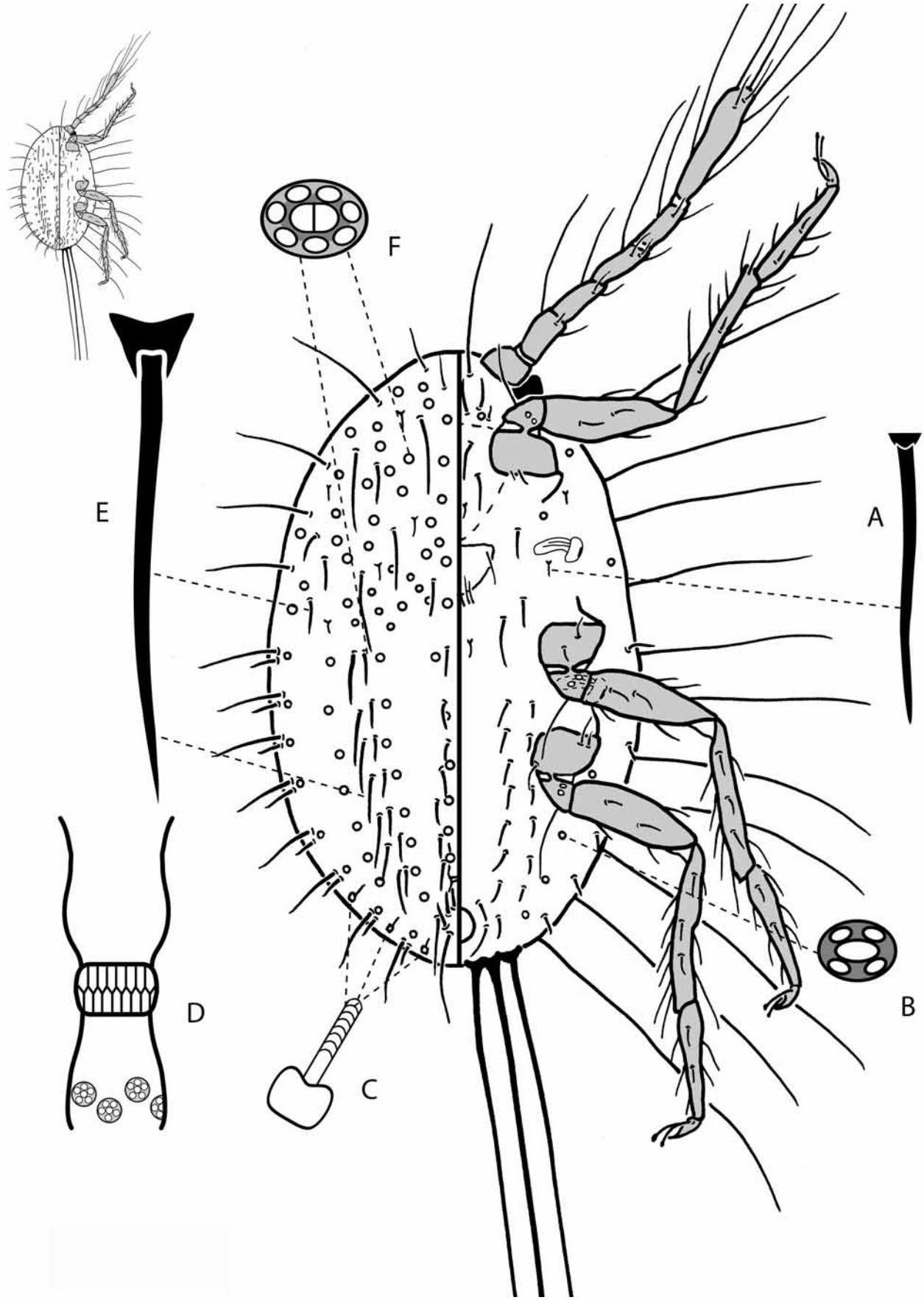

FIGURE 12. *Crypticerya palmeri* first-instar nymph. A. Flagellate seta; B. Simple multilocular pore with bilocular centre and four outer loculi; C. Abdominal spiracle; D. Anal tube; E. Long hair-like seta; F. Simple multilocular pore with bilocular centre and seven outer loculi.

Dorsum. Long, robust hair-like setae (Fig. 11P), 215–700 µm long, and short hair-like setae (Fig. 11O) 58–125 µm long, scattered across all body segments, longest setae in marginal clusters. Flagellate setae (Fig. 11C), 43–60 µm long, as for genus. Multilocular pores (Fig. 11F, G), each 8–10 µm in diameter, with bilocular (sometimes trilocular) centre and 6–10 outer loculi, scattered across all body segments and slightly clustered on median head and thorax.

Venter. Hair-like setae (Fig. 11O), 200–650 µm long, scattered across all segments, longest between antennae. Flagellate setae (Fig. 11C), 43–60 µm long, distributed as for genus, densest around mouthparts. Multilocular pores (Fig. 11F, G), each 8–10 µm in diameter, with bilocular or trilocular centre and 6–10 outer loculi, forming marginal clusters on each segment and scattered on submargins of head, thorax and abdomen. Simple multilocular pores (Fig 11B), each 8–10 µm in diameter, with bilocular or trilocular centre and 4 or 5 outer loculi, scattered on ventromedial areas of head and thorax; similar pores (Fig. 11J), each 8–9 µm in diameter, with bilocular centre and 4 or 5 outer loculi, scattered medially to submedially across abdomen.

Description of first-instar nymph (based on 1 non-type first-instar nymph)

Slide-mounted specimen. Body elliptical, 750 µm long, 460 µm wide. Antennae 450–460 µm long, apical segment 155–160 µm long, 40 µm wide; hair-like setae up to 500 µm long. Eyes 45–50 µm wide. Labium 90 µm long, 110 µm wide. Hindlegs 585 µm long; trochanter+femur 190–210 µm long; tibia+tarsus 340–360 µm long; hair-like setae on legs 25–150 µm long, spine-like setae 25–55 µm long; distal trochanteral setae 340–360 µm long, claw digitules 40–48 µm long. Thoracic spiracles each 45–55 µm long; atrium 28–30 µm wide. Abdominal spiracles (Fig. 12C) as for genus. Anal tube (Fig. 12D) 63 µm long, 38 µm wide at opening; multilocular pores inside anal tube each 5–6 µm in diameter.

Dorsum. Shape and distribution of pores as for genus, except each abdominal segment with one submarginal pore, one submedial pore and one medial pore; head and thorax with dense multilocular pores. Distribution of hair-like setae (Fig. 12E) and flagellate setae (Fig. 12A) as for genus. Long hair-like setae 70–125 µm long; short hair-like setae 35–48 µm long; long marginal setae 320–540 µm long. Flagellate setae 50–83 µm long. Multilocular pores (Fig. 12F), each 8–9 µm in diameter on head and thorax, each 6–7 µm in diameter on abdomen.

Venter. Distribution of setae and pores as for genus. Hair-like setae (Fig. 12E) 20–39 µm long; long hair-like setae 650–1060 µm long in 3 pairs at abdominal apex. Flagellate setae (Fig. 12A) 50–83 µm long. Multilocular pores (Fig. 12B), each 7–8 µm in diameter on head and thorax, each 5 µm in diameter on abdomen.

Type data. MEXICO, Sonora, San Jose de Guaymas, 9 miles [14 km] North of Guaymas, ex Muscat of Alexandria grapevine [=*Vitis vinifera*], 30.vii.1887 (*E. Palmer*).

Type material. Lectotype (designated by Unruh & Gullan, 2008b): second-instar nymph (USNM). Paralectotypes: second-instar nymphs (USNM); dry material (USNM).

Other material examined. MEXICO: 2 ad ♀♀, Guaymas, 4.v.1897 (*Koebele*) (1 slide at USNM, 1 slide at BME); 3 ad ♀♀, La Paz, ex Acacia sp., 17.i.1962 (*F. Raney*) (BME); 1 ad ♀, 1 first-instar nymph, Baja California, San Jose del Cabo, ex undetermined host, vii.1919 (*Ferris*) (BME).

***Crypticerya rileyi* (Cockerell)**
(Figs 13, 14)

Description of adult female (based on lectotypes of *I. rileyi* and *I. rileyi larreae*, 3 paralectotypes and 1 non-type ♀)

In life. Adult female dull red, covered with white and yellowish mealy powder, with lateral waxy tufts that easily break off. Ovisac white with slight yellowish tinge, smooth, not fluted, 10 mm long, 5 mm wide (adapted from Cockerell, 1895).

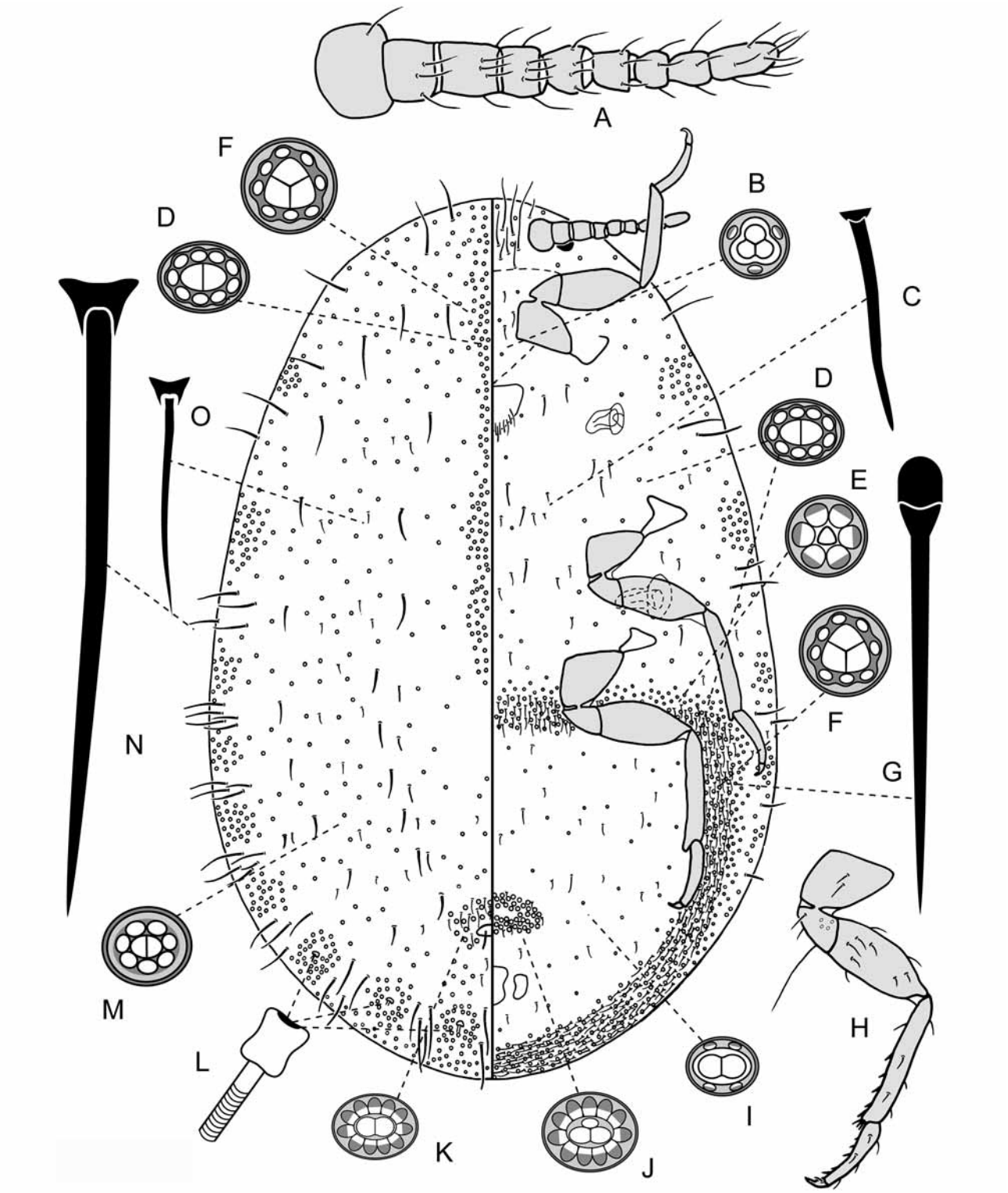

FIGURE 13. *Crypticerya rileyi* adult ♀. A. Antenna; B. Simple multilocular pore with trilocular centre and three outer loculi; C. Flagellate seta; D. Simple multilocular pore with bilocular centre and nine outer loculi; E. Simple multilocular pore, similar to vulvar pore, with trilocular centre and six outer loculi; F. Flagellate seta present in ovisac band; G. Simple multilocular pore with trilocular centre and eight outer loculi; H. Hindleg; I. Simple multilocular pore with bilocular centre and four outer loculi; J. Vulvar multilocular pore; K. Abdominal spiracle; L. Anal multilocular pore; M. Simple multilocular pore with bilocular centre and seven outer loculi; N. Long hair-like seta; O. Short hair-like seta.

Slide-mounted specimens. Body elliptical, widest at abdomen, 5.3–7.0 mm long, 3.8–6.0 mm wide (lectotype of *I. rileyi* 5.1 mm long, 3.8 mm wide; lectotype of *I. rileyi larreae* 6.6 mm long, 6.0 mm wide). Anten-

nae (Fig. 13A) 9 or 11 segmented, 860–1040 µm long, apical segment 130–180 µm long, 60–75 µm wide; hair-like setae up to 240 µm long. Eyes 120–150 µm. Clypeolabral shield 550–600 µm long, 300–500 µm wide, labium 320–350 µm long, 250–350 µm wide. Hindlegs (Fig. 13H) 1950–2345 µm long; trochanter+femur 700–810 µm long, tibia+tarsus 870–1030 µm long; setae on leg segments 58–125 µm long, spine-like setae 25–45 µm long; distal trochanteral setae 220–250 µm long; claw digitules 35–50 µm long. Mesothoracic spiracles each 190–250 µm long, atrium 145–175 µm wide; metathoracic spiracles each 225–300 µm long, atrium 170–230 µm wide; derm near atrial opening with cluster of 3–7 simple multilocular pores each 11–12 µm in diameter with bilocular centre and 9–12 outer loculi. Ovisac band present, formed by flagellate setae 53–60 µm long with rounded bases (Fig. 13G) and multilocular pores of two types: (i) larger pores (Fig. 13D, F) forming inner band 8–10 pores wide, each pore 10–12 µm in diameter, with trilocular centre (sometimes bilocular, rarely quadrilocular) and 8–12 outer loculi and (ii) smaller pores (Fig. 13E) forming outer band 5–7 pores wide, each pore 8–10 µm in diameter, with bilocular or trilocular centre and 4–12 outer loculi and appearing slightly bluish when stained. Vulvar opening surrounded by typical multilocular pores (Fig. 13J), each 13–14 µm in diameter, with bilocular centre and 8–12 outer loculi, and hair-like setae 70–100 µm long. Cicatrices elongate, numbering 3, central cicatrix 220–255 µm long, 110–170 µm wide; lateral cicatrices 120–200 µm long, 95–125 µm wide. Abdominal spiracles each (Fig. 13L) with atrium 20–30 µm wide. Anal ring 115–135 µm wide; anal opening surrounded by hair-like setae 85–120 µm long and typical multilocular pores (Fig. 13L).

Dorsum. Robust hair-like setae (Fig. 13N) 120–250 µm long, scattered across all body segments. Short hair-like setae (Fig. 13O) 25–85 µm long, scattered across all body segments. Flagellate setae (Fig 13C) 30–50 µm long, distributed as for genus. Multilocular pores (Fig. 13D, F), each 11–12 µm in diameter, with bilocular or trilocular centre and 6–9 outer loculi, forming medial to submedial longitudinal rows on head and thorax. Smaller simple multilocular pores (Fig. 13M), each 9–10 µm in diameter, with bilocular centre and 6–8 outer loculi, scattered across rest of dorsum.

Venter. Hair-like setae (Fig. 13O), 25–150 µm long, distributed as for genus, longest setae (Fig. 13N) forming marginal clusters. Flagellate setae (Fig. 13C), 30–50 µm long, distributed as for genus. Multilocular pores (Fig. 13D, G), each 10–12 µm in diameter, with bilocular or trilocular centre and 6–9 outer loculi, forming marginal clusters on each segment and scattered on margins and submargins of head, thorax and abdomen. Simple multilocular pores (Fig. 13B), each 11–12 µm in diameter, with bilocular or trilocular centre and 4 or 5 outer loculi, scattered medially to submedially on head and thorax; similar pores (Fig. 13I), each 11–12 µm in diameter, with bilocular centre and 4 or 5 outer loculi, scattered medially to submedially across abdomen.

Description of first-instar nymph (based on 5 non-type first-instar nymphs)

Slide-mounted specimens. Body elliptical, 740–890 µm long, 420–540 µm wide. Antennae 360–410 µm long, apical segment 120–140 µm long, 40–45 µm wide; hair-like setae up to 280 µm long. Eyes 50–60 µm wide. Clypeolabral shield 150–175 µm long, 138–188 µm wide. Labium 93–105 µm long, 138–150 µm wide. Hindlegs 663–730 µm long; trochanter+femur 210–230 µm long, tibia+tarsus 340–380 µm long; setae on legs 33–68 µm long; distal trochanteral setae 58–93 µm long, claw digitules 35–38 µm long. Thoracic spiracles each 55–78 µm long; atrium 23–35 µm wide. Cicatrix 28–33 µm in diameter. Abdominal spiracles (Fig. 14C) as for genus. Anal tube (Fig. 14D) 28–30 µm long, 80–88 µm wide at opening; multilocular pores inside anal tube 8–9 µm in diameter.

Dorsum. Shape and distribution of pores as for genus, except each abdominal segment with one submarginal pore, one submedial pore and one medial pore. Distribution of hair-like setae (Fig. 14E) and flagellate setae (Fig 14A) as for genus. Long hair-like setae 53–160 µm long; short hair-like setae 23–40 µm long; long marginal setae 155–310 µm long. Flagellate setae 38–48 µm long. Multilocular pores (Fig. 14F) each 8–9 µm in diameter on head and thorax, each 7–8 µm in diameter on abdomen.

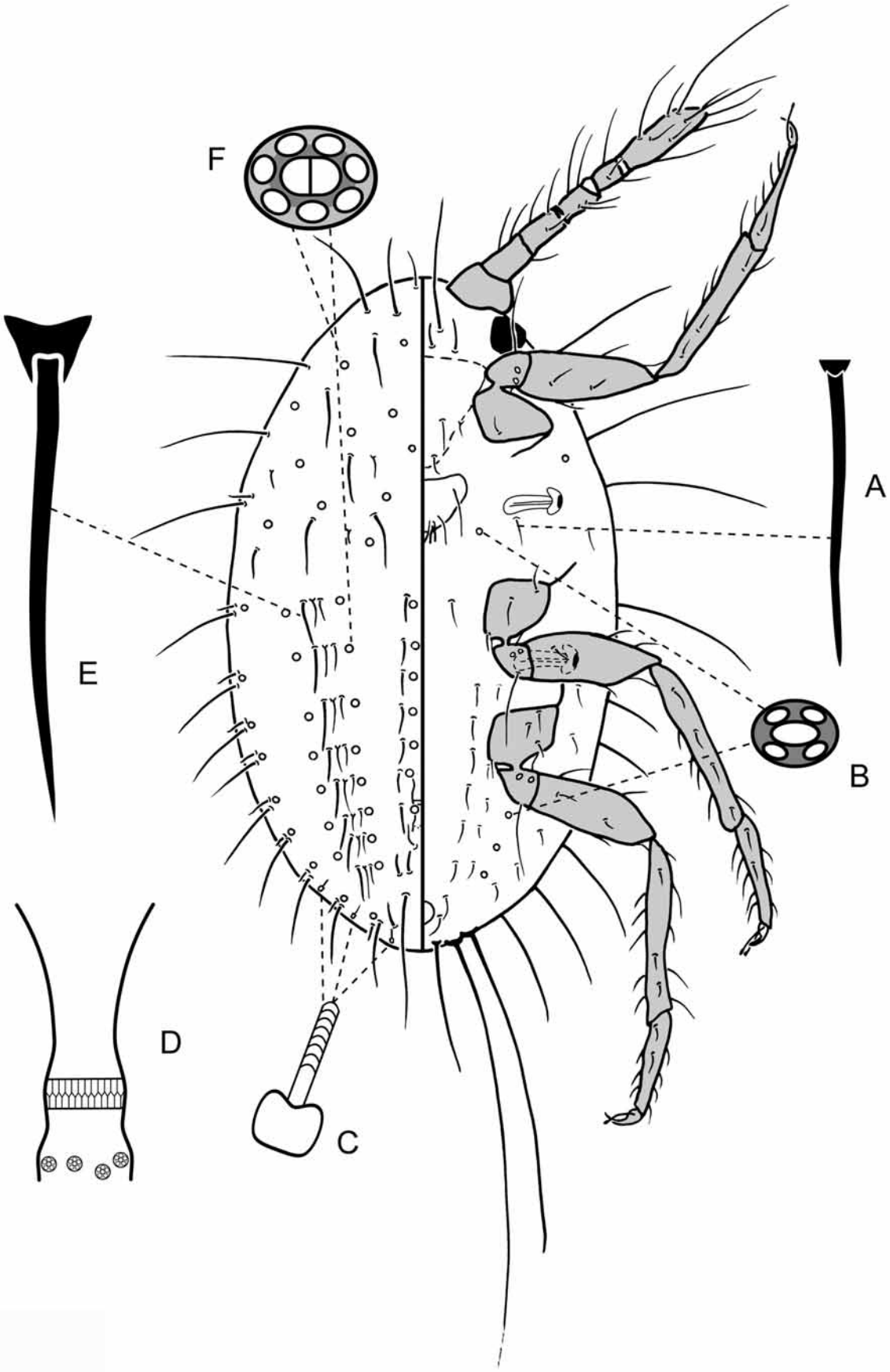

FIGURE 14. *Crypticerya rileyi* first-instar nymph. A. Flagellate seta; B. Simple multilocular pore with bilocular centre and four outer loculi; C. Abdominal spiracle; D. Anal tube; E. Long hair-like seta; F. Simple multilocular pore with bilocular centre and seven outer loculi.

Venter. Distribution of setae and pores as for genus. Hair-like setae (Fig. 14E) 25–60 µm long; long hair-like setae 480–850 µm long in two pairs at abdominal apex. Flagellate setae (Fig. 14A) 35–48 µm long. Multilocular pores (Fig. 14B) each 8 µm in diameter on head and thorax, each 6–7 µm in diameter on abdomen.

Type data. *Icerya rileyi*: U.S.A.., NM, Las Cruces, ex Mesquite (=*Prosopis* sp.), 26.iv.1892 (*Townsend*); ex Creosote bush (=*Larrea tridentata*) (20.xi.1894) (*Cockerell*); Tularosa, ex Mesquite (=*Prosopis* sp.), 30.ix.1892 (*Townsend*). *Icerya rileyi larreae*: MEXICO, Chihuahua, plain at base of Cerro Chilicote, ex *Larrea*, 29.iv.1902 (*T. and B. Cy*).

Type material. Lectotype of *Icerya rileyi* (designated by Unruh & Gullan, 2008b): ad ♀ (USNM). Paralectotypes: 3 ad ♀♀, dry material (USNM). Lectotype of *I. rileyi larreae* (designated by Unruh & Gullan, 2008b): ad ♀ (USNM). Paralectotypes: 1 first-instar nymph, 1 embryo, dozens of body parts of first-instar nymphs, dry material (USNM).

Other material examined. USA, AZ: ad ♀, Pima County, Coronado National Forest, Sabino Recreation Area, Phoneline Trail, 32°18'N, 110°48'W, 26.vi.2004 (*C.M. Unruh*) (BME); 20 first-instar nymphs, Santa Cruz County, Mustang Mountains, ex *Mimosa biuncifera*, 21.vii.1933 (*E.D. Ball*) (BME).

***Crypticerya tabernicola* (Ferris)**
(Figs 15, 16)

Description of adult female (based on lectotype, 4 non-type ad ♀♀)

In life. Adult female globose, round and most distended across abdomen; body dark purple; legs, antennae and eyes black; with age, covered in mealy secretion forming conspicuous transverse rows across dorsum; waxy tendrils forming around margin and dorsal head and thorax.

Slide-mounted specimen. Body elliptical, 4.4–5.2 mm long, 3.2–4.5 mm wide (lectotype 5.2 mm long, 4.5 mm wide). Antennae (Fig. 15A) 10 or 11 segmented (segments V and VI fused if 10 segmented), 810–860 µm long; apical segment 110–150 µm long, 60–70 µm wide. Eyes 100–190 µm wide. Clypeolabral shield 400–550 µm long, 340–400 µm wide. Labium 250–400 µm long, 300–550 µm wide. Hindlegs (Fig. 15F) 1880–2220 µm long, trochanter+femur 560–780 µm long, tibia+tarsus 750–1100 µm long; setae on leg segments 55–80 µm long, spine-like setae 30–45 µm long; distal trochanteral setae 100–170 µm long; claw digitules acute, 45–50 µm long. Mesothoracic spiracles each 150–270 µm long, atrium 150–190 µm wide; metathoracic spiracles each 200–350 µm long, atrium 200–225 µm wide. Derm at atrial opening with 5–10 simple multilocular pores with bilocular centre and 8–10 outer loculi. Marsupium present, shaped as for genus, except anterior edge of band formed by sparse band of multilocular pores; marsupial band formed by sparse short hair-like setae (Fig. 15N), 38–50 µm long, and simple multilocular pores of two types: (i) larger pores (Fig. 15D, E) forming inner band 5–7 pores wide, each pore 12–13 µm in diameter, with bilocular or trilocular centre and 6–9 outer loculi, and (ii) smaller pores (Fig. 15G) scattered around inner band, each pore 8–10 µm in diameter, with bilocular or trilocular centre and 6–10 outer loculi and appearing slightly bluish when stained. Vulvar opening as for genus, surrounded by typical multilocular pores (Fig. 15J), each 13–15 µm in diameter, with bilocular centre and 8–12 outer loculi. Cicatrices numbering 3, central cicatrix hourglass shaped, 230–300 µm long, 150–200 µm wide, lateral cicatrices reniform, 173–230 µm long, 75–120 µm wide. Abdominal spiracles (Fig. 15H) with atrium 10–23 µm wide. Anal tube 120–150 µm wide; anal opening surrounded by typical multilocular pores (Fig. 15K), each 12–14 µm in diameter, and robust hair-like setae, 55–110 µm long.

Dorsum. Short hair-like setae (Fig. 15N), 50–100 µm long, sparsely scattered across all body segments. Flagellate setae (Fig. 15C), 19–35 µm long, distributed as for genus. Simple multilocular pores (Fig. 15E, L), each 10–12 µm in diameter, with bilocular centre and 6–12 outer loculi, forming medial to submedial longitudinal row on head and thorax, densest in marginal clusters on abdomen, on medial to submedial areas of abdomen anterior to anal opening and medially to marginally on abdomen posterior to anal opening. Slightly

wrinkled patches of derm present on submarginal and submedial areas of thorax and in transverse rows on abdomen.

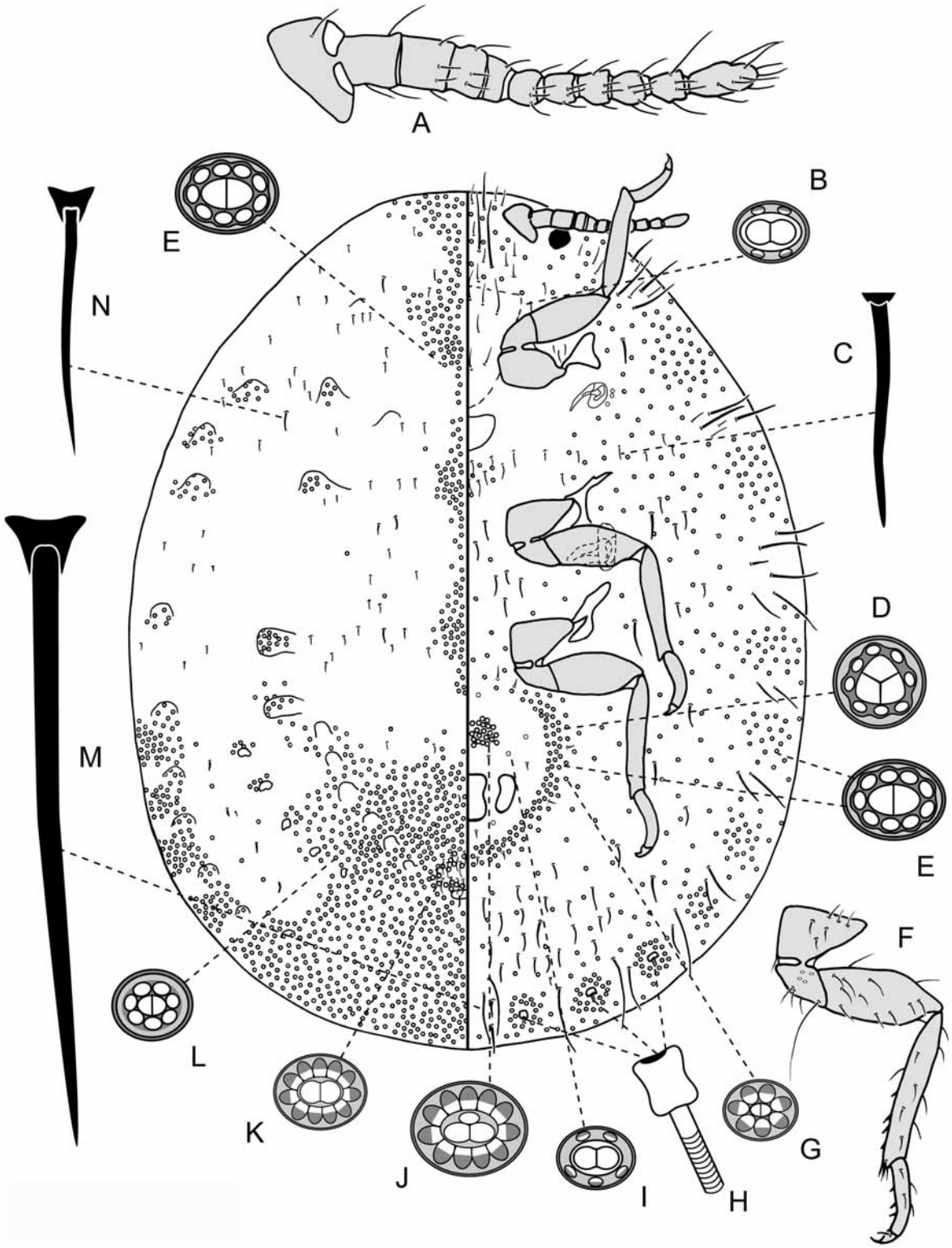

FIGURE 15. *Crypticerya tabernicola* adult ♀. A. Antenna; B. Simple multilocular pore with bilocular centre and four outer loculi; C. Flagellate seta; D. Simple multilocular pore with trilocular centre and eight outer loculi; E. Simple multilocular pore with bilocular centre and nine outer loculi; F. Hindleg; G. Simple multilocular pore, similar to vulvar pore, with bilocular centre and seven outer loculi; H. Abdominal spiracle; I. Vulvar multilocular pore; J; Anal multilocular pore; K. Simple multilocular pore with bilocular centre and seven outer loculi; L. Long hair-like seta; M. Short hair-like seta.

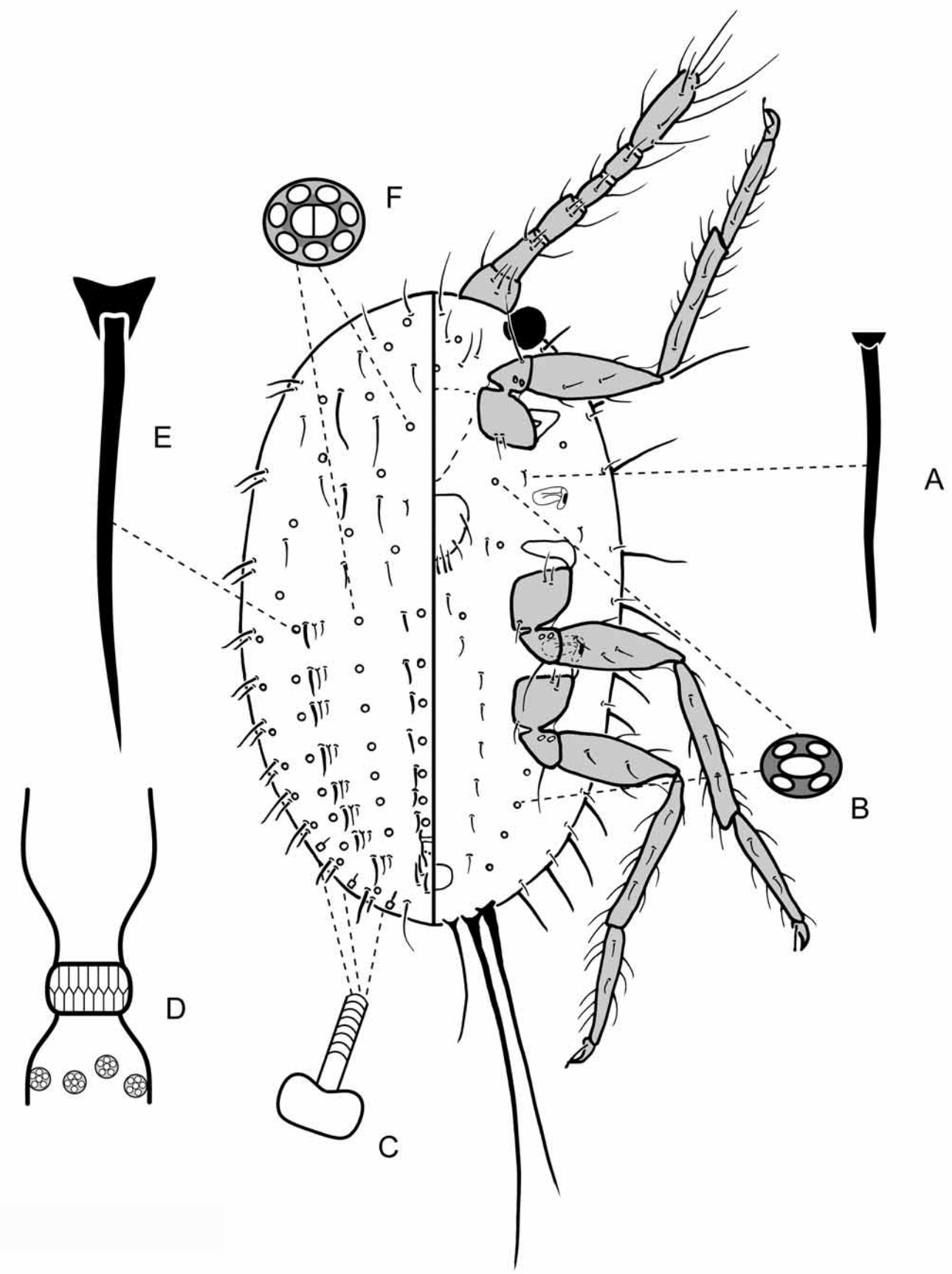

FIGURE 16. *Crypticerya tabernicola* first-instar nymph. A. Flagellate seta; B. Simple multilocular pore with bilocular centre and four outer loculi; C. Abdominal spiracle; D. Anal tube; E. Long hair-like seta; F. Simple multilocular pore with bilocular centre and seven outer loculi.

Venter. Hair-like setae (Fig. 15N), 30–175 µm long, sparsely scattered across all body segments; longest setae (Fig. 15M), 175–325 µm long, in marginal clusters on each body segment and between antennae. Flagellate setae (Fig. 15C), 38–45 µm long, distributed as for genus. Simple multilocular pores (Fig. 15E), each 12–13 µm in diameter, with bilocular (sometimes trilocular) centre and 8–12 outer loculi, forming marginal clusters on each body segment and scattered on submargins to margins of head and thorax, and also scattered across abdomen. Simple multilocular pores (Fig. 15B), each 10–12 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi, scattered medially to submedially on head and thorax; similar pores (Fig. 15I), each with bilocular centre and 4 or 5 outer loculi, scattered in marsupium.

Description of first-instar nymph (based on 1 non-type specimen)

Slide-mounted specimens. Body elongate, elliptical, 800 µm long, 470 µm wide. Antennae 400–410 µm long; apical segment 135–140 µm long, 45 µm wide. Eyes 50–55 µm wide. Clypeolabral shield 158 µm long, 138 µm wide. Labium 100 µm long, basal width 143 µm. Hindlegs 650–698 µm long; distal trochanteral setae 85–88 µm long; claw digitules 28–35 µm long. Thoracic spiracles each 58–65 µm long, atrium 8–13 µm wide. Abdominal spiracles (Fig. 16C) as for genus, atrium 5–8 µm wide. Anal tube (Fig. 16D) 80 µm long, as for genus, except with 6 multilocular pores at opening.

Dorsum. Shape and distribution of pores as for genus, except each abdominal segment with one submarginal pore, one submedial pore and one medial pore. Distribution of hair-like setae (Fig. 16E) and flagellate setae (Fig. 16A) as for genus. Long hair-like setae 30–75 µm long; short hair-like setae 18–25 µm long; long marginal setae 90–270 µm long. Flagellate setae 38–45 µm long. Multilocular pores (Fig. 16F), each 8–9 µm in diameter on head and thorax, each 7–8 µm in diameter on abdomen.

Venter. Distribution of setae and pores as for genus. Hair-like setae (Fig. 16E) 25–35 µm long; long hair-like setae at abdominal apex, outer two pairs 500–700 µm long, central pair 240–280 µm long. Flagellate setae (Fig. 16A) 25–40 µm long. Multilocular pores (Fig. 16B), each 7–8 µm in diameter on head and thorax, each 6–7 µm in diameter on abdomen.

Type data. MEXICO, Baja California, near La Rivera, ex *Prosopis* sp. (BME).

Type material. Lectotype (designated by Unruh & Gullan, 2008b): ad ♀ (BME). Paralectotype: second-instar nymph (BME).

Other material examined. first-instar nymph (same collection as lectotype and paralectotype) (BME); U.S.A., CA: 4 ad ♀♀, Kern County, Mojave Desert, Red Rock Canyon State Park, 35º23'N, 118º00'W, ex Larrea tridentata, 14.v.2004 (T. Kondo, C.M. Unruh & P.J. Gullan) (CSCA & BME; one ad ♀=CMU072); 4 ad ♀♀, San Bernardino County, Adelanto, ex Larrea divaricata, 14.i.1999 (R.J. Gill) (CSCA).

***Crypticerya townsendi* (Cockerell)**
(Figs 17, 18)

Description of adult female (based on lectotype of *I.* (*Crypticerya*) *townsendi*, lectotype of *I.* (*Crypticerya*) *townsendi plucheae*, 3 paralectotypes of *I. (Crypticerya*) *townsendi*, 1 non-type ad ♀)

In life. Adult female subglobose, denuded of wax, body appears dark pink to dark purple; legs, eyes and antennae black; dorsal surface thinly covered with white mealy secretion; tufts of wax forming middorsal and marginal longitudinal rows; ventral surface covered with thin white waxy secretion, especially around marsupial opening (adapted from Cockerell, 1896).

Slide-mounted specimens. Body elliptical, 4.2–5.7 mm long, 3.5–4.4 mm wide (lectotype of *Icerya* (*Crypticerya*) *townsendi* 5.7 mm long, 4.4 mm wide; lectotype of *Icerya* (*Crypticerya*) *townsendi plucheae* 5.5 mm long, 4.0 mm wide). Antennae (Fig. 17A) 11 segmented, 810–1220 µm long, apical segment 130–180 µm long, 60–75 µm wide; hair-like setae up to 240 µm long. Eyes 120–170 µm wide. Clypeolabral shield 550 µm long, 300 µm wide; labium 300–450 µm long, 300–350 µm wide. Hindlegs (Fig. 17F) 1780–2240 µm

long, trochanter+femur 650–770 µm long, tibia+tarsus 810–1070 µm long; setae on leg segments 90–155 µm long, spine-like setae 25–65 µm long; distal trochanteral setae 290–300 µm long; claw digitules acute, 45–50 µm long. Mesothoracic spiracles each 175–220 µm long, atrium 100–190 µm wide; metathoracic spiracles each 200–320 µm long, atrium 155–220 µm wide; multilocular pores in cluster of 6–8 near opening of thoracic spiracles. Marsupium present, marsupial band shaped as for genus, formed by sparse hair-like setae and simple multilocular pores (Fig. 17D, E) forming band about 4–6 pores wide, each pore 12–13 µm in diameter, with bilocular or trilocular centre and 6–12 outer loculi. Vulvar opening surrounded by hair-like setae and typical multilocular pores (Fig. 17I), each 13–15 µm in diameter, with bilocular centre and 8–12 (mostly 10) outer loculi. Cicatrices round to hourglass shaped, numbering 3, centre cicatrix 158–300 µm long, 83–175 µm wide; lateral cicatrices 88–230 µm long, 63–170 µm wide. Abdominal spiracles (Fig. 17H) each with atrium 28–40 µm in diameter. Anal ring 123–170 µm wide; anal opening surrounded by typical multilocular pores (Fig. 17J) and robust hair-like setae.

Dorsum. Hair-like setae (Fig. 17M) 50–250 µm long, distributed as for genus. Flagellate setae (Fig. 17C) 30–55 µm long, distributed as for genus. Multilocular pores (Fig. 17D, E), each 12–13 µm in diameter, with bilocular (sometimes trilocular) centre and 6–12 outer loculi, forming medial, submedial and submarginal longitudinal rows; similar smaller pores (Fig. 17L), each 9–11 µm in diameter, with bilocular (sometimes trilocular) centre and 6–9 outer loculi, scattered on rest of derm.

Venter. Hair-like setae (Fig. 17M) 40–300 µm long, distributed as for genus; longest setae (Fig. 17K), up to 500 µm long, forming clusters on margins and between antennae. Flagellate setae (Fig. 17C) 30–55 µm long, distributed as for genus. Simple multilocular pores (Fig. 17D, E), each 12–13 µm in diameter, with bilocular or trilocular (sometimes quadrilocular) centre and 8–12 outer loculi, forming marginal clusters on each body segment and scattered on margins to submargins of head and thorax, and also across abdomen; pores with a bilocular center only, not present in clusters. Simple multilocular pores (Fig. 17B), each 8–9 µm in diameter, with bilocular centre and 5–8 outer loculi and appearing slightly bluish when stained, scattered medially to submedially on head and thorax; similar pores (Fig. 17G), each 12–13 µm in diameter, with bilocular centre and 4–8 outer loculi and also resembling vulvar pores, scattered within marsupium.

Description of first-instar nymph (based on 5 paralectotypes of *Icerya* (*Crypticerya*) *townsendi*)

Slide-mounted specimens. Body elliptical, 750–910 µm long, 500–630 µm wide. Antennae 320–390 µm long, apical segment 100–130 µm long, 40–45 µm wide; hair-like setae up to 145 µm long. Eyes 50–55 µm wide. Clypeolabral shield 170–175 µm long, 130–170 µm wide. Labium 100–113 µm long, 105–133 µm wide. Hindlegs 516–620 µm long; distal trochanteral setae 75–120 µm long; claw digitules 25–30 µm long. Thoracic spiracles each 53–70 µm long; atrial opening 28–55 µm wide. Cicatrix 23–25 µm in diameter. Abdominal spiracles (Fig. 18C) as for genus. Anal tube (Fig. 18D) 80–85 µm long, 25–35 µm wide at opening; 6 multilocular pores inside anal tube, each 5–6 µm in diameter.

Dorsum. Shape and distribution of pores as for genus, except each abdominal segment lacking a submarginal pore, but with one submedial pore and one medial pore. Distribution of hair-like setae (Fig. 18E) and flagellate setae (Fig. 18A) as for genus. Long hair-like setae 45–65 µm long. Short hair-like setae 18–35 µm long; long marginal setae 95–175 µm long. Flagellate setae 40–55 µm long. Multilocular pores (Fig. 18F), each 9–10 µm in diameter on head and thorax, but each 8–9 µm in diameter on abdomen.

Venter. Shape and distribution of setae and pores as for genus. Hair-like setae (Fig. 18E) 18–30 µm long; long hair-like setae at abdominal apex 240–475 µm long, in two pairs. Flagellate setae (Fig. 18A) 40–55 µm long. Multilocular pores (Fig. 18B), each 7–8 µm in diameter on head and thorax, but each 6–8 µm in diameter on abdomen.

Type data. *Icerya* (*Crypticerya*) *townsendi*: U.S.A., NM, Mescalero Reservation, a short distance below the Agency, at base of stems of *Gutierrezia sarothrae*, 2.x.1896 (*Cockerell*). *Icerya* (*Crypticerya*) *townsendi plucheae*: U.S.A., NM, Mesilla Park, ex *Pluchea borealis*, 8.x.1896 (*Townsend*).

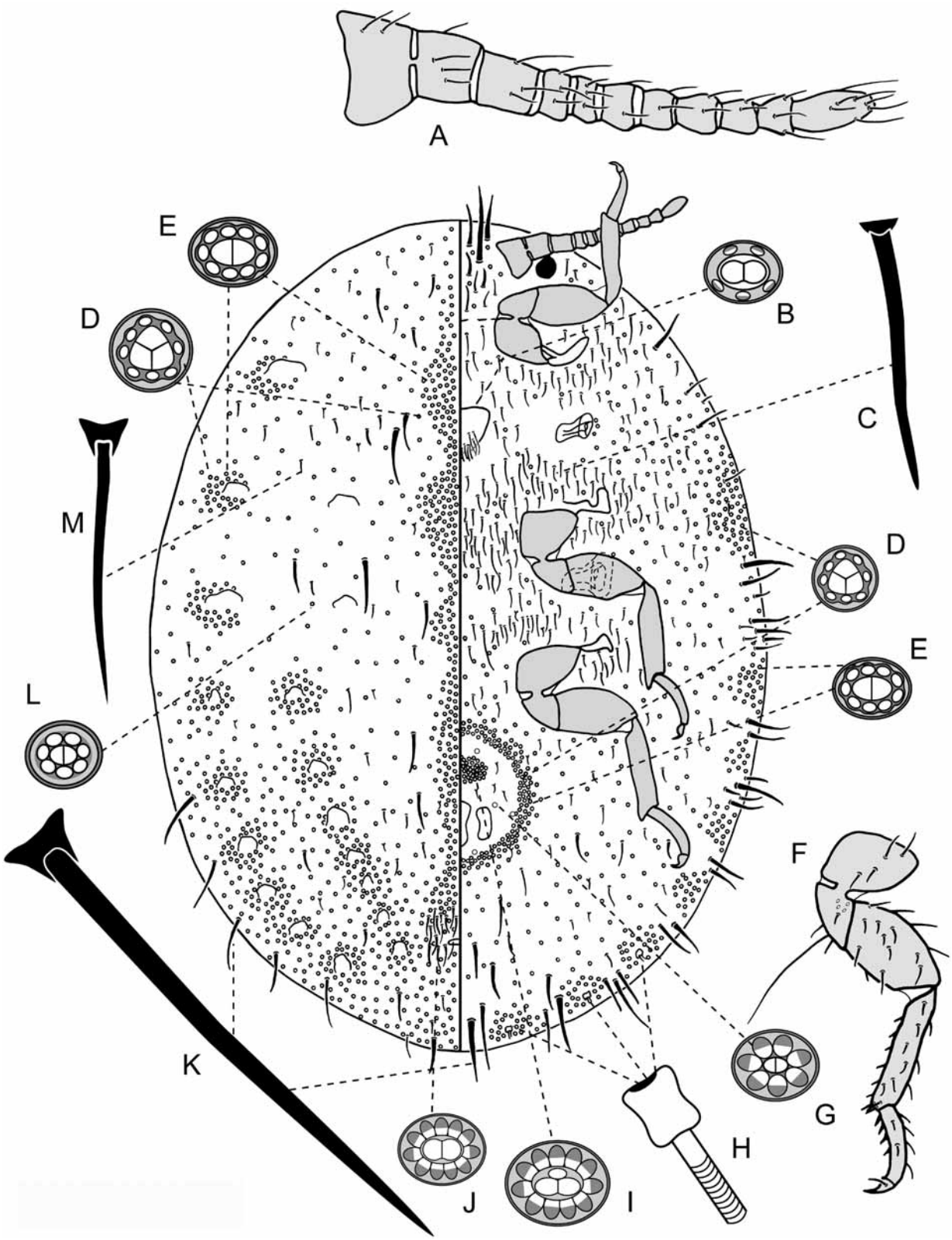

FIGURE 17. *Crypticerya townsendi* adult ♀. A. Antenna; B. Simple multilocular pore with bilocular centre and five outer loculi; C. Flagellate seta; D. Simple multilocular pore with trilocular centre and eight outer loculi; E. Simple multilocular pore with bilocular centre and nine outer loculi; F. Hindleg; G. Simple multilocular pore, similar to vulvar pore, with bilocular centre and seven outer loculi; H. Abdominal spiracle; I. Vulvar multilocular pore; J. Anal multilocular pore; K. Long hair-like seta; L. Simple multilocular pore with bilocular centre and seven outer loculi; M. Short hair-like seta.

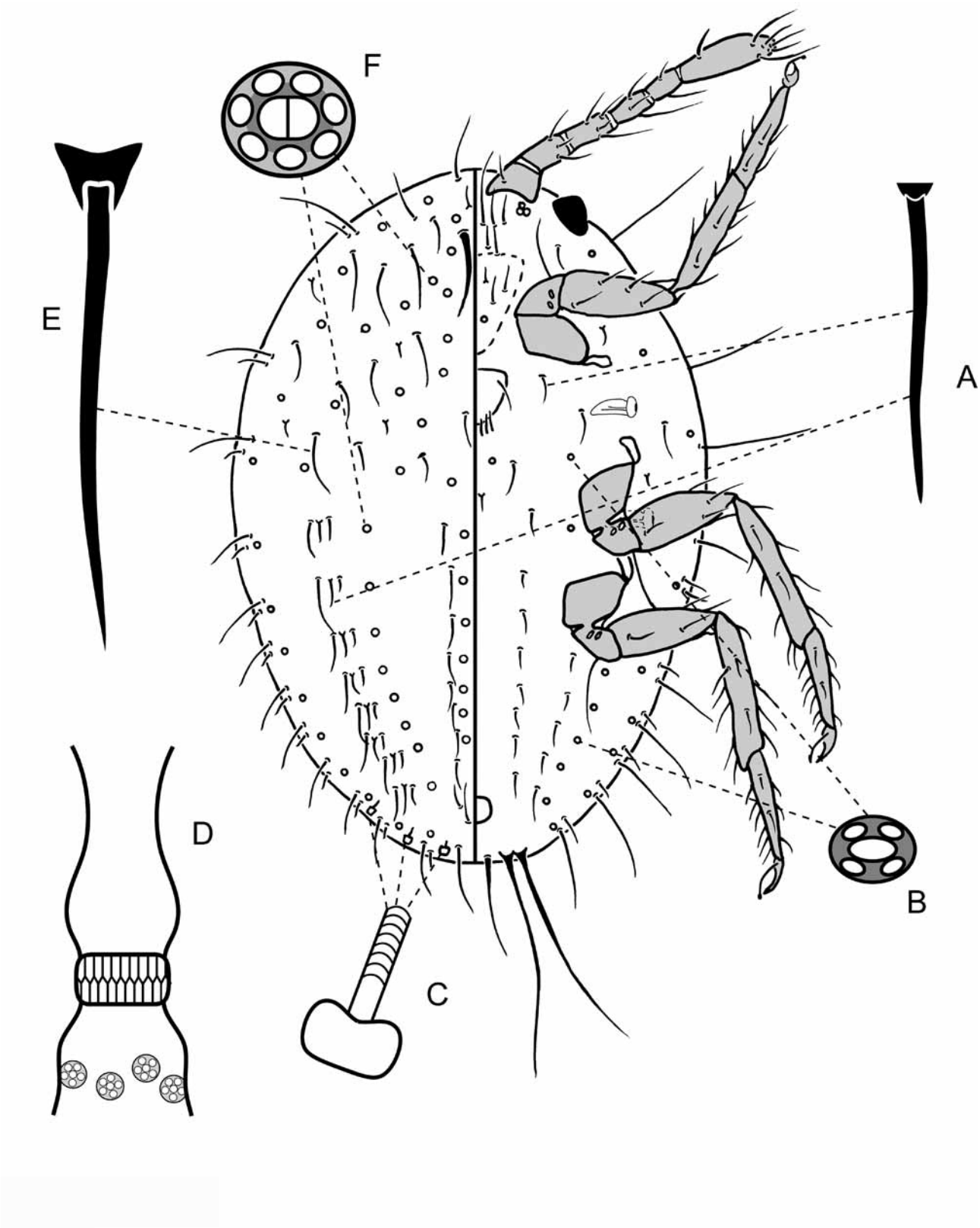

FIGURE 18. *Crypticerya townsendi* first-instar nymph. A. Flagellate seta; B. Simple multilocular pore with bilocular centre and four outer loculi; C. Abdominal spiracle; D. Anal tube; E. Long hair-like seta; F. Simple multilocular pore with bilocular centre and seven outer loculi.

Type material examined. Lectotype of *Icerya* (*Crypticerya*) *townsendi* (designated by Unruh & Gullan, 2008b): ad ♀ (USNM). Paralectotypes: 3 ad ♀♀, ca. 50 first-instar nymphs, dry material (USNM); ad ♀, 11

first-instar nymphs (BME). Lectotype of *Icerya* (*Crypticerya*) *townsendi plucheae* (designated by Unruh & Gullan, 2008b): ad ♀ (USNM). Paralectotypes: 2 ad ♀♀, 21 first-instar nymphs (USNM).

Other material examined. U.S.A., NM: ad ♀, Otero County, Sacramento Mountains, just outside Oliver Lee State Park, Dog Canyon, 32 44'N, 105 55'W, 1319 m, ex *Gutierrezia* sp., 7.vi.2004 (*C.M. Unruh*) (BME); ad ♀, Jornada Experimental Range Headquarters, 32 36'N, 106 44'W, 1311 m, 3.vi.2004 (*C.M. Unruh & R.L. Unruh*) (BME, same collection as CMU070).

***Crypticerya tuberculata* (Morrison)**
(Figs 19, 20)

Description of adult female (based on holotype and paratype)

In life. Adult female strongly ovoid, broadest and high convex across abdomen, narrowest at anterior end. Body of adult female blue purple in colour, dusted with wax, with whitish or yellowish tufts of wax forming four tufts on dorsum and eight tufts around margin on each side of body. Short tubercles forming four rows on dorsal surface, each tubercle with several stout setae; three or four tubercles forming inner submedial rows on head and thorax; six tubercles forming outer, submarginal rows; two conspicuous marginal tubercles on each side, apparently associated with thoracic spiracular region of body margin; smaller, inconspicuous tubercles on each body segment around margin; these tubercles less conspicuous in old, fully distended and sclerotized adults (adapted from Morrison, 1941).

Slide-mounted specimens. Body elliptical, 6.0–7.0 mm long, 4.2–5.6 mm wide (holotype 6.0 mm long, 5.6 mm wide). Antennae (Fig. 19A) 11 segmented, 1100–1250 µm long, apical segment 180–190 µm long, 60–70 µm wide; setae on antennal segments, increasing in length towards apex, up to 300 µm long. Eyes 140–190 µm wide. Clypeolabral shield 350 µm long, 400 µm wide. Labium 250 µm long, 150 µm wide. Hindlegs (Fig. 19G) 2295–2460 µm long, trochanter+femur 805–930 µm long, tibia+tarsus 1070–1195 µm long; setae on leg segments 75–90 µm long, spine-like setae 30–50 µm long; distal trochanteral setae 138–275 µm long; claw digitules 45–50 µm long. Mesothoracic spiracles each 200–210 µm long, atrium 100–110 µm wide; metathoracic spiracles each 250 µm long, atrium 130–150 µm wide; derm at atrial opening with 5–10 simple multilocular pores with bilocular centre and 8–10 outer loculi. Marsupium present, shaped as for genus; marsupial band formed by short hair-like setae, 38–50 µm long and simple multilocular pores two types: (i) larger pores forming inner ovisac band (Fig. 19E, F) 5–7 pores wide, each pore 12–13 µm in diameter, with bilocular or trilocular centre and 6–9 outer loculi, and (ii) smaller pores (Fig. 19H) scattered outside inner ovisac band, each 11–12 µm in diameter, with bilocular or trilocular centre and 6–12 outer loculi. Vulvar opening as for genus, surrounded by typical multilocular pores (Fig. 19J), 13–15 µm in diameter, with trilocular centre and 10–12 outer loculi. Cicatrices numbering 3, central cicatrix largest, oval, 350 µm long, 200 µm wide; lateral cicatrices reniform, 300 µm long, 190–250 µm wide. Abdominal spiracles each (Fig. 19I) with atrium 25–35 µm wide. Anal ring 100–150 µm wide; anal opening surrounded by robust hair-like setae and typical multilocular pores (Fig. 19K), 10–13 µm in diameter.

Dorsum. Robust hair-like setae (Fig. 19M), 50–200 µm long and finer hair-like setae (Fig. 19N), 20–300 µm long, scattered across all segments. Flagellate setae (Fig. 19D), 45–120 µm long, distributed as for genus. Simple multilocular pores (Fig. 19O, P), each 12–14 µm in diameter, with bilocular (rarely trilocular) centre and 8–12 outer loculi, scattered across all body segments and densest on head and thorax. Tubercles, each with several robust hair-like setae (Fig. 19L) on tips, 100–200 µm long, present on head and thorax as 1 medial pair, 2 submedial pairs and 2 submarginal pairs; also present on abdomen in 4 longitudinal rows: 2 medial and 2 submarginal.

Venter. Long hair-like setae (Fig. 19N), 200–400 µm long, scattered across all body segments; longest setae, 150–600 µm long, forming marginal clusters on all body segments and between antennae, longest at

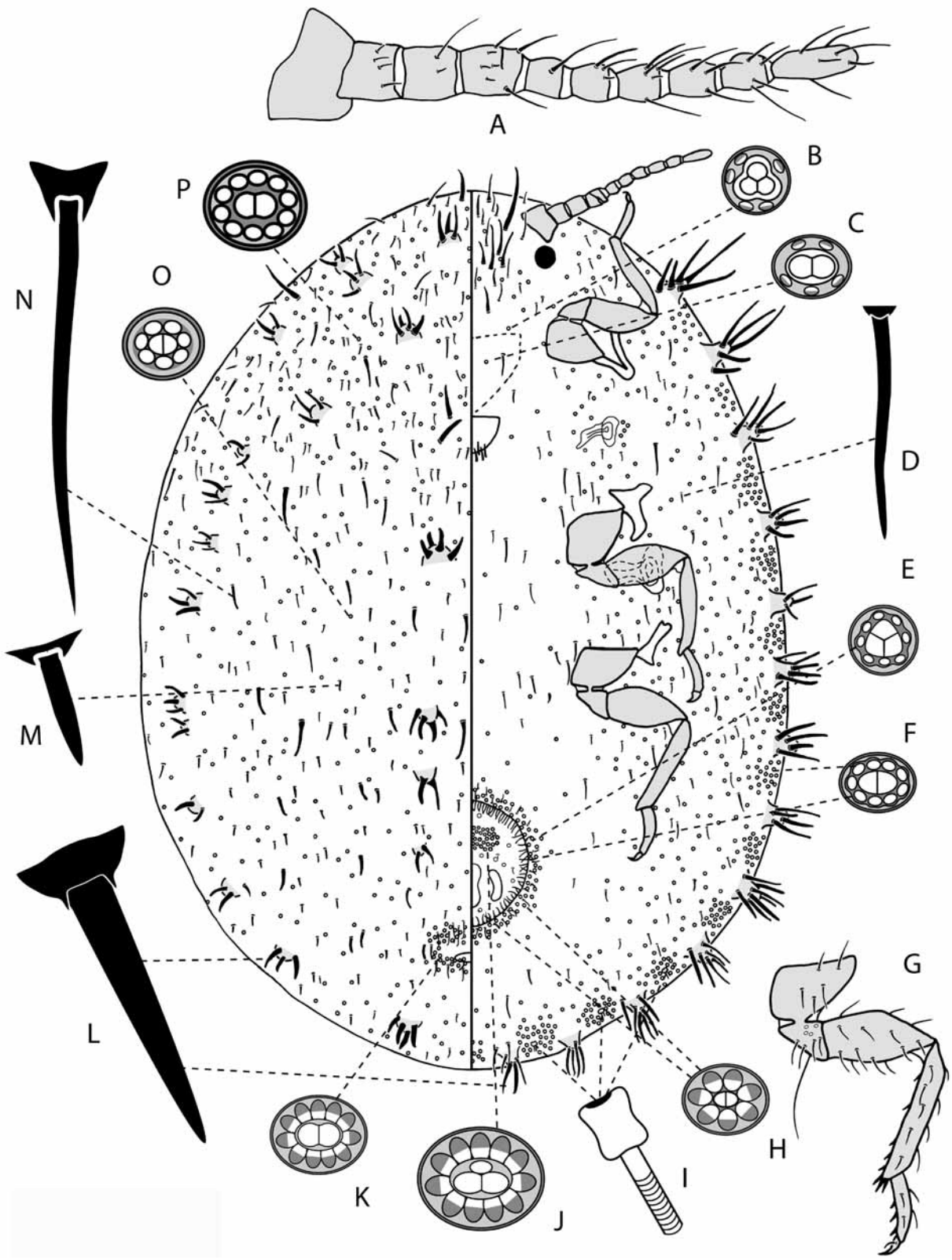

FIGURE 19. *Crypticerya tuberculata* adult ♀. A. Antenna; B. Simple multilocular pore with bilocular centre and five outer loculi; C. Simple multilocular pore with trilocular centre and five outer loculi; D. Flagellate seta; E. Simple multilocular pore with trilocular centre and eight outer loculi; F. Simple multilocular pore with bilocular centre and nine outer loculi; G. Hindleg; H. Simple multilocular pore, similar to vulvar pore, with bilocular centre and seven outer loculi; I. Abdominal spiracle; J. Vulvar multilocular pore; K. Anal multilocular pore; L. Robust hair-like seta; M. Short hair-like seta; N. Simple multilocular pore with bilocular centre and seven outer loculi; O. Simple multilocular pore with bilocular centre and ten outer loculi.

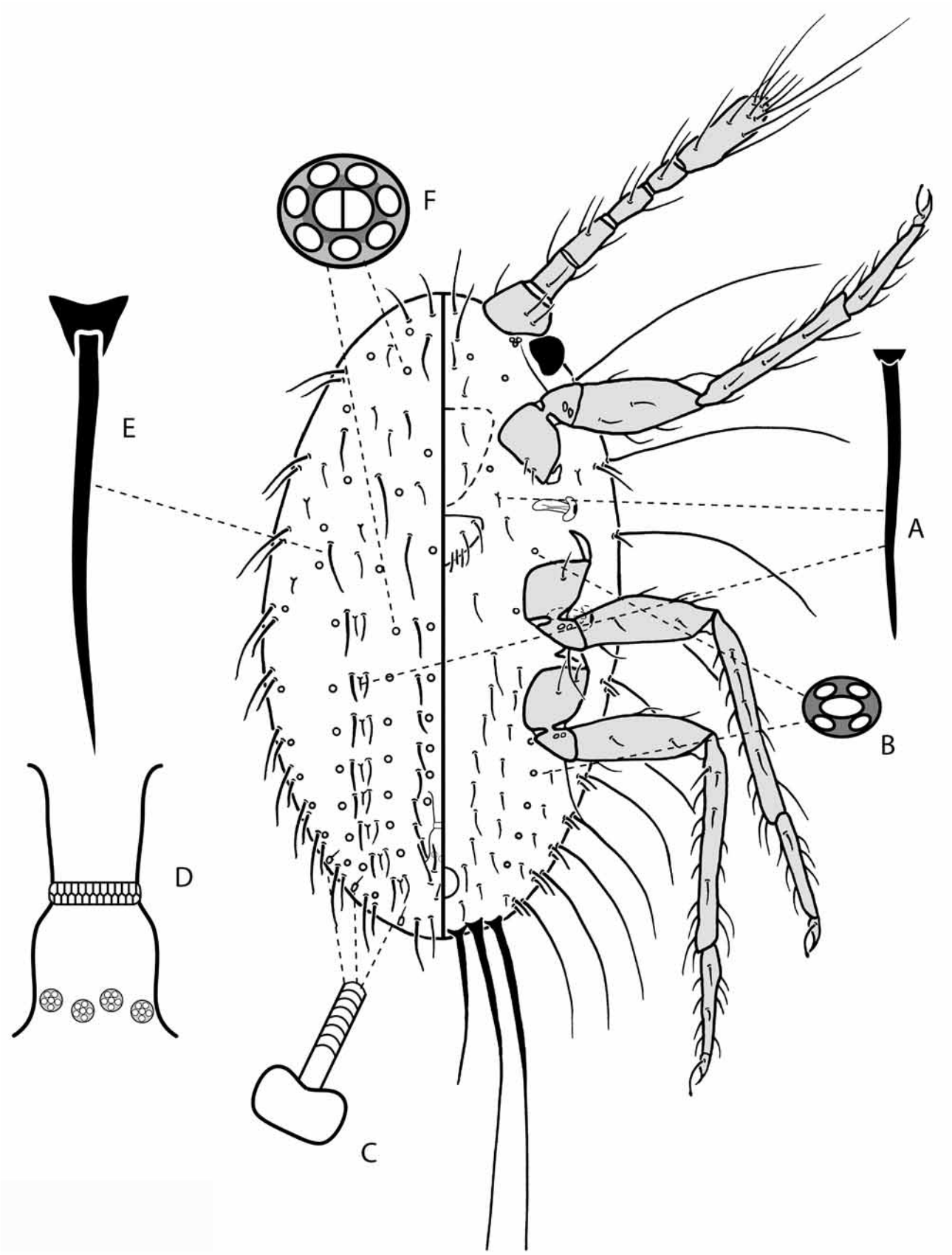

FIGURE 20. *Crypticerya tuberculata* first-instar nymph. A. Flagellate seta; B. Simple multilocular pore with bilocular centre and four outer loculi; C. Abdominal spiracle; D. Anal tube; E. Long hair-like seta; F. Simple multilocular pore with bilocular centre and seven outer loculi.

posterior abdomen; finer hair-like setae, 50–200 µm long, distributed as for genus. Flagellate setae (Fig. 19D), 48–175 µm long, distributed as for genus. Simple multilocular pores (Fig. 19F), each 10–12 µm in diameter, with bilocular (rarely trilocular) centre and 8–12 outer loculi, forming marginal clusters on all body segments and pores scattered across marginal to submarginal areas of head and thorax, and also across abdomen. Simple multilocular pores (Fig. 19B, C), each 9–10 µm in diameter, with bilocular or trilocular centre and 4–8 outer loculi and appearing slightly bluish when stained, scattered medially to submedially on head and thorax; similar pores (Fig. 19H), each 9–10 µm in diameter, with bilocular centre and 4–6 outer loculi, scattered within marsupium. Tubercles present in marginal longitudinal band, with several robust hair-like setae (Fig. 19L) on tips, 100–350 µm long.

Description of first-instar nymph (based on 3 paratypes)

Slide-mounted specimens. Body elongate, elliptical, 850–930 µm long, 480–540 µm wide. Antennae 460–515 µm long; apical segment 160–175 µm long, 40–60 µm wide; hair-like setae up to 360 µm long. Eyes 45–65 µm wide. Clypeolabral shield 138–150 µm long, basal width 100–140 µm; labium 108–113 long, 170 µm wide. Hindlegs 788–908 µm long; setae on leg segments 40–240 µm long; distal trochanteral setae 113–125 µm long; claw digitules 38–45 µm long. Thoracic spiracles each 30–63 µm long, atrium 10–18 µm wide. Cicatrix round, 25–30 µm wide. Abdominal spiracles (Fig. 20C) as for genus. Anal tube (Fig. 20D) 88–115 µm long, 35–38 µm wide.

Dorsum. Shape and distribution of pores as for genus, except each abdominal segment with one submarginal pore, one submedial pore and one medial pore. Distribution of hair-like setae (Fig. 20E) and flagellate setae (Fig. 20A) as for genus. Long hair-like setae 55–70 µm long; short hair-like setae 28–35 µm long; long marginal setae 250–600 µm long. Flagellate setae 33–40 µm long. Multilocular pores (Fig. 20F), each 9–10 µm in diameter on head and thorax, but each 7–8 µm in diameter on abdomen.

Venter. Shape and distribution of setae (Fig. 20A, E) and pores as for genus. Hair-like setae at abdominal apex in three pairs: central pair 350–420 µm long, outer pairs 780–1100 µm long. Multilocular pores (Fig. 20B), each 7–8 µm in diameter on head and thorax, each 5–6 µm in diameter on abdomen.

Type data. MEXICO: Oaxaca, Oaxaca, ex *Acacia pennatula*, 20-30.xi.1930; San Geronimo, ex *Caesalpinia coriaria*, 20-30.xi.1930 (*S. Hughes-Schrader*)

Type material. Holotype: ad ♀ (USNM). Paratypes: 1 ad ♀, 11 first-instar nymphs (USNM).

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