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# The mealybugs (Hemiptera: Coccoidea: Pseudococcidae) of Egypt

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# The mealybugs (Hemiptera: Coccoidea: Pseudococcidae) of Egypt

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**Abstract.** The Egyptian fauna of mealybugs (Hemiptera: Coccoidea: Pseudococcidae) is reviewed and an illustrated key to the 30 genera and 54 species is provided. *Phenacoccus madeirensis* Green is reported for the first time in Egypt. A **new genus**, *Ezzatacoccus* Evans and Abd-Rabou, is described and illustrated with *Amonostherium arabicum* Ezzat, 1960 designated as its type species. *Octococcus salicicola* Priesner and Hosny, 1935 is **reinstated** as a valid taxon and transferred to *Misericoccus* Ferris, **new combination**. *Ripersia cressae* Hall is transferred to *Maconellicoccus* Ezzat, **new combination** and *Planococcus lindingeri* (Bodenheimer) is transferred back to *Formicococcus* Takahashi, **revised status**.

**Key words.** Fauna, taxonomy, scale insects, new genus, pseudococcids, key.

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## Introduction

The family Pseudococcidae is the second largest family of scale insects (Coccoidea: Hemiptera) with about 2,035 nominal species belonging to 258 genera known worldwide (García-Morales et al. 2016); of these, 54 species belonging to 30 genera are known from Egypt. Mealybugs are also the second largest family of scale insects represented in the collection of the Egyptian Ministry of Agriculture in Giza, Egypt (Mohammed and Ghabbour 2008), following the armored scale insects (Diaspididae) and comprise many of the major pest species of various fruits and other cultivated plants worldwide. They feed on different parts of plants including the roots, trunks, stems, leaves, buds and fruit and are easily transported between countries through the international trade of plant products. Accurate and timely identification of mealybugs species is essential to developing an appropriate and efficient management strategy for the pests on domestic crops and is of great importance to thwart the introduction and establishment of invasive pest species that could pose a threat to the nation's agriculture. The following provides an updated list of the mealybugs known to occur in Egypt and their current taxonomy. An illustrated key to Egyptian genera and species of Pseudococcidae is provided to facilitate the identification of these species and their known plant hosts and geographic range in Egypt.

### Studies of the family Pseudococcidae in Egypt

Hall (1921–1927) published many of the early works on the mealybugs and other scale insects of Egypt. Priesner and Hosny (1935) described two new mealybug species and Hosny (1939) published on the scale insects found on roots of plants in Egypt which included several mealybug species. From 1954–1990, Ezzat greatly expanded the knowledge of the Egyptian fauna. He described and illustrated many new species, published a synopsis of the family Pseudococcidae of Egypt (Ezzat 1962a) which included a key to the genera and some of the species and later (Ezzat and McConnell 1956) provided a classification of the mealybug tribe Planococcini of the world. Ezzat and Nada (1987) provided a list of the species of the superfamily Coccoidea in Egypt. Mohammed et al. (1995) in their review of the Egyptian fauna of Coccoidea provided redescriptions, illustrations and host and locality data for 10 pseudococcid species. Mohammed and Ghabbour (2008) published an updated list of the Coccoidea as known to exist in Egypt. Other authors who have described species of the family in Egypt include Laing (1936) and Ben-Dov (1975); others who have reported on the certain species and/or their hosts include Abou-Elkair and Karam (1994), Abou-Elkhair (1999), Abd-Rabou et al. (2010), Attia and Abdel-Aziz (2015) and Beshr et al. (2016).

### Family Pseudococcidae

**Diagnosis.** Body of adult female usually membranous, elongate to broadly oval and covered by white, mealy-like wax. Most species have ostioles, trilocular pores and cerarii, and all but a few species, have at least one of these three characteristics. Anal ring present, usually with at least 2 rows of cells on each side and 3 pairs of setae. Legs present in most species; translucent pores usually present on at least one segment of the hind legs (most commonly the hind tibiae); antennae with 1–9 segments, most commonly with 7–9 segments; multilocular pores usually present at least on the venter of the abdomen; quinquelocular pores and oral rim ducts present in some genera; anal lobes usually not greatly protruding apically and dorsum usually not with modified setae as in many species of Eriococcidae.

Pseudococcids are similar to species in the superfamily Margarodoidea and the family Ortheziidae but lack abdominal spiracles. They are most similar to Putoidae species but differ in that the trochanters have 2 sensory pores on each surface and the lateral margin of body has 0–18 pairs of cerarii, each not set on a sclerotized plate and cerarii typically with less than 6 enlarged conical to lanceolate setae (most commonly with 2–3) (except in *Rastrococcus* which have cerarii similar to those of putoids), as opposed to Putoidae species which have 3–4 sensory pores on each surface, the lateral margin of the body with 18 pairs of cerarii, each set on a sclerotized plate and containing 6–40 enlarged conical to lanceolate setae. Pseudococcids are also similar to species in the family Rhizoecidae which were for many years part of the family Pseudococcidae. Rhizoecids are root feeders and are almost always found underground, and almost all species have geniculate antennae with never more than 6 segments. They lack cerarii and translucent pores on hind legs which are found commonly in pseudococcids and have tri-tubular or bitubular ducts which are not present in pseudococcids.

## Materials and Methods

**Identification of mealybugs (Pseudococcidae).** To identify a mealybug requires that one be able to see and understand the unique set of characters that define the taxon. Mealybugs can usually be identified to the level of family in nature by their general appearance (size, shape, sucking mouthparts, mealy-like wax on their dorsum); however to identify a mealybug to genus or species level requires: 1) a specimen of the identifiable life stage (detection and collection of an adult female); 2) the ability to observe the morphological characters that are used to distinguish the taxon (adequate optics and specimen preparation); 3) an understanding of the morphological characters used to define the taxon (morphology); and 4) identification tools (literature, reference specimens, etc.) to understand the unique set of characters that define the taxon and how they differ from that of other closely related taxa.

**1) Specimen detection and collection.** Mealybugs are obligate plant feeders and can be found on any part of the plant. Most species are found on the aerial parts of plants (stems, leaves, fruit); however, some species have been found only on roots and others on both the subterranean and aerial parts of plants. Hosny (1939) reported on the species of coccids found on roots in Egypt. Several of the mealybug species that he reported, such as *Planococcus citri* (Risso) and *Dysmicoccus brevipes* (Cockerell), are commonly found on the aerial parts of plants. When collecting mealybugs, it is important to select the largest individuals since the identification of mealybugs is almost exclusively based on characters found in adult females which are usually the largest individuals. It is also important to note the collection data, especially the date and location of the collection and the scientific name of the host plant; these provide important data on the host and distribution range of the species and may provide clues to the identity of the species. Specimens collected in the field are often placed in ziplock bags along with the host substrate and transported back to the laboratory for further processing. Afterwards, the sample is observed under a stereoscope and the largest individuals picked off the host and either processed and slide mounted directly or preserved in 70–75% alcohol and processed at a later date, or stored in 95–100% alcohol for DNA analysis.

**2) Specimen observation and preparation.** To identify mealybug species requires the ability to see the characters that are used to define the species. Since most of these characters are very small and many are internal structures such as ducts, mealybug identification in most cases requires that the specimen be cleared of its internal contents, slide mounted in a mounting medium and observed with an adequate compound microscope.

The following is one method for processing and slide mounting mealybugs as well as other scale insect families.

1) Choose the largest specimens (adult females) in the sample to be processed. While one specimen may be sufficient to identify the species, it is often beneficial to process multiple individuals.
2) Place the specimen (s) in a cold 10% solution of KOH (potassium hydroxide) for 24 to 48 hours to soften body contents. Specimens should not be left in KOH any longer than is necessary to soften body contents because KOH destroys or lightens the natural body color and deteriorates the cuticle. If an immediate mount is needed, make a small hole in the specimen, place it in a small watch glass or other dish, cover the dish to avoid evaporation, and then heat it under low heat on a hot plate for about 30 minutes. Alternatively, the specimen can be placed in a test tube with 10% KOH and held over a flame until the specimen clears.
3) Remove the internal contents of the mealybug by first making a small incision on the right side of the body between the 2nd and 3rd leg. This is standard or mealybugs because it is the part of the body where the characters used for identification are usually not found. The internal contents of the mealybug are removed by gently pressing on the top of the specimen with a small spatula or similar tool to pump out its internal contents. Alternatively, this can be done by filling a syringe with water then shooting the contents of the syringe into the incision made on the right side of the body side, whereby the internal content is flushed out. This may have to be done several times before all or almost all of the internal content is removed. Tracheae and other internal parts can be teased out of the specimen by entering the specimen through the incision with a minuten pin or similar object.
4) Place the specimen in water and gently pump the dorsum to remove the excess KOH.
5) Place the specimen in Acid Fuschin stain for about 10–15 minutes. Staining the specimen is optional but is often done to make the characters sharper.
6) Transfer the specimen to 70–75% ethanol for about 15–20 minutes; the use of isopropyl alcohol is not recommended in this process since has sometimes been observed to cloud the specimen when it is placed in clove oil. This is the start of the dehydration process. It is sometimes helpful to pump the dorsum of the mealybug while in alcohol to facilitate the exchange and remove excess stain. If more internal content is observed, the specimen can be flushed again with syringe containing water and then placed in 70–75% ethanol again or removed by pumping the dorsum and/or teasing the internal contents out with a minuten pin.
7) Transfer the specimen to 95–100% ethanol for about 15–20 minutes. Gently pumping the dorsum of the specimen may help with the dehydration process. Some people prefer to run the specimen through a series of graduated concentrations of alcohol, such as 70–80–90–95% alcohol and then into a 50–50 mixture of 95% alcohol and clove oil for 10–15 minutes, and then into 100% clove oil.
8) Submerge the specimen in clove oil for 15–30 minutes. When the specimen is first placed in the clove oil, its surface will shine as the clove oil replaces the alcohol on the inside and outside of the specimen. The specimen is ready for slide mounting when it loses its shine. If the specimen appears cloudy when placed into clove oil, it usually means that there is too much water content still in the specimen. If that occurs, place the specimen back into 95% ethanol for about 15 minutes, then back into clove oil for about 30 minutes. Since the presence or absence of translucent pores on the segments of the hind legs is often used in the identification of mealybugs, it is a good practice to gently pump the specimen above the hind legs so that the clove oil is allowed to enter the body, otherwise they may become cloudy and the translucent pores may be obscured. Specimens can be kept in clove oil overnight if needed; however, after a longer period of time the specimens may become brittle.

9) Place a small drop (about 3/4 the diameter of the cover slip) of Canada Balsam or Euparol at the center of a clean microscope slide. Dilute Canada Balsam with a drop of xylene; however, since xylene is carcinogenic, alpha-terpineol is often used.
10) Place the specimen in the drop of the medium and position it so that the dorsum is on top and the specimen faces downward towards you.
11) Place a coverslip on top of the specimen, apply gentle pressure to the top of the coverslip until the medium extends to the edge of the coverslip.
12) Label the slide with the following data: locality (country, state/department, city, other), date of collection, collector and host plant, sample number, and mounting medium used (Canada Balsam or Euparol).
13) Cure slides in a $110^0$F ($40^0$C) oven for one month so the balsam is no longer soft. If no oven is available, slides can be left undisturbed for two months at room temperature.

Mealybugs are sometimes mounted in Hoyer's medium instead because it quicker and some of the structures may be clearer. However, Hoyer's is not a permanent medium and does not retain stain well. If mounting in Hoyer's, you need soften the internal contents of the specimen in 10% KOH stage as if preparing the specimen for a balsam mount. The specimen is then placed in water and pumped to remove the excess KOH and then mounted directly into Hoyer's.

**3) Morphology.** To identify mealybugs to species level requires an understanding of the morphological characters that are used to distinguish the different genera and species (Fig. 1). There are four main categories of structures that are used most commonly: 1) pores, 2) ducts, 3) cerarii and 4) dorsal setae. Some of the other characteristics that are used include the presence or absence of an anal bar, claw denticle and circulus, and the number of antennal segments.

*A. Pores:* Pores can be round, oval or triangular and are present only on the surface of the integument, as opposed to ducts which have a round orifice on the surface but also have a sclerotized tube that extends into the body. They can be differentiated in slide mounted specimens observed with a compound microscope by focusing up and down on the orifice, to determine if they are surface pores, or are tubular and have depth as a duct. Setae often get broken off and the setal base that remains may be mistaken for a discoidal pore because it is similar in shape and size and does not have depth. There are 4 main kinds of pores that occur in mealybugs: trilocular, discoidal, quinquelocular and multilocular pores on the body and translucent pores on the hind legs; the latter two usually do not develop until the adult female stage and are usually a good way to determine if the specimen is an adult female or an immature, although species are known that lack translucent pores on the hind legs and/or multilocular pores in the adult stage. The adults of all mealybug species can be determined by the presence of the vulva.

1) trilocular pores: are triangular in shape and divided into 3 sections, which are called loculi. They are usually much smaller than the multilocular and quinquelocular pores. They are used in identification primarily because they comprise part of the cerarii, which are used extensively in keys to genera and species.
2) quinquelocular pores: have 5 loculi and appear as a round circle with a star in the middle, similar to a sheriff's badge and are found in many species, particularly those of the tribe Phenacoccini. In some genera such as *Brevennia* Goux, they occur on both the dorsum and the venter, but they most commonly are found only on the venter in genera such as *Phenacoccus* Cockerell. Although they may occur on other parts of the body, if they are present, they can usually be found on the venter under the mouthparts. They are generally only used as being present or absent, as opposed to being in a certain number or in a specific region of the body.
3) multilocular pores: are usually the largest pores on the mealybug, each one consisting of more than 5 loculi. At lower magnifications, they may appear as a round circle with at least 1 inner circle, but at higher magnifications one can see that each pore is comprised of 5 or more very small divisions (loculi). They are commonly found on the venter of adult females (immatures may have started to develop a few) and occur on the dorsum in some genera particularly in many species of *Phenacoccus*. They are most commonly used in species keys as whether they occur on the lateral margins of the abdomen and/or on which abdominal segments they occur.

4) discoidal pores: are oval to round in shape and are undivided (i.e., they lack loculi). They are most commonly used in keys, especially the keys to the species of *Pseudococcus* Westwood, as presence or absence on the edge of the eye and whether they occur on a sclerotized rim or not.

*B. Ducts:* Ducts have a round orifice and a tube that extends into the body that can be seen by focusing up and down on the orifice. The number and location of these ducts on the body is often used in mealybug identification.

1) Oral collar tubular ducts are sometimes called "tubular ducts" and are found in most mealybugs. The opening of the orifice of these ducts is very narrow and is as wide as the tube. The size and location of these ducts are used mainly in species identification.
2) Oral rim ducts are similar to oral collar tubular ducts but have a sclerotized rim around the orifice and are found in many mealybugs (*Pseudococcus, Paracoccus* Ezzat and McConnell, and others). The number and location of these ducts is often used in the identification of species.
3) Crateriform ducts are very uncommon; of the Egyptian fauna, they only occur in *Heliococcus osborni* Sanders. They are similar to oral rim ducts but their base is raised, heavily sclerotized, and usually has 1–4 short setae that appear star-like when viewed from above. The presence or absence of these ducts is used in the key to genera and their location and size are used to differentiate *Heliococcus* Šulc species.
4) *Ferrisia*-like ducts are only found in *Ferrisia* Fullaway species. They have a sclerotized ring around the orifice of the duct as in oral rim ducts but are much more elongate and have setae and often a pore on (or adjacent to) the rim. The location of these ducts on the body of *Ferrisia* species and the location of the pore is used in species identification.

*C. Cerarii:* Cerarii (cerarius singular) are most commonly located on the lateral margin of the body and are comprised of one or more setae (most often conical in shape) with a cluster of trilocular pores surrounding them. The cerarius may have auxiliary setae which are long flagellate setae that arise from within the cluster of trilocular pores of the cerarii (e.g., in *Pseudococcus*, *Dysmicoccus* Ferris and a few other genera). The number and position of the cerarii are used extensively in keys to mealybug genera and species. In the literature, the individual cerarii have been named or numbered as cerarius 1–18, which correspond to the segments of the body. Some authors name these starting at the head (cerarius 1) to the anal lobe (cerarius 18), while other authors consider the cerarius of the anal lobe as cerarius 1. To clarify this situation, we are proposing that the cerarii of the cephalothorax be labeled cc1–cc10 (cephalothoracic cerarii 1–10) with cc1 being the frontal pair, and cc10 the posteriormost pair. Cerarius cc2 is present in species that have 18 pairs of cerarii and serves as a quick way to determine if the specimen has 18 pairs of cerarii versus 17 pairs or fewer. Species that have 18 pairs have 3 pairs of cerarii at or above the level of the eyes; whereas species with 17 or fewer cerarii have 2 or less cerarii at or above the level of the eye. The cerarii on the abdomen are labeled ca1–8, corresponding to the first through the eighth abdominal segments with ca8 representing the cerarius of the anal lobe.

*D. Dorsal setae:* Dorsal setae are used mainly as supplemental characters in generic and species keys as the shape and relative length (short-long) of the dorsal setae, and the number of conical setae and presence or absence of auxiliary setae in the cerarii. For example, the dorsal setae of species of genus *Phenacoccus* (and some of the other Phenacoccini genera) are characteristically short and spindle-shaped; whereas they are most commonly flagellate in many of the other genera.

**4) Identification tools.** Identification tools (literature, reference specimens, etc.) are essential to understanding the unique set of characters that define the taxon and how they differ from that of other closely related taxa. Currently, there is no comprehensive work on the pseudococcids of Egypt or from other nearby countries. Three of the most important references to have to identify pseudococcid species are Williams and Granara de Willink (1992), Williams and Watson (1988) and Williams (2004). Although these works focus on the fauna of pseudococcids from other regions of the world, they provide an excellent background to the morphology, keys to genera and species and illustrations of all of the species included within them. In addition, many of the species included in these publications are cosmopolitan species, some of which are known to occur in Egypt.

Another essential tool for working with scale insects in general is ScaleNet (García-Morales et al. 2016) which is an online database/website that makes all published taxonomic, host, distribution and other data on scale insects accessible to anyone in the world who has access to the internet. For example, when we first started this project we queried ScaleNet for all of the mealybugs that have been reported in the literature from Egypt. Within seconds, it gave us a list of species and their taxonomic history, hosts and distribution as well as a list of all of the references dealing with the Egyptian fauna of pseudococcids. Note that ScaleNet only includes published data, therefore it is necessary to include any unpublished data from new collections, interceptions and other sources.

Here, we have included only the plant hosts on which mealybug species collected in Egypt were found and their distribution of each species within Egypt. The original name and type locality for each for each species is given along with other names the species have been referred to in the literature dealing with the Egyptian fauna. See ScaleNet (Garcia -Morales et al. 2016) for the complete taxonomic history, hosts, distribution and references. A key is provided with illustrations primarily from literature sources that have dealt with the Egyptian fauna and supplemented by other sources as given in Table 1.

Abbreviations used for type depositories:

**MAPPE** Ministry of Agriculture, Plant Protection Department, Cairo, Egypt.
**NHM** The Natural History Museum, England, UK.

**Table 1.** Host plants of pseudococcids in Egypt.

***Acacia nilotica*** **(Fabaceae)**
*Maconellicoccus hirsutus*
***Acalypha*** **sp. (Euphorbiaceae)**
*Maconellicoccus hirsutus*
***Albizia lebbeck*** **(Fabaceae)**
*Maconellicoccus hirsutus*
*Nipaecoccus viridis*
***Alcea rosea*** **(Malvaceae)**
*Phenacoccus madeirensis*
***Alhagi maurorum*** **(Fabaceae)**
*Spilococcus alhagii*
***Alocasia cuprea*** **(Araceae)**
*Ferrisia virgata*
***Ambrosia polystachya*** **(Asteraceae)**
*Dysmicoccus angustifrons*
*Dysmicoccus trispinosus*
***Andropogon sorghum*** **(Poaceae)**
*Trionymus polyporus*
***Andropogon*** **sp. (Poaceae)**
*Atrococcus halli*
*Kiritshenkella sacchari*
*Trionymus internodii*
***Annona squamosa*** **(Annonaceae)**
*Ferrisia virgata*
***Annona*** **sp. (Annonaceae)**
*Maconellicoccus hirsutus*
***Anthemis*** sp. (Asteraceae)
*Phenacoccus halli*
***Arachis hypogaea*** **(Fabaceae)**
*Maconellicoccus hirsutus*
*Planococcus citri*
***Artemisia judaica*** **(Asteraceae)**
*Spilococcus alhagii*
***Artemisia monosperma*** **(Asteraceae)**
*Fonscolombia artemisiae*
***Arundo donax*** **(Poaceae)**
*Chaetococcus phragmitis*
*Dysmicoccus trispinosus*
*Trionymus internodii*
*Trionymus phragmitis*
*Trionymus polyporus*
*Vryburgia amaryllidis*
***Asparagus officinalis*** **(Asparagaceae)**
*Maconellicoccus hirsutus*
***Avicennia marina*** **(Acanthaceae)**
*Crisicoccus mangrovicus*
***Bambusa*** **sp. (Poaceae)**
*Trionymus internodii*
***Bauhinia*** **sp. (Fabaceae)**
*Maconellicoccus hirsutus*
***Bougainvillea*** **sp. (Nyctaginaceae)**
*Maconellicoccus hirsutus*
***Cajanus cajan*** **(Fabaceae)**
*Maconellicoccus hirsutus*
***Calostemma*** **sp. (Amaryllidaceae)**
*Maconellicoccus hirsutus*
***Camellia*** **sp. (Theaceae)**
*Pseudococcus maritimus*
***Carex comans*** **(Cyperaceae)**
*Dysmicoccus trispinosus*
***Ceratonia siliqua*** **(Fabaceae)**
*Maconellicoccus hirsutus*
***Cestrum nocturnum*** **(Solanaceae)**
*Phenacoccus madeirensis*
***Chenopodium album*** **(Chenopodiaceae)**
*Maconellicoccus hirsutus*
***Chenopodium*** **sp. (Chenapodiaceae)**
*Dysmicoccus angustifrons*
*Dysmicoccus trispinosus*
***Chinochloa colona*** **(Poaceae)**
*Trionymus polyporus*
***Cissus*** **sp. (Vitaceae)**
*Spilococcus alhagii*
***Citrullus vulgaris*** **(Cucurbitaceae)**
*Planococcus citri*
***Cladium mariscus*** **(Cyperaceae)**
*Dysmicoccus trispinosus*
*Dysmicoccus trispinosus*
***Cleome arabica*** **(Capparaceae)**
*Mirococcus inermis*
***Convolvulus*** **sp. (Convolvulaceae)**
*Peliococcus convolvuli*
***Cosmos*** **sp. (Asteraceae)**
*Maconellicoccus hirsutus*
***Cressa cretica*** **(Convolvulaceae)**
*Dysmicoccus brevipes*
*Maconellicoccus cressae*
*Mirococcus inermis*
***Crinum*** **sp. (Amaryllidaceae)**
*Vryburgia amaryllidis*
***Crucianella aegyptiaca*** **(Rubiaceae)**
*Heliococcus osborni*
***Cucurbita*** **sp. (Cucurbitaceae)**
*Phenacoccus solani*
***Cupressus macrocarpa*** **(Cupressaceae)**
*Planococcus vovae*
***Cynodon dactylon*** **(Poaceae)**
*Atrococcus halli*
*Dysmicoccus brevipes*
*Dysmicoccus trispinosus*
*Peliococcopsis priesneri*
*Trionymus polyporus*
*Vryburgia amaryllidis*
***Cynodon*** **sp. (Poaceae)**
*Antonina graminis*
*Antonina natalensis*
***Cyperus*** **sp. (Cyperaceae)**
*Dysmicoccus trispinosus*
*Heterococcus cyperi*
*Kiritshenkella sacchari*
*Trionymus internodii*
*Trionymus polyporus*
*Vryburgia amaryllidis*
***Dactyloctenium aegyptium*** **(Poaceae)**
*Brevennia rehi*
***Dahlia*** **sp. (Asteraceae)**
*Maconellicoccus hirsutus*
***Dianthus caryophyllus*** **(Caryophyllaceae)**
*Pseudococcus maritimus*

***Echinochloa colona*** **(Poaceae)**
*Dysmicoccus trispinosus*
***Echinops spinosissimus*** **(Asteraceae)**
*Spilococcus alhagii*
*Trionymus internodii*
***Eragrostis pilosa*** **(Poaceae)**
*Dysmicoccus trispinosus*
***Euphorbia*** sp. **(Euphorbiaceae)**
*Maconellicoccus cressae*
*Peliococcus convolvuli*
***Ficus carica*** **(Moraceae)**
*Nipaecoccus viridis*
***Ficus platyphylla*** **(Moraceae)**
*Maconellicoccus hirsutus*
***Frankenia pulverulenta*** **(Frankeniaceae)**
*Mirococcus inermis*
***Gardenia*** **sp. (Rubiaceae)**
*Phenacoccus parvus*
***Glebionis coronaria*** **(Asteraceae)**
*Maconellicoccus hirsutus*
***Grevillea robusta*** **(Proteaceae)**
*Maconellicoccus hirsutus*
***Gynandropsis pentaphylla*** **(Capparaceae)**
*Planococcus citri*
***Gypsophila rokejeka*** **(Caryophyllaceae)**
*Phenacoccus gypsophilae*
***Gypsophila*** **sp. (Caryophyllaceae)**
*Phenacoccus gypsophilae*
***Haloxylon*** **sp. (Amaranthaceae)**
*Fonscolombia artemisiae*
***Helianthus annuus*** **(Asteraceae)**
*Maconellicoccus hirsutus*
***Hibiscus schizopetalus*** **(Malvaceae)**
*Maconellicoccus hirsutus*
***Hibiscus*** **sp. (Malvaceae)**
*Phenacoccus solenopsis*
***Hierochloe odorata (*****Poaceae)**
*Trionymus phragmitis*
***Hordeum vulgare*** **(Poaceae)**
*Dysmicoccus trispinosus*
***Hordeum*** **sp. (Poaceae)**
*Trionymus masrensis*
***Imperata cylindrica*** **(Poaceae)**
*Atrococcus halli*
*Dysmicoccus trispinosus*
*Kiritshenkella sacchari*
*Misericoccus imperatae*
*Trionymus masrensis*
*Trionymus williamsi*
***Jacaranda mimosifolia*** **(Bignoniaceae)**
*Maconellicoccus hirsutus*
*Nipaecoccus viridis*
***Jasminum*** **sp. (Rubiaceae)**
*Pseudococcus longispinus*
***Juncus*** **sp. (Juncaceae)**
*Dysmicoccus brevipes*
***Lantana camara*** **(Verbenaceae)**
*Ferrisia virgata*
***Limoniastrum monopetalus*** **(Plumbaginaceae)**
*Erimococcus limoniastri*
***Limonium*** **sp. (Plumbaginaceae)**
*Crisicoccus delottoi*
***Mangifera indica*** **(Anacardiaceae)**
*Planococcus ficus*
*Pseudococcus longispinus*
***Matthiola*** **sp. (Brassicaceae)**
*Ezzatacoccus arabicus*
*Fonscolombia artemisiae*
***Musa acuminata*** **(Musaceae)**
*Phenacoccus solenopsis*
***Narcissus*** **sp. (Amaryllidaceae)**
*Vryburgia amaryllidis*
***Nerium oleander*** **(Apocynaceae)**
*Nipaecoccus viridis*
***Nitraria*** **sp. (Nitrariaceae)**
*Spilococcus alhagii*
***Onopordum*** **sp. (Asteraceae)**
*Heliococcus osborni*
***Opuntia*** **sp. (Cactaceae)**
*Maconellicoccus hirsutus*
***Orobanche*** **sp. (Orobanchaceae)**
*Planococcus citri*
***Panicum turgidum*** **(Poace**ae)
***Antonina natalensis***
*Antonina panica*
*Trionymus internodii*
***Panicum viride*** **(Poaceae)**
*Dysmicoccus trispinosus*
***Panicum*** **sp. (Poaceae)**
*Formicococcus lindingeri*
***Phragmatis communis*** **(Poaceae)**
*Atrococcus halli*
*Chaetococcus phragmitis*
*Kiritshenkella sacchari*
*Trionymus phragmitis*
***Pluchea dioscoridis*** **(Asteraceae)**
*Planococcus citri*
***Polycarpaea repens*** **(Caryophyllaceae)**
*Mirococcus inermis*
***Polypogon*** **sp. (Poaceae)**
*Misericoccus imperatae*
***Psidium guajava*** **(Myrtaceae)**
*Maconellicoccus hirsutus*
*Nipaecoccus viridis*
***Punica granatum*** **(Punicaceae)**
*Planococcus ficus*
***Punica*** **sp. (Punicaceae)**
*Spilococcus alhagii*
***Rhapis excela*** **(Poaceae)**
*Dysmicoccus trispinosus*
***Robinia pseudoacacia*** **(Fabaceae)**
*Maconellicoccus hirsutus*
***Saccharum biflorum*** **(Poaceae)**
*Kiritshenkella sacchari*
*Trionymus internodii*
***Saccharum officinarum*** **(Poaceae)**
*Dysmicoccus boninsis*
*Dysmicoccus trispinosus*
*Formicococcus lindingeri*
*Trionymus internodii*
***Saccharum spontaneum*** **(Poaceae)**
*Kiritshenkella sacchari*
*Saccharicoccus sacchari*
*Trionymus internodii*
***Sarcocornia fruticosa*** **(Amaranthaceae)**
*Humococcus mackenziei*
S***etaria verticillata*** **(Poaceae)**
*Dysmicoccus trispinosus*
***Salsola imbricata (*****Amaranthaceae)**
*Misericoccus salsolicola*
***Schefflera*** **sp. (Araliaceae)**
*Rastrococcus invadens**
***Solanum lycopersicum*** **(Solanaceae)**
*Phenacoccus solenopsis*
*Planococcus citri*
***Solanum nigrum*** **(Solanaceae)**
*Planococcus citri*
***Solanum tuberosum*** **(Solanaceae)**
*Planococcus citri*
***Melia azedarach*** **(Meliaceae)**
*Pseudococcus longispinus*
***Mentha*** **sp. *(*Lamiaceae)**
*Peliococcus convolvuli*
***Sonchus oleracea*** **(Asteraceae)**
*Dysmicoccus angustifrons*
***Sporobolus spicatus*** **(Poaceae)**
*Dysmicoccus brevipes*
*Trionymus internodii*
***Sorghum halepense*** **(Poaceae)**
*Dysmicoccus trispinosus*
*Trionymus polyporus*
***Sorghum halepense*** **(Poaceae)**
*Trionymus polyporus*
***Sorghum vulgare*** **(Poaceae)**
*Trionymus polyporus*
***Statice*** **sp. (Plumbaginaceae)**
*Crisicoccus delottoi*
***Sternbergia*** **sp. (Amaryllidaceae)**
*Vryburgia amaryllidis*
***Suaeda*** **sp. (Amaranthaceae)**
*Spilococcus alhagii*
***Tamarix*** **sp. (Tamaricaceae)**
*Trabutina mannipara*
*Trabutina serpentina*
T***ecoma capensis*** **(Bignoniaceae)**
*Planococcus citri*
***Tecoma*** **sp. (Bignoniaceae)**
*Maconellicoccus hirsutus*
***Trifolium alexandrinum*** **(Fabaceae)**
*Planococcus citri*

**UCD** The Bohart Museum of Entomology, University of California, Davis, California, USA.
**USNM** The United States National Museum of Natural History, Coccoidea collection located at the USDA facility in Beltsville, Maryland, USA.

## Key to species of Pseudococccidae of Egypt

1. Legs, cerarii and ostioles absent; antennae 1–3 segmented; usually found on grasses . . . . . . . . . . . . . . . **2**

— Legs present; cerarii and ostioles present in most species (rarely absent); antennae with more than 3 segments (most commonly with 8–9 segments); hosts variable . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **5**

2(1). Disc-like pores absent on venter of abdomen; duct-like pores present; abdomen tapered posteriorly with posterior most 4 segments (5th–8th abdominal segments, A5–A8) lobed laterally, accordion-like; antennae 1-segmented (rarely 2); large cluster of pores present under posterior spiracles; multilocular pores scattered on venter and dorsum; dorsal setae short, spine-like; 1 species found on *Arundo*, *Phragmites* (Poaceae); (Fig. 6) . . . . . . . . . . . . . . . . . . . . . . . . . . ***Chaetococcus phragmitis* (Marchal)**

— Disc-like pores present on venter of abdomen; duct-like pores absent; abdomen . . . rounded; antennae 2–3 segmented; without cluster of pores present under posterior spiracles; dorsal setae minute, 3 species . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ***Antonina* 3**

3(2). Multilocular disc pores present adjacent to spiracular openings; dorsal setae on posterior abdominal margins long and flagellate; disc-like pores with well-defined rims, varying in diameter, many as wide as a multilocular disc pore, present from metathorax to abdominal segment VI; dorsal setae on posterior abdominal margins thick, stiff and blunt; antennae usually 2 segmented; (Fig. 2) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ***A. graminis* (Maskell)**

— Multilocular disc pores absent adjacent to spiracular openings, trilocular pores only in these positions; antennae 3-segmented . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **4**

4(3). A few trilocular pores mixed with multilocular disc pores present adjacent to spiracular openings; disc-like pores present, extending posteriorly to abdominal segment V; multilocular disc pores on abdomen reaching lateral margins of zones of disc-like pores; large type tubular ducts present only on abdominal segments VI and VIII (Fig. 3) . . . . . . . . . . . . . . . . . . . . . . . . . . . ***A. natalensis* Brain**

— Trilocular pores normally absent entirely from areas adjacent to spiracular openings; disc-like pores, extending posteriorly to abdominal segment VI; majority of multilocular disc pores on abdomen located medially to disc-like pores; large-type tubular ducts present across abdominal segments VII and VIII and anteriorly around margins to prothorax (Fig. 52C) . . . . . . . . . . . . . . . . ***A. panica* Hall**

5(1). Dorsum with 8–18 pairs of cerarii (most commonly 17 or 18) with at least 1 pair on the cephalothorax . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **6**

— Dorsum with 0–5 pairs of cerarii (most commonly 0–2), if present, then only on the abdomen . . . . **30**

6(5). Dorsum with 18 pairs of cerarii (cc2 present, 3 cerarii above the level of the eye on each side of the body); oral rim ducts absent; anal bar present or absent . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **7**

— Dorsum with 8–17 pairs of cerarii (cc2 absent, 0–2 cerarii above the level of the eye on each side of the body); oral rim ducts and anal bar present or absent . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **18**

7(6). Anal bar present; dorsal setae usually relatively long and flagellate, not short and spindle-shaped; antennae 8-segmented . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **8**

— Anal bar absent; dorsal setae short and spindle-shaped; antennae 9-segmented (rarely 8) . . . . . . . . . **11**

8(7). Each cerarius with auxiliary setae and more than 2 conical setae; antennae 7–8 segmented; (Fig. 17) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ***Formicococcus lindingeri* (Bodenheimer)**

— Each cerarius without auxiliary setae and with 2 conical setae; antennae usually 8-segmented . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ***Planococcus* 9**

9(8). Multilocular disc pores absent entirely from ventral abdominal margins; cephalic cerarian setae long and flagellate; translucent pores on hind coxae and tibiae; on *Cupressus* (Fig. 37) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ***Planococcus vovae* (Nasonov)***

— Multilocular disc pores present on ventral abdominal margins; cephalic cerarian setae not as long and flagellate; translucent pores present on hind coxae, present or absent on femora and tibiae .... **10**

10(9). Translucent pores usually present on hind femora; oral collar tubular ducts on head usually 4 or less; lateral margin of abdominal segments A2 and A3 usually with 1–2 multilocular pores on margin; most commonly found on *Punica* and *Vitis* (Fig. 36) ............. ***Planococcus ficus*** **(Signoret)**

— Translucent pores never present on hind femora; oral collar tubular ducts on head 6 or more; A2 and A3 lateral margin usually without 1–2 multilocular pores on margin; polyphagous (Fig. 35) ........ ........................................................ ***Planococcus citri*** **(Risso)**

11(7). Dorsum with crateriform ducts; ostioles absent; 1 species on *Onopordum* and *Crucianella* (Fig. 18) .... ........................................................ ***Heliococcus osborni*** **(Sanders)**

— Dorsum without crateriform ducts; ostioles present; various hosts ........................... **12**

12(11). Dorsum with quinquelocular pores on both the dorsum and venter; circulus absent; on *Cynodon* (Poaceae) (Fig. 26) ........................................ ***Peliococcopsis priesneri*** **(Laing)**

— Dorsum with quinquelocular pores, when present, only on venter; circulus present or absent ...... **13**

13(12). Dorsum with clusters of multilocular pores; circulus present (Fig. 28) ...... ***Peliococcus zillae*** **(Hall)**

— Dorsum with single or transverse rows of multilocular pores when present; circulus present or absent .. **14**

14(13). Multilocular pores on both the dorsum and venter; with some cerarii located dorsomedially; quinquelocular pores present; circulus yoke-shaped; polyphagous (Fig. 30) .......................... ........................................................ ***Phenacoccus madeirensis*** **Green**

— Multilocular pores only on the venter; without cerarii located dorsomedially; quinquelocular pores present or absent; circulus roundish, not yoke-shaped; polyphagous .......................... **15**

15(14). Quinquelocular pores present on venter; circulus present or absent .......................... **16**

— Quinquelocular pores absent; circulus present ............................................ **17**

16(14). Translucent pores absent from hind legs; circulus absent; on *Anthemis* (Asteraceae) (Fig. 29) ........ ........................................................ ***Phenacoccus halli*** **Ezzat**

— Translucent pores present on tibia of hind legs; circulus present; polyphagous (Fig. 31) ............. ........................................................ ***Phenacoccus parvus*** **Morrison**

17(15). Antennae usually 8-segmented (rarely 9); ventral multilocular pores on abdominal segments usually present on segments 4–8 (rarely 5–8); circulus usually small and nearly round; cluster of translucent pores absent from apex of hind femora (Fig. 33) ................... ***Phenacoccus solani*** **Ferris**

— Antennae usually 9-segmented (rarely 8); ventral multilocular pores on abdominal segments usually present on segments 6–8 (rarely 5–8); circulus larger and more oval shaped than in *P. solani*; cluster of translucent pores usually present on apex of hind femora (Fig. 34) ......................... ........................................................ ***Phenacoccus solenopsis*** **Tinsley**

18(6). Cerarii with auxiliary setae; antennae usually 8-segmented (rarely 7); dorsal setae relatively long and flagellate (not short and spindle-shaped) ............................................ **19**

— Cerarii without auxiliary setae present; dorsal setae variable ................................ **24**

19(18). Oral rim ducts present; 17 pairs of cerarii .................................. ***Pseudococcus*** **20**

— Oral rim ducts absent; 5–17 pairs of cerarii ................................. ***Dysmicoccus*** **21**

20(19). Abdominal segments with 3 oral rim ducts on lateral margin of each segment forming a triangle; multilocular pores not extending anteriorly beyond the A6 abdominal segmented (only present around the vulva); eye without discoidal pores along the posterior margin; 17 pairs of cerarii (Fig. 38) .... .............................................. ***Pseudococcus longispinus*** **(Targ.-Tozz.)**

— Abdominal segments with 1 oral rim duct on lateral margin of each segment; multilocular pores extending to A5 abdominal segmented; eye with a discoidal pore along the posterior margin; (Fig. 39) ... ................................................ ***Pseudococcus maritimus*** **(Ehrhorn)**

21(19). With 5–8 pairs of cerarii, all on posterior abdominal segments, except for 1 frontal pair (cc1), each with 2 conical setae; oral collar tubular ducts on dorsum ..................................... **22**

— With 14–17 pairs of cerarii, several present on the cephalothorax; some species with more than 2 conical setae; oral collar tubular ducts absent from dorsum . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **23**

22(21). Circulus present; translucent pores only on hind coxae; 7–8 pairs of cerarii, including 1 pair on the head; multilocular pores absent from dorsum; polyphagous (Fig. 10) . . ***Dysmicoccus boninsis* (Kuwana)**

— Circulus absent; translucent pores only on hind femora and tibiae; 5–6 pairs of cerarii; some multilocular pores present on dorsum; polyphagous (Fig. 9) . . . . . . ***Dysmicoccus angustifrons* (Hall) in part**

23(21). Dorsum with about 14 pairs of cerarii all with conspicuously long setae; antennae normally 7-segmented; circulus absent; A7 dorsal setae not conspicuously longer than setae on other segments, mostly on Poaceae and Cyperaceae (Fig. 12) . . . . . . . . . . . . . . . . . . . . . . . . . . ***Dysmicoccus trispinosus* (Hall)**

— Dorsum with 17 pairs of cerarii with stout conical setae; antennae 8-segmented; circulus present; A7 dorsal setae conspicuously longer than setae on other segments; polyphagous (Fig. 11) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ***Dysmicoccus brevipes* (Cockerell)**

24(18). Oral rim ducts present; dorsum with 16–17 pairs of cerarii, anal bar absent; antennae 8-segmented; dorsal setae long and spine-like; translucent pores present only on hind tibiae; various hosts (Fig. 42) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ***Spilococcus alhagii* (Hall)**

— Oral rim ducts absent; other characters variable . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **25**

25(24). Dorsal setae short and spindle-shaped; antennae 9-segmented; quinquelocular pores present . . . . . . **26**

— Dorsal setae relatively long and flagellate or if conical, then similar to size and shape to cerarian setae (in *Nipaecoccus*); antennae 7–9 segmented; quinquelocular pores present or absent . . . . . . . . . . . . . **28**

26(25). Cerarii numbering 17 pairs, each with numerous truncate-conical setae; circulus transverse (much wider than long); (Fig. 40) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ***Rastrococcus invadens* Willliams****

— Cerarii variable but not with numerous truncate-conical setae; circulus, if present, not transverse . . **27**

27(26). Dorsum with 16 pairs of cerarii and rows of stout spines; circulus present; on *Convolvulus*, *Euphorbia*, *Mentha* (Fig. 7D) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ***Peliococcus convolvuli* (Ezzat)**

— Dorsum with 10 pairs of cerarii (2 on head, 3 on prothorax, 4–5 on abdomen); circulus absent; multilocular pores on both dorsum and venter; quinquelocular pores present; host unknown (Fig. 32) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ***Phenacoccus pyramidensis* Ezzat**

28(25). Anal bar absent; dorsal setae conical, similar in shape and size as cerarian conical setae, the latter widely separated by about the diameter of the conical seta; antennae 7-segmented; cerarii numbering at least 8 pairs; multilocular pores present on the venter of the cephalothorax; polyphagous (Fig. 25) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ***Nipaecoccus viridis* (Newstead)**

— Anal bar present; at least some dorsal setae long and flagellate, not similar in shape and size as cerarian setae; antennae 8-segmented; dorsum with 16–17 pairs of cerarii; on *Avicennia* or *Statice* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ***Crisicoccus* 29**

29(28). Circulus and dorsal oral collar tubular ducts present; on Avicennia (Fig. 8) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ***Crisicoccus mangovicus* Ben-Dov**

— Circulus and dorsal oral collar tubular ducts absent; on Statice (Fig. 7) . . . . ***Crisicoccus delottoi* Ezzat**

30(5). Dorsum with very large and elongate tubular ducts each with orifice surrounded by a flat sclerotized area containing 1 or more setae, situated within or adjacent to the rim; antennae 8-segmented; cerarii present only on anal lobes; polyphagous (Fig. 15) . . . . . . . . . . . . . . . . . ***Ferrisia virgata* (Cockerell)**

— Dorsal tubular ducts, if present, not as above, several genera with oral rim ducts but not as elongate and rim of ducts without setae; number of cerarii variable . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **31**

31(30). Cerarii absent, even from anal lobes . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **32**

— Cerarii present, at least on anal lobes . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **35**

32(31). Body black and round in nature; anal ring incomplete; cluster of large discoidal pores present anterior to anal ring; antennae 6–7-segmented; legs short and stocky, translucent pores present on at least hind coxae; on Tamarix Trabutina . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **33**

— Body not black and round in nature; anal ring complete; cluster of large discoidal pores absent anterior to anal ring; antennae 9-segmented; legs normal, translucent pores absent from hind legs; not found on *Tamarix* . . . . . . . . . . **34**

33(32). Oral collar tubular ducts on venter of thorax noticeably wider than trilocular pores; anal ring surrounded by 70–90 long flagellate setae (Fig. 43) . . . . . . ***Trabutina mannipara* (Hemprich and Ehrenberg)**

— Oral collar tubular ducts on venter of thorax either same width or narrower than trilocular pores; anal ring surrounded by 17–30 long flagellate setae (Fig. 44) . . . . . . . . . . ***Trabutina serpentina* (Green)**

34(32). Quinquelocular pores present on venter; trilocular pores and circulus absent; dorsal setae long and flagellate; multilocular pores present on venter around vulva; on *Cyperus* (Fig. 19) . . . . . . . . . . ***Heterococcus cyperi* (Hall)**

— Quinquelocular pores absent; trilocular pores and circulus present; dorsal setae short, spindle-shaped; multilocular pores present on dorsum and venter; polyphagous on non-grasses (Fig. 24) . . . . . . . . . . ***Mirococcus inermis* (Hall)**

35(31). Oral rim ducts present somewhere on the body, or dorsum with transverse rows of short, wide sclerotized oral collar tubular ducts on abdomen (in some *Vryburgia* species), dorsal setae flagellate. . . . . . . . . . **36**

— Without oral rim ducts or transverse rows of short, wide sclerotized oral collar tubular ducts on abdomen; dorsal setae variable . . . . . . . . . . **40**

36(35). Dorsum with 1 pair of cerarii on anal lobe; antennae 6–7-segmented; anal ring simple without cells and with 3 pairs of short anal ring setae about as long as the ring; on grasses (Fig. 20) . . . . . . . . . . ***Humococcus mackenziei* Ezzat**

— Dorsum with 2–6 pairs of cerarii; antennae 8–9-segmented; anal ring normal with cells and with 3 pairs of long setae much longer than the ring; usually on other hosts than grasses . . . . . . . . . . **37**

37(36). Dorsum with 4–6 pairs (usually 4) of cerarii; anal bar present; antennae 8–9 segmented . . . . . . . . . . ***Maconellicoccus* 38**

— Dorsum with 2 pairs of cerarii (on A7 and A8; antennae 8-segmented (in Egyptian species); anal bar absent . . . . . . . . . . **39**

38(37). Antennae 9-segmented; circulus present; translucent pores absent on hind coxae, present on hind femora and tibiae; oral rim ducts limited to lateral margins of venter; polyphagous (Fig. 23) . . . . . . . . . . ***Maconellicoccus hirsutus* (Green)**

— Antennae usually 8-segmented (rarely 9); circulus absent; translucent pores present on hind coxae; oral rim ducts scattered on the venter; on *Cressa* and *Euphorbia* (Fig. 22) . . . . . . . . . . ***Maconellicoccus cressae* (Hall)**

39(37). Circulus present; translucent pores only on hind coxae (Fig. 4) . . . . . . . . . . ***Atrococcus halli* (McKenzie and Williams)**

— Circulus absent; translucent pores on hind femora and tibiae; absent from hind coxae (Fig. 51) . . . . . . . . . . ***Vryburgia amaryllidis* (Bouche)**

40(35). Circulus large and hour-glass shaped; derm above the hind coxae with many minute pores; lateral margin of A4–A8 with conspicuously long setae; dorsal setae long and flagellate; only known on sugarcane (Fig. 41) . . . . . . . . . . ***Saccharicoccus sacchari* (Cockerell)**

— Circulus not large and hour-glass shaped; derm above the hind coxae without many minute pores; lateral margin of A4–A8 without conspicuously long setae; if on sugarcane, not as above . . . . . . . . . . **41**

41(40). Cerarii with auxiliary setae; antennae usually 8-segmented; circulus absent; 5–6 pairs of cerarii; translucent pores on hind femora and tibiae; polyphagous (Fig. 9) . . . . . . . . . . ***Dysmicoccus angustifrons* (Hall) in part**

— Cerarii without auxiliary setae; other characters variable . . . . . . . . . . **42**

42(41). Quinquelocular pores present on both the venter and dorsum; only posterior pair of ostioles present or discernible; dorsum with 6–8 pairs of cerarii (present on at least A3–A8) . . . . . . . . . . **43**

— Quinquelocular pores, if present, only on venter; ostioles variable; dorsum with 1–4 pairs of cerarii (not present anterior to A5) . . . . . . . . . . **44**

43(42). Dorsal setae short and spindle-shaped; anal lobes without trilocular pores; antennae 6-segmented; circulus absent; translucent pores on hind femora and tibiae; on Poaceae and Cyperaceae (Fig. 5) . . . . . . . . . . ***Brevennia rehi*** **(Lindinger)**

— Dorsal setae relatively long and flagellate; anal lobes with trilocular pores; antennae 6–8-segmented; circulus small and round; translucent pores absent; on *Artemisia* and *Haloxylon* (Fig. 16) . . . . . . . . . . ***Fonscolombia artemisiae*** **(Hall)**

44(42). Dorsal setae short and spindle-shaped or conical; circulus absent; multilocular pores in transverse rows on dorsum and venter; quinquelocular pores present or absent; on non-grasses . . . . . . . . . . **45**

— Dorsal setae flagellate, not short and spindle-shaped or conical; circulus present or absent; multilocular pores variable; quinquelocular pores absent; most species on grasses . . . . . . . . . . **47**

45(44). Anal bar present; antennae 9-segmented; dorsum with clusters of oral collar tubular ducts, each cluster with one to three ducts of two sizes; on *Limoniastrum* (Fig. 13) . . . ***Erimococcus limoniastri*** **Ezzat**

— Anal bar absent; antennae 6- or 9-segmented; dorsum without clusters of oral collar tubular ducts; anal lobe variable . . . . . . . . . . **46**

46(45). Anal ring complete anteriorly; antennae 9-segmented; abdomen with at least 2 pairs of cerarii, but apparently no more than 4 pairs; anal ring setae much longer than the anal ring; presence or absence of quinquelocular pores not known; on *Gypsophila* and *Cichorium* roots (Fig. 52D) . . . . . . . . . . ***Phenacoccus gypsophilae*** **Hall**

— Anal ring incomplete anteriorly; antennae 6-segmented; dorsum with 1 pair of cerarii on anal lobe; anal ring setae not much longer than the anal ring; multilocular pores in single transverse rows on dorsum and venter; dorsal setae conical, two sizes, larger ones at least on head; quinquelocular absent; on *Matthiola* (Fig. 14) . . . . . . . . . . ***Ezzatacoccus arabicus*** **(Ezzat)**

47(44). Oral collar tubular ducts with a wide, flange-shaped collar; a longitudinal band of trilocular pores present medially from the prothorax to A8; circulus absent; antennae 6-segmented; only posterior pair of ostioles present; multilocular pores scattered over the dorsum and venter; on grasses (Fig. 21) . . . . . . . . . . ***Kiritshenkella sacchari*** **(Green)**

— Oral collar tubular ducts without a wide, flange-shaped collar; without a longitudinal band of trilocular pores present medially; circulus present or absent; antennae 6–8-segmented . . . . . . . . . . **48**

48(47). Trilocular pores absent, claw denticle present; antennae 6–7-segmented . . . . . . . . . . **49**

— Trilocular pores present, claw denticle absent; antennae 6–8-segmented . . . . . . . . . . ***Trionymus*** **50**

49(48). Venter with 2 circuli; with 1 pair of cerarii (only on anal lobe); antennae 6-segmented; translucent pores on the hind coxae; on grasses (Fig. 52B) . . . . . . . . . . ***Misericoccus imperatae*** **(Hall)**

— Circulus absent; with 3–4 pairs of cerarii, each with 2 stout spines; antennae 7-segmented; translucent pores on the hind tibiae; on *Salsola* (Fig. 52A) . . . . ***Misericoccus salsolicola*** **(Priesner and Hosny)**

50(48). Dorsum with 1 pair of cerarii (on anal lobes, A8); antennae 7–8-segmented . . . . . . . . . . **51**

— Dorsum with 3 pairs of cerarii (on posteriormost abdominal segments, A6–A8); antennae 6–7-segmented . . . . . . . . . . **54**

51(50). Antennae 7-segmented; circulus hour-glass shaped; legs short, about 2× length of the circulus; on *Arundo*, *Cyperus*, *Hierochloe* and *Phragmatis* (Fig. 13D) . . . . . . . . . . ***Trionymus phragmitis*** **(Hall)**

— Antennae 8-segmented; circulus absent; legs not as short . . . . . . . . . . **52**

52(51). Oral collar tubular ducts having one or more adventitious oral cells adjoining the main orifice of the duct (appears as a tiny oval pore on the side of the duct); anal ring normal; body about 2.2× as long as wide; on *Imperata* (Poaceae) (Fig. 50) . . . . . . . . . . ***Trionymus williamsi*** **Ezzat**

— Oral collar tubular ducts without adventitious oral cells; anal ring with outer pores with some abnormality, either widely spaced in a single row or crowded in a row of about 3–4 pores wide . . . . . . . . . . **53**

53(52). Anal ring with outer band of pores loose, composed of comparatively large and widely spaced pores arranged in a single row; anal lobe apical setae obviously longer than anal ring setae; body elongate, about 2.4× longer than wide; on *Imperata* (Fig. 47) .................. ***Trionymus masrensis* Hall**

— Anal ring with outer band of pores compact, composed of comparatively small pores arranged in a compound row of about 3–4 pores wide; anal lobe apical setae as long or slightly longer than anal ring setae; body not as elongate, about 2.0× longer than wide; on various grasses (Poaceae) and *Cyperus* (Fig. 49) .................................................. ***Trionymus polyorus* Hall**

54(50). Venter with 2 circuli; antennae 7-segmented; only posterior pair of ostioles present; on *Cynodon dactylon* (Fig. 45) ........................................... ***Trionymus cynodontis* (Kiritchenko)**

— Venter with 1 circulus; antennae 6-segmented; anterior and posterior pairs of ostioles present; on various Poaceae and Cyperaceae (Fig. 46) .............................. ***Trionymus internodii* (Hall)**

*the report of the occurrence of this species in Egypt is erroneous, however we include it in the key since it is present in several nearby countries and may be recorded from Egypt in the future.

**record of *Rastrococcus invadens* in Egypt based on an interception recorded from Italy.

# Checklist of Pseudococcidae of Egypt

Much of the information below was summarized from more detailed information found in ScaleNet (García-Morales et al. 2016). Taxonomic data for the species below includes only the references of the type locality for each species and other names the species has been called in publications dealing with the Egyptian fauna. We have included only the distribution and host plants on which they were collected in Egypt. The complete taxonomic history, host plants and distribution records for these species can be found in ScaleNet (García-Morales et al. 2016).

### *Antonina graminis* (Maskell, 1897)

(Figure 2, after Williams 2004).

**Taxonomy.** *Sphaerococcus graminis* Maskell 1897a: 244. Type data. HONG KONG: on grass.

*Antonina graminis* (Maskell); Fernald 1903: 121.

**Hosts in Egypt.** *Cynodon* sp. (Takahashi 1928).

**Distribution in Egypt.** Giza (Mohammed et al. 1995).

**Remarks.** This species is worldwide in distribution and has been found on many hosts, most of which are in the families Poaceae or Cyperaceae. It was first reported in Egypt by Takahashi (1928). Mohammed et al. (1995) provided a redescription and illustration of the species. Williams (2001) provided descriptions, illustrations and a key to the African species of *Antonina* that included this species. This species is known as the "rhodesgrass scale" and is the most widespread and injurious species of the genus. It has been reported from most tropical and temperate areas, often causing damage to pasture and lawn grasses, and is often reported from bamboo species.

### *Antonina natalensis* Brain, 1915

(Figure 3, after Mohammed et al. 1995).

**Taxonomy.** *Antonina natalensis* Brain 1915: 86. Type data. SOUTH AFRICA: Natal, on grass; Mohammed et al. 1995: 491.

*Erium natalense* (Brain, 1915); Lindinger 1935: 122. change of combination.
*Antonina natalensis* Brain, not a synonym of *A. panica* according to Mohammed et al. 1995.

**Hosts in Egypt.** *Cynodon* sp. (Takahashi 1928), *Panicum turgidum* (Hall 1925), Mohammed et al. (1995).

**Distribution in Egypt.** Hamet el Abeed (Hall 1925); Geneifa (Mohammed et al. 1995); Suez Road (Mohammed et al. 1995).

**Remarks.** De Lotto (1958) synonymized this species with *Antonina indica panica* Hall, 1925 and *Antonina transvaalensis* Brain, 1915; the former was removed from synonymy by (Mohammed et al. 1995: 491) who also provided a redescription and illustration of the species. Yang and Kosztarab (1967) found distinct morphological differences between the first instar nymphs of *Antonina transvaalensis* and *Antonina natalensis* to justify their treatment as distinct species. Williams (2001) provided descriptions, illustrations and a key to the African species of *Antonina* that included this species.

### *Antonina panica* Hall, 1925

(Figure 52C, after Hall 1925)

**Taxonomy.** *Antonina indica panica* Hall 1925: 6. Type data. EGYPT: Hamet el Abeed, on *Panicum turgidum.*

**Hosts in Egypt.** *Panicum turgidum* (Hall 1925).

**Distribution in Egypt.** Hamet el Abeed (Hall 1925).

**Remarks.** Hall (1925) stated that this species was usually found in the fork at the branching of the stem. It has also been found in Algeria, Israel and Jordan. Williams (2001) provided descriptions, illustrations and a key to the African species of *Antonina* that included this species.

### *Atrococcus halli* (McKenzie and Williams, 1965)

(Figure 4, after Ezzat 1962)

**Taxonomy.** *Trionymus indecisus* Hall 1923: 12. Type data. EGYPT: Mansura and Giza, on *Imperata cylindrica.*

*Spilococcus indecisus* (Hall, 1923); Ezzat 1962a: 61, change of combination.

*Chorizococcus halli* McKenzie and Williams, 1965: 3; replacement name for *Chorizococcus indecisus* (Hall) due to homonymy with *Chorizococcus indecisus* (Cockerell, 1901).

*Spilococcus halli* (McKenzie and Williams, 1965); Danzig 1998: 126. revived combination previously published by Tang (1992) and later by Danzig (1998).

*Atrococcus halli* (McKenzie and Williams, 1965); Danzig and Gavrilov-Zimin 2014: 253. change of combination.

**Hosts in Egypt.** *Andropogon* sp., *Cynodon dactylon*, *Imperata cylindrica*, *Phragmatis communis* (Hall 1926a).

**Distribution in Egypt.** Mansuram Giza (Hall 1923; 1926a).

**Remarks.** Hall (1923) stated that this species was found between the leaf sheath and the parent stem of *Imperata cylindrica.* This species only has 2 pair of cerarii on the posteriormost abdominal segments (A7, A8). Williams and Granara de Willink (1992) separated *Chorizococcus* from *Spilococcus* based on the number of cerarii; *Chorizococcus* has fewer than 6 pairs and *Spilococcus* has 6 or more pairs. Danzig and Gavrilov-Zimin (2015) placed it in the genus *Atrococcus,* which according to Kosztarab and Kozar (1988) also has 1–7 pairs of cerarii but lacks a circulus (except in *A. bejjienkoi*) the latter is present or absent in *Chorizococcus.* There does not appear to be a clear morphological distinction between *Chorizococcus* and *Atrococcus,* however specimens of *Atrococcus* become black when placed in alcohol or KOH and *Chorizococcus* species presumably do not. This species is also similar to *Vryburgia* species in that it has 2 pairs of cerarii on the anal lobe (ac8) and penultimate segment (ac7) and oral rim ducts; however this species has a circulus which is absent in all known *Vryburgia* species. Based on what we know, it appears that this species is best placed in *Atrococcus* Goux, 1941 which has taxonomic priority of *Chorizococcus* McKenzie, 1960.

### *Brevennia rehi* (Lindinger, 1943)

(Figure 5, after Williams 2004)

**Taxonomy.** *Ripersia rehi* Lindinger 1943: 152. replacement name for *Ripersia sacchari oryzae* Fletcher, 1917. Type data. INDIA: Tirhut and Bihar, on rice.

**Host plants in Egypt.** *Dactyloctenium aegyptium* (Abd-Rabou 2001).

**Distribution in Egypt.** (Abd-Rabou 2001).

**Remarks.** This is a cosmopolitan species known from many species of Poaceae and Cyperaceae with one record on a palm (Arecaceae).

### *Chaetococcus phragmitis* (Marchal, 1909)

(Figure 62, after Kosztarab 1996: 80.)

**Taxonomy.** *Antonina phragmitis* Marchal 1909: 872. Type data. FRANCE: Agay (Var), on *Phragmites gigantea*.

**Hosts in Egypt.** *Arundo donax* (Hall 1926a)*; Phragmites communis* (Mohammed et al. 1995).

**Distribution in Egypt.** Giza (Hall 1923), Helwan (Mohammed et al. 1995), Alexandria (Mohammed et al. 1995).

**Remarks.** Hall (1923) stated that this species was found between the leaf sheaths and the parent stem of *Phragmites communis.* It is known from many countries in Europe and several states in the United States and is only known to attack *Arundo* and *Phragmites* (Poaceae). Mohammed et al. (1995) provided a redescription of the species.

### *Crisicoccus delottoi* Ezzat, 1959

(Figure 7, after Ezzat 1959c)

**Taxonomy.** *Crisicoccus delottoi* Ezzat 1959c: 401. Type data. EGYPT: Zukari, on *Statice* sp.

**Hosts in Egypt.** *Statice* sp. (Ezzat 1959c), *Limonium* sp. (Ezzat 1959c).

**Distribution in Egypt.** 40 km south of Zukari (Ezzat 1959c).

**Remarks.** This species has been found only on *Statice* and *Limonium* in Egypt.

### *Crisicoccus mangrovicus* Ben-Dov, 1975

(Figure 7, after Ben-Dov 1975)

**Taxonomy.** *Crisicoccus mangrovicus* Ben-Dov 1975: 452. Type data. EGYPT: Sinai Peninsula, Nabek, on *Avicennia marina.*

**Hosts in Egypt.** *Avicennia marina* (Ben-Dov 1975).

**Distribution in Egypt.** Sinai Peninsula, Nabek (Ben-Dov 1975).

### *Dysmicoccus angustifrons* (Hall, 1926)

(Figure 9, after Ezzat 1962b)

**Taxonomy.** *Trionymus angustifrons* Hall 1926b: 11. Type data. EGYPT: the Barrage, 1925 on *Ambrosia maritima* (=*Ambrosia polystachya*) and *Sonchus oleracea*; Hosny 1939: 8.

*Dysmicoccus angustifrons* (Hall, 1926); Matile-Ferrero, Williams & Kaydan 2015: 309 –312, change of combination.

**Hosts in Egypt.** *Ambrosia polystachya* (Hall 1926b); *Chenopodium* sp. (Hosny 1939); *Sonchus oleracea* (Hall 1926b); *Urtica* sp. (Hall 1926b).

**Distribution in Egypt.** Barrage (Hall 1926b); El-Marg, Gebel Asfar, Shebin-el-Kanater (Hosny 1939).

**Remarks.** Hosny (1939) reported this species on the roots of *Ambrosia maritima* (=*Ambrosia polystachya*) and *Chenopodium* sp. It occurs in many European countries and China and has been recorded on 83 genera in 24 plant families, including grasses (Poaceae).

### *Dysmicoccus boninsis* (Kuwana, 1909)

(Figure 10, after Williams 2004)

**Taxonomy.** *Dactylopius (Pseudococcus) boninsis* Kuwana 1909: 161. Type data. JAPAN: Ogasawara (Bonin) Islands, on sugar cane.

*Pseudococcus aegyptiacus* Hall, 1925: 8; synonymy according to Hall 1926b: 33.

**Hosts in Egypt.** *Saccharum officinarum* (Hall 1925).

**Distribution in Egypt.** Mit Ghamr, Lower Egypt (Hall 1925).

**Remarks.** Hall (1925) stated that this species (as *Pseudococcus aegyptiacus*) was found just below the node of *Saccharum officinarum,* sheltered by the enveloping leaf sheath. This is a cosmopolitan species found on 32 genera in 12 families including some grasses.

### *Dysmicoccus brevipes* (Cockerell, 1893)

(Figure 11, after Williams 2004)

**Taxonomy.** *Dactylopius brevipes* Cockerell 1893: 267. Type data. JAMAICA: Kingston, on pineapples.

*Dysmicoccus brevipes* (Cockerell); Ferris 1950b: 59.
*Pseudococcus bromeliae* Hempel; Fernald 1903: 98; Hall 1923; Hosny 1939: 4.

**Hosts in Egypt.** *Cressa cretica*, *Cynodon dactylon*, *Juncus* sp., *Sporobolus spicatus*.

**Distribution in Egypt.** Willcocks (1922); Giza (Hall 1923); Ezbet-el-Nakhl and Maadi (Hosny 1939).

**Remarks.** Hall (1923) stated that this species (as *Pseudococcus bromeliae*) was both a subterranean and an aerial feeder, attacking the roots of sedge. According to Hosny (1939) this species was first found in Egypt on roots of *Phoenix* sp. in the Royal Gardens of Kubbeh in 1932. Hosny (1939) reported *D. bromeliae* (a synonym of *D. brevipes*) on roots of *Asparagus* sp. in Ezbet-el-Nakhl and on the roots of *Cyperus* sp. in Maadi.

### *Dysmicoccus trispinosus* (Hall, 1923)

(Figure 12, after Ezzat 1960c)

**Taxonomy.** *Pseudococcus trispinosus* Hall 1923: 5; Type data. EGYPT: Nag Hamadi, on roots of *Imperata cylindrica;* Hosny 1939: 6.

**Hosts in Egypt.** *Ambrosia polystachya*, *Arundo donax*, *Carex comans*, *Chenopodium* sp., *Cladium mariscus*, *Cynodon dactylon*, *Cyperus* sp. (Hosny 1939), *Echinochloa colona*, *Eragrostis pilosa* (Hosny 1939), *Hordeum vulgare, Imperata cylindrica*, *Panicum viride* (Hosny 1939), *Rhapis excela*, *Saccharum officinarum*, *Setaria verticillata*, *Sorghum halepense*, *Zea mays* (Hall 1923).

**Distribution in Egypt.** Nag Hamadi, Upper Egypt, various localities in the Nile Delta, Giza and Nag Hamadi in Upper Egypt, 1924–1939 (Hall 1923); Bilbeis, Belkas, Damanhour, Minia-el-Kamh, Shebin-el-Kom, Talkha (Hosny 1939).

**Remarks.** Hall (1925) stated that this species was found on the roots of sedge, *Panicum*, maize and sugarcane. It is most commonly found on Poaceae and Cyperaceae but has also been collected on *Chenopodium* (Amaranthaceae) and *Ambrosia* (Asteraceae). It is known also to occur in Israel. Hosny (1939) reported it on the roots of *Cyperus*, *Panicum viride* and *Eragnotis pilosa*. Ezzat (1960a) redescribed and illustrated the species.

### *Erimococcus limoniastri* (Priesner and Hosny, 1935)

(Figure 13, after Ezzat 1965b)

**Taxonomy.** *Phenacoccus limoniastri* Priesner and Hosny 1935: 112. Type data. EGYPT: Mersa Matrouh, on *Limoniastrum monopetalus*.

*Erimococcus limoniastri* (Priesner and Hosny, 1935); Ezzat 1965b: 169, change of combination.

**Hosts in Egypt.** *Limoniastrum monopetalus* (Priesner and Hosny 1935).

**Distribution in Egypt.** Mersa, Marouh (Priesner and Hosny 1935).

**Remarks.** This is the only record of this species. Ezzat (1965b) and Mohammed et al. (1995) redescribed and illustrated this species.

### *Ezzatacoccus* Evans and Abd-Rabou, new genus

(Figure 14, after Ezzat 1960a)

**Type species.** *Amonostherium arabicum* Ezzat 1960a: 23.

**Diagnosis.** Body of adult female broadly oval, membranous; cerarii present only on the anal lobes membranous, poorly developed with rounded posterior margin, each cerarius consisting of 2 conical-shaped setae, about 4 trilocular pores and a short spindle-shaped seta; antennae 6-segmented; legs relatively short and slender, translucent pores present on the hind tibiae, claws with a small denticle; circulus absent; dorsum with two well developed pairs of ostioles; anal ring situated a short distance from the apex of the abdomen, bearing 3 pairs of relatively short setae, about as long as the anal ring; cisanal and obanal setae short, each about 15 um long; dorsal setae short, spindle-shaped, as in *Phenacoccus* species; ventral setae on lateral and sublateral margin similar to dorsal setae, medial setae of venter long and flagellate; multilocular pores scattered sparsely on both the dorsum and venter of the cephalothorax and abdomen; oral collar tubular ducts sparsely distributed on dorsum and venter each sclerotized with the anterior end slightly more bulbous.

**Comments.** Ezzat (1960a) assigned this species in the genus *Amonostherium* stating that "this species could be easily distinguished from any other species in the genus *Amonostherium* by having six-jointed antennae and two pairs of prominent ostioles". He noted that "the inclusion of the species in the genus requires some extension in the limits of the genus concerning the presence or absence of ostioles and the number of antennal joints". Species of *Amonostherium* are similar to *Ezzatacoccus arabicus* in that they have cerarii present on the anal lobes only, lack a circulus and have a claw denticle, but differ in that they have 7–8 segmented antennae, have either no ostioles or one pair of poorly developed ones on the abdomen, the dorsal setae flagellate, except for a few scattered spindle-shaped setae located medially, ventral setae similar in form and length, legs short and stout, multilocular pores present only on the venter and the oral collar tubular ducts of 2 sizes, one size more slender than the other but both are parallel sided. *Ezzatacoccus* has 6-segmented antennae, 2 pairs of prominent ostioles, the dorsal setae short and spindle-shaped (as in other Phenacoccinae), ventral setae of 2 kinds with those along the submargin and margin short and spindle-shaped similar to the dorsal setae and those located medially long and flagellate, legs short but slender, multilocular pores present on the venter and dorsum, oral collar tubular ducts of 1 size, one size being more bulbous, one size more slender than the other but both are parallel sided.

*Ezzatacoccus* is also similar to *Mirococcus* Borchsenius, 1947 which has the posterior margin rounded, two pairs of prominent ostioles, a claw denticle, multilocular pores on both the venter and dorsum, but differs in that it has 7–9 segmented antennae, lacks cerarii, quinquelocular pores sometimes present and has short flagellate dorsal setae.

Danzig and Gavrilov-Zimin (2014) transferred *Amonostherium arabicum* to the genus *Phenacoccus* Cockerell, 1893 stating that the species "is not related in our mind with the type (American) species of the genus *Amonostherium, A. lichtensioides* (Cockerell, 1897), but can be covered by the diagnosis of *Phenacoccus* accepted here". *Ezzatacoccus arabicus* is similar to most *Phenacoccus* species in that it has short spindle-shaped dorsal setae and a claw denticle, but differs primarily by having 6-segmented antennae, cerarii present on the anal lobes only, and the posterior margin rounded whereas most species of *Phenacoccus* have 18 pairs of cerarii, but rarely fewer than 10 pairs; the anal lobes protruding so that the posterior margin is not rounded, and 9 segmented antennae (rarely 8 or fewer). Since *Amonostherium arabicum* Ezzat, 1960a has a unique combination of characters that do not clearly fit in any of these genera without greatly expanding the concept of the genus, we hereby erect a new genus.

**Etymology.** *Ezzatacoccus* is named in honor of Yehia M. Ezzat for his numerous works on the scale insects of Egypt and the discovery of the type species; gender masculine.

### *Ezzatacoccus arabicus* (Ezzat, 1960), new combination

(Figure 14, after Ezzat 1960a)

**Taxonomy.** *Amonostherium arabicum* Ezzat 1960a: 23. Type data. EGYPT: Burg el Arab, 14.iv.1934, on *Matthiola* sp.

*Phenacoccus arabicus* (Ezzat, 1960a); Danzig and Gavrilov-Zimin 2014: 252, change of combination.

**Hosts in Egypt.** *Matthiola* sp. (Ezzat 1960a).

**Distribution in Egypt.** Burg el Arab (Ezzat 1960a).

**Remarks.** Ezzat (1960a) provided a good description and illustration of this species.

### *Ferrisia virgata* (Cockerell, 1893)

(Figure 15, after Williams 2004)

**Taxonomy.** *Dactylopius virgatus* Cockerell 1893: 178. Type data. JAMAICA: Kingston, 1892, TD Cockerell collector.

*Ferrisiana virgata* (Cockerell); Takahashi 1929: 429, change of combination; Ezzat 1962d: 160.

*Ferrisia virgata* (Cockerell); Fullaway 1923: 308, change of combination.

**Hosts in Egypt.** *Alocasia cuprea*, *Annona squamosa*, *Lantana camara* (Ezzat 1962d).

**Distribution in Egypt.** (Ezzat 1962d); (Abd-Rabou 2001); (Abd-Rabou and Evans 2021).

**Remarks.** This is a very polyphagous and common cosmopolitan species.

### *Fonscolombia artemisiae* (Hall, 1926)

(Figure 16, after Mohammed et al. 1995)

**Taxonomy.** *Ripersia artemisiae* Hall 1926b: 10. Type data. EGYPT: Suez Road (6th Tower), on *Artemsia monosperma.*

*Euripersia artemisiae* (Hall, 1926a); Ezzat 1962d: 160, Mohammed et al. 1995: 495–497.
*Fonscolombia artemisiae* (Hall, 1926a); Danzig 2007: 363, change of combination; Mohammed et al. 1995: 495-497.

**Hosts in Egypt.** *Artemisia monosperma* (Hall 1926b); roots of *Matthiola* (Hosny 1939).

**Distribution in Egypt.** 6th tower Suez Road in 1925 (Hall 1926b); (Hosny 1939); Mariout (Hosny 1939).

**Remarks.** This species has also been recorded in Jordan on *Haloxylon* (Amaranthaceae). Redescription and illustration by Mohammed et al. (1995).

### *Formicococcus lindingeri* (Bodenheimer, 1924), revised status

(Figure 17, after Ezzat and McConnell 1956)

**Taxonomy.** *Pseudococcus lindingeri* Bodenheimer, 1924: 81. Type data. ISRAEL: Miqwe Yisrael, on *Panicum colonum.*

*Planococcoides lindingeri* (Bodenheimer, 1924); Cox and Ben-Dov 1986: 482, change of combination.
*Formicococcus lindingeri* (Bodenheimer, 1924); Williams and Matile-Ferrero 2005a: 150, change of combination.
*Planococcus lindingeri* (Bodenheimer, 1924); Ben-Dov 1980: 269, change of combination; Danzig and Gavrilov-Zimin 2015: 18.
*Pseudococcus variabilis* Hall, 1924. Type data: EGYPT: Sheikh Fadl, on *Saccharum officinarum*, and ISRAEL: Jaffa, *on Saccharum officinarum;* Hosny 1939: 4; synonymy by Ben-Dov 1980: 269.
*Planococcus variabilis* (Hall, 1924); Type data: EGYPT: Sheikh Fadl, on *Saccharum officinarum*, and ISRAEL: Jaffa, *on S. officinarum;* Ezzat and McConnell 1956: 101, change of combination.

**Hosts in Egypt.** *Panicum* sp., *Saccharum officinararum* (Hall 1924); Hosny (1939) reported this species (as *Pseudococcus variabilis* Hall) on the roots of *Convolvulus* sp., *Cyperus* sp., *Panicum viride* and *Zygophyllum album.*

**Distribution in Egypt.** Sheikh Fasdl, Upper Egypt (Hall 1924); Alexandria, Ayat, Belkas, Beni-Suef, El Mex, Embabeh, Fayoum, Mehalla-el-Kobra, Nahia, Shebin-el-Kom, Shebin-el-Kanater, Talkha and Wasta (Hosny 1939).

**Remarks.** Hall (1924) described this species as *Pseudococcus variabilis* and stated that it was found between the leaf-sheath and parent stem, but both the roots and the crown of *Panicum* were attacked. Hall's illustration of the posterior margin of the species shows the setae on the penultimate segment of the abdomen (A7) as having 2 conical spine-like setae and 3 long flagellate auxiliary setae and no anal bar on the ventral surface of the anal lobe. Hosny (1939) reported that this was one of the most common coccoids that occur on roots in Egypt. This species has been recorded on 23 genera in 11 plant families, some in the families Poaceae and Cyperaceae and is also known to occur in Israel.

### *Heliococcus osborni* (Sanders, 1902)

(Figure 18, after Ezzat 1960b)

**Taxonomy.** *Phenacoccus* (*Paroudablis*) *osborni* Sanders 1902: 284. Type data. U.S.A.: Ohio, on *Platanus occidentalis*.

**Hosts in Egypt.** *Crucianella aegyptiaca, Onopordum* sp; Rubiaceae: (Ezzat 1960b).

**Distribution in Egypt.** El Salloum, 1936 (Ezzat 1960b).

**Remarks.** This is a polyphagous species on non-grass hosts; it is also known to occur in the USA, Canada and Sweden. Ezzat (1960b) provided a redescription and illustration of this species.

### *Heterococcus cyperi* (Hall, 1926)

(Figure 19, after Ezzat 1960d)

**Taxonomy.** *Phenacoccus cyperi* Hall 1926b: 4. Type data. EGYPT: Kharga Oasis, on *Cyperus* sp.

**Hosts in Egypt.** *Cyperus* sp. (Hall 1926b).

**Distribution in Egypt.** Kharga Oasis in 1925 (Hall 1926b).

**Remarks.** This species is only known from the type collection. Ezzat (1960d) provided a re-description and illustration of the species. Miller (1975) included this species in his revision of the genus *Heterococcus*.

### *Humococcus mackenziei* Ezzat, 1959

(Figure 20, after Ezzat 1959b)

**Taxonomy.** *Humococcus mackenziei* Ezzat 1959b: 409. Type data. EGYPT: Alexandria, El-Max, on *Zygophyllum album*.

**Hosts in Egypt.** *Sarcocornia cellulose*, *Zygophyllum album*, *Zygophyllum* sp. (Ezzat 1959b).

**Distribution in Egypt.** Alexandria, El-Max (Ezzat 1959b).

**Remarks.** This species has only been found in Egypt on these hosts. Ezzat (1959b) provided a description and illustration of the species.

### *Kiritshenkella sacchari* (Green, 1900)

(Figure 21, after Willliams 2004)

**Taxonomy.** *Ripersia sacchari* Green 1900: 37. Type data. INDIA: Gorakhpur, on sugarcane.

*Ripersia cellulosa* Hall, 1923: 7. Type data. EGYPT: Armant, Nag Hamadi, Cairo and Giza on *Imperata cylindrica* and *Saccharum biflorum;* Hosny 1939: 10; synonymy according to Williams 1970: 1.

**Hosts in Egypt.** *Agropogon* sp., *Cyperus* sp., *Imperata cylindrica*, *Phragmites australis*, *Saccharum biflorum*, *Saccharum spontaneum*; roots of *Imperata cylindrica* (Hosny 1939).

**Distribution in Egypt.** Armant, Nag'Hamadi, Upper Egypt, Old Cairo, Giza (Hall 1923); El-Marg (Hosny 1939).

**Remarks.** This species occurs in the Europe and Asia and is usually found on Poaceae and Cyperaceae but has also been recorded once on *Ailanthus (*Simaroubaceae). Discussion by Mohammed et al. (1995).

### *Maconellicoccus cressae* (Hall, 1927), new combination

(Figure 22, after Ezzat 1962b)

**Taxonomy.** *Phenacoccus hirsutus cressae* Hall 1927c: 270. Type data. EGYPT: in the desert near Khanka, 1926, on *Cressa cretica.*

*Trionymus euphorbiae* Hall 1927c: 271. Type data. EGYPT: Sollum, on *Euphorbia* sp.; synonymy according to Ezzat 1962b: 72.

*Trionymus cressae* (Hall, 1927); Ezzat 1962b: 72, change of combination.

**Hosts in Egypt.** *Cressa cretica*, *Euphorbia* sp. (Hall 1927c).

**Distribution in Egypt.** in the desert near Khanka; Sollum (Hall 1927c).

**Remarks.** Hall (1927c) described *Phenacoccus hirsutus var. cressae* as a variety of *Maconellicoccus hirsutus* as having 8–9 antennal segments, but usually 8 segments. Like *Maconellicoccus hirsutus,* it has oral rim ducts on both the dorsum and venter, an anal bar, and 4 pairs of cerarii on the 4 posteriormost abdominal segments but differs primarily in lacking a circulus and usually having 8-segmented antennae versus *M. hirsutus* which has a circulus and 9-segmented antennae. In the key to the species of *Maconellicoccus* provided by Williams (1996), this species would key to *Maconellicoccus leptospermi* Williams in that it lacks a circulus, has 4 pairs of cerarii and has oral collar tubular ducts on the dorsum, but differs that species and other *Maconellicoccus* species by having translucent pores on the hind coxae. This species is also known to occur in Jordan and Turkey on the hosts mentioned above. Ezzat (1962b) provided a good re-description and illustration of the species.

### *Maconellicoccus hirsutus* (Green, 1908)

(Figure 23, after Williams 2004)

**Taxonomy.** *Phenacoccus hirsutus* Green 1908a: 25. Type data. INDIA, on undetermined shrub; Hosny 1939: 2.

*Maconellicoccus hirsutus* (Green); Hall 1926c; Ezzat 1958: 380, change of combination; Ezzat 1962d: 161.

**Host plants in Egypt.** *Acacia nilotica*, *Acalypha* sp., *Albizia lebbeck*, *Annona* sp., *Arachis hypogaea*, *Asparagus officinalis*, *Bauhinia* sp., *Bougainvillea* sp., *Cajanus cajan*, *Calostemma* sp., *Ceratonia siliqua*, *Chenopodium album*, *Cosmos* sp., *Dahlia* sp., *Ficus platyphylla*, *Glebionis coronaria*, *Grevillea robusta*, *Helianthus annuus*, *Hibiscus schizopetalus*, *Jacaranda mimosifolia*, *Opuntia* sp., *Psidium guajava*, *Robinia pseudoacacia*, *Tecoma* sp., *Vitis vinifera*, *Zea mays*.

**Distribution in Egypt.** Alexandria in 1924 (Hall 1921), Mattariah, Maadi, Bilbeis, El-Saff, Barrage (Hosny 1939).

**Remarks.** This is a very polyphagous, cosmopolitan species. Hall (1921) first reported its presence in Egypt. Hosny (1939) reported a heavy infestation of this species on the roots of beans in Maadi and on *Arachis hypogaea* (peanuts) from Sharkieh.

### *Mirococcus inermis* (Hall, 1925)

(Figure 24, after Ezzat 1965a)

**Taxonomy.** *Phenacoccus inermis* Hall 1925: 7. Type data. EGYPT: Helwan, on roots of *Zygophyllum simplex;* Hosny 1939: 2.

*Aegyptococcus inermis* (Hall); Ezzat 1965a: 163-167, change of combination.

**Hosts in Egypt.** *Cleome arabica*, *Cressa cretica*, *Frankenia pulverulenta*, *Polycarpaea repens*, *Zygophyllum simplex* (Hall 1925).

**Distribution in Egypt.** near Helwan in 1908 (Hall 1925), Alexandria, El-Max, Maadi, Helwan (Hosny 1939).

**Remarks.** This is a polyphagous species recorded on 31 genera in 16 plant families, including some grasses; it is known from Europe and North Africa. In their discussion of the species, Mohammed et al. (1995) stated that Ezzat (1965a) redescribed and illustrated this species showing the presence of quinquelocular pores.

### *Misericoccus imperatae* (Hall, 1923)

(Figure 52B, after Hall 1923)

**Taxonomy.** *Ripersia imperatae* Hall 1923: 8. Type data. EGYPT: Heliopolis, on *Imperata cylindrica*.

*Misericoccus imperatae* (Hall, 1923); Ezzat 1961: 68, change of combination.

**Hosts in Egypt.** *Imperata cylindrica* (Hall 1923), *Polypogon* sp. (Hall 1923).

**Distribution in Egypt.** Heliopolis (Hall, 1923).

**Remarks.** This species is known from Corsica, France, Iraq and Israel; it is only known to feed on grasses.

### *Misericoccus salsolicola* (Priesner and Hosny, 1935), new combination

(Figure 52A, after Priesner and Hosny 1935)

**Taxonomy.** *Ripersia salsolicola* Priesner and Hosny 1935: 114. Type data. EGYPT: North of Mersa Halaib at the Red Sea Coast, on *Salsola foetida*.

*Octococcus salsolicola* (Priesner and Hosny); Ezzat 1962d: 163, change of combination.

**Host.** *Salsola imbricata* (Priesner and Hosny 1935).

**Distribution.** Egypt (Priesner and Hosny 1935).

**Remarks.** Priesner and Hosny (1935) provided the following details of the species: antennae 7-segmented; tarsal claw with a denticle; translucent pores conspicuous on hind tibiae; anal ring feebly developed with 3 pairs of short setae (35µm); 3–4 pairs of cerarii, each with 2 stout spines; discoidal pores (probably refers to multilocular pores) in a sparse transverse series across the venter; micropores (probably refers to trilocular pores) absent even on anal lobes; and no translucent circular area (circulus) on the abdomen. Ezzat (1962d) stated that "a thorough search proved that no material of this species exists in the Coccid Collection of the Egyptian Ministry of Agriculture. Dr. Williams kindly examined a single transparent specimen of this species in the British Museum and replied that it has some relation to the genus *Octococcus* Hall. Since *salsolicola* lacks general features of *Ripersia* as now understood and since no material, Williams' opinion is here accepted and this species is transferred to *Octococcus*". Miller and Giliomee (2016) considered this species to be a *nomen dubium* stating that "based on the original description and illustration it appears that the dorsal setae are either not enlarged or only slightly enlarged, the setae on the hind legs are all approximately of the same thickness, there are no translucent pores on the hind coxa, and the antennae are 7-segmented with only a slight indication of a division of the distal segment. There apparently are no trilocular pores and there is no indication that there are oral rim tubular ducts. The wax covering is said to be very thin and it occurs on a non-asteraceous host in North Africa. All of these character states are inconsistent with species of *Octococcus*. We are here treating this species as a *nomen dubium* since the original type series has been lost or destroyed and the description is insufficient to place it". Although the specimens from which Priesner and Hosny used to describe the species are apparently lost, the authors provided a description and illustrations of the species that indicate that the species may belong to the genus *Misericoccus* based on the denticle on the claw, apparent lack of trilocular pores, 6-segmented antennae and flagellate dorsal setae. This species is similar to *Fonscolombia artemisiae* (Hall) which was found on the same host plant in Egypt and has a claw denticle; however the latter species has trilocular pores.

### ***Nipaecoccus viridis*** **(Newstead, 1894)**

(Figure 25, after Williams 2004)

**Taxonomy.** *Dactylopius viridis* Newstead 1894: 5. Type data. INDIA: Madras, Nungumbaukum, on *Hygrophila spinosa*.

*Dactylopius perniciosus* Newstead and Willcocks 1910: 138. Type data: EGYPT: Cairo, on *Albizia lebbek*; synonymy according to Zimmerman 1948: 245.

*Pseudococcus perniciosus* (Newstead, 1920); Hall 1923: 35-36.

**Hosts in Egypt.** *Albizia lebbek*, *Ficus carica*, *Jacaranda mimosifolia*, *Nerium oleander*, *Psidium guajava*, *Vitis vinifera* (Hall 1923).

**Distribution in Egypt.** No locality data (Hall 1923).

**Remarks.** This is a very polyphagous species known from many Old World countries and was recently found in Florida (USA) (Stocks and Hodges 2010). Deeter and Ahmed (2023) provided a list of the hosts and localities on which this species has been found.

### ***Peliococcopsis priesneri*** **(Laing, 1936)**

(Figure 26, after Ezzat 1960e)

**Taxonomy.** *Phenacoccus priesneri* Laing 1936: 80. Type data. EGYPT: Giza, on grass. *Peliococcus priesneri* (Laing, 1936); Ezzat 1960d: 51, change of combination.

**Hosts in Egypt.** *Cynodon dactylon* (Laing 1936).

**Distribution in Egypt.** Dokki, Cairo (Laing 1936).

**Remarks.** This is a European species known only to feed on grasses. Ezzat (1960d) provided an illustration and redescription of the species. Danzig (2001) and Danzig and Gavrilov-Zimin (2014) reviewed the Palearctic species of this genus.

### ***Peliococcus convolvuli*** **(Ezzat, 1960)**

(Figure 27 after Ezzat 1960a)

**Taxonomy.** *Spinococcus convolvuli* Ezzat 1960a: 28. Type data. EGYPT: Talkha, on *Convolvulus* sp.

*Peliococcus convolvuli* (Ezzat, 1960a); Danzig 1980: 118, change of combination.

**Hosts in Egypt.** *Convolvulus* sp., *Euphorbia* sp., *Mentha* sp. (Ezzat 1960a).

**Distribution in Egypt.** Mansourah, Minia el Qamh, Nahiah, Sandub, Talkha (Ezzat 1960a); Belkas, Benha, Damanhour, Dokki, El-Wasta, Fayum, Kafr-el-Zayat, Mehalla-el-Kobra, Mineih, Shebin-el-Dom, Sherbin, Tanta (Hosny 1939).

**Remarks.** This species is known only to occur in Egypt. Ezzat (1960a) provided a good description and illustration of the species. Hosny (1939) reported this species as *Phenacoccus* sp. and said that it was under study by E.E. Green who apparently did not describe the species. Danzig (2001) and Danzig and Gavrilov-Zimin (2014) included this species in their review of the Palearctic species of this genus.

### *Peliococcus zillae* (Hall, 1926)

(Figure 28, after Ezzat 1960e)

**Taxonomy.** *Phenacoccus zillae* Hall 1926b: 5. Type data. EGYPT: Fayed (Suez), on *Zilla spinosa;* Hosny 1939: 3.

**Hosts in Egypt.** *Zilla spinosa* (Hall 1926b; Hosny 1939; Ezzat 1960d).

**Distribution in Egypt.** Sallum, Fayed, near Suez in 1925 (Hall 1926; Ezza, 1960d), Helwan Desert (Hosny 1939).

**Remarks.** Ezzat (1960d) provided a good illustration and re-description of the species. It has also been recorded in Tajkistan and Turkmenistan and on Acanthaceae: *Avicennia marina*; Asteraceae: *Centaurea*; Fabaceae: *Glycyrrhiza*; Rutaceae: *Haplophyllum*; and Zygophyllaceae: *Zygophyllum*. Danzig (2001) and Danzig and Gavrilov-Zimin (2014) reviewed the Palearctic species of this genus.

### *Phenacoccus gypsophilae* Hall, 1927

(Figure 52D, after Hall 1927c)

**Taxonomy.** *Phenacoccus gypsophilae* Hall 1927c: 268. Type data. EGYPT: Khanka, on roots of *Gypsophila rokejeka*.

**Hosts in Egypt.** *Gypsophila capillaris, Gypsophila rokejeka, Gypsophila* sp. (Hall 1927c).

**Distribution in Egypt.** in desert near Khanka (Hall 1927c).

**Remarks.** Hall (1927c) stated that this species attacks the roots of its hosts. Mohammed et al. (1995) discussed the species.

### *Phenacoccus halli* Ezzat, 1962

(Figure 29, after Mohammed et al. 1995)

**Taxonomy.** *Phenacoccus halli* Priesner and Hosny 1935. Type data. EGYPT: Giza, Pyramids, on roots of *Anthemis* sp., 10.iv.1930, collector unknown; lectotype and paralectotype designated by Mohammed et al. 1995: 501; Ezzat 1962d: 163-164.

**Hosts in Egypt.** *Anthemis* sp. (Priesner and Hosny 1935).

**Distribution in Egypt.** Pyramids (Priesner and Hosny 1935; Ezzat 1962d).

**Remarks.** Mohammed et al. (1995) provided a description and illustration of this species. Ezzat (1962) credited Priesner and Hosny (1935) with the authorship of the species; however, the paper he referred to has no mention of this species. Based on Ezzat's (1962d) brief description of the species, he is considered the author of the species.

### *Phenacoccus madeirensis* Green, 1923

(Figure 30, after Williams 2004)

**Taxonomy.** *Phenacoccus madeirensis* Green 1923: 90. Type data. MADEIRA: Funchal, on unidentified plant.

**Hosts in Egypt.** *Alcea rosea*, *Cestrum nocturnum* (Badr and Moharum 2017).

**Distribution in Egypt.** Al-Amriya, Alexandria Governorate; Giza Governorate (Badr and Moharum 2017).

**Comment.** Badr and Moharum (2017) first reported this species in Egypt.

### *Phenacoccus parvus* Morrison, 1924

(Figure 31, after Williams 2004)

**Taxonomy.** *Phenacoccus parvus* Morrison 1924a: 147. Type data. ECUADOR: Galapagos Islands, Tover, on bush near shore.

**Hosts in Egypt.** *Gardenia* sp. (Abd-Rabou et al. 2010).

**Distribution in Egypt.** (Abd-Rabou et al. 2010).

**Remarks.** This is a very polyphagous, cosmopolitan species that is known to occur in Egypt since 2010.

### *Phenacoccus pyramidensis* Ezzat, 1960

(Figure 32, after Ezzat 1960a)

**Taxonomy.** *Phenacoccus pyramidensis* Ezzat 1960a: 26. Type data. EGYPT: Giza Pyramids, on undetermined host.

**Hosts in Egypt.** unknown (Ezzat 1960a).

**Distribution in Egypt.** Giza (Ezzat 1960a).

**Remarks.** Ezzat (1960a) provided a good description and illustration of the species.

### *Phenacoccus solani* Ferris, 1918

(Figure 33, after Williams 2004)

**Taxonomy.** *Phenacoccus solani* Ferris 1918: 60. Type data. U.S.A.: California on *Hemizonia rudis*.

**Hosts in Egypt.** *Cucurbita* sp. (Dewer et al. 2018).

**Distribution in Egypt.** Rosetta (Dewer et al. 2018).

**Remarks.** This is a very polyphagous, cosmopolitan species known to occur in Egypt since 2018.

### *Phenacoccus solenopsis* Tinsley, 1898

(Figure 34, after Kosztarab, 1996).

**Taxonomy.** *Phenacoccus solenopsis* Tinsley 1898: 47. Type data. U.S.A.: New Mexico, no host plant data.

**Hosts in Egypt.** *Hibiscus* sp. (Abd-Rabou et al. 2010), *Musa acuminata* (El-Fatih and Ahmed 2015), *Solanum lycopersici* (Ibrahim et al. 2015).

**Distribution in Egypt. (**Abd-Rabou et al. 2010); Qalyoubia Governorate (Ibrahim et al. 2015); El-Wasta, Beni-Swief Governorate (El-Fatih and Ahmed 2015); Dakahlia Governorate (Moharum et al. 2017).

**Remarks.** Nabil et al. (2015) reported this species on four economic plants in Egypt. Moharum et al. (2017) reported on a survey of *Phenacoccus solenopsis* Tinsley on host plants in Dakahlia Governorate, Egypt. El-Zahi et al. (2016) reported on the presence and control of this species on cotton in Egypt. Watson (2020) reported on the distribution and hosts and provided illustrations of this species. El-Zahi et al. (2016) reported on the economics of this pest.

### *Planococcus citri* (Risso, 1813)

(Figure 35, after Williams 2004).

**Taxonomy.** *Dorthesia citri* Risso 1813: 416. Type data. FRANCE: Menton, on *Citrus* spp. *Pseudococcus citri phenacocciformis* Brain 1915: 116. Type data: SOUTH AFRICA: Cape Province, Rosebank, on *Bouvardia* sp., synonymy according to Ezzat and McConnell 1956: 65; Hall 1926b: 6.

*Planococcus citri* (Risso); Ferris 1950: 165, change of combination; Ezzat 1962d: 164.

**Hosts in Egypt.** *Tecoma capensis*, *Trifolium alexcasndrinum* (Hall 1926b); on the roots of *Arachis hypogaea*, *Citrullus vulgaris*, *Gynandropsis pentaphylla*, *Orobanche*, *Pluchea dioscoridis*, *Solanum tuberosum*, *Solanum lycopersicum*, *Solanum nigrum* and *Zygophyllum* (Hosny 1939).

**Distribution in Egypt.** Mataria (Hall 1926b); Alexandra, Barrage, Bilbeis, Dokki, El-Max, Ein-el-Sheikh, Khargah and Mansourah (Hosny 1939).

**Remarks.** This is a very polyphagous, cosmopolitan species known to occur in Egypt since 1926.

### ***Planococcus ficus*** **(Signoret, 1875)**

(Figure 36, after Williams 2004).

**Taxonomy.** *Dactylopius ficus* Signoret 1875: 315. Type data. FRANCE: Hyeres and Nice, on figs.

*Planococcus ficus* (Signoret); Ezzat and McConnell 1956: 79, new combination; Ezzat 1962d: 164.

**Host plants in Egypt.** *Mangifera indica*, *Punica granatum*, *Vitis vinifera* (Ezzat and McConnell 1956).

**Distribution in Egypt.** No locality information (Ezzat and McConnell 1956).

**Remarks.** This is a very polyphagous, cosmopolitan species.

### ***Planococcus vovae*** **(Nasonov, 1909)**

(Figure 37, after Ezzat and McConnell 1956)

**Taxonomy.** *Pseudococcus* (*Dactylopius*) *vovae* Nasonov 1909: 484. Type data. POLAND: Skolimov, on *Juniperus*.

*Planococcus vovae* (Nasonov, 1909); Danzig 1980: 168, change of combination.

**Host plants in Egypt.** *Cupressus macrocarpa* (Halima-Kamel et al. 2019).

**Distribution in Egypt.** Not known to occur in Egypt. The report of this species in Egypt by Halima-Kamel et al. (2019) was based on a record given in Abd-Rabou et al. (2012) of which the DNA sample for this species was from France as opposed to Egypt. This species is present in many European countries and may eventually be found in Egypt.

**Remarks.** This species is usually found on evergreens in the Cupressaceae and Taxaceae families, but has also been recorded on Araceae, Lauraceae and Moraceae species. It is widely distributed in Europe and also occurs in China. Williams and Granara de Willink (1992) also provided a good illustration of the species.

### ***Pseudococcus longispinus*** **(Targioni-Tozzetti, 1867)**

(Figure 38, after Williams 2004)

**Taxonomy.** *Dactylopius longispinus* Targioni Tozzetti 1867: 75. Type data. ITALY: Florence, Botanical Gardens, on *Cycas revoluta*.

*Pseudococcus longispinus* (Targioni-Tozzetti, 1867); Cockerell 1902: 252, change of combination.

**Hosts in Egypt.** *Cycas revoluta, Draceana sp., Jasminum* sp., *Mangifera indica*, *Melia azedarachi, Pittosporum* sp. (Ezzat and Rashad 1962), *Vitis vinifera* (Hall 1922a).

**Distribution in Egypt.** Alexandria, Embabeh, Moharrem Bay, Zohria (Ezzat and Rashad 1962), Cairo (Hall 1922a).

**Remarks.** Hall (1925) stated that this species was common in certain nurseries in Cairo particularly under glass. It is a very polyphagous, cosmopolitan species.

### ***Pseudococcus maritimus*** **(Ehrhorn, 1900)**

(Figure 39, after Ezzat and Rashad 1962)

**Taxonomy.** *Dactylopius maritimus* Ehrhorn 1900: 316. Type data. U.S.A.: California, Santa Cruz, on roots of *Eriogonum latifolium*.

**Hosts in Egypt.** *Camellia* sp., carnation (=*Dianthus caryophyllus*) Caryophyllaceae (Ezzat and Rashad 1962).

**Distribution in Egypt.** Damanhour, Zagazig (Ezzat and Rashad 1962).

**Remarks.** Ezzat and Rashad (1962) were the first to report this species in Egypt.

### ***Rastrococcus invadens*** **Williams, 1986**

(Figure 40, after Williams 2004)

**Taxonomy.** *Rastrococcus invadens* Williams 1986b: 696. Type data. PAKISTAN: Karachi, on *Mangifera indica*.

**Hosts in Egypt.** *Schefflera* sp. (Porcelli and Pellizzari 2019).

**Distribution in Egypt.** (Porcelli and Pellizzari 2019).

**Note.** Porcelli and Pellizzari (2019) stated that this record refers to an interception at the Rome's airport (Ciampino) off an infested *Schefflera* sp. (Araliaceae) imported from Egypt, 17.VI.1994, determined by Marotta. It is a very polyphagous species known to occur in Europe, Asia, Africa and the Pacific Islands; its presence in Egypt needs to be confirmed by a collection of the species in Egypt.

### *Saccharicoccus sacchari* (Cockerell, 1895)

(Figure 41, after Williams 2004)

**Taxonomy.** *Dactylopius sacchari* Cockerell 1895: 195. Type data. TRINIDAD: St Ann's, on sugarcane;

*Pseudococcus sacchari* (Cockerell, 1895); Ferris 1950: 217, change of combinaton; Hall 1922a: 13.

**Hosts in Egypt.** *Saccharum spontaneum* (Hall 1922a).

**Distribution in Egypt.** Upper Egypt in 1921 (Hall 1922a).

### *Spilococcus alhagii* (Hall, 1926), revived status

(Figure 42, after Ezzat 1960d)

**Taxonomy.** *Pseudococcus alhagii* Hall 1926b: 7. Type data. EGYPT: Masara on *Alhagi maurorum* roots; Hosny 1939: 4.

*Spilococcus alhagii* (Hall, 1926b); Ezzat 1960d: 43, change of combination.

*Atrococcus alhagii* (Hall, 1926b); Danzig and Gavrilov-Zimin 2015: 238, change of combination.

*Atrococcus bartangica* Bazarov 1975: 52. Type data. TADZHIKISTAN: West Pamir, Yazgulemsk Ridge, on *Scutellaria* sp., synonomy according to Pellizzari and Williams 2013: 411.

**Hosts in Egypt.** *Alhagi maurorum* (Hall 1926b), *Echinops spinosissimus* (as *Echinops spinosus*) (Hall 1926b), *Artemisia judaica*, *Cissus* sp., *Nitraria* sp., *Punica*, *Suaeda*, *Ziziphus*, *Zygophyllum eichwaldii* (Hosny 1939).

**Distribution in Egypt.** On the edge of the desert at Masara and Heliopolis (Hall 1926b); Maadi and Maasarab (Hosny 1939).

**Comment.** Hosny (1939) reported this species on the roots of *Alhagi maurorum* in Maadi Desert and on the roots of *Echinops* sp. in Maasarab.

### *Trabutina mannipara* (Hemprich and Ehrenberg, 1829)

(Figure 43, after Willliams 2004).

**Taxonomy.** *Coccus manniparus* Hemprich and Ehrenberg in Ehrenberg 1829: 1. Type data. EGYPT: Sinai Peninsula, Wadi Nasib, on *Tamarix* sp.

*Trabutina leonardii* Silvestri; Mohammed et al. 1995: 504.

**Hosts in Egypt.** *Tamarix* sp. (Ehrenberg 1829).

**Distribution in Egypt.** Sinai Peninsula, Wadi Nasib, (Ehrenberg 1829); Wadi Firan (Mohammed et al. 1995).

**Remarks.** Mohammed et al. (1995) redescribed and illustrated this species (as *T. leonardii*). Danzig and Miller (1996) included this species in their systematic revision of the genus *Trabutina.*

### *Trabutina serpentina* (Green, 1919)

(Figure 44, after Willliams, 2004).

**Taxonomy.** *Naiacoccus serpentinus* Green 1919: 117. Type data. INDIA: Lahore, on *Tamarix*; *Naiacoccus serpentinus* var. minor Green; Hall 1923: 3. Type Egypt: Suez, 27.vii.1921.

**Hosts in Egypt.** *Tamarix* sp. (Hall, 1923).

**Distribution in Egypt.** Cairo, Beni Suef, Fayum, Kharga Oasis, (Hall, 1925), Suez (Mohammed et al. 1995).

**Remarks.** Hall (1923) stated that this species was found on small twigs of its host. Mohammed et al. (1995) provided a redescription and illustration of this species. Danzig and Miller (1996) included this species in their systematic revision of the genus *Trabutina.*

### *Trionymus cynodontis* (Kiritchenko, 1932)

(Figure 45, after Willliams, 2004).

**Taxonomy.** *Ripersia cynodontis* Kiritchenko 1932: 139. Type data. UZBEKISTAN: Samarkand, on *Cynodon dactylon*.

**Hosts in Egypt.** Unknown.

**Distribution in Egypt.** No locality mentioned in Danzig (1998).

**Remarks.** First reported in Egypt by Danzig (1998). This species is found only on grasses.

### *Trionymus internodii* (Hall, 1923)

(Figure 46, after Ezzat, 1962b)

**Taxonomy.** *Ripersia internodii* Hall 1923: 8. Type data. EGYPT: Gezira, on *Saccharum officinarum;* Hosny 1939: 10.

*Trionymus internodii* (Hall, 1923); Ezzat 1962b: 75

**Hosts in Egypt.** *Andropogon* sp., *Arundo donax*, *Bambusa* sp., *Cyperus* sp., *Echinochloa colona*, *Panicum turgidum*, *Saccharum biflorum*, *Saccharum officinarum*, *Saccharum spontaneum*, *Sporobolus spicatus*, *Zea mays*; roots of *Panicum turgidum* and *Zea mays* (Hosny 1939).

**Distribution in Egypt.** Gezira, Minya (Hall 1923); Dokki and Wasta (Hosny 1939).

**Remarks.** Hall (1923) stated that this species was found between the leaf sheaths and the parent cane of sugarcane.

### *Trionymus masrensis* Hall, 1925

(Figure 47, after Hall 1925)

**Taxonomy.** *Trionymus masrensis* Hall 1925: 10. Type data. EGYPT: Kharga Oasis, on *Imperata cylindrica;* Hosny 1939: 9; Mohammed et al. 1995: 508–509.

**Hosts in Egypt.** *Imperata cylindrica* (Hall 1925), *Hordeum* sp. (Hosny 1939).

**Distribution in Egypt.** Kharga Oasis in 1924 (Hall 1925); (Hosny 1939), Mariout (Hosny 1939).

**Remarks.** Hosny (1939) reported this species on the stems and roots of *Imperata cylindrica* and barley (*Hordeum*).

### *Trionymus phragmitis* (Hall, 1923)

(Figure 48, after Ezzat 1962)

**Taxonomy.** *Ripersia phragmitis* Hall 1923: 10. Type data. EGYPT: Gezira, on *Phragmites communis*.

*Pseudococcus phragmitis* (Hall, 1923); Borchsenius 1949: 153, change of combination.
*Trionymus phragmitis* (Hall, 1923); Ezzat 1962b: 79, change of combination.

**Hosts in Egypt.** *Arundo donax*, *Hierochloe odorata*, *Phragmites communis* (Hall, 1923).

**Distribution in Egypt.** Gezira (Hall 1923).

**Remarks.** Hall (1923) stated that this species was collected between the stem and enveloping leaf sheath of *Phragmatis communis* (now called *Phragmatis australis*).

### *Trionymus polyporus* Hall, 1924

(Figure 49, after Ezzat 1962b)

**Taxonomy.** *Trionymus polyporus* Hall 1924: 6. Type data. EGYPT: Gezireh, on *Andropogon sorghum* [= *Sorghum vulgare*].

**Hosts in Egypt.** *Andropogon sorghum*, *Arundo donax*, *Chinochloa colona*, *Cynodon dactylon*, *Cyperus* sp., *Sorghum bicolor*, *Sorghum halepense*, *Sorghum vulgare* (Hall 1924).

**Distribution in Egypt.** No locality data (Hall 1924).

**Remarks.** Hall (1924) stated that this species was found below the leaf sheath of *Andropogon sorghum*.

### *Trionymus williamsi* Ezzat, 1959

(Figure 50, after Ezzat 1959a)

**Taxonomy.** *Trionymus williamsi* Ezzat 1959a: 405. Type data. EGYPT: Maadi, on *Imperata cylindrica*.

**Hosts in Egypt.** *Imperata cylindrica* (Ezzat 1959a).

**Distribution in Egypt.** Maadi, Barrage (Ezzat 1959a).

**Remarks.** Ezzat (1959a) stated that this species is unusual because it has adventitious/ auxiliary pores adjacent to the oral collar tubular ducts, which are also found in the genus *Anisococcus*.

### *Vryburgia amaryllidis* (Bouché, 1837)

(Figure 51, after Hall, 1923).

**Taxonomy.** *Coccus amaryllidis* Bouché 1837: 99. Type data. THE NETHERLANDS: Poeldijk, on *Amaryllis* sp.

*Trionymus lounsburyi* Brain 1912: 179; Hosny 1939: 8; synonymy according to Ben-Dov and Cox 1990: 80).

*Trionymus crini* Hall 1923: 11. Type data. EGYPT: Cairo, on *Crinum* sp. and Port Said, on *Narcissus* sp; synonymy according to Hall 1920: 20.

**Hosts in Egypt.** *Arundo* sp., *Crinum* sp., *Cynodon dactylon*, *Cyperus* sp., *Narcissus* sp., *Sternbergia* sp. (Hall 1923); (Hosny 1939).

**Distribution in Egypt.** Cairo, Port Said (Hall 1923); Cairo (Hosny 1939).

**Remarks.** Hall (1923) stated that this species (as *Trionymus crini* Hall) was found low down between the fleshy leaves just above the ground. Hosny (1939) reported this species on the roots of *Crinum* sp. in Cairo.

### Other species reported from Egypt

*Pseudococcus comstocki* (Kuwana, 1902) was reported by Ezzat and Rashad (1962), who stated that "the existence of this species in Egypt is still of much doubt. Only a single poor specimen of the species is available in the collection at hand. Even this was found on bananas from a shop in Cairo on January 26, 1922, and ever since apparently no similar material has ever arrived to the Department of Plant Protection".

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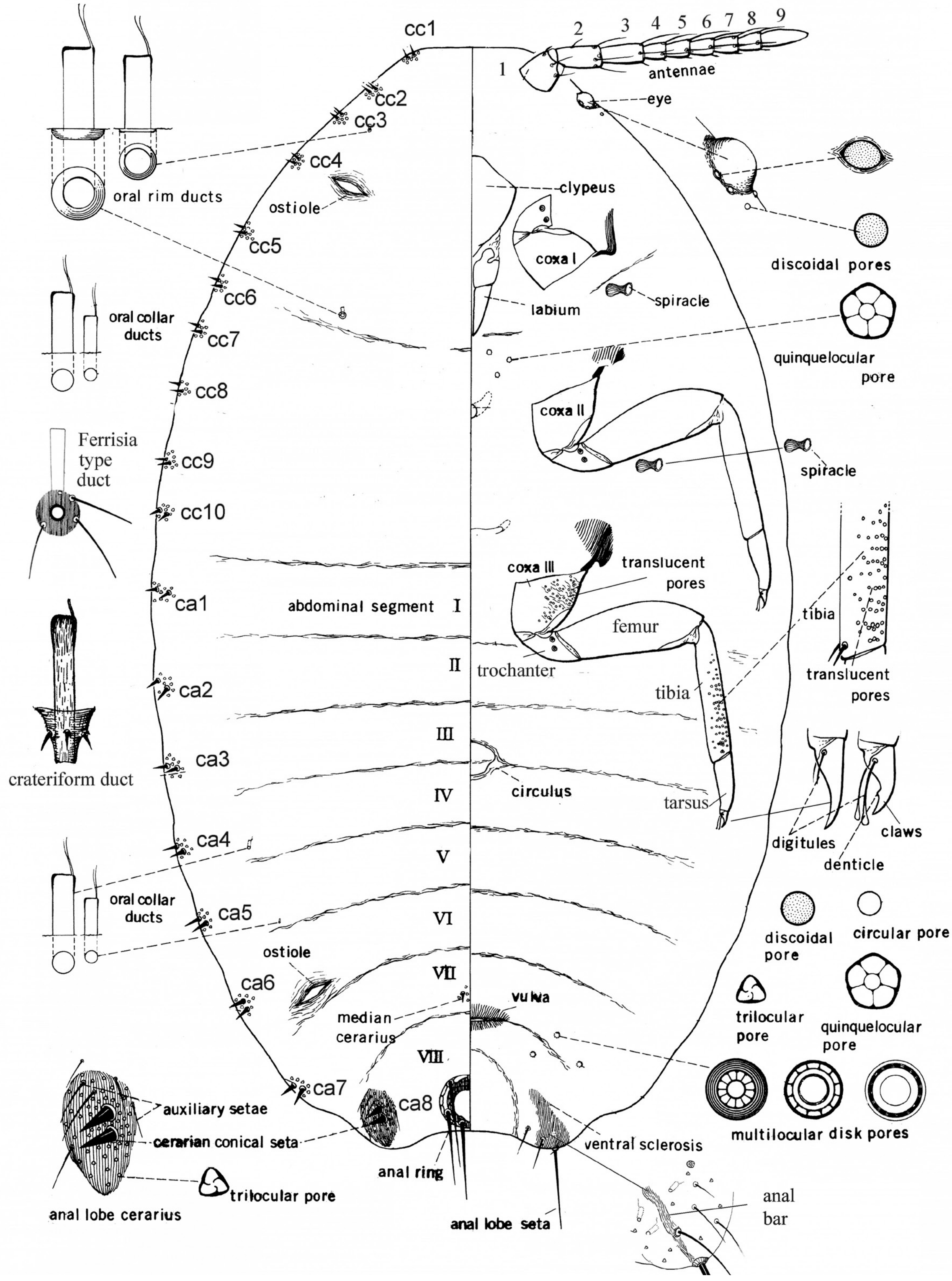


**Figure 1**. Morphological terms used in Pseudococcidae. **A)** Antennae. **B)** Hind leg—translucent pores (tp), claw denticles (cd), tarsal denticles (td). **C)** Habitus—cephalothoracic cerarii 1–10 (c1–c10), abdominal cerarii 1–8 (ac1–ac8). **D)** Cerarii. **E)** Pores—multilocular pore (ml), quinquelocular pore (qp), trilocular pore (tl), discoidal pore (dp). **F)** Ducts— oral rim tubular duct (or), oral collar tubular duct (oc), crateriform duct (cf), *Ferrisia*-type duct (fd). **G)** Anal lobe, dorsal. **H)** Anal ring. **I)** Anal lobe, ventral. Source: modified from Williams (2004).

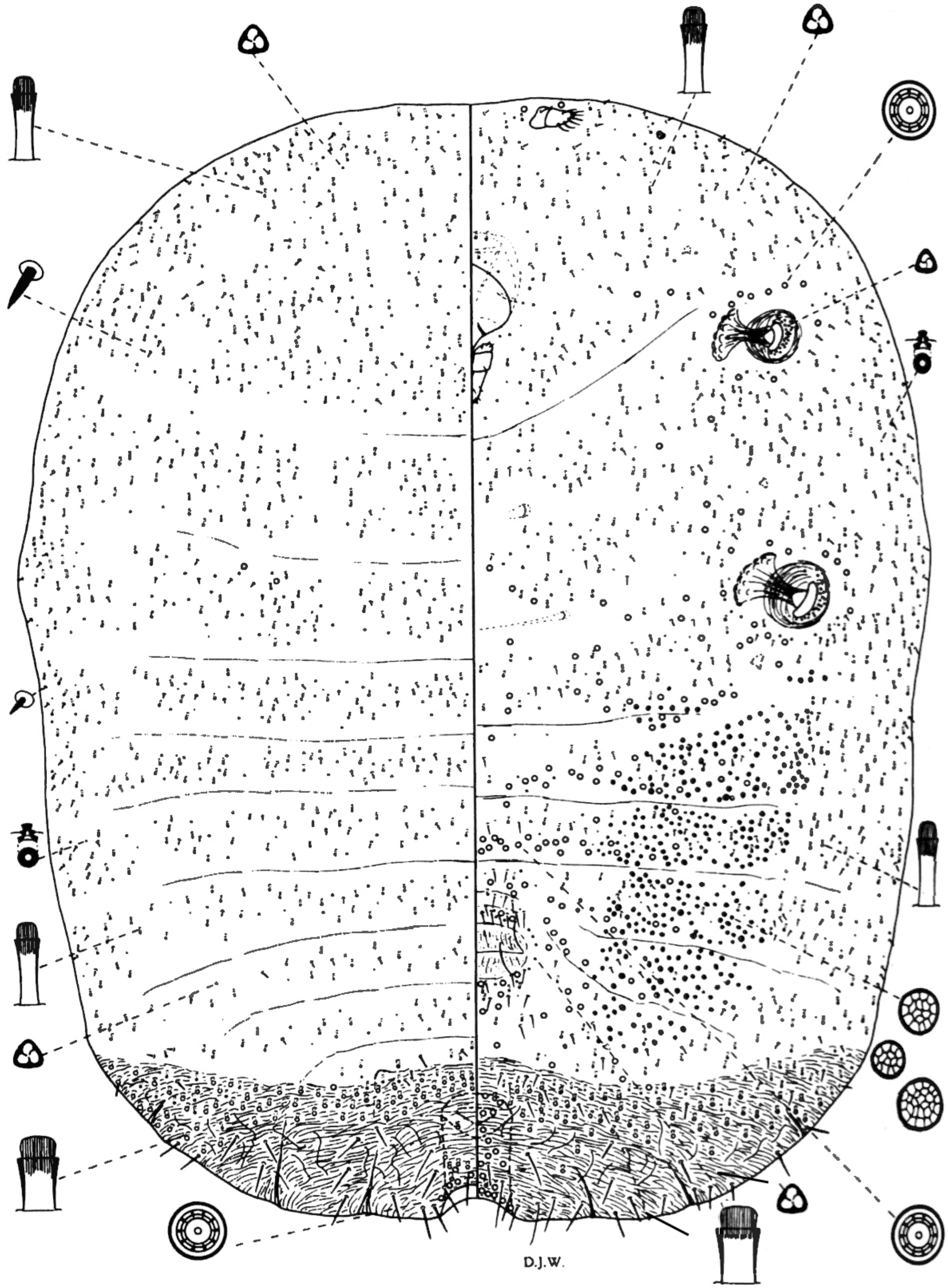


**Figure 2.** *Antonina graminis* (after Williams 2004).

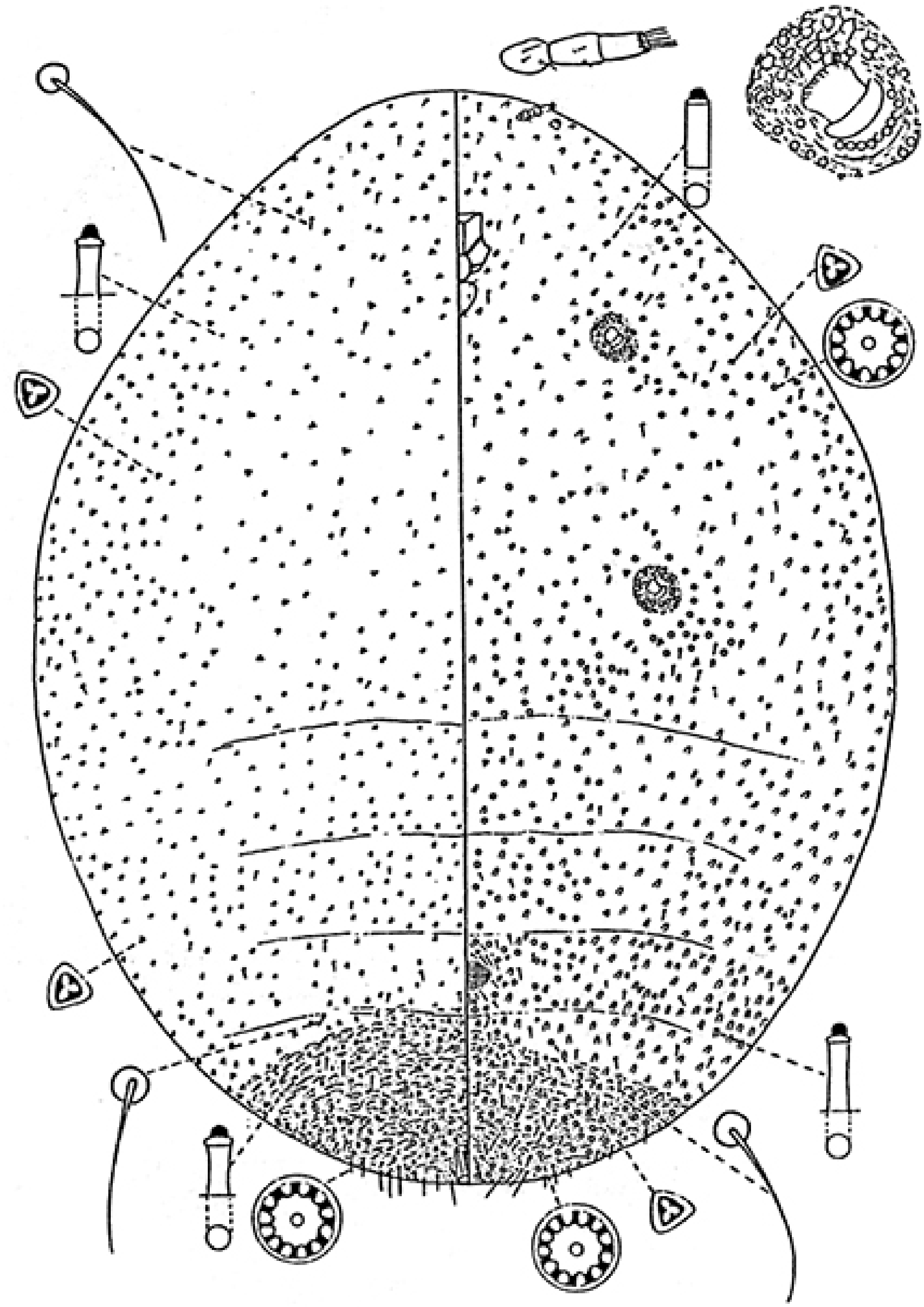

**Figure 3.** *Antonina natalensis* (after Mohammed et al. 1995).

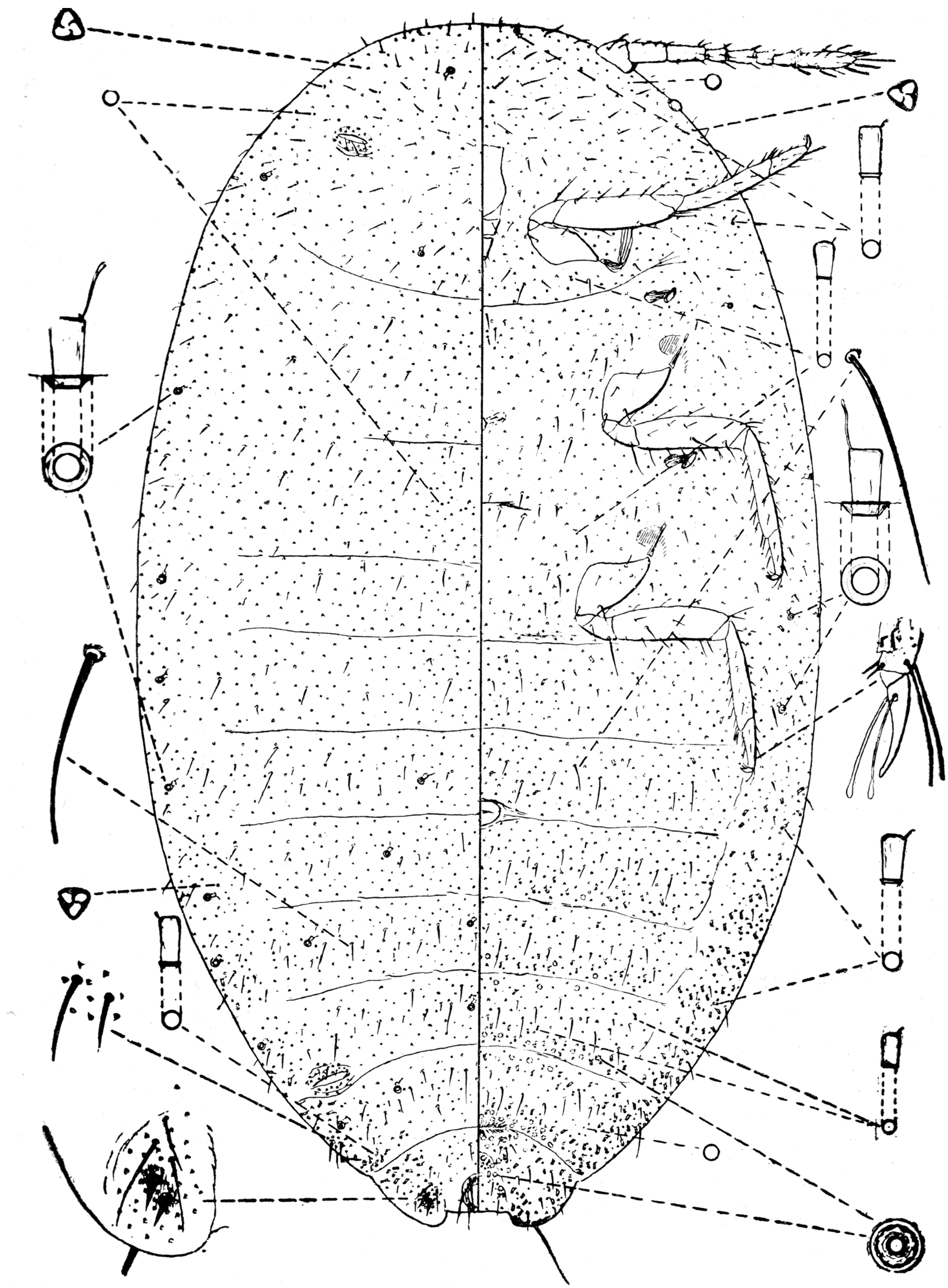

**Figure 4.** *Atrococcus halli* (after Ezzat 1962a).

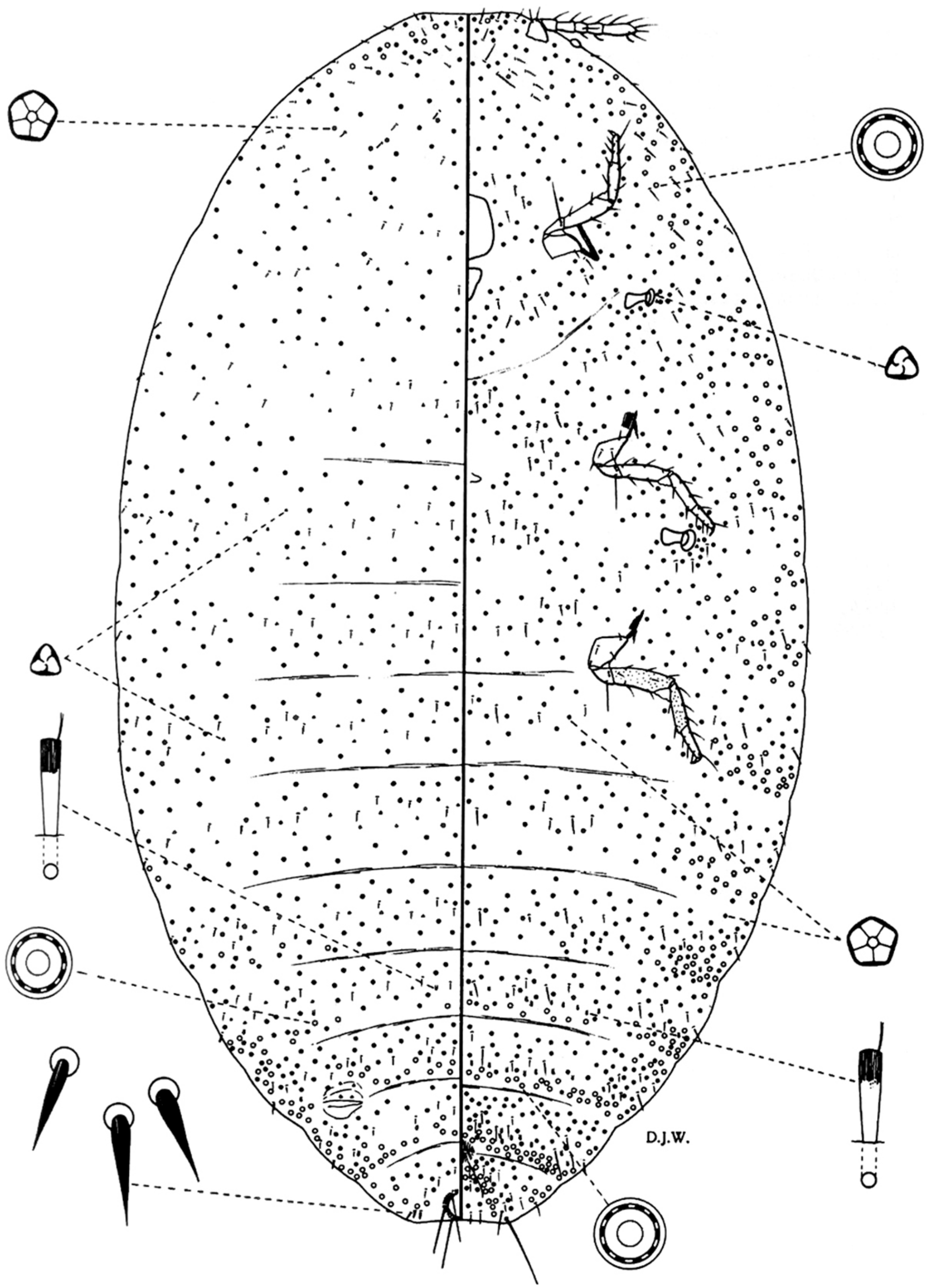


**Figure 5.** *Brevennia rehi* (after Williams 2004).

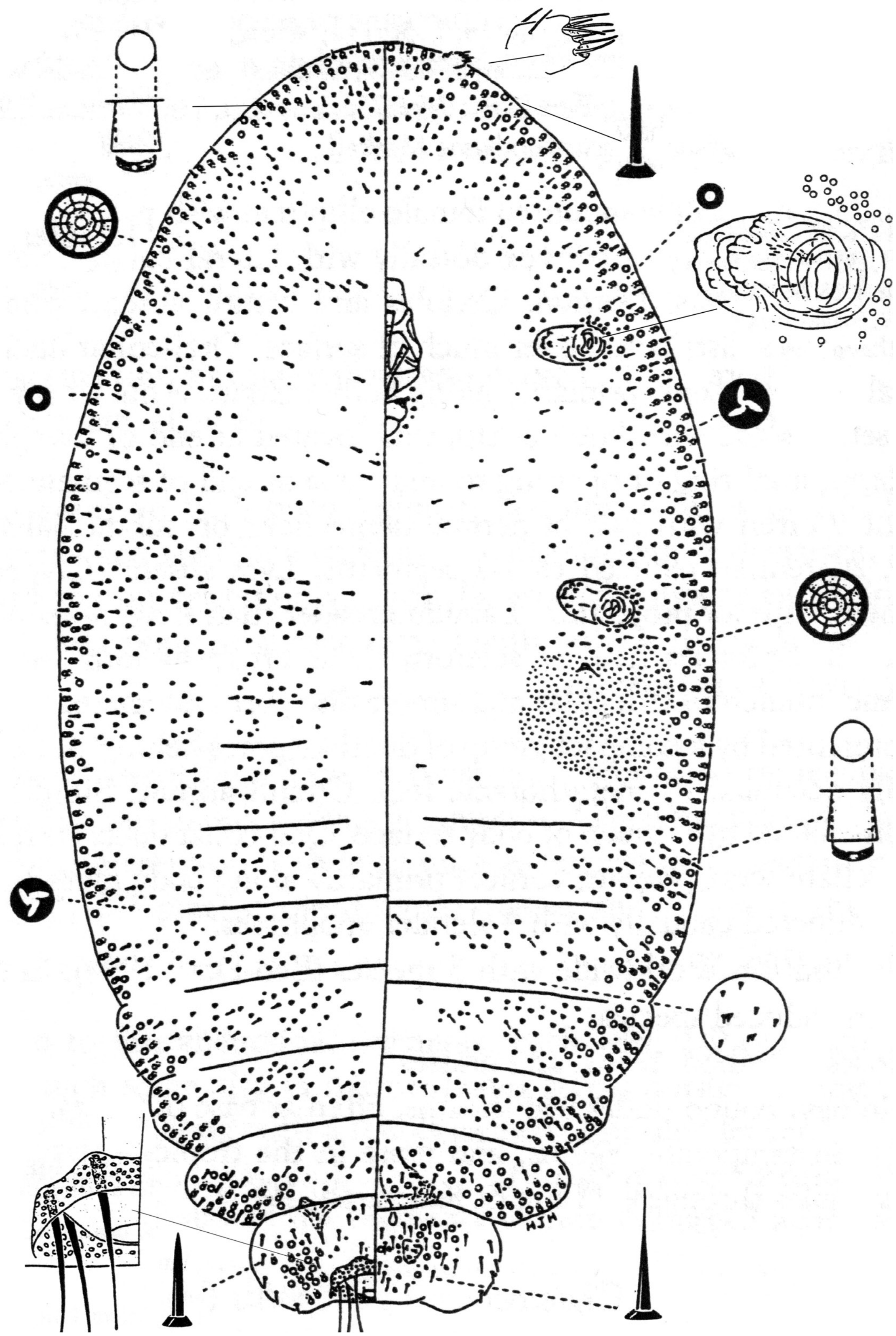

**Figure 6.** *Chaetococcus phragmitis* (after Kosztarab 1996).

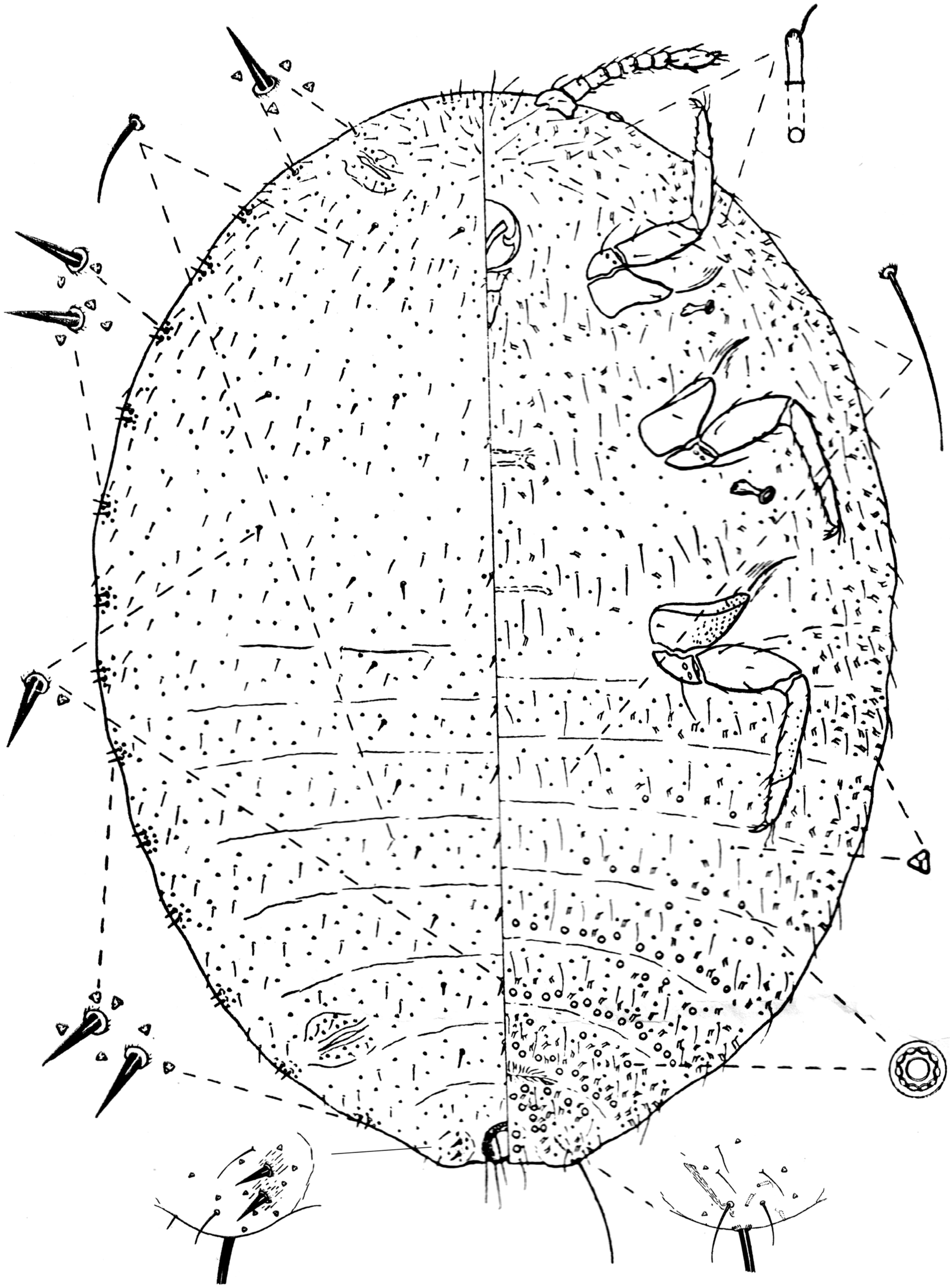

**Figure 7.** *Crisicoccus delottoi* (after Ezzat 1959c).

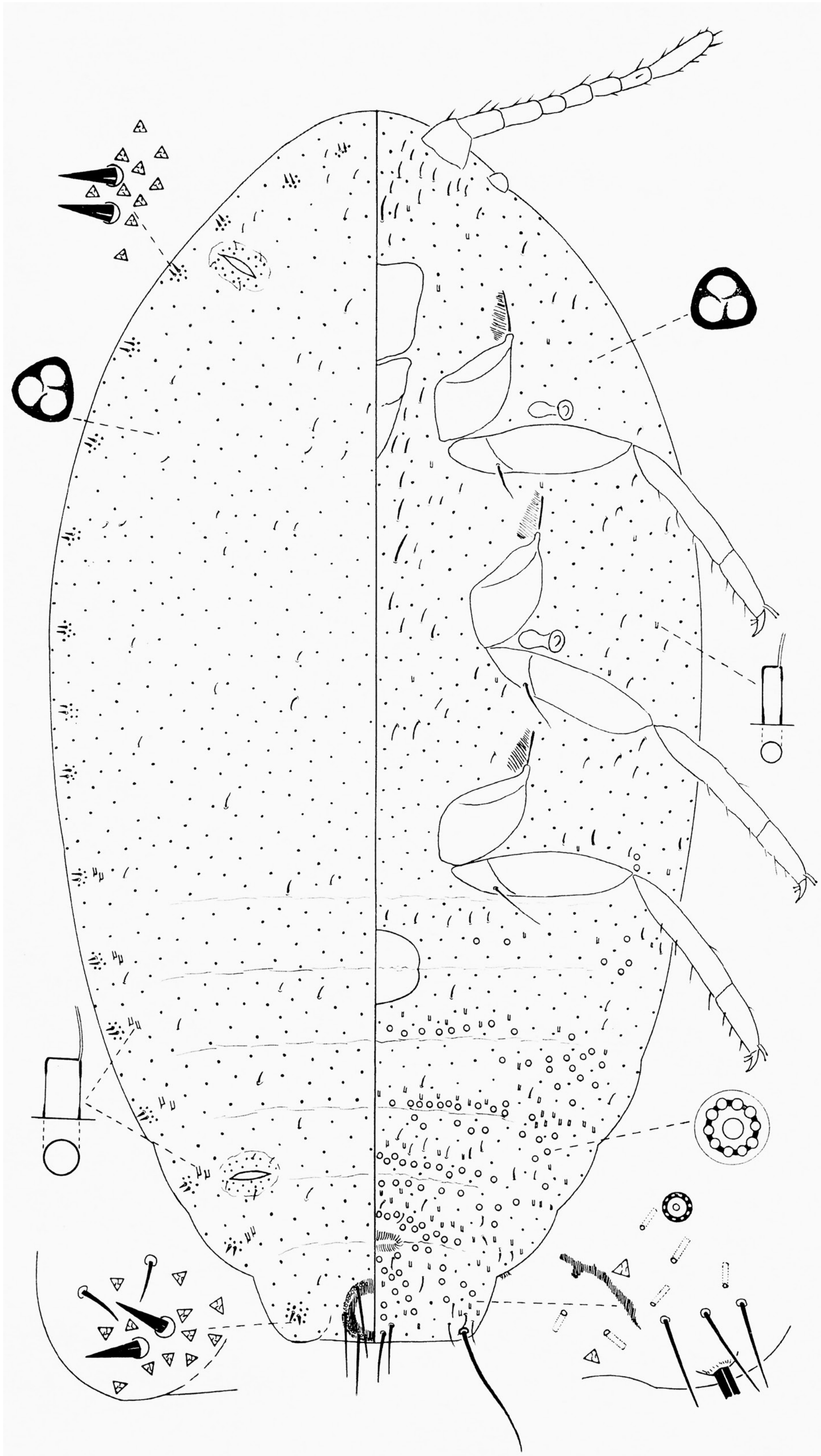

**Figure 8.** *Crisicoccus mangrovicus* (after Ben-Dov 1975).

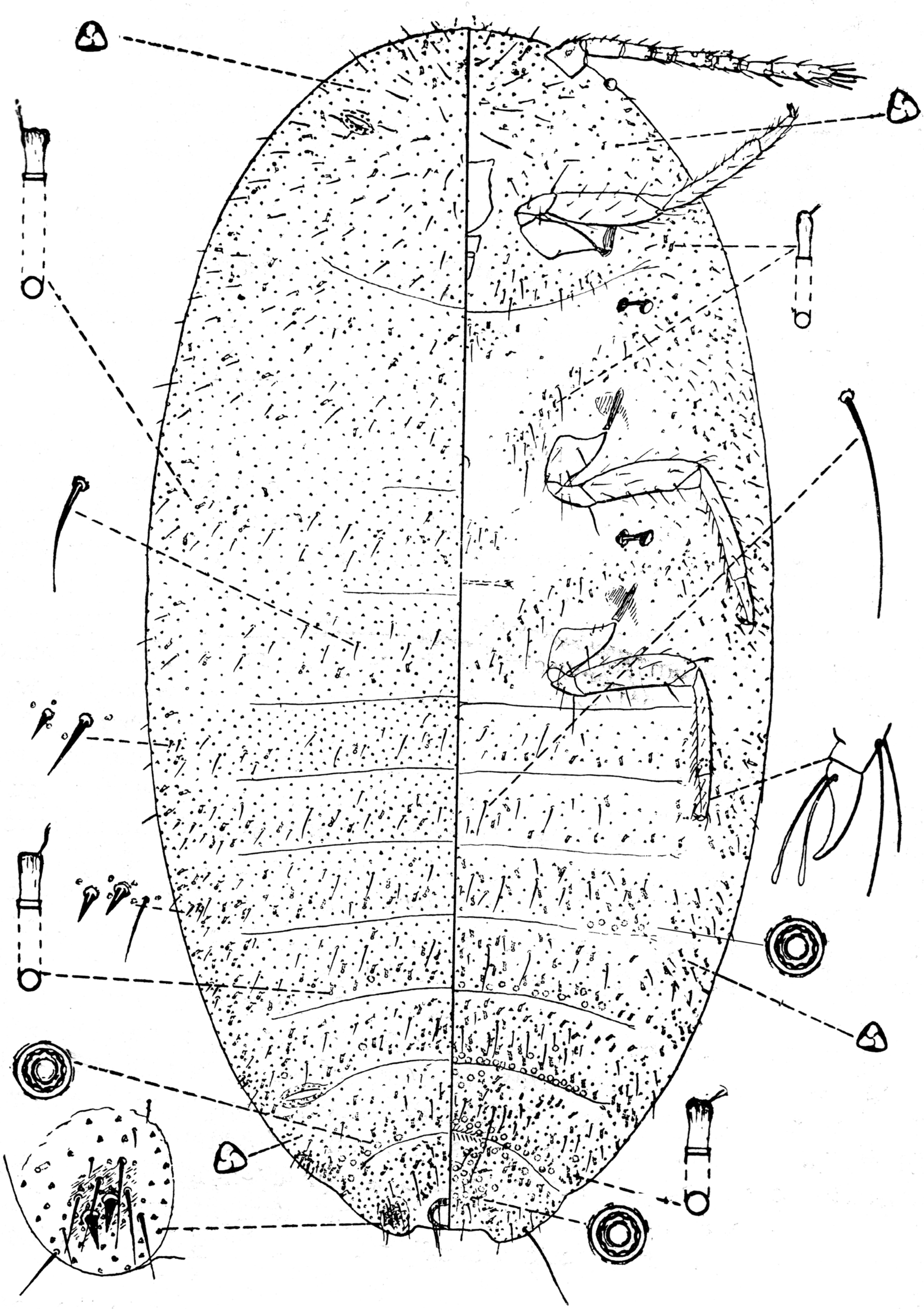

**Figure 9.** *Dysmicoccus angustifrons* (after Ezzat 1962b).

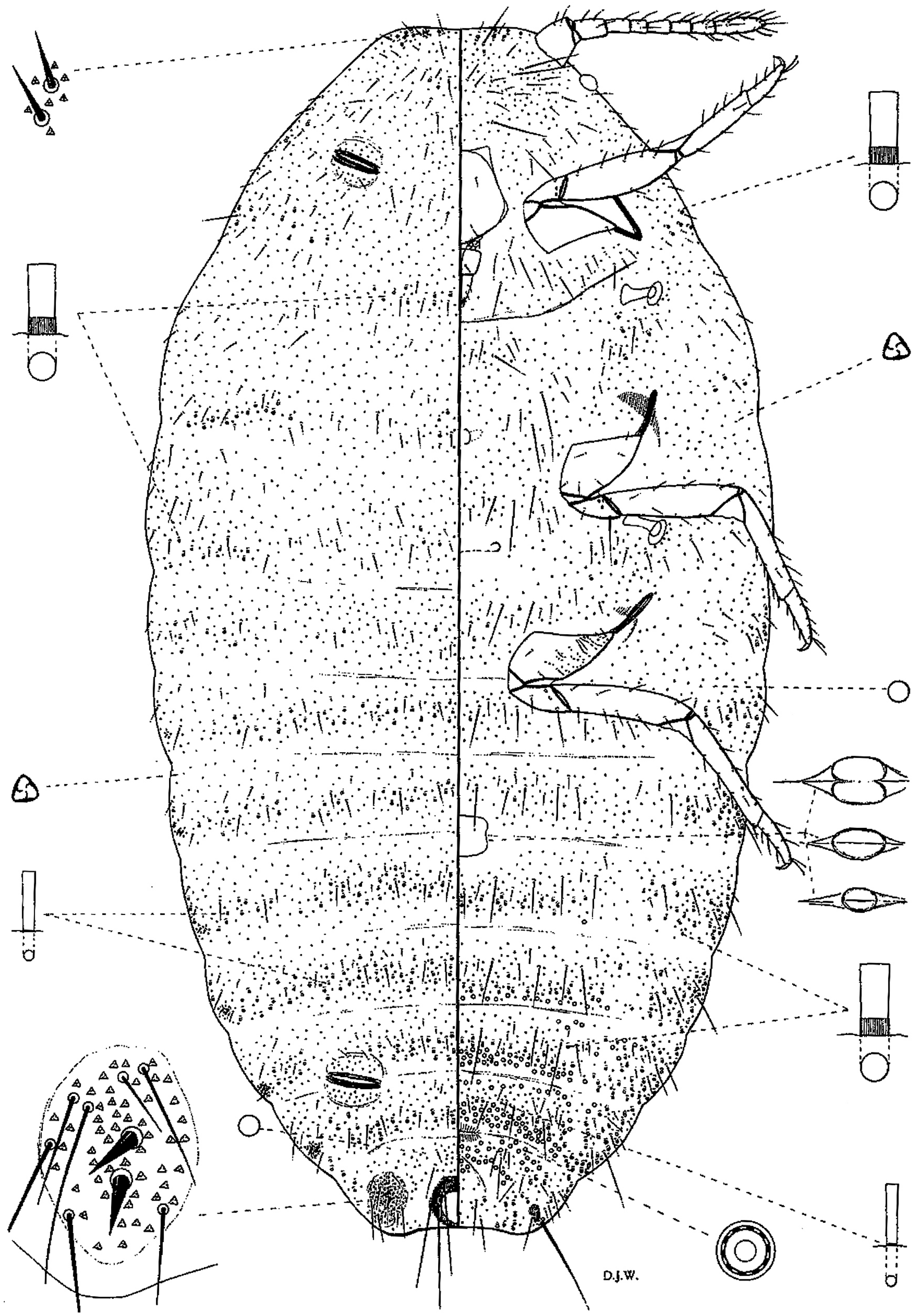


**Figure 10.** *Dysmicoccus boninsis* (after Williams 2004).

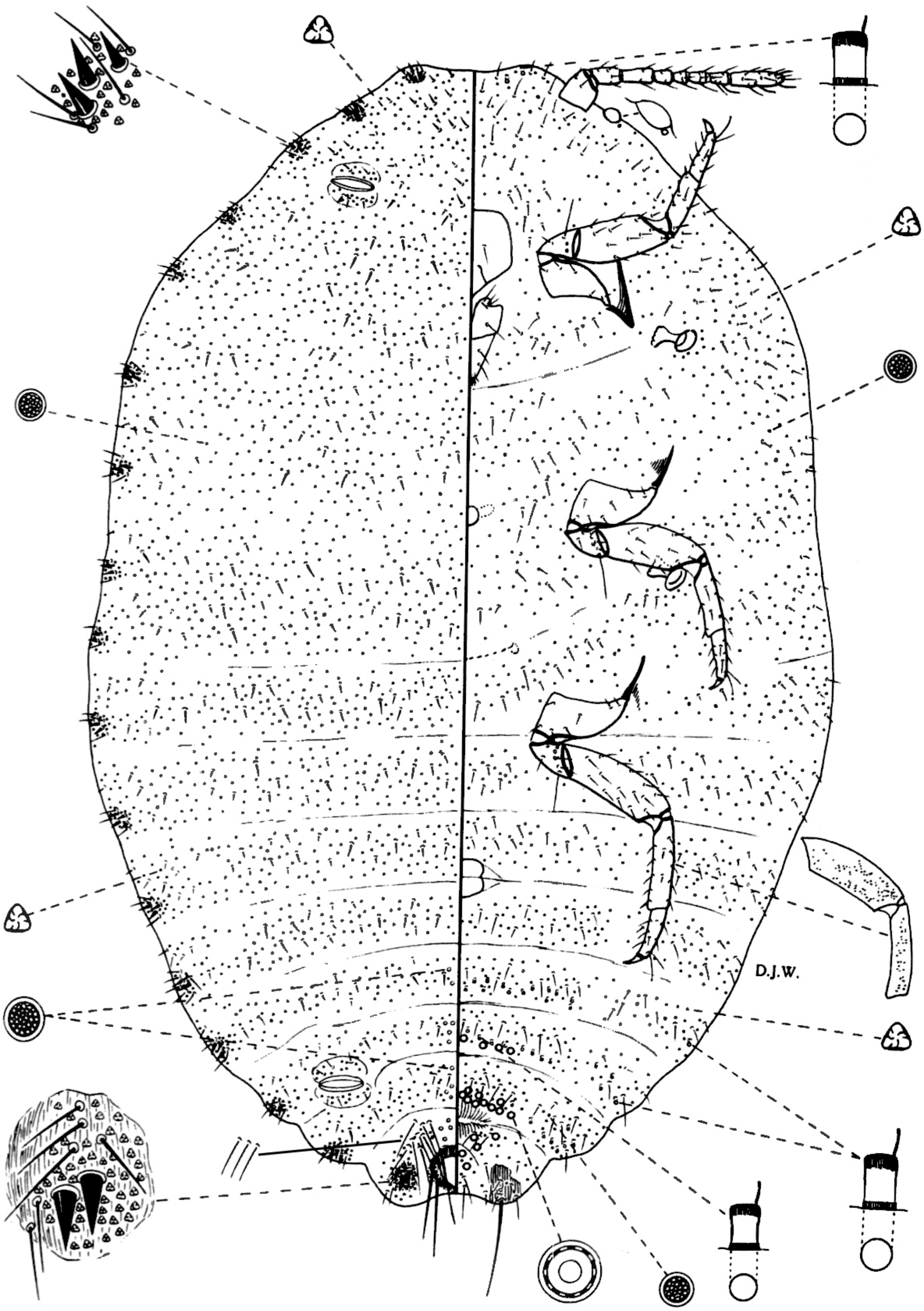


**Figure 11.** *Dysmicoccus brevipes* (after Williams 2004).

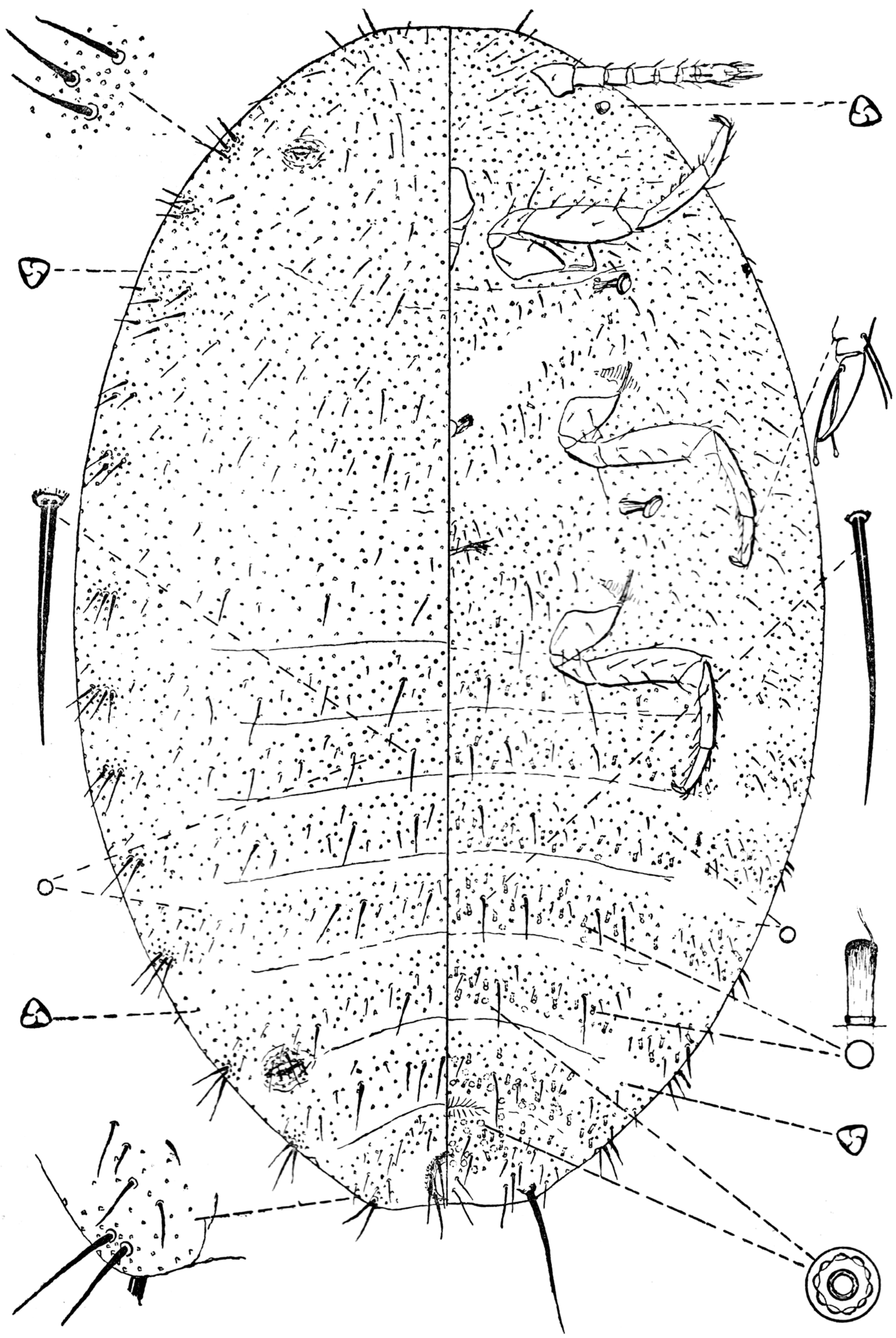

**Figure 12.** *Dysmicoccus trispinosus* (after Ezzat 1960c).

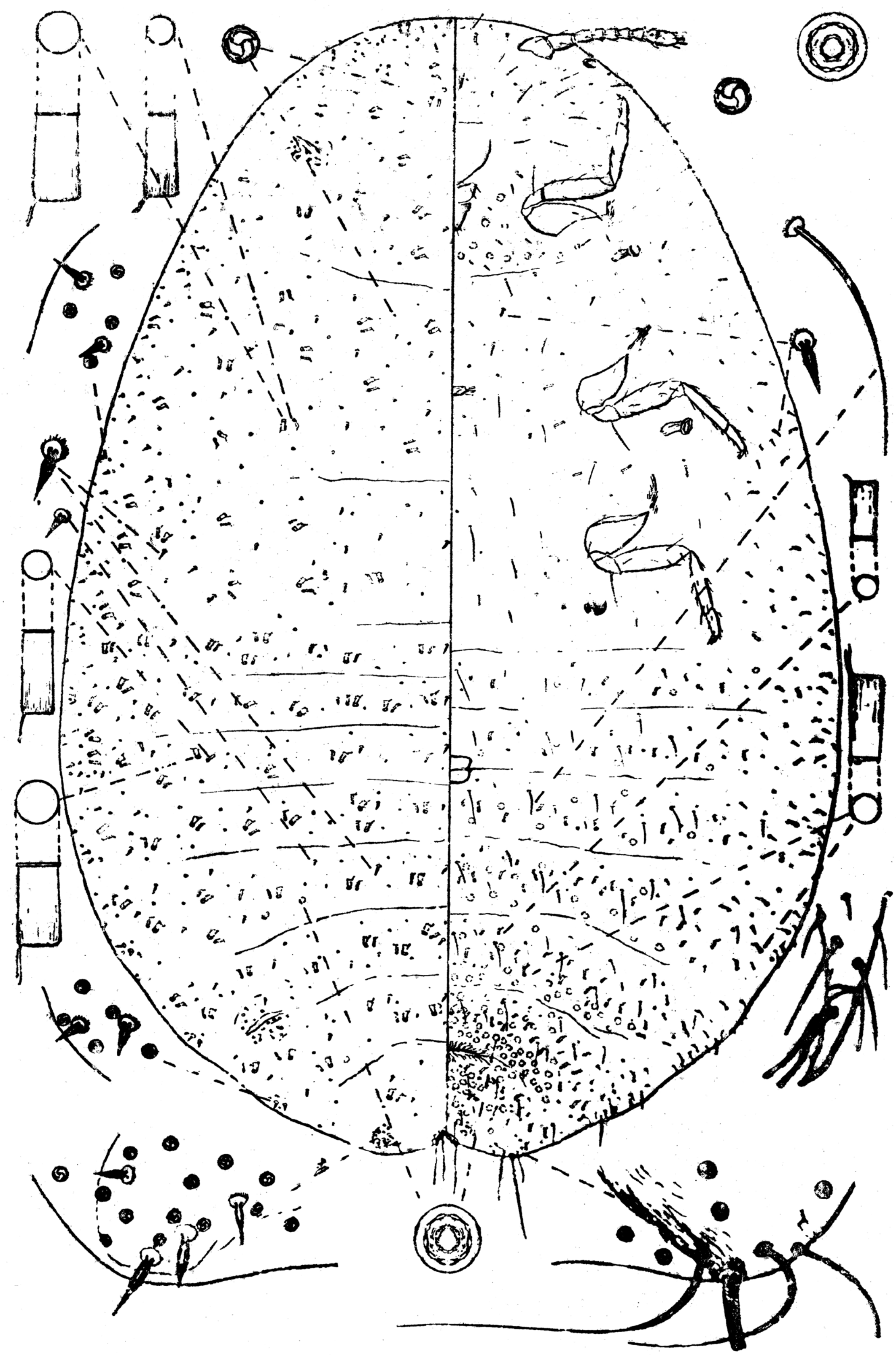

**Figure 13.** *Erimococcus limoniastri* (after Ezzat 1965a).

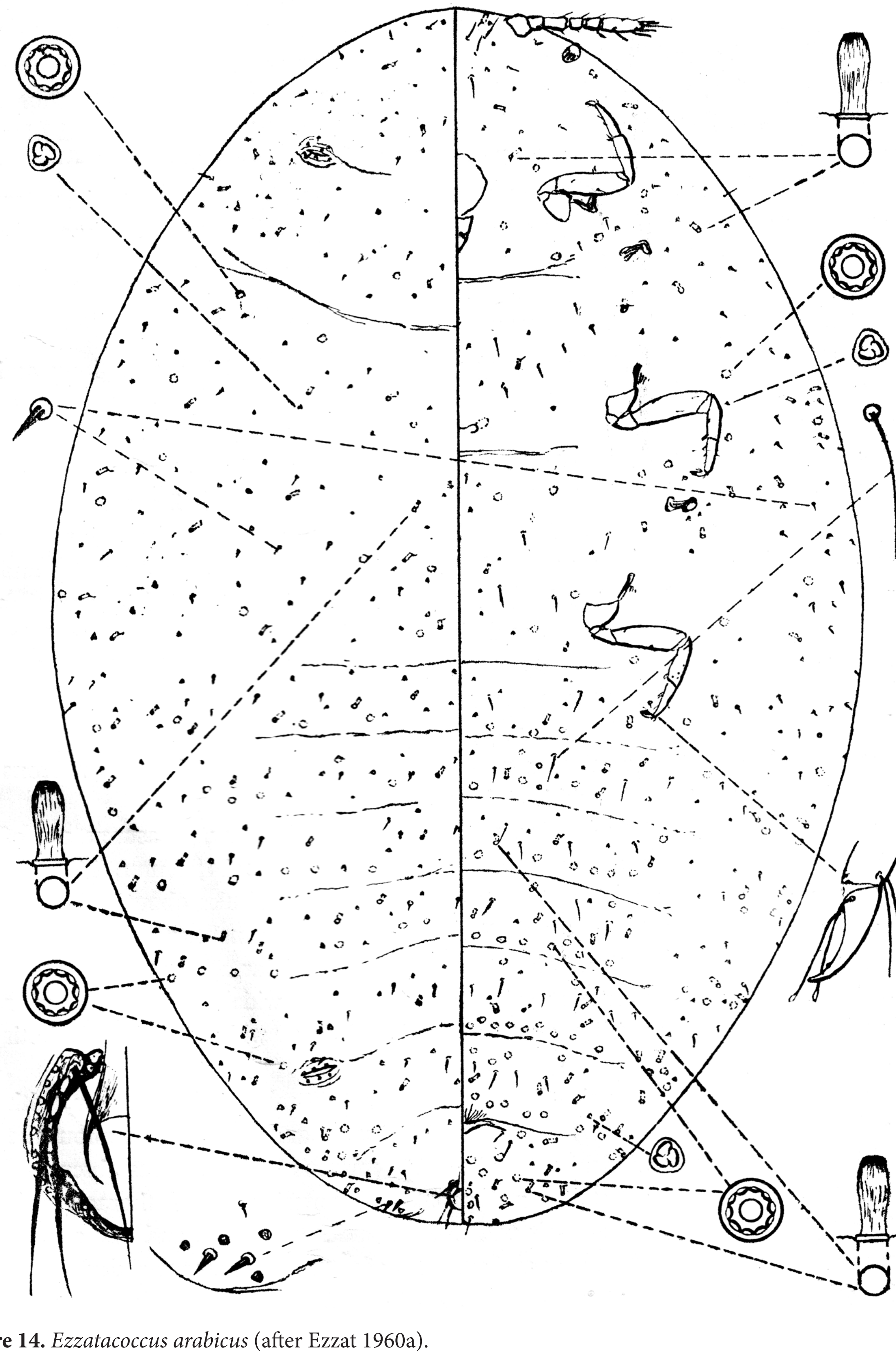

**Figure 14.** *Ezzatacoccus arabicus* (after Ezzat 1960a).

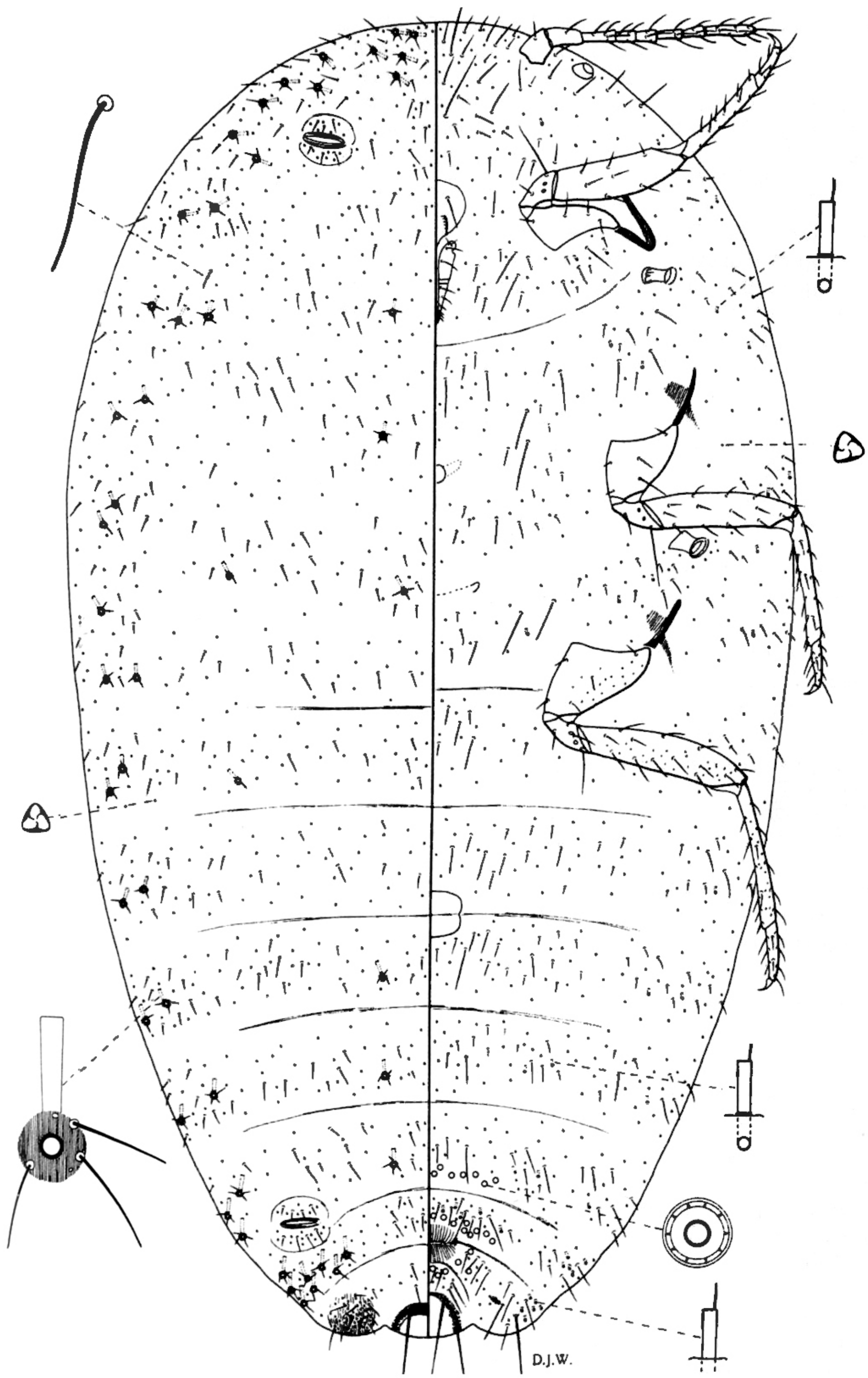


**Figure 15.** *Ferrisia virgata* (after Williams 2004).

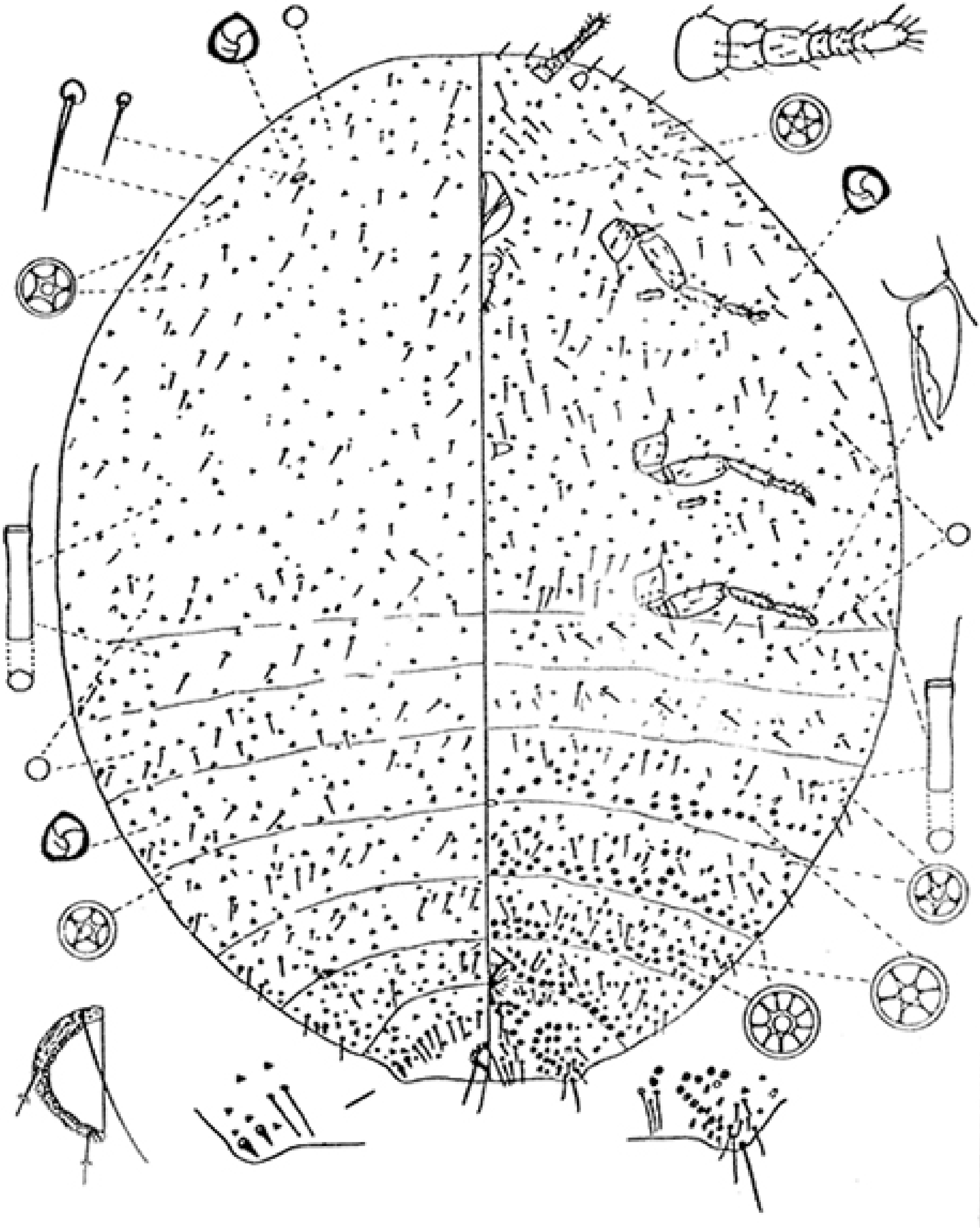

**Figure 16.** *Fonscolombia artemisiae* (after Mohammed et al. 1995).

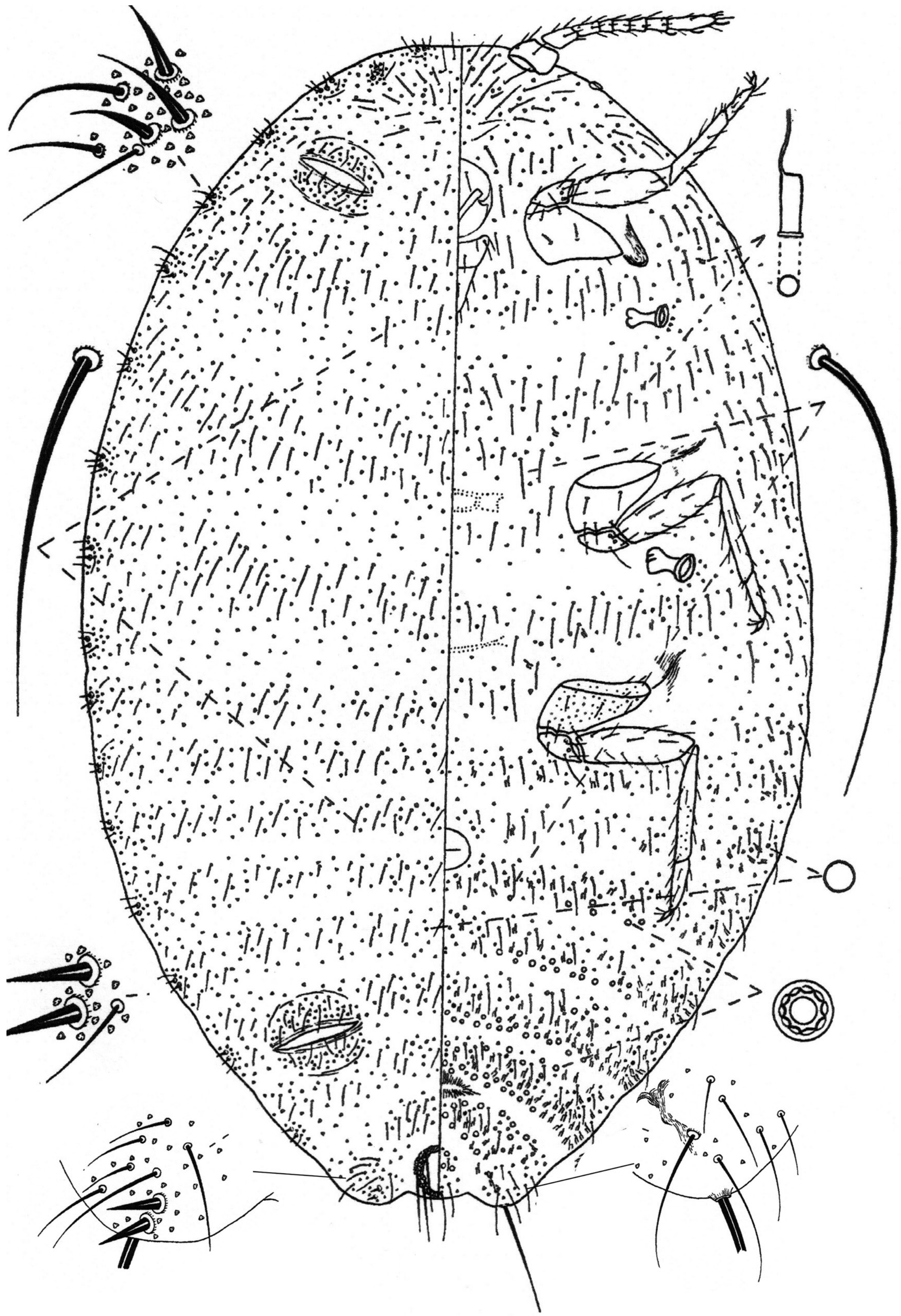

**Figure 17.** *Formicococcus lindingeri* (after Ezzat and McConnell 1956).

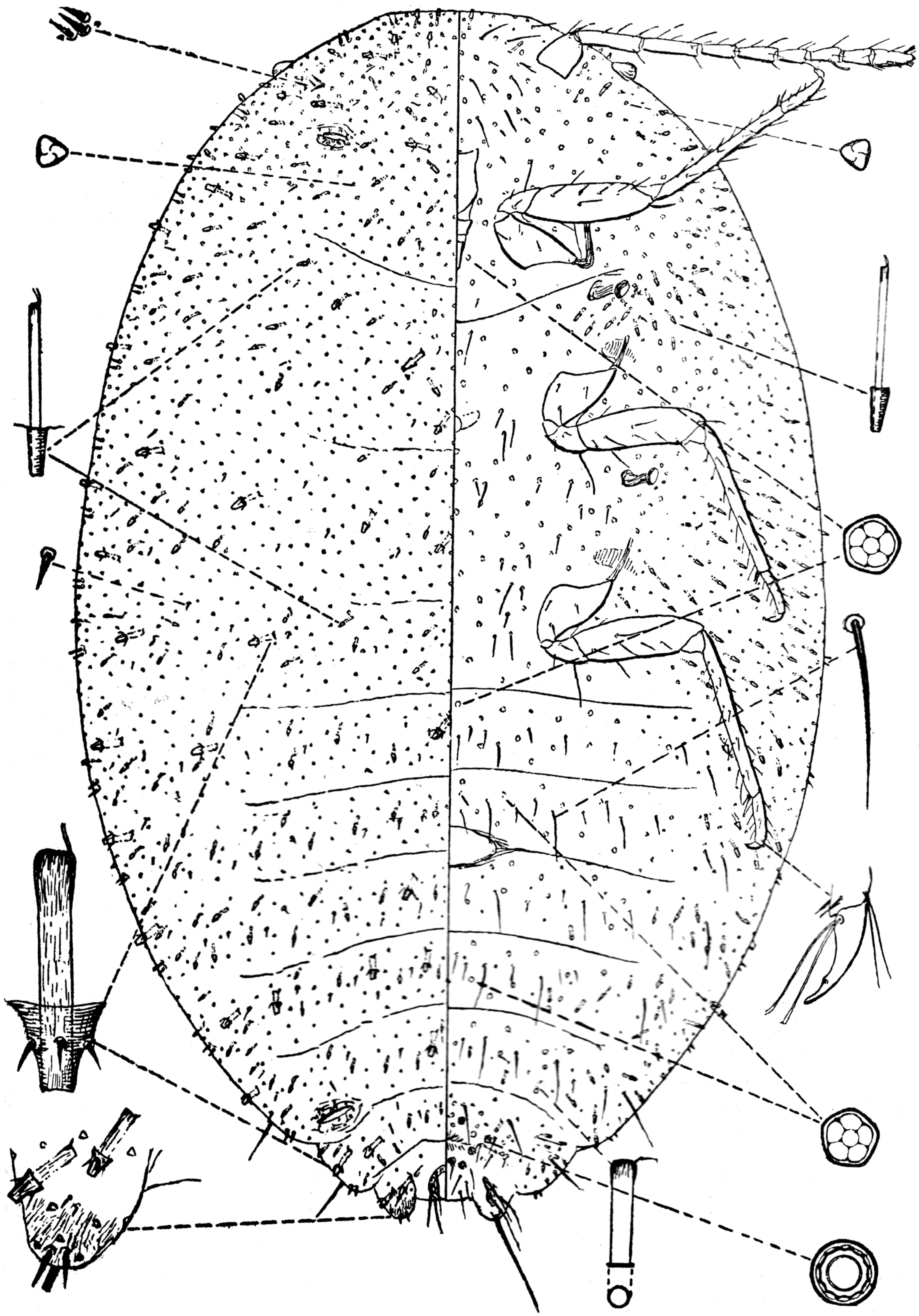

**Figure 18.** *Heliococcus osborni* (after Ezzat 1960b).

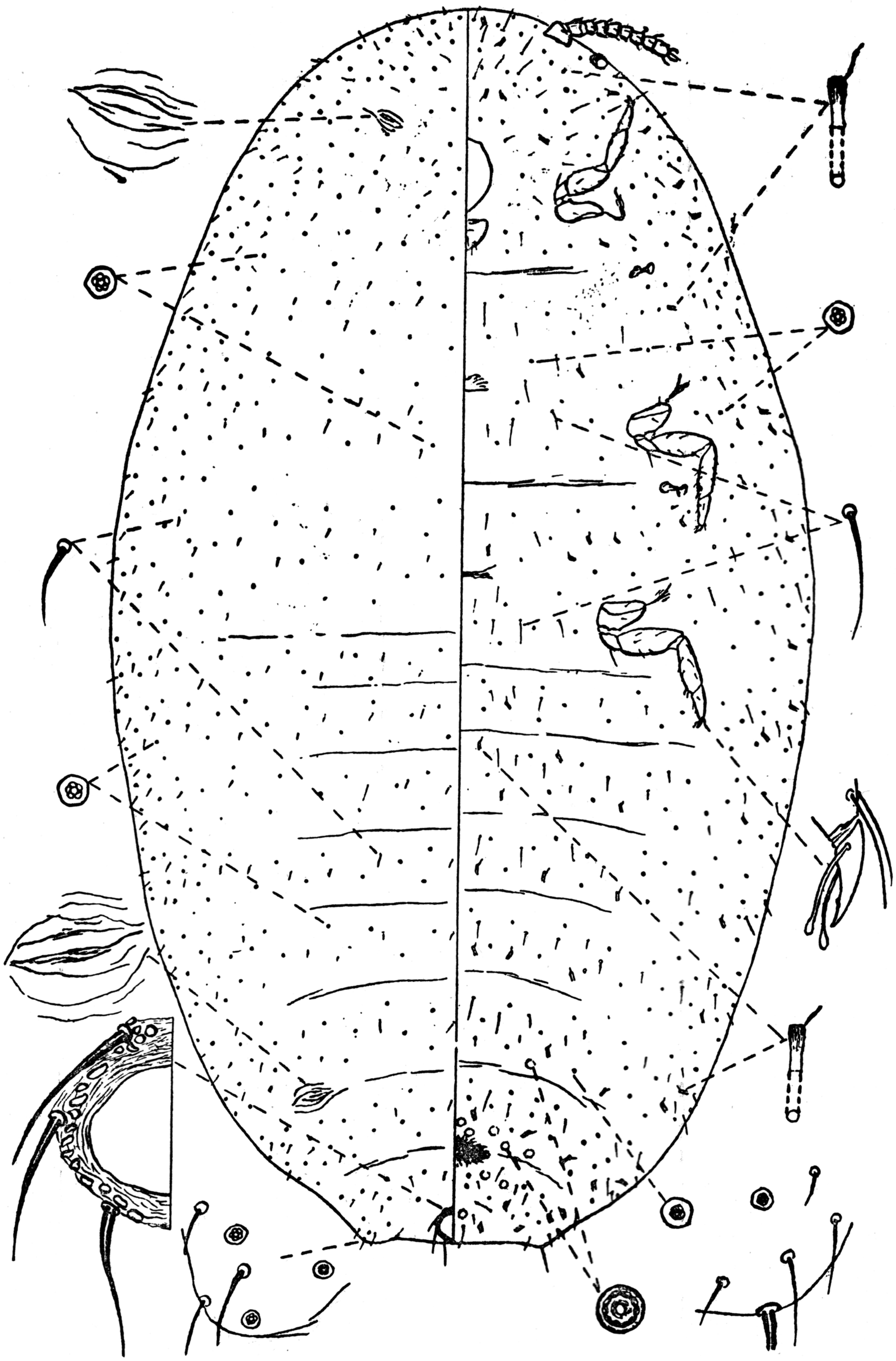

**Figure 19.** *Heterococcus cyperi* (after Ezzat 1960d).

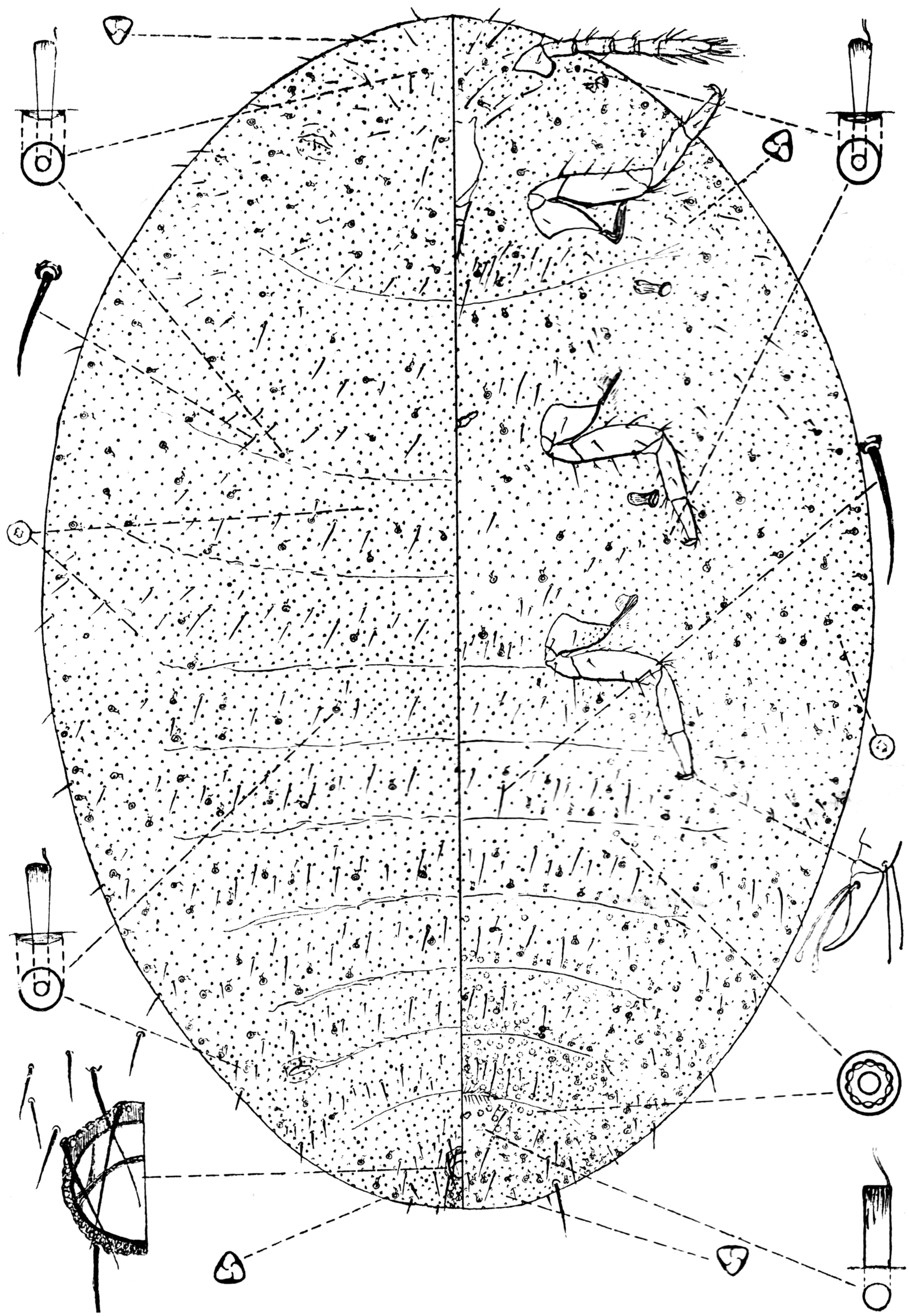

**Figure 20.** *Humococcus mackenziei* (after Ezzat 1959b).

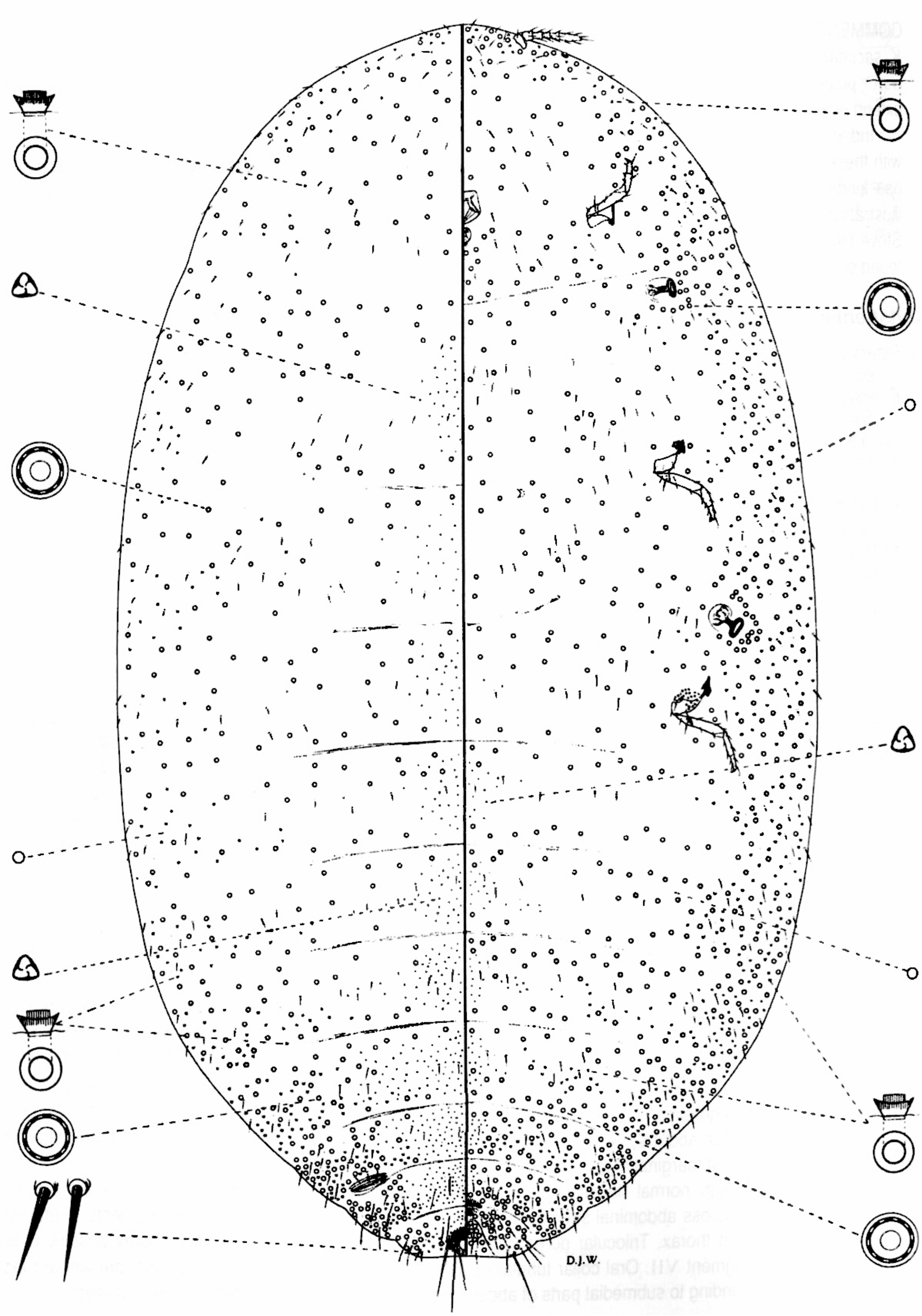


**Figure 21.** *Kiritschenkella sacchari* (after Willliams 2004).

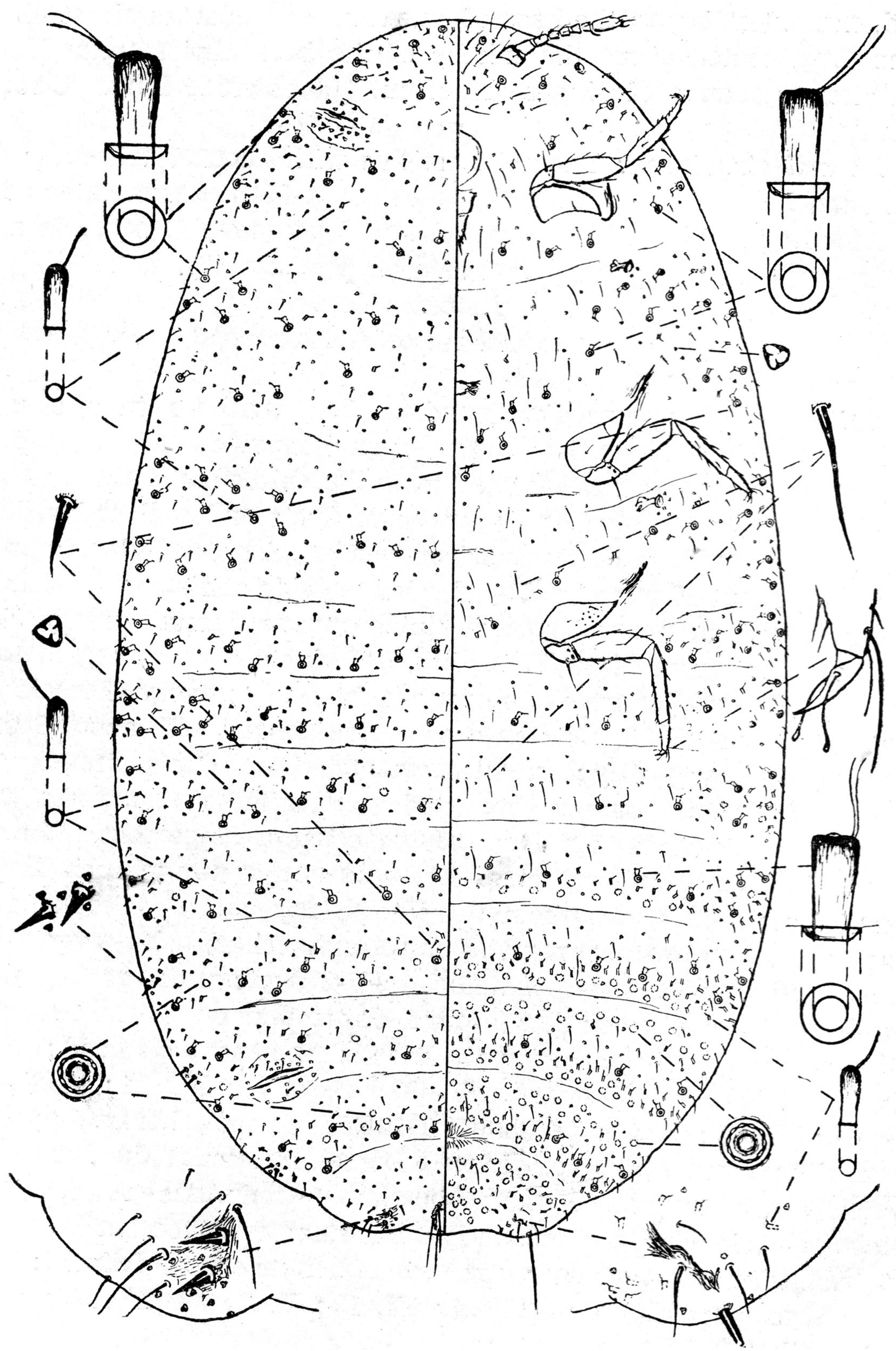

**Figure 22.** *Maconellicoccus cressae* (after Ezzat 1962b).

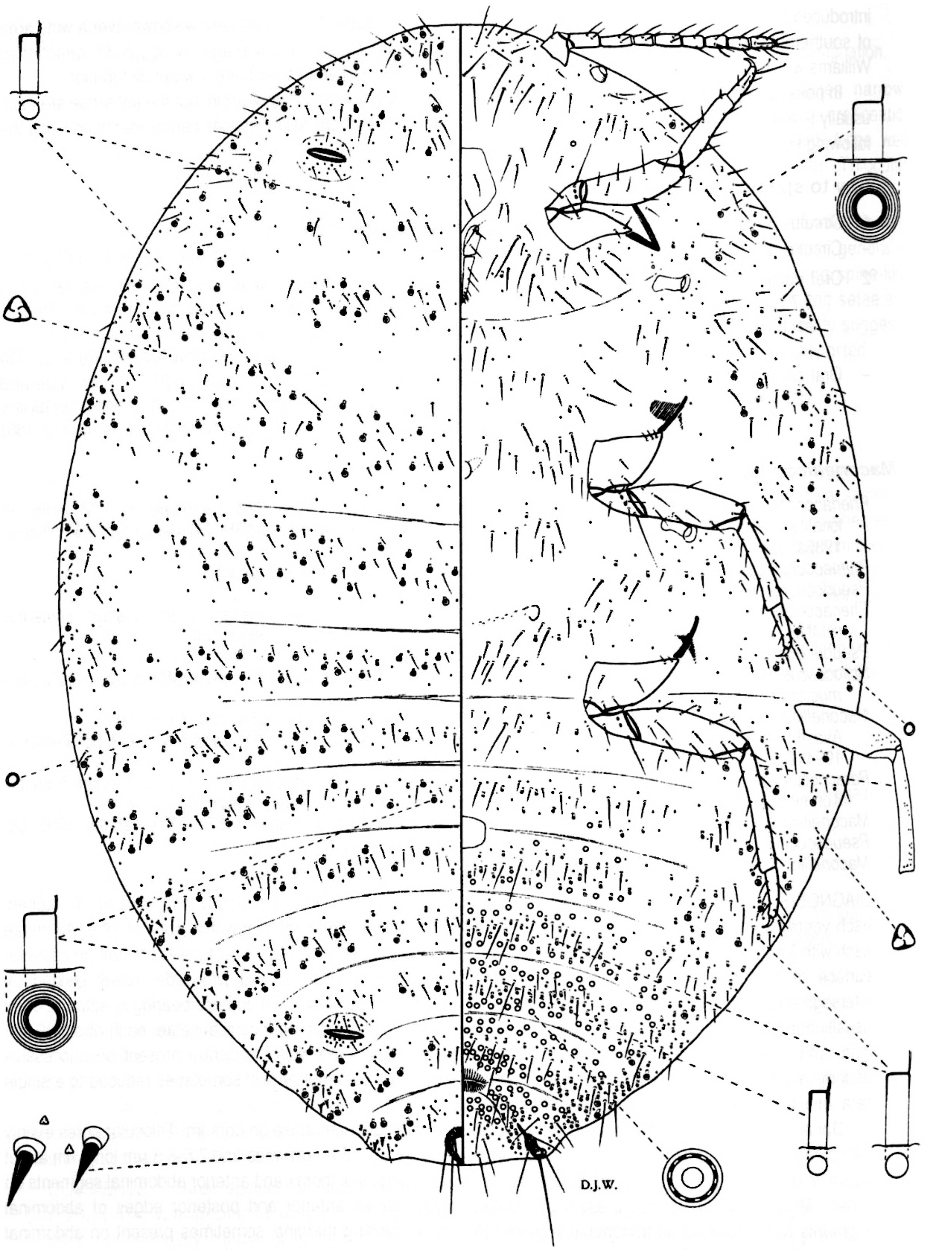


**Figure 23.** *Maconellicoccus hirsutus* (after Williams 2004).

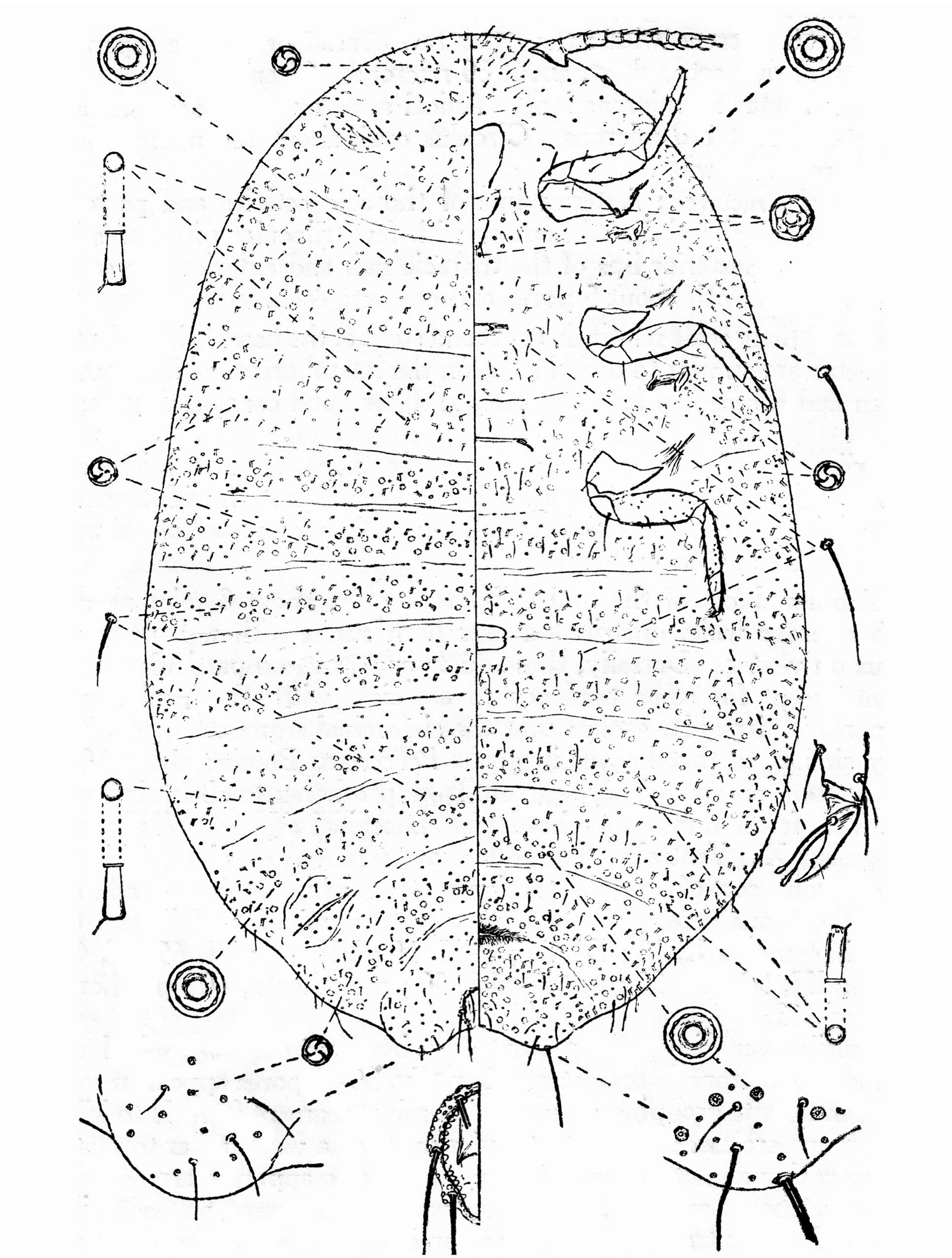

**Figure 24.** *Mirococcus inermis* (after Ezzat 1965a).

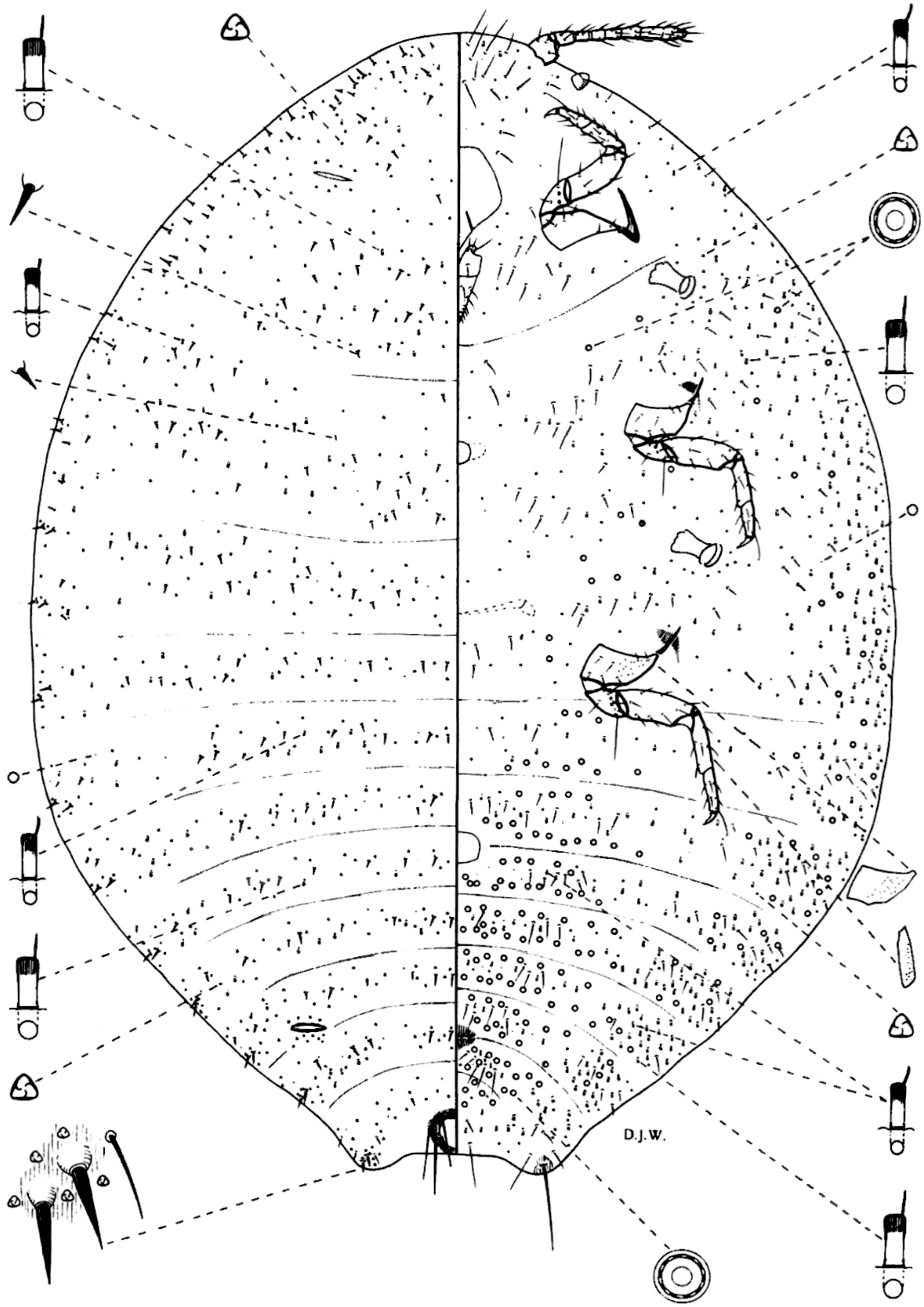


**Figure 25.** *Nipaecoccus viridis* (after Willliams 2004).

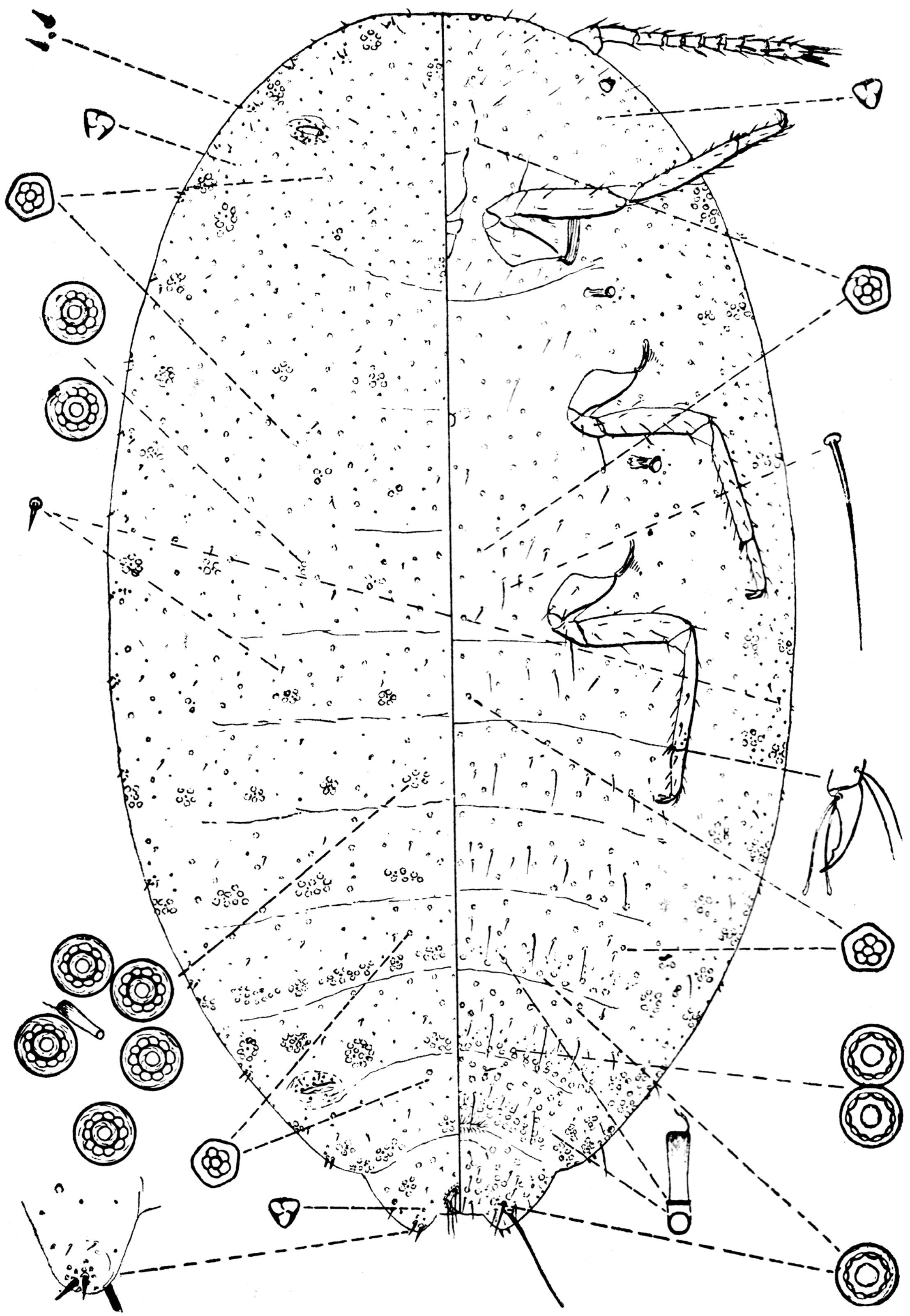

**Figure 26.** *Peliococcopsis priesneri* (after Ezzat 1960e).

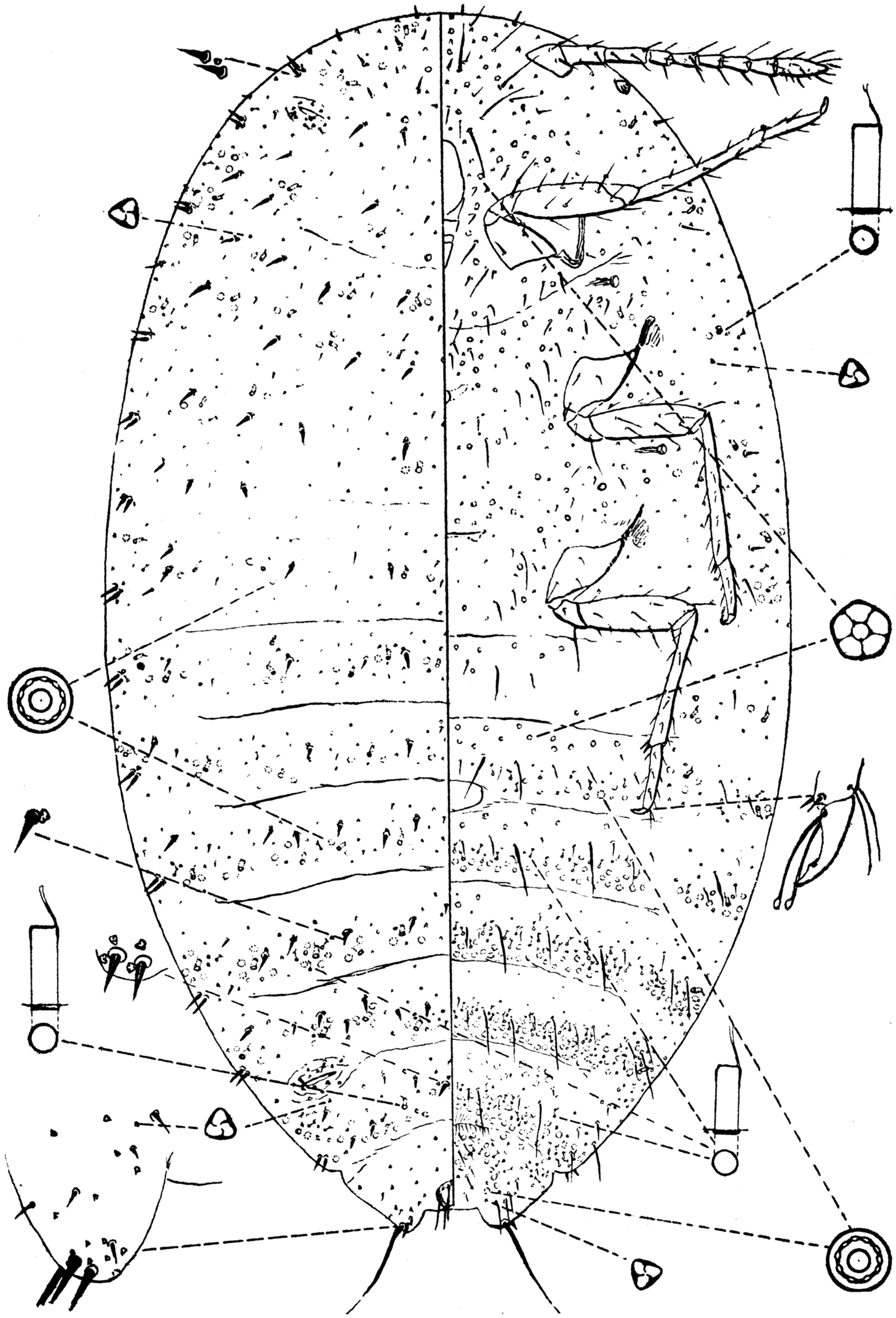

**Figure 27.** *Peliococcus convolvuli* (after Ezzat 1960a).

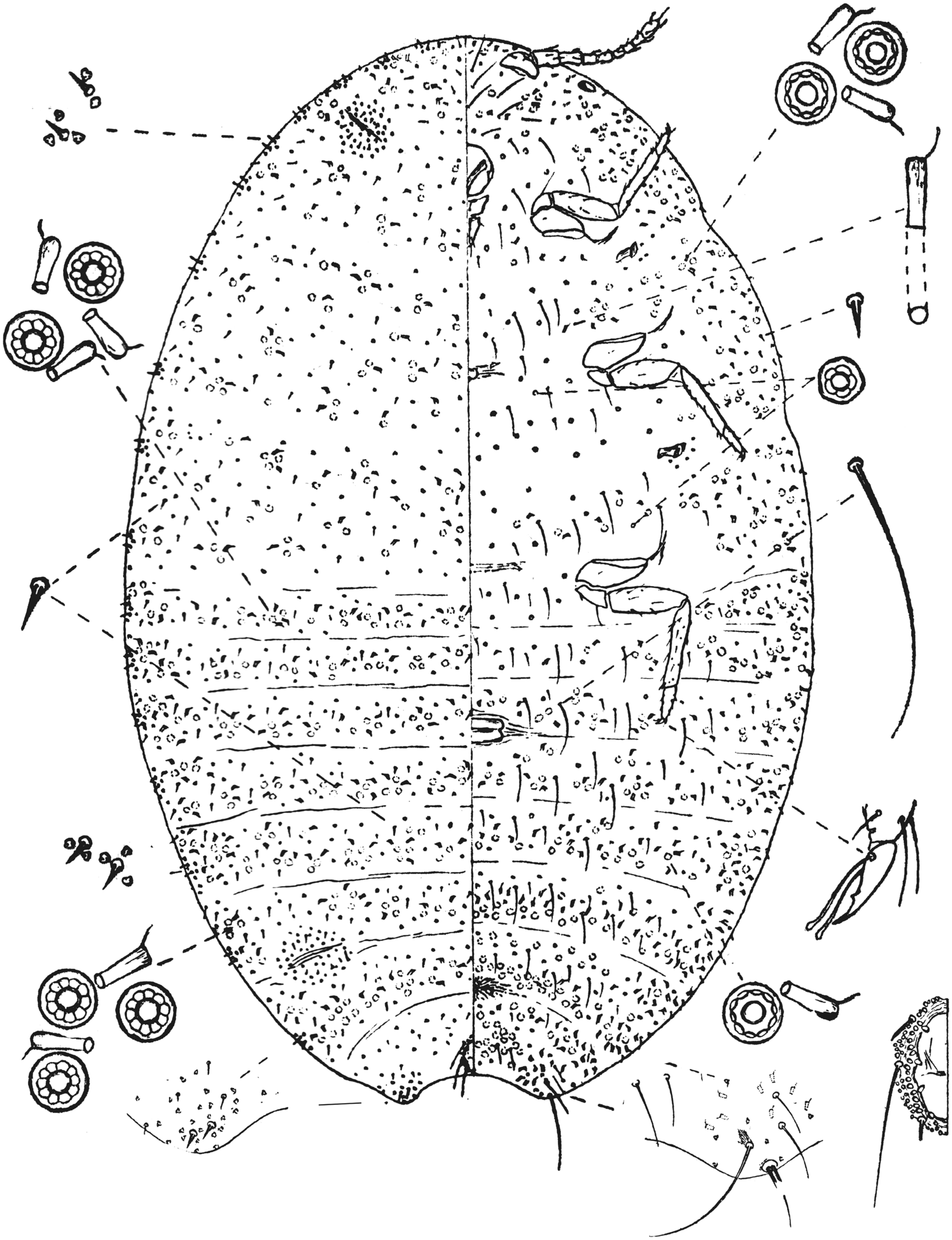

**Figure 28.** *Peliococcus zillae* (after Ezzat 1960e).

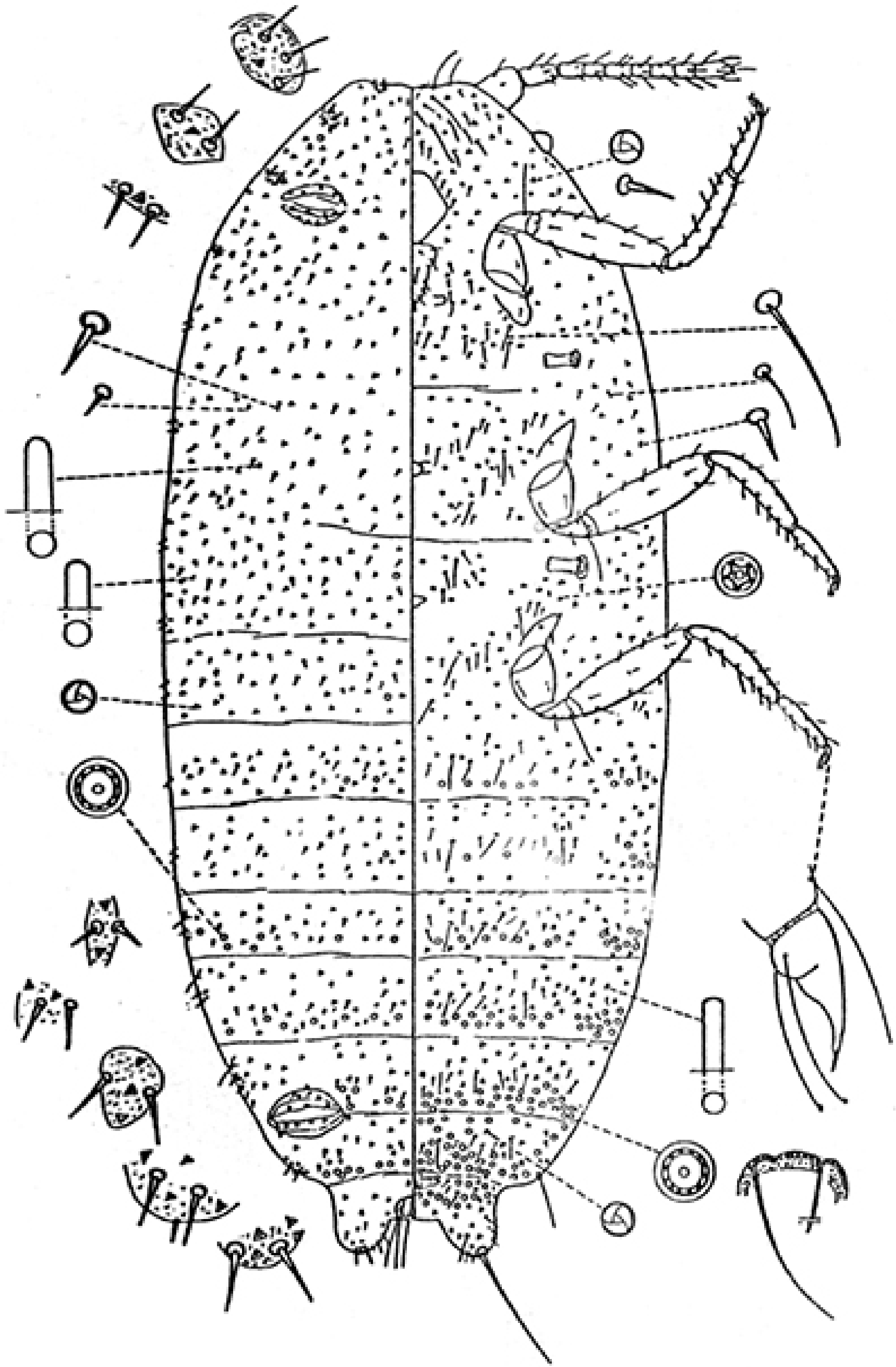

**Figure 29.** *Phenacoccus halli* (after Mohammed et al. 1995).

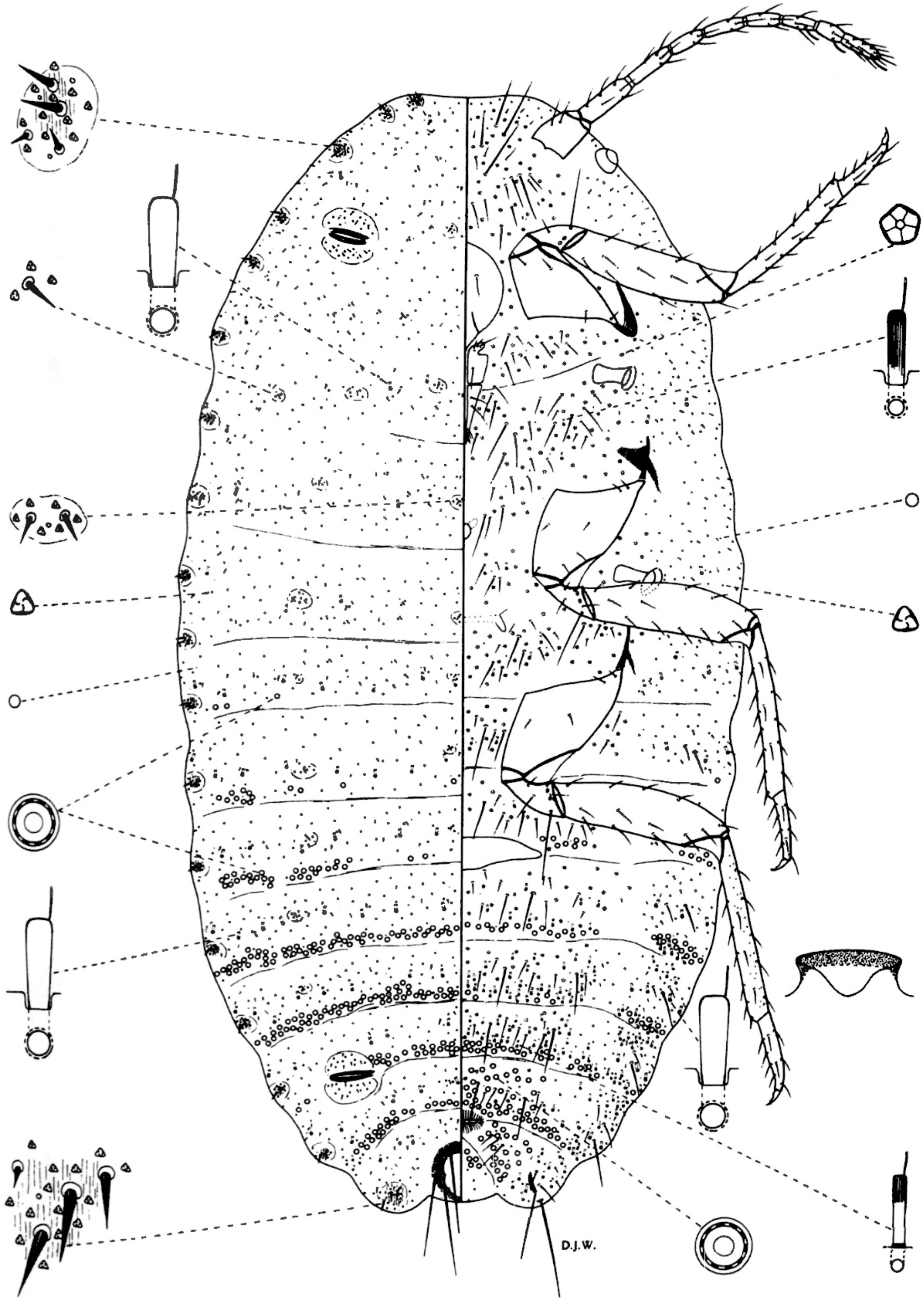


**Figure 30.** *Phenacoccus madeiriensis* (after Willliams 2004).

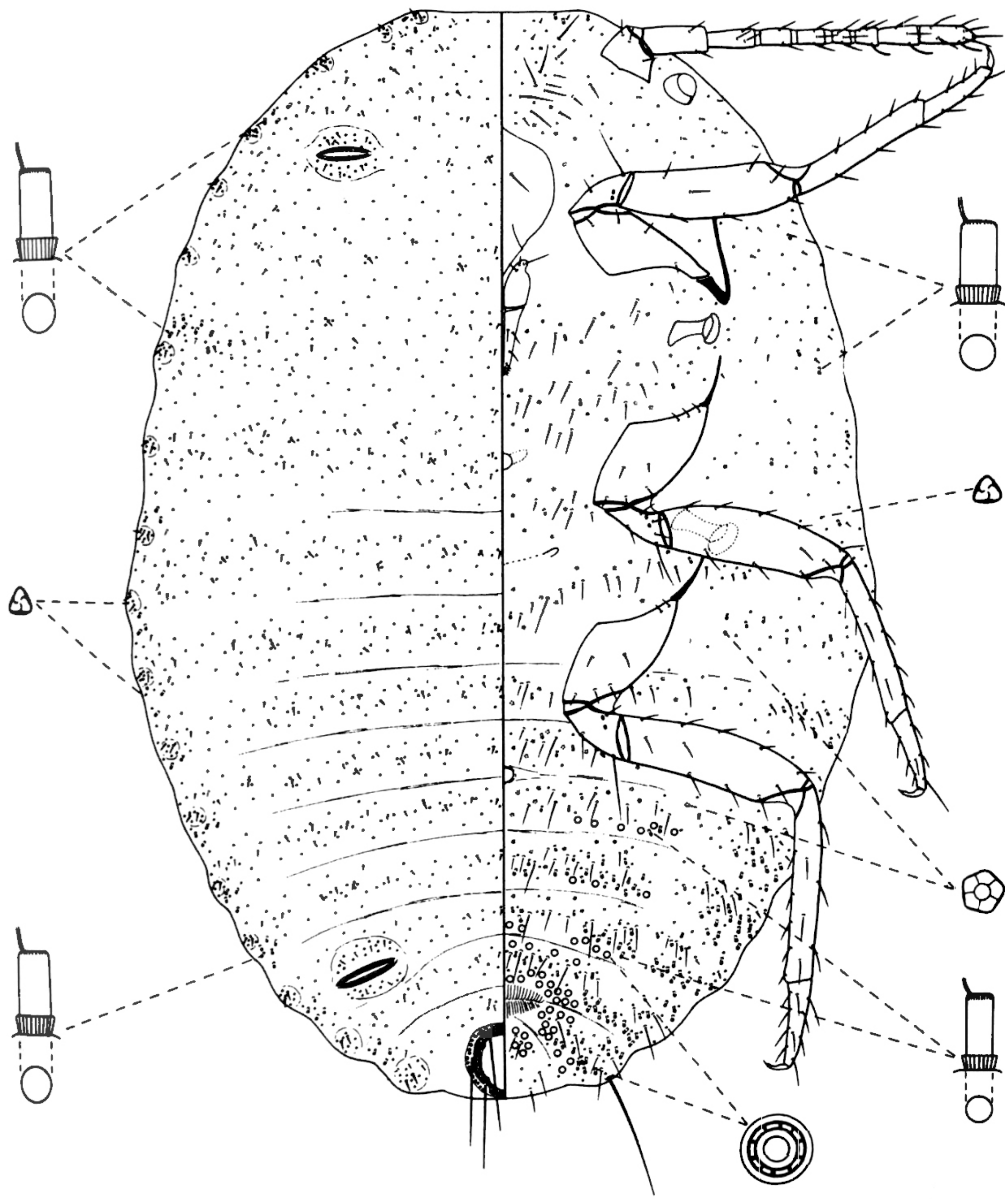

**Figure 31.** *Phenacoccus parvus* (after Willliams 2004).

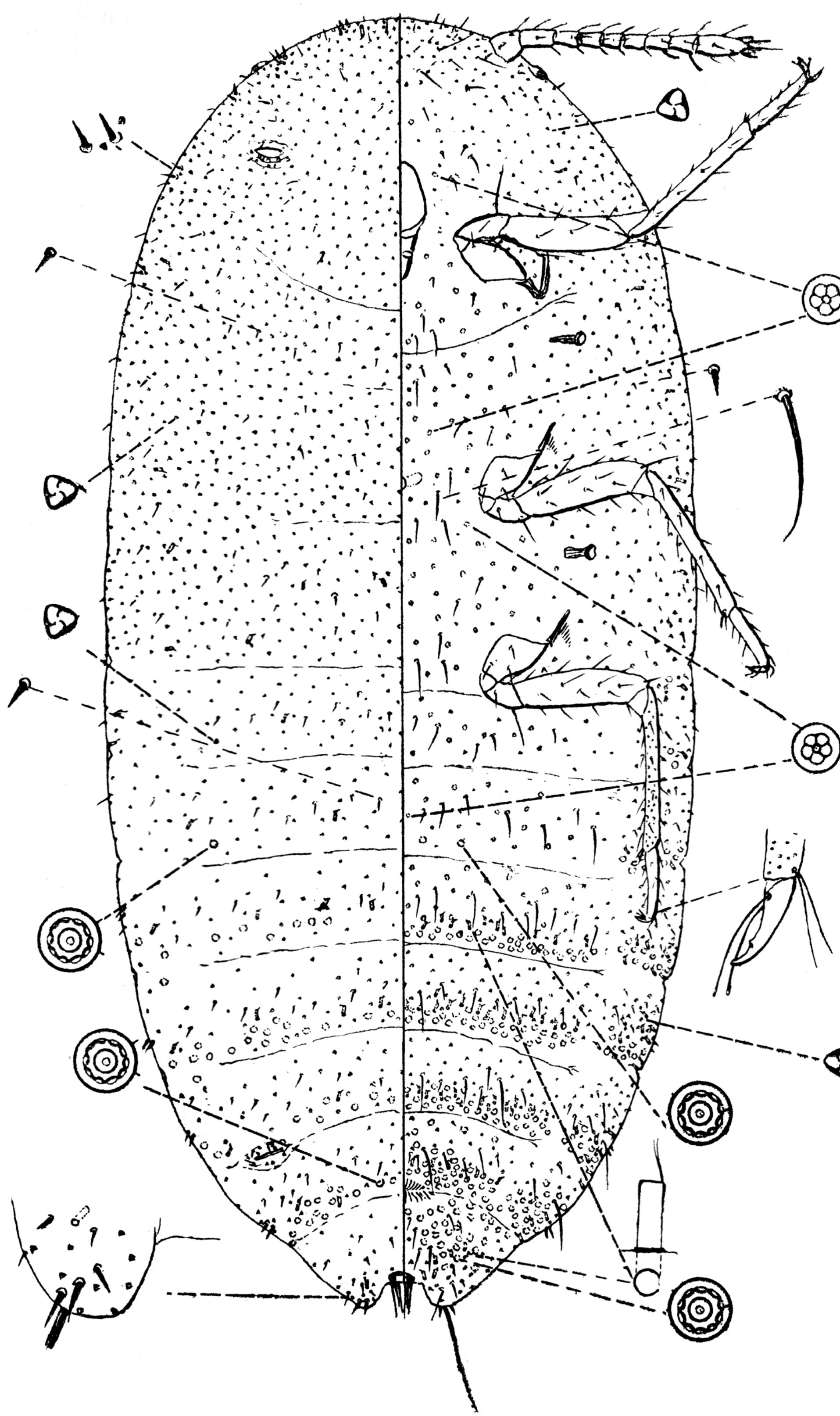

**Figure 32.** *Phenacoccus pyramidensis* (after Ezzat 1960a).

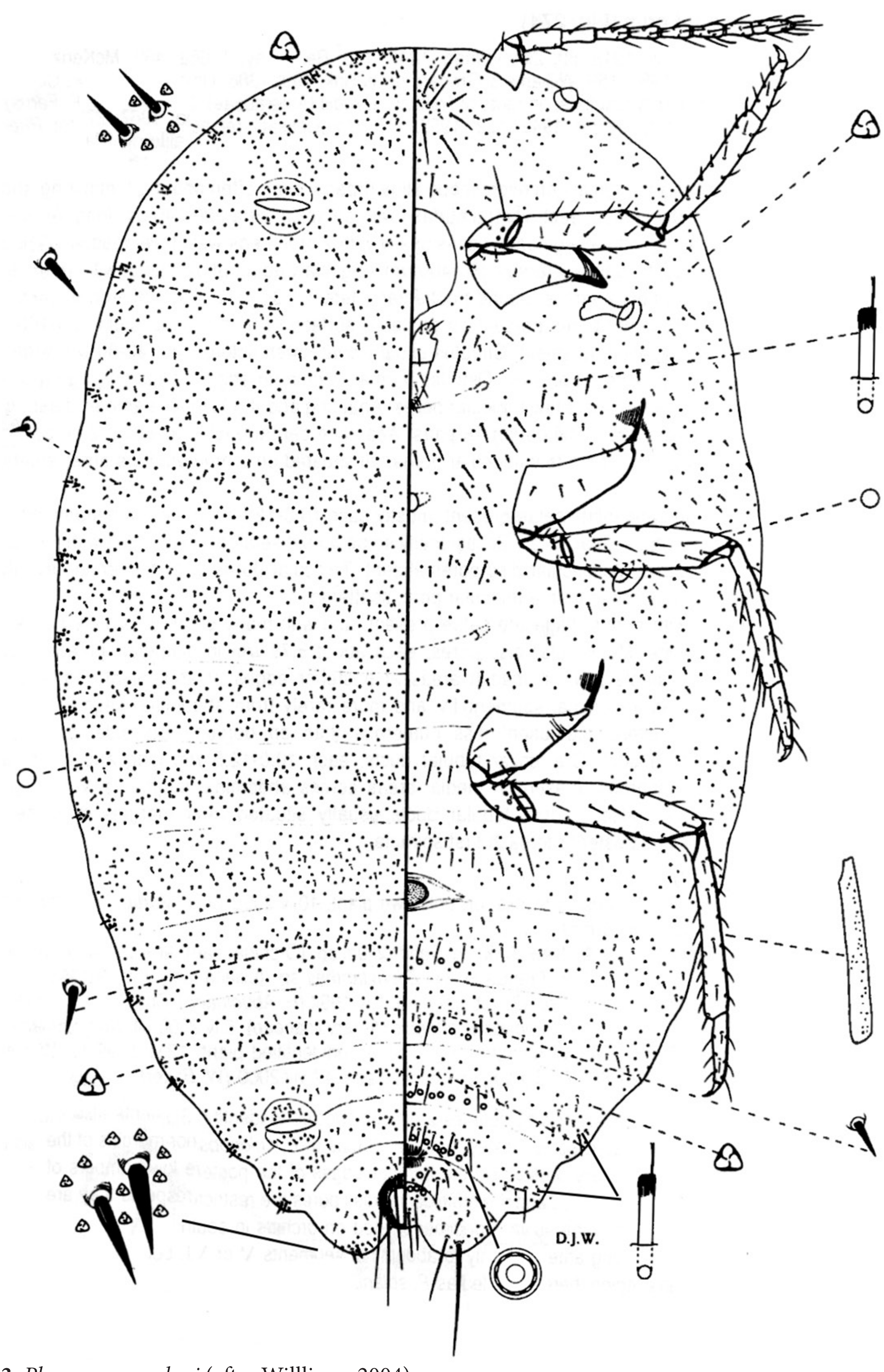


**Figure 33.** *Phenacoccus solani* (after Willliams 2004).

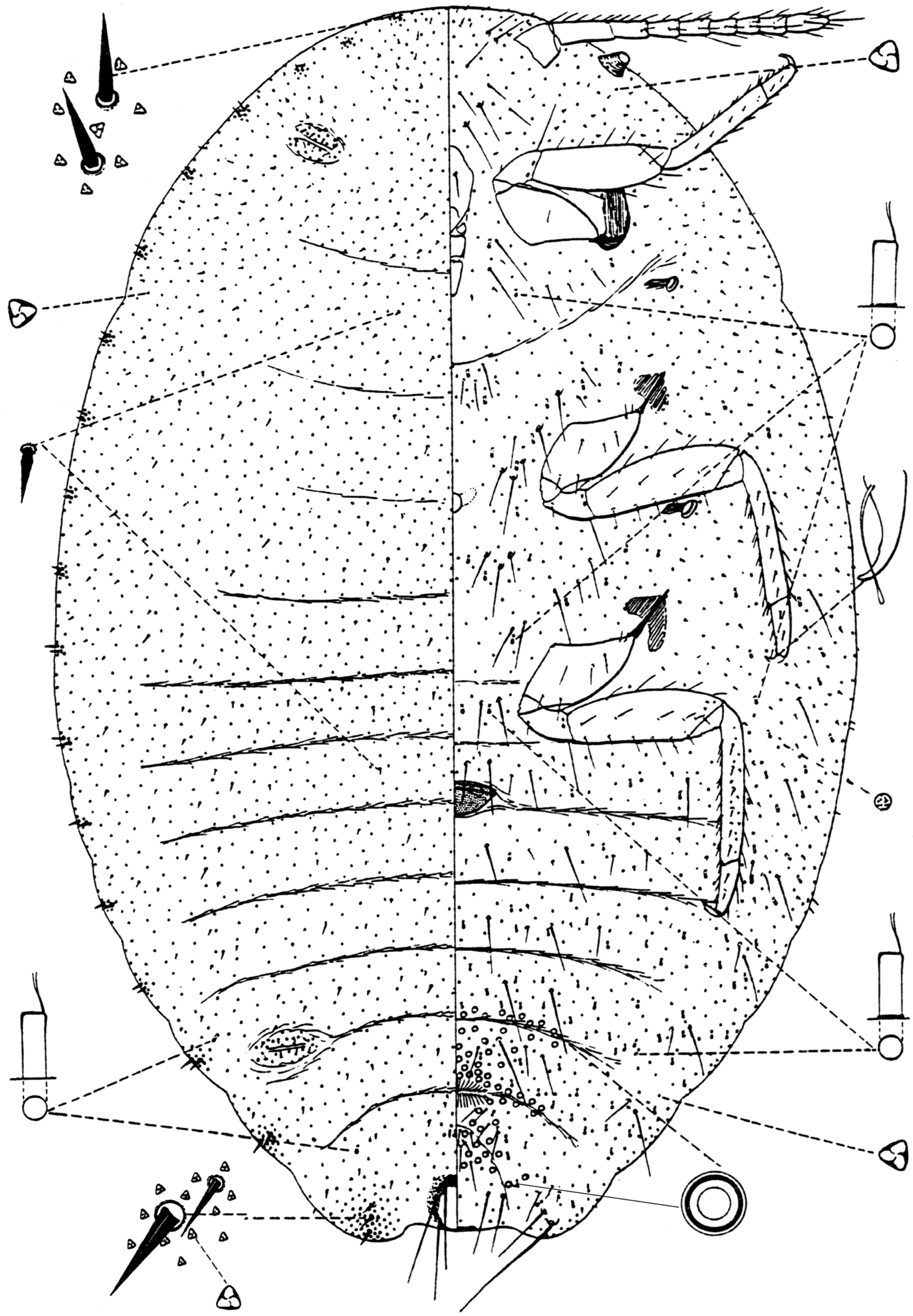

**Figure 34.** *Phenacoccus solenopsis* (after Kosztarab 1996).

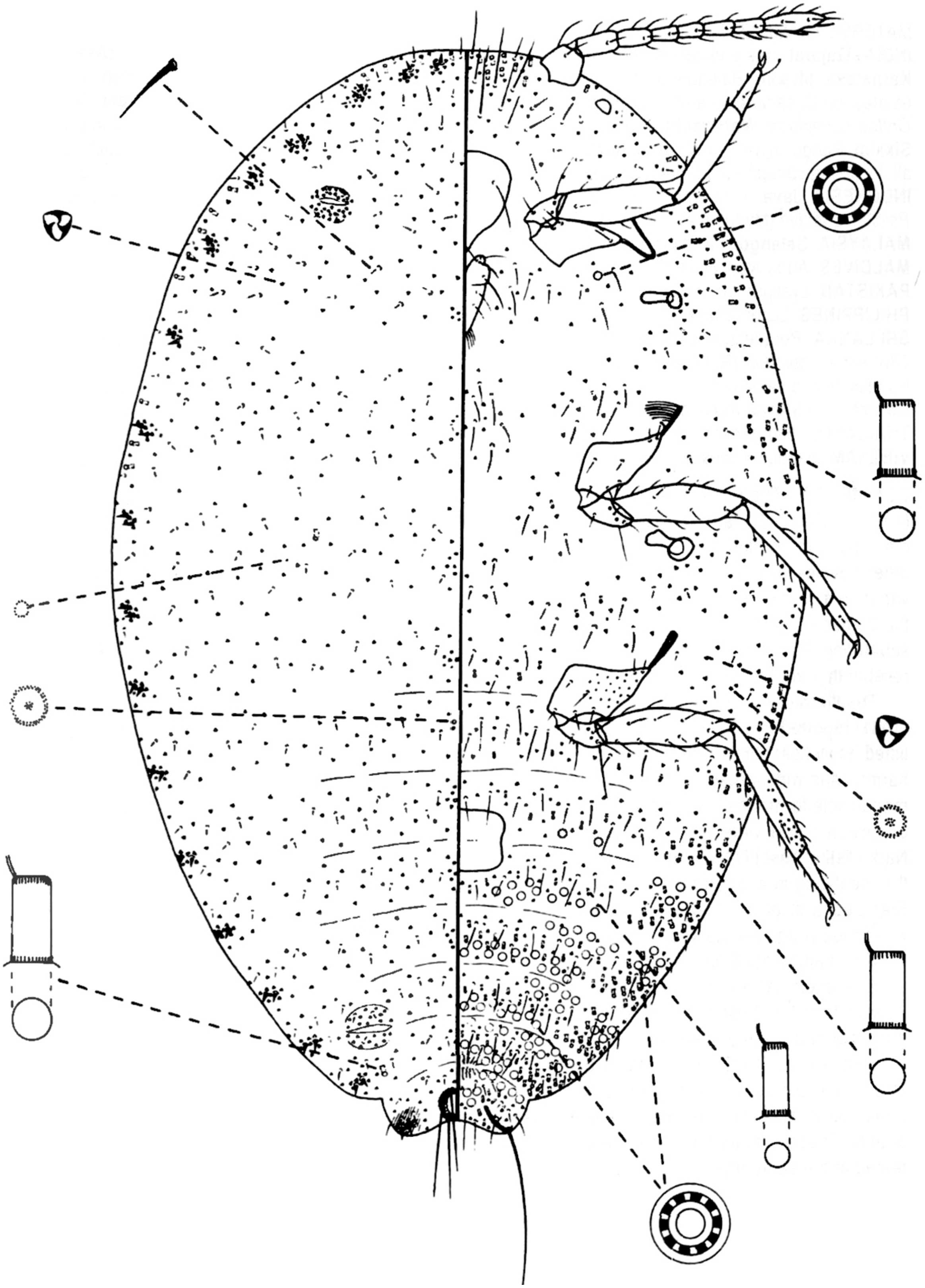

**Figure 35.** *Planococcus citri* (after Willliams 2004).

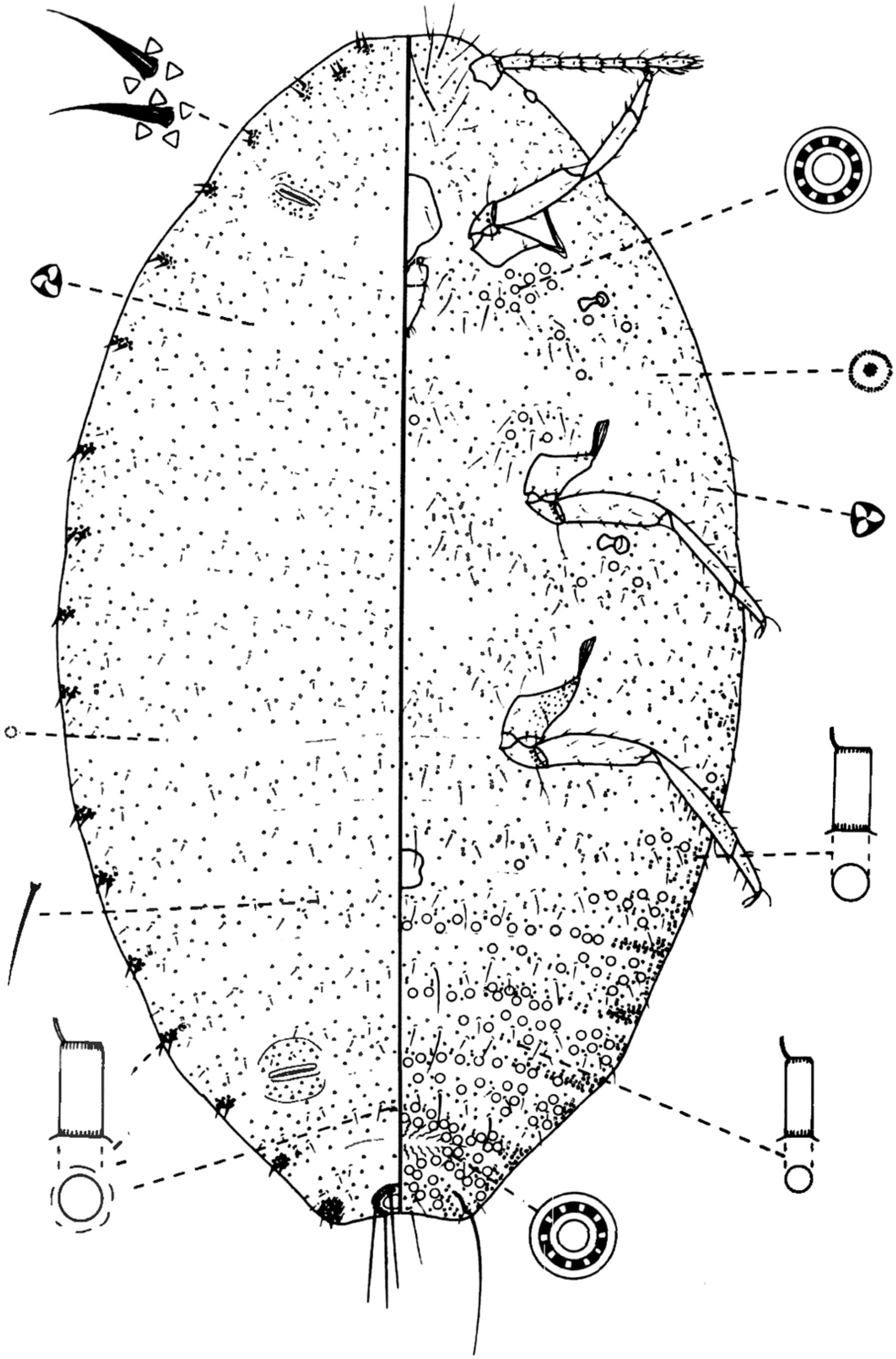

**Figure 36.** *Planooccus ficus* (after Willliams 2004).

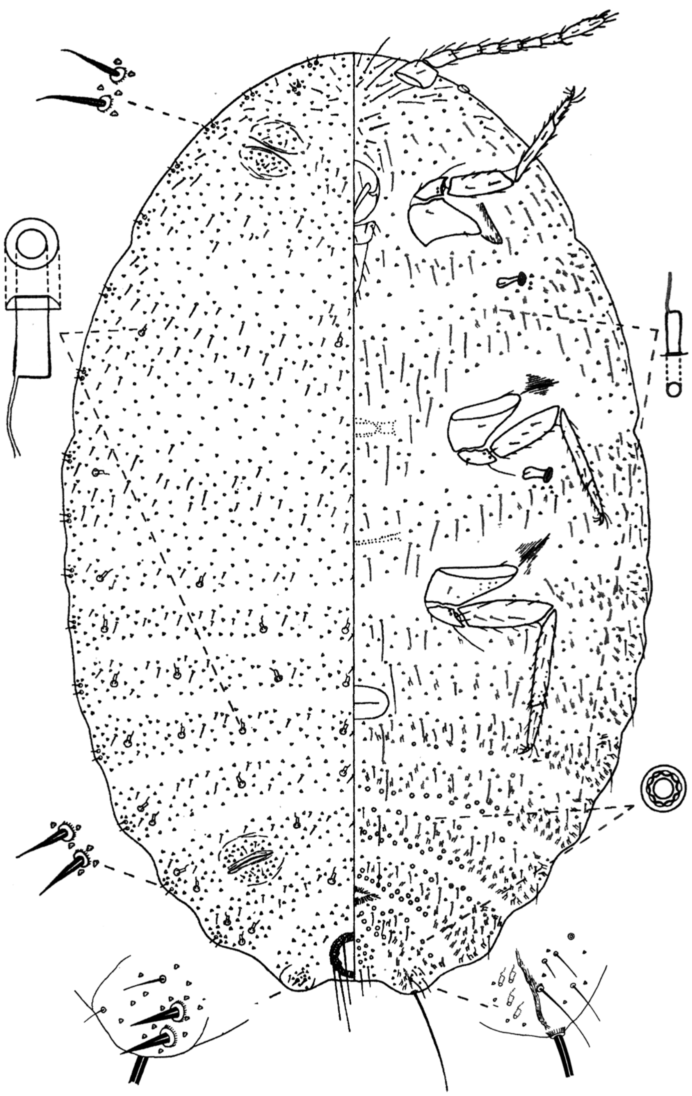

**Figure 37.** *Planococcus vovae* (after Ezzat and McConnell 1956).

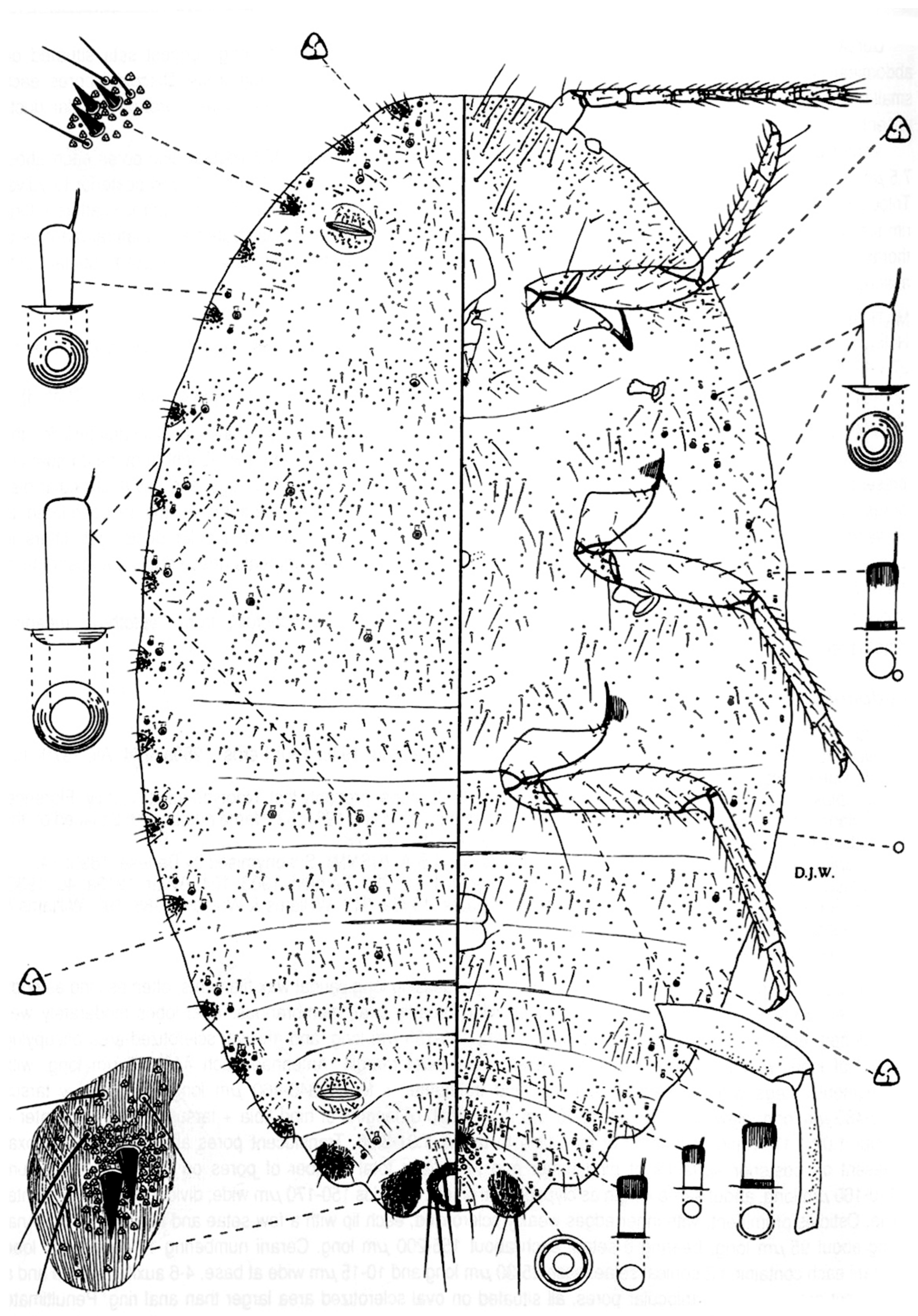


**Figure 38.** *Pseudococcus longispinus* (after Willliams 2004).

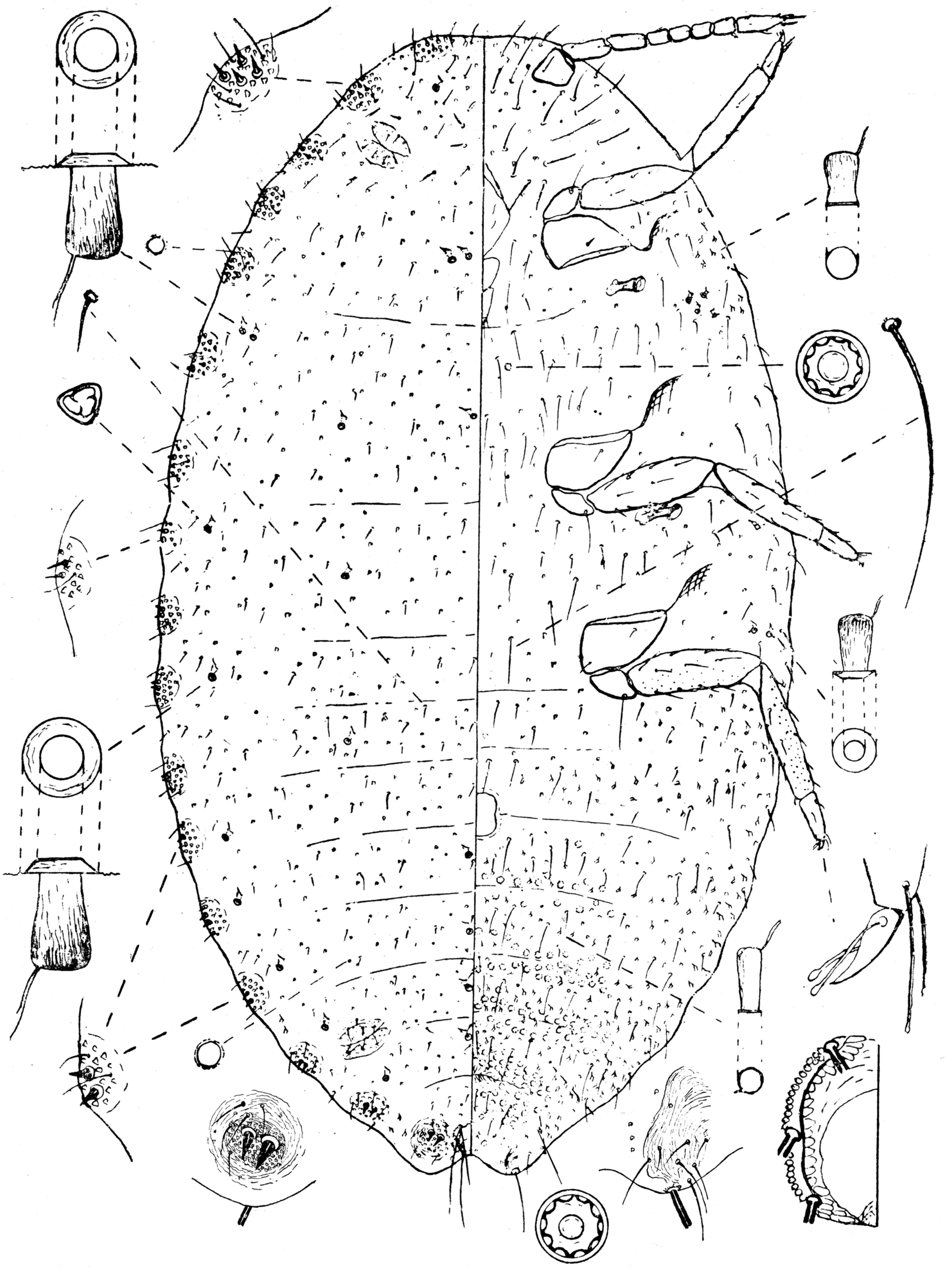

**Figure 39.** *Pseudococcus maritimus* (after Ezzat and Rashad 1962).

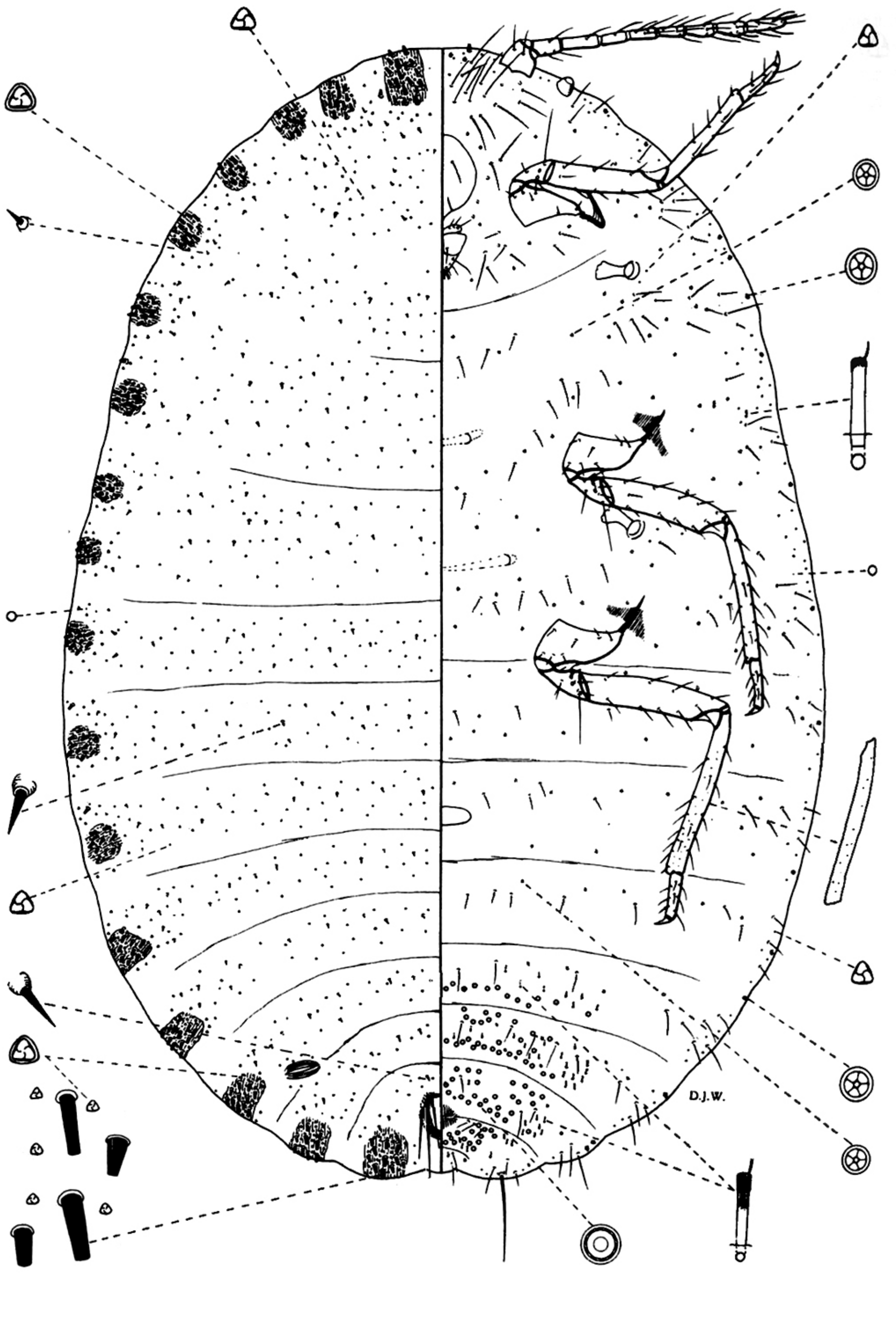


**Figure 40.** *Rastrococcus invadens* (after Willliams 2004).

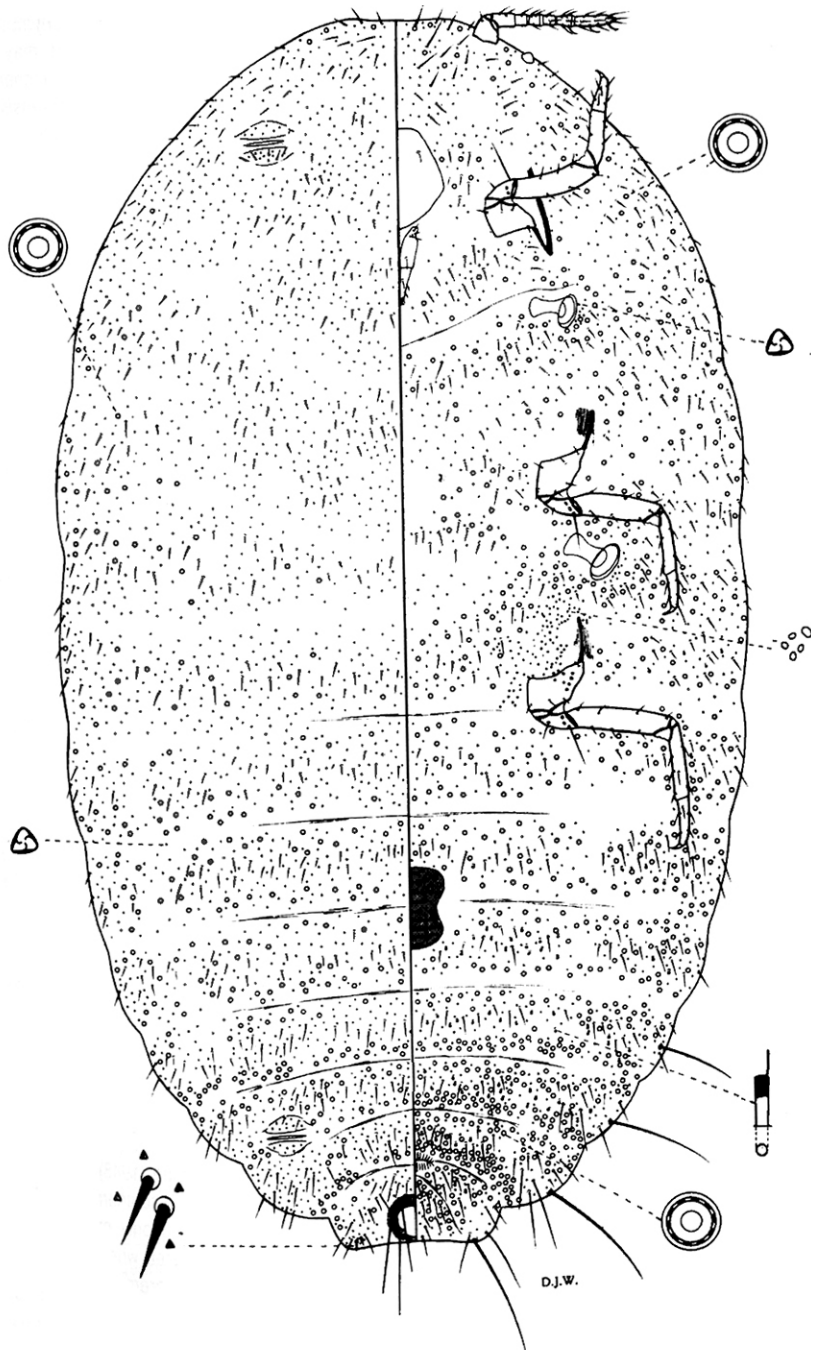


**Figure 41.** *Saccharicoccus sacchari* (after Willliams 2004).

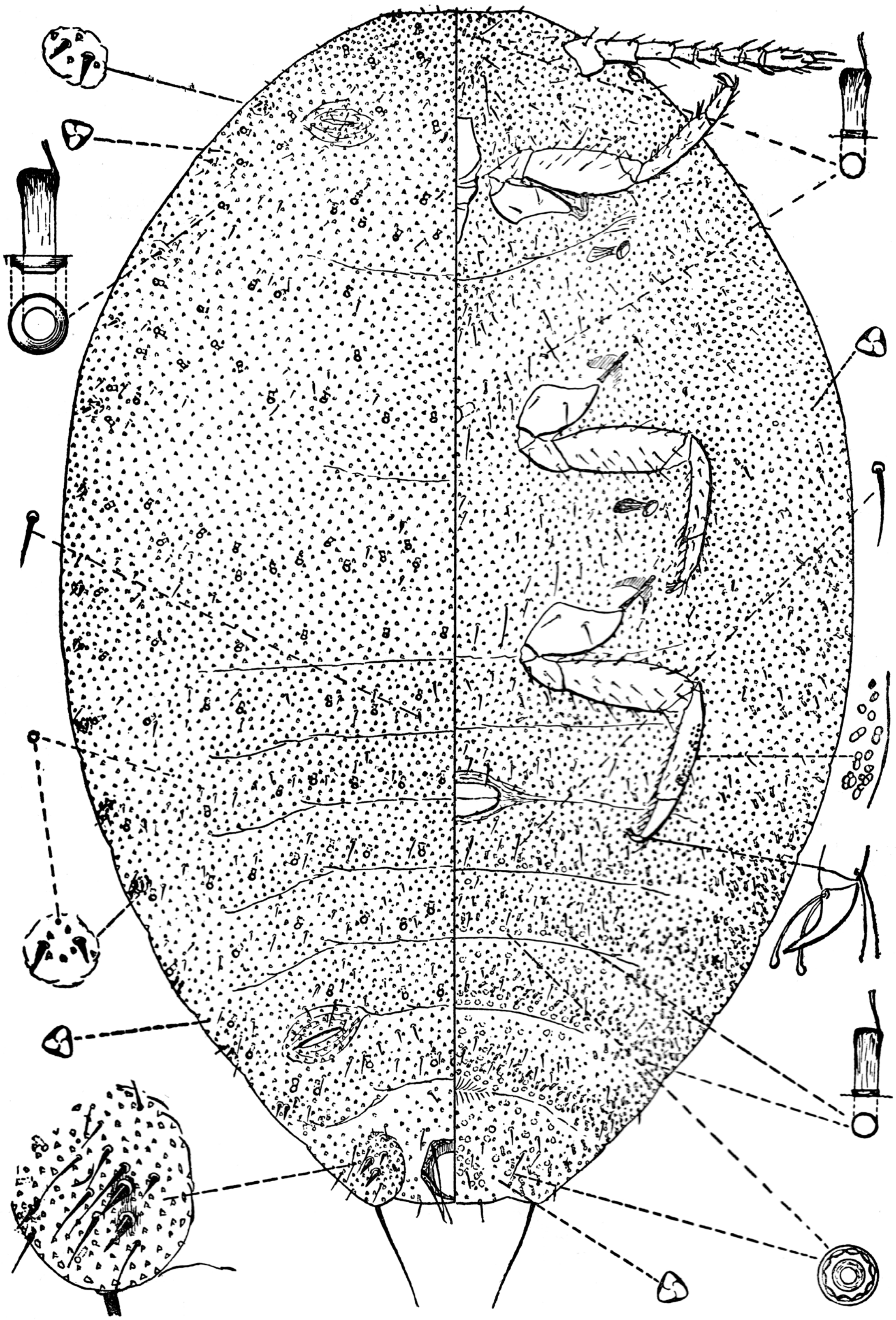

**Figure 42.** *Spilococcus alhagii* (after Ezzat 1960d).

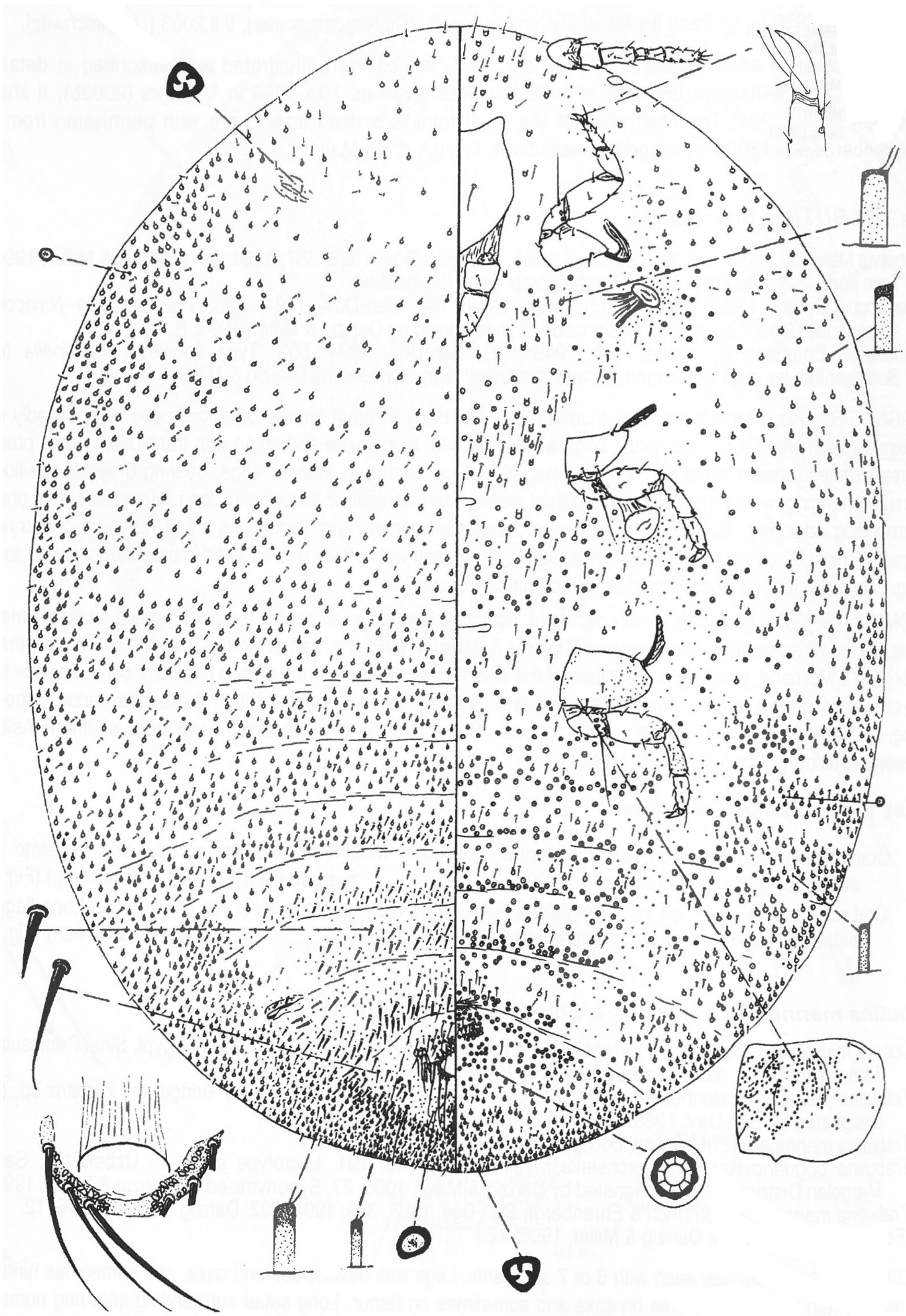

**Figure 43.** *Trabutina mannipara* (after Willliams 2004).

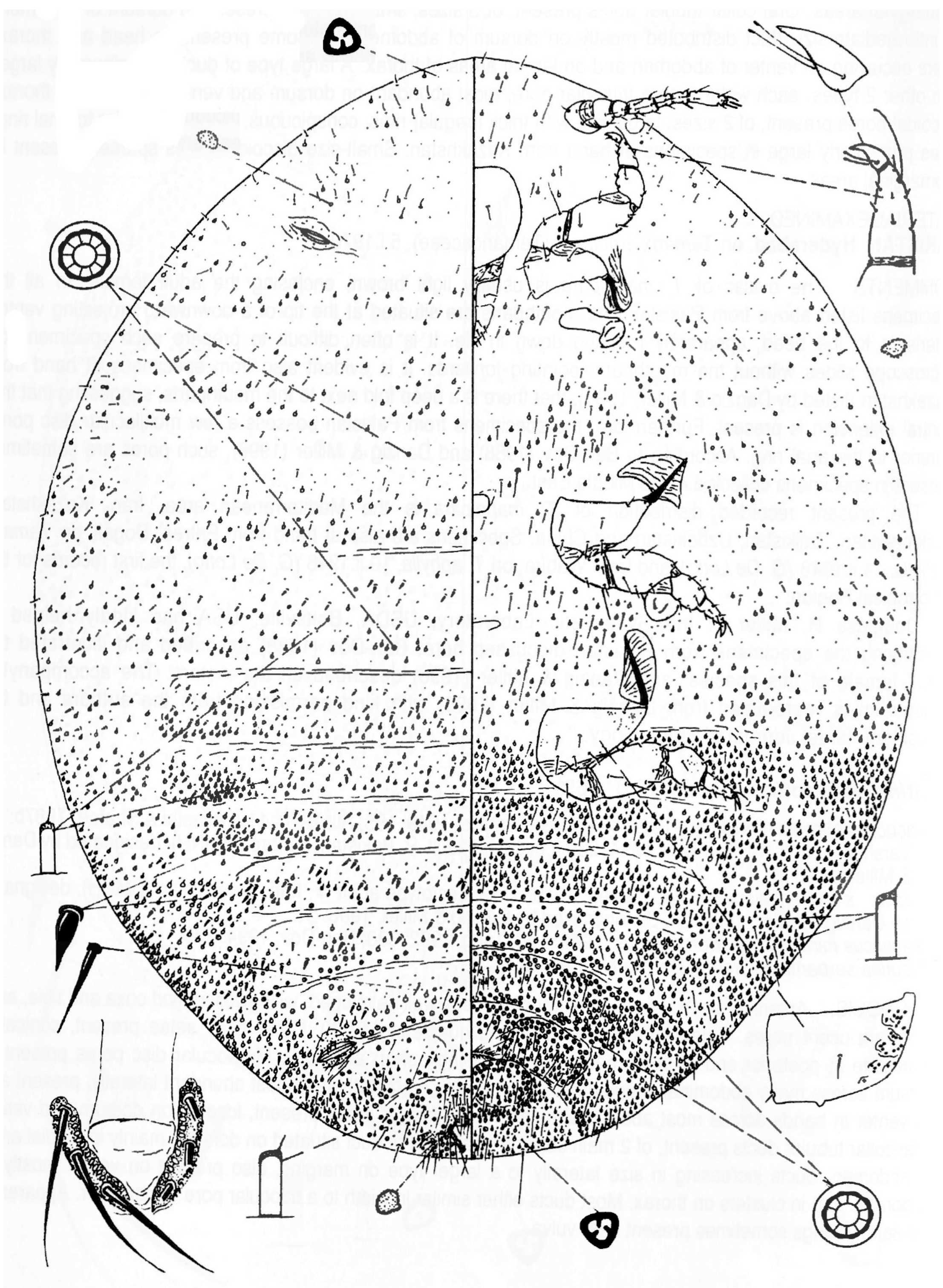

**Figure 44.** *Trabutina serpentina* (after Willliams 2004).

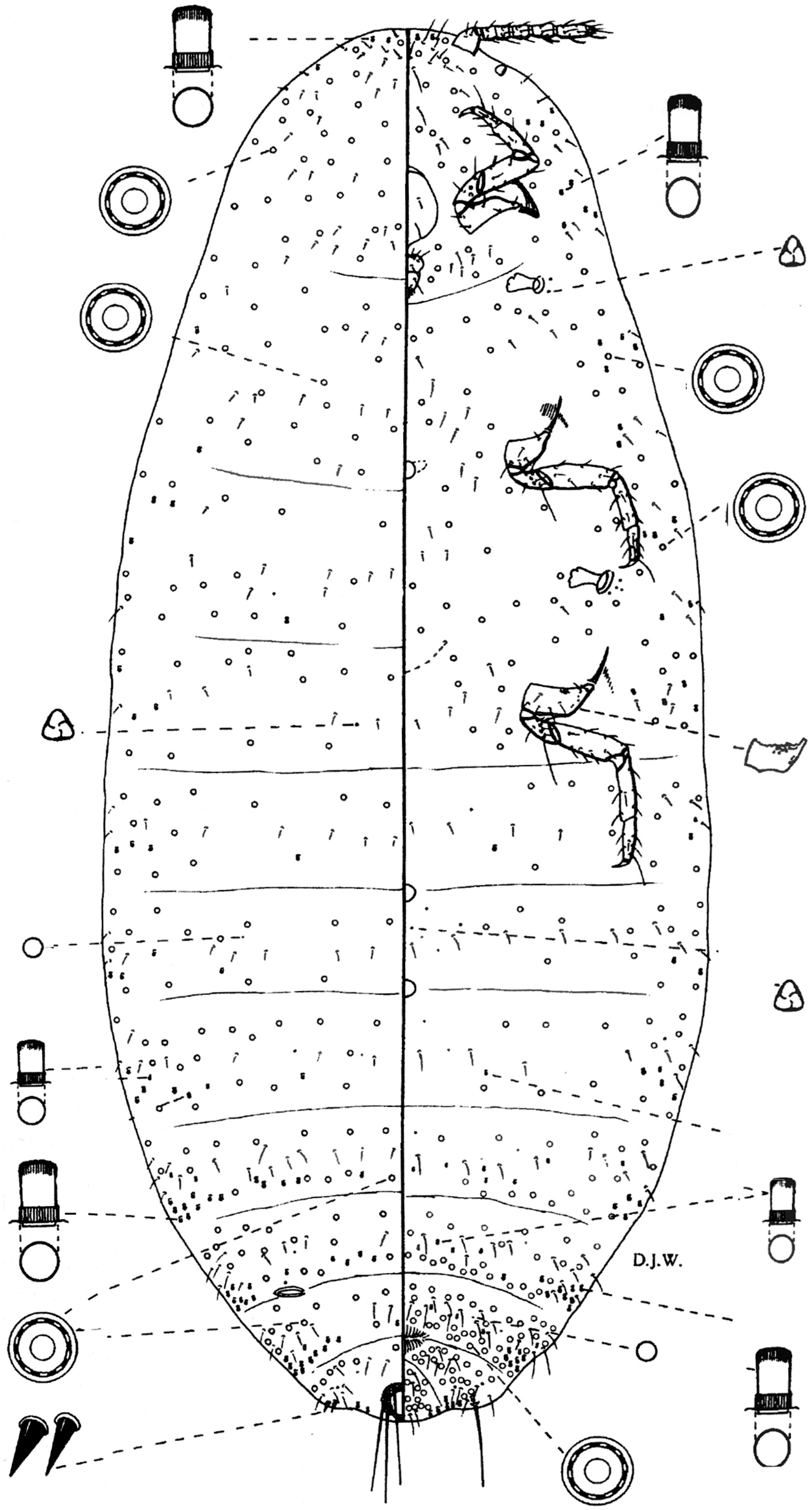


**Figure 45.** *Trionymus cynodontis* (after Willliams 2004).

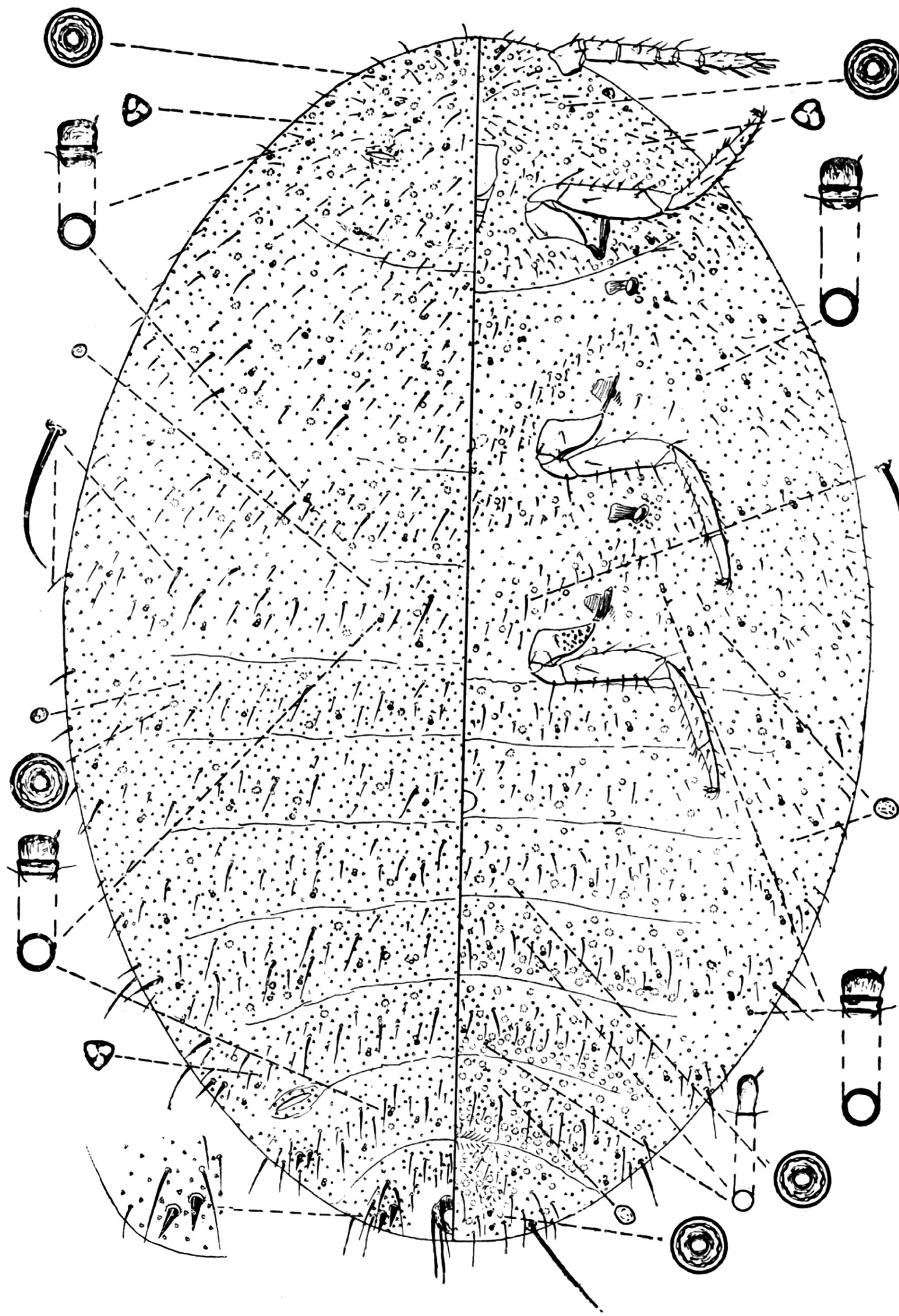

**Figure 46.** *Trionymus internodii* (after Ezzat 1962b).

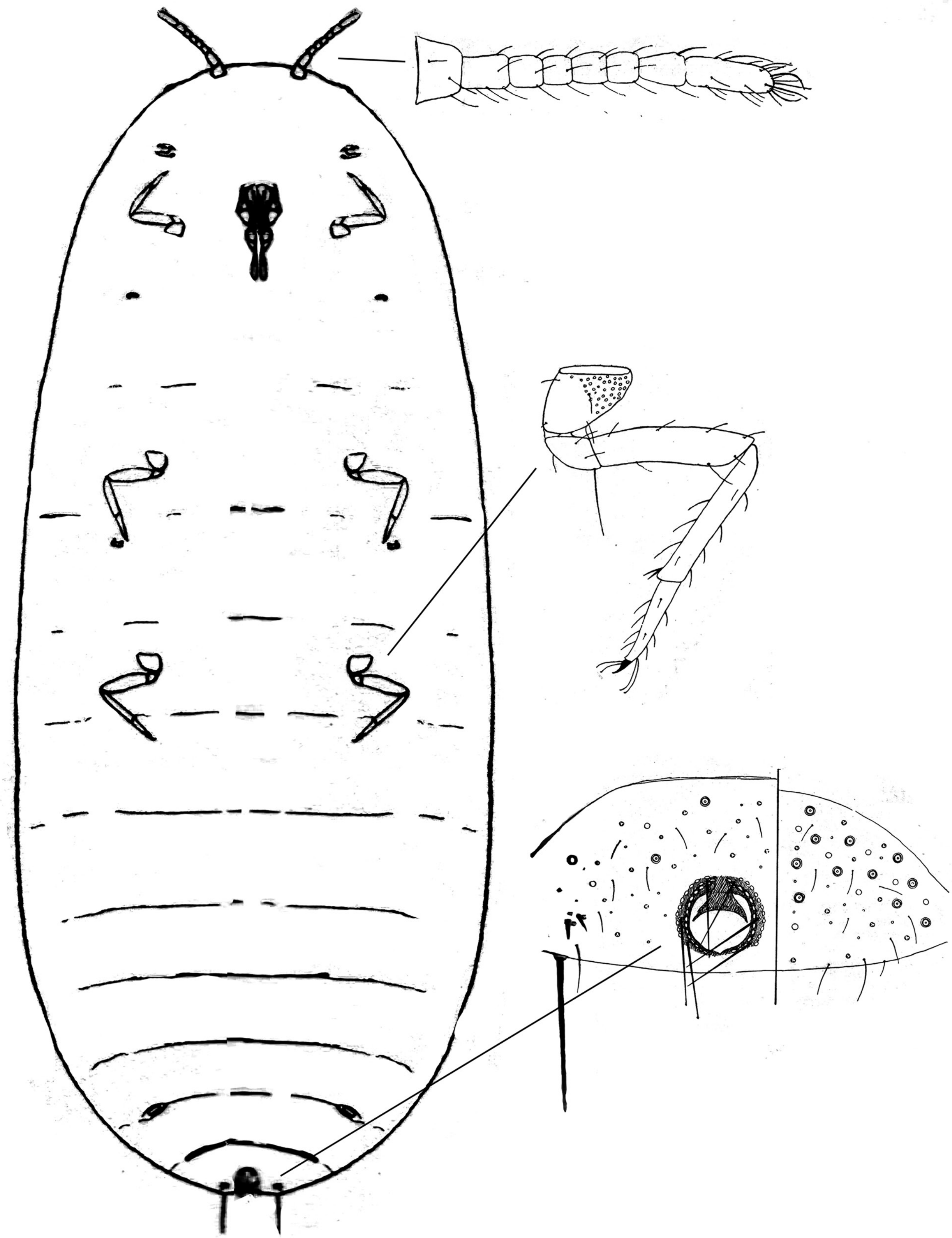

**Figure 47.** *Trionymus masrensis* (after Hall 1925).

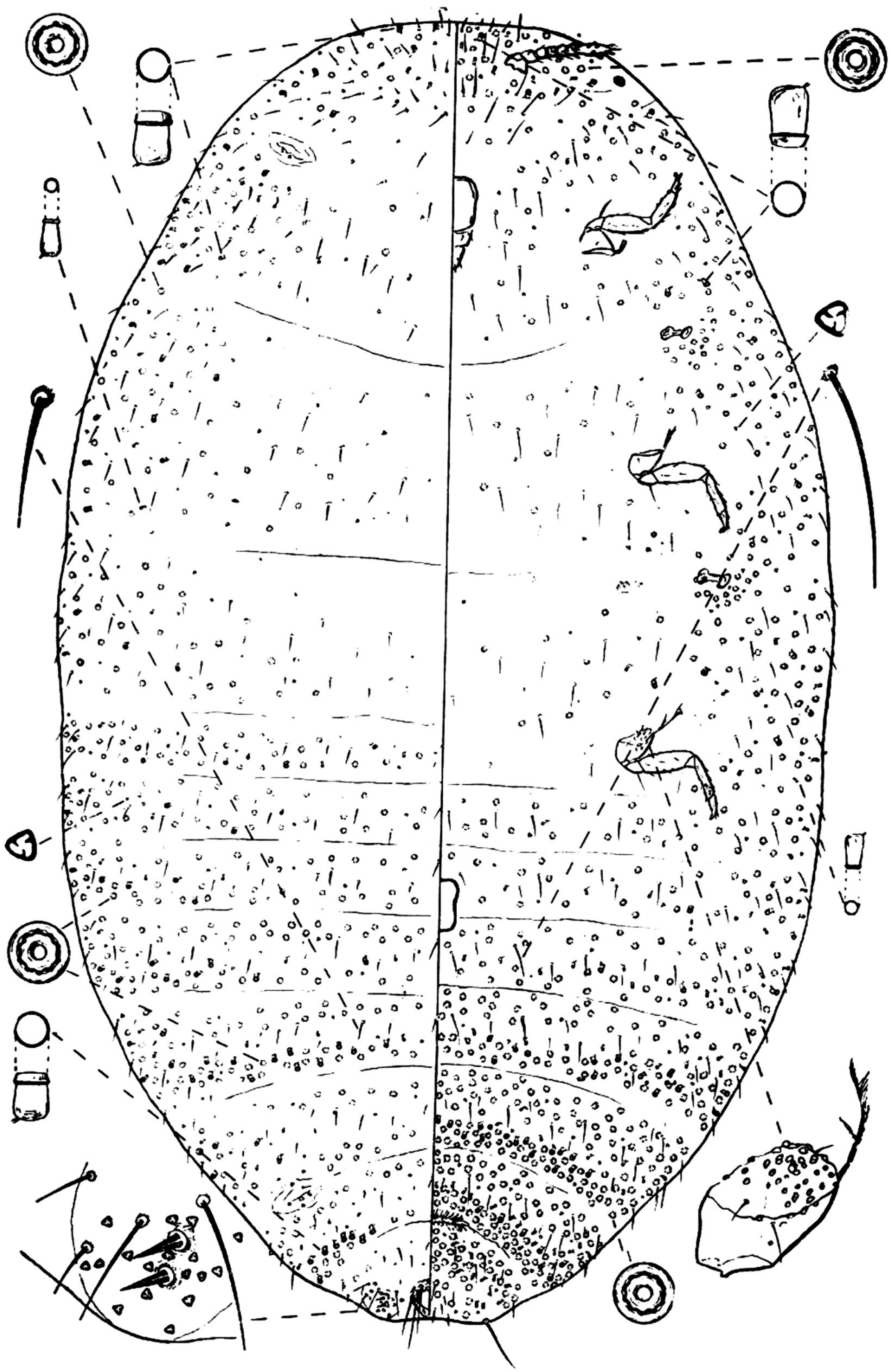

**Figure 48.** *Trionymus phragmatis* (after Ezzat 1962b).

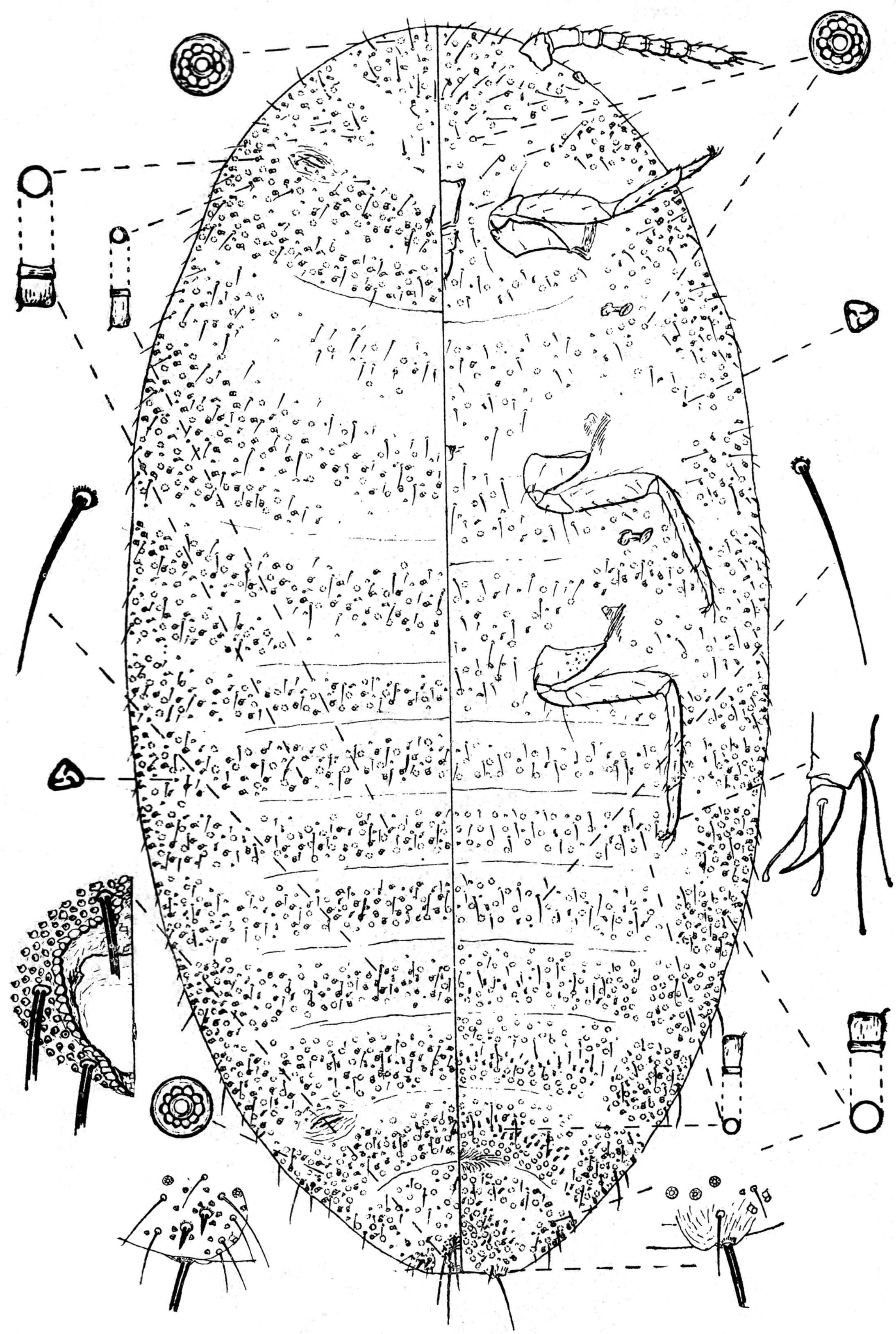

**Figure 49.** *Trionymus polyporus* (after Ezzat 1962b).

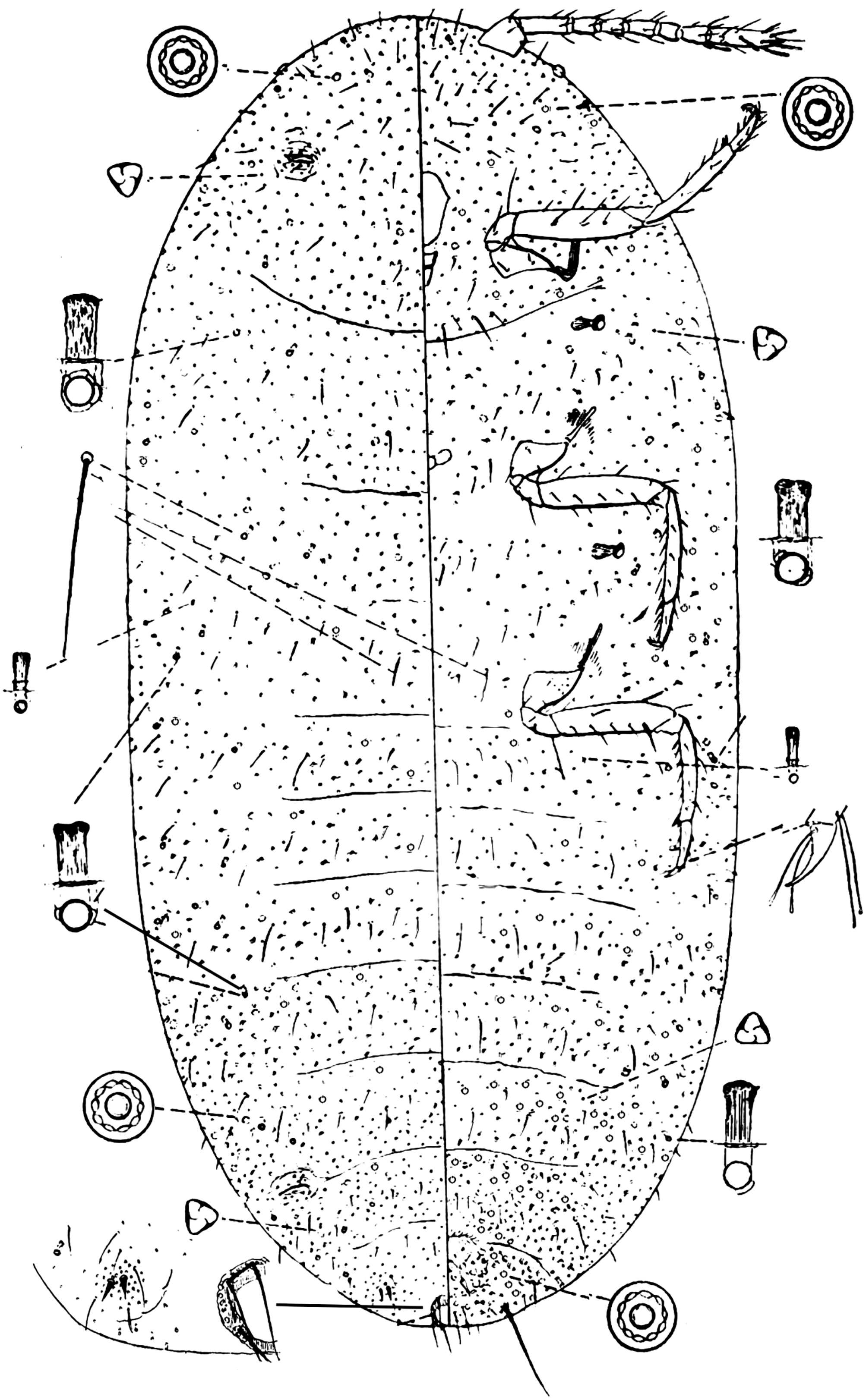

**Figure 50.** *Trionymus williamsi* (after Ezzat 1959a).

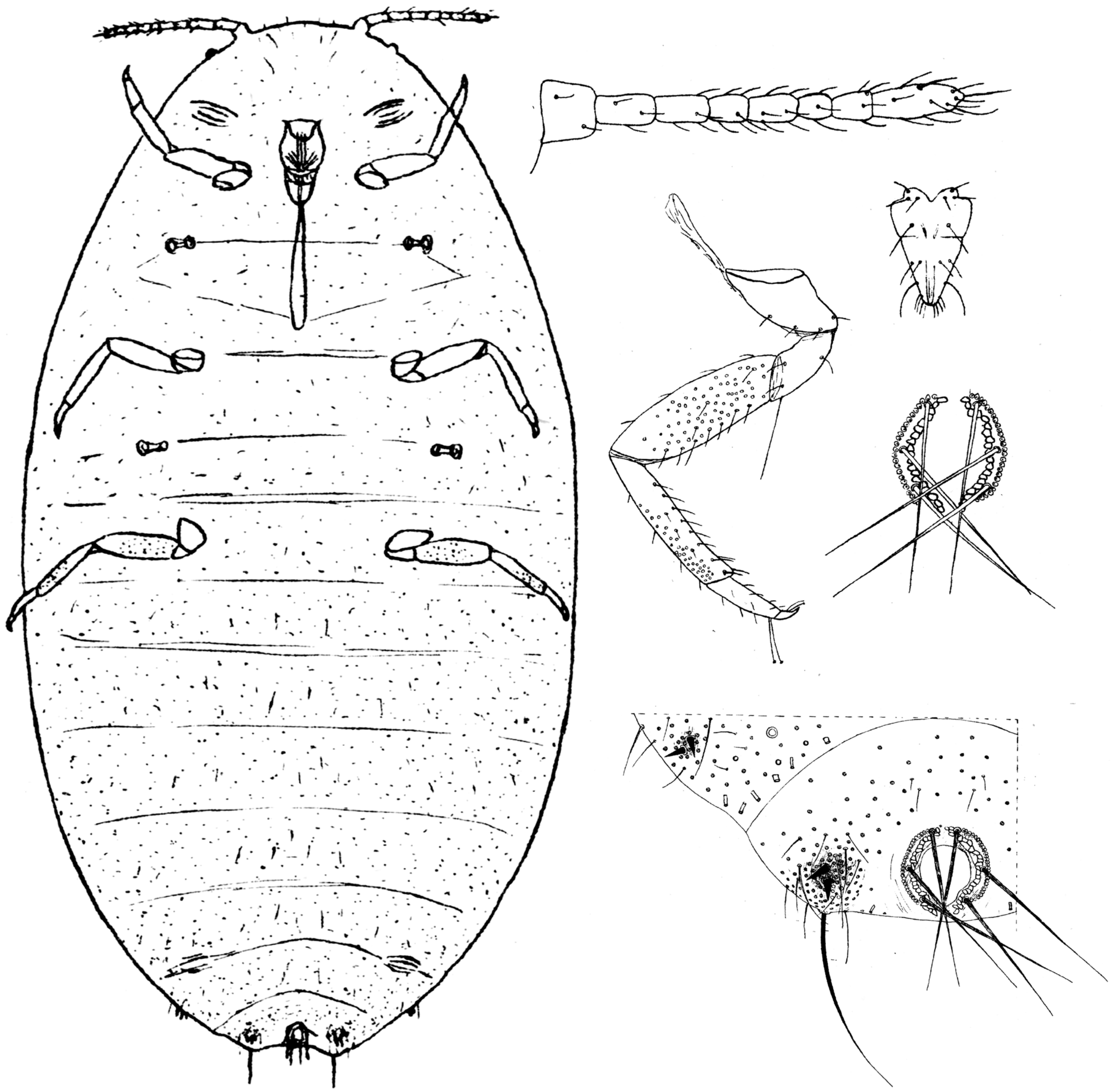

**Figure 51.** *Vryburgia amaryllidis* (after Hall 1923).

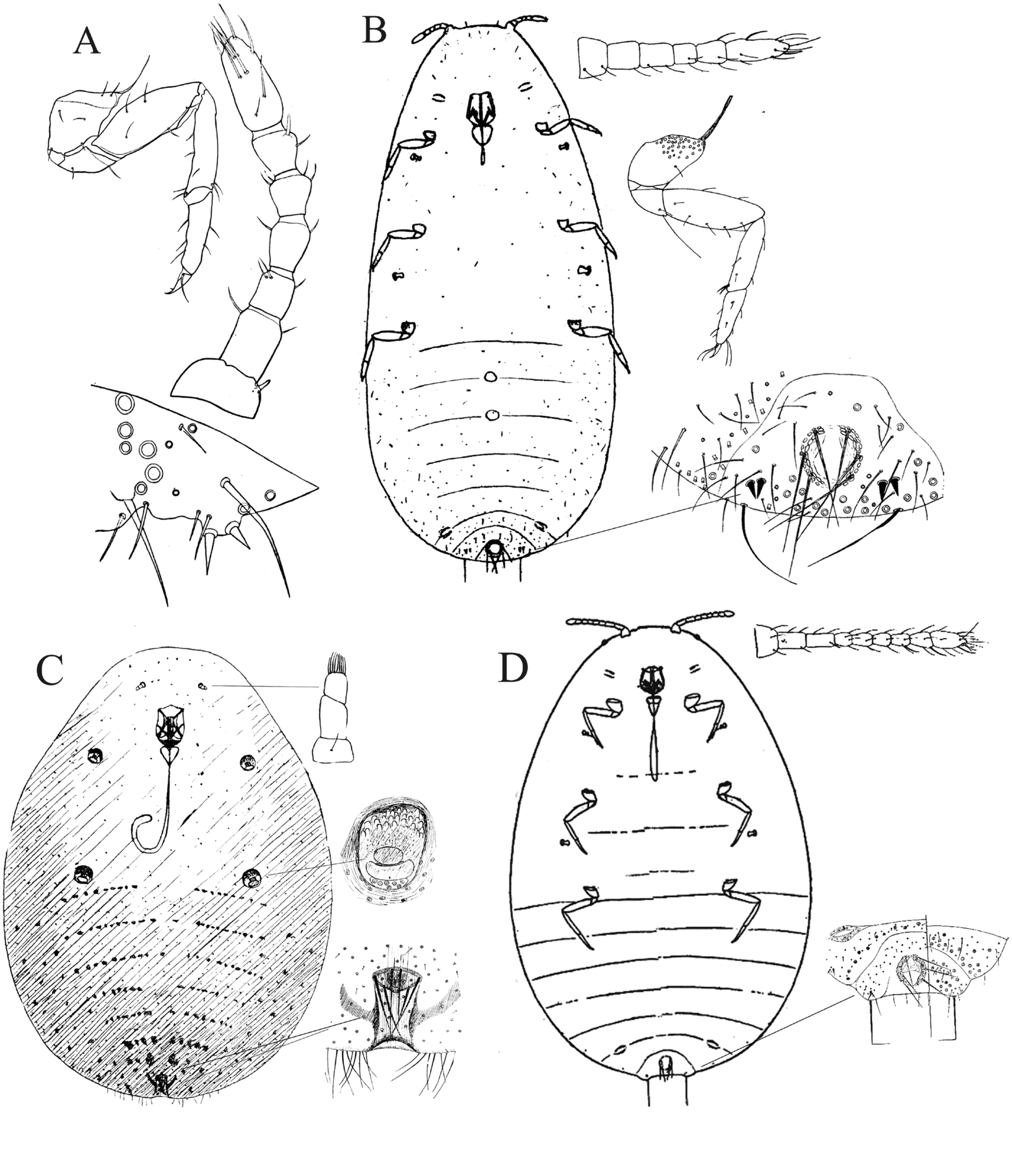


**Figure 52.** Pseudococcidae spp. **A)** *Misericoccus salsolilcola* (after Priesner and Hosny 1935). **B)** *Misericoccus imperatae* (after Hall 1923). **C)** *Antonina panici* (after Hall 1925). **D)** *Phenacoccus gypsophilae* (after Hall 1927c).