INSECTA MUNDI

A Journal of World Insect Systematics

0218

# A new genus and species of armored scale insect (Hemiptera: Diaspididae) from Australia found in the historic Koebele Collection of the California Academy of Sciences

John W. Dooley III
United States Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
389 Oyster Point Blvd, Suite 2A
South San Francisco, CA 94080
john.w.dooley@aphis.usda.gov

Gregory A. Evans
USDA/ APHIS/ PPQ
c/o Systematic Entomology Laboratory
Bldg 005, Room 137, BARC-WEST
10300 Baltimore Ave.
Beltsville, MD 20705

Date of Issue: March 23, 2012

Center for Systematic Entomology, Inc., Gainesville, FL

John W. Dooley III and Gregory A. Evans
A new genus and species of armored scale insect (Hemiptera: Diaspididae) from Australia found in the historic Koebele Collection of the California Academy of Sciences
Insecta Mundi 0218: 1-14

**Published in 2012 by**
Center for Systematic Entomology, Inc.
P. O. Box 141874
Gainesville, FL 32614-1874 U. S. A.
http://www.centerforsystematicentomology.org/

**Insecta Mundi** is a journal primarily devoted to insect systematics, but articles can be published on any non-marine arthropod. Topics considered for publication include systematics, taxonomy, nomenclature, checklists, faunal works, and natural history. **Insecta Mundi** will not consider works in the applied sciences (i.e. medical entomology, pest control research, etc.), and no longer publishes book reviews or editorials. **Insecta Mundi** publishes original research or discoveries in an inexpensive and timely manner, distributing them free via open access on the internet on the date of publication.

**Insecta Mundi** is referenced or abstracted by several sources including the Zoological Record, CAB Abstracts, etc. **Insecta Mundi** is published irregularly throughout the year, with completed manuscripts assigned an individual number. Manuscripts must be peer reviewed prior to submission, after which they are reviewed by the editorial board to ensure quality. One author of each submitted manuscript must be a current member of the Center for Systematic Entomology.



**Printed copies (ISSN 0749-6737) deposited in libraries of:**
CSIRO, Canberra, ACT, Australia
Museu de Zoologia, São Paulo, Brazil
Agriculture and Agrifood Canada, Ottawa, ON, Canada
The Natural History Museum, London, Great Britain
Muzeum i Instytut Zoologiczny PAN, Warsaw, Poland
National Taiwan University, Taipei, Taiwan
California Academy of Sciences, San Francisco, CA, USA
Florida Department of Agriculture and Consumer Services, Gainesville, FL, USA
Field Museum of Natural History, Chicago, IL, USA
National Museum of Natural History, Smithsonian Institution, Washington, DC, USA
Zoological Institute of Russian Academy of Sciences, Saint-Petersburg, Russia

**Electronic copies (On-Line ISSN 1942-1354, CDROM ISSN 1942-1362) in PDF format:**
Printed CD mailed to all members at end of year.
Florida Center for Library Automation: http://purl.fcla.edu/fcla/insectamundi
University of Nebraska-Lincoln, Digital Commons: http://digitalcommons.unl.edu/insectamundi/
Goethe-Universität, Frankfurt am Main: http://edocs.ub.uni-frankfurt.de/volltexte/2010/14363/

**Author instructions** available on the Insecta Mundi page at:
http://www.centerforsystematicentomology.org/insectamundi/

INSECTA MUNDI 02XX: 1-14 2012

# A new genus and species of armored scale insect (Hemiptera: Diaspididae) from Australia found in the historic Koebele Collection of the California Academy of Sciences

John W. Dooley III
United States Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
389 Oyster Point Blvd, Suite 2A
South San Francisco, CA 94080
john.w.dooley@aphis.usda.gov

Gregory A. Evans
USDA/ APHIS/ PPQ
c/o Systematic Entomology Laboratory
Bldg 005, Room 137, BARC-WEST
10300 Baltimore Ave.
Beltsville, MD 20705

**Abstract**. A **new genus and species** of armored scale insect (Hemiptera: Diaspididae), *Protomorgania koebelei* Dooley and Evans, is described and illustrated from specimens collected by Albert Koebele on *Pittosporum* sp. (Pittosporaceae) in Australia around the year 1900. A key to the genera of armored scale insects similar to *Protomorgania* and known to occur in Australia is provided.

**Key words.** Aspidiotinae, Coccoidea, taxonomy

## Introduction

Albert Koebele was sent by the U.S. Department of Agriculture (USDA) to Australia around the year 1900 to search for natural enemies of various species of exotic scale insects (Hemiptera: Coccoidea) that had become pests in California (Boardman 1977). In the process of collecting natural enemies, he also collected many specimens of scale insects (Weathers and Lawton 1982). The senior author examined Koebele's collection of armored scales at the California Academy of Sciences Collection in San Francisco, California (CASC). Upon examination of specimens processed and slide mounted from the dried specimens in the collection, a new genus and species of armored scale insects was discovered and is here described.

## Material and Methods

The method used for preparation of slide mounted specimens follows that used by Gill (1997), Miller and Davidson (2005), and the Systematic Entomology Laboratory (SEL), USDA (Anonymous 2006). Specimens of adult female armored scales were placed into test tubes containing 5% KOH and heated in a bubbling hot water bath for 15 minutes. They were then washed in water to remove potassium hydroxide and soaked in Essig's aphid fluid with the addition of two drops of double stain for 10-15 minutes. The stained specimens were placed in 70% ethanol for 15 minutes and then transferred into 90% ethanol for 10 minutes. Specimens were transferred to clove oil for 15 minutes prior to slide mounting in Canada balsam. Images and measurements were taken with a SMZ 1500 wide field and a Nikon Eclipse 80i compound microscope using a Nikon DS-Fi1 Digital Image camera. Measurements were taken from 4 specimens and given in micrometers (µm).

**Specimen Depositories. ASCU**–Agricultural Scientific Collections Unit of Industry and Investment, NSW, Australia; **CASC**–California Academy of Sciences Collection, San Francisco, California; **CSCA**–California State Collection of Arthropods, California Department of Food and Agriculture, Sacramento,

California; **FSCA**–Florida State Collection of Arthropods, Gainesville, Florida; **PPQC**–Plant Inspection Station reference collection, USDA-APHIS-PPQ at San Francisco, California; **USNM**–National Coccoidea Collection, United States National Museum of Natural History, Beltsville, Maryland.

**Morphology and Terminology.** A glossary for the morphological terms used to describe armored scales can be found in Miller and Davidson (2005). The following abbreviations are used: abdominal segments 1 through 8 ($A_1$-$A_8$); cephalon ($C_1$); pygidial lobes–median or first lobe ($L_1$), second lobe ($L_2$), third lobe ($L_3$) and fourth lobe ($L_4$); perispiracular pores (pps); perivulvar pores (pvp); and thoracic segments–prothorax ($T_1$), mesothorax ($T_2$) and metathorax ($T_3$).

## Key and illustrations

A key to the genera of armored scales known to occur in Australia that are similar to *Protomorgania* n. gen. is provided. The genera in this group belong to the subfamily Aspidiotinae and are characterized by having a broad body with a constriction or incision between the prothorax and mesothorax. The metathorax and abdomen are usually broader than the region from the anterior margin of the body to the mesothorax. In addition, most of the species in this group lack perivulvar pores and unlike most of the species in other aspidiotine genera which lack perispiracular pores, many of the species in this group have perispiracular pores present at least above the anterior spiracle and sometimes above the posterior spiracle.

Illustrations of the type species of the genera similar to *Protomorgania* are provided to assist the readers with the key. All of the illustrated species are known to occur in Australia (Brimblecombe 1954, 1956, 1957, 1959, Ferris 1937 and MacGillvray 1921) with the exception of *Pseudaonidia duplex* (Cockerell) (Cockerell 1897 and Ferris 1937) and *Duplaspidiotus claviger* (Cockerell). Each of the plates of the various genera includes the habitus of the adult female, a detail of the pygidium and a detail of the left side of the pygidial lobes and paraphyses.

## Key to the genera of armored scales in Australia similar to *Protomorgania*

1. Dorsum of pygidium primarily reticulate or areolate. ..... 2
– Dorsum of pygidium primarily stippled, striate or smooth. ..... 9

2(1) Anterior and posterior spiracles without associated perispiracular pores; pygidial plates fringed, extending beyond $L_1$ lobes; $L_2$ and $L_3$ absent. ..... 3
– Anterior spiracles with, and posterior spiracles with or without, associated perispiracular pores; pygidial plates fringed or straight, not extending beyond $L_1$ lobes; $L_2$ present (except in *Mimeraspis cuspiloba* Brimblecombe), $L_3$ present or absent. ..... **4**

3(2) $L_1$ lobes fused or appressed; 1 species on *Eucalyptus* (Fig. 10)..... ***Dichosoma*** **Brimblecombe**
– $L_1$ lobes separated; 1 species on *Eucalyptus* (Fig. 9). ..... ***Diastolaspis*** **Brimblecombe**

4(2) $L_1$ lobes fused or appressed; perispiracular pores above the anterior spiracle usually widely dispersed, extending laterally well beyond the width of the spiracle; 2 species on *Melaleuca* and *Callistemon* (Fig. 14)..... ***Mimeraspis*** **Brimblecombe**
– $L_1$ lobes separated; perispiracular pores above the anterior spiracle not widely dispersed, not extending laterally well beyond the width of the spiracle. ..... **5**

(4) Paraphysis between $L_1$ and $L_2$ lobes elongate, each with a large round sclerotization at its apex. .. **6**
– Paraphysis between $L_1$ and $L_2$lobes variable, but without a large round sclerotization at its apex. **7**

6(5) Pygidium with 3 lobes, $L_2$ well separated from $L_1$; 18 species on various hosts (Fig. 11). ..... ..... ***Duplaspidiotus*** **MacGillivray**
– Pygidium with 2 lobes, $L_2$ nearly contiguous with $L_1$; 1 species on *Acacia* (Fig. 12). ..... ..... ***Eulaingia*** **Brimblecombe** (in part).

7(5) Paraphyses present on each side of the $L_1$ lobes; $L_4$ present; some species with perivulvar pores; 19 species on various hosts (Fig. 18). ***Pseudaonidia*** **Cockerell**

– Paraphyses present only on anterior side of the $L_1$ lobes; $L_4$ absent; all species without perivulvar pores. **8**

8(7) Anterior and posterior spiracles with associated pores; vulva not encompassed by large, sclerotized arch; 13 species, various hosts (Fig. 19). ***Pseudotargionia*** **Lindinger**

– Anterior spiracles with, and posterior spiracles without, associated pores; vulva encompassed by large, sclerotized arch; 4 species on *Melaleuca* and *Leptospermum* (Fig. 15). ***Myrtophila*** **Brimblecombe**

9(1) Perivulvar pores present; paraphyses absent; $L_1$ lobes separated; $L_2$ and $L_3$ present; 1 species on *Eugenia* (Fig. 13). ***Megaspidiotus*** **Brimblecombe**

– Perivulvar pores absent; paraphyses present (except in *Diaspidopus distinctus* Brimblecome) $L_1$ lobes variable; $L_2$ and $L_3$ present or absent. 10

10(9) Pygidium with 1 pair of paraphyses which terminate in a large round sclerotization; plates setiform; $L_2$ small, almost contiguous with large $L_1$ lobes; 1 species on *Acacia* (Fig. 12). ***Eulaingia*** **Brimblecombe** (in part)

– Pygidium with 0, 1 or more pairs of paraphyses, none of which terminate in a large round sclerotization; plates fringed, $L_2$variable but not almost contiguous with large $L_1$ lobes. **11**

11(10) $L_1$ lobes fused or appressed; $L_2$ and $L_3$ absent (except in some *Neoleonardia* species). **12**

– $L_1$ lobes separated; $L_2$ and $L_3$ present (except in *Diaspidopus distinctus*). **14**

12(9) Pygidium tapering posteriorly to a point; basal sclerosis elongate; $L_1$lobes fused; $L_2$ and $L_3$ present or absent; vulva not encompassed by large, sclerotized arch; 5 species on *Eucalyptus* and *Melaleuca* (Fig. 16). ***Neoleonardia*** **MacGillivray**

– Pygidium not tapering posteriorly to a point; basal sclerosis absent; $L_1$ lobes fused or appressed; $L_2$ and $L_3$ absent; vulva encompassed by large, sclerotized arch. **13**

13(12) Anterior and posterior spiracles with associated pores; $L_1$ lobes fused ventrally, appressed dorsally; tubercle present on lateral margin of cephalon; 1 species on *Pittosporum*. (Fig. 1–3). ***Protomorgania*** **Dooley and Evans, gen. nov.**

– Anterior spiracles with, and posterior spiracles without, associated pores; $L_1$ lobes appressed ventrally and dorsally; tubercle absent on lateral margin of cephalon; 1 species on various hosts (Fig. 17). ***Neomorgania*** **MacGillvray**

14(11) $L_2$ and $L_3$ absent; $L_1$ lobes short, round and separated by a distance of about the width of one lobe; paraphyses absent; 1 species on *Homoranthus* (Fig. 8). ***Diaspidopus*** **Brimblecombe**

– $L_2$ and $L_3$ present; $L_1$ lobes variable but not separated by a distance of about the width of one lobe; paraphyses present. **15**

15(14) $L_1$ lobes tri-lobed with paraphyses present on each side of the each lobe; 1 species on *Dissilaria* (Fig. 5). ***Acontonidia*** **Brimblecombe**

– $L_1$ lobes uni-lobed with paraphyses present only on anterior margin of each lobe. **16**

16(15) Lobes elongate, much longer than wide; paraphyses short and yoked; 1 species on *Dissilaria* (Fig. 6 ). ***Aspidonymus*** **Brimblecombe**

– Lobes short and round, much wider than long; paraphyses elongate, not yoked; 2 species on *Casuarina* (Fig. 4). ***Achorophora*** **Brimblecombe**

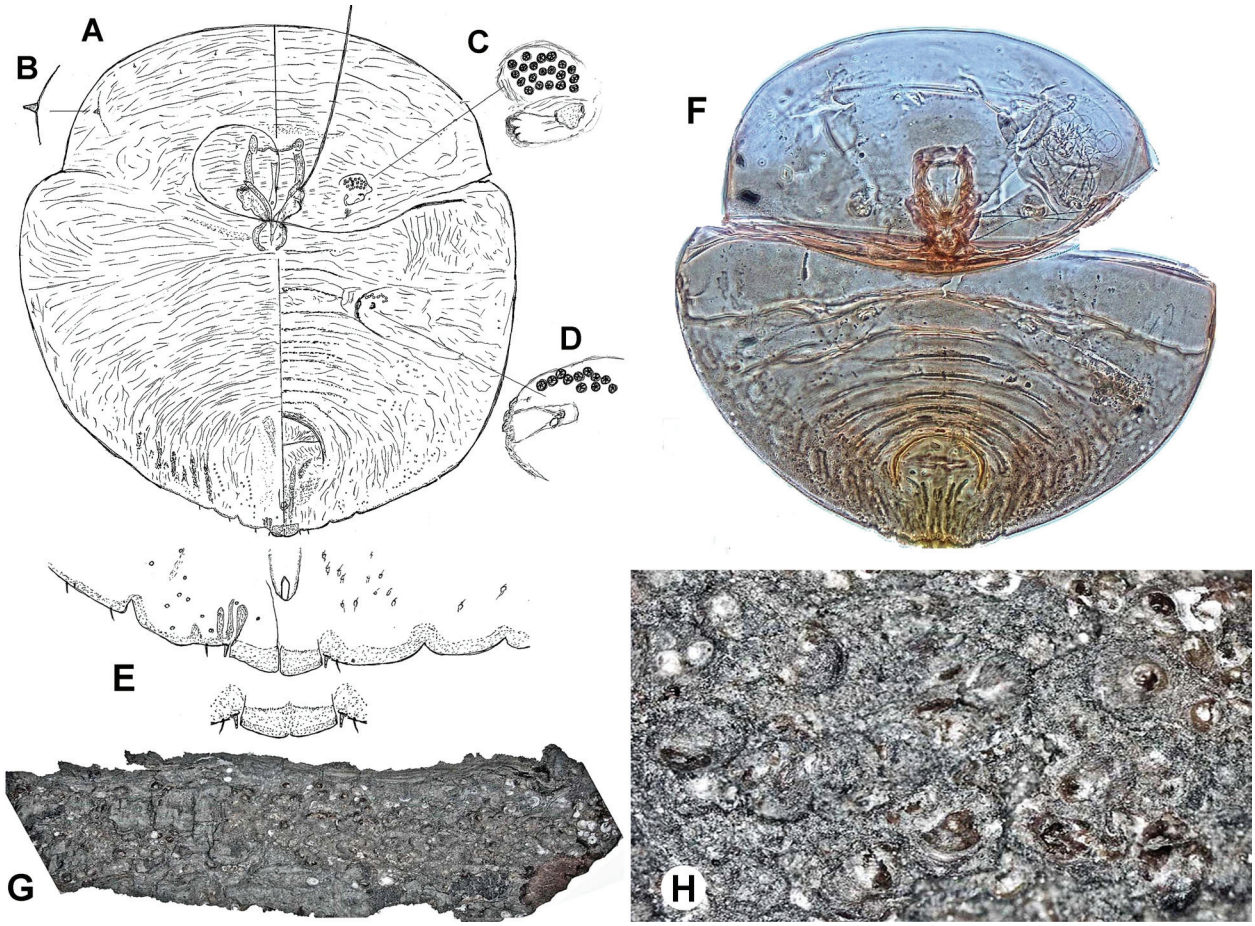



**Figure 1.** *Protomorgania koebelei* adult female. A) habitus; B) tubercle; C) anterior spiracle; D) posterior spiracle; E) pygidial lobes; F) slide mounted female habitus; G) habitus on host; H) close-up of habitus on host

***Protomorgania* Dooley and Evans, gen. nov.**

**Type species**. *Protomorgania koebelei* Dooley and Evans, sp. nov.

**Diagnosis.** *Protomorgania* Dooley and Evans is a monotypic genus that belongs to the subfamily Aspidiotinae based on presence of macroducts of the 1-barred type. Unlike many of the aspidiotine genera, it has perispiracular pores associated with the spiracles. It is similar to several of the genera treated herein in that they have a relatively broad body with a constriction or incision between the prothorax and mesothorax with most of the species in this group lack perivulvar pores. It can be distinguished from these genera by the following combination of characters: anterior and posterior spiracles with associated perispiracular pores; dorsum of the pygidium not reticulated; $L_1$ lobes fused ventrally, appressed dorsally. It is most similar to *Neomorgania* (MacGillvray, 1921) but can be distinguished from that genus by having: the anterior and posterior spiracles with associated pores; $L_1$ lobes fused ventrally, appressed dorsally; and a tubercle present on lateral margin of the cephalon; in *Neomorgonia*, only the anterior spiracles have associated pores; the $L_1$ lobes are appressed ventrally and dorsally; and it lacks the tubercle on lateral margin of the cephalon.

**Adult female**

**Description.** *Habitus in nature*. Individuals abundant, found on bark and somewhat cryptic in appearance being similar to the color and texture of the bark. Exuviae brown, oval and subcentral.

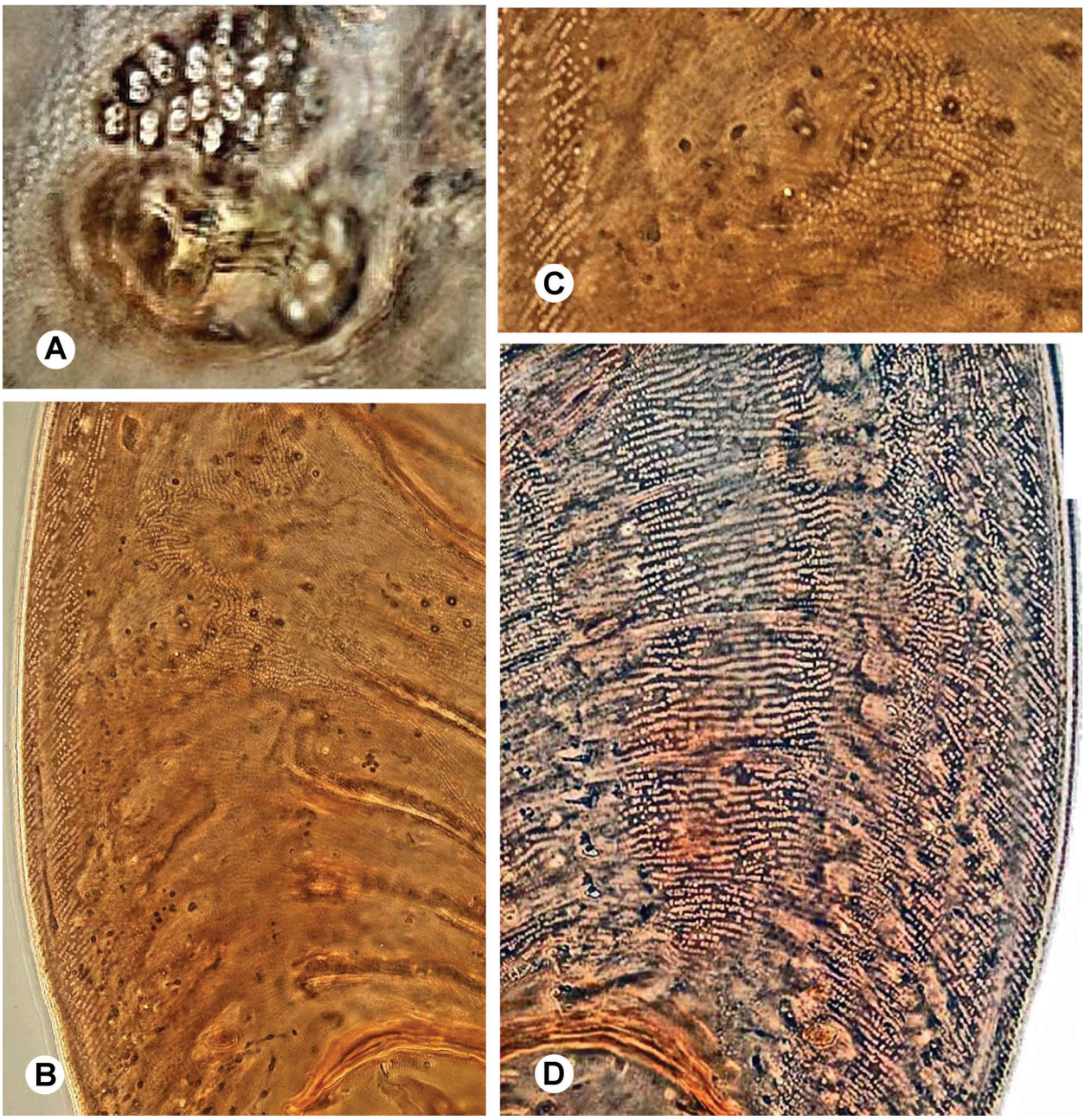



**Figure 2.** *Protomorgania koebelei* adult female (thorax and Abdomen). A) anterior perispiracular pores; B) dorsal microducts; C) dorsal microducts, magnified; D) roughened cuticle.

*Slide mounted adult female*. Specimens with a deep prothoracic-mesothoracic constriction with the anterior margin uniformly dome-shaped. Abdomen broadly rounded with the pygidium slightly more sclerotized and cuticle stippled. Clusters of disc pores associated with the anterior and posterior spiracles. Pygidium with only median lobes that are broad, short and appressed; $L_2$ and $L_3$ absent. 1-barred dorsal macroducts present. Perivulvar pores absent with the pygidium marked by dorsal sclerotized arch anterior to the vulva extending laterally on each side of and beyond the vulva.

**Etymology.** Genus name from the Latin word "proto" meaning first, which refers to the species being collected by Koebele before the discovery of the genus *Neomorgania*.

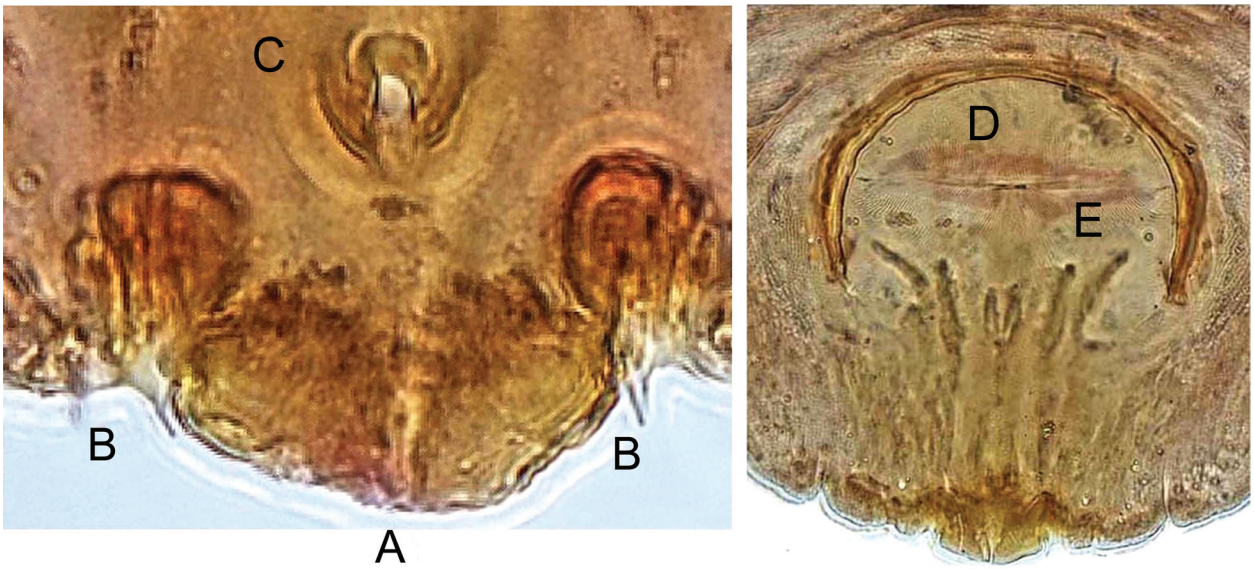



**Figure 3.** *Protomorgania koebelei* adult female (pygidium). A) L1 lobes fused ventrally, appressed dorsally; B) single simple plate between L1 and position of L2 seta; C) anal pore; D) sclerotized arch; E) chitinized and finely stippled cuticle around vulva.

***Protomorgania koebelei* Dooley and Evans sp. nov.**
**(Fig. 1, 2, 3)**

**Diagnosis.** *Protomorgania koebelei* is currently the only species described within the genus. It is described with the following combination of morphological characters: perispiracular pore clusters associated with both the anterior and posterior pair of spiracles; dorsum of pygidium finely stippled, not reticulate; only one pair of pygidial lobes ($L_1$) present, which are appressed, contiguous and joined basally; a single simple plate present on pygidium between $L_1$ and the position of the $L_2$ seta.

**Adult female**

**Description.** *Habitus in nature.* Armored scales abundant on the bark with female exuvia oval and brown in color with shed skins subcentral (Fig. 1).
*Slide mounted adult female* (Fig. 1, 2, 3). Specimens range from 1034–1041 µm in length and from 815–827 µm in width. Cuticle ornately and finely stippled. Cephalothorax with deep mesothoracic-metathoracic constriction; area above constriction broadly rounded and dome-shaped. Antenna with one seta; minute tubercle present (absent in some specimens) on lateral margin and anterior to mouthparts and anterior spiracle. Each anterior spiracle associated with a cluster of 17–20 perispiracular pores; each posterior spiracle associated with cluster of 8–12 perispiracular pores and cluster of microducts situated from below and adjacent to spiracle, extending into the submedian area between posterior spiracle and margin. Pygidium chitinized and finely stippled around vulva, broadly rounded from metathorax to pygidial apex. Single pair of appressed broad, short median lobes ($L_1$) present. Apex with single glandular plate located between $L_1$ and position of seta occupying $L_2$ position, does not extend beyond apex of $L_1$. Two small clusters of microducts extend along submedian region to submargin of $A_1$ segment and continue as a band of submarginal microducts extending from $A_2$ to almost beyond $A_7$. Perivulvar pores absent. A sclerotized arch that consists of 5–6 sclerotized striae present above and extending around vulva, terminating between vulva and posterior apex of body. Vulva area finely stippled. Anal pore located directly anterior to, and almost touching, basal area of median lobe, and bounded by an inverted v-shaped structure.

**Distribution**. Australia (Victoria)**.**
**Host**. Pittosporaceae: *Pittosporum* sp.

**Material examined** (Australia). Holotype (adult female). Melbourne, Australia on *Pittosporum* sp. 18-xii-1890 (Koebele collection # F1972) deposited at the CASC. Paratypes (24 adult females), Melbourne, Australia on *Pittosporum* sp., 18-xii-1900 (Koebele collection # F1972). Two adult females (two slides) deposited at ASCU, five adult females (one slide) deposited at CASC, five adult females (one slide) deposited at USNM, six adult females (2 slides) deposited at PPQC, 3 adult females (one slide) deposited at FSCA, and three adult females (two slides) deposited at CDFA.

**Etymology**. This species is named in honor of Albert Koebele.

**Discussion.** The finding of *Protomorgania koebelei* is especially important because it shows that the study of specimens that have been stored away in collections for over a hundred years may result in the discovery of new taxa. *Protomorgania koebelei* appears to have several taxonomic traits, such as the constricted thorax, that are common to other endemic Australian genera. Brimblecombe described many of the genera and species treated herein; however, no comprehensive keys to the genera or species of armored scales of Australia have been published. It is possible that once other species are discovered and the morphological and molecular characteristics of the species are better understood, that some of these genera may prove to be synonymous. We have not attempted to make such decisions based on the small number of species known in most of these genera and the lack of detailed morphological and molecular studies.

**Acknowledgments**

We are grateful to Dr. Norman Penny, California Academy of Sciences (CASC), Ray Gill (retired, CDFA), and Peter Gillespie, Agricultural Scientific Collections Unit of Industry and Investment , NSW, Australia (ASCU) for reviewing this publication.

**Literature Cited**

**Anonymous. 2006.** Specimen Preparation Guidelines: Sternorrhyncha. Systematic Entomology Lab, United States Department of Agriculture, Agricultural Research Service, at http://www.ars.usda.gov/Main/docs.htm?docid=9832 (last accessed 6 December 2011).

**Boardman, R. M. 1977.** Biological control: pitting insects against insects. California Agriculture. Available at http://ucce.ucdavis.edu/files/repositoryfiles/ca3110p8-63342.pdf. (accessed December 5, 2011).

**Borchsenius, N. S., and D. J. Williams. 1963.** A study of the types of some little-known genera of Diaspididae with descriptions of new genera (Hemiptera: Coccoidea). British Museum (Natural History) Entomological Bulletin 13: 353–394.

**Brimblecombe, A. R. 1954.** Studies of Coccoidea. 2. Revision of some of the Australian Aspidiotini described by Maskell. Queensland Journal of Agricultural Science 11: 149–160.

**Brimblecombe, A. R. 1956.** Studies of the Coccoidea. 4. New species of Aspidiotini. Queensland Journal of Agricultural Science 13: 107–122.

**Brimblecombe, A. R. 1957.** Studies of the Coccoidea. 6. New genera and new species of Aspidiotini. Queensland Journal of Agricultural Science 14: 261–291.

**Brimblecombe, A. R. 1959.** Studies of the Coccoidea. 8. Three new genera and sixteen new species of Aspidiotini. Queensland Journal of Agricultural Science 16: 121–156.

**Cockerell, T. D. A. 1897.** The San Jose scale and its nearest allies. United States Department of Agriculture, Division of Entomology, Technical Series 6: 1–31.

**Ferris, G. F. 1937.** Contributions to the knowledge of the Coccoidea (Homoptera). V. (Contribution no. 6). Microentomology 2: 47–101.

**Ferris, G. F. 1938.** Contributions to the knowledge of the Coccoidea (Homoptera). VII. (Contribution no. 9). Microentomology 3: 37–56.

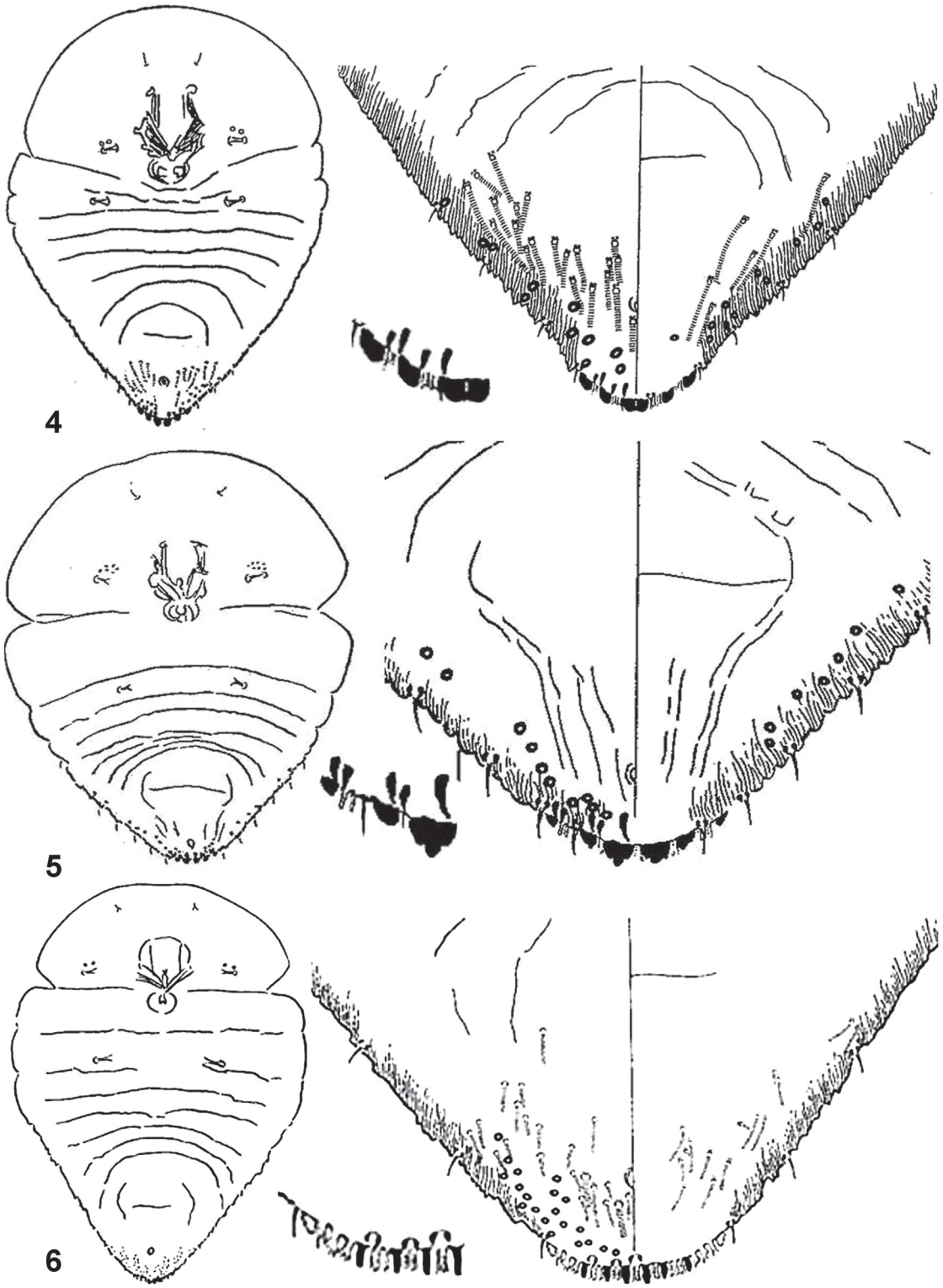
**Gill, R. J. 1997.** The scale insects of California: Part 3. The armored scales (Homoptera: Diaspididae). California Department of Food and Agriculture, Sacramento, CA. 307 pp.

**MacGillivray, A. D. 1921.** The Coccidae. Tables for the identification of the ssubfamilies and some of the more important genera and species, together with discussions. Scarab; Urbana, Ill. 502 p.

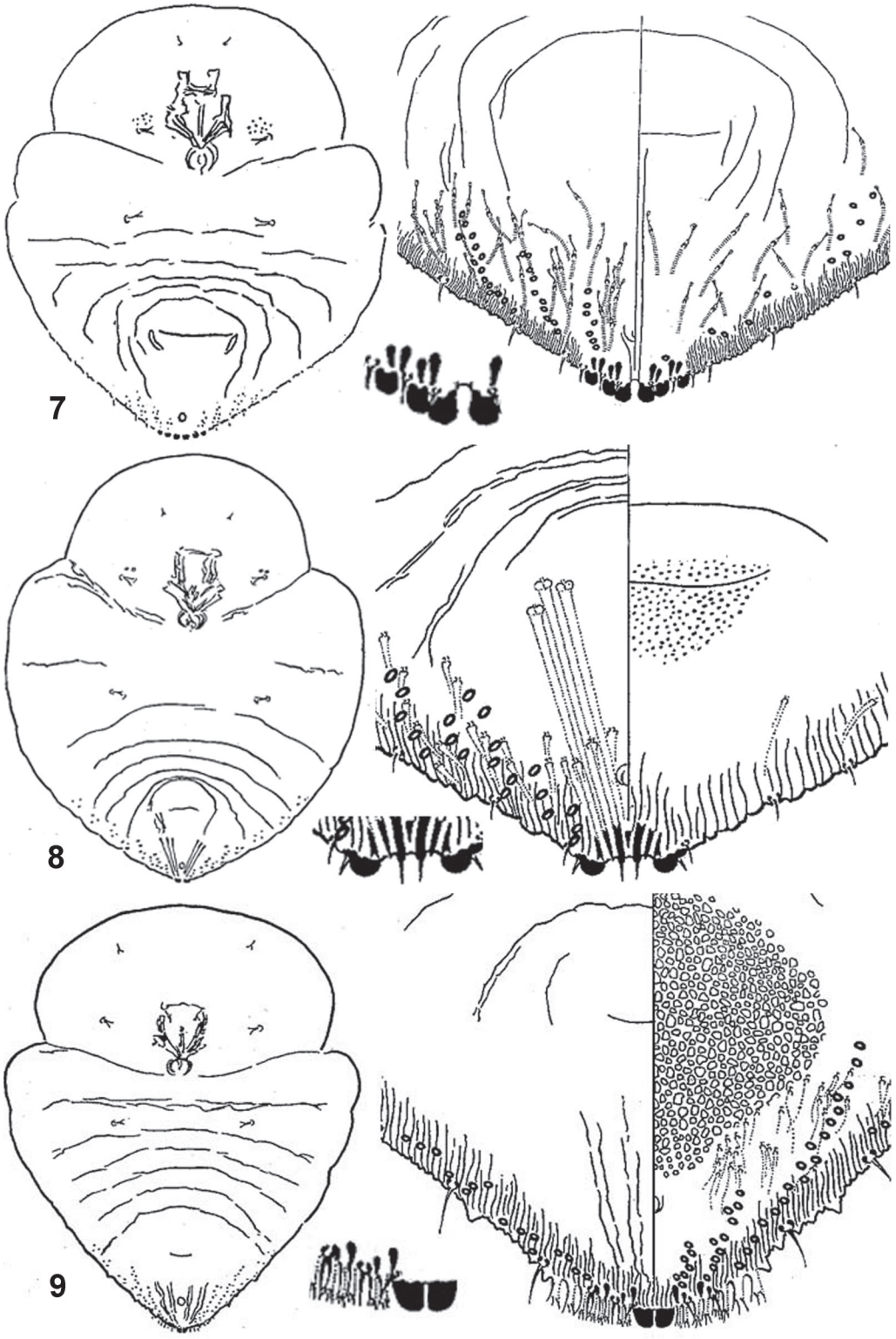
**Miller, D. R., and J. A. Davidson. 2005.** Armored scale insect pests of trees and shrubs. Cornell Univ. Press, Ithaca, NY. 442 pp.

**Weathers, L. G. and H. W. Lawton.** 1982. History of the Citrus Research Center Citrus Experiment Station Riverside, CA. Available at http://ucce.ucdavis.edu/files/repositoryfiles/ca3611pCR-2-72292.pdf (accessed 6 December 2011).

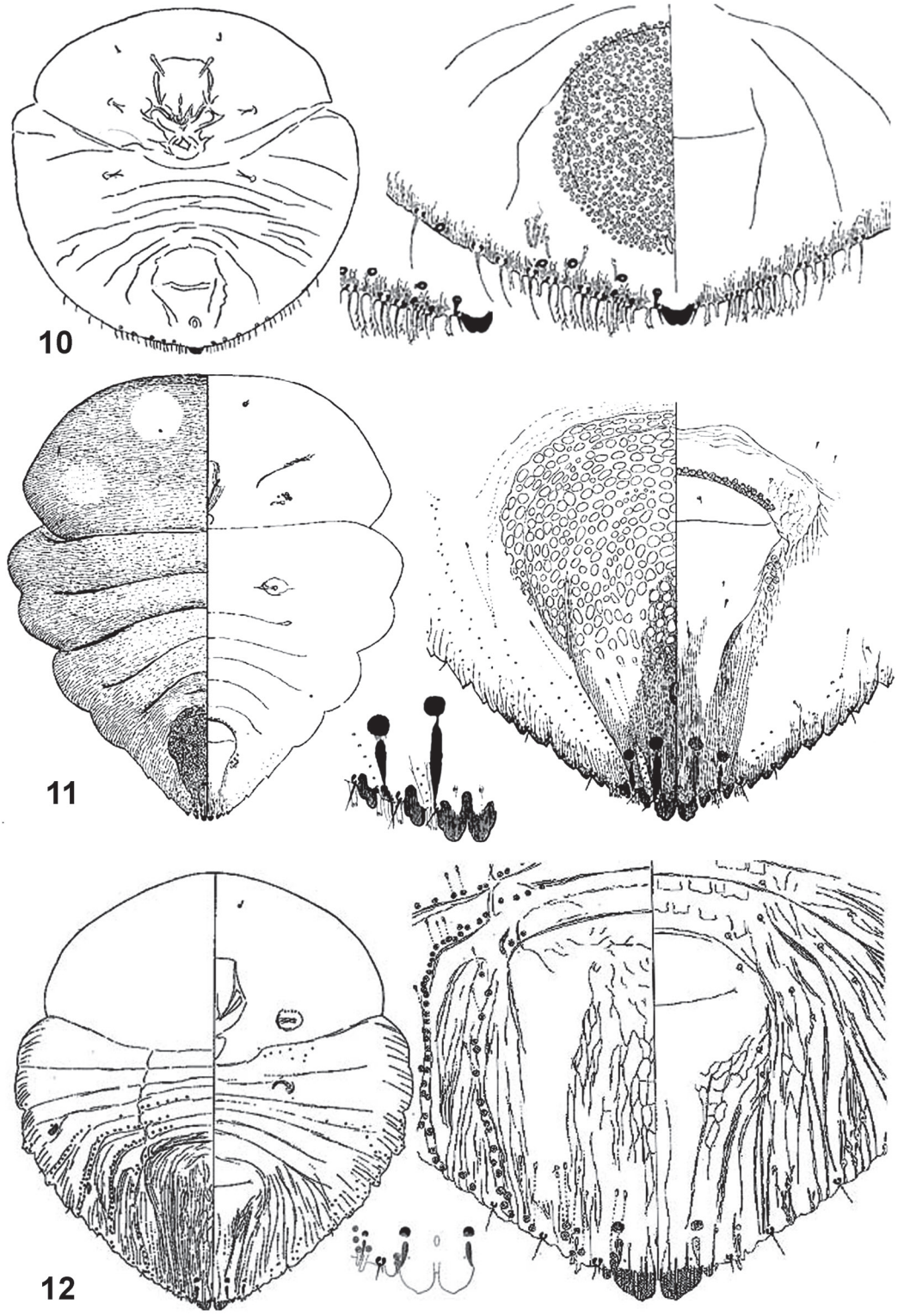
**Received March 8, 2011; Accepted December 14, 2012**
**Subject edited by Ian C. Stocks**



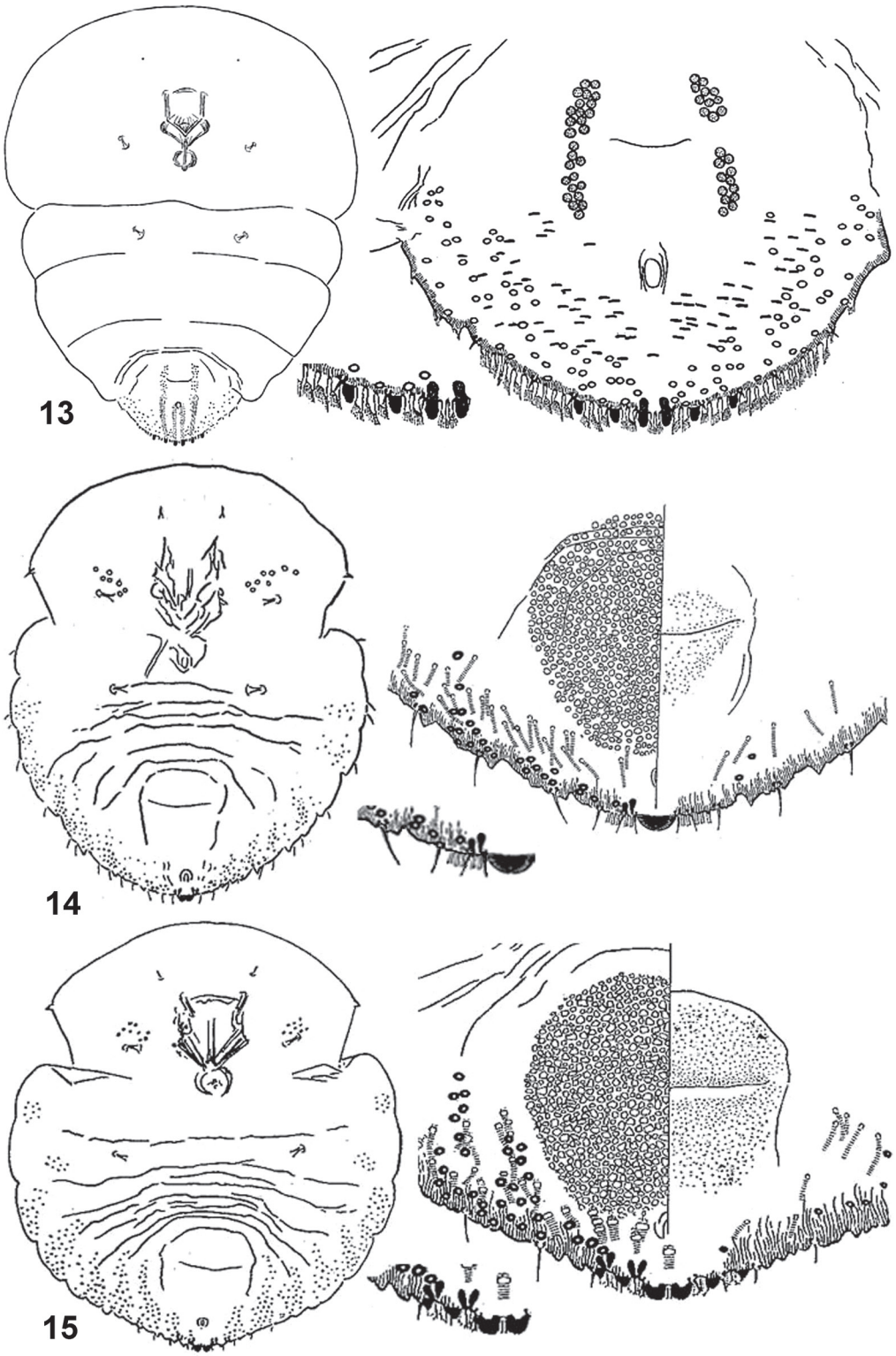

**Figures 4-6.** Diaspididae spp., habitus, detail of venter of L1 lobes, and pygidium ventral (left) and dorsal (right) (after Brimblecombe 1957). **4)** *Achorphora obliqua*. **5)** *Acontonidia triangulari*. **6)** *Aspidonymus woodwardi*.



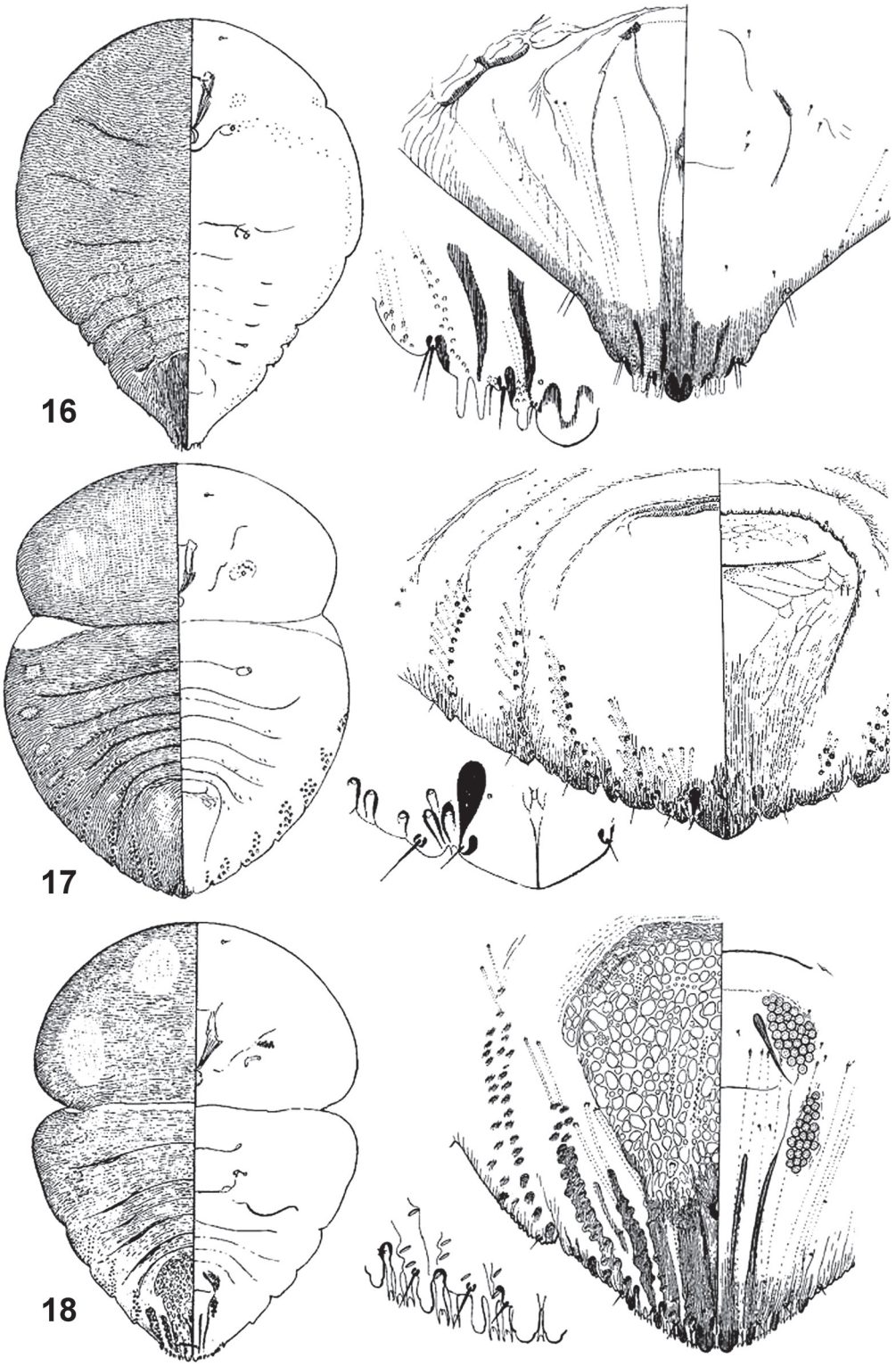

**Figures 7-9.** Diaspididae spp., habitus, detail of venter of L1 lobes, and pygidium ventral (left) and dorsal (right) (after Brimblecombe 1957). **7)** *Diaphoraspis orbata*. **8)** *Diaspidopus distinctus*. **9)** *Diastolaspis novata*.




**Figures 10-12.** Diaspididae spp., habitus, detail of venter of L1 lobes, and pygidium ventral (left) and dorsal (right). **10)** *Dichosoma convexa* (after Brimblecombe 1957). **11)** *Duplaspidiotus claviger* (after Ferris 1937). **12)** *Eulaingia stenophyllae* (after Borchsenius and Williams 1963).




**Figures 13-15.** Diaspididae spp., habitus, detail of venter of L1 lobes, and pygidium ventral (left) and dorsal (right) (after Brimblecombe 1957). **13)** *Megaspidiotus fimbriatus*. **14)** *Mimeraspis cuspiloba*. **15)** *Myrtophila curvata*.




**Figures 16-18.** Diaspididae spp., habitus, detail of venter of L1 lobes, and pygidium ventral (left) and dorsal (right). **16)** *Neoleonardia extensa* (after Ferris 1938). **17)** *Neomorgania eucalypti* (after Ferris 1937). **18)** *Pseudaonidia duplex* (after Ferris 1937).

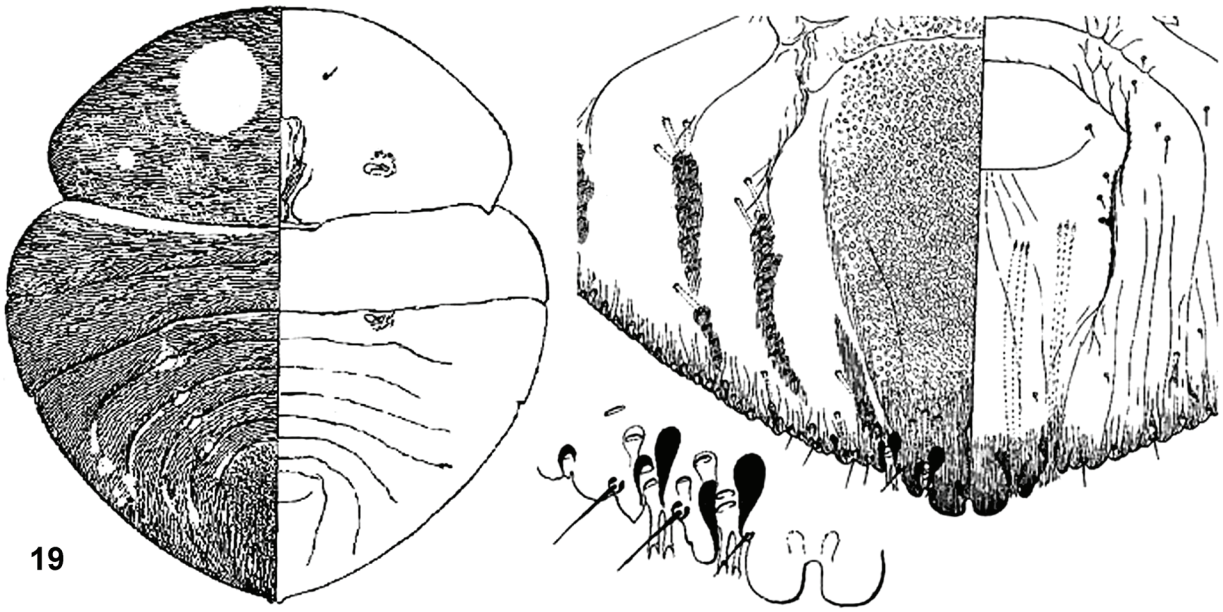



**Figure 19.** *Pseudotargionia glandulosa*, habitus, detail of venter of L1 lobes, and pygidium ventral (left) and dorsal (right) (after Ferris 1937).