

Taxonomic and faunistic notes on scale insects (Homoptera: Coccinea) of Bali, Flores and New Guinea (Indonesia)

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Abstract: Two new species of scale insects (Homoptera: Coccinea) from the mountains of Bali Island, *Pedrococcus glandulitubulatus* sp. nov. and *Tectopulvinaria latidigitata* sp. nov., are described and illustrated. In addition, 18 species new to the local faunas of Bali, Flores and New Guinea are recorded.

Key words: Margarodidae, Ortheziidae, Pseudococcidae, Coccidae, Kerriidae, taxonomy, morphology, Flores, Bali, New Guinea.

Introduction

The vast territory of Indonesia with its more than 17000 large and small islands has been studied rather irregularly and incompletely in respect of scale insects. Most of the material available in the world museums was collected from the Greater Sunda Islands of Sumatra and Java by Dutch and English scientists; the fauna of the two other largest islands, Sulawesi and New Guinea, is only fragmentarily represented in the major scale insect collections, whilst the scale insects of most of the numerous small Indonesian islands have never been studied. In particular, no one scale insect species has been recorded until now from Flores and only 7 species have been recorded previously from Bali (Garcia Morales et al. 2016: ScaleNet database). Taxonomically, only the family Pseudococcidae (the mealybugs) has been comprehensively reviewed for the region in the large monograph by Williams (2004) on the mealybugs of southern Asia. The series of monographs by Williams & Watson (1988a & b; 1990) on the scale insects of the tropical South Pacific Region was based mainly on material collected in Melanesia, Polynesia and the eastern part of New Guinea, but also recorded some new and widely distributed species from the western (Indonesian) part of New Guinea. Recently, I published a paper describing 6 new species and 27 previously unrecorded species from the western, Indonesian part of New Guinea (Gavrilov-Zimin 2013).

The present paper provides the results of my short visits to Bali and Flores in 2011-2012 and also includes notes on several species collected by Professor N.Yu. Kluge in the vicinity of Jayapura (northern New Guinea) in 2012.

Materials and methods

The method of preparation of Canada balsam slide mounts can be found in Danzig & Gavrilov-Zimin (2014), and the higher taxa names used are according to the system in that publication.

The collection numbers with "K" refer to unique collection and preservation numbers for both ethanol material and Canada balsam slides. Most of the material discussed below was collected by the author, collectors of other material are specifically noted under the appropriate species names.

All the material is deposited in the Zoological Institute, Russian Academy of Sciences (ZIN RAS) in St. Petersburg, Russia.

Taxonomic part

Margarodidae s. l.

Drosicha townsendi Cockerell, 1905

Material: K 981, Flores, Labuan Bajo, beach by the sea, on stem of dicotyledonous herb, 16.XII.2012, coll.



D.A. Gapon.

Comments: The genus *Drosicha* Walker, 1858 contains 24 nominal species and is in great need of revision. Many of these “species” were described by early authors without complete figures, discussion of important taxonomic characters or comparison with other species; some of the other “species” are known only as males and therefore cannot be compared with species described based on adult females. One of the “oldest” species, described from the Oriental region (Philippines), is *Drosicha townsendi* and I did not find any differences between the redescription of this species by Morrison (1920) and characters of the female collected from Flores.

Icerya samaraia (Morrison, 1927)

Steatococcus samaraius Morrison, 1927

Material: K 966, Bali, peninsula Bukit near Padang beach, on leaves of tree, 13.XII.2012.

Comments: The species is widely distributed in tropical and subtropical regions of the world, including different islands of Indonesia; however, this is the first record from Bali.

Ortheziidae

Insignorthezia insignis (Browne, 1887)

Material: K 951, Bali, mountain forest above Lake Buyan, about 1700 m altitude, on stem and leaves of bush, 15.XI.2011.

Comments: This widely distributed, pantropical species has not been recorded previously from Bali or Indonesia as a whole.

Pseudococcidae

***Pedrococcus glandulitubulatus* sp. nov.** (Fig. 1)

Holotype ♀: K 938, Bali, mountain forest above Lake Buyan, about 1,200 m altitude, on leaf of tree, 13.XI.2011, coll. Ilya Gavrilov-Zimin.

Derivatio nominis: The species name is constructed from two Latin words “glandula” and “tubula”.

Description: Adult female. Body elongate oval, about 2 mm long. Antenna 8-segmented. Legs normally developed; hind coxa with translucent pores; claw without a denticle; tarsal digitules knobbed. Anal apparatus complete, with inner row of pores, outer row of spinulae and 6 setae, length of each seta about twice diameter of anal ring. Both pairs of ostioles well developed, each with

trilocular pores and short flagellate setae on lips. Circulus absent. Multilocular pores few, present around vulva and forming transverse row in medial zone of abdominal sternite VI. Quinquelocular pores absent. Trilocular pores evenly scattered over body surface; additionally, minute trilocular pores present in cerarii around collars of conical setae. Tubular ducts of simple type, very few, occasionally present on several posterior abdominal sternites; each duct about same length as diameter of a multilocular pore. Cerarii numbering 17 pairs, each cerarius with 2 large conical setae, except C₁ with 4 setae and C₂ with 1 seta, plus several minute trilocular pores and several normal trilocular pores, all on a sclerotized tubercle. Large conical setae similar to cerarian setae present (larger setae on a sclerotized area of derm, smaller setae on membranous cuticle), forming transverse rows across all segments of dorsum (Fig. 1); other dorsal setae rather variable. Flagellate setae of various sizes numerous on both body surfaces.

Collected female, pre-oviposition, was without any wax secretions.

Males and morphology of larvae are unknown.

Comments: The genus *Pedrococcus* Mamet, 1942 was erected for four Afrotropical species; later four additional species were described from Mauritius (*P. simplex* Mamet, 1943), Madagascar (*P. madagascariensis* Mamet, 1954), Solomon Islands (*P. tinahulanus* Williams, 1960) and Malaysian Borneo (*P. poruli* Williams, 2004). Williams (2004) provided a new generic concept of *Pedrococcus*, distinguishing it from the nearest genus, *Pedronia* Green, 1922, by the presence of minute trilocular pores in the cerarii. According to this (and some others) character, *P. simplex* and *P. tinahulanus* should be excluded from the genus (Williams 2004). All the four remaining species (three Afrotropical and one Oriental) totally lack tubular ducts. In contrast to them, *Pedrococcus glandulitubulatus* sp. nov. has tubular ducts on the posterior abdominal sternites; also, it differs from the Oriental *P. poruli* in having 17 pairs cerarii (*P. poruli* has one pair) and shorter flagellate setae on dorsum.

Chaetococcus bambusae (Maskell, 1893)

Material: K 978, Flores, Labuan Bajo, under the leaf sheaths of bamboo, 15.XII.2012.

Comments: The species is widely distributed in tropical and subtropical regions of the world, including the larger islands of Indonesia; this is the first record from Flores.



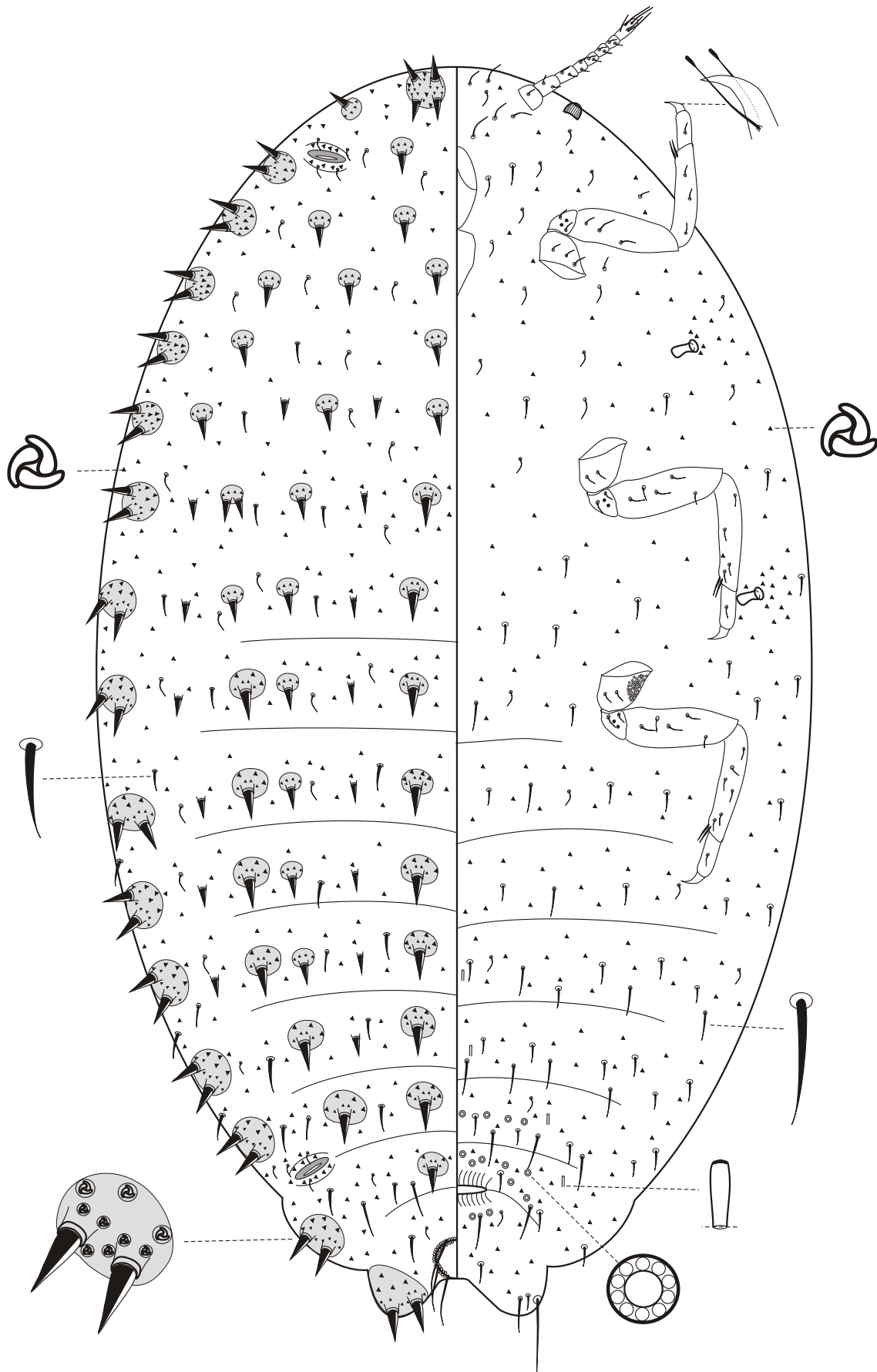


Figure 1. *Pedrococcus glandulitubulatus* sp. nov., holotype ♀: dorsal & ventral view.



Crisicoccus cambodiensis (Takahashi, 1942)

Material: K 945, Bali, mountain forest above Lake Buyan, about 1700 m altitude, on leaf of bush, 14.XI.2011.

Comments: This species was previously only known from its type locality, Cambodia: Angkor. The present specimens, collected in Bali, differ from the syntypes (redescribed and illustrated by Williams 2004: 131) in having significantly fewer tubular ducts on the thorax and all the tubular ducts clearly have a double collar, in contrast to the simple tubular ducts figured by Williams (l.c.); however, the latter character could simply be not discernible during the study of old slides prepared by R. Takahashi.

Crisicoccus kimanisicus Williams, 2004

Material: K 1299, Indonesian part of New Guinea, vicinity of Jayapura, Sentani, without information on host plant, coll. N.Yu. Kluge.

Comments: The species has been noted previously only from Malaysian Borneo (Sabah) (Williams 2004). This is the first record from western New Guinea and from Indonesia as a whole.

Dysmicoccus neobrevipes Beardsley, 1959

Material: K 971, 974, Flores, Labuan Bajo, on inflorescence of undetermined tree and on stem of dicotyledonous herb, 14 and 15.XII.2012.

Comments: The species is widely distributed in tropical and subtropical regions of the world, but this is the first record from Flores and from Indonesia as a whole.

Maconellicoccus hirsutus (Green, 1908)

Material: K 989, Flores, Labuan Bajo, on ornamental *Hibiscus* sp., 16.XII.2012.

Comments: The species is widely distributed in tropical and subtropical regions of the world, including various islands of Indonesia (Williams 2004); this is the first record from Flores.

Palmicultor lumpurensis (Takahashi, 1951)

Material: K 940, 952, Bali, terrace of agricultural slopes above Lake Buyan, about 1200 m altitude, under the leaf sheaths of bamboo, 14 and 15.XI.2011.

Comments: The species is widely distributed in the Oriental region and recently was recorded by Gavrilov-Zimin (2013) for the first time from Indonesia (western New Guinea, vicinity of

Manokwari). This is the first record from Bali.

Phenacoccus solenopsis Tinsley, 1898

Material: K 964, 965, Bali, Bukit peninsula near Padang beach, on leaves of Fabaceae tree and on dicotyledonous herb, 12.XII.2012; K 983, 986, 988, Flores, Labuan Bajo, on leaves and stems of various ornamental bushes, especially numerous on *Hibiscus* spp., 16.XII.2012.

Comments: The species is widely distributed in tropical and subtropical regions of the world. For Indonesia, it was recently recorded by Gavrilov-Zimin (2013) from western New Guinea, vicinity of Manokwari. These are the first records from Bali and Flores.

Planococcus lilacinus (Cockerell, 1905)

Material: K 972, 975, 977, Flores, Labuan Bajo, on leaves and fruits of different trees, 14 and 15.XII.2012.

Comments: The species is widely distributed in tropical and subtropical regions of the world, including different islands of Indonesia; this is the first record from Flores.

Pseudococcus jackbeardsleyi Gimpel et Miller, 1996

Material: K 982, Flores, Labuan Bajo, beach by the sea, on leaf of dicotyledonous herb, 16.XII.2012.

Comments: The species is widely distributed in tropical and subtropical regions of the world. In Indonesia, it has been recorded from Java (Williams 2004) and from western New Guinea, vicinity of Manokwari (Gavrilov-Zimin 2013); this is the first record from Flores.

Pseudococcus* cf. *philippinicus Williams, 2004

Material: K 937, 949, Bali, mountain forest above Lake Buyan, about 1,200 m altitude, on leaves of various trees, 13 and 15.XI.2011; K 1299, Indonesian part of New Guinea, vicinity of Jayapura, Sentani, without information on host plant, 22.VIII.2012, N.Yu. Kluge.

Comments: The species has been noted previously in the Philippines and China (Beijing); this is the first record from Bali, the western part of New Guinea and from Indonesia as a whole. The specimens collected in Bali and New Guinea differ from the type specimens described and illustrated by Williams (2004) in the number of dorsal fungiform ducts (= "oral rim tubular" ducts): these are more numerous in the females from Bali than in the type specimens and are almost totally



lacking in the females from New Guinea. However, both series demonstrate a unique character of *P. philippinicus* – a saccate vulva with four internal sclerotized pouches, i.e., as in the type specimens of this species; so these samples are here believed to represent *P. philippinicus* and the differences in the number of dorsal ducts are considered to be due to geographical intraspecific variation.

Coccidae

***Tectopulvinaria latidigitata* sp. nov.** (Fig. 2)

Holotype ♀: K 946, Bali, mountain forest above Lake Buyan, about 1700 m altitude, on twig of tree, 14.XI.2011, Ilya Gavrilov-Zimin.

Derivatio nominis: The species name was constructed from two Latin words “latus” and “digitalis”.

Description: Adult female. Body broadly oval, about 2 mm long. Antenna 8-segmented. Legs well developed, each with a tibio-tarsal articulation; claw without a denticle; claw digitules enlarged, with large basal and apical knobs (Fig. 2). Anal apparatus with 6 setae. Multilocular pores present on posterior 4 abdominal segments only. Quinquelocular pores forming a band 2 or 3 pores wide in each spiracular furrow. Preopercular pores forming a sparse band from anal plates to mesothorax. Simple pores scattered on both body surfaces. Dorsal duct tubercles absent. Tubular ducts of three main types: ducts with broad inner ductules scattered medially on thoracic and anterior abdominal segments; ducts (small and large) with thin ductules forming a broad submarginal band on ventral surface of body. Marginal setae long, flagellate, each about same length as tarsus, forming double row along entire body margin. Stigmatic setae absent, but shallow stigmatic clefts present. Dorsum with sparse, short conical setae. Ventral surface of body with sparse flagellate setae of different sizes, the largest scattered in medial zone of venter. Collected female, pre-oviposition, was without any wax covering.

Males and morphology of larvae are unknown.

Comments: The type species of the genus *Tectopulvinaria* Hempel, 1900, *T. albata* Hempel, 1900 was redescribed in detail by Hodgson (1994). Amongst the important diagnostic characters of this species is the absence of stigmatic setae, which are usually well developed in other genera of soft scale insects (Coccidae) and differ significantly in form and size from the other marginal setae. Two other species formally placed by subsequent

authors in *Tectopulvinaria* (*T. farinosa* (Green, 1922) from Sri Lanka and *T. loranthi* Froggatt, 1915 from Australia), have well-developed and distinct stigmatic setae and also differ from the type species in some other important details; both of these species are probably unrelated to *T. albata*, as was noted previously by other scientists (see discussion in Hodgson 1994: 574). On the other hand, the specimens collected in Bali seem to be very similar morphologically to the type species of *Tectopulvinaria* although they differ from it by lacking dorsal bilocular pores, and by having ventral tubular ducts on the head and enlarged claw digitules.

Coccus viridis (Green, 1889)

Material: K 939, Bali, mountain forest above Lake Buyan, about 1200 m altitude, on leaves of tree, 13.XI.2011.

Comments: The species is widely distributed in tropical and subtropical regions of the world, including the larger islands of Indonesia; this is the first record from Bali.

Luzulaspis australis (Maskell, 1894)

Material: K 992, Flores, vicinity of Labuan Bajo, Wae Cicu, on leaves of grass (Poaceae), 17.XII.2012.

Comments: This species was known only from Australia until recently. However, it was collected in 2013 in the northern part of New Guinea in vicinity of Jayapura by Gavrilov-Zimin (2013); this is the first record from Flores.

Milviscutulus mangiferae (Green, 1889)

Material: K 968, Bali, Bukit peninsula near Padang beach, on leaf of tree, 13.XII.2012.

Comments: The species is widely distributed in tropical and subtropical regions of the world, including the larger islands of Indonesia; this is the first record from Bali.

Pulvinaria psidii Maskell, 1893

Material: K 987, Flores, vicinity of Labuan Bajo, on leaves of *Morinda citrifolia*, 16.XII.2012.

Comments: The species is widely distributed in tropical and subtropical regions of the world, including the larger islands of Indonesia; this is the first record from Flores.



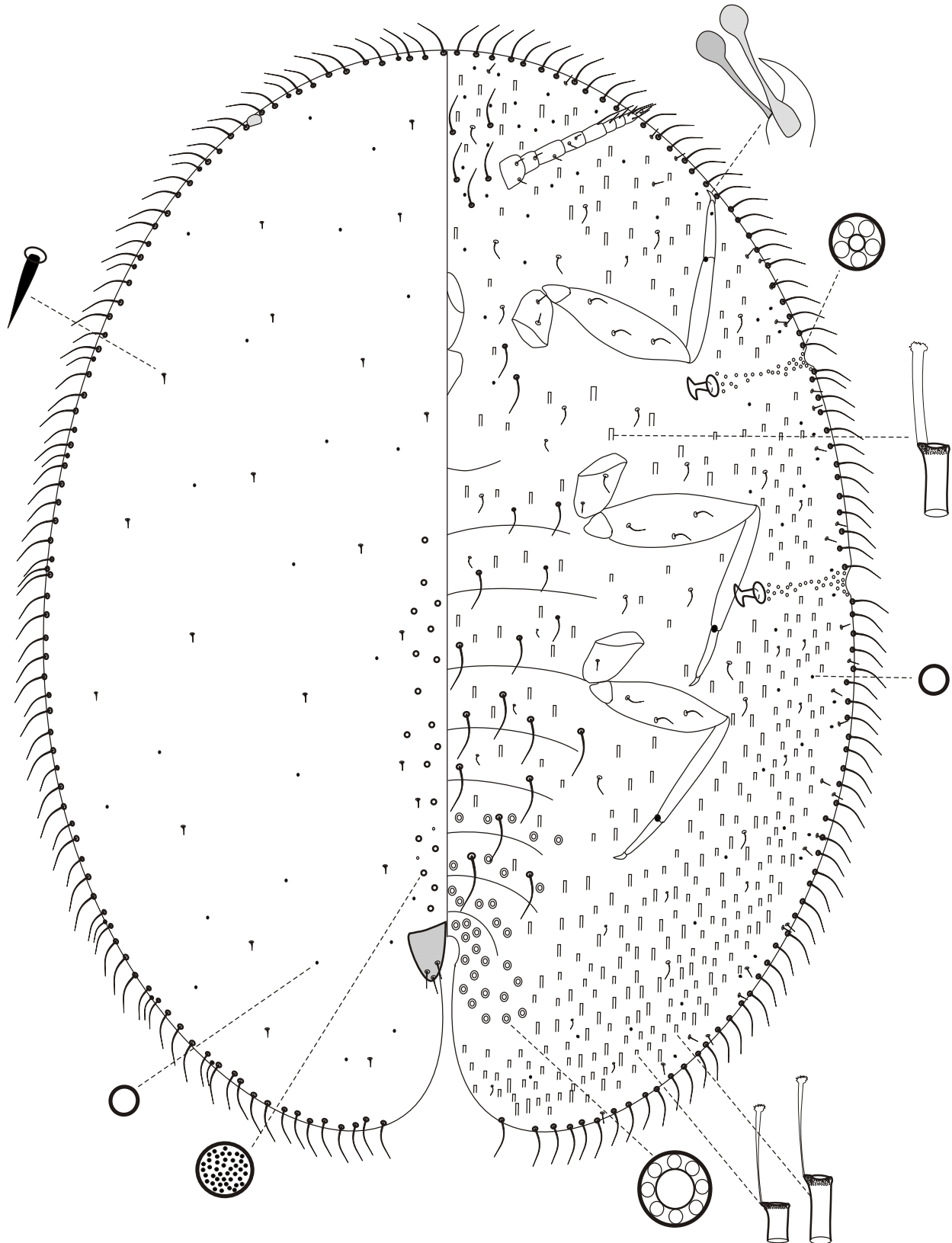


Figure 2. *Tectopulvinaria latidigitata* sp. nov., holotype ♀: dorsal & ventral view.



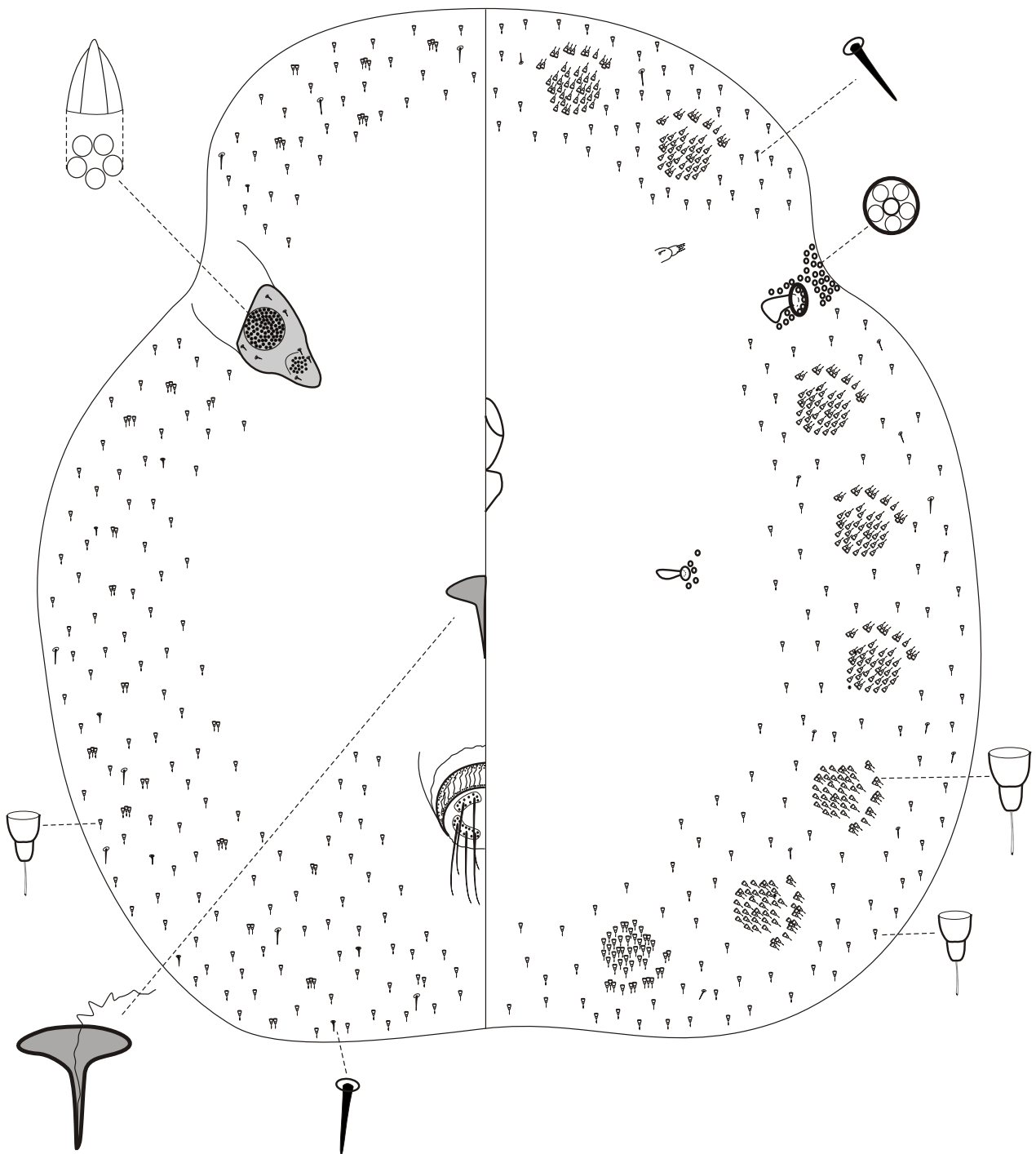


Figure 3. *Tachardina aurantiaca* (Cockerell, 1903), ♀ from Flores Island: dorsal & ventral view.



Kerriidae

Tachardina aurantiaca (Cockerell, 1903) (Fig. 3)
Material: K 980, Flores, vicinity of Labuan Bajo, on leaves of *Morinda citrifolia*, 15.XII.2012; K 1300, Indonesian part of New Guinea, vicinity of Jayapura, without information on host plant, VIII.2012, N.Yu. Kluge.

Comments: The species has been previously noted from the Maldives, Thailand, Malaysia, Singapore, Indonesia (Java) and Christmas Island (according to Garcia Morales et al. 2016: the ScaleNet database); these are the first records from Flores and the Indonesian part of New Guinea. In view of the absence of an adequate illustration of this species in the coccidological literature, I have included one (Fig. 3), based on the females collected on Flores.

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