



## The Coccidae (Hemiptera: Coccoidea) of Chile, with descriptions of three new species and transfer of *Lecanium resinatum* Kieffer & Herbst to the Kerriidae

TAKUMASA KONDO<sup>1</sup> & PENNY J. GULLAN<sup>2</sup>

<sup>1</sup>*Corporación Colombiana de Investigación Agropecuaria (CORPOICA), Centro de Investigación Palmira, Calle 23, Carrera 37, Continuo al Penal, Palmira, Valle, Colombia, E-mail: tkondo@corpoica.org.co*

<sup>2</sup>*Department of Entomology, University of California, One Shields Avenue, Davis, CA 95616-8584, U.S.A. E-mail: pjgullan@ucdavis.edu*

### Abstract

Three new species of Coccidae: *Cryptinglisia chilensis* Kondo & Gullan **sp. nov.**, *Pulvinaria drimyswinteri* Kondo & Gullan **sp. nov.**, and *Stictolecanium cranstoni* Kondo & Gullan **sp. nov.**, are described and illustrated. An updated species list and a taxonomic key to the 13 coccid species now known to occur in Chile are provided. *Pulvinariella mesembryanthemi* (Vallot) is newly recorded for Chile. *Lecanium resinatum* Kieffer & Herbst, currently known as *Coccus resinatus* (Kieffer & Herbst), is transferred to the family Kerriidae as *Tachardiella resinata* (Kieffer & Herbst) **comb. nov.**, based on examination of the original German description.

**Key words:** soft scale insect, *Tachardiella*, taxonomic key, species list

### Resumen

Tres nuevas especies de Coccidae: *Cryptinglisia chilensis* Kondo & Gullan **sp. nov.**, *Pulvinaria drimyswinteri* Kondo & Gullan **sp. nov.**, y *Stictolecanium cranstoni* Kondo & Gullan **sp. nov.**, son descritas e ilustradas. Se provee una lista actualizada y una clave taxonómica para las 13 especies de cóccidos que se reportan para Chile. *Pulvinariella mesembryanthemi* (Vallot) es registrada por primera vez para Chile. *Lecanium resinatum* Kieffer & Herbst, actualmente conocida como *Coccus resinatus* (Kieffer & Herbst), se transfiere a la familia Kerriidae como *Tachardiella resinata* (Kieffer & Herbst) **comb. nov.**, basándose en la examinación de la descripción original escrita en alemán.

### Introduction

The scale insect (Coccoidea) fauna of Chile is currently composed of 105 species distributed in 11 families, i.e., Asterolecaniidae (3 spp.); Cerococcidae (1 sp.); Coccidae (10 spp.); Conchaspidae (1 sp.); Diaspididae (39 spp.); Eriococcidae (18 spp.); Lecanodiaspididae (1 sp.); Monophlebidae (3 spp.); Margarodidae (2 spp.); Ortheziidae (3 spp.), and Pseudococcidae (24 spp.) (Ben-Dov *et al.*, 2009). There have been recent studies of Chilean armoured scales (e.g., Claps *et al.*, 2001), eriococcids (Kondo *et al.*, 2006; Kozár & Konczné Benedicty, 2008) and mealybugs (e.g., González, 2003a,b; Kozár & Foldi, 2004; Granara de Willink & Szumik, 2007), but no recent taxonomic research on Chilean soft scales (Coccidae) has been done. Very few Coccidae have been described from Chile, although the study of these insects in Chile dates back to 1828, when Gray (1828) described *Coccus* (*Ceroplastes*) *chilensis* Gray (= *Ceroplastes ceriferus* (Fabricius)). Nine of the 10 species of Coccidae recorded from Chile are widespread and polyphagous (Ben-Dov, 2009). One species, *Coccus resinatus* (Kieffer & Herbst), is known only from the original collection in Chile, and was described just over one hundred years ago as *Lecanium resinatum* (Kieffer & Herbst, 1909), but was transferred to the genus *Coccus* Linnaeus by Ben-Dov (1993).

Here, we describe three new species of Coccidae that were collected during two collecting trips to Chile by the first author. We illustrate the adult female of each new species and re-assess the identity of *C. resinatus*. We provide an updated list of Coccidae known from Chile and a key to distinguish the adult females of all species. In addition, several new collection records are reported.

## Material and methods

Specimens were slide mounted by the method discussed by Williams and Granara de Willink (1992). Morphological features of the adult female follow chiefly those of Hodgson (1994), Steinweden (1929) and Thro (1903). Measurements of insect specimens were made using an ocular micrometer on an Olympus phase contrast microscope. The illustrations of the coccids follow the traditional style adopted for the Coccoidea, with the dorsal surface drawn on the left side of the drawing and the ventral surface drawn on the right, with enlargements of important features placed around the illustration. The total number of specimens used for each description is given in parentheses, e.g. (n=14). Under material studied, the number of slides and specimens on each slide are given as the number of slides followed by the total number of specimens; for example, '1(1)' is one slide with one specimen. Abbreviations of structures in the figures are as follows: anplt: anal plate; ant: antennae; ar: anal ring; dmic: dorsal microduct; dset: dorsal setae; edd: enlargement of dorsal derm; mset: marginal setae; pantp: preantennal pore; prop: preopercular pore; pvp: perivulvar pore; sp: simple pore; spp: spiracular pore; stgsp: stigmatic spine; vmic: ventral microduct; vset: ventral setae; vsset: ventral submarginal setae; vtd: ventral tubular duct.

## Specimen depositories

BME	Bohart Museum of Entomology, University of California, Davis, California, U.S.A.
MNNC	Museo Nacional de Historia Natural de Chile, Santiago, Chile
USNM	National Museum of Natural History Entomological Collection, Washington, DC., U.S.A. (Coccoidea collection held at USDA, Beltsville, Maryland)

## Taxonomy

### KERRIIDAE

#### *Tachardiella resinata* (Kieffer & Herbst), **comb. nov.**

*Lecanium resinatum* Kieffer & Herbst, 1909: 122.

*Coccus resinatum*; Ben-Dov, 1993: 88 (change of combination).

*Coccus resinatus*; Williams & Ben-Dov, 2009: 41 (justified emendation).

Many scale insect species described in the genus *Lecanium* Burmeister (now an unavailable name) are soft scale insects and a number have been transferred to the genus *Coccus* (see Williams & Ben-Dov, 2009). Presumably, this was the reason that Ben-Dov (1993) transferred *L. resinatum* to *Coccus*. Kieffer & Herbst (1909) described this scale insect from the host plant *Baccharis rosmarinifolia* (Asteraceae), which is now *Baccharis linearis* (Tropicos, 2010), from Concepcion, Chile. The original description is in German and the claim (Ben-Dov, 1993), which has been perpetuated by others (e.g., Gullan *et al.*, 2005), that this species induces a gall is based on a misinterpretation of the description, which refers to these insects producing "Harzgallen", which literally translates to "resin galls". These structures are described as yellow, tending to spherical or hemispherical, attaining 4–5 mm in diameter, sessile, and usually densely packed. Resinous tests are produced by several scale insect groups, including the lac insects (Kerriidae). It seems certain that *C. resinatus* is a kerriid because Kieffer's & Herbst's (1909) description of the red "larvae", the first-instar nymphs, matches that of kerriid nymphs. Two genera of Kerriidae, *Austrotachardiella* Chamberlin and

*Tachardiella* Cockerell, are widespread in South America (Ben-Dov, 2006) and it cannot be established with certainty to which genus *C. resinatus* belongs because there is no type material. However, only *Tachardiella* species have been found on Asteraceae, including *T. pustulans* (Cockerell) on *Baccharis* from the southwestern USA. Furthermore, the resinous tests of adult females of *Tachardiella* species are usually globular, as in *C. resinatus*, whereas those of *Austrotachardiella* species usually have various projections or processes. Here we transfer *Lecanium resinatum* to *Tachardiella* as *T. resinata* (Kieffer & Herbst) comb. nov., until the identity of this species can be investigated further based on collections made from the host plant in the region of the type locality.

## COCCIDAE

### Genus *Cryptinglisia* Cockerell

*Cryptinglisia* Cockerell, 1900: 173.

Type species: *Cryptinglisia lounsburyi* Cockerell, 1900: 173. By monotypy.

*Cryptinglisia* has hitherto included 4 species, namely *C. lounsburyi*, *C. elytropappi* (Brain), *C. patagonica* Granara de Willink and *C. zizyphi* (Brain) (Ben-Dov *et al.*, 2009). The new species, described below, shares the following features with *C. lounsburyi*, the type species of the genus: (1) insects in life with a semi-transparent, glassy and brittle test; (2) preopercular pores present in a linear group anterior to anal plates; (3) derm entirely membranous apart from a heavily sclerotized, elongate, crescent around anal plates; (4) marginal setae sharply spinose, with a broad base and well-developed basal socket; (5) spiracular pores with 5 loculi; (6) a single stigmatic spine per stigmatic cleft; (7) perivulvar pores with 5 loculi; and (8) ventral tubular ducts of 1 type, present in a broad submarginal band, and also present medially.

### Key to separate the known species of *Cryptinglisia* Cockerell

[Adapted from Brain (1920), De Lotto (1967), Granara de Willink (1999) and Hodgson (1967, 1994)]

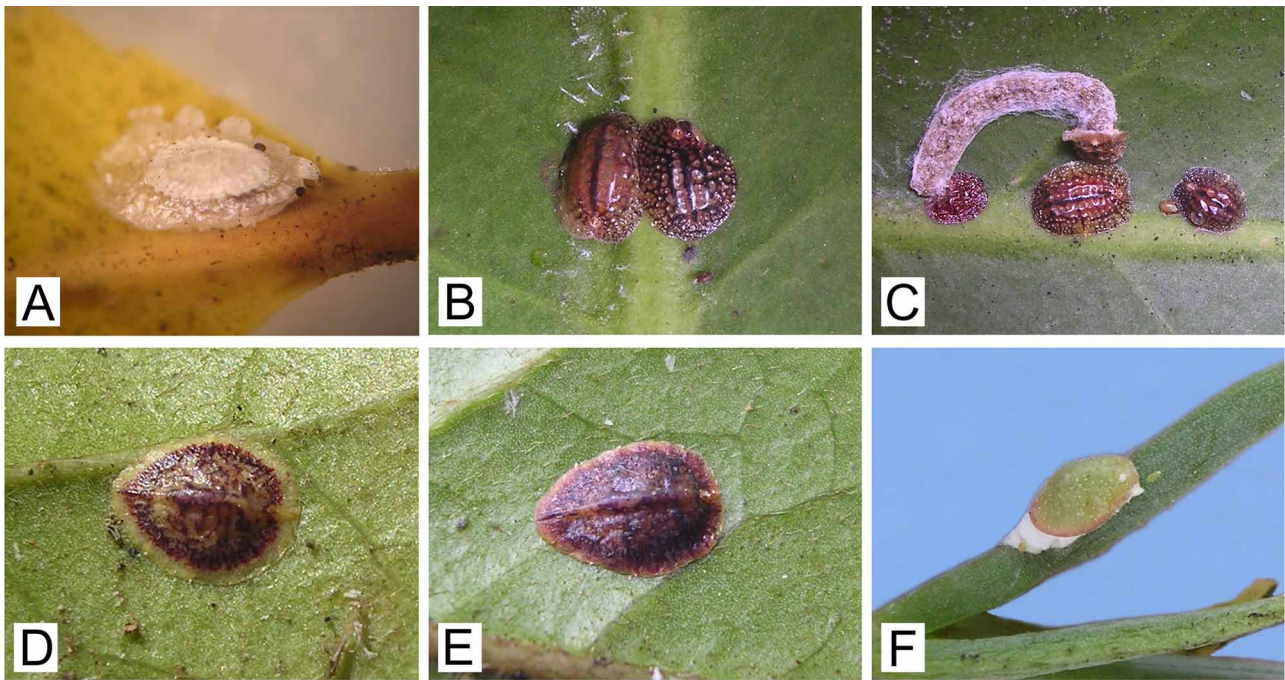
1. Stigmatic spines not differentiated from marginal setae.....*C. patagonica* Granara de Willink
- Stigmatic spines totalling 1 per stigmatic cleft..... 2
2. Legs rudimentary, with reduced number of segments.....*C. elytropappi* (Brain)
- Legs normal, with well-developed coxa, trochanter, femur, tibia and tarsus as typical for Coccidae. .... 3
3. Perivulvar pores present in small groups on either side of anal cleft just posterior to anal plates only. Antennae 7 or 8 segmented.....*C. lounsburyi* Cockerell
- Perivulvar pores present along the anal cleft, with some pores extending anterolaterally on posterior abdominal segments. Antennae 6 or 7 segmented. .... 4
4. Preopercular pores present along midline from area just anterior to anal plates and extending anteriorly to head margin. Uni- and bilocular microducts intermixed with the preopercular pores, and also present alongside marginal setae, absent elsewhere. Antennae 6 or 7 segmented.....*C. zizyphi* (Brain)
- Preopercular pores present along midline from area just anterior to anal plates and extending anteriorly to about mesothorax. Bilocular microducts absent. Unilocular microducts scarce, scattered throughout dorsum, not intermixed with preopercular pores, not present alongside marginal setae. Antennae 7 segmented. ....  
..... *C. chilensis* Kondo & Gullan **sp. nov.**

### *Cryptinglisia chilensis* Kondo & Gullan **sp. nov.**

(Figs 1A, 2)

*Proposed common names.* Spanish: Escama blanda vidriosa de Chile; English: Chilean glassy scale.

**Type material examined.** Holotype, adult female. Chile, Xth region, Volcán Osorno, 16.ii.2006, coll. Takumasa Kondo, ex twig of *Nothofagus dombeyi*, 1(1) (USNM). Paratype, same data, first-instar nymph, 1(1) (USNM).



**FIGURE 1.** Adult female coccids: A, *Cryptinglisia chilensis*; B, *Pulvinaria drimyswinteri*, young adults; C, *Pulvinaria drimyswinteri*, adult with ovisac (centre); D, *Stictolecanium cranstoni*, young adult; E, *Stictolecanium cranstoni*, mature adult; F, *Pulvinariella mesembryanthemi*.

**Adult female** (measurements based on n=1).

**Unmounted material** (Fig. 1A). Adult female in life 4.0 mm long, 3.2 mm wide, oval, moderately convex. Test of scale glassy, semi-transparent, with about 12 pointed waxy/glassy plates around body, with an ovoid whitish median central plate composed of three subplates with radiating ridges.

**Slide-mounted material** (Fig. 2). Insect 3.9 mm long, 3.0 mm wide, body oval in shape, anterior margin notched.

**Dorsum.** Derm membranous, apparently with a thin cuticle. Dorsal setae completely absent. Dorsal microducts oval, unilocular, each about 1.2  $\mu\text{m}$  wide, very scarce, scattered over dorsum. Simple pores each 3.0  $\mu\text{m}$  wide, scarce, scattered over dorsum. Dorsal tubular ducts, dorsal tubercles and pocket-like sclerotizations absent. Preopercular pores circular to irregularly ovoid in shape, each about 4.0–7.0  $\mu\text{m}$  wide, present along midline from area just anterior to anal plates and extending anteriorly up to about mesothorax. Anal plates together subcircular, with smooth rounded outer angles, plates located at about 1/5 of body length from posterior margin, each plate 120–130  $\mu\text{m}$  long, 43–55  $\mu\text{m}$  wide, with about 4 bluntly spinose setae on dorsal surface along inner margin, plus 4 pairs of fringe setae anteriorly (2 shorter and 2 longer pairs); ventral subapical setae and hypopygial setae not detected. Anal ring with 10 setae. A narrow sclerotic area present around anal plates.

**Margin.** Marginal setae conical, with a bulbous base, straight, each 20–40  $\mu\text{m}$  long, arranged in a single row, with about 28 on each side between anterior and posterior stigmatic areas. Stigmatic clefts very shallow or absent, each with 1 stigmatic spine per stigmatic area, probably all with a pointed apex and about 50  $\mu\text{m}$  long. Eyes about 22.5  $\mu\text{m}$  wide, located on dorsal margin.

**Venter.** Derm entirely membranous. Perivulvar pores each 5.0–6.0  $\mu\text{m}$  wide, with 5 loculi, present submarginally along anal fold just posterior to vulvar area, with a linear submedial group extending anteriorly on either side up to around abdominal segment V. Spiracular pores each 4.0–5.0  $\mu\text{m}$  wide, with 5 loculi, present in a narrow band as wide as peritreme (about 1 or 3 pores wide), but widening near margins (about 4 to 5 pores wide), with line of pores extending laterally from each spiracle to body margin. Ventral microducts scarce, scattered evenly throughout, each about 3.0  $\mu\text{m}$  wide. Ventral tubular ducts present in a broad submarginal band, and also around mouthparts, and medially between each pair of legs; each tubular duct with a terminal filament ending in a roundish flower-shaped gland. Ventral submarginal setae slender, straight or

slightly bent, each 11–16  $\mu\text{m}$  long; ventral median setae present on last 4 abdominal segments, each 10–16  $\mu\text{m}$  long, with longest setae (23–32  $\mu\text{m}$  long) present on last abdominal segment. Spiracles rather small, anterior spiracular peritremes each 45–48  $\mu\text{m}$  wide, posterior peritremes each 50–53  $\mu\text{m}$  wide, with a ring of sclerotization around each spiracle. Legs well developed, but small, each coxa 120–130  $\mu\text{m}$  long, trochanter + femur 160–170  $\mu\text{m}$  long; tibia + tarsus 180–220  $\mu\text{m}$  long, without a tibio-tarsal scleroses; claw 20–23  $\mu\text{m}$  long, without a denticle. Tarsal digitules both similar, knobbed; claw digitules similar and broad. Antennae each 210–220  $\mu\text{m}$  long, 7 segmented, with fleshy setae present on last 3 antennal segments; with long slender setae present on pedicel and antennal segment IV. With about 4 pairs of interantennal setae, each interantennal seta 9–21  $\mu\text{m}$  long. Mouthparts relatively small; clypeolabral shield 145  $\mu\text{m}$  wide; labium 95  $\mu\text{m}$  long, 100  $\mu\text{m}$  wide, 1 segmented, with 4 pairs of labial setae.

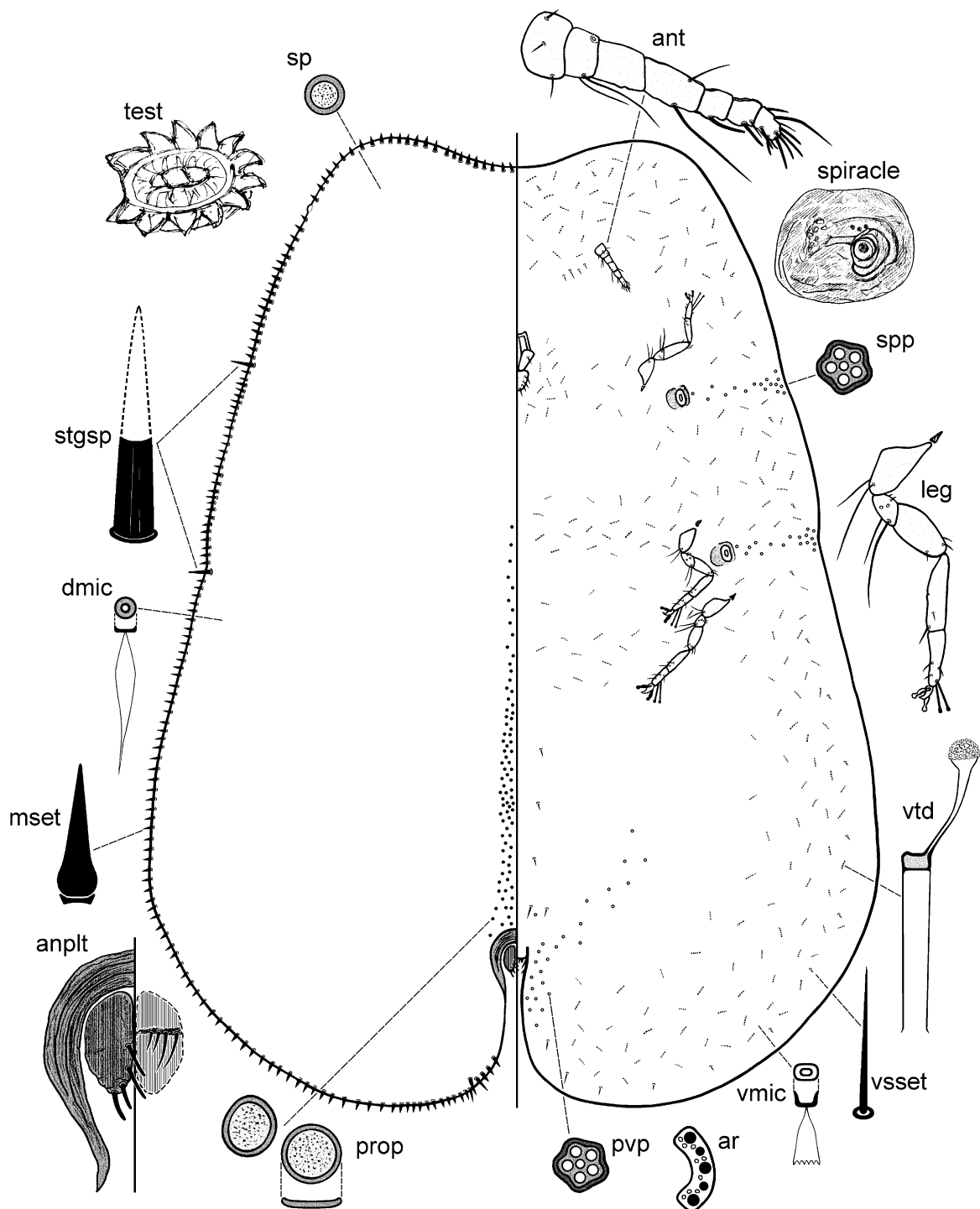


FIGURE 2. *Cryptinglisia chilensis* Kondo & Gullan, adult female.

**Diagnosis.** The adult female of *C. chilensis* can be diagnosed by the combination of the following features: (1) insect in life covered in an ornate glassy wax cover; (2) dorsum entirely membranous; (3) dorsal setae completely absent; (4) dorsal tubercles and dorsal tubular ducts absent; (5) one stigmatic spine per stigmatic cleft; (6) antennae well developed, 7 segmented; (7) legs well developed, small, without tibio-tarsal scleroses; (8) ventral tubular ducts present in a broad submarginal band, around mouthparts, and medially between each pair of legs; and (9) perivulvar pores with 5 loculi, present submarginally along anal cleft just posterior to vulvar area, with a linear group extending anteriorly on either side up to around abdominal segment V.

There are currently two species of *Cryptinglisia* recorded from the New World, namely *C. lounsburyi* and *C. patagonica*. *Cryptinglisia chilensis* appears closest to *C. lounsburyi*, but the two species can be differentiated by the combination of the following features (character states of *C. lounsburyi* in parentheses, taken from Hodgson (1994)): (1) antennae 7 segmented (antennae 7 or 8 segmented); (2) perivulvar pores present submarginally along anal fold just posterior to vulvar area, with a linear submedial group extending anteriorly on either side up to around abdominal segment V (perivulvar pores restricted to a small group of 1–3 pores on either side of anal cleft just posterior to anal plates). *Cryptinglisia chilensis* differs from *C. patagonica* by the following combination of features (character states of *C. patagonica* in parentheses, taken from Granara de Willink (1999)): (1) preopercular pores shallow (preopercular pores deeply invaginated); (2) mid-dorsal line of preopercular pores extending up to about mesothorax (mid-dorsal line of preopercular pores extending up to cephalic region); (3) stigmatic spine differentiated from marginal setae, 1 per stigmatic cleft (stigmatic spine not differentiated from marginal setae); and (4) antennae with 7 segments (8 segments).

**Etymology.** The species is named after its country of origin, Chile.

**Biology.** Insects found on twigs and leaves of *N. dombeyi*. The holotype was collected on a twig, and several specimens collected on the leaves were lost.

## Genus *Pulvinaria* Targioni Tozzetti

*Pulvinaria* Targioni Tozzetti, 1866: 146.

Type species: *Coccus vitis* Linnaeus, 1758: 456. By original designation and monotypy.

The new species, described below, is a typical member of the tribe Pulvinariini, of the subfamily Coccinae. The Pulvinariini is defined by the following combination of features: (i) production of a woolly ovisac; (ii) presence of ventral tubular ducts of 3 or 4 types (rarely 2), including a small duct with a fine inner ductule, which generally forms the submarginal band, and a larger duct with the inner and outer ductules of subequal width, which is typically present medially on head and thorax and occasionally elsewhere, (iii) absence of ovisac covering dorsum (or if mealy covering present, very sparse), (iv) absence of dorsal tubular ducts, or if present, of one type and typically similar to smallest of ventral tubular ducts, (v) presence of spinose dorsal setae, (vi) presence of a tibio-tarsal articulatory sclerosis, (vii) absence of pocket-like sclerotizations, (viii) presence of an eyespot near margin, and (ix) shallow, unsclerotized stigmatic clefts.

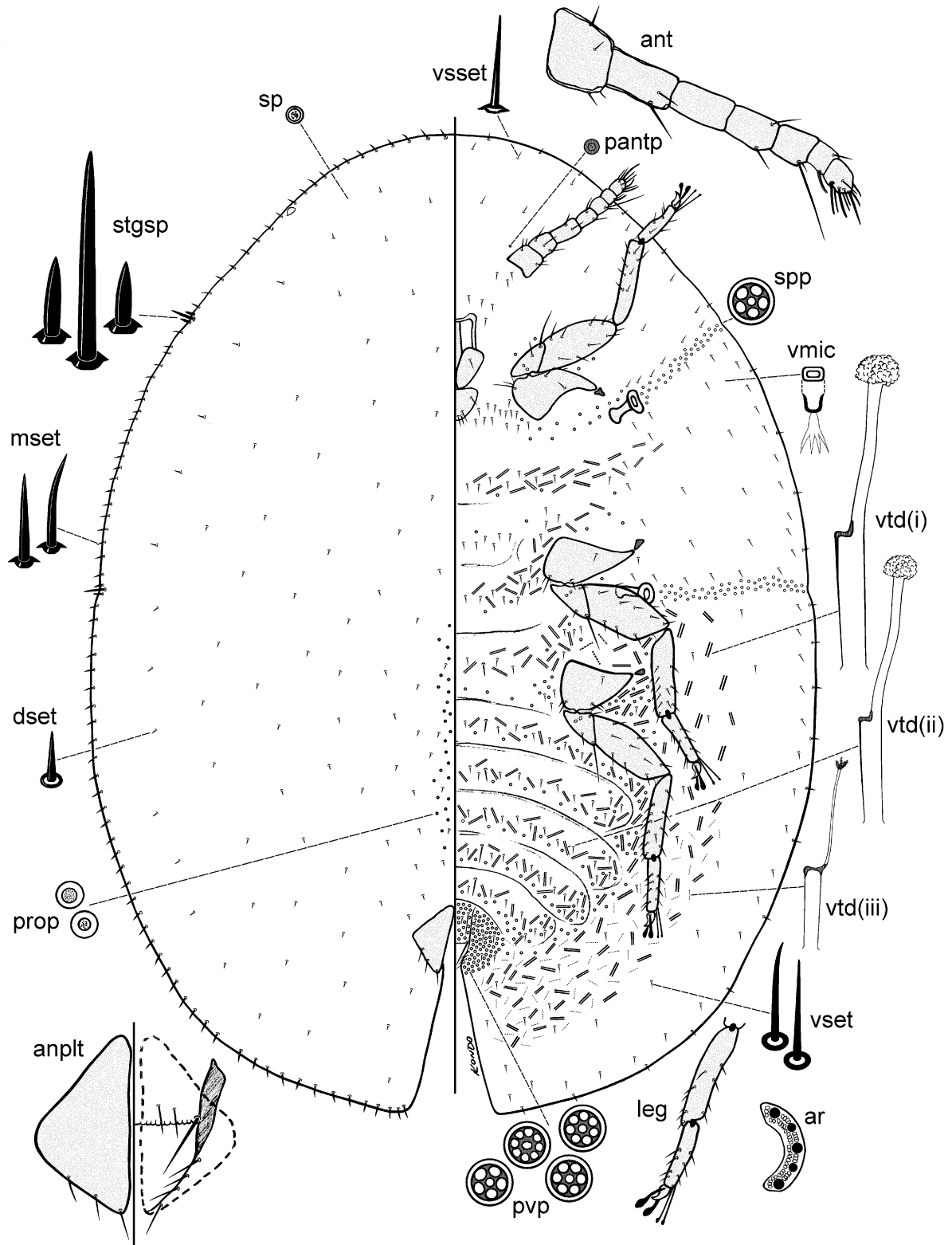
The present species keys out to the genus *Pulvinaria* in Hodgson's keys to subfamilies, tribes and genera of Coccidae (Hodgson, 1994) and fits into his *Pulvinaria*-group, in which tubular ducts are scarce or absent on the head. According to Hodgson (1994), this group can be further divided into those species that have distinctly bilocular pores on the dorsum (*Pendularia* Fonseca and *Tectopulvinaria* Hempel) and those without (*Chloropulvinaria* Borchsenius, *Neopulvinaria* Hadzibejli and *Pulvinaria*).

## *Pulvinaria drimyswinteri* Kondo & Gullan sp. nov.

(Figs 1B & C, 3).

*Proposed common names.* Spanish: Escama blanda algodonosa del canelo; English: Canelo cottony scale. (The host plant of this scale is known by the common name of "canelo" in Chile.)

**Type material examined.** Holotype, adult female. Chile, Xth region, Huerquehue National Park, 39°10'00"N, 75°43'29"N, 750 m a.s.l., 21.ii.2006, coll. Takumasa Kondo, ex *Drimys winteri* J.R. Forst. & G. Forst., 1(1) (USNM). Paratypes, same data as holotype, 15 (15) (2 in BME including voucher No. TK0241, 3 in MNNC, 10 in USNM).



**FIGURE 3.** *Pulvinaria drimyswinteri* Kondo & Gullan, adult female.

**Adult female** (measurements based on n=14).

**Unmounted material** (Figs 1B & C). Adult female in life about 2.5–6.2 mm long, 2.0–4.2 mm wide, oval, moderately convex, covered by a thin waxy layer. Brown to yellowish brown; some specimens with submarginal areas lighter, yellowish, with mid-dorsal area darker, reddish-brown. Younger specimens especially tessellated, tessellations becoming less clear in older specimens; some older specimens with a clear darker mid-dorsal longitudinal line running from area just anterior to anal plates up to head margin. Immature females reddish brown. Ovisac, in either a straight or curved line, present on mature adult females, up to 4 times length of female.

**Slide-mounted material** (Fig. 3). Body 2.3–6.1 mm long, 1.7–4.1 mm wide, elongate-oval in shape.

**Dorsum.** Derm membranous. Dorsal setae sharply spinose, rather short, each 7.5–12.5 mm long, scattered evenly on dorsum. Dorsal microducts not detected. Simple pores each 1.8  $\mu\text{m}$  wide, scarce, scattered over dorsum. Dorsal tubular ducts, dorsal tubercles and pocket-like sclerotizations absent. Preopercular pores small, each 4.0–6.0  $\mu\text{m}$  wide, circular in shape, present along midline from area just anterior to anal plates and extending anteriorly up to about mesothorax. Anal plates together quadrate, with rounded outer angles, plates located at about 1/5 to 1/4 of body length from posterior margin, each plate 215–225  $\mu\text{m}$  long, 105–125  $\mu\text{m}$  wide, anterolateral margin 160–175  $\mu\text{m}$  long, posterolateral margin 150–165  $\mu\text{m}$  long; with about 3 slender setae on dorsal surface along posterior margin of each plate; 1 pair of fringe setae; about 4 ventral subapical setae on each side and 2 pairs of hypopygial setae. Anal ring with 10 setae. Sclerotic area around anal plates absent.

**Margin.** Marginal setae sharply spinose, straight to slightly bent, each 13–30  $\mu\text{m}$  long, arranged in a single row, with 10–21 on each side between anterior and posterior stigmatic areas. Stigmatic clefts very shallow or absent. Stigmatic spine totalling 3 per stigmatic area, median seta longest, each 32–65  $\mu\text{m}$  long; lateral setae shorter, each 10–43  $\mu\text{m}$  long. Eyes 22–25  $\mu\text{m}$  wide, located on dorsal margin.

**Venter.** Derm entirely membranous. Perivulvar pores each 8–10  $\mu\text{m}$  wide, with 5–8 loculi, abundant on perivulvar region, more or less in single rows across mid areas of all abdominal and thoracic segments, abundant around metathoracic coxae, with a fewer around prothoracic and mesothoracic coxae. Spiracular pores each 6.0–7.0  $\mu\text{m}$  wide, usually with 5 loculi, an occasional pore with 3, 4 or 6 loculi, present in a narrow band as wide as peritreme or narrower (about 2 or 3 pores wide), with line of pores extending laterally from each spiracle to body margin. Ventral microducts scattered evenly throughout, each about 3.0  $\mu\text{m}$  wide. Ventral tubular ducts of 3 types: (i) large size tubular ducts present on each side of abdomen in an inner submarginal band from area posterior to vulvar region near anal folds up to area just posterior to metathoracic spiracular pore band, each duct with a broad inner duct and flower-shaped terminal gland; (ii) medium size tubular ducts present in transverse rows across all abdominal segments, and submedially between meso- and metathoracic coxae, and in transverse band in area between prothoracic and mesothoracic coxae, each duct rather similar to large size ducts but smaller and with a narrower inner duct; (iii) smaller tubular ducts present submarginally from area posterior to vulvar region near anal folds up to about abdominal segment II, intermixed with larger size tubular ducts. Ventral tubular ducts of all types absent marginally and submarginally from head and thorax and from the outer submarginal and marginal areas of abdomen. Ventral submarginal setae slender, straight or slightly bent, arranged in a row; other ventral setae present in transverse rows across all abdominal and thoracic segments; about 4 pairs anterior to tentorial bridge; a transverse group present between procoxae and mouthparts and sparsely distributed elsewhere, each seta 7.5–17.5  $\mu\text{m}$  long, with longest setae (45–113  $\mu\text{m}$  long) present on last 3 abdominal segments. Spiracles well developed, anterior spiracular peritremes each 75–85  $\mu\text{m}$  wide, posterior peritremes each 90–103  $\mu\text{m}$  wide, without a sclerotization around each spiracle. Legs well developed, each coxa 265–325  $\mu\text{m}$  long (at widest point), trochanter + femur 400–435  $\mu\text{m}$  long; tibia + tarsus 395–455  $\mu\text{m}$  long, with tibio-tarsal scleroses; claw 47.5–52.5  $\mu\text{m}$  long, without a denticle. Tarsal digitules both similar, knobbed, one slightly thicker than other; claw digitules similar and broad. Antennae each 410–440  $\mu\text{m}$  long, 7 segmented, with fleshy setae present on last 2 antennal segments; with a long slender seta present on antennal segment V. Preantennal pores present, small each 2.5  $\mu\text{m}$  wide. With about 3 pairs of interantennal setae. Mouthparts relatively small; clypeolabral shield 193–215  $\mu\text{m}$  wide; labium 1 segmented, with 4 pairs of labial setae.



**Diagnosis.** The adult female of *P. drimyswinteri* can be diagnosed by the combination of the following features: (1) producing a long ovisac, up to 4 times its body length; (2) dorsal microducts, tubular ducts and tubercles absent; (3) dorsal setae sharply spinose, short; (4) antennae well developed, 7 segmented; (5) legs well developed, with tibio-tarsal scleroses; (6) ventral tubular ducts absent from head and body margins plus submargins, but elsewhere 3 types present: (i) large size tubular ducts on each side of abdomen in a submarginal band from posterior of vulvar region near anal folds anteriorly to just posterior to metathoracic spiracular pore band, (ii) medium size tubular ducts in transverse rows across all abdominal segments, submedially between meso- and metathoracic coxae, and in transverse band in area between prothoracic and mesothoracic coxae, (iii) smaller tubular ducts present in the inner submarginal areas of abdomen from posterior of vulvar region near anal folds to about abdominal segment II, intermixed with larger size tubular ducts; and (7) perivulvar pores with 5–8 loculi, present on perivulvar region, across mid areas of all abdominal and thoracic segments, and around coxae.

The genus *Pulvinaria* is composed of more than 100 species (Hodgson, 1994; Ben-Dov, 2009), of which 25 have been recorded from the New World (Ben-Dov *et al.*, 2009). Reviewing the genus *Pulvinaria* of the New World was out of the scope of this paper. Five species in the genus *Pulvinaria* are considered to be invasive species in South America, namely *Pulvinaria elongata* Newstead, *Pulvinaria floccifera* (Westwood), *Pulvinaria iceryi* (Signoret), *Pulvinaria psidii* Maskell, and *Pulvinaria vitis* (Linnaeus) (Kondo unpublished data). *Pulvinaria drimyswinteri* does not appear to be an invasive species considering its native host *Drimys winteri* (Winteraceae) and its geographical location in the Chilean *Nothofagus* forest. *Pulvinaria elongata* and *P. iceryi* occur commonly on grasses (Ben-Dov *et al.*, 2009), and the morphology of *P. drimyswinteri* does not match the morphology of any of the other three species considered to be invasive (character states of *P. drimyswinteri* in parenthesis), i.e., *P. psidii* has fringed marginal setae (sharply spinose, with a pointed apex); *P. floccifera* and *P. vitis* have dorsal submarginal tubercles (absent) [character states taken from Gill (1988), Hodgson (2002) and Tanaka & Amano (2007)]. No other *Pulvinaria* species have been described from Chile. There are five species described from neighboring Argentina and none recorded from neighboring Peru (Ben-Dov *et al.*, 2009). In Granara de Willink's (1999) key to species recorded from Argentina, *P. drimyswinteri* comes closest to *P. flavescens* Brethes and *P. platensis* Brethes. It differs from *P. flavescens* by having an elongate, oval-shaped body and abundant ventral tubular ducts across mid areas of the abdominal segments (body pyriform shaped and ventral tubular ducts absent across mid areas of abdominal segments in *P. flavescens*), and from *P. platensis* by the lack of dorsal tubular ducts, in having straight to slightly bent sharply spinose marginal setae, and by having smaller tubular ducts present submarginally from area posterior to vulvar region near anal folds anteriorly to about abdominal segment II (dorsal tubular ducts present, marginal setae curved and with a round apex, and with some smaller tubular ducts present on submarginal areas of thorax and abdomen in *P. platensis*) (character states taken from Granara de Willink (1999)).

**Etymology.** The species is named after its host: *Drimys winteri* (Winteraceae) and the name is a noun in apposition.

**Biology.** Adult females were collected on the leaves of the host, locally known as canelo. No males were observed.

## Genus *Stictolecanium* Cockerell

*Stictolecanium* Cockerell, 1902: 452.

Type species: *Lecanium ornatum* Hempel, 1900: 421. By original designation and monotypy.

This genus belongs to the Saissetiini (Coccinae) (Hodgson, 1994) and has four species, two from Brazil and two from Argentina (Granara de Willink, 2006). The type species was described based on specimens from *Eugenia jaboticaba* (Myrtaceae) collected in Brazil. The new species, described below, shares the following features with *S. ornatum* (Hempel), the type species of the genus: (1) dorsal pores arranged in a reticulated pattern; (2) marginal setae numerous; (3) ventral tubular ducts of two or more types in a submarginal band; (4)

legs with tibio-tarsal scleroses; (5) spiracular pores with 5-loculi; (6) perivulvar pores with 10 loculi, present on mid areas of all abdominal segments; and (7) antennae 8 segmented.

The species differs from *S. ornatum* by the following combination of features (character states of *S. ornatum* in parentheses, taken from Hodgson (1994)): (1) cribriform plates absent (present), (2) stigmatic spine differentiated from marginal setae (not differentiated), (3) marginal setae of 2 types, i.e., bluntly spinose with knobbed apex, and sharply spinose (marginal setae very long and setose, with a flagellate apex), (4) ventral tubular ducts of 2 types (3 types), and (5) perivulvar pores absent from area mesad to each prothoracic coxa and near antennae (present mesad to each prothoracic coxa and with a single pore near each antenna).

### Key to separate the known species of *Stictolecanium* Cockerell

(Adapted from Granara de Willink (2006))

1. Stigmatic spines differentiated from marginal setae. Dorsal reticulation partial or obscure, not covering entire body ..... 2
- Stigmatic spines not differentiated from marginal setae. Dorsal reticulation formed by propepercular pores covering entire dorsum ..... 3
2. Cribriform plates scattered over body surface. Reticulation pattern on dorsum when present, formed by preopercular pores restricted to margin only ..... *Stictolecanium entrerrianum* Granara de Willink
- Cribriform plates absent. Reticulation pattern formed by preopercular pores restricted to mid-areas of dorsum only. .... *Stictolecanium cranstoni* Kondo & Gullan **sp. nov.**
3. Preopercular pores on abdomen only. Marginal setae slender, long, with a flagellate apex. Legs with tibio-tarsal scleroses ..... *Stictolecanium ornatum* (Hempel)
- Preopercular pores extending anteriorly to thorax. Marginal setae slender, spiniform or setose. Legs without tibio-tarsal scleroses..... 4
4. Clear marginal areas very broad, approximately twice as broad as long, delineated by circular pores, cribriform plates and setae that form lines. Perivulvar pores present on abdomen but absent on thorax ..... *Stictolecanium convexum* (Hempel)
- Clear marginal areas smaller, about as broad as long, delineated by broad bands formed by numerous pores, cribriform plates and setae. Perivulvar pores present on both abdomen and thorax ..... *Stictolecanium aspidospermum* Granara de Willink

### *Stictolecanium cranstoni* Kondo & Gullan **sp. nov.**

(Figs 1D & E, 4).

*Proposed common names.* Spanish: Escama blanda de Cranston; English: Cranston's scale.

**Type material examined.** Holotype, adult female. *Stictolecanium cranstoni* Kondo & Gullan, Chile, Peulla, 41°05'13.7" S, 72°00'54.7" W, 241 m, 17.ii.2006, voucher No. TK0242, T. Kondo, ex *Gevuina avellana* Mol., 1(1) (USNM). Paratypes, same data as holotype, adult female 1(1) (USNM), and second-instar male nymphs 2(2) (USNM).

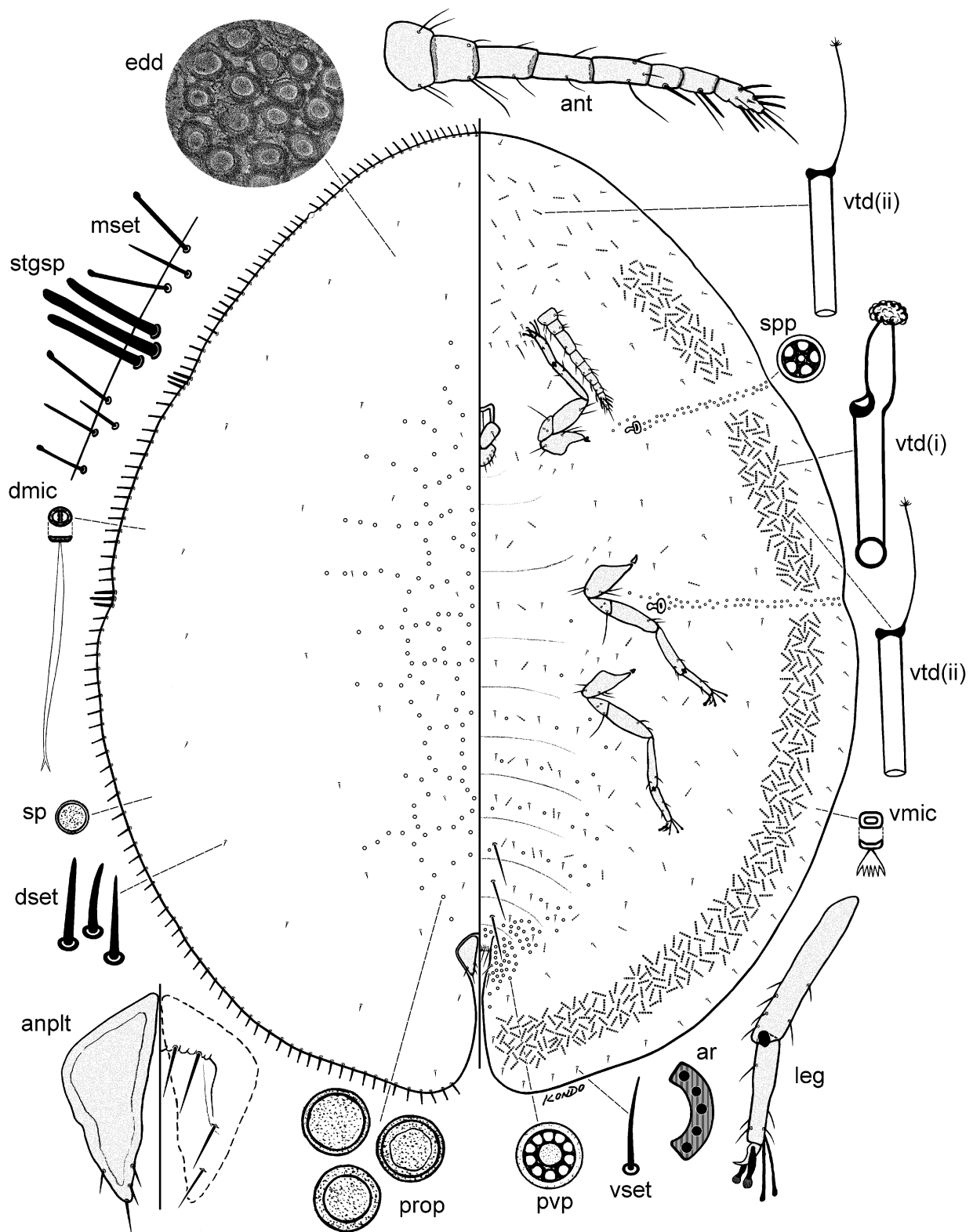
**Description.** Adult female (measurements based on n=2).

**Unmounted material** (Fig. 1D & E). Adult female in life about 4–5 mm long, 3–4 mm wide, oval, moderately convex. Insect covered in a thin layer of clear wax.

**Slide-mounted material** (Fig. 4). Body 4.0–4.7 mm long, 3.1–3.5 mm wide, rather convex, elongate oval in shape.

**Dorsum.** Derm areolated. Dorsal setae sharply spinose, straight or slightly bent, each 7.5–17.5 mm long. Dorsal microducts oval, with a clear septum seen under high magnification, each about 2.5 µm wide, scattered over dorsum. Simple pores each 2.0–3.0 µm wide, scarce, scattered over dorsum. Cribriform plates absent. Dorsal tubular ducts, dorsal tubercles and pocket-like sclerotizations absent. Preopercular pores circular to irregularly circular in shape, with a granulated surface, each 7.5–8.8 µm wide, present on mid-dorsal area in a reticulated pattern. Anal plates together quadrate, with smooth rounded outer angles, plates located at about 1/5 of body length from posterior margin, each plate 175–178 µm long, 73–78 µm wide, anterolateral margin

100–105  $\mu\text{m}$  long, posterolateral margin 123–125  $\mu\text{m}$  long, with 4 slender setae on dorsal surface, i.e., 1 subapical seta on outer margin, 2 subapical setae on inner margin and 1 apical seta; with 2 pairs of fringe setae on ventral side and with 2 subapical setae on each side; hypopygial setae not detected. Anal ring with 10 setae. Sclerotic area around anal plates absent.



**FIGURE 4.** *Stictolecanium cranstoni* Kondo & Gullan, adult female.

**Margin.** Marginal setae of 2 types; (i) slender, straight, capitate setae, each 36–45  $\mu\text{m}$  long, arranged in a single row, and (ii) sharply spinose setae with a pointed apex, each seta 20–33  $\mu\text{m}$  long, present in an irregular single row, intermixed with type (i) setae; total number of marginal setae (type i + ii) totalling 25–41 on each side between anterior and posterior stigmatic areas. Stigmatic clefts shallow, with 3 stigmatic spines per stigmatic area, each bluntly spinose, and 25–55  $\mu\text{m}$  long, generally with median setae longest. Eyes 26–28  $\mu\text{m}$  wide, located on dorsal margin.

**Venter.** Derm entirely membranous. Perivulvar pores each 8.0–9.0  $\mu\text{m}$  wide, with 10 loculi, abundant on perivulvar area; in sparse transverse rows on abdominal segments, and with a pore mesad to each mesothoracic and metathoracic coxa. Spiracular pores each 5.0–6.0  $\mu\text{m}$  wide, with 5 loculi, present in a narrow band as wide as peritreme (about 1 or 2 pores wide), with line of pores extending laterally from each spiracle to body margin, with several pores in a linear group anterior to each spiracle extending from each spiracle towards mid area between spiracle and nearest coxa. Ventral microducts scattered evenly throughout, each about 2.5  $\mu\text{m}$  wide. Ventral tubular ducts of 2 types present: (i) larger duct with a short and broad inner ductule with flower-shaped terminal gland, present around body in an almost complete submarginal band, except absent from spiracular furrows and from head region between eyespots; (ii) a smaller duct with a thin inner ductule with a small and branched terminal gland, rather sparse throughout on thorax and abdomen, with a few around mouthparts, more abundant and fairly evenly distributed on head region, and with a few intermixed with larger ducts in submarginal band; with neither duct type present around margins near ventral submarginal setae. With about 7 pairs of setae on area between antennae; ventral submarginal setae slender, straight or slightly bent, each 10–25  $\mu\text{m}$  long; long pairs of ventral median setae present on last 3 abdominal segments, each 107–163  $\mu\text{m}$  long; other setae slender, similar in shape to submarginal setae, each 5–15  $\mu\text{m}$  long, present in single transverse rows across abdominal segments and sparse on thorax and elsewhere. Spiracles rather small, anterior spiracular peritremes each 47–55  $\mu\text{m}$  wide, posterior peritremes each 60–70  $\mu\text{m}$  wide, without a sclerotization around each spiracle. Legs well developed, each coxa 190–265  $\mu\text{m}$  long, trochanter + femur 300–355  $\mu\text{m}$  long; tibia + tarsus 340–405  $\mu\text{m}$  long, with tibio-tarsal scleroses; claw 37–40  $\mu\text{m}$  long, without a denticle. Tarsal digitules similar, knobbed, one slightly thicker than other; claw digitules similar, broad, with apical dilations, each longer than claw. Antennae each 500–550  $\mu\text{m}$  long, 8 segmented, with fleshy setae present on last 3 antennal segments. Mouthparts normally positioned between coxae; clypeolabral shield 175–210  $\mu\text{m}$  wide; labium 1 segmented, with 4 pairs of labial setae.

**Diagnosis.** The adult female of *S. cranstoni* can be diagnosed by the combination of the following features: (1) insect in life covered in a thin clear waxy layer; (2) dorsal derm areolated; (3) cribriform plates absent; (4) preopercular pores present on mid-dorsum in a reticulated pattern; (5) dorsal tubercles and dorsal tubular ducts absent; (6) marginal setae of two types, i.e., capitate and sharply spinose, more or less intermixed, present in an irregular row; (7) stigmatic spines bluntly spinose, three per stigmatic cleft, median seta generally slightly longer than lateral setae; (8) antennae well developed, 8 segmented; (9) legs well developed, small, with tibio-tarsal scleroses; (10) ventral tubular ducts of two types, the larger forming an almost complete submarginal band; and (11) perivulvar pores with 10 loculi, present on vulvar area, and on mid areas of venter and with a few around mesothoracic and metathoracic coxa. *Stictolecanium cranstoni* can be easily separated from all other species currently included in the genus by the lack of cribriform plates and the presence of differentiated stigmatic spines. The only other species of *Stictolecanium* with differentiated stigmatic spines is *S. entrerrianum* Granara de Willink (Granara de Willink, 2006), but the two can be easily separated by the character states given in the key to species of *Stictolecanium* provided above.

**Etymology.** The species is named after the entomologist Dr Peter Cranston, who kindly invited the first author on a collecting trip to Chile, during which the species was collected.

**Biology.** Insects found on the leaves of the host, *Gevuina avellana* (Proteaceae).

### Other material of Coccidae examined

*Ceroplastes sinensis* Del Guercio, Chile, VII Region, Curico, 12.x.2007, coll. T. Kondo, ex *Ilex* sp., voucher No. TK0580, 1(1) (BME); *C. sinensis*, Chile, Region Metropolitana de Santiago, Pirque, 13.x.2007, coll. T.

Kondo, ex *Hedera* sp., voucher No. TK0585, 1(1) (BME); *Coccus hesperidum* L., Chile, Peulla, 41°05'14"S, 72°00'55"W, 241 m a.s.l., 17.ii.2006, coll. T. Kondo, ex *Azara lanceolata*, 6(6) (BME); *Pulvinariella mesembryanthemi* (Vallot), Chile, Peulla, Hotel Peulla, 41°05'11.1"S, 72°01'15.6"W, 200 m a.s.l., 17.ii.2006, coll. T. Kondo, ex Mesembryanthemaceae, voucher No. TK0240, 1(1) (BME); *Parthenolecanium corni* (Bouché), Chile, VII Region, Curico, 12.x.2007, 35°00'44.3"S, 71°14'54.1"W, 200 m, coll. T. Kondo, ex *Vitis uvifera*, voucher No. TK0590, 1(1) (BME); *Saissetia oleae* (Olivier), Chile, Santiago, Sao Carlos, 1.x.2007, coll. T. Kondo, ex *Fatsia japonica*, voucher No. TK0604, 1(1) (BME).

The above collection of *P. mesembryanthemi* appears to be the first published record of this species in Chile. The mesems now are considered part of the family Aizoaceae (Klak *et al.*, 2003) but the family Mesembryanthemaceae is used still by some botanists. This species is usually found wherever Aizoaceae are grown, and often it is placed in the genus *Pulvinaria* Targioni Tozzetti (Qin & Gullan, 1992; Hodgson, 1994).

### An updated list of Coccidae found in Chile (Modified from Ben-Dov, 2009)

[\*Collected in the present study; \*\*New record for Chile]

*Ceroplastes ceriferus* (Fabricius)  
*Ceroplastes cirripediformis* Comstock  
 \**Ceroplastes sinensis* Del Guercio  
 \**Coccus hesperidum* Linnaeus  
 \**Cryptinglisia chilensis* Kondo & Gullan  
 \**Parthenolecanium corni* (Bouché)  
*Parthenolecanium persicae* (Fabricius)  
*Protopulvinaria pyriformis* (Cockerell)  
 \**Pulvinaria drimyswinteri* Kondo & Gullan  
 \*\**Pulvinariella mesembryanthemi* (Vallot) (Fig. 1F)  
*Saissetia coffeae* (Walker)  
 \**Saissetia oleae* (Olivier)  
 \**Stictolecanium cranstoni* Kondo & Gullan

### A key to known Coccidae of Chile based on the adult females.

(Character states taken from material list above or from Gill (1988) and Hamon & Williams (1984))

1. Stigmatic spines numerous, robust and enlarged, conical or bullet shaped; anal plates surrounded by an elevated caudal process; dorsum with thick-rimmed trilocular, quadrilocular or quinquelocular pores ..... 2
- Stigmatic spines numbering 3 or fewer per stigmatic area, not particularly robust, each seta sharply or bluntly pointed, or cylindrical; thick-rimmed trilocular, quadrilocular or quinquelocular pores absent ..... 4
2. Filamentous ducts absent submarginally on venter ..... *Ceroplastes cirripediformis* Comstock
- Filamentous ducts present submarginally on venter ..... 3
3. Perivulvar pores present around vulva and at least a few on all ventral abdominal segments and around mesothoracic and metathoracic coxae ..... *Ceroplastes ceriferus* (Fabricius)
- Perivulvar pores present around vulva and on last abdominal segments only ..... *Ceroplastes sinensis* Del Guercio
4. Without ventral tubular ducts in a submarginal band ..... *Coccus hesperidum* L.
- With numerous ventral tubular ducts of one or more types forming a complete or incomplete band submarginally around body ..... 5
5. Stigmatic area with only one stigmatic spine; marginal setae conical, with a bulbous base; test of insect glassy, highly ornate ..... *Cryptinglisia chilensis* Kondo & Gullan
- Stigmatic spines totalling 3 per stigmatic area; marginal setae not as above; test of insect composed of a thin layer of clear wax, not as above ..... 6
6. Body outline pyriform; anal plates together pyriform, located near mid dorsum .....
- ..... *Protopulvinaria pyriformis* (Cockerell)
- Body outline oval to elongate oval; anal plates together quadrate, located at about 1/5 to 1/4 of body length from

- posterior margin ..... 7
7. Anal plates each with a large discal seta; marginal setae slender or sharply spinose, often with bifid or fimbriate apices ..... 8
- Anal plates without discal setae; marginal setae slender or sharply spinose, with pointed, blunt or knobbed apices ...  
..... 9
8. Ventral tubular ducts of two types, one with inner ductule as wide or wider than outer ductule, and other with filamentous inner ductule ..... *Saissetia coffeae* (Walker)
- Ventral tubular ducts of one type only, with filamentous inner ductule ..... *Saissetia oleae* (Olivier)
9. Preopercular pores on mid-dorsum forming a reticulated pattern; marginal setae sharply or bluntly spinose, some setae with knobbed apices; tibio-tarsal articulatory scleroses present ..... *Stictolecanium cranstoni* Kondo & Gullan
- Preopercular pores not forming a reticulated pattern, present in a small group just anterior to anal plates; marginal setae sharply or bluntly spinose, with pointed apices; tibio-tarsal articulatory scleroses present or absent ..... 10
10. Dorsal submarginal tubercles absent; ventral tubular ducts fairly abundant in median areas of body; producing an ovisac ..... 11
- Dorsal submarginal tubercles present or absent; ventral tubular ducts absent or very sparse in median areas of body; not producing an ovisac, eggs held under insect body ..... 12
11. Dorsal tubular ducts present; ventral tubular ducts abundant on head region; on Aizoaceae .....  
..... *Pulvinariella mesembryanthemi* (Vallo)
- Dorsal tubular ducts absent; ventral tubular ducts absent on head region; on *Drimys winteri* .....  
..... *Pulvinaria drimyswinteri* Kondo & Gullan
12. Inner ductule of ventral tubular ducts in submarginal band shortened, enlarged; with 24 to 34 dorsal submarginal tubercles; with slender marginal setae ..... *Parthenolecanium persicae* (Fabricius)
- Inner ductule of ventral tubular ducts in submarginal band elongate, thin; with 0 to 26 dorsal submarginal tubercles; with stout, straight, spinose marginal setae ..... *Parthenolecanium corni* (Bouché)

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