

A new genus and new species of Coccidae from Central America (Homoptera: Coccinea)

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Williams, M., Hodgson, Ch. & Danzig, E.M. 2002. A new genus and new species of Coccidae from Central America (Homoptera: Coccinea). *Zoosystematica Rossica*, **11**(1): 111-126.

A new genus of soft scale, *Prionococcus* Williams, Hodgson & Danzig, is introduced to take two new species, *P. agave* Williams, Hodgson & Danzig and *P. americanus* Williams, Hodgson & Danzig from Central America. The adult females of both are described, as are the 1st-instar and 2nd-instar male and female and pupa of the latter species. *P. americanus* has been intercepted several times in the United States of America on imported plants. The new genus is considered to belong to the Coccidae tribe Coccini, and a key is provided to separate it from other genera in this tribe.

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Introduction

An undescribed species of soft scale (Homoptera: Coccinea: Coccidae) from Central America has been intercepted on several occasions by the quarantine services in the United States. This (*P. americana*) and another related species (*P. agave*), also from Central America, are here described as new and placed in a new genus, *Prionococcus* Williams, Hodgson & Danzig. The former species appears to be highly variable but no constant differences could be found to separate the various lots of material.

Depositories: BMNH: The Natural History Museum, London, UK; USNM: US National Museum of Natural History, Washington, D.C., USA; ZIAS: Zoological Institute, Academy of Sciences, St. Petersburg, Russia; CSDA: California State Department of Agriculture, Sacramento, California, USA.

Prionococcus gen. n.

Type species: Prionococcus agave sp. n.

Diagnosis: Adult female. Body oval to almost round, symmetrical or asymmetrical, probably rather flat in life, widest across abdomen; stig-

matic cleft shallow, anal cleft distinct, margins adpressed but not fused. *Dorsum*: derm membranous on young adult, but with a narrow sclerotisation around anterior margin of anal plates; becoming sclerotised medially outwards at maturity; with areolations, largest near margin, becoming smaller or absent medially. Dorsal setae stoutly spinose and tapering; sparse throughout. Dorsal pores of three types: (i) large preopercular pores, each pore heavily sclerotised, with a broad basal disc: in a distinct longitudinal band extending anteriorly from anal plates to about prothorax; (ii) dorsal microductule, each with a fine inner ductule: frequent throughout, and (iii) a small open simple-pore: present throughout. Dorsal tubular ducts and dorsal tubercles absent. Anal plates approximately quadrate, inner margins more or less parallel, posterior margins slightly convex; each plate with 3 strong setae dorsally near apex (1 near each inner margin, near apex and near posterior margin), and with a short seta ventrally near apex. Ano-genital fold with a pair of long seta on anterior margin and 3 pairs of shorter setae on lateral margins plus that near apex; supporting bar distinct, extending anteriorly to anterior margin of anal plates. Anal ring with five pairs of setae and with an incomplete

double row of pores. *Margin*: marginal setae all slightly displaced onto dorsum, of two main types: (i) a stout, spinose seta, longest posteriorly but slightly variable in shape; apical half of each spine with minute dimples; each with a broad, well-developed basal-socket: usually rather abundant; and (ii) a setose seta, each with a well developed basal socket: sparsely distributed between spinose setae. Stigmatic spines undifferentiated from marginal spines. Eyespot marginal. *Venter*: derm membranous. Pregenital disc-pores each with 5-7 loculi: present on pregenital segment only, mainly laterad to anterior end of anal cleft and anal plates. Spiracular disc-pores with mainly 5 loculi: in a narrow band extending from each spiracle to margin. Ventral microducts frequent in a broad marginal band, on head and around labium but possibly absent medially on abdomen. Preantennal pores absent. Ventral tubular ducts absent. Ventral setae: anal lobe setae undifferentiated from submarginal setae; with long pregenital setae on 3 segments only, but each segment with a sparse band of short setae across each abdominal segment; usually with 2 or more setae near articulation of each coxa; interantennal setae: two pairs; with several small submarginal setae between stigmatic areas; with 1 pair of hypopygial setae; other setae small and quite sparse. Antennae 6-segmented; scape with 3 setae; pedicel: 2 setae + campaniform pore; segment III: 3 setae; IV: 1 fleshy setae only, V: 1 fleshy seta + 1 setose seta, and VI: 3 fleshy setae + 5 or 6 setose/spinose setae. Mouthparts usually placed asymmetrically; labium generally twisted, with 4 pairs small setae. Spiracles normal. Legs usually quite well developed but highly variable, sometimes without distinct trochantofemur and tibiotarsal segmentation; setae: coxa 5-6; trochanter 1 long seta on ventral margin and one short seta on dorsal margin; femur 2; tibia 2-4 and tarsus 2-4; tarsal campaniform pore absent; claw with a distinct denticle; tarsal digitules extending well beyond tip of claw; claw digitules subequal in length to tarsal digitules and extending well beyond tip of claw; one claw digitule generally broader than other claw digitule.

Comment. *Prionococcus* is easily recognised by (i) the line of large preopercular pores anterior to the anal plates, (ii) the restriction of the pregenital disc-pores to the most posterior pregenital segment; (iii) the absence of tubular ducts on both the dorsum and venter; (iv) the robust spinose marginal setae, each of which appears to have a slightly dimpled and spinulate surface, and (v) the possession of two types of marginal setae: spinose setae and flagellate setae.

Discussion. The genus *Prionococcus* appears to belong to the tribe Coccini Fallén as defined by Hodgson (1994). In the key given to genera

in Hodgson (1994), *Prionococcus* keys out at *Mesolecanium* Morrison, to which it is clearly closely related. Like *Mesolecanium*, *Prionococcus* appears to be restricted to the New World. *Prionococcus* can be separated from other Coccini by replacing couplet 12 in the Coccini key of Hodgson (1994) with the following couplets:

12. Preopercular pores present in a broad longitudinal band anterior to anal plates; with few setae present along ano-genital fold; dorsal tubercles absent; each posterior band of disc-pores not extending from each posterior spiracle to mesad of each mesocoxa . . . 13
Preopercular pores absent; with numerous setae along ano-genital fold; dorsal tubercles present; each posterior band of spiracular disc-pores past each posterior spiracle to mesad of each mesocoxa **Suarezziella** Mamet
13. Marginal setae of 2 or 3 types, one finely setose and the others stoutly spinose; stigmatic clefts each with spines not clearly differentiated from marginal spines **Prionococcus** gen. n.
- Marginal setae of one type, spinose, bent with a blunt apex; stigmatic clefts each with three stigmatic spines clearly differentiated from marginal spines, each median spine distinctly longer than lateral spines **Mesolecanium** Morrison

Prionococcus shares with *Mesolecanium* the following characters: (i) preopercular pores quite large, in a broad, longitudinal band anterior to anal plates; (ii) dorsal setae slightly spinose; (iii) dorsum with areolations; (iv) pregenital disc-pores restricted to most posterior abdominal segment; (v) pregenital disc-pores with mainly seven loculi; (vi) absence of ventral tubular ducts, and (vii) tibio-tarsus segmentation absent or poorly developed.

Etymology: *Prionococcus* is formed from *prionos* (Gr. m) meaning 'saw', referring to the marginal setae which look rather like the teeth on a chainsaw, and *-coccus* after the family name.

Prionococcus currently contains 2 species, *P. agave* and *P. americanus*, both described as new below.

***Prionococcus agave* sp. n.**

Holotype, ♀, **Mexico**, San Luis Potosi, ex leaf of *Agave falcata* (Agavaceae), 9.VI.1980, R.L. Hodgson, (USNM: Laredo 13961): young unsclerotised adult female on a slide with 5 ad ♀, holotype female clearly marked on map on right-hand label.

Paratypes. **Mexico**, as for holotype, 4 sclerotised ad ♀ on slide with holotype ♀ (USNM). Slide deposited in USNM.

Other material. **Mexico**, intercepted at Brownsville, off leaf of *Agave stricta*, Burgess Reist, (USNM 6897), 1/1 ad ♀ in good condition. Slide deposited in ZIAS.

Adult female (Fig. 1) (Described from 6 specimens, 2 in excellent condition, 4 more heavily sclerotised and dorsum split but still quite good).

Unmounted material: not seen.

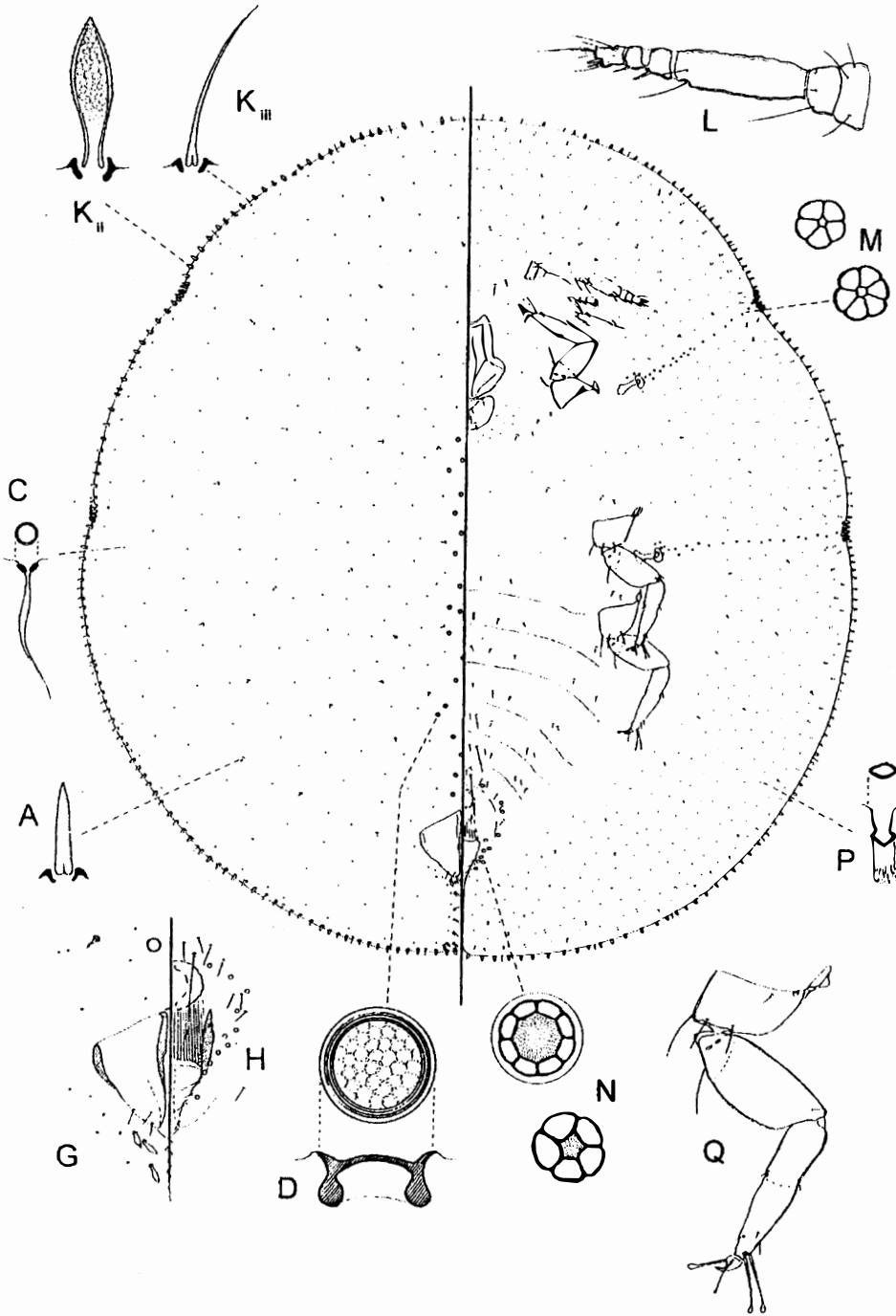


Fig. 1. *Prionococcus agave* sp. n., adult female. In this and in Figs 2-6: A = dorsal setae; B = dorsal simple pore; C = dorsal microductule; D = preopercular pore; G = anal plates; H = ano-genital fold; K = marginal setae (i: bulbous spinose seta; ii: lanceolate spinose seta; iii: flagellate seta); L = antenna; M = spiracular disc-pore; N = pregenital disc-pore; P = ventral microduct; Q = metathoracic leg or claw.

Mounted material: body showing very slight signs of asymmetry (most obvious in position of mouthparts); length 1.57-2.63 mm, width 1.3-2.0 mm.

Dorsum: dorsal setae spinose, either tapering to a sharp point (Brownsville material) or rather blunt and parallel-sided (San Luis Potosi material); each 7-9 μm long. Dorsal pores: (i) preopercular pores, each broad basal disc supporting a rather flat closed pore; large (each 5-9 μm wide): in a distinct longitudinal band of 31-63 pores; (ii) dorsal microductule, and (iii) a small open simple-pore, similar in size to microductule. Anal plates each 134-145 μm , combined width 155-180 μm ; each plate with 3 setae each 21-32 μm long. Ano-genital fold: long seta on anterior margin each about 40-45 μm . Anal ring: with 3 pairs of long setae and two rather shorter.

Margin: marginal setae: (i) spinose setae lanceolate, longest posteriorly but slightly variable in shape: in single row around margin, highly variable in frequency; length 11-20 μm long; and (ii) setose setae each 10-17 μm long; distribution of setae on Brownsville material: 20 spinose + 8 setose between eyespots, 15-18 spinose + 2 setose between eyespot and anterior stigmatic cleft, 16-17 spinose + 1 setose between stigmatic clefts laterally, 57-59 spinose + 6 setose between posterior stigmatic clefts and anal cleft, and 7-9 spinose only along margin of anal cleft; San Luis Potosi material: 12-20 spinose + 4-8 setose anteriorly between eyespots, 7-10 spinose + 1-2 setose between eyespot and anterior stigmatic cleft, 5-13 spinose + 1 setose between stigmatic clefts laterally, 23-45 spinose + 6 setose between posterior stigmatic clefts and anal cleft, and 1-6 spinose + 0-1 setose along margin of anal cleft. Stigmatic spines undifferentiated from marginal lanceolate spines but forming a distinct group, with 9-10 per cleft (Brownsville material) and 4-9 (San Luis Potosi material). Anal cleft about 1/10th body length. Eyespots each 12-16 μm wide.

Venter: pregenital disc-pores: with 11-14 on either side. Spiracular disc-pores: with 18-25 in each anterior disc-pore band and 18-37 in each posterior band. Ventral microducts as in generic diagnosis. Ventral setae: anal lobe setae generally undifferentiated from submarginal setae but occasionally up to 22 μm long; longest pregenital setae each about 74-101 μm long; other setae present medially across abdominal segments: VII: 15 or 16, VI 8-11, V: 9-11, IV-II: each 6-8; setae associated with each coxa: metacoxa 2, mesocoxa 2 and procoxa 4, all short; interantennal setae: two pairs, longest about 25 μm long; with 6-8 small submarginal setae (each 3-4 μm long) between stigmatic areas; other setae small and quite sparse. Antennae: total length 175-208 μm ; terminal seta quite long, length 33 μm ;

length of "long" fine setose seta on terminal segment about 38 μm . Mouthparts usually showing only slight signs of asymmetry; length of clypeolabral shield 153-160 μm ; labium sometimes twisted. Spiracles normal: each anterior peritreme 33-42 μm , each posterior peritreme 38-43 μm . Legs perhaps rather small, without any distinct segmentation between trochanter and femur or between tibia and tarsus; longest coxal seta each 33-43 μm long; long trochanter seta each about 26-34 μm long; lengths (μm) of metathoracic leg: coxa 83-96; trochanter + femur 107-116; tibia + tarsus 132-140; claw 21-24.

Etymology. This species is named after the host plant genus *Agave* (Agavaceae).

Comment. *P. agave* is very similar to the following species but differs (character-states on *P. americana* in brackets) in having (i) distinct groups of spines in the stigmatic clefts (no groups of stigmatic spines), (ii) only one type of spinose marginal seta (the anterior spinose setae are mainly bulbous with rounded apices, whereas the most posterior are lanceolate), and (iii) the claw digitules very different in size (often with one broader than the other but never as markedly so as on *P. agave*). Otherwise these two species are clearly closely related.

Prionococcus americanus sp. n.

Holotype: ad ♀, **Mexico**, Cozumel, ex *Coccoloba* sp. (Polygonaceae), 20.VIII.1988, M.L. Williams (USNM, AL-028-88). Slide deposited in USNM.

Paratypes. **Mexico**, as for holotype, 29 slides with 8 young ad ♀ (2 of dorsums only), 13 old ad ♀ (3 poor), 2nd ♀, 2 2nd ♂, 14 crawlers (8 poor) + 1 embryo. (Depositories: 2 ad ♀ BMNH, 2 ad ♀ ZIAS, 1 ad ♀ NMW; rest in USNM.)

Other material. **Mexico**: Cuernavaca Morelos, ex *Yucca* sp., 31.III.1996, E. Shuvachina (ZIAS 73-96), 2/5 ad ♀ in good condition and several unmounted ad ♀ + larvae; Chivela, Oaxaca, on *Coccoloba* sp. "Carnero" (Polygonaceae), 1926, G.F. Ferris (CSDA, -X-64-remount-.X.1964 RJW), 3/3 ad ♀ (+ embryo) in good condition; intercepted Brownsville (USA), ex *Anthurium clarinerium* (Araceae), 9.VIII.1977, Burgess (USNM 7595), 1/4 ad ♀ + embryos; intercepted Brownsville (USA), ex *Anthurium hookeri*, 26.V.1978, G. Burgess (USNM 8363), 1/2 ad ♀ (poor) + 2 2nd ♀; intercepted Brownsville (USA), ex *Anthurium robustum*, 10.VIII.1977, Burgess Vanvalkenburg (USNM 7598), 1/2 ad ♀, 2 2nd ♀; Veracruz div., intercepted Brownsville (USA), ex *Anthurium* sp., 23.III.1973, Stevens et al. (USNM 3575), 2/3 ad ♀, 2 2nd ♂, 2 2nd ♀ + pupa; intercepted at Miami, on *Philodendron* sp. (Araceae), 27.II.1951, A.S. Mills (USNM, 2006, 51.824), 1/3 ad ♀ + 2nd ♂. **Guatemala**: intercepted Los Angeles (USA), on leaf of unknown plant, 20.I.1986, K. Shimoda (USNM, 058574 - 86-5641), 2/4 ad ♀; intercepted at New Orleans, on *Coccoloba unifera*, 17.VIII.1982, H. Fingerman (USNM 014820): 5/9 ad ♀; intercepted at Hoboken, on *Anthurium salvii*, 11.VII.1949, L. Siroto (USNM 1362; 50-271), 1/3 ad ♀, 5 2nd ♀. **Honduras**: intercepted Miami, ex epiphytic cactus, 25.VII.1975, R.E. Cotter (USNM 11740), 3/5 ad ♀, 2 2nd ♂ + 2nd ♀.

Described from 30 specimens, mostly in fair to good condition. Note that this is a highly variable species – it could represent a complex of species but no constant character could be found to separate them and it is here assumed that this variation represents host-induced or environmentally-induced (or both) differences.

Adult female (Figs 2, 3; Table).

Unmounted material: dried specimens oval, rather flat to slightly convex, dorsum sclerotised and brown with a thin cottony cover except medially; leaf covered in fluffy white cottony wax, which is assumed to have been secreted by the adult females.

Mounted material: body sometimes oval (Fig. 2) but generally showing slight to considerable asymmetry, with one side significantly longer than other and with anal lobe on one side strongly convex (Fig. 3); anal cleft about 1/9–1/10th body length; length 1.3–3.1 mm, width 0.85–2.5 mm.

Dorsum: dorsal setae tapering to a sharp point: perhaps most common medially on abdomen; each 7–10 μm long. Dorsal pores: (i) preopercular pores fairly large, each 5–10 μm wide, with a broad basal-disc supporting a convex closed pore: in a distinct longitudinal band of 9–59 pores; (ii) a small microductule: perhaps most common near margin and up margins of anal cleft, and (iii) a small open simple-pore. Anal plates: posterior margins often with a distinct indentation; length 111–162 μm , combined width 140–210 μm ; anal plate setae all strongly setose and subequal in length, each 28–50 μm long; dorsal surface frequently with pale areas (areolations) near anterior margin. Ano-genital fold: long setae on anterior margin each 22–58 μm long. Anal ring with 2 or 3 pairs of long, thick setae plus 2 or 3 pairs of thinner, shorter setae; anal tube about 1.5–2.0 \times length of anal plates.

Margin. Marginal setae: (i) spinose setae of two types: anteriorly bulbous with a more or less rounded apex and with a dimpled surface apically, each about 8–17 μm long; at posterior end of abdomen, marginal setae more lanceolate, but this variable, some specimens having slightly pointed spines even on head; each about 13–25 μm long along anal cleft; in a single to double row around margin; with 15–50 between eyespots on head; 6–43 between each eyespot and anterior stigmatic cleft; 11–43 laterally between stigmatic clefts (rows more or less double when spines abundant), 36–138 along each side of abdomen (of which posterior 10–20 are lanceolate) and with 1–12 on either side of anal cleft, always longest and most pointed (material from Honduras and off *Philodendron* from Mexico had fewest spinose marginal setae, those from Morelos and

Oaxaca in Mexico had most); and (ii) a setose seta, 16–40 μm long: with 4–9 between eyespots; 1–2 between each eyespot and anterior stigmatic cleft; 1 laterally between stigmatic clefts and 6–7 along each side of abdomen, and with 0–2 on each lateral margin of anal cleft. Stigmatic clefts slightly sclerotised along margin: stigmatic spines undifferentiated from marginal bulbous spines. Eyespot about 11–13 μm wide.

Venter. Derm membranous. Pregenital disc-pores: with 4–20 on either side (1 specimen had a single disc-pore on segment VI). Spiracular disc-pores: with 9–34 in each anterior band and 13–39 in each posterior band. Ventral microducts as in generic diagnosis. Ventral setae: longest pregenital setae each about 79–133 μm long, long seta also rarely present on segment IV; other setae present medially across abdominal segments (totals): VII: 11–19, VI: 8–15, V: 4–18, IV: 5–14, III: 5–14 and II: 2–10; setae associated with each coxa: metacoxa 1–5, mesocoxa 2–6 and procoxa 1–7, usually all short, occasionally longest procoxa seta up to 18 μm long; each prothoracic segment with some setae medially; interantennal setae: 2 pairs (rarely – 5, Guatemala at Los Angeles), longest 25–65 μm long; with 6–13 small submarginal setae (length 3–8 μm) laterally between stigmatic areas; other setae small but frequent, particularly in a broad marginal band. Antennae: IIIrd segment rarely with a pseudo-articulation; each 160–274 μm long; length of terminal seta 28–52 μm ; length of long setose seta on terminal segment 33–91 μm . Mouthparts usually distinctly asymmetrical, rather closer to one procoxa; length of clypeolabral shield 125–190 μm . Spiracles: each anterior peritreme 28–47 μm , each posterior peritreme 33–65 μm . Legs: presence of tibio-tarsal segmentation variable, usually with slight signs of a small pseudo-segmentation on smallest legs, but with a distinct segmentation on largest legs; lengths (μm) of metathoracic leg: coxa 74–133; trochanter + femur 97–228; tibia + tarsus 107–251; claw 22–35 μm ; longest coxal seta each 51–112 μm long; longest trochanter seta each about 42–95 μm long; claw digitules almost similar on smallest legs, distinctly dissimilar on largest legs, slightly broader than tarsal digitules and extending well beyond tip of claw.

Discussion: this material was extremely variable. The main variation was in: (i) body shape: that from Morelos, Mexico (Fig. 2), was barely asymmetrical whereas most other material (e.g. from Guatemala, intercepted in Miami (Fig. 3)) showed considerable asymmetry; (ii) number of marginal spinose setae: these were more than twice as abundant on material from Morelos and Oaxaca, Mexico as on the material with the fewest marginal setae from Honduras and that

Table. Ranges in data for 8 collections of adult female *P. americanus* from various localities. Where: No. = number of specimens studied; column 1 = length of anal plates (μm); 2 = no. of preopercular pores; 3 = no. of marginal spines along anal cleft; 4 = no. of marginal spines laterally between stigmatic clefts; 5 = no. of marginal spines anteriorly between eyespots; 6 = no. of pregenital disc-pores; 7 = no. of spiracular disc-pores between anterior spiracles and margin; 8 = width of anterior spiracular peritreme (μm); 9 = length of coxa (μm); 10 = length of trochanter + femur (μm); 11 = length of tibia + tarsus (μm); 12 = claw digitules; where 0 indicates digitules similar ranging to 5 very dissimilar; 13 = length of antennae (μm); 14 = degree of asymmetry; where 1 indicates barely asymmetrical, only mouthparts displaced; 2: intermediate; 3: margin of body showing high degree of asymmetry, particularly posteriorly (as in Fig. 3); 15 = tibio-tarsal articulation: where 1 indicates pseudo-segmentation poor, sometimes absent ranging to 5 where complete segmentation present.

Locality	No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Guatemala: Hoboken	3	145-162	26-42	6-12	13-31	15-37	12-18	23-34	41-47	107-128	165-199	4	215-240	145-162	1	3
Guatemala: New Orleans	4	128-145	24-55	1-4	12-26	21-35	5-13	9-22	31-37	95-112	132-166	2	166-183	150-190	1-3	3
Guatemala: Los Angeles	4	139-145	26-49	5-9	24-31	18-33	14-18	14-24	36-44	107-132	169-207	2	186-228	145-153	1-3	4
Honduras: Miami	5	140-153	9-18	3-8	11-27	15-21	5-10	17-28	36-42	91-120	161-186	5	211-248	136-166	1	2
Mexico: Oaxaca	3	145-150	52-55	7-10	34-38	30-42	7-14	15-33	46-53	120-132	236	3	248-270	157-173	1-2	5
Mexico: Miami	3	134-143	16-21	3-5	11-16	15-18	4-10	12-30	33-42	74-83	108	2	160-178	161-166	2	1
Mexico: Morelos	3	144-161	44-59	8-14	26-43	30-50	6-17	11-18	41-47	111-124	221-250	4	256-273	157-174	1	5
Mexico: Cozumel	4	124-133	18-27	5-8	16-31	21-37	11-20	13-24	36-43	86-116	169-203	2	186-228	132-145	2-3	4
Range		124-162	9-59	1-14	11-43	15-50	4-20	9-34	31-53	74-132	108-250	3	160-273	132-190	-	3.5

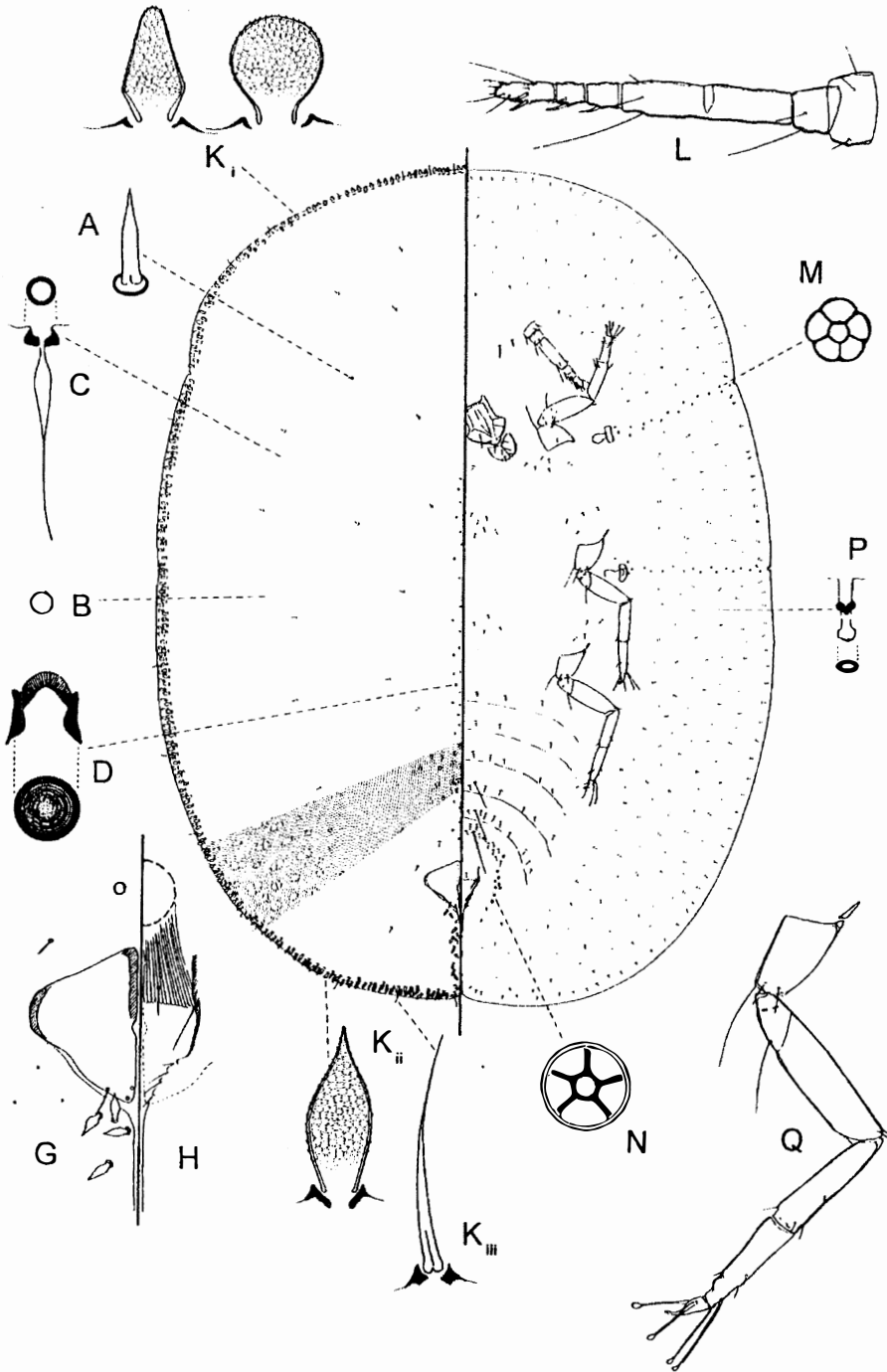


Fig. 2. *Prionococcus americanus* sp. n., adult female from Morelos, Mexico. Note that this form is almost symmetrical, apart from the position of the mouthparts. Labels as in Fig. 1, except R = ventral seta.

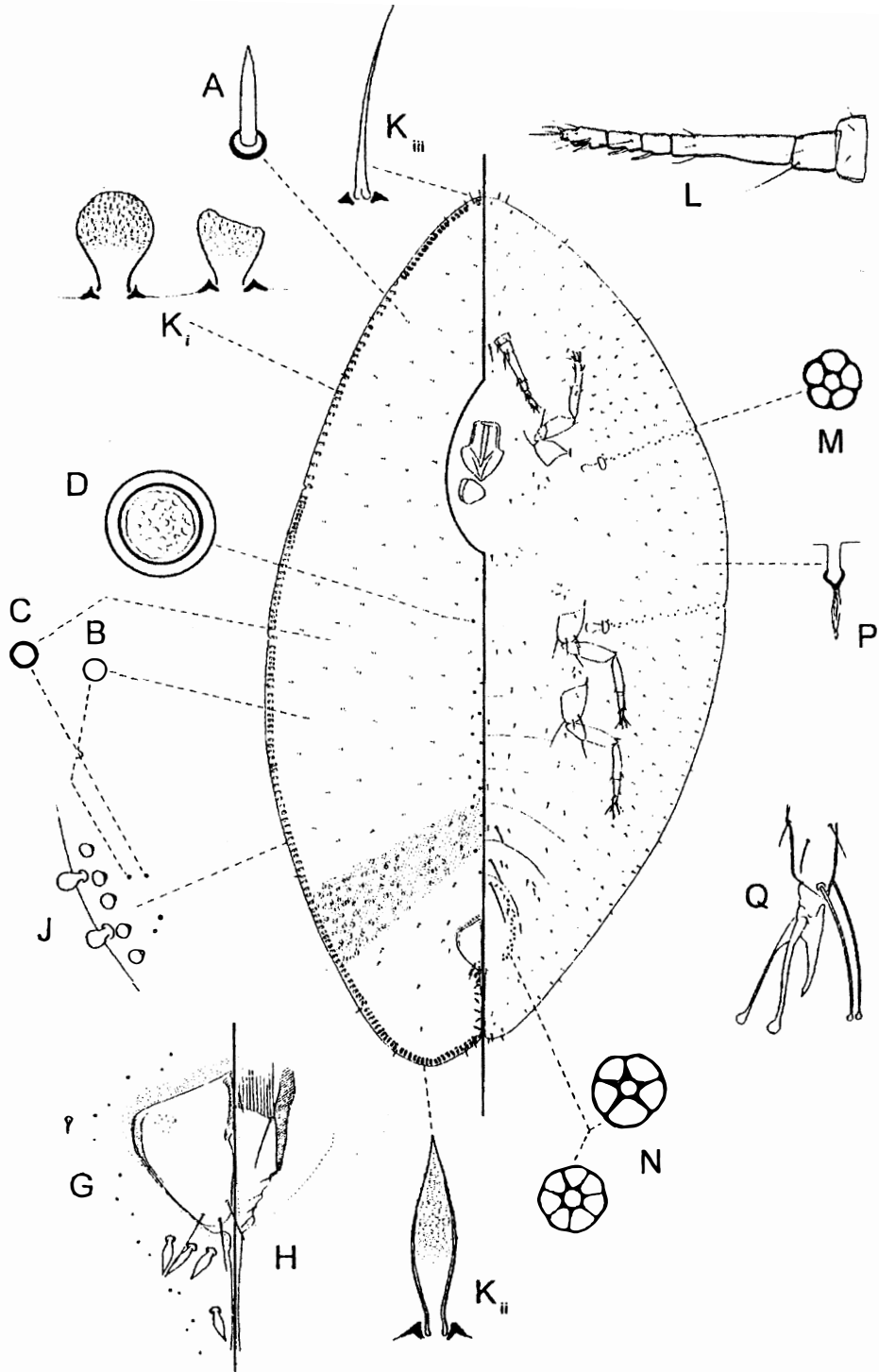


Fig. 3. *Prionococcus americanus* sp. n., adult female from Cozumel, Mexico. Note that this form is strongly asymmetrical. Labels as in Fig. 1, except J = margin.

intercepted at Miami from Mexico; (iii) size of the legs and antennae: the longest legs (from Mexico: Oaxaca, Morelos, Cozumel; Guatemala, intercepted at Los Angeles) were more than twice the length of the shortest legs (Mexico, off *Philodendron*); the antennae showed the same trends, with the longest more than 1/3rd longer than the shortest; (iv) the presence of segmentation between tibia and tarsus: this was well developed on the longest legs but indistinct or absent on the shortest; and (v) the shape of the claw digitules: distinctly different on the longest legs but more or less similar on the shortest. Table 1 gives some of the data for 8 lots of this material. It is clear that there is much overlap in most of these data but no structural differences could be found which constantly separated them. In addition, no differences (other than in size) were found in the other life stages studied and described below. It has therefore been accepted that this must represent a single highly variable species, the differences being caused by host-plant or ecological factors.

P. americanus is easily separable from *P. agave* in (i) lacking a distinct group of spines in each stigmatic cleft; (ii) having different-shaped marginal spines anteriorly and posteriorly; and (iii) in having the claw digitules much more similar than on *P. agave*.

First-instar nymph (Fig. 4)

Described from 3 specimens in good condition and from a few others in poorer condition.

Unmounted material: not seen.

Mounted material: oval, about equally rounded at both ends; anal cleft very shallow. Length 430-914 μm ; width 220-412 μm .

Dorsum: derm membranous. Dorsal setae: 1 pair of minute setae (each 2 μm , long) about dorsal to each scape (absent on one specimen). Dorsal pores of three types: (i) minute dorsal microductules, which appear bilocular; (ii) rather faint minute simple pores, each slightly larger than a microductule; with one of each pore type in a pair; with pairs of pores in two submarginal and two submedial rows, each line with a pair of pores on each abdominal and thoracic segment, but with only one pair of submarginally on head; and with (iii) a pair of small trilocular pores near anterior margin on head. Anal plates each elongate and diverging, length 46-55 μm , width of each plate 25-28 μm ; each plate with a very long apical seta perhaps 160-270 μm long; also one seta about half-way along each inner margin, 10-14 μm long, and a seta on each side of long apical seta, each 18-32 μm long. Anogenital fold with a pair of setae on each anterolateral corner, each 10-17 μm long, and another seta on each

lateral margin, each 23-30 μm long; supporting bar poorly developed. Anal ring with 6 setae and 9 pores; anal tube short.

Margin: marginal setae of two types: (i) flagellate setae, each up to 30 μm long, and (ii) spinose setae (each with small dimples and/or spinules on apical half) of 2 types: rounded, bulbous spines (each 8 μm long) and elongate spatulate spines (each 11-13 μm long); distribution: around head between eyespots: 4 bulbous spines + 8 flagellate setae; on each side between eyespots and anterior stigmatic area: 3 bulbous spines + 2 flagellate setae; laterally between stigmatic areas: 3 bulbous spines + 1 flagellate seta; and posterior to posterior stigmatic area: with 2 bulbous spines anteriorly, these becoming spatulate posteriorly, with 5 or 6 of latter + 7 flagellate setae. Stigmatic spines undifferentiated from marginal spines; stigmatic clefts absent. Eyespot on margin; width 11-13 μm .

Venter: derm membranous. Preanal multilocular disc-pores absent. Spiracular disc-pores each with 2-5 (mainly 3) loculi in a band 1 pore wide between spiracle and margin, with 3 disc-pores in each anterior band and 3 or 4 in each posterior band. Ventral microducts possibly restricted to 1 posterior to each scape, 1 between each pro- and mesocoxa, and 4-5 submarginally in abdominal segments II-VI. Preantennal pores absent. Ventral tubular ducts absent. Ventral setae: anal lobe setae not differentiated from submarginal setae; with a pair of long setae on abdominal segment VII, and short pairs medially on VI and (usually) V; also each abdominal segment with a small mediolateral seta on each side; without setae near each coxa; with a single pair of inter-antennal setae, each 23-33 μm long; submarginal setae: 1 pair anteriorly on head, 1 between each lateral stigmatic area and 1 on each abdominal segment. Antennae each 6 segmented and 139-166 μm long; setal distribution: scape: 3, pedicel: 2 + a campaniform pore, segment III: 2 (1 very long); IV: 1 fleshy seta only, V: 1 fleshy seta + 1 flagellate seta, and VI: with 3 fleshy setae and 5 or 6 flagellate/spinose setae; apical seta long, 66-96 μm long and lateral flagellate seta long, 83-105 μm . Clypeolabral shield 78-85 μm long; labium with four setae. Spiracles small, each peritreme 8-9 μm wide. Legs well developed; lengths of metathoracic legs (μm): coxa 45-50; trochanter + femur 72-81; tibia 43-52, tarsus 31-40; claw 16-20; setal distribution: coxa with 7 setae, longest 30-33 μm ; trochanter with 1 long seta, length 30-33 μm ; femur with 2 setae, tibia 2 and tarsus 4 setae; distal margin of each tibia with microctenidia; tarsal digitules dissimilar, with one narrower than other but both much longer than claw; claw digitules very dissimilar, one much broader than other, both

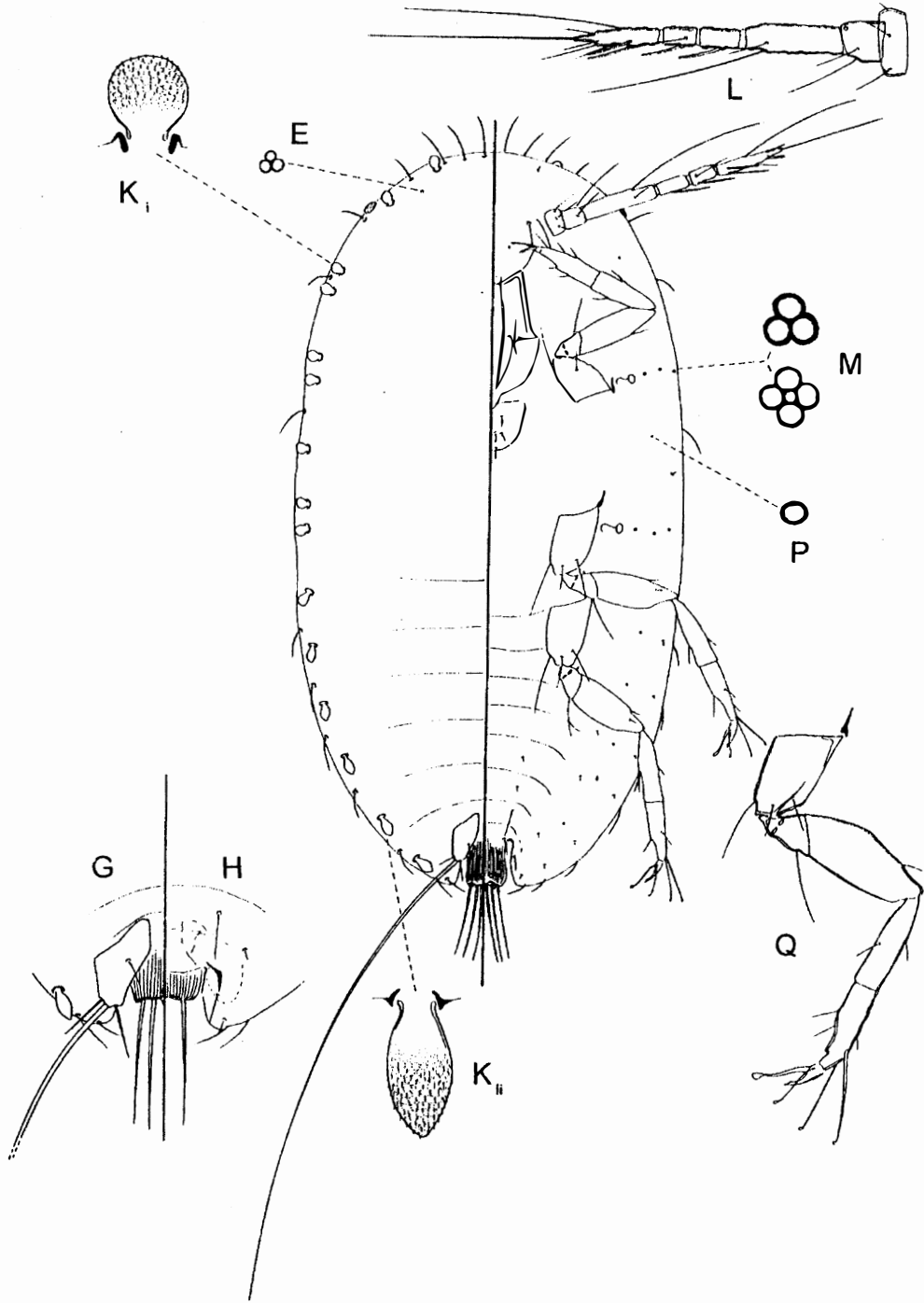


Fig. 4. *Prionococcus americanus* sp. n., 1st-instar nymph from Cozumel, Mexico. Labels as in Fig. 1, except E = dorsal trilocular pore, R = anal ring.

subequal in length to tarsal digitules; claw with a distinct denticle.

Comment: the crawler of *P. americanus* would appear to be easily separated from known first instar Coccidae in the shape and structure of the spinose marginal setae and also in possessing flagellate marginal setae.

Second-instar female (Fig. 5)

Described from 8 specimens, mostly in fair to good condition.

Unmounted material: not seen.

Mounted material: elongate oval, asymmetrical, rounded at both ends; 1500-2625 μm long, 825-1625 μm wide, anal cleft about 1/13th body length.

Dorsum: derm entirely membranous. Dorsal setae present or absent: when present (Cozumel material), 4 μm long, spinose, pointed, sparse throughout; absent on all other material. Dorsal pores of two types, both sparse throughout: (i) small microductules, with an elongate, thin inner ductule, and (ii) simple pores, 1.5-2 times larger than microductules. Preopercular pores absent. Dorsal tubular ducts absent. Anal plates together approximately quadrate, 83-116 μm long, 107-141 μm wide; each plate with a seta dorsally near inner margin, 25-33 μm long; an apical seta, 25-40 μm long and a seta on posterior margin, 27-40 μm long. Anogenital fold with a pair of setae laterally on anterior margin, each 25-40 μm long, and with 2 setae on lateral margin and usually with another small fine seta just below the apex of each plate; supporting bars narrow but each extending anteriorly past anterior margin of anal plates. Anal ring with 3-4 pairs of setae; anal tube about 1.5-2 \times length of anal plates.

Margin: marginal setae spinose, of three types: (i) large, sharply-pointed, lanceolate spines, each with small dimples and/or spinules on surface of distal half and about 10-20 μm long; (ii) rounded, bulbous spines, each with small dimples and/or spinules on surface of distal half and about 8-14 μm long, and (iii) long setose setae, each about 15-30 μm long; distributed as follows: around head between eyespots: 0 lanceolate spines, 8-17 bulbous spines and 6-9 setose setae; on each side between eyespot and anterior stigmatic area: 0 lanceolate spines, 6-20 bulbous spines and 2 setose setae; laterally between stigmatic areas: 0 lanceolate spines, 7-24 bulbous spines and 1 setose seta; between posterior stigmatic area and anal cleft: 14-15 lanceolate spines (only along posterior margin), 11-48 bulbous spines (only along anterior margin) and 7-8 setose setae; along dorsal margin of anal cleft: 1-4 lanceolate spine and 0 setose setae. Stigmatic clefts present, each

shallow; stigmatic spines undifferentiated from marginal spines. Eyespots marginal, each about 7-10 μm wide.

Venter: derm membranous. Pregenital disc pores absent (a single pore was noted on one specimen). Spiracular disc-pores each with mainly 4-5 loculi, in narrow bands between each spiracle and margin, with 10-19 in each anterior band and 8-23 in each posterior band; with 1-3 extending medially past peritreme on each anterior spiracle. Ventral microducts in a sparse submarginal band and with a few medially on head near labium. Preantennal pores absent. Ventral tubular ducts absent. Ventral setae: anal lobe setae not differentiated from submarginal setae; with pair of long setae on abdominal segments V-VII, those on VII each 58-85 μm long; other setae medially on abdominal segments: VII: 5-10; VI: 3-7; V: 3-9; IV: 3-6; III: 3-7; II: 2-4, also with 1 or 2 pairs mediolaterally in each segment; with 1-3 setae near each metacoxa and mesocoxa and 0-3 near each procoxa; with 2 pairs of interantennal setae, longest about 30 μm ; with 5 small submarginal setae laterally between stigmatic areas; with 2 hypopygial setae. Antennae each 6-segmented, about 142-180 μm long; setal distribution: scape 3, pedicel 2, segment III 3, IV 1 fleshy seta only, V 1 fleshy seta + 1 setose seta, and VI with 3 fleshy setae and 5 setose/spinose setae; apical seta 31-43 μm long, long lateral flagellate seta each 33-60 μm long. Clypeolabral shield about 100-150 μm long; labium with 4 setae. Spiracles small, each peritreme 18-28 μm wide. Legs well developed; lengths of metathoracic legs (μm): coxa 56-86; trochanter + femur 68-116; tibia + tarsus 66-139; claw 17-19; tibia-tarsus with good segmentation (Cozumel material) or with segmentation poor or absent; setae: coxa with 5-6 setae, longest 30-56 μm ; trochanter with 2 setae, longest 35-42 μm ; femur with 2 setae; tibia with 1-2 and tarsus with 3-4 setae; tarsal digitules similar and much longer than claw; claw digitules dissimilar, one narrower than other and subequal in length to tarsal digitules; claw with a distinct denticle.

Comment: as on the adult female, there is great variation. The lengths of the antennae and (particularly) the legs are highly variable, the material from Veracruz, Mexico, being much smaller than the rest, particularly that from Guatemala, intercepted at Hoboken. In addition, the Cozumel material has clear dorsal setae but dorsal setae are equally clearly absent from the other four lots of material of 2nd-instar females. It is just possible that the single Cozumel specimen represents a 3rd-instar but this is thought unlikely as all the measurements fall within that of the other material. This wide variation might indicate that some of the material included under *P. americana* may be a different spe-

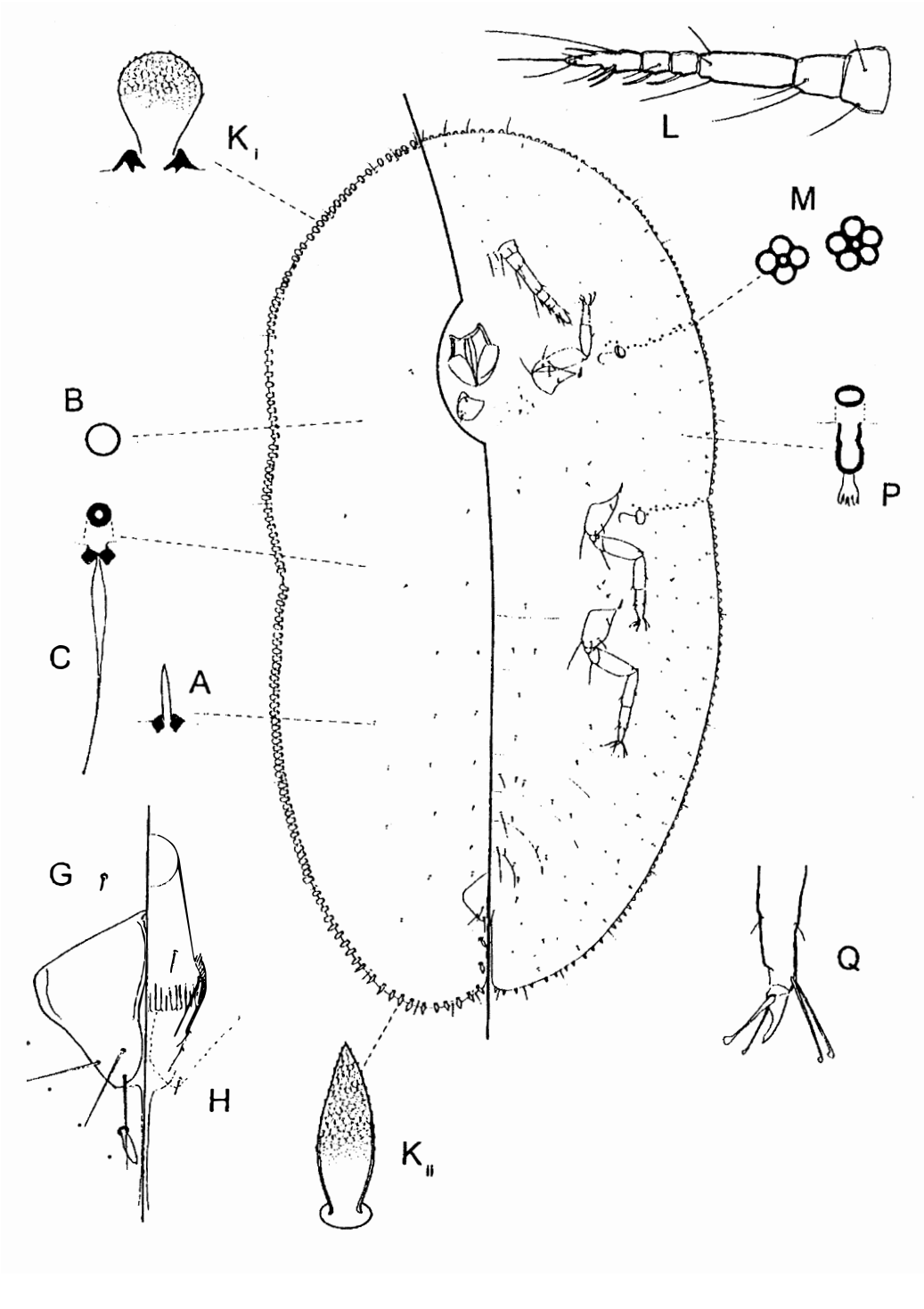


Fig. 5. *Prionococcus americanus* sp. n., 2nd-instar female nymph from Cozumel, Mexico. Note that this form has dorsal setae; all 2nd-instar nymphs collected from other localities were apparently similar but lacked dorsal setae. Labels as in Fig. 1.

cies but, as no constant differences were found in the adult females, all of this material is here assumed to represent a single species.

Second-instar male (Fig. 6)

Described from 7 specimens, mostly in fair to good condition.

Unmounted material: unmounted material with a glassy, translucent test, divided by sutures into 'plates', with an anterior plate, two posterior plates (one on either side of anal cleft), two lateral plates and a median plate dorsally.

Mounted material: elongate oval, symmetrical, rounded at both ends; 875-1525 μm long, 475-800 μm wide, anal cleft about 1/14th body length.

Dorsum: derm entirely membranous. Dorsal setae limited to 0-3 pairs of minute setae (each 1-4 μm long) just anterolaterally to anal plates. Dorsal pores of two types, both sparse throughout: (i) small microductules, with an elongate thin inner ductule, and (ii) simple pores, 1.5-3 times larger than microductules. Preopercular pores absent. Dorsal tubular ducts of two sizes present: (i) larger ducts, about 45-50 μm long with a fairly thick inner ductule: forming a submarginal band, as follows – with 7-10 between eyespots anteriorly; 4-6 between each eyespot and anterior stigmatic area; 3-5 laterally between stigmatic areas, and 2-7 just posterior to each posterior stigmatic area; none along posterior 1/3rd of abdominal margin; and (ii) a much smaller duct, almost half as long as marginal ducts, each 30 μm long, also with a broad inner ductule: present in two submedial lines running from about prothorax posteriorly to just anterior to each anal plate; with 10-14 in each line; and with 3 pairs of radial lines, one anteriorly to near each eyespot, one to each posterior stigmatic area and another pair on about abdominal segment V; each radial line with 3-6 ducts. Anal plates together approximately quadrate, 69-80 μm long, 80-95 μm wide; each plate with a seta dorsally near inner margin, 17-30 μm long; an apical seta, 20-35 μm long and a seta on posterior margin, 20-28 μm long. Anogenital fold with a pair of setae laterally on anterior margin, each 18-33 μm long, and with a single seta on lateral margin and usually with another small fine seta just below the apex of each plate; supporting bars narrow but each extending anteriorly past anterior margin of anal plates. Anal ring with 3 pairs of setae; anal tube about 1.5-2 \times length of anal plates.

Margin: marginal setae spinose, of three types: (i) large, sharply-pointed, lanceolate spines, each with small dimples and/or spinules on surface of distal half and each about 20 μm long; (ii) rounded, bulbous spines, each with small dimples and/or spinules on surface of distal half and

about 10 μm long, and (iii) long setose setae, each about 15-19 μm long; distributed as follows: around head between eyespots: 0 lanceolate spines, 6-12 bulbous spines and 6-7 setose setae; and on each side between eyespot and anterior stigmatic area: 0 lanceolate spines, 5-8 bulbous spines and 2 setose setae; laterally between stigmatic areas: 0 lanceolate spines, 3-9 bulbous spines and 1 setose seta; between posterior stigmatic area and anal cleft: 6-11 lanceolate spines (only along posterior margin), 15-26 bulbous spines (only along anterior margin) and 7-8 setose setae; along dorsal margin of anal cleft: 1-3 lanceolate spines and 0 or 1 setose setae. Stigmatic clefts present, each shallow; stigmatic spines absent from dorsad to each stigmatic cleft. Eyespots marginal, each about 7-10 μm wide.

Venter: derm membranous. Pregenital disc pores absent. Spiracular disc-pores mainly with 4-5 loculi, in narrow bands between each spiracle and margin, with 5-10 in each anterior band and 5-9 in each posterior band; with 1-3 extending medially past peritreme on each anterior spiracle. Ventral microducts in a sparse submarginal band and with a few medially on head. Preantennal pores absent. Ventral tubular ducts absent. Ventral setae: anal lobe setae not differentiated from submarginal setae; with a pair of long setae (each 33-50 μm long) medially on abdominal segment VII plus a pair of short setae and a pair laterad to anogenital fold; segments VI and V (and rarely IV) each with a pair of short setae medially and 1-2 pairs mediolaterally; segments II-IV without setae medially but each with a pair mediolaterally; with a single seta near each metacoxa and mesocoxa but none near either procoxa; with 2 pairs of interantennal setae, longest about 28-45 μm long; with 2 (rarely 1) small submarginal setae laterally between stigmatic areas; without hypopygeal setae. Antennae each 6-segmented, about 96-145 μm long; setal distribution: scape: 3, pedicel: 2, segment III: 3, IV: 1 fleshy seta only, V: 1 fleshy seta + 1 setose seta, and VI: with 3 fleshy setae and 5 setose/spinose setae; apical seta 23-40 μm long, long lateral flagellate seta each 25-50 μm long. Clypeolabral shield about 91-120 μm long; labium with 4 setae. Spiracles small, each peritreme 13-19 μm wide. Legs well developed; tibia-tarsus segmentation variable; lengths of metathoracic legs (μm): coxa 44-63; trochanter + femur 51-90; tibia + tarsus 63-105; claw 13-15; setae: coxa with 5 setae, longest 30-45 μm ; trochanter with 2 setae, longest 17-35 μm ; femur with 2 setae; tibia with 1-2 and tarsus with 3-4 setae; tarsal digitules similar and much longer than claw; claw digitules dissimilar, one narrower than other and subequal in length to tarsal digitules; claw with a distinct denticle.

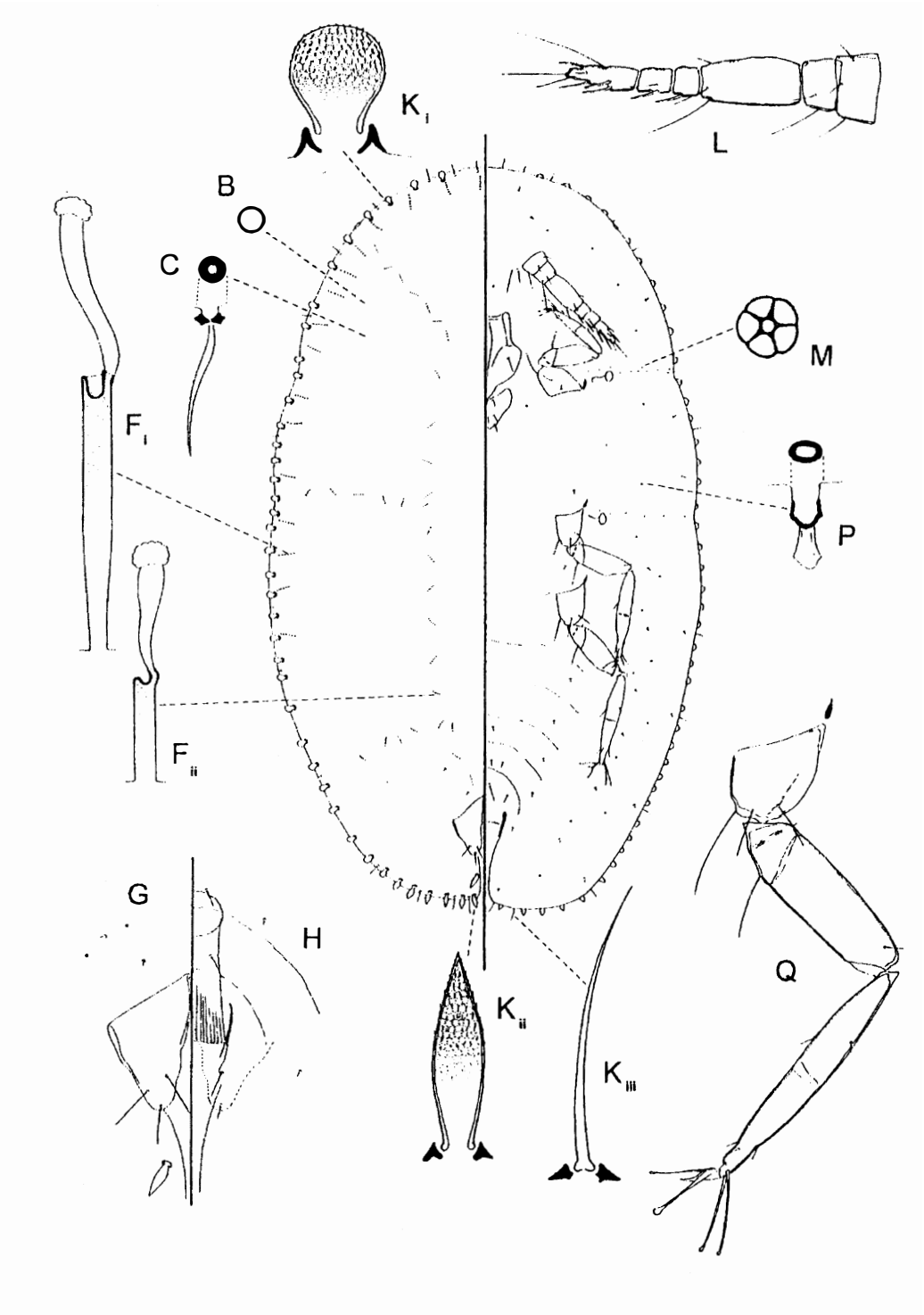


Fig. 6. *Prionococcus americanus* sp. n., 2nd-instar male nymph from Cozumel, Mexico. Labels as in Fig. 1, except F = dorsal tubular ducts (i: ducts around margin; ii: ducts medially on dorsum).

Comment: this is a typical 2nd-instar male nymph. As with the 2nd-instar female, the material of the 2nd-instar male shows much variation in the lengths of parts of the legs, with that from Cozumel having significantly longer legs (but not antennae) than the rest of the material. No other differences could be detected. The smaller dorsal tubular ducts secrete the sutures in the glassy test which will, therefore, have the same arrangement. The larger marginal tubular ducts secrete wax which sticks the test to the host plant while the male develops inside.

The shape and structure of the marginal setae should separate this second-instar male from all other known second-instar males.

Pupa (Fig. 7).

Described from one specimen in excellent condition, but parts of some legs missing.

Unmounted material: not seen.

Mounted material: elongate oval, rather pointed at head end; length 1338 µm, width at base of antennae 412 µm. Division into head, thorax and abdomen clear (Fig. 7), although segmentation obscure apart from on abdomen. Derm membranous, with reticulations and small dermal spinules. All ducts and pores, except spiracular disc-pores, absent and setae few.

Head. Lacking mouthparts and simple eyes. Setae: with 1 pair of minute setae medially on dorsal surface, none on anterior ventral surface, and with 2 medially just posterior to each scape. With a pair of moderately long antennae pointing posteriorly, each 597 µm, reaching mesocoxae (ratio of antennal length to total body length 1:2.24); segmentation obscure but with 10 segments; with 1 short fleshy finger on apex, probably incipient capitate seta; basal segments moderately sclerotised.

Thorax: mildly sclerotised, segmentation obscure. Setae: dorsal: with a single pair small setae medially on mesothorax; ventral: with 2 small setae just posterior to each mesocoxa. Spiracles: width of peritremes: 25-28 µm; with 2 or 3 spiracular disc-pores associated with each anterior spiracle and 3-7 with each posterior spiracle; number of loculi in each disc-pore 2-7. With three pairs of moderately well-developed legs, segmentation clear; all segments showing some sclerotisation; prothoracic legs C-shaped, directed anteriorly and curving round in front of anterior margin of head; metathoracic legs extending posteriorly to about VIIIth abdominal segment; coxae with 1-2 minute setae or pores; tarsal campaniform pores absent; each tibia with a small conical structure on distal ventral margin, possibly an incipient spur, and each tarsus with a small triangular finger on apex, probably

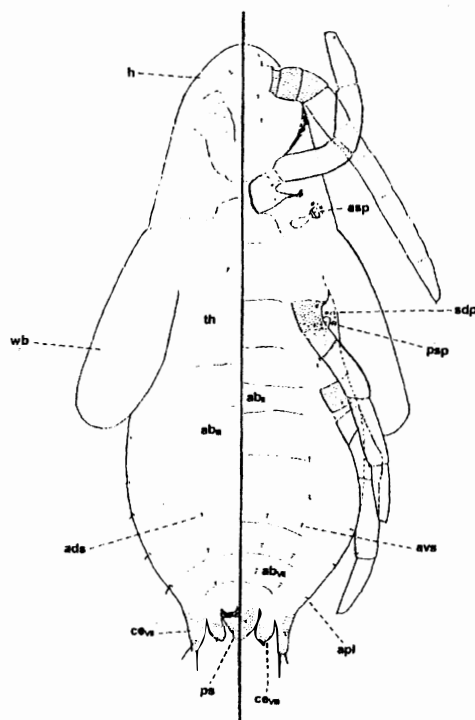


Fig. 7. *Prionococcus americanus* sp. n., pupa. Where abII = abdominal segment II, abIII = segment III; abVII = segment VII; ads = dorsal abdominal setae; apl = abdominal pleural setae; asp = anterior spiracle; avs = ventral abdominal setae; ceVII = caudal extension of abdominal segment VII; ceVIII = extension of segment VIII; h = head; ps = penial sheath; psp = posterior spiracle; sdp = spiracular disc-pores; wb = wingbud.

an incipient claw; length of metathoracic legs 546 µm. With a pair of long wing-buds on either side, each 412-432 µm long and 146-160 µm wide; extending posteriorly to about abdominal segment III, mildly sclerotised; ratio of length to width 1:0.36.

Abdomen: segments I-VII: segmentation usually distinct, anterior-most segment considered to represent segment II on venter, so that there are seven visible segments (segments II to VIII) anterior to penial sheath. Segment VII with a long pair of lateral sclerotised lobes, significantly longer than length of penial sheath. Setae: with pairs of small dorsal abdominal setae medially on segments V to VII; with pairs of small ventral abdominal setae on segments III & IV, 2 pairs on V-VII; dorsopleural setae on each side: 2 long setae on caudal extension of VII, 1 long seta on VI, 1 short seta on V-III; ventropleural setae: with 1 longer seta on apex and 1 short setae ventrally on caudal extension of VII, and 1 short setae on

segments VI-III. *Segment VIII-IX*: with a pair of well-developed, sclerotised lobes, subequal in length to penial sheath, located on either side of base of penial sheath; each with 1 or 2 smallish setae near apex. Ante-anal setae absent. Penial sheath sclerotised, subequal in length to caudal extensions of segment VIII, length 70 μm , width at base 83 μm (ratio of length to breadth usually between 1:1.18), without obvious minute setae or pores on dorsal surface.

Comment: of the pupae known to the authors, this is unusual for several reasons: (i) large size (most are around 1 mm long); (ii) presence of spiracular disc-pores associated with both pairs of spiracles (more usually associated with just posterior spiracles); (iii) caudal extension of abdominal segment VII longer than penial sheath (usually shorter); and (iv) caudal extension of

segment VIII subequal in length to penial sheath (usually small and inconspicuous, even absent). This last character is otherwise only known on *Pounamococcus* species (Hodgson & Henderson, 1998).

Etymology: the specific name of this species (*americanus*) refers to its apparent widespread distribution in Central America.

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Received 26 December 2001