

Mealybugs of the genera *Planococcus* and *Crisiccoccus* (Sternorrhyncha: Pseudococcidae) of Russia and adjacent countries

Мучнистые червецы родов *Planococcus* и *Crisiccoccus* (Sternorrhyncha: Pseudococcidae) фауны России и сопредельных стран

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A key for four species of the genus *Planococcus* Ferris, 1950 is given; three species inhabit the territory of Russia and adjacent countries and the fourth one, *P. citri* (Risso, 1813), was erroneously recorded from the territory of the former USSR, because of the confusion of this species with *P. ficus* (Signoret, 1875) during identification. All discussed species are morphologically described and illustrated. *Planococcus taigae* Danzig, 1980 and *P. juniperus* Tang, 1988 are placed in synonymy under *Planococcus vovae* Nasonov, 1908. The genus *Crisiccoccus* Ferris, 1950, which is morphologically similar to *Planococcus*, is also discussed and reported for the territory of Russia for the first time with the species *C. pini* (Kuwana, 1902).

В статье приводится определительная таблица для 4 видов рода *Planococcus* Ferris, 1950; 3 из них обитают на рассматриваемой территории, четвертый, *P. citri* (Risso, 1813), ранее указывался ошибочно в связи со сложностью его дифференциации от *P. ficus* (Signoret, 1875). Для всех обсуждаемых видов даны рисунки и описания. *Planococcus taigae* Danzig, 1980 и *P. juniperus* Tang, 1988 помещаются в синонимы *Planococcus vovae* Nasonov, 1908. Рассмотрен также ближайший к *Planococcus* род *Crisiccoccus* Ferris, 1950, представленный в России единственным видом *C. pini*, который впервые указывается для рассматриваемой фауны.

Key words: scale insects, Pseudococcidae, *Planococcus*, morphology, taxonomy, new synonyms

Ключевые слова: кокциды, Pseudococcidae, *Planococcus*, морфология, таксономия, новые синонимы

TAXONOMIC PART

Order STERNORRHYNCHA

Family PSEUDOCOCCIDAE

Planococcus Ferris, 1950

Planococcus Ferris, 1950: 164.

Planococcus: Ezzat & McConnell, 1956: 60; McKenzie, 1967: 280; Danzig, 1980: 168; Cox, 1989: 1–78.

Allococcus Ezzat & McConnell, 1956: 13 (type species *Pseudococcus inamabilis* Hambleton, 1935, by original designation).

Allococcus: Cox & Ben-Dov, 1986 (= *Planococcus*).

Type species: *Pseudococcus citri* Risso, 1813, by original designation.

Diagnosis of the genus. Adult female. Body oval. Anal lobes with characteristic anal lobe bars. Antennae 8-segmented. Legs well developed; coxae, tibiae and sometimes

femora of hind legs with translucent pores. Circulus usually present. Spiracles well developed. Multilocular pores numerous on ventral parts of abdominal segments; sometimes single pores present on ventral parts of thorax and head and also on dorsum. Tubular ducts present on both body sides; usually dorsal ducts larger and sometimes with collars. Cerarii usually totaling 18 pairs; sometimes thoracic cerarii absent, but C_3 always well developed. All cerarii with two conical setae (sometimes cerarii on head with 3 conical setae); additional flagellate setae present in C_{18} only. C_{18} are situated on sclerotized plates.

The genus comprises about 40 species, mainly tropical and subtropical in distribution. Only *P. vovae* (Nasonov, 1908) and *P. matesovae* Danzig, 1986 inhabit the boreal zone. Many species of the genus are important pests of agricultural and ornamental plants; in the fauna of Russia and neighboring countries *P. ficus* (Signoret, 1875) is the only economically important species of the genus.

Most species of the genus *Planococcus* are very similar morphologically and, at the same time, demonstrate significant variability.

***Planococcus ficus* (Signoret, 1875)**
(Fig. 1)

Dactylopius ficus Signoret, 1875: 315 (France).

Planococcus ficus: Ezzat, McConnell, 1956: 79; Danzig, 1977: 99; Cox, Ben-Dov, 1986: 483; Cox, 1989: 25; Williams, Moghaddam, 2000: 34.

Coccus vitis (non Linnaeus) Nedzelskii, 1869: 19 (misidentification).

Pseudococcus citri auct. (non Risso, 1813): Borchsenius, 1949: 131; Ter-Grigorian, 1973: 82; De Lotto, 1975: 125; Tereznikova, 1975: 226; Khadzibeili, 1983: 67.

Material. Thirty slides from greenhouses of the Main Botanical Garden, Moscow. More than 100 slides from Spain, France, Ukraine (Crimea), Abkhazia, Georgia, Armenia, Azerbaijan, Turkey, Turkmenistan, Uzbekistan, Egypt, Israel, Iraq, Afghanistan, India, Vietnam, USA.

Description. Adult female. Translucent pores present on hind coxae and sometimes

on hind femora. Multilocular pores present on last 5 abdominal segments; sometimes single pores present also on thorax. Single dorsal tubular ducts present near each cerarii; ventral tubular ducts form transverse rows in the middle part of abdomen and groups along abdominal margin; single ducts present in middle part of thorax; sometimes 1–5 ducts present on head and near first thoracic cerarii. Eighteen pairs of cerarii present; setae of head cerarii with flagellate apex.

Remarks. The two sympatric species, *P. ficus* and *P. citri* are very similar to each other morphologically and ecologically. Some authors (Borchsenius, 1949; Ferris, 1950; McKenzie, 1967; Ter-Grigorian, 1973; De Lotto, 1975; Terznikova, 1975; Khadzibeili, 1983) regarded these as a single species. In recent coccidological papers *P. ficus* and *P. citri* are considered as separated species. During the study of material from the territory of former USSR we verified that only *P. ficus* inhabit the discussed territory. The record of Danzig (1977) of *P. citri* in Abkhazia (Sukhum) on *Vitis* sp., *Ficus carica* and *Punica granatum* was based on the presence of two groups of tubular ducts (with 2–8 ducts in each group) on head of some studied individuals. However, the other individuals from the same populations did not have such groups. So, this character varies between specimens. Cerarian setae of all analyzed females from Abkhazia are thin and with flagellate setae. Also, three females with similar morphological characters were found by us in material collected by E.F. Kozarzevskaya in greenhouses of the Main Botanical Garden on Euphorbia and Coleus.

Differential characters between *P. ficus* and *P. citri* are noted in the Key (see below). Both of these species probably originated from Mediterranean region and spread to other regions through the time with the cultivation of grapes and Citrus. Now both species are distributed everywhere in tropical and subtropical regions and in greenhouses. It seems that both species have the same hymenopteran parasitoids, but, for example, in

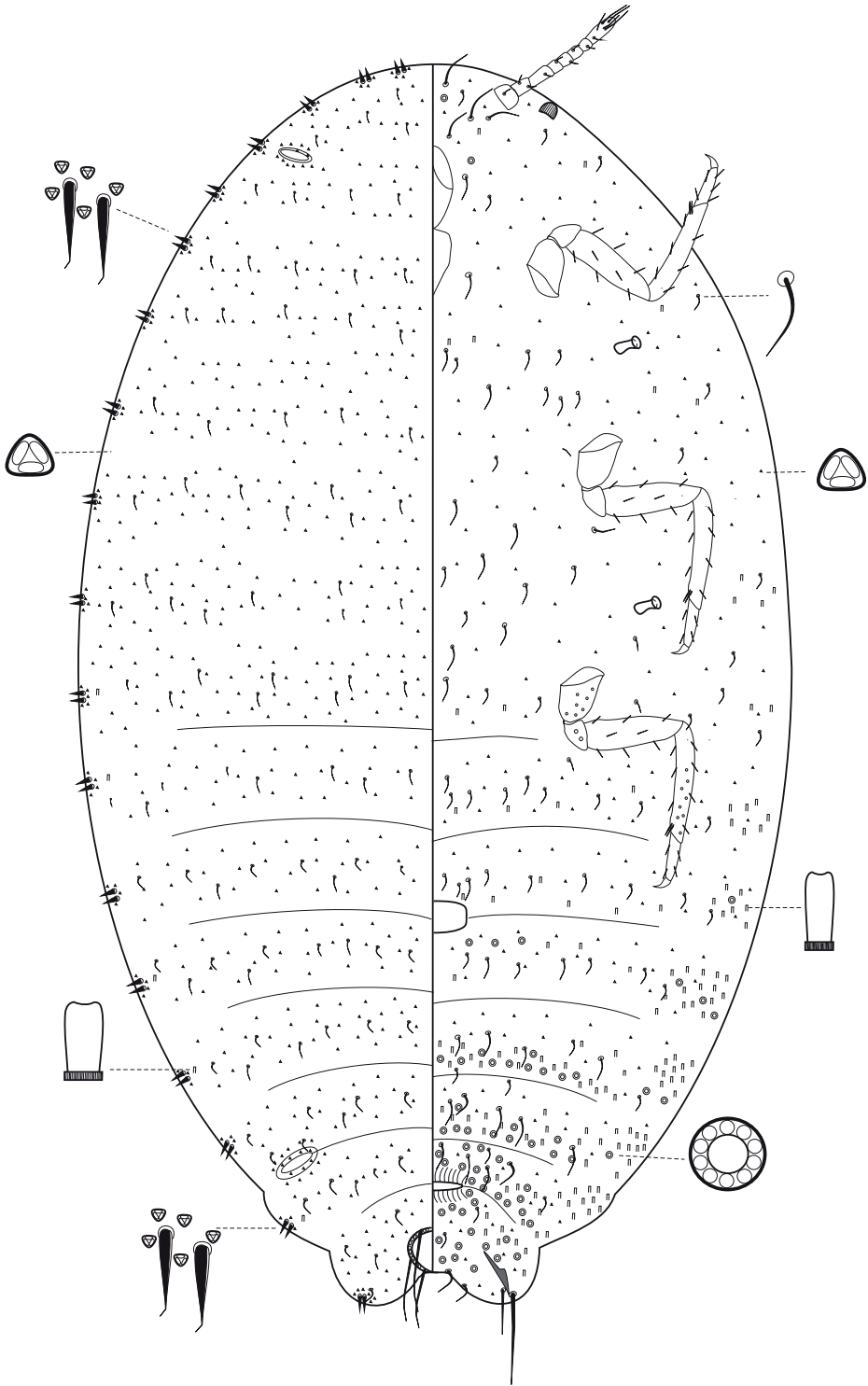


Fig. 1. *Planococcus ficus*, Uzbekistan, from *Morus*.

Israel some *P. ficus* parasitoids were never noted on *P. citri* (Noyes & Hayat, 1994). Serological methods also do not show any differences; and moreover, crossings between *P. ficus* and *P. citri* are possible (Tremblay et al., 1980; Tranfaglia & Tremblay, 1982).

Experiments in which *P. ficus* is grown under different temperatures showed that the translucent pores of the hind femora (a taxonomically important character) were present in high temperature and absent in low temperature (Cox, 1989).

Distribution. Russia (greenhouses of the Main Botanical Garden, Moscow); Ukraine (the Crimea), Transcaucasia, Middle Asia, Mediterranean region, the Near East; introduced in India, Pakistan, Vietnam, Argentine, Brazil, USA (California), South Africa.

Mode of life. Polyphagous; inhabit overground parts of numerous wild, agricultural and ornamental plants; most common on *Vitis*, *Ficus*, *Punica granatum*, *Platanus*, and *Morus*. In the Crimea and Caucasus the species has three generations per year (Umnov, 1940; Khadzibeili, 1985).

Planococcus citri (Risso, 1813)
(Fig. 2)

Dorthezia citri Risso, 1813: 416.
Synonymy: see Ben-Dov, 1994: 355.

Material. Series of females from Iran, India, China, Vietnam.

Remarks. The description of Borchsenius (1949) includes mixed characters of *P. citi* and *P. ficus*. Detailed descriptions of *P. citri*, its differences from similar species and experimental data on interspecific variability are given in the papers by Cox (1981, 1983, 1989).

Distribution. Polyphagous. Widely distributed in the tropics and subtropics and in greenhouses in the entire world; a serious pest of Citrus.

Planococcus vovae (Nasonov, 1908)
(Fig. 3)

Coccus gossipifera Rondani, 1874: 43, nomen oblitum.

Pseudococcus (Dactylopius) vovae Nasonov, 1908: 484 (Poland).

Pseudococcus vovae: Borchsenius, 1949: 134.

Pseudococcus junipericola Borchsenius, 1949: 116 (Tajikistan).

Pseudococcus junipericola: Danzig, 1986: 18 (synonymy, lectotype designation).

Pseudococcus inamabilis Hambleton, 1935: 112 (Brasil).

Allococcus inamabilis (Hambleton, 1935): Ez-zat & McConell, 1956: 15; Danzig, 1986: 18 (synonymy); Roberti, Tranfaglia, 1981: 305.

Planococcus taigae Danzig, 1980: 168 (*P. vovae*, partly); 1986: 19 (Russia), **new synonym**.
Planococcus taigae: Cox, 1989: 68.

Planococcus juniperus Tang in Tang & Li, 1988: 42 (China, Inner Mongolia), **new synonym**.

Planococcus juniperus: Tang, 1992: 352.

Material. Russia (Leningrad Prov., Karelia, North Caucasus, Siberia, South of Primorsk Territory, South Sakhalin, Kuril Islands (Shikotan); Ukraine (Crimea and Odessa Prov.), Armenia, mountains of Middle Asia (including the type series of *P. junipericola*), Spain, France, Czech Republic, Poland; in general 64 slides.

Description. Adult female. Circulus present (sometimes absent in insects from the mountains of Middle Asia). Multilocular pores located on last five abdominal segments. Number of dorsal tubular ducts varies geographically (see Remarks); sometimes some tubular ducts appearing to be of the oral rim type. Ventral tubular ducts numerous on all segments; form groups along body margin; marginal ducts a little bit larger than median ones. Cerarii 18 pairs in number; sometimes 1 or 2 pairs of thoracic cerarii absent. Cerarian setae (excluding C_{18}) in females from Spain, France, Georgia and Crimea, collected from Cupressus and Juniperus are thin, long, flagellate or even hair-like. In the eastern part of their distribution, insects have conical, comparatively short cerarian setae, but the cerarian setae on the head can be thinner and longer than the thoracic and abdominal ones.

Remarks. *Planococcus taigae* differs from *P. vovae* in the large number of dorsal tubular ducts and in having thicker cerarian setae. However, the first character varies geographically: insects from the Mediter-

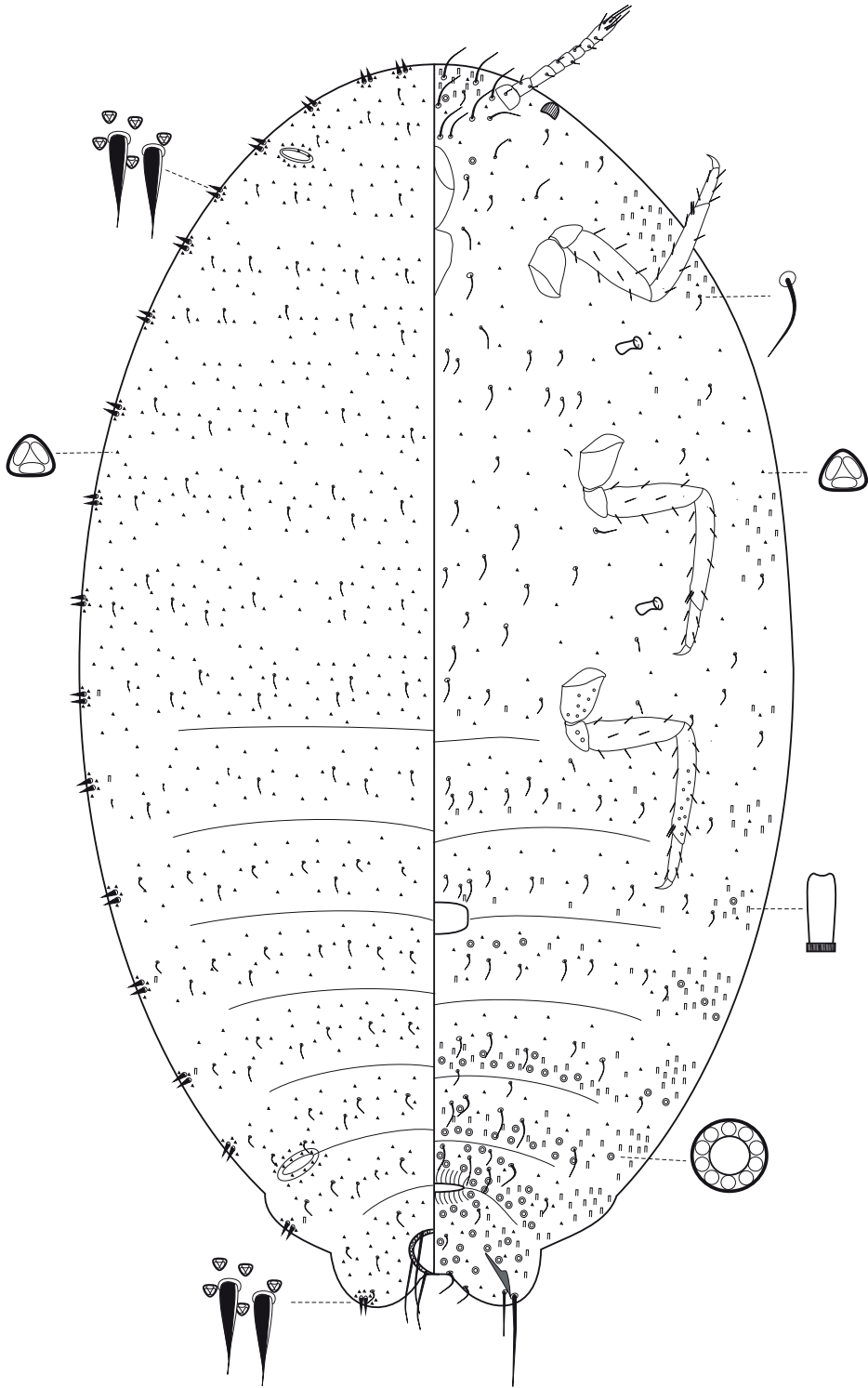


Fig. 2. *Planococcus citri*, quarantine material of Main Botanical Garden, Moscow.

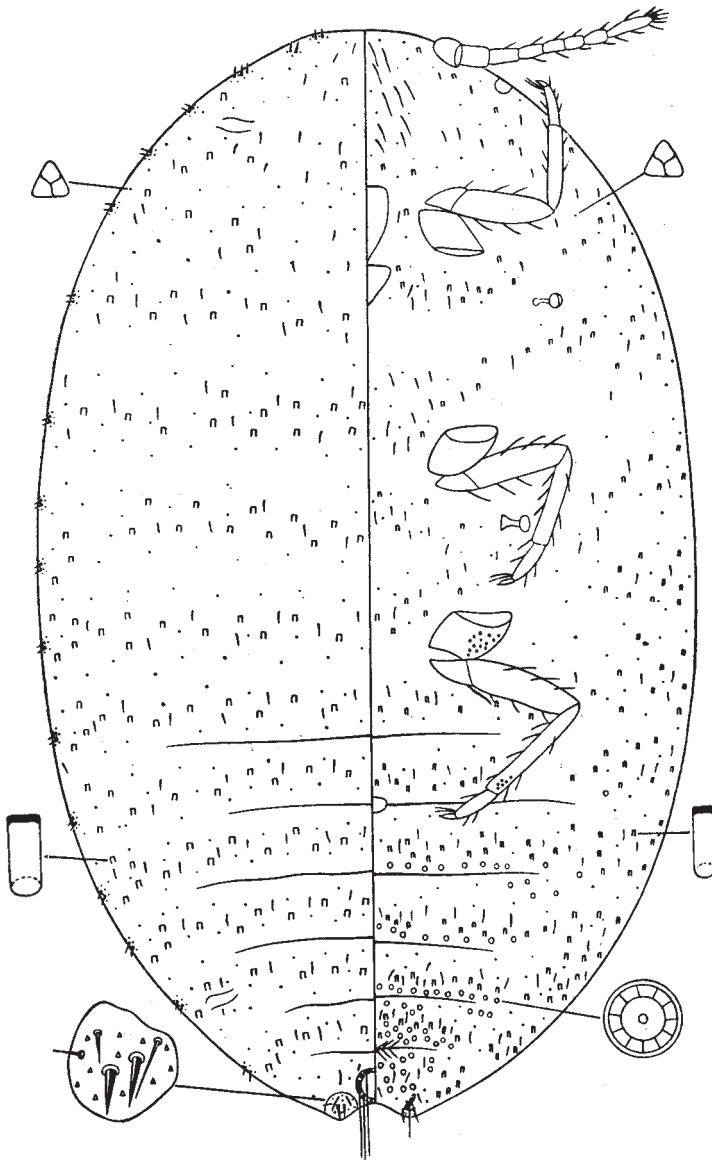


Fig. 3. *Planococcus vovae*, holotype of *P. taigae*, after Danzig (1980).

ranean region have a small number of ducts in the last abdominal segments; insects from central Europe have much more ducts which form transverse rows on the entire body (Cox, 1989; Williams & Moghaddam, 2000; Marotta, 1990); insects from North-West Russia, Siberia and Far East (types of *P. taigae*) have the greatest number of these ducts. As for the thickness of cerarian setae, this character varies amongst specimens in

the Eastern part of the area; in general, insect populations from the Russian Far East have thicker setae and numerous ventral tubular ducts along the body margin.

Borchsenius (1949) separated *P. junipericola* from *P. vovae* by the presence of a large circulus in the former one. We have revealed that this character varies between individuals; insects without a circulus are very rare and were collected in the mountains of

Middle Asia only. Females from Eastern Turkey have even up to 2 circuli (B. Kaydan's material). The number of multilocular pores along the ventral abdominal margin is also a variable character; these pores are usually absent or rare, but specimens from Iran have many of these pores (Williams & Moghaddam, 2000).

The figure of *P. juniperus* drawn by Tang & Li (1988), shows no differences with *P. vovae* (= *P. taigae*) collected from the same species of *Juniperus*.

Mode of life. Oligophagous, on Cupressaceae; inhabit branches and needles; sometimes causing damage. Oviposition in July–August.

Distribution. *Planococcus vovae* is a widely distributed Palaearctic species, present in Russia, from Western to Eastern borders, Transcaucasia, mountains of Middle Asia, Europe, the Middle East, Turkey, Iran; introduced in Brazil and Argentina.

***Planococcus matesovae* Danzig, 1986**
(Fig. 4)

Planococcus matesovae Danzig, 1986: 21 (Kazakhstan: Kalbinskii mountain ridge).

Crisicoccus matesovae: Cox, 1989: 70.

Material. Types and series of females from Zailiiskii Alatau (Kazakhstan).

Description. Adult female. Multilocular pores on venter present on last five posterior abdominal segments; single pores present on IV–VII abdominal segments. Dorsal tubular ducts of two sizes, forming transverse bands on all segments, excluding last abdominal segment. Number of larger ducts decreases towards anterior part of body; some ducts appearing to be of the oral rim type. Ventral tubular ducts numerous on all segments; forming groups along body margin; marginal ducts slightly larger than median ones. Number of cerarii varies geographically: insects collected from the Kalbinskii range have 5–10 pairs (thoracic and anterior abdominal cerarii absent); insects from Zailiiskii Alatau have 18 pairs of cerarii. Cerarian setae thin, flagellate, excluding C_{18} which has more conical setae.

Remarks. The species is similar to *P. vovae*, but differs in having more numerous tubular ducts that are of two sizes and in the presence of multilocular pores on dorsum.

Distribution. Kazakhstan: Kalbinskii and Zailiiskii mountain ranges.

Mode of life. The species was collected from *Juniperus sabina* in June, on steppe rocks.

***Crisicoccus* Ferris, 1950**

Crisicoccus Ferris, 1950: 45.

Crisicoccus: Ezzat, McConnell, 1956: 22; Williams, 1985: 94, 2004: 129; Williams & Watson, 1988: 41; Tang, 1992: 347.

Type species *Dactylopius pini* Kuwana, 1902, by original designation and monotypy.

Remarks. The genus *Crisicoccus* was described by Ferris (1950) in the same monograph with *Planococcus* during a revision of the American fauna and included a single species *C. pini*, introduced from Asia. Ferris (1950) also noted that *C. pini* could be probably transferred to the genus *Planococcus*. Other authors also noted the close similarity of both discussed genera, in particular, the presence of anal lobe bars. The main differences between *Planococcus* and *Crisicoccus* is a smaller number of cerarii, in particular the absence of C_3 in *Crisicoccus*, which is well developed in *Planococcus* (Williams, 2004). Currently, *Crisicoccus* comprises about 30 species, mainly from Asia and the Australasian region, but their relationship with the type species is not obvious.

***Crisicoccus pini* (Kuwana, 1902)**
(Fig. 5)

Dactylopius pini Kuwana, 1902: 54 (Japan);

Crisicoccus pini: Ferris, 1950: 46; Ezzat & McConnell, 1956: 29; McKenzie, 1967: 127.

Material. One series of females from Khasan region of Primorsk Terr. (Russia) and one else series from China (Tsindao).

Description. Adult female. Circulus absent. Multilocular pores located in middle areas of the last five ventral abdominal

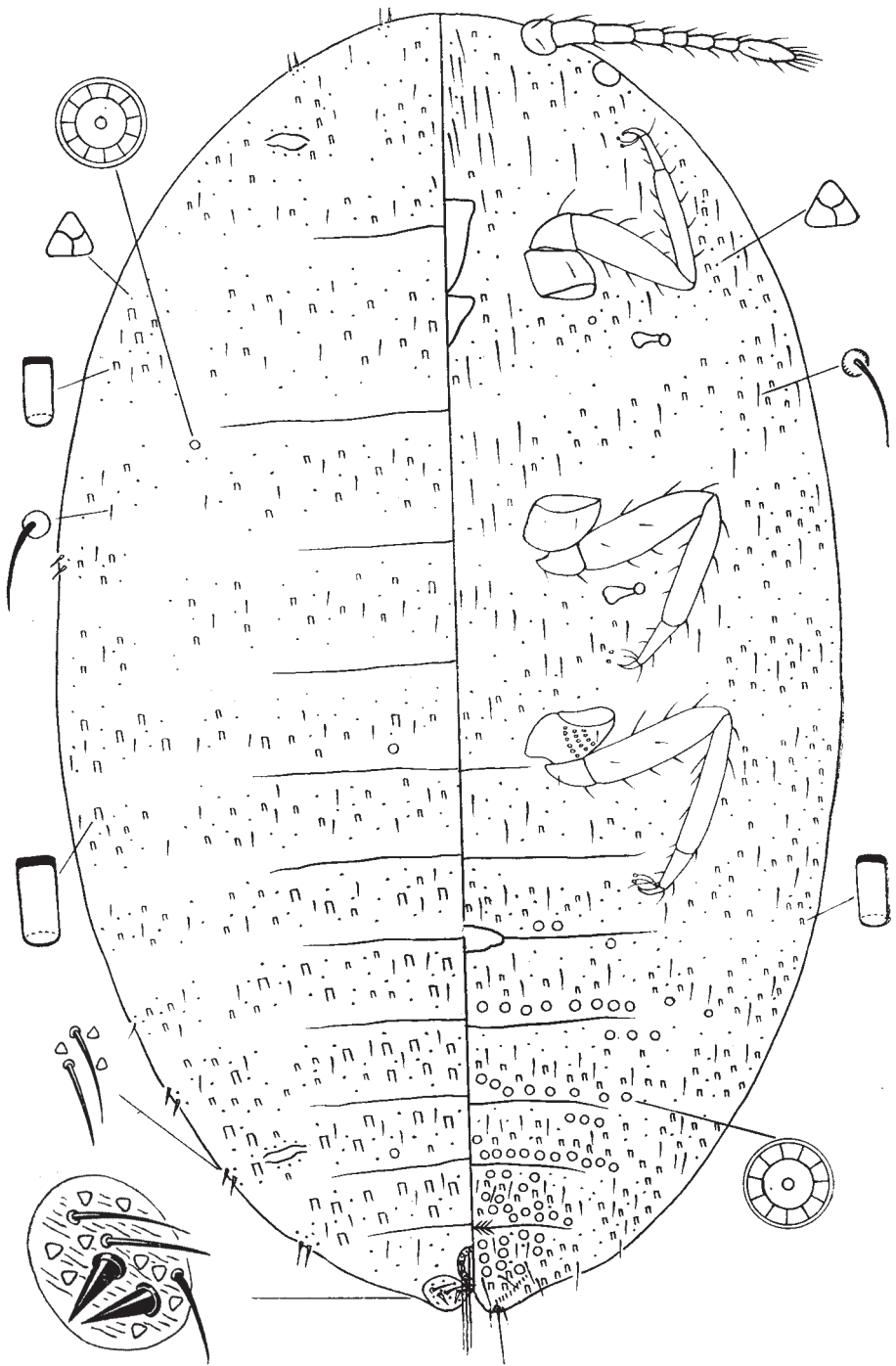


Fig. 4. *Planococcus matesovae*, after Danzig (1986).

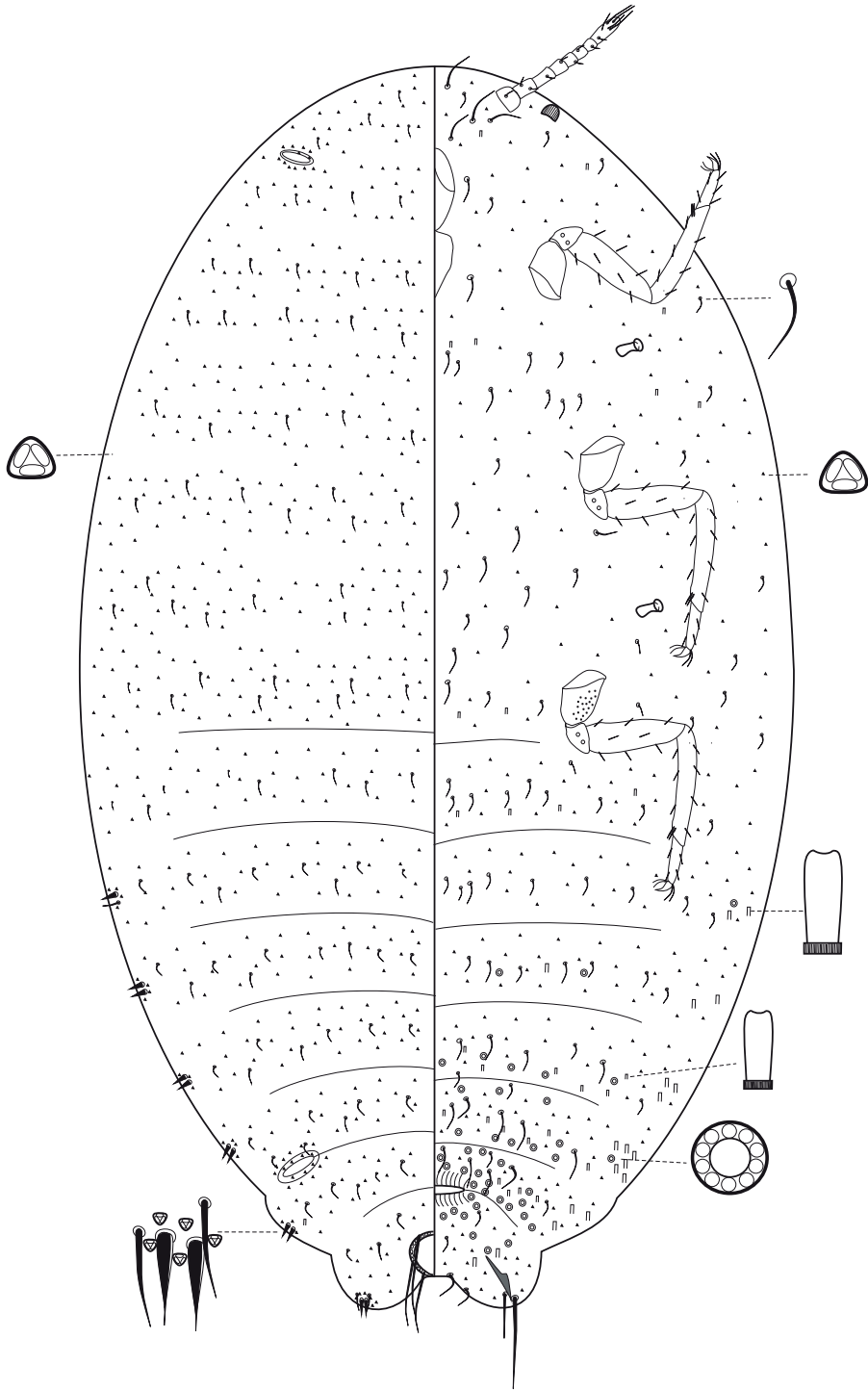


Fig. 5. *Crisicoccus pini*, Primorsk Territory.

segments. Tubular ducts present on venter of abdomen only; these ducts of two sizes: larger ones form groups along body margin, excluding 8-th abdominal segment, where they are located in the middle area of the segment; smaller ones located in middle areas of posterior ventral abdominal segments. Cerarii 6–7 pairs in number; cerarian setae conical, rather thin. C_{18} with two additional setae and a group of trilocular pores. Body covered by long thickened hairs.

Remarks. The notable character of the species is the absence of a circulus.

Distribution. Russia: Primorsk Terr. Korea, China (including Tibet), Japan; introduced to California (USA).

Mode of life. The species inhabit the needles of different *Pinus* species. In Primorsk territory young females were collected from *Pinus funebris* in mid June. In California, it is known to cause damage to ornamental pine-trees.

Key to species of the genus *Planococcus*

- 1(4). Dorsal tubular ducts, if present, located near cerarii only; sometimes 1 or 2 ducts present in middle part of abdomen. Most cerarii with conical setae, but cerarii on head and thorax sometimes thin, with flagellate apex. On deciduous trees and shrubs.
- 2(3). Tubular ducts on ventral part of head and near first thoracic cerarii absent; if present, they are located on head and thorax, in groups of 1–5 ducts in each group. Cerarii on head and thorax with flagellate apex. Hind femora usually with translucent pores *P. ficus*
- 3(2). Tubular ducts on ventral part of head and thorax present; up to 30 ducts in a single group. All cerarii with conical setae. Sometimes setae in head pairs of cerarii thinner. Translucent pores absent on hind . . . *P. citri*
- 4(1). Dorsal tubular ducts numerous (13–200 in number); located along body margin and in middle areas of body. All cerarii with thin setae; although some cerarian setae may be thick in individuals from the Eastern part of the species range. On *Juniperus* and *Cupressus*.
- 5(6). Dorsal tubular ducts of one size. Multilocular pores absent on dorsum. Cerarii 18 pairs

in number. Widely distributed in the Palearctic region *P. vovae*

6(5). Dorsal tubular ducts of two sizes. Multilocular pores present on dorsum. Sometimes first abdominal and thoracic cerarii absent. Known from Kazakhstan only *P. matesovae*

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