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Mealybugs of the Genus *Phenacoccus* Ckll. (Homoptera, Pseudococcidae) in the Fauna of Russia and Adjacent Countries: II

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Abstract—The second part of the publication contains a key to 40 species from the former USSR and a review of the 25 species not covered by the first part of the revision (Danzig, 2003); these are mostly species with an incomplete set of the cerarii. Species of the *Ph. piceae* (Loew) group are not included in this paper because they are dealt with in special publication (Danzig, 2004). New data are reported on *Ph. hordei* (Lind.), *Ph. pumilus* Kir., *Ph. strigosus* Borchs., and *Ph. perilustris* Borchs., which are reviewed in the first part of the revision. The descriptions and figures of all the species discussed in this paper are given. Lectotypes are designated for 6 nominal species. The following new synonymies are ascertained: *Phenacoccus setiger* Borchs. (= *Ph. gobicus* Danzig, = *kaplini* Danzig); *Ph. abditus* Borchs. (= *Ph. bicerarius* Borchs.); *Ph. incertus* Kir. (= *Euripersia caulicola* Terezn.); *Ph. phenacoccoides* Kir. (= *Ph. cynodontis* Borchs., = *eugeniae* Baz., = *bazarovi* Ben-Dov); *Ph. pumilus* Kir. (= *Ph. pseudopumilus* Hadz.), synn. n. Two new species are described: *Phenacoccus kochiae* sp. n. and *Ph. kazakhstanicus* sp. n. *Phenacoccus stipae* Nurm. is not included in the review because it has been transferred to the genus *Euripersia* Borchs. The distinctions between the genera *Euripersia* and *Phenacoccus* are conventional and will be discussed in the subsequent publication.

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The present paper is the second and concluding part of the revision of the genus *Phenacoccus* in the territory of the former USSR. The paper contains a key to 40 species from the former USSR and a review of the 25 species not covered by the first part of the revision (Danzig, 2003); these are mostly species with an incomplete set of the cerarii. Species of the *Ph. piceae* (Loew) group are not included in this paper because they are dealt with in a special publication (Danzig, 2004). On the other hand, new data are reported on *Ph. hordei* (Lind.), *Ph. pumilus* Kir., *Ph. strigosus* Borchs., and *Ph. perilustris* Borchs., which are reviewed in the first part of the revision. The descriptions and figures of all the species discussed in this paper are given. Lectotypes are designated for 6 nominal species. The following new synonymies are ascertained: *Phenacoccus setiger* Borchs. = *Ph. gobicus* Danzig, syn. n., = *Ph. kaplini* Danzig, syn. n.; *Ph. abditus* Borchs. = *Ph. bicerarius* Borchs., syn. n.; *Ph. incertus* Kir. = *Euripersia caulicola* Terezn., syn. n.; *Ph. phenacoccoides* Kir. = *Ph. cynodontis* Borchs., syn. n., = *Ph. eugeniae* Baz., syn. n., = *Ph. bazarovi* Ben-Dov, syn. n.; *Ph. pumilus* Kir. = *Ph. pseudopumilus* Hadz., syn. n. Two new species are described: *Phenacoccus kochiae* sp. n. and *Ph. kazakhstanicus* sp. n. *Phenacoccus stipae* Nurm. is not included in the review because it has been transferred to the genus *Euripersia* Borchs. The distinctions between the genera *Euripersia* and *Phenacoccus* are conventional and will be discussed in the subsequent publication.

The holotypes and paratypes of the new species are deposited in the Zoological Institute, Russian Academy of Sciences, St. Petersburg.

A Key to Species of the Genus Phenacoccus

1(10). Insects on *Picea* and *Abies* .... *Ph. piceae* (Loew) group.

2(9). Dorsal tubular ducts twice as wide as ventral ones. 1–3 circuli present.

3(4). On *Picea abies* in Europe (except the Caucasus) and *P. obovata* in Siberia .... 30. *Ph. piceae* (Loew).

4(3). On other species of *Picea* and in other regions.

5(6). Only 1 circulus present. On *Picea schrenkiana* in Tien Shan ..... 31. *Ph. borchsenii* (Mat.).

6(5). Two circuli present.

7(8). Dorsal multilocular pores present. On *P. ajanensis* in Primorskii Territory ..... 32. *Ph. maritimus* Danzig.

8(7). Dorsal multilocular pores absent. On *P. orientalis* in the Caucasus ..... 33. *Ph. montanus* (Hadz.).

9(2). Dorsal and ventral tubular ducts of the same size. 3 circuli present. On *P. ajanensis* and *P. glehni* in Sakhalin and Kunashir (Kuril Islands) ..... 34. *Ph. isadenatus* Danzig.

10(1). Insects on other plants.

11(98). Multilocular pores present, sometimes few in number and situated only around vaginal opening.

12(95). Multilocular pores numerous on ventrum and sometimes present on dorsum.

13(18). Dorsal multilocular pores numerous on all tergites, arranged in transverse bands or rows or in a stripe along body margin.

14(17). Dorsal multilocular pores forming transverse bands or rows on all tergites.

15(16). Antennae 9-segmented. Dorsal tubular ducts numerous. 18 pairs of cerarii present, occasionally part of anterior abdominal cerarii poorly distinguished ..... 1. *Ph. hordei* (Lind.).

16(15). Antennae 7-segmented. Dorsal tubular ducts absent. 3 pairs of cerarii present only on posterior segments of abdomen ..... 20. *Ph. isadenatus* Danzig.

17(14). Multilocular pores forming broad stripe along body margin, occasionally also interrupted transverse bands or rows on abdominal tergites. Antennae 9-segmented. Cerarii forming 2 pairs ..... 21. *Ph. poriferus* Borchs.

18(13). Dorsal multilocular pores absent, or present only on posterior abdominal tergites.

19(56). 15–18 pairs of cerarii present.

20(23). Circuli 2–4 in number.

21(22). Long flagellate setae present on posterior abdominal tergites. Circuli 2 in number ..... 22. *Ph. trichonotus* (Danzig).

22(21). Flagellate setae absent on dorsum. Circuli 2, 3 or 4 in number ..... 2. *Ph. aceris* (Sign.).

23(20). One circulus present or circuli entirely absent.

24(45). Circulus present.

25(26). Dorsal tubular ducts either absent entirely or present only in median area of segments VI and VII and, a few, along abdominal margin ..... 3. *Ph. transcaucasicus* Hadz., part.

26(25). Dorsal tubular ducts numerous.

27(28). Dorsal tubular ducts forming rows or bands, interrupted in median area on thorax and anterior abdominal tergites ..... 3. *Ph. transcaucasicus* Hadz., part.

28(27). Rows or bands of dorsal tubular ducts not interrupted in median area.

29(32). Dorsal tubular ducts of two sizes.

30(31). Large and small tubular ducts spread over entire dorsum ..... 11. *Ph. loiki* Danzig.

31(30). Large dorsal tubular ducts forming sparse transverse rows; small ones forming lateral groups on segment VII and occasionally on segment VI ..... 10. *Ph. avenae* Borchs.

32(29). All dorsal tubular ducts of equal size, large.

33(34). 7–8 cerarii situated along midline of abdomen. Antennae 7-segmented. Anterior ostioles absent ..... 12. *Ph. persimplex* Borchs.

34(33). Dorsal cerarii, if present, situated on frons and on tergite VII. Antennae 9-segmented. Anterior ostioles present.

35(36). Dorsal tubular ducts forming transverse bands wider on thorax than on abdomen; ducts large, exceeding trilocular pores in diameter ..... 4. *Ph. perilustris* Borchs.

36(35). Dorsal tubular ducts forming transverse rows, doubled in places; ducts of different sizes.

37(40). Dorsal tubular ducts large, exceeding trilocular pores in diameter.

38(39). C_{18} with 2 conical setae. Tubular ducts on ventral margin of body of two sizes ..... 6. *Ph. tataricus* Mat.

39(38). C_{18} with 5 or 6 conical setae. Tubular ducts on ventral margin of body of one size, the same as those in median area of body ..... 5. *Ph. querculus* (Borchs.)

40(37). Dorsal tubular ducts fine, smaller than trilocular pores in diameter.

41(44). Dorsal conical setae minute, without trilocular pores at base.

42(43). Tubular ducts along margin of ventral surface of body equal in size to dorsal ducts, larger than ducts in middle part of ventral surface .... 7. *Ph. karelinae* Borchs.

43(42). Tubular ducts along margin of ventral surface of body equal in size to those in middle part, smaller than dorsal ducts .... 8. *Ph. strigosus* Borchs.

44(41). Some of dorsal conical setae of the same size as those in cerarii and with several trilocular pores at base ..... 23. *Ph. insularis* Danzig.

45(24). Circulus absent.

46(55). Dorsal tubular ducts situated not only along body margin, but also in its medial part.

47(48). Dorsal conical setae with trilocular pore at base, forming transverse rows .... 13. *Ph. specificus* Mat.

48(47). Dorsal conical setae without trilocular pore at base.

49(50). Digitules shorter than claw, sharpened apically. Ventral trilocular pores absent in medial part of thorax and anterior segments of abdomen ..... 24. *Ph. tibialis* Borchs.

50(49). Digitules longer than claw. Ventral trilocular pores numerous in medial part of thorax and anterior segments of abdomen.

51(54). Quinquelocular pores absent or few on thorax.

52(53). Dorsal tubular ducts usually not numerous, sparse in rows, occasionally (Central Asia) more numerous, forming doubled rows .... 14. *Ph. pumilus* Kir.

53(52). Dorsal tubular ducts numerous, arranged in bands ..... 9. *Ph. eurotiae* Danzig.

54(51). Quinquelocular pores numerous .... 25. *Ph. interruptus* Green, part.

55(46). Dorsal tubular ducts present only along body margin ..... 15. *Ph. karaberdi* Borchs.

56(19). 1–11 pairs of cerarii present along body margin.

57(66). 6–11 pairs of cerarii situated on sclerotized plates on anterior and posterior segments of body.

58(63). Dorsal tubular ducts significantly smaller than multilocular pores in diameter. On grasses.

59(60). Circulus present. Dorsal conical setae rather large. Dorsal tubular ducts always numerous, forming transverse bands .... 26. *Ph. evelynae* Terezn.

60(59). Circulus absent. Dorsal conical setae minute. Dorsal tubular ducts not numerous, forming transverse rows, often absent in anterior part of body.

61(62). Ventral marginal tubular ducts larger than medial ones. Quinquelocular pores absent on 4 last abdominal sternites .... 25. *Ph. interruptus* Green, part.

62(61). Ventral marginal and medial tubular ducts of the same size. Quinquelocular pores numerous on all abdominal sternites, except 2 posterior segments where singular pores only present .... 27. *Ph. angustatus* Borchs.

63(58). Dorsal tubular ducts larger than multilocular pores in diameter. Circulus present or absent. On *Vaccinium* and *Ledum*.

64(65). Circulus present. Dorsal conical setae thin .... 28. *Ph. vaccinii* Danzig.

65(64). Circulus absent. Dorsal setae stout, some of them similar to cerarian setae .... 29. *Ph. shutovae* Danzig.

66(57). 1–3 pairs of cerarii present on posterior segments of body; occasionally C_3 or, rarely, C_1–C_3 also present. Sclerotized plates, if present, situated under posterior cerarii only.

67(82). Dorsal multilocular pores forming transverse rows on abdomen. Quinquelocular pores numerous or absent.

68(69). C_{18} with pair of unusually stout conical setae and one long flagellate seta, situated on heavily sclerotized plate. On roots of *Salsola* .... 37. *Ph. salsolae* Danzig.

69(68). C_{18} with 2 thin conical setae, without flagellate seta and sclerotized plate.

70(75). Quinquelocular pores numerous over entire body, sometimes absent on posterior abdominal segments.

71(72). Circulus present. Quinquelocular pores absent on posterior abdominal segments .... 36. *Ph. halimiphylli* Danzig.

72(71). Circulus absent. Quinquelocular pores numerous on all abdominal segments, except terminal one.

73(74). Dorsal tubular ducts forming transverse rows on all segments of the body. On saxaul and saltworts ..... 35. *Ph. arthrophyti* Arch.

74(73). Dorsal tubular ducts presents on V–VII abdominal segments only. On gramineans .... 38. *Ph. nurmamatovi* Baz.

75(70). Quinquelocular pores absent or few.

76(79). Dorsal tubular ducts numerous; on segment VII, in addition to large tubular ducts, group of small ducts present. Usually on gramineans and liliaceoses.

77(78). Antennae 8-segmented. On wheat and other gramineans, probably also on dicotyledonous weeds in wheat fields .... 39. *Ph. tergrigorianae* Borchs.

78(77). Antennae 9-segmented. On bulbs and under leaf sheaths of liliaceoses .... 40. *Ph. emansor* Will. et Kozarzh.

79(76). Dorsal tubular ducts not numerous, tergite VII without group of small ducts. On dicotyledons.

80(81). Dorsal tubular ducts present on 3 posterior abdominal segments only. Spiracles with groups of trilocular pores ..... 41. *Ph. kochiae* sp. n.

81(80). Dorsal tubular ducts distributed over entire body. Spiracles without groups of trilocular pores ..... 42. *Ph. schmelevi* Baz.

82(67). Dorsal multilocular pores absent or few. Quinquelocular pores absent or few.

83(90). Dorsal tubular ducts numerous.

84(87). Circulus present. Quinquelocular pores absent.

85(86). Tibia slender and long, about 3 times as long as tarsus without claw (Fig. 20) .... 43. *Ph. setiger* Borchs.

86(85). Tibia thicker and shorter, about twice as long as tarsus without claw (Fig. 21) .... 44. *Ph. kokandicus* Nurm.

87(84). Circulus absent.

88(89). Ventral tubular ducts of one size. 2–3 pairs of cerarii present. Dorsal conical setae short .... 45. *Ph. abditus* Borchs.

89(88). Ventral tubular ducts of two sizes: marginal ducts similar to dorsal ones, twice as large as medial ducts. 1–2 pairs of cerarii present. Dorsal setae rather long and slender .... 46. *Ph. incertus* Kir.

90(83). Dorsal tubular ducts not numerous or absent.

91(94). Dorsal tubular ducts not numerous; small dorsal ducts of the same size as ventral ducts.

92(93). Dorsal tubular ducts present on posterior abdominal segments only. Spiracles with groups of trilocular pores ..... 47. *Ph. phenacoccoides* Kir.

93(92). Dorsal tubular ducts present everywhere on body. Spiracles without groups of trilocular pores ..... 48. *Ph. kazakhstanicus* sp. n.

94(91). Dorsal tubular ducts absent. Ventral marginal and medial tubular ducts (except some ducts on thorax) of the same size, large; similar ducts in other species present along body margin only ..... 49. *Ph. alticola* Borchs.

95(12). Multilocular pores situated around vaginal opening only, singular ones present on two adjacent segments.

96(97). Multilocular pores situated around vaginal opening only. Tubular ducts present on both ventral and dorsal sides of body. Quinquelocular pores absent ..... 16. *Ph. ferulae* Borchs.

97(96). Multilocular pores situated not only around vaginal opening, but also on two adjacent segments. Singular tubular ducts present only on ventral side of body. Quinquelocular pores numerous ..... 17. *Ph. juniperi* Ter-Gr.

98(11). Multilocular pores absent.

99(100). Antennae 9-segmented. C_{18} with 2 conical setae. Tubular ducts present, not numerous; 1–6 pairs of ducts situated along ventral margin of body, occasionally some pores also present on dorsum ..... 18. *Ph. larvalis* Borchs.

100(99). Antennae 8-segmented. C_{18} with 7–8 conical setae. Tubular ducts absent .... 19. *Ph. memorabilis* Borchs.

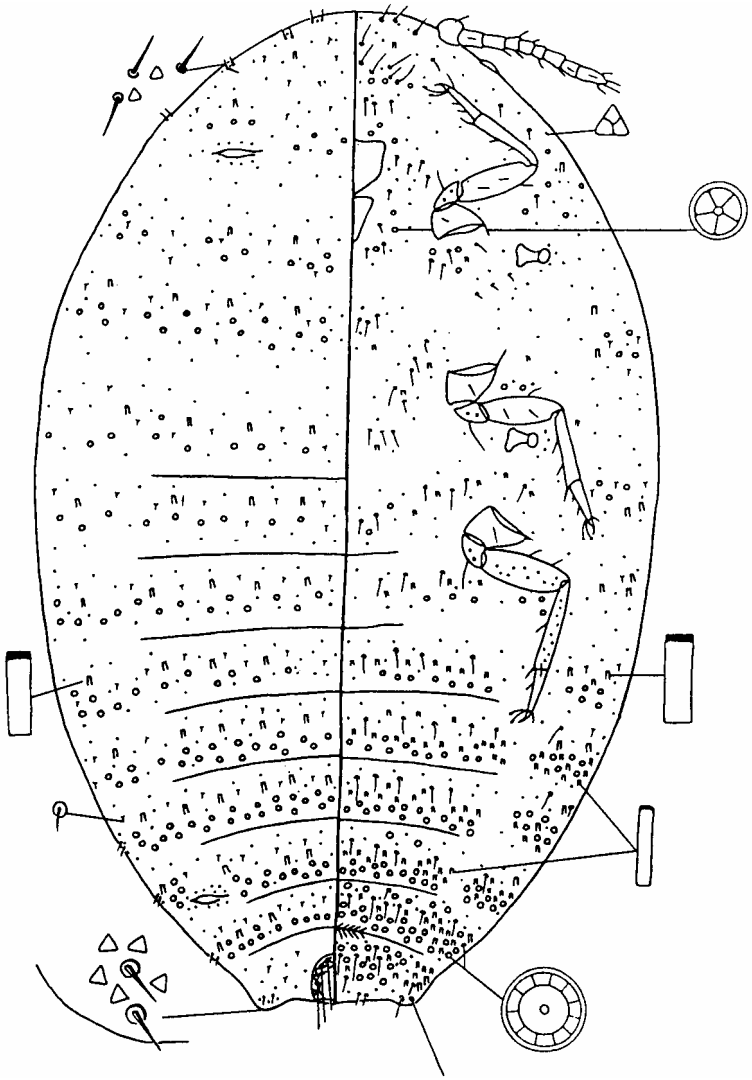

Fig. 1. *Phenacoccus hordei* (Lind.), female without group of multilocular pores and tubular ducts. Eastern Kazakhstan, on *Orostachys spinosa*.

Additions to, and Corrections in the First Part of the Revision of the Genus Phenacoccus (Danzig, 2003)

1. ***Phenacoccus hordei*** (Lindeman, 1886) (Fig. 1)

Six females from eastern Kazakhstan (the Ubinskii Range), not available to me earlier, differ in the absence of the group of multilocular pores and tubular ducts near fore coxae, which is present in *Ph. hordei*. These females were collected from unusual hosts, *Orostachys spinosa* (Crassulariaceae) (five females) and *Ziziphora clinopodioides* (Lamiaceae) (one female), whereas *Ph. hordei* is oligophagous on grasses. In addition to these females, I also examined two females from dicotyledons, *Trifolium* (Fabaceae) and *Sinapis* (Brassicaceae). These two females do not differ from specimens collected from grasses. Additionally, I have examined females collected from *Iris* in eastern Kazakhstan (the Kolbinskii Mt. Range), which is the eastern border of the species range, and found that these females had all typical characters of *Ph. hordei*. For the present I do not consider the six above mentioned females from *Orostachys* and *Ziziphora* to represent a separate species, but only a variation of *Ph. hordei*.

In the preceding paper, the material of *Ph. perilustris* and *Ph. strigosus* the material on these species was mixed. Here, I give corrected data on these species.

4. ***Phenacoccus perilustris*** Borchsenius, 1949

Female. Conical setae short.

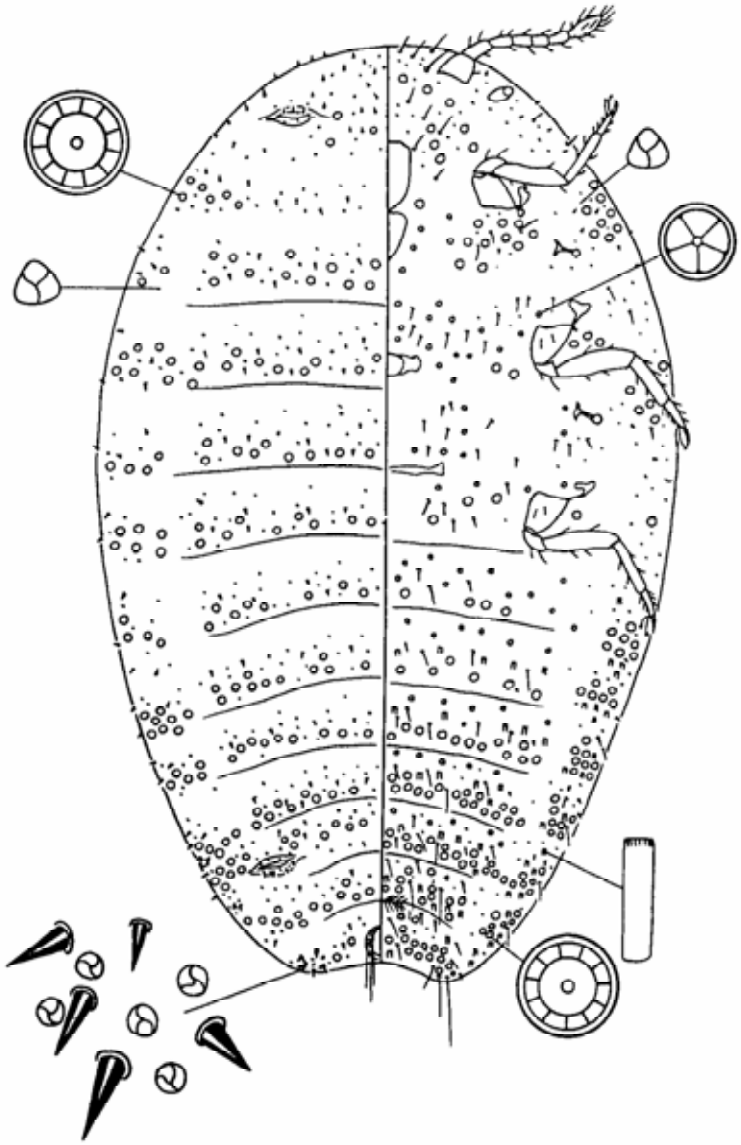

Fig. 2. *Phenacoccus discadenatus* Danzig, female, after Danzig (1978).

Variability. The data reported for *Ph. strigosus* refer to *Ph. perilustris*.

Material. In addition to that given earlier, several series of females from western and central Kazakhstan and from Mongolia.

Distribution. In addition to that given earlier, western and central Kazakhstan and Mongolia.

Mode of life. I have received an extensive material from the roots of *Artemisia* in Daghestan, Kazakhstan, and Mongolia. Probably, *Artemisia* is the primary host of this species.

8. ***Phenacoccus strigosus*** Borchsenius, 1949

Variability. The data reported earlier (Danzig, 2003) for *Ph. strigosus* refer to *Ph. perilustris*.

Material. In addition to 9 type specimens, 8 females (2 series) from Zaisan Distr. of Kazakhstan.

Distribution. Turkmenia (Repetek), Kazakhstan (Zaisan Distr.).

Mode of life. In Turkmenia, the species was collected from leaves of *Heliotropium argusioides*; in Kazakhstan, from leaves of *Stipa* sp.

14. ***Phenacoccus pumilus*** Kiritschenko, 1936

—*pseudopumilus* Hadzibejli, 1960 : 62 (Georgia: Shiraki), syn. n.

The species was included in my preceding review (Danzig, 2003). I have not examined type material of *Ph. pseudopumilus,* but have compared lectotype and

abundant material of *Ph. pumilus* with the original description of *Ph. pseudopumilus*. The distinguishing characters given by Z. K. Hadzibejli (mainly the presence of quinquelocular pores and smaller number of multilocular pores) fall within the limits of individual variability of *Ph. pumilus*. The mode of life is also similar; *Ph. pseudopumilus* was collected from roots of *Artemisia* spp., a common host plant of *Ph. pumilus*.

20. ***Phenacoccus discadenatus*** Danzig, 1978 (Fig. 2)

Danzig, 1978: 128 (Yakutia).

Description. Female. Body oval, light, up to 3 mm long. Antennae 7-segmented. Legs short. Circulus absent. Multilocular pores present on both sides of body; dorsal multilocular pores forming transverse rows on all tergites; ventral ones abundant everywhere on body. Quinquelocular pores numerous. Tubular ducts present on ventral side of body only, forming transverse rows on abdominal sternites III–VII and occasionally present along body margin. 3 pairs of cerarii present, C_{18} with 5 conical setae and 8 trilocular pores, C_{16} and C_{17} with 2 conical setae and 2–3 trilocular pores. C_{18} situated on small sclerotized plate. Cerarian conical setae short and thick. Dorsal conical setae minute.

Eggs yellow.

Material. Type series.

Distribution. Russia: northern and central Yakutia.

Mode of life. The species was collected from roots of *Poa* and *Agropyron cristatum* in the steppe and in pine forests. Oviposition was observed on July 23, near Verkhoyansk.

21. ***Phenacoccus poriferus*** Borchsenius, 1949 (Fig. 3)

Borchsenius, 1949 : 234 (south of Primorskii Terr.); Danzig, 1980 : 135 (lectotype designation); Tang, 1992 : 433 (*Caulococcus*).

—*comitans* Bazarov, 1967 : 62 (the Western Pamirs); Danzig, 1980 : 135 (synonymy).

Description. Female. Body elongate-oval, up to 4 mm long. Antennae with 9 comparatively short segments. Legs small; femora and tibiae of hind legs with translucent pores. Circulus absent. Multilocular pores forming marginal zone along body and transverse bands on abdominal sternites and tergites IV–VII. Quinquelocular pores always present near labium and fore coxae. Tubular ducts forming groups along body margin and transverse rows on sternites IV–VIII; singular ones present on abdominal sternite VIII. Cerarii numbering only 2 pairs, situated on prominent sclerotized plates. C_{18} with 2–3 conical setae and 7–9 trilocular pores; C_{17} with 2 conical setae and 4–5 pores. Cerarian and dorsal conical setae thin.

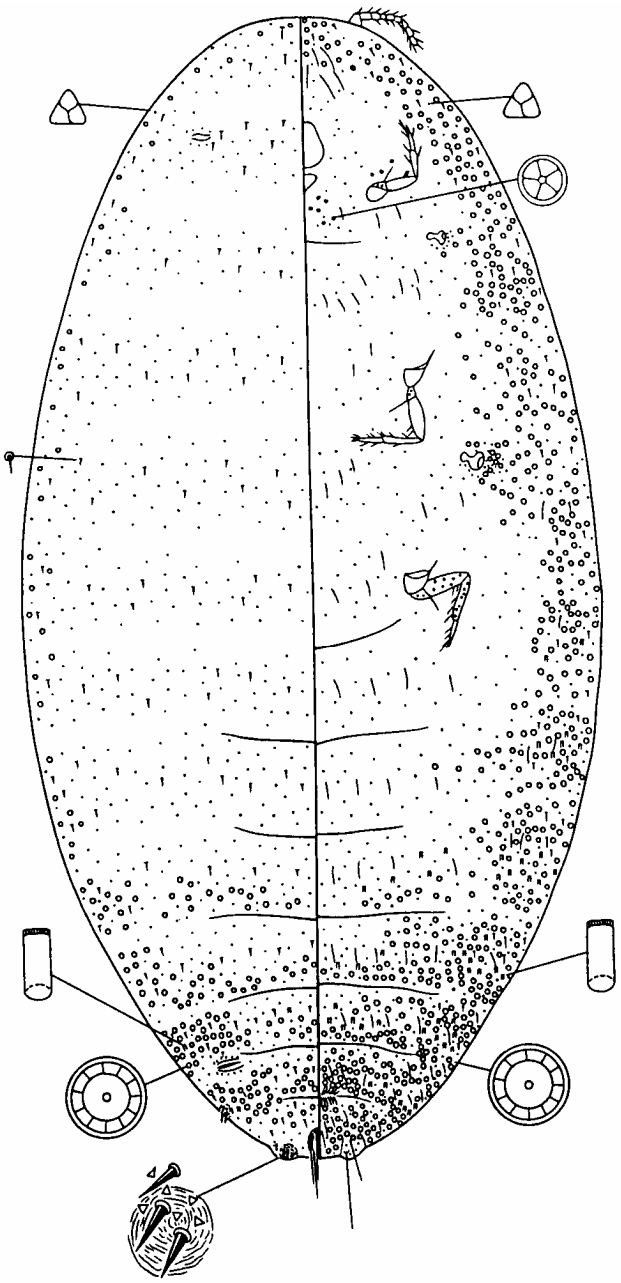

Fig. 3. *Phenacoccus poriferus* Borchs., female, after Danzig (1980) with correction.

Material. In addition to types of *Ph. poriferus* and *Ph. comitans*, females from the Eastern Pamirs (Lake Zor-Kul), Primorskii Terr. (Lazovskii Reserve) and North Korea have been examined.

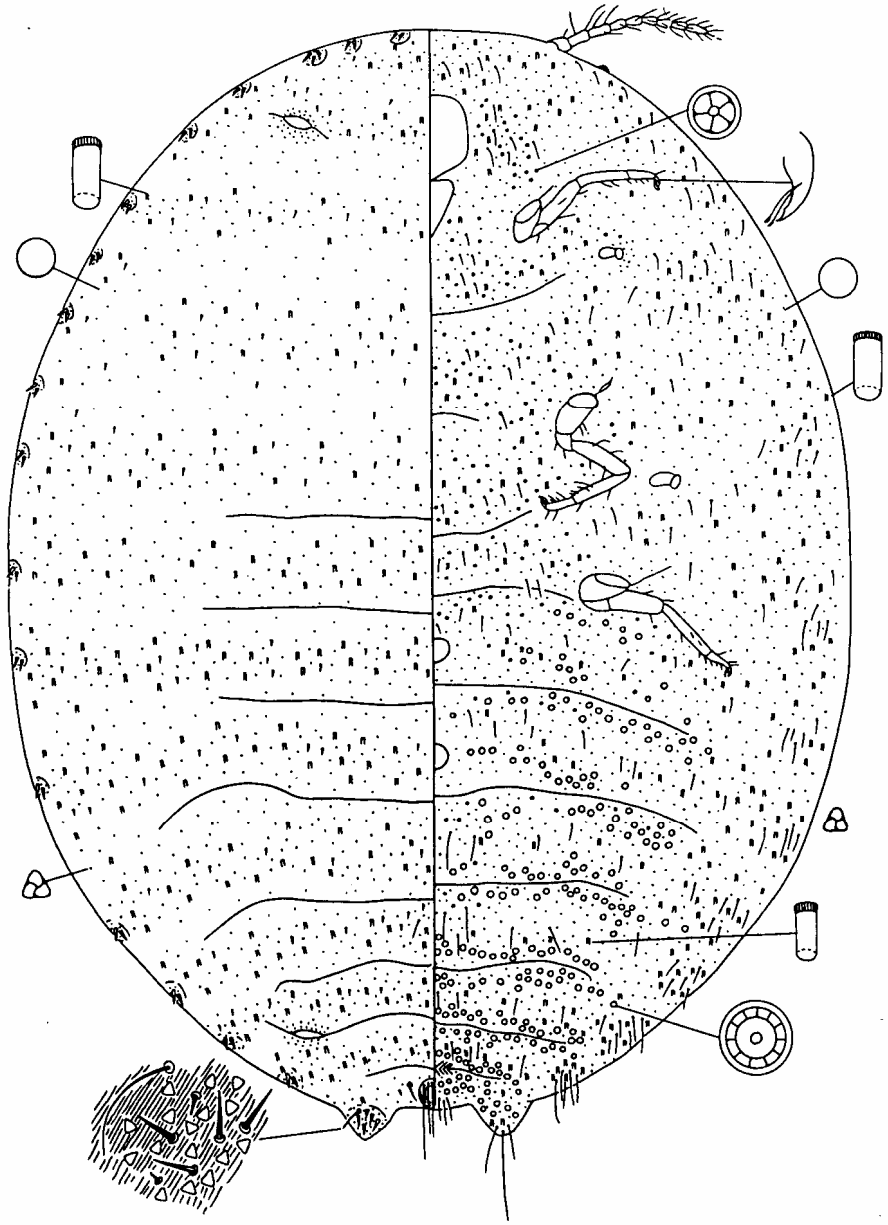

Fig. 4. *Phenacoccus trichonotus* (Danzig), female, after Danzig (1980).

Distribution. The Pamirs (widely), south of Primorskii Terr. (seashore near Vladivostok and Lazovskii Reserve near Glazkovka). North Korea near Pyongyang and Hjesan (Hamgyeongnam-do Province), China.

Mode of life. In Primorskii Terr. the species was collected on sand beaches under the leaf sheaths of *Elymus*, *Festuca supina* and *Carex*; in the Pamirs it lives on roots and underground stems of *Elymus*, occupying sandy grounds at altitudes of 1800–3500 m; often abundant, a dangerous pest.

22. ***Phenacoccus trichonotus*** (Danzig) (Fig. 4)

Danzig, 1971 : 388 (*Coccura*; Russia, south of Primorskii Terr.); 1980 : 127.

Description. Female. Body broad-oval, orange, up to 3 mm. Antennae 9-segmented. Circuli 2 or 3 in number. Multilocular pores present on abdominal sternites only, numerous. Quinquelocular pores present on thorax and anterior abdominal sternites. Tubular ducts broad and short, numerous over entire body; dorsal and marginal ventral tubular ducts larger in diameter than medial ventral ones. Cerarii numbering 18 pairs.

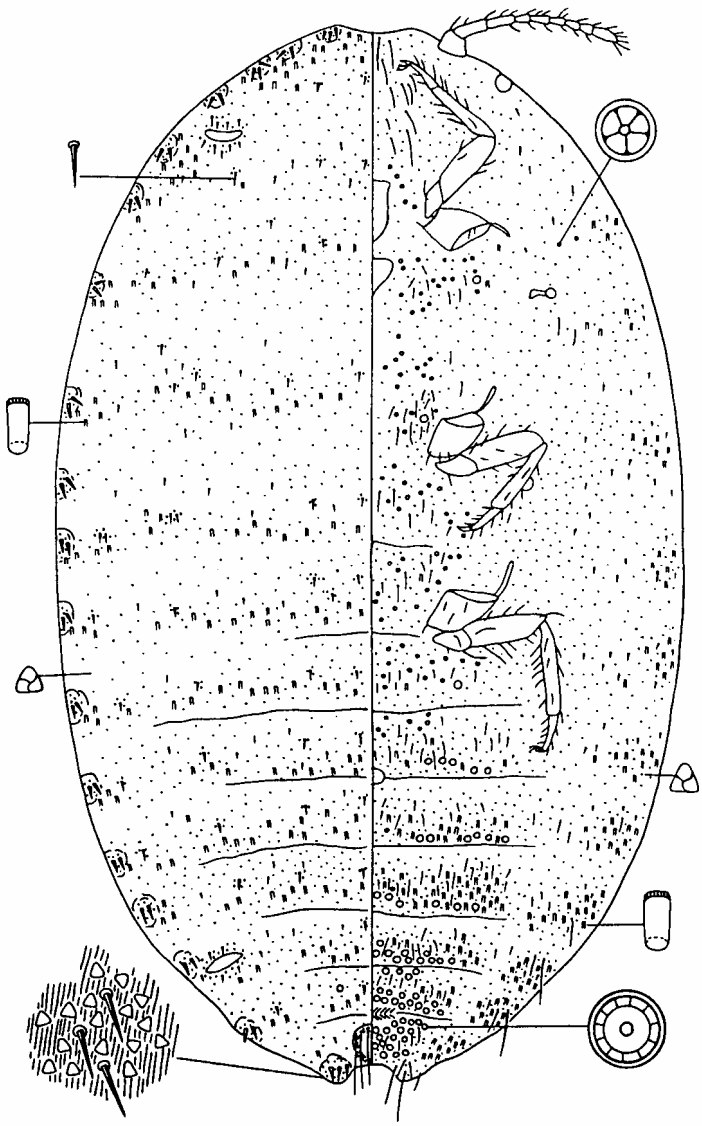

Fig. 5. *Phenacoccus insularis* Danzig, female, after Danzig (1980).

C_{18} with 4–6 conical setae, one flagellate seta and 12–16 trilocular pores; C_{16}, C_{17} and C_3 with 3 conical setae and 4–6 pores; other cerarii usually with 2 conical setae and 2–4 pores; some of these cerarii occasionally with 3rd additional conical or flagellate seta. All cerarii situated on slightly sclerotized plates. Cerarian conical setae thin. On posterior abdominal tergites, in addition to minute conical setae, singular flagellate setae occasionally present.

Taxonomic notes. *Ph. trichonotus* differs from other species of the genus in the presence of flagellate setae on the dorsum.

Material. In addition to types, 2 series from Khasan Distr. of Primorskii Terr.

Distribution. Russia, south of Primorskii Terr.

Mode of life. Widely polyphagous species, lives on various trees and shrubs, usually inhabits underground stems and thick roots; when living on overground parts of the hosts, occupies secluded places (under bark, in cracks, etc.). In these cases, only ants indicate the presence of the mealybugs; the ants tend colonies of mealybugs and build galleries from masticated wood over them. Most often and in great colonies, the mealybugs live on *Alnus hirsuta*, *Padus asiatica* and *Eleuterococcus senticosus*, also live on *Malus manshurica*, *Crataegus* spp., *Betula* spp., *Ulmus propinqua*, *Euonymus* spp., *Aralia mandshurica*, *Artemisia* sp. One of the landscape species in the south of Primorskii Terr.

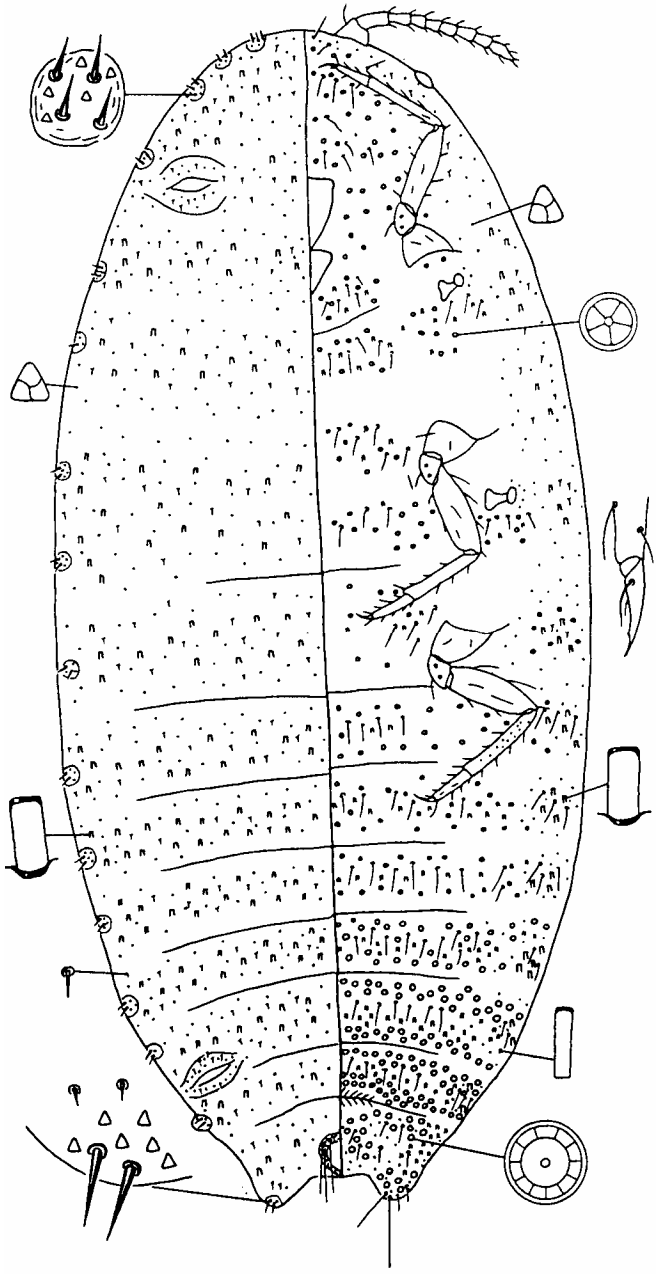

Fig. 6. *Phenacoccus tibialis* Borchs., female, lectotype.

It lives in mesophilic forests. In June and July, young females without ovisacs were collected.

23. ***Phenacoccus insularis*** Danzig (Fig. 5)

Danzig, 1971 : 378 (Russia: the Kuril Islands, Kunashir); 1978 : 10; 1980 : 127.

Description. Female. Body oval, pink, up to 3.5 mm long. Antennae 9-segmented. Circulus small, oval. Multilocular pores occasionally present on dorsum and anterior part of ventrum, and forming transverse rows and bands on abdominal sternites. Quinquelocular pores numerous on thorax and anterior sternites of abdomen. Tubular ducts numerous everywhere on body; dorsal and ventral ducts approximately of the same size. Cerarii numbering 18 pairs; all situated on prominent sclerotized plates. C_{18} with 3 conical setae, one minute conical seta and group of pores; other cerarii with 2 (C_1 and C_3 with 3) conical setae and 5–7 pores. Cerarian conical setae thin. Some of dorsal conical setae similar to cerarian ones and accompanied by several trilocular pores.

Ovisac white, narrow, friable. Eggs pink.

Material. In addition to types, 2 series from Sakhalin.

Distribution. Russia, Sakhalin (Novoaleksandrovsk, Kholmsk), the Kuril Islands, Kunashir (Sernovodsk).

Mode of life. Polyphagous, inhabits annual shoots of *Ribes* and leaves of herbs: *Fragaria iinumae*, *Filipendula kamtschatica*, *Aruncus kamtschaticus*, *Plantago kamtschatica*, *Majanthemum dilatatum*, and also *Vaccinium praestans*. Constantly to be found on tall grasses, often in great numbers. Oviposition in July and at this time it was difficult to find mealybugs even on those plants where they were present in great numbers two weeks before. Probably, females migrate to secluded places for oviposition.

24. ***Phenacoccus tibialis*** Borchsenius, 1949 (Fig. 6)

Borchsenius, 1949 : 227 (Tajikistan, Vakhsh valley, Shaartuz Distr.; lectotype, designated here, ♀, "*Phenacoccus tibialis* Borchs., Tajikistan, Shaartuz Distr., near Aivadzh, on leaves of *Phragmites*, 18.VI.1944, N. Borchsenius," slide no. 36–45; paralectotypes, the same data, 3 ♀ and a series of larvae II or III.

Description. Female. Body elongate, pink, up to 3.5 mm long. Antennae 9-segmented. Legs long, slender; hind tibia with translucent pores; claw digitules shorter than claw, pointed. Circulus absent. Multilocular pores present on sternites IV–VIII, numerous. Quinquelocular pores numerous on thorax and 3 anterior abdominal sternites. Ventral trilocular pores absent in medial part of thorax and anterior abdominal sternites. Dorsal tubular ducts forming transverse bands on all segments. Ventral tubular ducts of two sizes; large ducts of the same size as dorsal ones, situated along body margin. Narrow ventral tubular ducts situated in medial part of thorax and abdomen. Cerarii

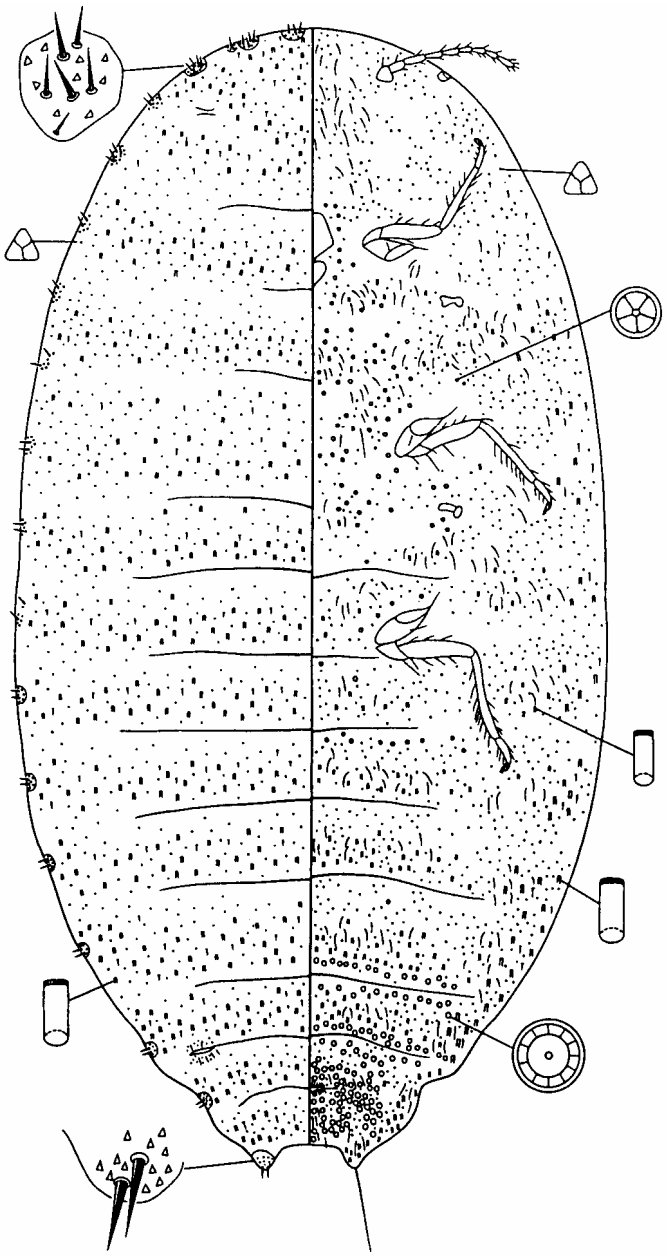

Fig. 7. *Phenacoccus interruptus* Green, female, after Danzig (1980).

numbering 16 pairs, situated on slightly sclerotized plates. C_1 and C_3 with 3–4 conical setae; other cerarii with 2 conical setae. C_{18} with 7–8 trilocular pores, other cerarii with 3–4 pores. Cerarian and dorsal conical setae thin.

Note. The species differs from the congeners in the short and pointed claw digitals.

Material. Type series.

Distribution. The species is known from the type locality only.

Mode of life. Collected from under the leaf sheaths of *Phragmites*.

25. ***Phenacoccus interruptus*** Green, 1923 (Fig. 7)

Green, 1923 : 215 (England); Kiritshenko, 1936 : 130; 1940a : 188; Borchsenius, 1949 : 240 (*Paroudablis*); Williams, 1962 : 35; Matesova, 1968 : 110 (*Paroudablis*); Danzig, 1978 : 10; 1980 : 131; Kosztarab, Kozár, 1988 : 130.

Description. Female. Body elongate-oval, green, with dark transverse bands, up to 4.5 mm long. Antennae 9-segmented, with slender segments. Circulus absent. Multilocular ducts present on posterior abdominal sternites only. Quinquelocular pores numerous. Tubular ducts present on both sides of body. Di-

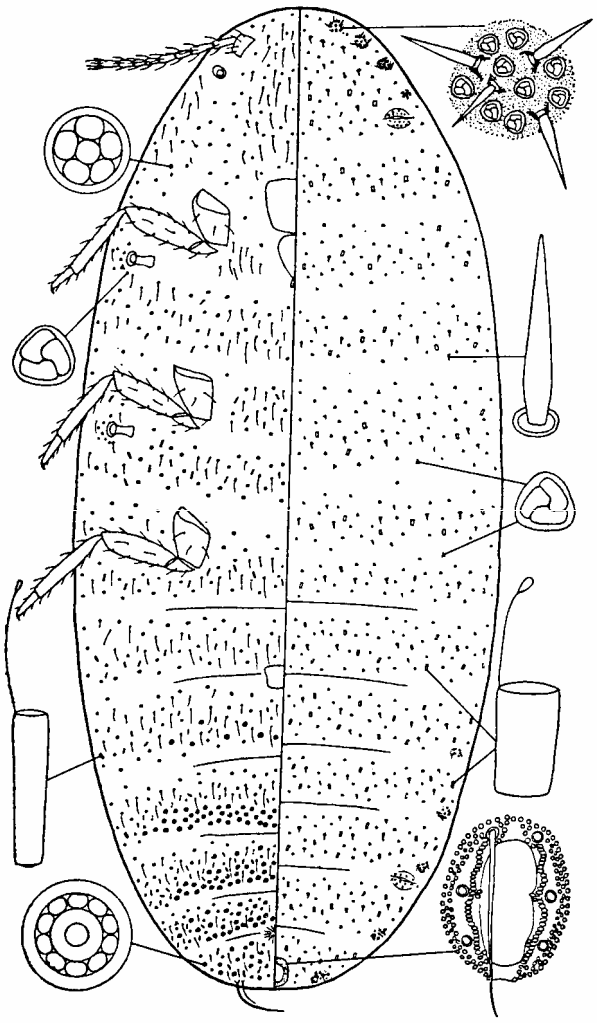

Fig. 8. *Phenacoccus evelinae* Terezn., female, after Tereznikova (1975).

ameter of dorsal and marginal ventral tubular ducts twice that of medial ventral ones. Number of cerarii varies geographically, from 9 to 18 pairs. C_1–C_3 with 6 or 7, C_4, C_5 with 3 or 4 conical setae; other cerarii with 2 conical setae. All cerarii with 6–10 pores, but C_{18} has significantly more pores. Cephalic and posterior abdominal cerarii situated on heavily sclerotized prominences. Cerarian conical setae thin. Dorsal conical setae varying in size, mainly minute, but sometimes rather large, similar to cerarian ones.

Variability. The species is characterized by geographical variability in the number of cerarii and dorsal tubular ducts. Insects from Primorskii Territory, Eastern Siberia, and Korea have 15–18 pairs of cerarii, although occasionally the thoracic and anterior abdominal cerarii are represented by the widely spaced conical setae and are hardly noticeable. Insects from the European part of the range, from Yakutia, Mongolia and Sakhalin have no thoracic and anterior abdominal cerarii, but in one specimen from Leningrad Province each of these cerarii is replaced with 2 widely spaced conical setae. The number of dorsal tubular ducts varies geographically and within populations (transverse rows or broad bands). In the western part of the range, females with a small number of tubular ducts predominate (see figures of Williams, 1962 and Tereznikova, 1975), while in the eastern part of the range females have numerous ducts (Fig. 7).

Material. Approximately 40 series from the listed below areas of Russia, Switzerland, Mongolia, and North Korea.

Distribution. Russia (Leningrad, Kaliningrad, and Irkutsk Provinces, Yakutia, south of Primorskii Territory, Sakhalin); Ukraine with the Crimea; Kazakhstan; Europe (widely), Mongolia, North Korea.

Mode of life. Oligophagous on gramineans; lives on leaves, prefers well sunlit habitats: pine forests, sphagnum marches, steppes and rocks.

26. ***Phenacoccus evelinae*** Tereznikova, 1968 (Fig. 8)

—*graminis* Tereznikova, 1968 : 472 (*Paroudablis*; Ukraine; secondary homonym of *Phenacoccus graminis* Reuter, 1904); Ter-Grigorian, 1973 : 175 (*Paroudablis*).

—*evelinae* Tereznikova, 1975 : 211 (replacement name for *Ph. graminis* Tereznikova, 1968); Kosztarab, Kozár, 1988 : 126.

Taxonomic notes. The species is very similar to *Ph. interruptus* and differs in the presence of circulus, numerous dorsal tubular ducts, and large dorsal conical setae. Probably, *Ph. evelinae* is an intraspecific form of *Ph. interruptus*.

Material. Six series from Russia, Ukraine, Armenia, Georgia, and Hungary.

Distribution. Russia (Leningrad, Kaliningrad, and Volgograd provinces, Taman Peninsula); Ukraine, Armenia, Georgia, Poland, Hungary, Italy.

Mode of life. Oligophagous on gramineans.

27. ***Phenacoccus angustatus*** Borchsenius, 1949 (Fig. 9)

Borchsenius, 1949 : 222 (Kirghizia, Tajikistan; lectotype, designated here, ♀: "*Phenacoccus angustatus* Borchs., Tajikistan, near Parkhar Vill., Kulyab Prov-

ince (District), under the leaf sheaths of sorghum, 4.X.1944, N. Borchsenius, no. 344," slide no. 32–45, specimen in black circle; paralectotypes: series of females on the same slide with the lectotype, "*Phenacoccus angustatus* Borchs., Kirghizia, bank of the Kugartka River, 35 km upstream from Dzhalalabad, on *Cynodon dactylon*, 1.VIII.1937, N. Borchsenius," slide no. 3–38, 2 ♀ and 5 last instar larvae); 1960 : 47.

Description. Female. Body elongate, 3 mm long. Antennae 9-segmented. Legs long; hind coxa and tibia with translucent pores. Circulus absent. Multilocular pores present on five posterior abdominal sternites. Quinquelocular pores numerous everywhere on body, but rare on two posterior abdominal segments. Tubular ducts not numerous, situated as shown in Fig. 9. Dorsal tubular ducts somewhat larger than ventral ones. Cerarii numbering 7–10 pairs: cephalic and posterior abdominal ones; sometimes thoracic cerarii also present. C_1 with 3, C_3 with 4 conical setae and 3–4 pores; other cerarii, except C_{18}, with 2 conical setae and 2–3 (C_{17} with 4–5) pores. C_{18} with 2 long and 2 short conical setae and 10–12 pores. Cerarian conical setae, except C_{18}, thin. Cerarii situated on sclerotized plates. Dorsal conical setae minute.

Taxonomic notes. The species is characterized by a great number of quinquelocular pores, which are present even on two posterior sternites. Females from Aktyubinsk Province and Turkmenia differ from the type material in the presence of singular small tubular ducts (along with large ducts) on posterior sternites. Probably, this material is not *Ph. angustatus*. Matesova (1968) recorded a species from eastern Kazakhstan and named it "*Ph.* prope *angustatus*;" it was collected from leaves of *Phleum*. It is not clear whether this species is *Ph. angustatus* or not.

Material. In addition to the types, 1 ♀ from Aktyubinsk Province, 1 ♀ and 1 last instar larva from Turkmenia (Kopet Dagh).

Distribution. Kazakhstan (Aktyubinsk Province), Turkmenia (Kopet Dagh), Kirghizia (Dzhalalabad), Tajikistan (Kulyab District).

Mode of life. The species lives under the leaf sheaths of *Sorghum*, *Cynodon dactylon*, *Triticum*, *Aegilops* and *Hordeum*.

28. ***Phenacoccus vaccinii*** Danzig, 1960 (Fig. 10)

Danzig, 1960 : 174 (*Paroudablis*; Russia, Leningrad Province); 1971 : 384.

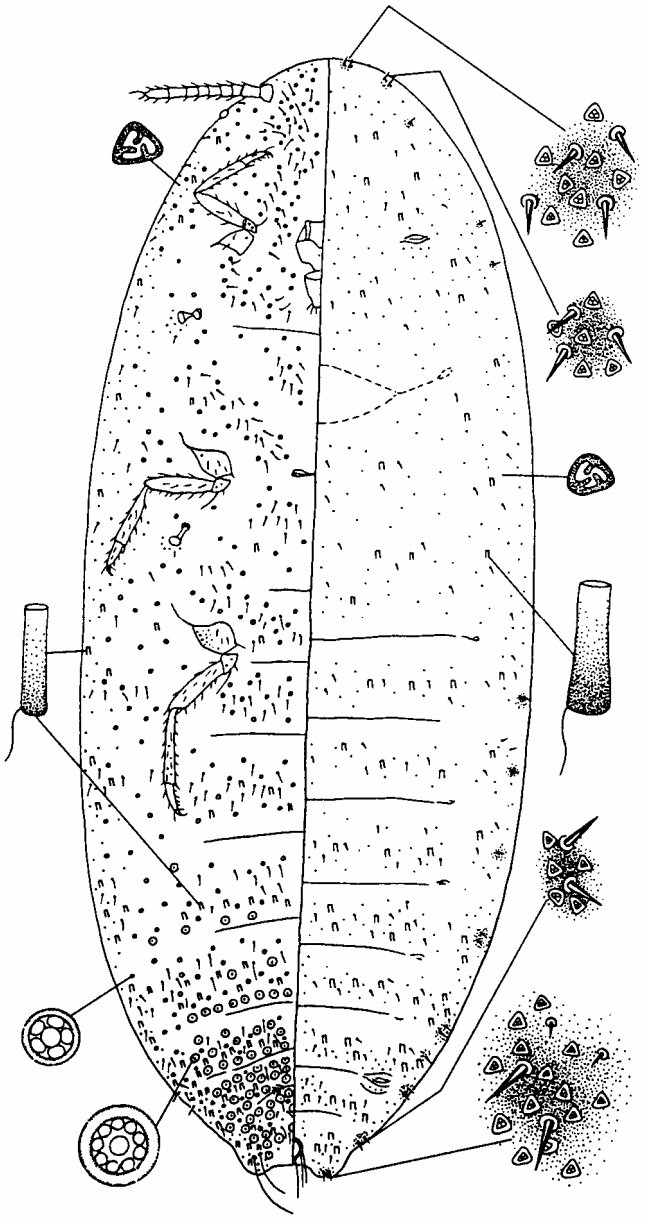

Fig. 9. *Phenacoccus angustatus* Borchs., after Borchsenius (1960), corrected.

Description. Female. Body broad-oval, up to 3 mm long. Antennae 8–9-segmented. Legs well developed. Circulus large, oval. Multilocular pores present on ventral surface of abdomen only. Quinquelocular pores numerous everywhere on body except posterior abdominal sternites. Tubular ducts of three sizes. Large ducts numerous on dorsum; mid-sized ducts situated along ventral margin of body; small ones present in medial part of ventrum. Cerarii numbering 8–11 pairs: C_1–C_4 and C_{15}–C_{18}, sometimes C_1–C_5 and C_{13}–C_{18}. C_3 with 4 conical setae and 8–9 pores, C_{18} with 3 conical setae and 10–15 pores; other cerarii

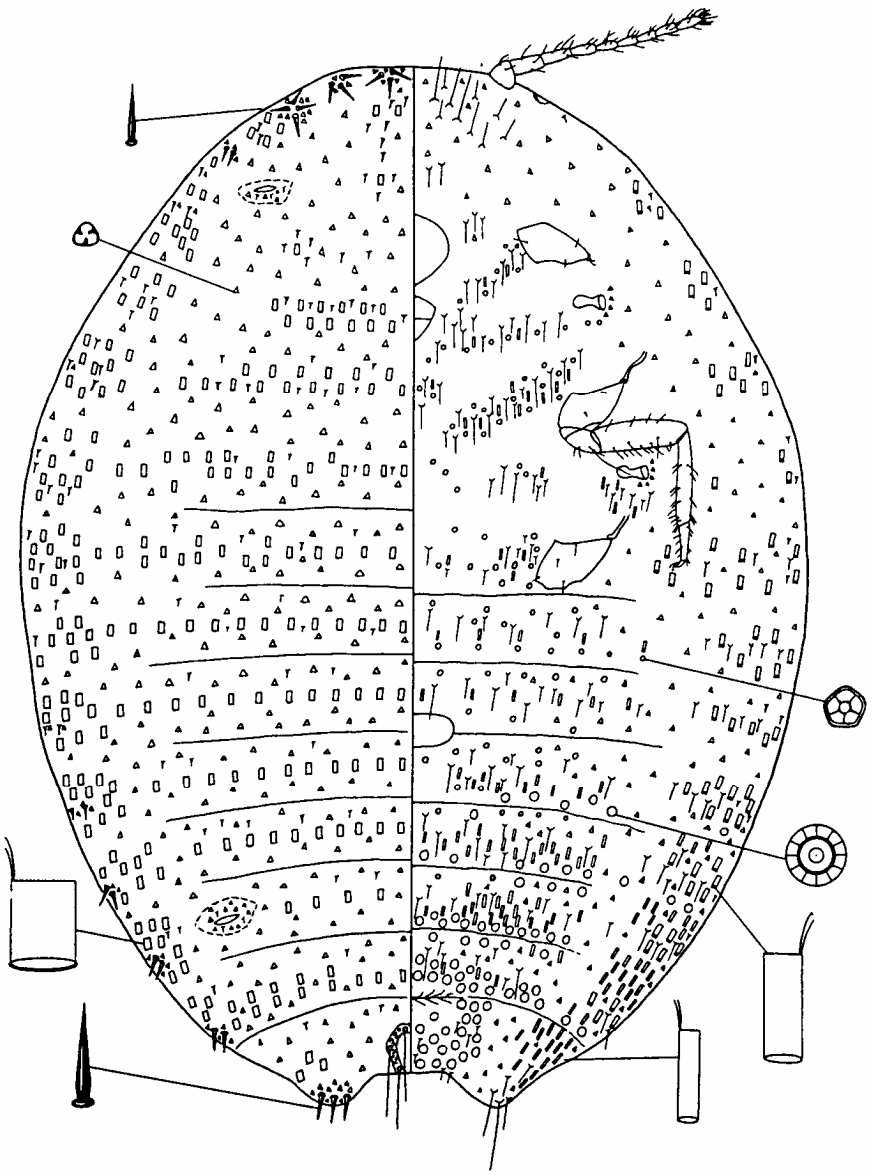

Fig. 10. *Phenacoccus vaccinii* Danzig, after Danzig (1960).

with 2–3 conical setae and 2–6 (C_{17} with 4–8) pores. Cerarii situated on sclerotized plates. Cerarian and dorsal conical setae thin.

Ovisac white, oval. Cocoon of male white, elongate.

Material. In addition to the types, females from Eastern Siberia and Yakutia.

Distribution. Russia (Priozersk Distr. of Leningrad Province, Eastern Siberia: the Eastern Sayan near Arshan and near Irkutsk; Northern and Central Yakutia.

Mode of life. Oligophagous on the family Ericaceae; lives on the underside of the leaves of *Vaccinium vitis-idaea* L., *V. myrtillus*, *V. uliginosum* and *Ledum palustre*. In all mentioned above regions, females were collected in late July.

29. ***Phenacoccus shutovae*** Danzig (Fig. 11)

Danzig, 1971 : 380 (Russia: Primorskii Terr.); 1978 : 10; 1980 : 133.

Description. Female. Body elongate-oval, white; 3 mm long. Antennae 8–9-segmented. Circulus absent. Multilocular pores present only on abdominal sternites IV–VII, not numerous. Quinquelocular pores present everywhere on ventrum. Trilocular pores absent in medial part of ventrum; this character distinguishes this species from other *Phenacoccus* spp. Dorsal tubu-

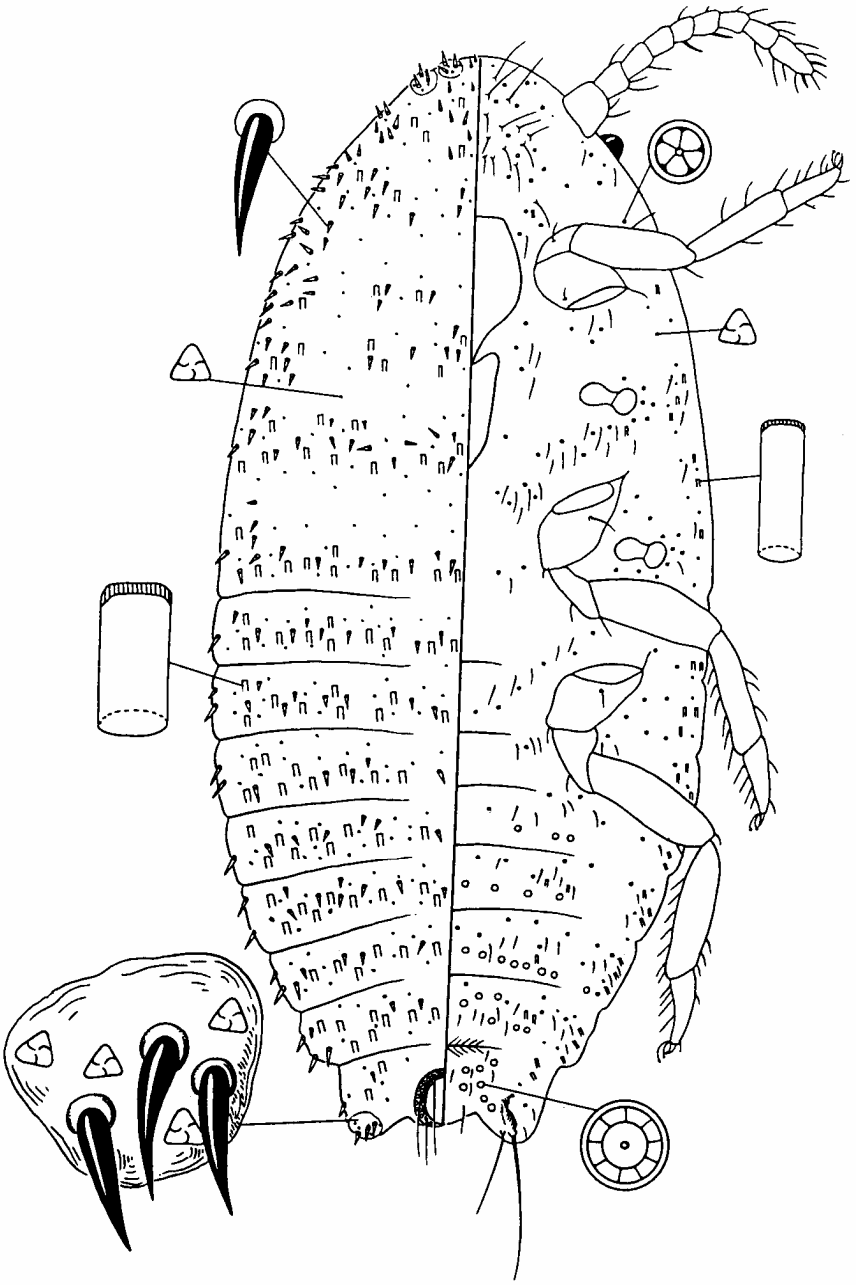

Fig. 11. *Phenacoccus shutovae* Danzig, after Danzig (1980).

lar ducts very large, numerous on all tergites. Ventral tubular ducts small, arranged along body margin; in medial part of ventrum these ducts present mainly on abdomen. Cerarii numbering 4–10 pairs: C_1, C_2 (sometimes C_3–C_6) and C_{17}, C_{18} (sometimes C_{15}, C_{16}); C_1, C_3 and C_{18} with 3–5 conical setae and 3–5 (C_{18} with 4–6) pores, situated on weakly sclerotized plates; other cerarii with 2 widely spaced conical setae and 2–3 pores. Cerarian conical setae thick. Dorsal conical setae similar to cerarian ones (holotype series); in other specimens these setae minute but thick.

Material. In addition to the types, 2 series from Sakhalin.

Distribution. Russia (Irkutsk Province, Primorskii Territory: Sovetskaya Gavan', Vanino, Levadiiskii Mt. Range; Sakhalin: Novoaleksandrovsk; the Kuril Islands: Kunashir).

Mode of life. Females and larvae develop on the underside of leaves of *Ledum macrophyllum* and *L. palustre*. Probably, larvae of both sexes overwinter. In late May (Sakhalin), larvae of females and nymphs of

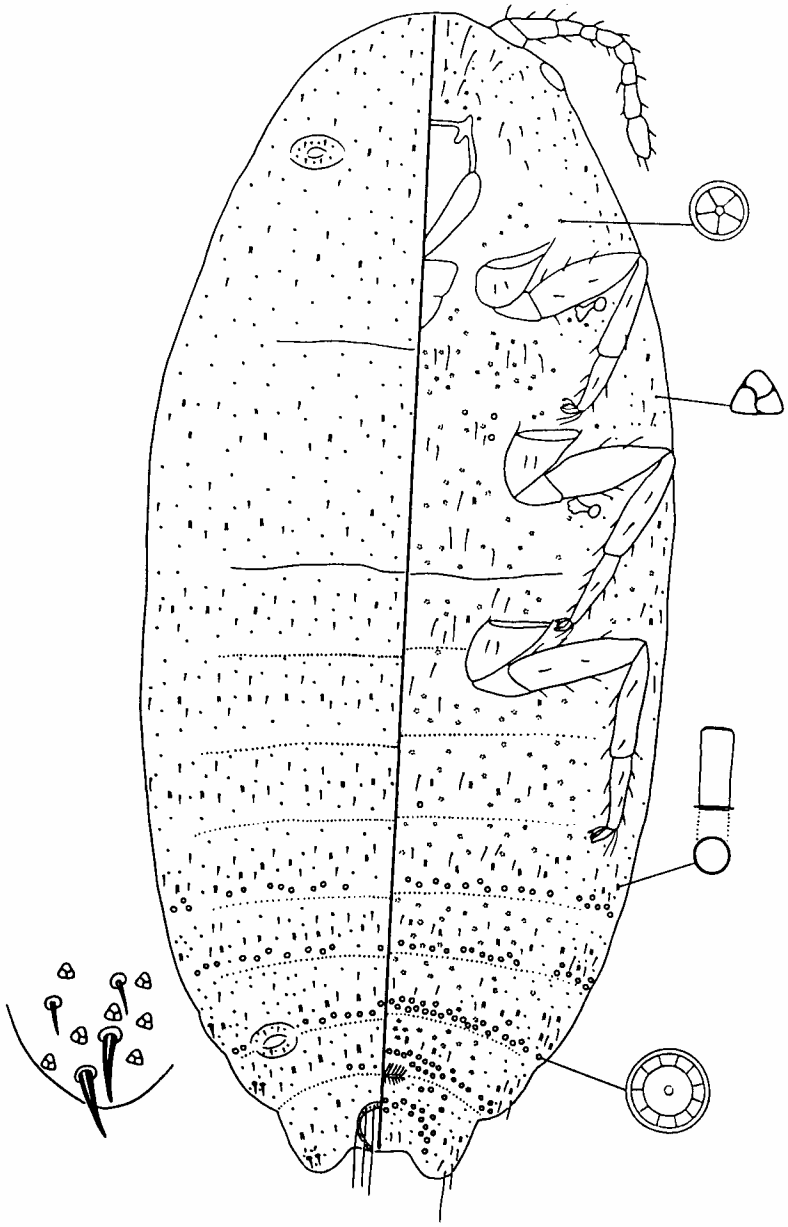

Fig. 12. *Phenacoccus arthrophyti* Arch., female, after Danzig (1968).

males were collected. On July 18 (Kunashir), oviposition took place and on July 8 (Levadiiskii Mt. Range), crawlers hatched.

35. *Phenacoccus arthrophyti* Archangelskaya, 1930 (Fig. 12)

Archangelskaya, 1930 : 78 (*arthrophytoni*; Turkmenia: Repetek, type probably lost); 1931 : 74 (*arthrophyti*, incorrect subsequent spelling); 1937 : 129; Borchsenius, 1949 : 232; Danzig: 1968 : 846; Danzig, Sugonjaev, 1969 : 116; Bazarov, Nurmamatov, 1975 : 59.

Note. The name *arthrophytoni* had been used only once (Archangelskaya, 1930); on the contrary, the name *arthrophyti* has prevailing usage and can be saved (ICZN, Article 33.3.1).

Description. Female. Body elongate-oval or elongate, yellowish, 2.5 mm long. Antennae 9-segmented. Legs well developed. Circulus absent. Multilocular pores forming transverse rows on tergites IV–VII and rows and bands on sternites IV–VIII, some pores also present on thoracic sternites. Quinquelocular pores numerous on all sternites, except sternite VIII. Dorsal

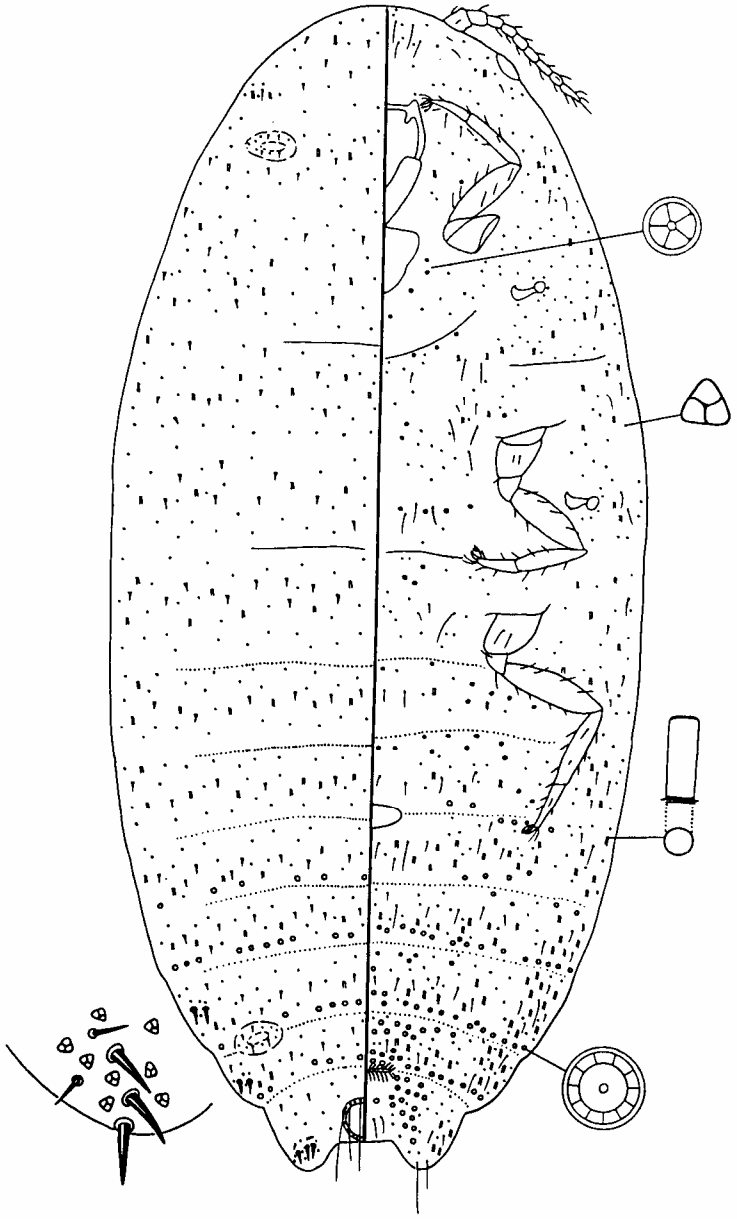

Fig. 13. *Phenacoccus halimiphylli* Danzig, female, after Danzig (1968).

tubular ducts forming transverse rows on all tergites; ventral ones forming transverse rows on sternites III–VII, rare on thorax and on anterior abdominal segments (mainly along body margin). Dorsal and ventral tubular ducts approximately of the same size. Cerarii numbering 2–3 pairs: C_{17} and C_{18} and sometimes C_{16}, C_{18} with 2 thin conical setae and 4–5 pores; C_{17} with 2 still thinner conical setae and 3–4 pores. Dorsal conical setae thin.

Ovisac friable. Eggs and larvae yellow.

Material. A total of 25 series from Turkmenia (including 2 series from Repetek), southern Kazakhstan, Uzbekistan, Tajikistan, and Mongolia.

Distribution. Sand deserts of Central Asia and Mongolia.

Mode of life. The main host plant is saxaul (*Haloxylon persicum*, *H. aphyllum*, *H. ammodendron*). Insects live at the base of stem and on young shoots, sometimes cover the host plant entirely with honeydew. The species also lives in galls of psyllids from genus *Caillardia* Berg: *C. notata* Log. and *C. robusta* Log., preferring galls of *C. notata* with more friable scales. I have also examined a material from saltworts: *Anabasis salsa*, *Halostachys begangerianum*, *Camphorosma lessingi* and *Kochia prostrata*. In southern Kazakhstan, the mealybugs were collected from *Arte-*

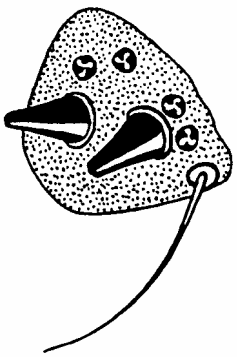

Fig. 14. *Phenacoccus salsolae* Danzig, female, C_{18}, after Danzig (1975).

misia terrae-albae, *A. cina* and *Artemisia* spp. The species is bivoltine. The development in psyllid galls was described in detail by Danzig (1968), Danzig and Sugonjaev (1969), and Bazarov and Nurmamatov (1975).

36. ***Phenacoccus halimiphylli*** Danzig (Fig. 13)

Danzig, 1968 : 846 (southern Tajikistan, Vakhsh valley near Kzyl-Kala and Ganzhina); Danzig, Sugonjaev, 1969 : 116; Bazarov, Nurmamatov, 1975 : 60.

Description. Female. The species is very similar to *Ph. arthrophyti*, but differs in the presence of circulus, much fewer number of quinquelocular pores, and presence of trilocular pores in the medial part of the ventrum.

Material. In addition to the types, a series from the Hissar Mt. Range, near the mouth of the Iskander-Dar'ya River.

Distribution. Tajikistan, Hissar Mt. Range and Vakhsh valley.

Mode of life. Monophagous on *Halimiphyllum gontsharovii*. It inhabits deserts of the Vakhsh valley and mountain arid zones up to an altitude of 1700 m. In the mountains, the mealybugs live either openly (on leaves, fruits, and stems) or in fruits damaged by caterpillars of Lepidoptera. In deserts, the mealybugs live in the fruits only. I reared from such fruits adults of *Aristotelia zygophyllivorella* Vl. Kuzn. (Gelechiidae), but probably, the mealybugs also live in fruits, damaged by other species of moths. The mealybugs penetrate into fruit through the opening made by a caterpillar; the mealybugs were never found in intact fruits.

I studied the development of two generations of the species. Oviposition of the first generation occurs in the 2nd and 3rd ten-day periods of May; at the end of May or in early June, the crawlers of the second generation hatch. Oviposition of the second generation occurs in the last third of June. At this time, in the stony desert near Kzyl Kala the fruits of *Halimiphyllum gontsharovii* dehisce and fall. The oviposition occurs openly on branches and carpels. Ovisacs protect females and eggs from dehydration. At the same time, the crawlers of the next generation begin to hatch; probably, they migrate in the shelters. The subsequent development of the species was not studied.

37. ***Phenacoccus salsolae*** Danzig, 1975 (Fig. 14)

Danzig, 1975 : 54 (Mongolia).

Description. Female. Body elongate-oval; 3 mm long. Antennae 9-segmented. Legs with comparatively short parts, of different thickness. Circulus absent. Multilocular pores forming transverse rows on thoracic and abdominal tergites; ventral multilocular pores forming rows and bands on sternites III–VIII and rare on thorax. Quinquelocular pores present on all segments, except two posterior ones; occasionally (in specimens from Kazakhstan) rare or absent. Tubular ducts forming transverse rows on all segments; ventral tubular ducts arranged in marginal band, occur on thorax, and forming transverse rows on all sternites, except on sternite VIII. Dorsal and ventral ducts of the same size. Cerarii numbering 3 pairs: C_{16}–C_{18}. C_{18} with 2 unusually thick and short conical setae, one long slender seta and 6 trilocular pores, situated on heavily sclerotized plate. C_{17} with 2, C_{16} with 1–2 short and thick conical setae, and with 2–3 or 1–2 pores accordingly. Dorsal conical setae short, with broad base.

Taxonomic notes. The species is similar to *Ph. arthrophyti*, specialized pest of saxaul, rarely feeding on other saltworts. *Ph. salsolae* differs in the construction of C_{18}: unusually thick conical, auxiliary slender seta, sclerotized plate, and also in small number of quinquelocular pores, which are occasionally absent.

Material. 12 females of type series and 3 females from Kazakhstan.

Distribution. Kazakhstan (Alma-Ata Province, right bank of the Ili River, Tas-Murun Vill.); Mongolia (Bayan-Hongor and Ömnögovi Aimaks).

Mode of life. All the specimens were collected on roots of saltworts; in Kazakhstan on *Bassia sedoides*, in Mongolia on *Salsola gemmascens passerina*.

38. ***Phenacoccus nurmamatovi*** Bazarov, 1979 (Fig. 15)

Bazarov, 1979 : 44 (Tajikistan: Vakhsh valley, Ganzhina).

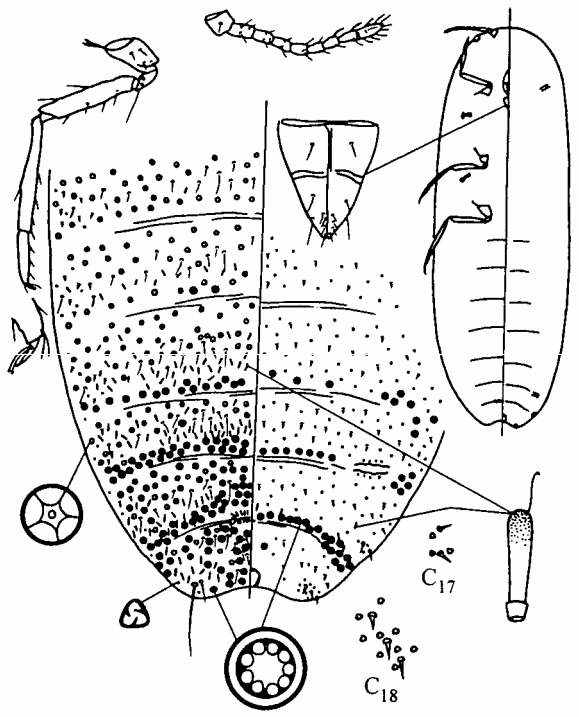

Fig. 15. *Phenacoccus nurmamatovi* Baz., female, after Bazarov (1979).

Description. Female. Body elongate, parallel-sided, pale green, up to 4 mm long. Antennae 8- or 9-segmented. Legs with slender segments. Circulus absent. Multilocular pores forming transverse rows on tergites V–VII, present on 4–5 posterior abdominal sternites and, occasionally, near spiracles. Quinquelocular pores numerous. Dorsal tubular ducts present on posterior abdominal segments only, in groups along margins and in medial part of tergites V–VII. Ventral tubular ducts numerous in medial part of posterior segments; singular ventral ducts present along margins of metathorax and anterior abdominal segments. Dorsal and ventral ducts of the same size. Cerarii numbering 2–3 pairs: C_{17}, C_{18} and occasionally C_3. C_{18} with 3 conical setae and 6–9 trilocular pores, C_{17} with 2 conical setae and 2 pores, C_3 with 5 conical setae and 3 pores. Cerarian and dorsal conical setae thin.

Material. In addition to the holotype, a series of females from the Hissar Mt. Range.

Distribution. Tajikistan; southern slopes of the Hissar Mt. Range, Kondara; Vakhsh valley, Ganzhina.

Mode of life. The species lives under the leaf sheaths of gramineans; it was described from *Avena*. Females were collected in late May and in early June.

39. ***Phenacoccus tergrigorianae*** Borchsenius, 1956 (Fig. 16)

Borchsenius, Ter-Grigorian, 1956 : 21 (Armenia: Azizbekov and Aginskii Districts); Ter-Grigorian, 1973 : 163; Williams, Kozarzhevskaya, 1988 : 761 (lectotype designation).

Description. Female. Body oval, dark rose-colored; 2.5 mm long. Antennae 8-segmented. Legs not large, with thick parts, without translucent pores on femora and tibiae. Circulus absent. Multilocular pores occur on abdominal tergites V–VII and sternites III–VIII. Quinquelocular pores absent. Tubular ducts of two sizes. On dorsum, large ducts forming transverse rows on all tergites; small ones arranged in group on tergite VII. On ventrum, large ducts, similar to dorsal ones, situated along body margin; small ducts forming transverse rows and bands in medial part of abdominal sternites; singular ventral small ducts present on thorax. Large tubular ducts more than twice as large as small ones. Cerarii numbering 3 pairs: C_3, C_{17}, and C_{18}. C_{18} with 3 thin conical setae and 7–10 pores, situated on weakly sclerotized plate. C_{17} with 2 shorter conical setae and 3–4 pores. C_3 with 3–4 small conical setae and 4–5 pores. Dorsal conical setae short.

Larvae I–III described by Ter-Grigorian (1973).

Material. The type series.

Distribution. Armenia.

Mode of life. The species lives on roots of wheat and wild Poaceae in the wheat fields. However, Ter-Grigorian (1973) noted that the summer generation of this species could inhabit overground parts of plants, not only gramineans, but also dicotyledons.

A bivoltine species; larvae II and III overwinter.

40. ***Phenacoccus emansor*** Williams et Kozarzhevskaya, 1988 (Fig. 17)

Williams, Kozarzhevskaya, 1988 : 760 (The Netherlands).

The species is very similar to *Ph. tergrigorianae* and differs in the number of cerarii (6–8 pairs; in addition to C_3, C_{17} and C_{18}, C_1, C_2 and other cerarii often present on thorax and abdomen), 9-segmented antennae, and presence of translucent pores on hind femur and tibia. Circulus occasionally present.

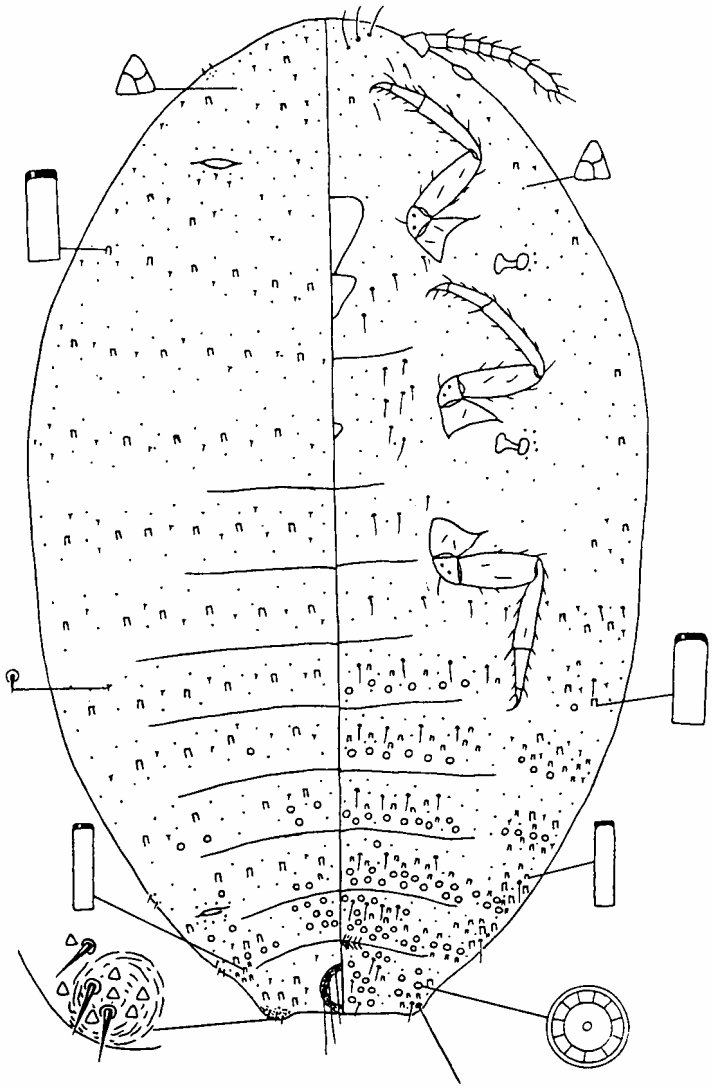

Fig. 16. *Phenacoccus tergrigorianae* Borchs., female, lectotype.

Material. In addition to 2 specimens of the type series, 2 series from Turkmenia: artificial reservoir near Ashkhabad and Kopet Dagh, 43 km S of Bakharden.

Distribution. *Ph. emansor* is the second (after *Ph. avenae*) species of *Phenacoccus*, recorded recently on bulbs of ornamental plants imported from the Netherlands. The species was found in Moscow (Main Botanical Garden of the Russian Academy of Sciences), England, and the USA. Here, this species is recorded from wild plants in Turkmenia for the first time, which confirms the assumption in the original description of this species about its introduction to the Netherlands from Turkey.

Mode of life. The species was found by a quarantine inspection on bulbs of irises (*Iris, Xiphium*) and lilies. In Turkmenia, the species was found in sand desert and in desert mountains under the leaf sheaths of *Iris* and *Eremurus* (Liliaceae). Females were collected in mid-May.

41. ***Phenacoccus kochiae*** sp. n. (Fig. 18)

Description. Female. Body oval; 3 mm. Antennae 9-segmented. Legs with slender segments; hind femur and tibia with translucent pores. Spiracles with groups of trilocular poes. Circulus absent. Multilocular pores present on dorsal and ventral sides of abdomen; singular multilocular pores occasionally occurring near hind spiracles. Quinquelocular pores absent. Tubular ducts present on both sides of abdomen; dorsal and ventral ducts of the same size. Cerarii numbering 2 pairs: C_{18} with 3 conical setae and several pores, situated on sclerotized plate; C_{17} with 2 conical setae and 5 pores.

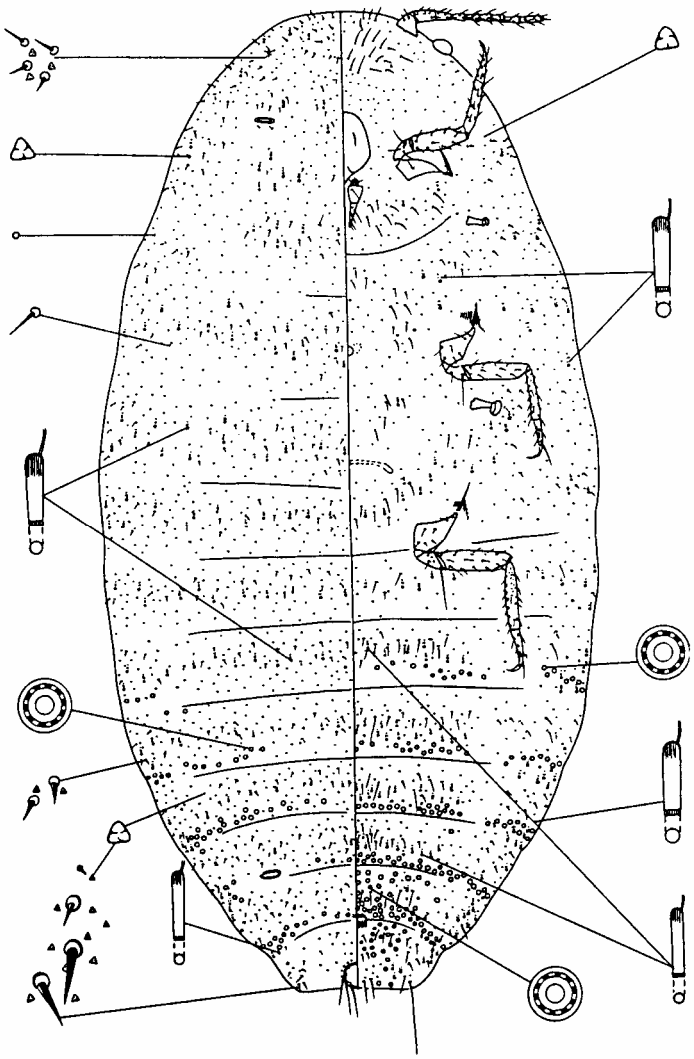

Fig. 17. *Phenacoccus emansor* Will. et Kozarzh., after Williams and Kozarzhevskaya (1988).

Cerarian conical setae thin. Dorsal setae thin, flagellate.

Taxonomic notes. The new species is similar to *Ph. phenacoccoides* and differs in the oval body and more numerous multilocular pores on both sides of the body. The host plants of the two species are also different; *Ph. phenacoccoides* is oligophagous on Poaceae and has never been collected from dicotyledons.

Holotype and paratypes: Kazakhstan, Alma-Ata Province, near Lepsy Station, between Lake Balkhash and the railway, sandy desert, on *Kochia prostrata*, 11.VI.1963 (G. Matesova), slide no. 1693, 4 ♀ on 4 slides.

42. ***Phenacoccus schmelevi*** Bazarov, 1980 (Fig. 19)

Bazarov, 1980 : 404 (Tajikistan: the Eastern Pamirs, Gorno-Badakhshanskaya Province, Lake Bulun Kul).

Description. Female. Body oval, pale pink; 2 mm long. Antennae 9-segmented. Legs short, with slender segments, without translucent pores. Circulus small, oval; sometimes absent. Multilocular pores present on both sides of abdomen only. Quinquelocular pores absent. Tubular ducts rambling on head and forming transverse rows on thoracic and abdominal tergites; ventral multilocular pores situated along body margin, forming transverse rows on abdomen; singular ventral multilocular pores present in medial part of cephalothorax. Dorsal and marginal ventral tubular ducts larger than other ones. Cerarii numbering 5 pairs: C_1, C_2 and C_{16}–C_{18}. All cerarii with 2 short conical setae. C_{18} with 7, other cerarii with 1–2 trilocular pores. C_{18} situated on small prominence.

Taxonomic notes. I have not seen the material on this species. The description is given according to the description and figure by B.B. Bazarov.

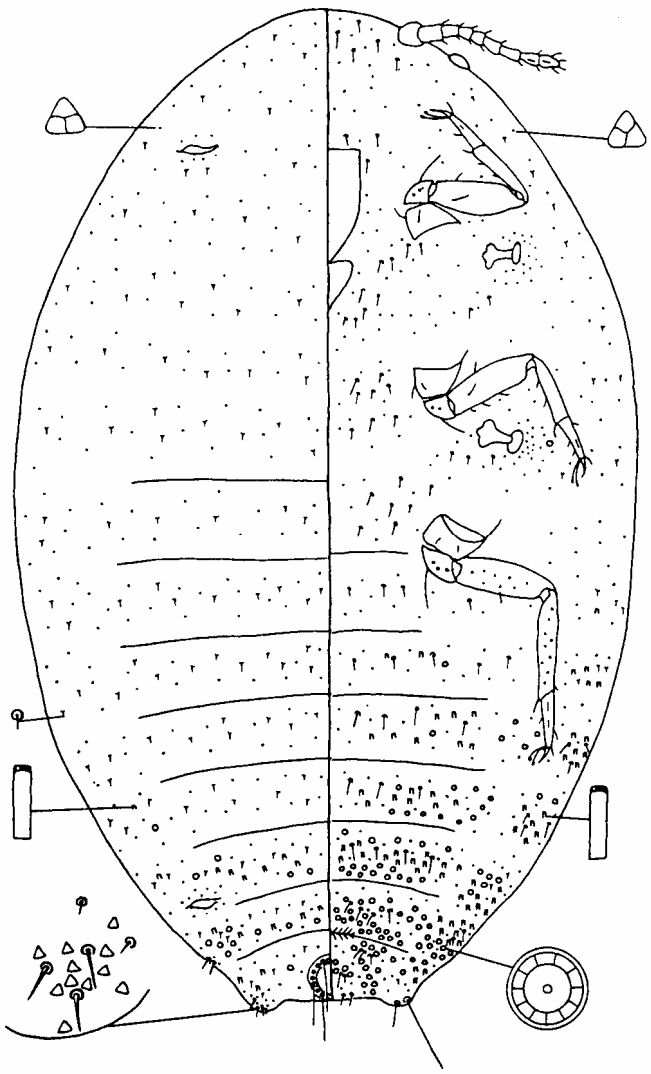

Fig. 18. *Phenacoccus kochiae* Danzig, sp. n., female, holotype.

Distribution. The species is known from the type locality only.

Mode of life. The egg-laying females were collected in late June on roots of *Silene pamirensis* in the mountain sandy and rubbly desert.

43. ***Phenacoccus setiger*** Borchsenius, 1949 (Fig. 20)

Borchsenius, 1949 : 223 (Kazakhstan, Aktyubinsk Province; Russia, Orenburg Province; lectotype, designated here, ♀, "*Phenacoccus setiger* Borchs., Aktyubinsk, virgin lands, on soil, 20–21.VII.1937, plot 1–60," slide no. 43–38; paralectotypes: "*Phenacoccus setiger* Borchs., Saverovka Vill. near Orsk, Orenburg Province, couch-grass, sweeping no. 5," slide no. 171–38, 2 ♀; ibidem, but "old fallow land, sweeping no. 5, 9.VII.1936," slide no. 170–38, 1 ♀; ibidem,

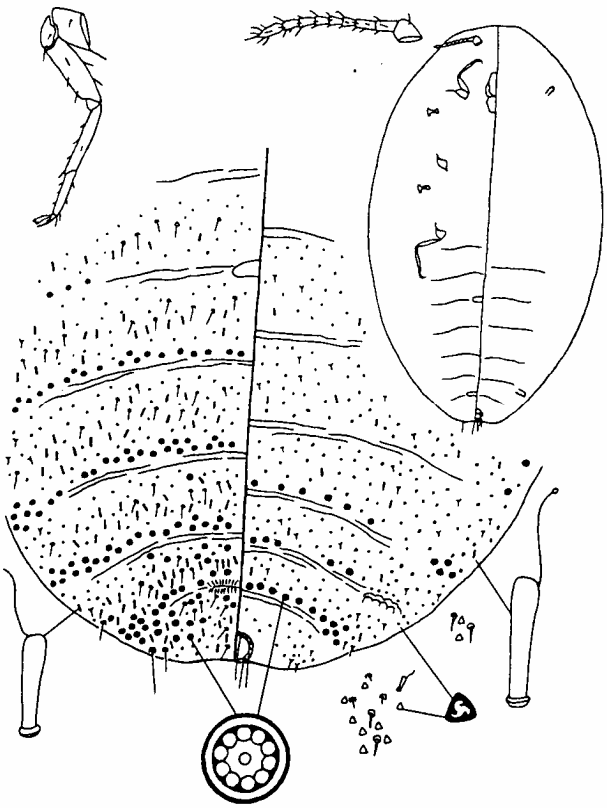

Fig. 19. *Phenacoccus schmelevi* Baz., female, after Bazarov (1980).

but, "virgin lands, sweeping no. 6, 21.II.1936," slide no. 173–38, 1 ♀; ibidem, but "sweeping no. 2, *Stipa lessingiana*, 8.II.1937," slide no. 163–38, 2 ♀).

—*kaplini* Danzig, 1983 : 514 (Turkmenia: Repetek), syn. n.

—*gobicus* Danzig, 1987 : 577 (Mongolia: Bayan-Hongor Aimak), syn. n.

Description. Female. Body elongate, 1.8 mm long. Antennae 9-, rarely 8-segmented. Legs well developed, with long and thin tibiae and tarsi; tibia more than 3 times as long as tarsus without claw. Circulus large, oval. Multilocular pores situated on 3 posterior abdominal sternites. Quinquelocular pores usually absent; sometimes singular pores present. Dorsal tubular ducts forming transverse rows on thorax and bands on abdomen. Ventral ducts somewhat smaller than dorsal ones, arranged along margin of metathorax and abdomen and forming transverse rows on abdominal sternites IV–VII; singular ventral ducts present in medial part of thorax. Cerarii numbering 3–7 pairs: C_1–C_4 and C_{16}–C_{18}. C_1–C_4 with 2–3 conical setae and 4–5 pores, occasionally absent; C_{18} with 2 conical setae and 7–8 trilocular pores; other cerarii with 2 conical setae and

2–3 pores. C_{18} situated on small sclerotized plate. Cerarian conical setae thin. Dorsal conical setae short and thin. The structure of the conical setae of C_{18} in the type series is not clear, because the only conical seta has remained in one paralectotype. So, in Fig. 20, C_{18} of *Ph. kaplini* has been shown.

Taxonomic notes. The synonymy referred to above is based on comparison of the types; the differences between the types are within intraspecific variation.

Material. The types of *Ph. setiger*, *Ph. kaplini* and *Ph. gobicus*, 2 ♀ from Kazakhstan (Chimkent Province) and a series of females from Turkmenia (Krasnovodsk Province).

Distribution. Russia, Orenburg Province; Kazakhstan, Aktyubinsk and Chimkent Provinces, the Khantau Mountains; Turkmenia, Repetek, and also Akhcha Kuima in Krasnovodsk Province.

Mode of life. The species lives in the steppes, on stems of Poaceae; it was collected on *Stipa lessingiana*, *S. gobica*, *Elytrigia repens* and *Stipagrostis karelinii*.

44. ***Phenacoccus kokandicus*** Nurmamatov, 1986 (Fig. 21)

Nurmamatov, 1986 : 93 (Tajikistan: the Kuraminskii Mt. Range).

The species is very similar to *Ph. setiger* Borchs. and differs in the thicker and shorter tibiae, which are only twice as long as tarsi. Nurmamatov (1986) described and figured three conical setae in C_{18}. However, the holotype and a paratype, available to me, have (similar to *Ph. setiger*) two conical setae in C_{18}, but these setae are much thinner than those in *Ph. setiger*.

Material. The holotype and a paratype.

Distribution. The type locality only.

Mode of life. The species lives under the leaf sheaths of *Piptatherum kokanicum*; was collected on rocky slope at an altitude 2000 m. Females and larvae of last stage were found in early June.

45. ***Phenacoccus abditus*** Borchsenius, 1949 (Fig. 22)

Borchsenius, 1949 : 226 (Tajikistan; lectotype, designated here, ♀, "*Phenacoccus abditus* Borchsenius, Tajikistan, the Hissar Mt. Range, near Ghushary Vill., under the leaf sheath of *Cynodon dactylon*, 19.VII.

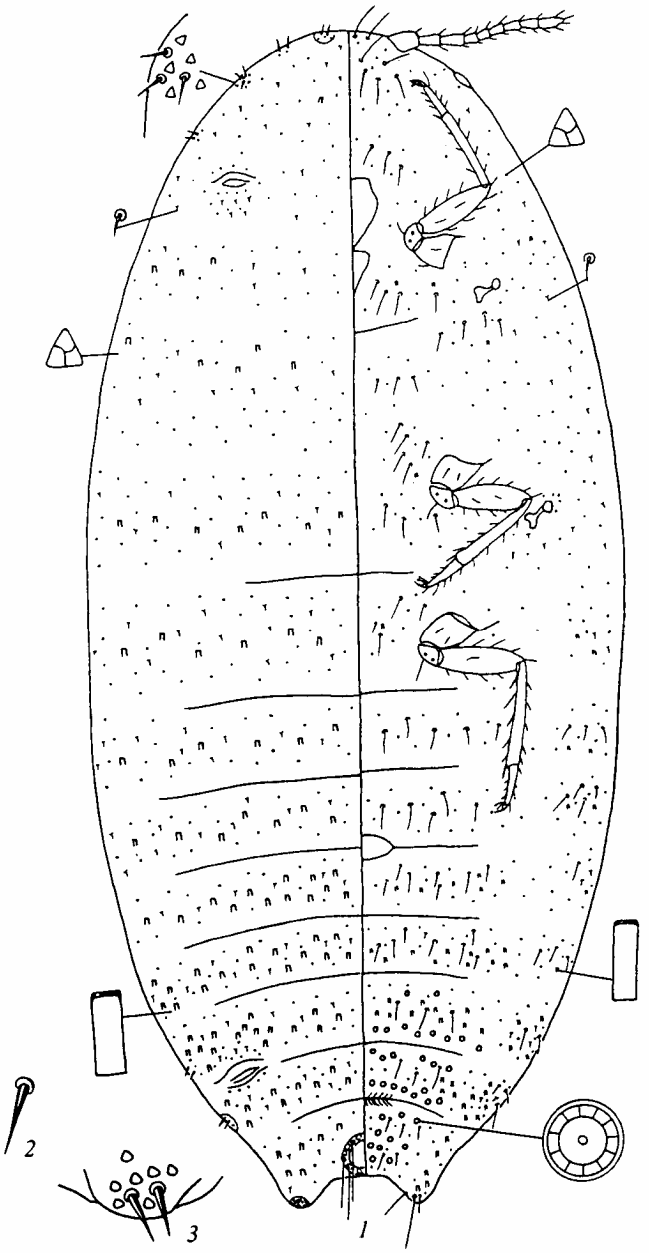

Fig. 20. *Phenacoccus setiger* Borchs.: (*1*) female, lectotype; (*2*) C_{18}, conical seta, paralectotype; (*3*) C_{18} (*Ph. kaplini* Danzig, holotype).

1944, N. Borchsenius," slide no. 34–45, specimen in black circle; paralectotypes: series of females with the same data; "*Phenacoccus abditus* Borchsenius, near the Highway Samarkand–Kurgan Tyube, on *Cynodon dactylon*, 22.VI.1944, N. Borchsenius," slide no. 34–45 (the same no. as that in lectotype?), 1 ♀; also a female on the same slide with paralectotype of *Ph. cynodontis* from Tajikistan, near Stalinabad (Dushanbe); Bazarov, Nurmamatov, 1975 : 58.

—*bicerarius* Borchsenius, 1949 : 225 (Armenia; lectotype, designated here, ♀, "*Phenacoccus bicer-*

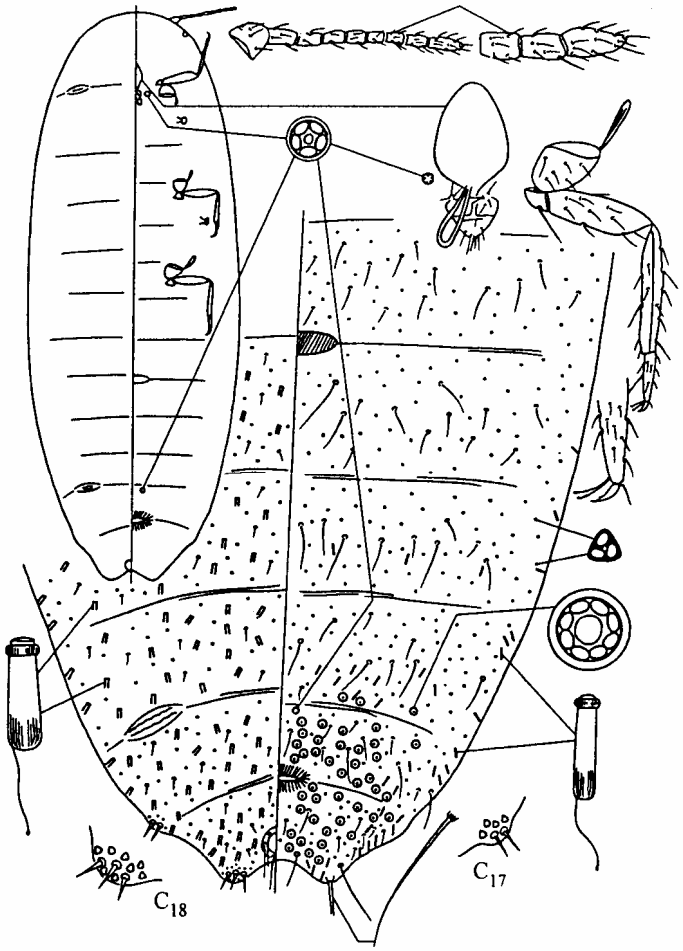

Fig. 21. *Phenacoccus kokandicus* Nurm., female, after Nurmamatov (1986).

arius, Armenia, Airum Station, left slope, under the leaf sheath of oat, 9.VI.1947, N. Borchsenius," slide no. 241–47, specimen in black circle; paralectotypes: series of females with the same data; "*Phenacoccus* "bispinus" southern vicinity of Erevan, under the leaf sheaths of *Sorghum*, 1.IX.1948, N. Borchsenius, no. 660," slide no. 272–48, specimen in black circle; the second specimen on this slide is *Peliococcus kimmericus*), syn. n.; Matesova, 1968 : 110, Ter-Grigorian, 1973 : 170; Kosztarab, Kozár, 1988 : 126.

Description. Female. Body elongate, pink, up to 2 mm long. Antennae 9-segmented. Legs with slender segments, apices of tibiae with translucent pores. Circulus absent. Dorsal multilocular pores absent, or singular pores present on posterior abdominal segments. Ventral tubular ducts present on sternites VI–VIII. Quinquelocular pores not numerous or absent. Dorsal tubular ducts numerous, forming transverse rows on thorax and bands on abdomen. Ventral tubular ducts smaller than dorsal ones, arranged in marginal band on metathorax and abdomen, scanty in medial part of abdominal segments; singular ventral ducts present on thorax. Cerarii numbering 2–3 pairs: C_{17}, C_{18} and sometimes C_{16}. C_{18} with 2–3 conical setae and 5–6 trilocular pores, situated on small sclerotized plate; C_{17} with 2 conical setae and 2–4 pores, C_{16} with 2 conical setae and 1–2 pores. Cerarian and dorsal conical setae thin.

Variability. The number of the quinquelocular pores is a subject to geographical and individual variation. In specimens from Tajikistan, these pores are always present and situated near the mouthparts, fore and middle coxae; occasionally singular pores are present on anterior abdominal segments. In specimens from Armenia, Kazakhstan, Turkmenia, and Yakutia, quinquelocular pores are always absent. In Georgian specimens these pores are also absent or singular pores occur near the mouthparts.

Taxonomic notes. The synonymy is based on a comparison of the types. *Ph. bicerarius* differs from *Ph. abditus* in the absence of the quinquelocular pores, but this character varies between specimens.

Material. In addition to the types of *Ph. abditus* and *Ph. bicerarius*, 7 series from Tajikistan, Armenia, Georgia, Kazakhstan, Turkmenia, and Yakutia.

Distribution. Russia: central Yakutia; Georgia (Borzhomi and Gagry Districts); Armenia (vicinity of Erevan and Airum Station), Turkmenia (Kopet Dagh, Kara-Kala), Kazakhstan (Alma-Ata and East Kazakhstan provinces), Tajikistan (vicinity of Dushanbe and Kurgan Tyube, the Hissar Mt. Range near Gushary Vill. and Kondara, the Darvaz Mt. Range, the Western Pamirs: Khaburabad Pass, Vanch Mt. Range) [and also Uzbekistan (Kagan); label is probably erroneous].

Mode of life. The species usually inhabits the valleys of the mountain rivers; in the Pamirs was found at an altitude of 2500 m in the wormwood saline deserts; in Yakutia was collected in pine forest. Mealybugs live under the leaf sheaths of the gramineans: *Sorghum*, *Piptatherum, Avena, Leymus angustus*, and most commonly on *Cynodon dactylon* and *Festuca valesiaca*.

46. ***Phenacoccus incertus*** (Kiritshenko, 1940) (Fig. 23)

Kiritshenko, 1940b : 124 (*Ripersia*; Ukraine: Kopani, Kherson Province; Odessa; the Crimea, Simferopol; lectotype, designated here, ♀, "*Ripersia*, *Phenacoccus*, Kopani Vill., Kherson Distr., *Festuca*, 1931;" paralectotypes: 3 larvae on the same slide. The slide has no number but has a pencil inscription "*incerta*" on the label and "*Phenacoccus incertus* (Kir.), det. Borchsenius"); Borchsenius, 1949 : 225; Tereznikova, 1975 : 219; Marotta, 1992 : 85.

—*caulicola* Tereznikova, 1979 : 49 (*Euripersia*; Ukraine: the Crimea), syn. n.

Description. Female. Body oval, from pink to lemon yellow; 2.5 mm. Antennae 9-segmented. Legs comparatively short, with thick hind femur. Anal ring with incomplete outer row of pores and short slender setae. Circulus absent. Multilocular pores situated on 3–4 posterior sternites of abdomen. Quinquelocular pores absent. Dorsal tubular ducts forming transverse rows on all tergites. Ventral ducts forming rows and bands on abdomen, arranged along body margin; groups of ventral ducts and singular ones also occur on thorax. Dorsal and marginal ventral ducts twice as large as majority of ventral medial ones, but some medial ventral ducts of the same size as dorsal ducts. Cerarii numbering 1–2 pairs, C_{17} and C_{18}. C_{18} with 2 thin conical setae and several trilocular pores. Dorsal setae long, slender.

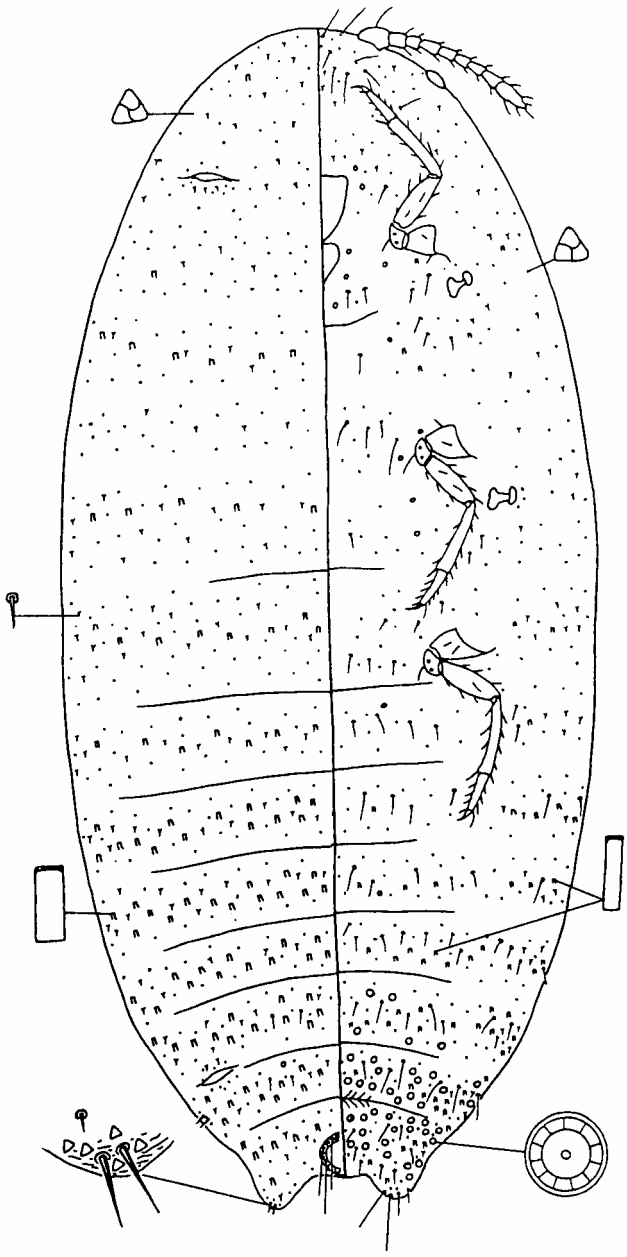

Fig. 22. *Phenacoccus abditus* Borchs., female, lectotype.

Female larva III was described by Kiritshenko (1940b) and Tereznikova (1975).

Taxonomic notes. As noted by Borchsenius (1949), Kiritshenko described *Ph. incertus* from female larva

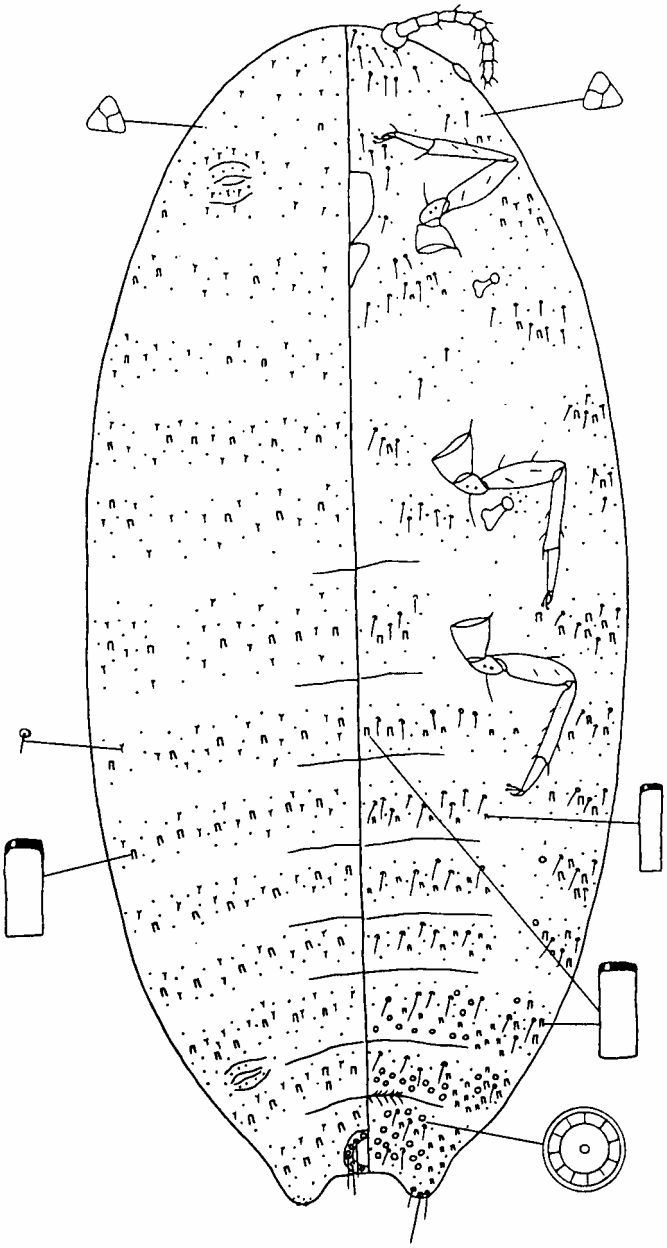

Fig. 23. *Phenacoccus incertus* (Kir.), female, Ukraine (Kherson Province).

III, supposing that it was adult female. Only one type slide with one female was available to me and I am designating it here as a lectotype. Probably, this specimen was described by Borchsenius (1949) and Tereznikova (1975). The drawing by Tereznikova differs from the specimen mentioned above in the absence of ventral tubular ducts in the medial part of thorax and large ones in the medial part of the ventral surface of the body (perhaps these ducts were overlooked). Also, Tereznikova figured C_{18}, which is absent in the lectotype, but perhaps she reconstituted C_{18}, basing on the openings of conical setae.

The synonymy is based on a comparison of the types.

Material. The types of *Ph. incertus*, a paratype of *Ph. caulicolus* and 2 females from Uralsk Province, Yanvartsevo.

Distribution. Southern Ukraine, including the Crimea, Moldova, western Kazakhstan, Italy.

Mode of life. The species lives in the steppes on the roots of *Festuca ovina, Stipa* and *Ammophila arenaria*; it was also found under the leaf sheaths of an undetermined graminean.

47. ***Phenacoccus phenacoccoides*** (Kiritshenko, 1932) (Fig. 24)

Kiritshenko, 1932 : 136 (*Trionymus*; Ukraine, Odessa, lectotype, designated here, ♀: "*Phenacoccus phenacoccoides* mihi, Ukraine, Odessa, UGSI, under the leaf sheaths of couch-grass, 20.VI.1929, A. Kiritshenko, slide without number; paralectotype: 1 ♀ with the same label data); 1940a : 121; Borchsenius, 1949 : 228; Tereznikova, 1975 : 222; Kosztarab, Kozár, 1988 : 131; Tang, 1992 : 433 (*Caulococcus*).

—*cynodontis* Borchsenius, 1949 : 229 (Tajikistan, vicinity of Voroshilovabad (now Dusti), lectotype, designated here, ♀ "*Phenacoccus cynodontis* Borchs., Tajikistan, vicinity of Voroshilovabad (now Dusti), zon[al] station of subtropics, under the leaf sheaths of *Cynodon dactylon*, 6.VI.1944, N. Borchsenius, no. 167;" also, one slide (with the same data on the label) with fragments of an undetermined insect; Uzbekistan, vicinity of Kagan, under the leaf sheaths of *Cynodon dactylon*, 16.VIII.1944, N. Borchsenius, no. 245," slide no. 35–45), syn. n.

—*eugeniae* Bazarov, 1967 : 67 (Tajikistan, the South-Western Pamirs, Lake Zor Kul), syn. n.; Bazarov, Nurmamatov, 1975 : 58.

—*bazarovi* Ben-Dov, 1994, syn. n., replacement name for *Ph. eugeniae* Bazarov, 1967, homonym of *Ph. eugeniae* Takahashi, 1942.

Description. Female. Body elongate, pink, 3.5 mm long. Antennae 9-, rarely 8-segmented. Legs comparatively short, often with tick hind femur; hind femur and tibia sometimes with translucent pores. Spiracles with groups of trilocular pores. Circulus usually absent. Dorsal multilocular pores occasionally present on abdominal segments. Ventral multilocular pores forming transverse rows and bands on 3–4 posterior abdominal segments; sometimes singular pores present along body margin. Quinquelocular pores often absent. Tubular ducts occasionally present on posterior abdominal tergites. Ventral tubular ducts arranged along abdominal margin and in medial part of sternites III–VI; ducts vary in number. Dorsal and ventral ducts of the same size. Cerarii numbering 2–3 pairs: C_{17}, C_{18} and sometimes C_{16}, situated on sclerotized plates. C_{18} with 2–3 conical setae and 5–6 trilocular pores, C_{16} and C_{17} with 2 conical setae and 3–4 pores. Cerarian setae thin. Dorsal setae thin, flagellate.

Variability. The species is characterized by variability in the number of multilocular pores and tubular ducts and the presence or absence of quinquelocular pores. Quinquelocular pores are always absent in specimens from the western part of the species range and occasionally present in specimens from the eastern populations. These pores occur in females from Pamirs and Mongolia, and in some females from Kazakhstan and Yakutia. Quinquelocular pores vary in number between specimens. Thus, in Mongolia, the number of pores varies from 1 to 5, rarely 8. One series can include females with and without pores. Circulus is usually absent in this species, but in one of the two fe-

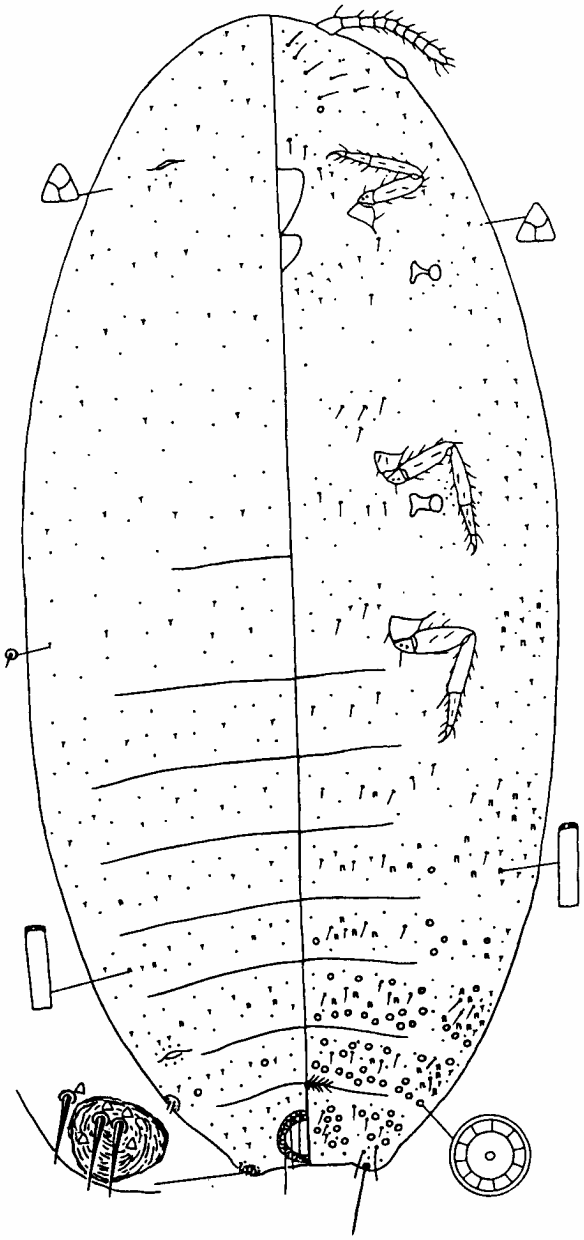

Fig. 24. *Phenacoccus phenacoccoides* (Kir.), female, lectotype.

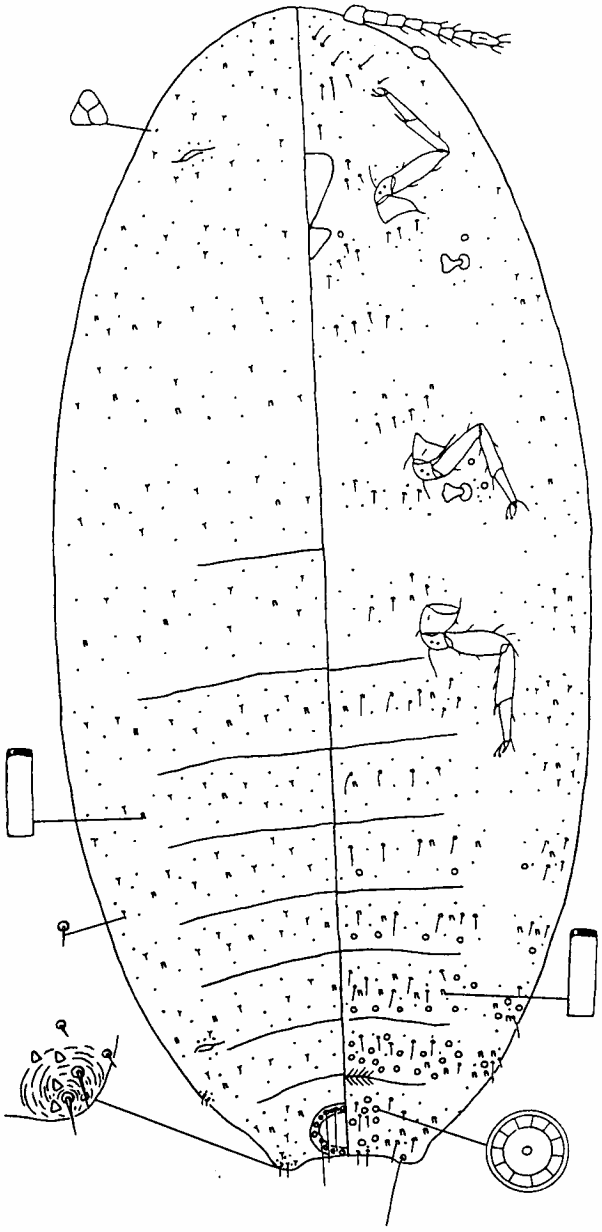

Fig. 25. *Phenacoccus kazakhstanicus*, sp. n., female, holotype.

males from Yakutia the circulus was found. In types of *Ph. cynodontis* outer row of pores of anal ring is partly reduced. This character is subject to variation in two series from Kazakhstan.

Taxonomic notes. The synonymy is based on the comparison of the types. *Ph. bazarovi* differs from *Ph. phenacoccides* in the presence of a small number of quinquelocular pores only. This character varies between specimens of *Ph. phenacoccoides* (see Variability), as well as in other species of the genus. So, I am placing *Ph. bazarovi* in synonymy with *Ph. phenacoccoides*. *Ph. cynodontis* is known from several females, which differ from *Ph. phenacoccoides* in the reduction of the outer row of pores of the anal ring. The above mentioned variability of this character suggests that *Ph. cynodontis* is a junior synonym of *Ph. phenacoccoides*.

Material. In addition to the types of *Ph. phenacoccoides, Ph. bazarovi*, and *Ph. cynodontis*, females from Russia (Volgograd Province, Daghestan, Eastern Siberia: the Eastern Sayan, central Yakutia), Ukraine (the Crimea), Kazakhstan (Uralsk, Aktyubinsk, Akmolinsk, and Alma-Ata provinces), Uzbekistan (vicinity of Kagan) and Mongolia.

Distribution. Russia (Voronezh and Volgograd Provinces, Daghestan, Eastern Siberia: the Eastern Sayan, Yakutia), Ukraine (including the Crimea), Moldova, Georgia, Kazakhstan (widely), Tajikistan (vicinity of Dushanbe, Kurgan-Tyube, Dusti, the South-Western Pamirs), Uzbekistan (vicinity of Kagan). Hungary, Poland, Germany, central Mongolia, China.

Mode of life. The species inhabits plain and mountain steppes, occurs in the deserts and in saline lands. In the Western Pamirs; it was found at an altitude of 3400 m. It lives in axils of lower leaves and on roots of wild Poaceae: *Elytrigia repens, Cynodon dactylon, Elymus, Poa nemorosa, Festuca ovina, Aneurolepidium, Puccinellia*. Females were collected from June to September.

48. ***Phenacoccus kazakhstanicus*** Danzig, sp. n. (Fig. 25)

Description. Female. Body elongate, 2.5 mm long. Antennae 9-segmented. Legs with comparatively short segments and thick hind femur; hind femur and tibia with translucent pores. Circulus absent. Multilocular pores situated on five posterior abdominal sternites; singular pores occur near spiracles and mouthparts. Quinquelocular pores absent. Dorsal tubular ducts forming rows on meso- and metathorax, and on abdomen; singular dorsal ducts occur along margin of anterior part of body. Ventral tubular ducts not numerous, of the same size as dorsal ones. Cerarii numbering 2 pairs: C_{18} with 2 conical setae and 6 trilocular pores, C_{17} with 2 conical setae and 2 pores. Cerarian setae thin. Dorsal setae thin, flagellate.

Taxonomic notes. The new species is similar to *Ph. phenacoccoides* and differs in larger tubular ducts, which are present everywhere on the dorsum. The groups of trilocular pores near spiracles, characteristic of *Ph. phenacoccoides,* are absent in the new species.

Holotype. ♀, Kazakhstan, Dzhambul Province, Budennovka Vill., a river bank, on undetermined species of Poaceae, 9.VI.1964 (G. Matesova).

49. ***Phenacoccus alticola*** Bazarov, 1967 (Fig. 26)

Bazarov, 1967 : 61 (Tajikistan, the South-Western Pamirs, Lake Zor Kul); Bazarov, Nurmamatov, 1975 : 58.

Description. Female. Body elongate; 2.5 mm long. Antennae 7-segmented. Legs with comparatively short segments; hind tibiae with translucent pores. Spiracles as in *Ph. phenacoccoides*, with compact groups of trilocular pores. Circulus absent. Multilocular pores present on two posterior abdominal sternites only. Quinquelocular pores absent. Tubular ducts present on ventrum only, not numerous, of two sizes; large tubular ducts forming narrow band along margin of thorax and abdomen and occur in medial part of sternites III–VI. Only one small tubular duct found, situated near middle coxa, twice as large as other tubular ducts. Cerarii numbering 2 pairs: C_{17} and C_{18}. C_{18} with 2 conical setae and 5–8 trilocular pores, situated on sclerotized plate. C_{17} with 2 conical setae and 2 pores. Cerarian conical setae short, thick. Dorsal conical setae short.

Note. *Ph. alticola* differs from similar species of the genus *Phenacoccus* in the presence of large ventral tubular ducts not only in the marginal zone, but also in the middle part of abdomen.

Material. The holotype and 2 females from the Eastern Pamirs (the Oksu River 6 km upstream of Subashi kishlak).

Distribution. Tajikistan (the Western and Eastern Pamirs).

Mode of life. The species lives on roots and underground stems of *Elymus mutans, Elymus* sp., and *Leymus secalinus*.

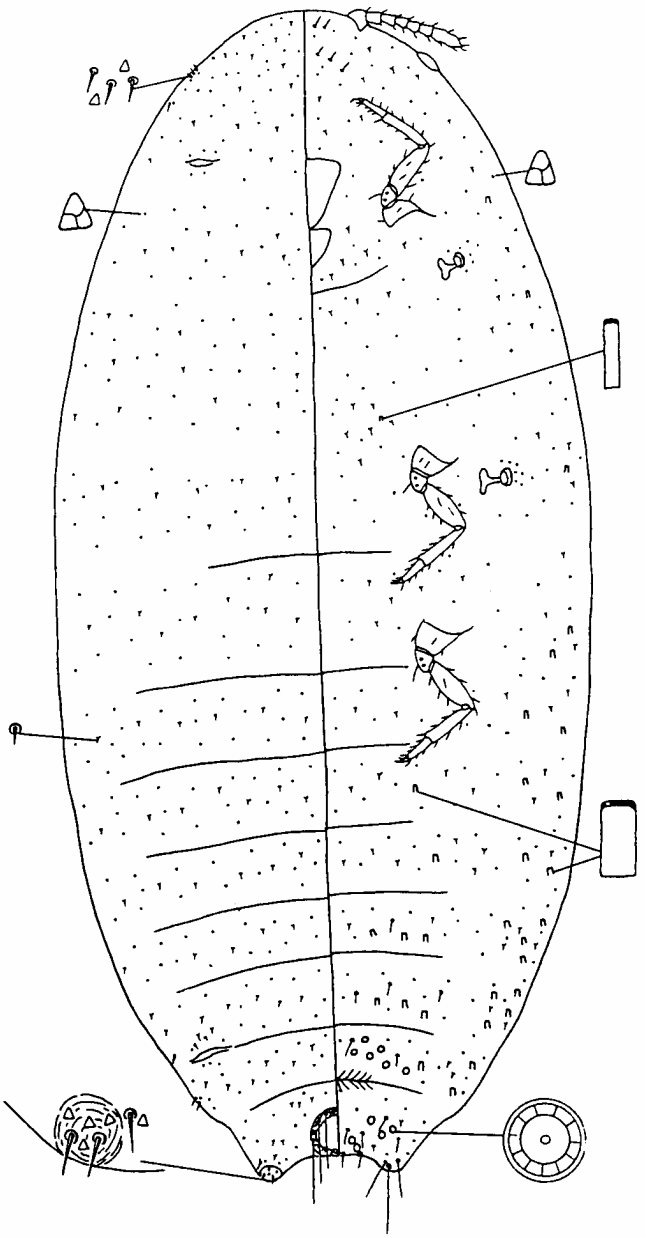

Fig. 26. *Phenacoccus alticola* Baz., female, holotype.

ACKNOWLEDGMENTS

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