

## WATER MITES OF THE GENUS *PIONACERCUS* PIERSIG, 1894 (ACARI: HYDRACHNIDIA, PIONIDAE) IN RUSSIA

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[Тузовский П.В. Водяные клещи рода *Pionacercus* Piersig, 1894 (Acari: Hydrachnidia: Pionidae) России]

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**Key words:** Hydrachnidia, Pionidae, *Pionacercus*, water mites, morphology, identification keys, male, female, Russia

**Ключевые слова:** Hydrachnidia, Pionidae, *Pionacercus*, водяные клещи, морфология, определительные ключи, самец, самка, Россия

**Summary:** The study presents a detailed taxonomic review of water mites of the genus *Pionacercus* Piersig, 1894 (Pionidae) found in the fauna of Russia during the long-term survey between 1970 and 2008. The review includes illustrated (re)descriptions of males and females of seven species: *Pionacercus leuckartii* Piersig, 1894, *P. uncinatus* (Koenike, 1895), *P. norvegicus* Thor, 1898, *P. colymicus* Tuzovskij, 1982, *P. anadyrensis* Tuzovskij, 2001, *P. tundrosum* Tuzovskij, 2001, and *P. major* Tuzovskij, 2005. Diagnostic keys to the adult males and females of all species are presented.

**Резюме:** Представлен детальный таксономический обзор водяных клещей рода *Pionacercus* Piersig, 1894 (Pionidae), найденных в фауне России в течение длительного периода (1970–2008 гг.). Обзор включает иллюстрированное (пере)описание самцов и самок 7 видов: *Pionacercus leuckartii* Piersig, 1894, *P. uncinatus* Koenike, 1895), *P. norvegicus* Thor, 1898, *P. colymicus* Tuzovskij, 1982, *P. anadyrensis* Tuzovskij, 2001, *P. tundrosum* Tuzovskij, 2001, and *P. major* Tuzovskij, 2005. Предложены определительные ключи для самцов и самок.

### INTRODUCTION

Water mites of the genus *Pionacercus* Piersig, 1894 are associated with fresh-water biotopes. Like other members of Hydrachnidia, the life cycle of water mites typically includes egg, three active stages (six-legged larva, eight-legged sexually undifferentiated deutonymph, and eight-legged sexually differentiated adult), and three inactive resting stages (prelarva, protonymph and tritonymph). The resting stages are strongly reduced, consisting mostly of integument; they do not have organs except for provisional ones. Larvae differ greatly from other active stages in ecology and morphology. Larvae of the genus *Pionacercus* are known to parasitize the abdominal region of imagoes Chironomidae from the subfamily Orthocladiinae [Smith and Oliver, 1986]. Deutonymphs and adults are free-living predators that feed on various small invertebrates. Adults and deutonymphs are well adapted for a subaquatic life, but most larvae have adaptations for aerial existence.

The world fauna of water mites of the genus *Pionacercus* Koch, 1837 currently includes six species: *P. leuckartii* Piersig, 1894; *P. uncinatus* (Koenike, 1895); *P. norvegicus* Thor, 1898; *P. pyriformis* Soar, 1901; *P. japonicus* Imamura, 1954 and *P. vatrax* (Koch, 1837) [Viets, 1987]. Lundblad [1962] considered *P. pyriformis* as junior synonym of *P. leuckartii*. Marshall [1924] described what she thought to be a new species, *P. novus*, from Alaska, this latter is actually the deutonymph of one of the larger species of *Pionacercus* [Cook, 1974]. Three species of *Pionacercus* have been known from Russia, namely *P. leuckartii*, *P. uncinatus* and *P. norvegicus* [Sokolov, 1940, Tuzovskij, 1977]. Four other species, *P. colymicus* Tuzovskij, 1982, *P. anadyrensis* Tuzovskij, 2001, *P. tundrosum* Tuzovskij, 2001, and *P. major* Tuzovskij, 2005 [Tuzovskij, 1982, 2001a, 2001b, 2005; respectively], were described from Russia lately.

Morphology of *Pionacercus* larvae has been described for the following taxa: *Pionacercus leuckartii* [Piersig 1901, Lundblad 1927]; *P. colymicus* [Tuzovskij, 1982], *P. anadyrensis* [Tuzovskij, 2001a], *P. tundrosum* [2001]

and *P. major* [Tuzovskij, 2005].

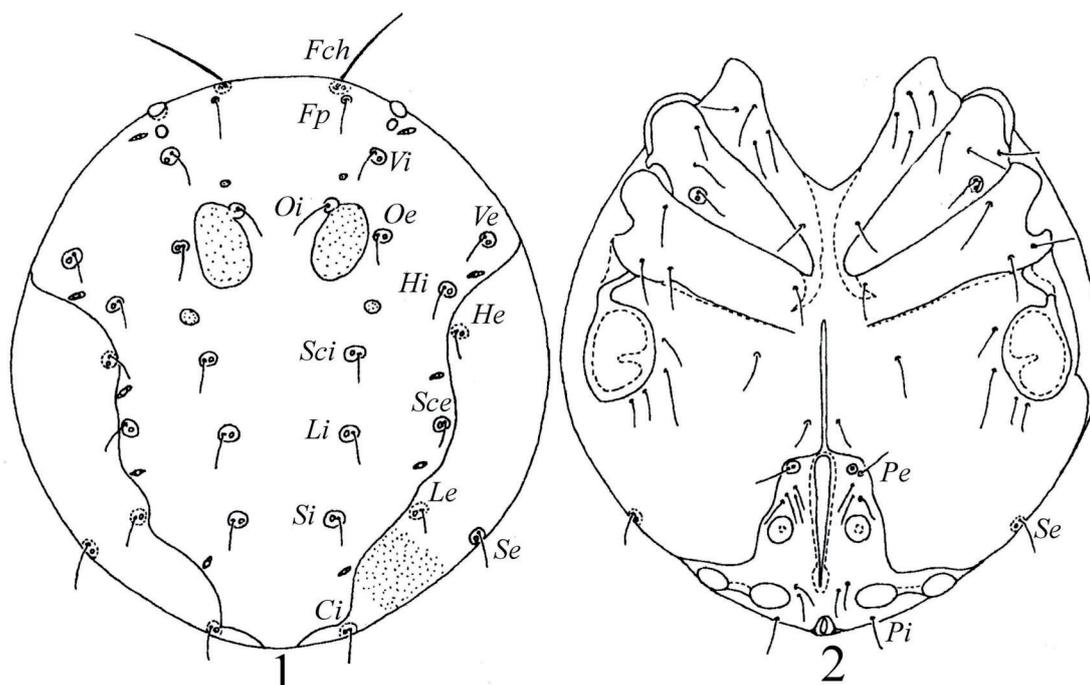
Information on the morphology of deutonymphs has been given only for *P. leuckartii* [Piersig 1894, 1897–1900] and *P. japonicus* [Imamura, 1954].

The identification of adult mites of the genus *Pionacercus*, especially for females, is very difficult. The aim of the paper is to study the morphology of adults of the genus *Pionacercus* collected in Russia and to give an identification keys for the males and females.

### MATERIAL AND METHODS

Most material used in the present study was collected by the author in the European and Asian parts of Russia within 1970–2008. Some important comparative materials have been investigated in a collection of the Naturmuseum Senckenberg, Frankfurt on Main (Germany) and the Naturhistorisches Museum Basel (Switzerland). Specimens collected by P. Tuzovskij were not fixed in Koenike liquid, but slides were made from the fresh material. Most specimens were not dissected, thus preserving the natural shape of the body. For several females and males the gnathosoma was mounted in a position that allowed investigating pedipalps in lateral view. All mite specimens were mounted in Hoyer's medium.

Some idiosomal ventral setae are named according to Tuzovskij [1987]: *Fch* – frontales chelicerae, *Fp* – frontales pedipalporum, *Vi* – verticales internae, *Ve* – verticales externae, *Oi* – occipitales internae, *Oe* – occipitales externae, *Hi* – humerales internae, *He* – humerales externae, *Hv* – humerales ventralia, *Sci* – scapulares internae, *Sce* – scapulares externae, *Li* – lumbales internae, *Le* – lumbales externae, *Si* – sacrales internae, *Se* – sacrales externae, *Ci* – caudales internae, *Pi* – praeanales internae, *Pe* – praeanales externae. Furthermore, the following abbreviations are used: P-1–5, pedipalp segments (trochanter, femur, genu, tibia and tarsus); I-Leg-1–6, first leg, segments 1–6 (trochanter, basifemur, telofemur, genu, tibia and tarsus) i.e. III-Leg-4 = genu of third leg; L, length; W, width; n =



Figs. 1-2. *Pionacercus tundrosum* Tuzovskij, 2001, male: 1 – dorsal view; 2 – ventral view

Рис. 1-2. *Pionacercus tundrosum* Tuzovskij, 2001, самец: 1 – дорсальная сторона; 2 – вентральная сторона

number of specimens measured. The length of appendage segments was measured along their dorsal side; all measurements are given in  $\mu\text{m}$ .

Specimen depositories and reference to accession numbers are given using the following abbreviation: IBIW – the Institute for Biology of Inland Waters of the Russian Academies of Science (Borok, Yaroslavl Province, Russia).

## SYSTEMATIC PART

### Family Pionidae

#### Genus *Pionacercus* Piersig, 1894

Type: *Pionacercus leuckartii* Piersig, 1894

**Diagnosis.** Adults. Idiosoma soft in females but with extensive dorsal and ventral secondary sclerotization including formation of dorsal and ventral shields) in males; posterior apodemes of first coxal group short, median margin of fourth coxae well developed in males, but may be reduced in females (especially in *Pionacercopsis*); coxal plates in four group in female but posterior coxal groups fused medially or even all coxal plates fused in male; three pairs of genital acetabula present; male without petiole; fourth legs of male exhibiting a pronounced sexual dimorphism: IV–leg-6 curved and bearing peg-like setae on concave side.

Nymph. See Piersig [1894, 1897–1900], Imamura [1954], Tuzovskij [1990].

Larva. See Piersig [1901], Lundblad [1927], Tuzovskij [1982, 2001a, 2001b, 2005, 2008].

#### *Pionacercus tundrosum* Tuzovskij, 2001

(Figs. 1–18)

= *Pionacercus leuckartii*, deutonymph: Tuzovskij, 1990: 203-204, Figs 145, 1-7.

**Material examined.** Holotype male (IBIW 4492), Russia, Magadan Province, Chaun District, small tundra lake on the right bank of the Pucheweem River, 18 km upstream of the mouth, 28 July 1982, leg. P.V. Tuzovskij. Paratypes:

6 males, 10 females, the same location as holotype, July–August 1982.

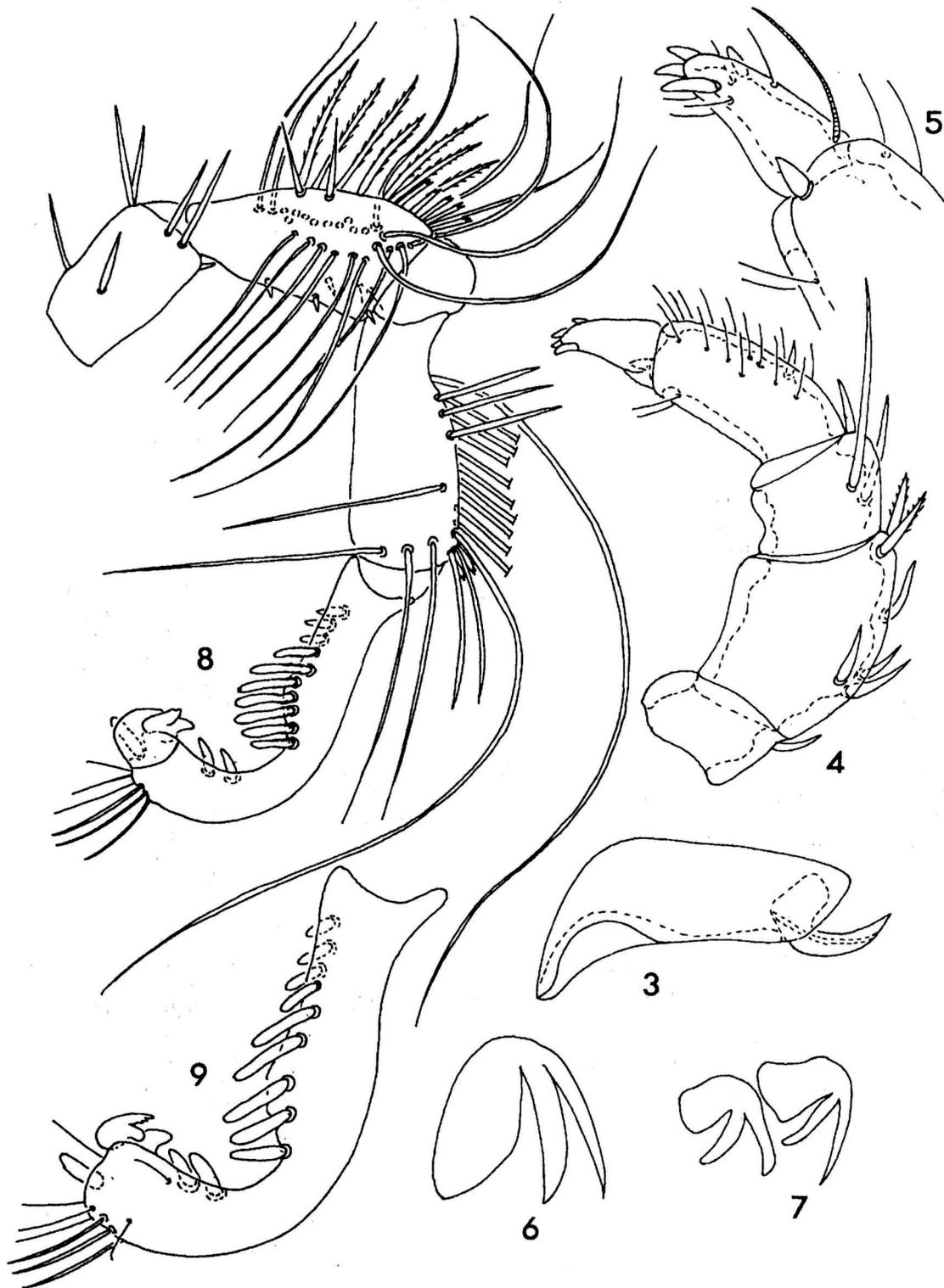
Additional material: 14 females and 3 deutonymps, Anadyr District, small sedge-sphagnum tundra swamps on the left bank of the Anadyr River, 5–10 km upstream of village Markovo, July–September 1981.

**Male.** Color brown, idiosoma almost round. Setae *Fch* (Fig. 1) long. Large part of idiosoma soft, with thin wrinkles. Anterior part of dorsum with three pairs of medial plates: tiny anterior, large intermediate and small posterior. Bases of setae *Oi* in anteromedial corners of intermediate plates. Lateral parts of dorsal surface with wide stripes of secondary sclerotization being processes of ventral shield. Setae *Hi*, *Le*, *Se* and *Ci* situated on these processes. Width of lateral processes of ventral shield gradually decreasing to posterior end of idiosoma. All five pairs of lyriform organs on dorsal side of body.

Coxal plates, especially posterior ones, enlarged, fused with each other and with external genital organ and forming a monolithic shield, laterodorsal processes of which turned onto dorsal surface (Fig. 2). Coxal plates IV fused to each other, with suture between disappearing; coxal plates II with distinct borders on whole perimeter. Suture line between coxal plates III and IV incomplete, slightly not reaching their median margin. Medial border between coxal plates IV complete, that between coxal plates III distinct only in their posterior part. Posteromedial parts of coxal plates IV forming a deep, reaching to their middle, rectangular indentation, in which the anterior pair of genital acetabula is situated. Medial and posterior acetabula close together, situated at one level near posterior end of ventrum. Genital opening long and narrow.

Basal segment of chelicera (Fig. 3) strongly thickened and curved in proximal part and tapering to distal end. Cheliceral stylet short, crescent shaped.

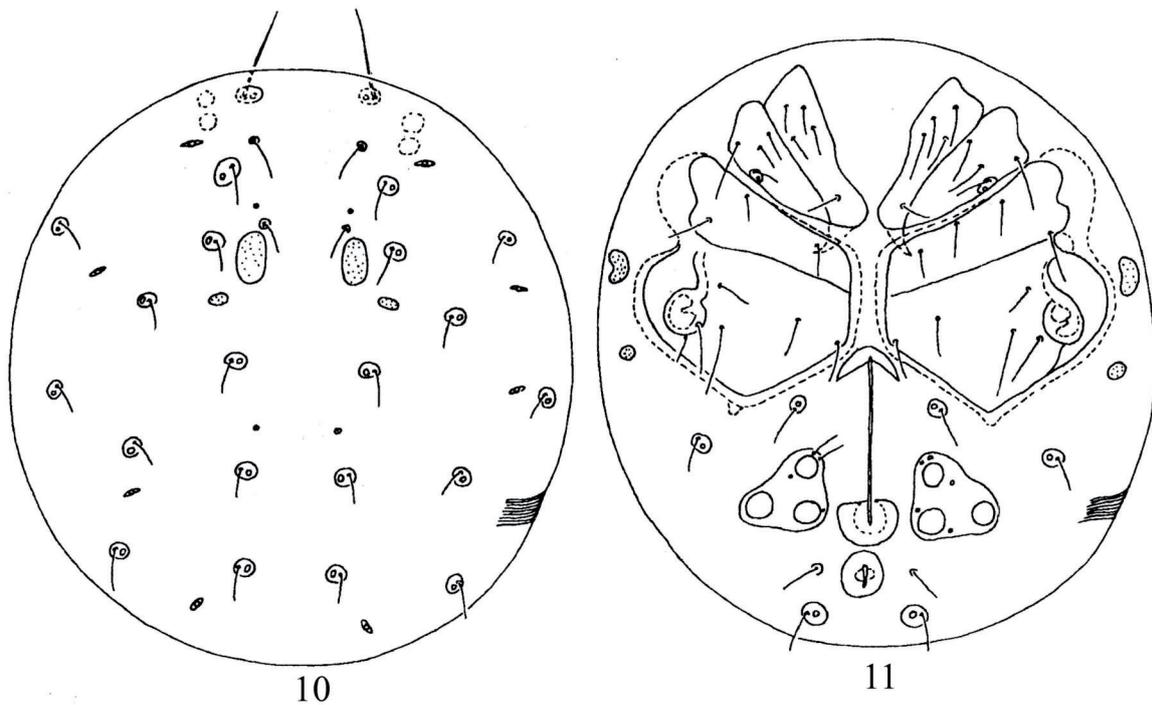
Pedipalps (Fig. 4) short and massive. Ventral margin of P-2 weakly concave, with two groups of dorsal setae: proxi-



Figs. 3-9. *Pionacercus tundrosus* Tuzovskij, 2001, male: 3 – chelicera; 4 – pedipalp, lateral view; 5 – distal part of tibia and tarsus of pedipalp; 6 – claw of leg I; 7 – claws of leg III; 8 – femur II, genu, tibia and tarsus of leg IV; 9 – tarsus of leg IV  
 Рис. 3-9. *Pionacercus tundrosus* Tuzovskij, 2001, самец: 3 – хелицера; 4 – педипальпа, боковая сторона; 5 – дистальная часть голени и лапка педипальпы; 6 – коготок ноги I; 7 – коготки ноги III; 8 – бедро II, колено, голень и лапка ноги IV; 9 – лапка ноги IV

mal, composed of 3–4 setae, and dorsodistal, composed of 2 setae. External lateral seta on P–3 twice as long as internal. P–4 with straight ventral margin, laterodorsal surface covered with numerous solenidia, bases of ventral setae situated at the very distal margin of segment. Distolateral spine on P–4 0.25 times as long as P–5 (Fig. 5).

Claws of two anterior pairs of legs each with a well-developed plate and wide internal and thin external denticles of subequal length (Fig. 6). Claws of legs III with short plates and two denticles, slightly differing from each other in shapes and sizes (Fig. 7). IV–Leg-4 (Fig. 8) short, IV–Leg-5 with two rows of swimming setae, its dorsodistal part with



Figs. 10-11. *Pionacercus tundrosus* Tuzovskij, 2001, female: 10 – dorsal view; 11 – ventral view  
 Рис. 10-11. *Pionacercus tundrosus* Tuzovskij, 2001, самка: 10 – дорсальная сторона; 11 – вентральная сторона

short, thick setae splitted at apex. Swimming setae on IV–Leg-5 very long and projecting well beyond distal part of IV–Leg-6 and, in dorsodistal part, with several short, thick setae bifurcate at apex. Ventral edge of IV–Leg-6 (Fig. 9) with 10–12 short, thick setae rounded at apex, of which 3–4 anterior setae usually the shortest and two distal setae situated somewhat apart.

Measurements (n=6). L of idiosoma 450–515; basal segment of chelicera 120–130, L of cheliceral stylet 40; L of pedipalpal segment 25, 80–82, 40, 73–80, 30; L of leg segments: I–Leg-1–6: 48–57, 73–80, 80–90, 105–110, 115–125, 145–155; II–Leg- 1–6: 55–65, 90–100, 85–90, 115–120, 145–155, 160–170; III–Leg-1–6: 65–75, 80–90, 70–75, 80–85, 120–125, 115–125; IV–Leg-1–6: 105–115, 75–90, 70–80, 120–140, 130–145, 155–165.

**Female.** Idiosoma almost round, integument soft, dorsum with two well-developed pairs of plates only: large elongate anterior and small transverse intermediate (Fig. 10). In addition, small sclerites present in front setae *Oi* and setae *Li*. Bases of setae *Oi* on soft integument. Anterior groups of coxal plates (Fig. 11) with relatively long apodemes. Suture line between coxal plates III and IV complete; medial margin of coxal plates III only slightly shorter than that of coxal plates IV. Posteromedial margins of coxal plates IV straight; apodemes very short or almost absent. Width of coxal plate IV equal to combined length of coxal plates III and IV. Two pairs of plates lateral to posterior coxal plates, anterior ones larger than posterior. Acetabular plates triangular (Figs 12, 13), almost half as long as genital opening. Anterior genital sclerite short and wide, with convex anterior and concave posterior margin. Posterior genital sclerite large, more or less rectangular, wider than long. Genital acebula of moderate size, occupying no more half of area of plates. Distance between acetabula usually greater than diameter of one acetabulum (Fig. 12), but between anterior and medial acetabula sometimes smaller (Fig. 13). Excretory pore opens on oval plate (Fig. 14).

Pedipalp (Fig. 15, 16) as in male, but P–4 with a few

solenidia.

Terminal segments of anterior legs of equal thickness along the whole length (Fig. 17). Swimming setae present only on tibiae of all legs: 2 on tibia I, 3–4 on tibia II, 5–6 on tibia III and 6–7 on tibia IV; setae on tibia I short, on tibia II–IV long. Claws with wide internal and thin external denticles (Fig. 18).

Measurements (n=10). L of idiosoma 610–695; L of genital plate 80–90, width 80–90; L of basal segment of chelicera 120–140, L of cheliceral stylet 40–50; L of pedipalpal segment 25–35, 80–105, 40–60, 75–83, 30–45; L of leg segments: I–Leg-1–6: 55–65, 80–90, 105–110, 105–115, 130–140; II–Leg-1–6: 55–75, 80–90, 90–100, 115–120, 130–145, 145–155; III–Leg-1–6: 65–75, 80–90, 85–90, 120–130, 145–165, 155–165; IV–Leg-1–6: 95–115, 95–100, 110–115, 155–165, 165–180, 160–180.

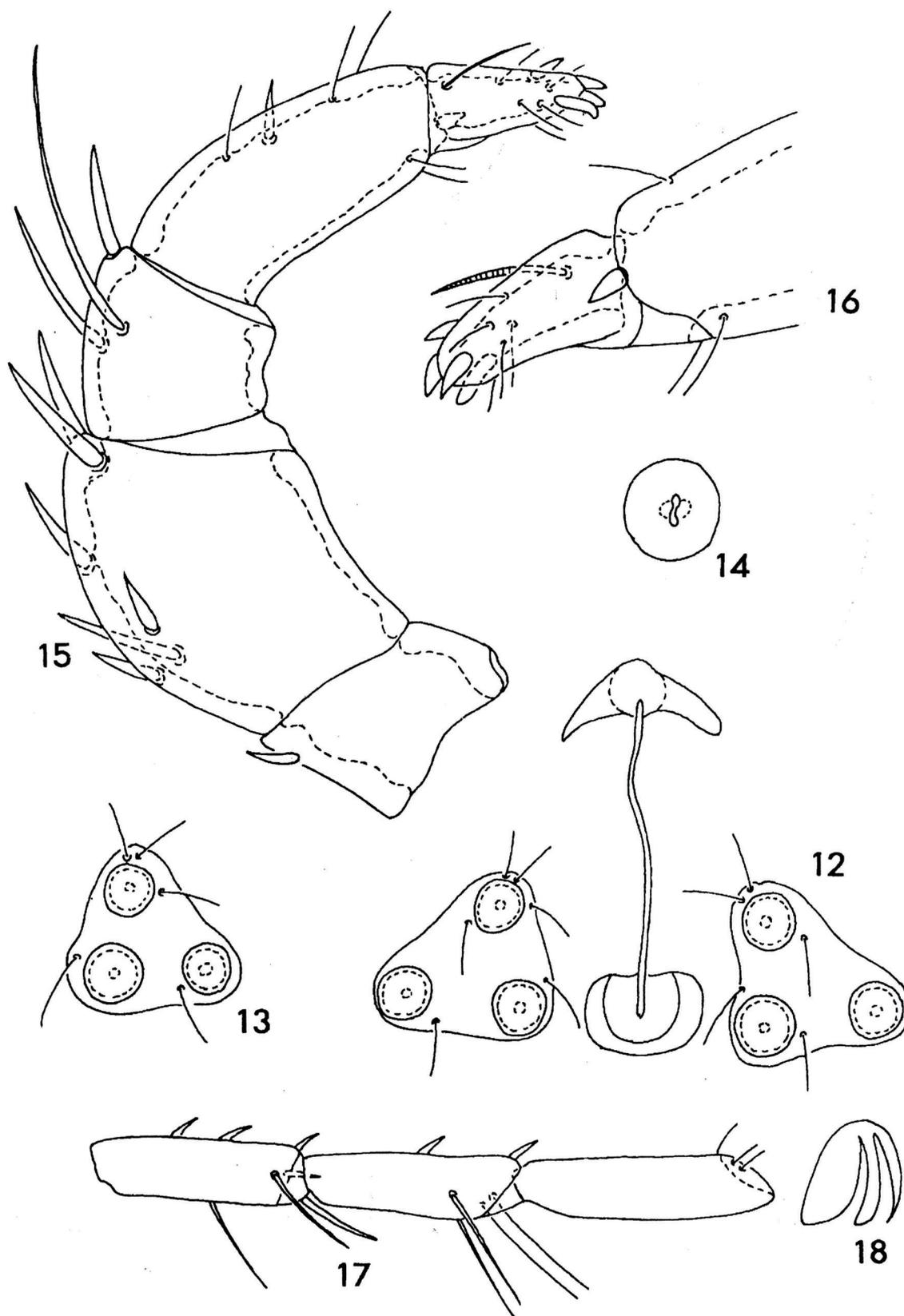
**Larva.** See Tuzovskij [2001b].

**Deutonymph.** See Tuzovskij [1990].

**Habitat.** Thermocarstic lakes, sedge-sphagnum tundra swamps.

**Distribution.** Asia, Russia: Magadan Province.

**Remarks.** The species is similar to *P. leuckartii*, in which the larva is not parasitic also (Lundblad, 1927). The male of *P. tundrosus* especially well differs from *P. leuckartii* in weaker sclerotization of dorsal surface (Fig. 1) and deeper genital hollow reaching to the middle of posterior coxal plates (Fig. 2). In contrast, in male of *P. leuckartii*, the whole dorsum is covered by a monolithic dorsal shield (Fig. 77), and genital hollow is rather short and does not reach the middle of coxal plates III (Fig. 78). The female *P. tundrosus* is characterized by short and wide coxal plates IV with straight posteromedial margins, large posterior genital sclerite (Fig. 11), and ventral setae on P–4 situated at the apex of the segment (Fig. 15); in opposite, in female of *P. leuckartii*, coxal plates IV with concave posteromedial margins and longer than wide, posterior genital sclerite small (Fig. 84), and ventral setae on P–4 situated close to the middle of the segment (Fig. 85).

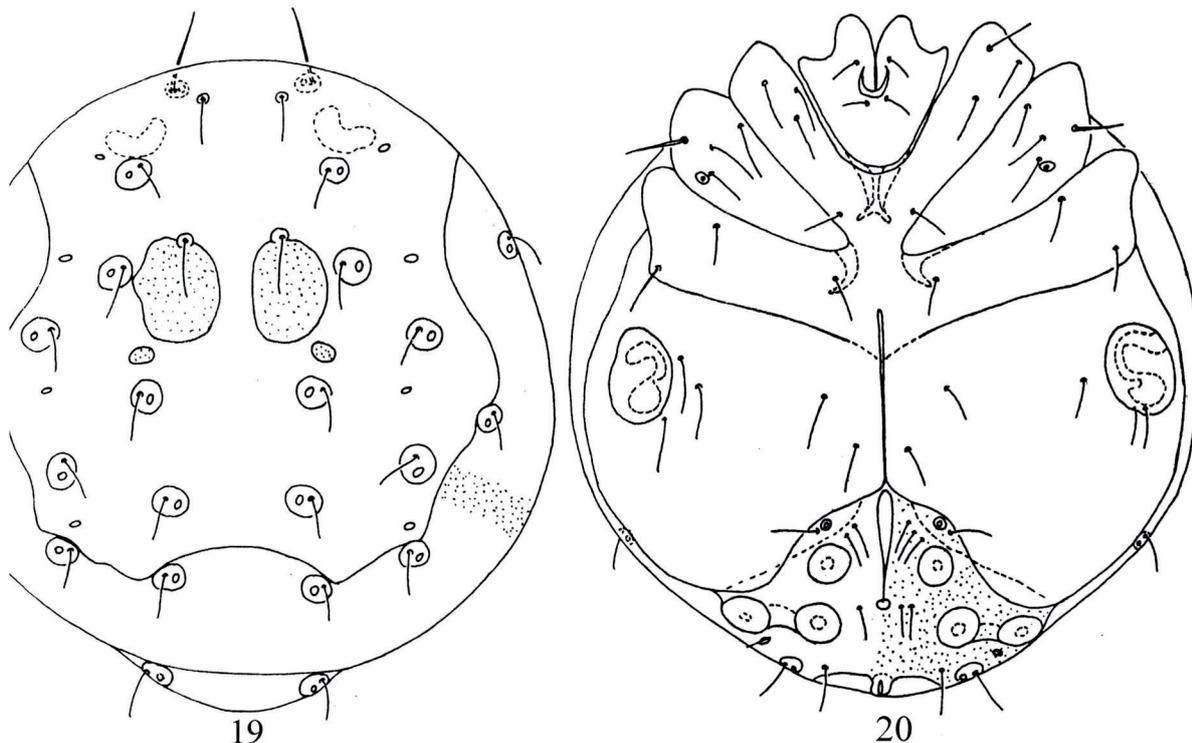


Figs. 12-18. *Pionacercus tundrosus* Tuzovskij, 2001, female: 12 – external genital organ; 13 – genital plate; 14 – excretory pore; 15 – pedipalp; 16 – distal part of tibia and tarsus of pedipalp; 17 – genu, tibia and tarsus of leg I; 18 – claw of leg I  
 Рис. 12-18. *Pionacercus tundrosus* Tuzovskij, 2001, самка: 12 – наружный генитальный орган; 13 – генитальная пластинка; 14 – экскреторная пора; 15 – педипальпа; 16 – дистальная часть голени и лапка педипальпы; 17 – колено, голень и лапка ноги I; 18 – коготок ноги I

*Pionacercus anadyrensis* Tuzovskij, 1990  
 (Figs. 19–34)

**Material examined.** Holotype male (IBIW 2833), Rus-

sia, Magadan Province, Anadyr District, small thermocarstic lake on the right bank of the Anadyr river, 12 km downstream of the village Markovo, 4 August 1981, leg. P.V. Tu-



Figs. 19-20. *Pionacercus anadyrensis* Tuzovskij, 1990, male: 19 – dorsal view; 20 – ventral view  
 Рис. 19-20. *Pionacercus anadyrensis* Tuzovskij, 1990, самец: 19 – дорсальная сторона; 20 – вентральная сторона

zovskij. Paratypes: 2 males, 20 females and 2 deutonymphs, in the same locality as holotype, July-September 1981.

**Male.** Color greenish. Body almost round (Fig. 19). Setae *Fch* long. Large part of dorsum soft, with thin wrinkles. Anterior part of dorsum with two pairs of medial plates: large anterior and small posterior. Bases of setae *Oi* fused with anterior margin of large plates. Lateral and posterior parts of dorsal surface with wide stripes of secondary sclerotization being processes of ventral shield. Setae *Ve*, *Hi*, *Le* and *Si* situated on these processes. Four pairs of lyriform organs on dorsal side of idiosoma.

Coxal plates, especially posterior ones, enlarged, fused with each other and with external genital organ and forming a monolithic shield (Fig. 20). Suture line between coxal plates IV and posterior half of coxal plates III well developed. Coxal plates II with distinct borders on whole perimeter. Posteromedial parts of coxal plates IV forming a not deep, triangular indentation, in which the anterior pair of genital acetabula is situated. Medial and posterior acetabula close together, situated at one level near posterior end of ventrum. Genital opening fused with genital field.

Basal segment of chelicera (Fig. 21) strongly curved near middle part and slightly tapering to distal end. Cheliceral stylet short, crescent shaped.

Pedipalps (Fig. 22) relatively short. Ventral margin of P-2 weakly concave or almost straight, with five dorsal setae. P-3 with 3 unequal dorsal setae, proximal seta on P-3 twice as long as distal setae. P-4 with straight ventral margin, laterodorsal surface covered with numerous solenidia, bases of ventral setae situated at the very distal margin of segment. Distolateral spine on P-4 0.25 times as long as P-5 (Fig. 23).

IV-Leg-3 (Fig. 24) short, IV-Leg-4 slightly shorter than IV-Leg-5. Swimming setae on IV-Leg-5 very long and projecting well beyond distal part of IV-Leg-6. Ventral edge of IV-Leg-6 (Fig. 25) with 7-8 short, thick setae rounded at apex and 2-3 distal setae situated somewhat apart. Claws of

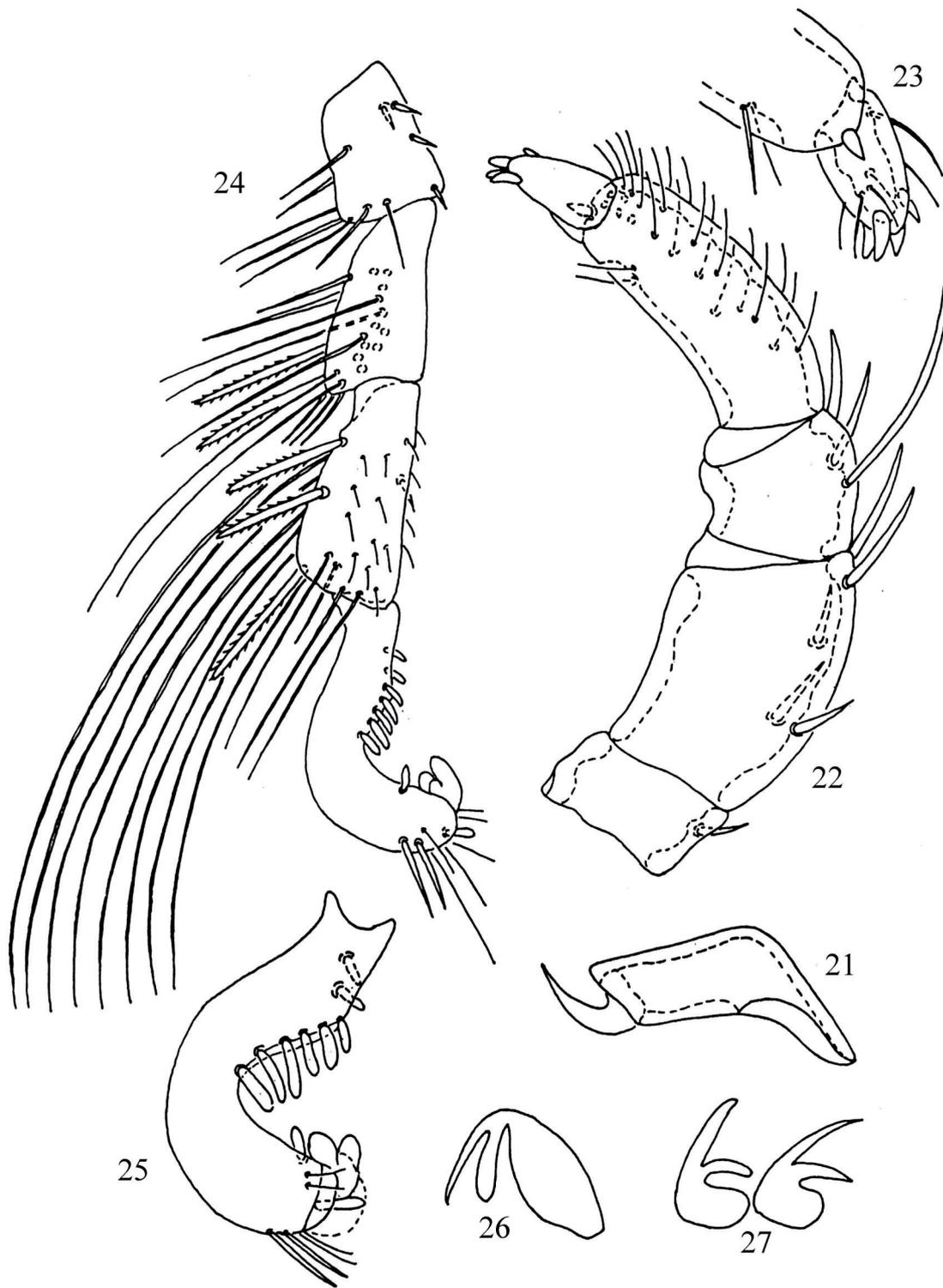
two anterior pairs of legs (Fig. 26) each with a well-developed plate and wide internal and thin external denticles of subequal length. Claws of legs III (Fig. 27) with short plates, long external and relatively short internal denticles.

Measurements (n=3). L of idiosoma 390-430; basal segment of chelicera 95-100, L of cheliceral stylet 40; L of pedipalpal segment 25, 55-70, 32-40, 65-75, 25; L of leg segments: I-Leg-1-6: 40-57, 73-80, 70-75, 90-100, 105-115, 155-165; II-Leg-1-6: 40-57, 80-85, 80-85, 105-110, 130-140, 160-180; III-Leg-1-6: 45-65, 73-80, 65-70, 73-80, 115-125, 130-140; IV-Leg-1-6: 80-90, 80-85, 70-75, 90-105, 115-125, 120-130.

**Female.** Idiosoma almost round, integument soft, dorsum with three pairs of plates only: large elongate anterior, small transverse intermediate and very small posterior (Fig. 28). Bases of setae *Oi* on soft integument. Four pairs of lyriform organs situated along lateral margins of dorsum.

Anterior groups of coxal plates (Fig. 29) with short apodemes. Suture line between coxal plates III and IV complete; medial margin of coxal plates III only slightly longer than that of coxal plates IV. Posteromedial margins of coxal plates IV straight or slightly concave, apodemes very short or almost absent. Three pairs of plates lateral to posterior coxal plates, anterior ones larger than both pairs of posterior plates. Genital plates more or less triangular (Figs 30, 31), almost half as long as genital opening. Anterior genital sclerite short and wide, with convex anterior and concave posterior margin. Posterior genital sclerite large, more or less rectangular, wider than long. Genital acetabula of moderate size, occupying less than half of plates. Distance between acetabula usually greater than diameter of one acetabulum, but between anterior and medial acetabula sometimes smaller (Fig. 31). Excretory pore usually with single anterior sclerite (Fig. 32), but sometimes very small posterior one presents (Fig. 33).

Pedipalp (Fig. 34) as in male, but P-4 with several dor-



Figs. 21-27. *Pionacercus anadyrensis* Tuzovskij, 1990, male: 21 – chelicera; 22 – pedipalp, lateral view; 23 – distal part of tibia and tarsus of pedipalp; 24 – femur II, genu, tibia and tarsus of leg IV; 25 – tarsus of leg IV; 26 – claw of leg I; 27 – claws of leg III

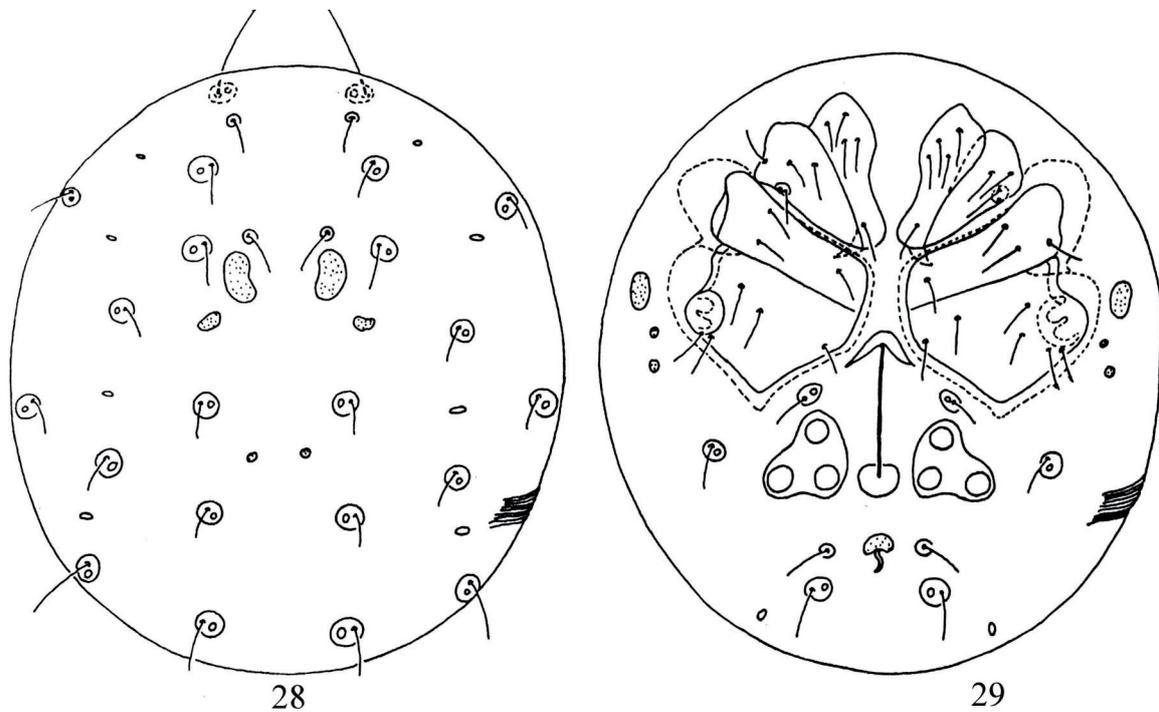
Рис. 21-27. *Pionacercus anadyrensis* Tuzovskij, 1990, male: 21 – хелицера; 22 – педипальпа, боковая сторона; 23 – дистальная часть голени и лапка педипальпы; 24 – бедро II, колено, голень и лапка ноги IV; 25 – лапка ноги IV; 26 – коготок ноги I; 27 – коготки ноги III

sal setae.

Terminal segments of anterior legs of equal thickness along the whole length. Swimming setae distributed as follows: 2-3 on genu II-IV, 3-4 on tibia II, 5-6 on tibia III, 5-7 on tibia IV. Claws with well developed lamella, both denticles subequal in length, external denticle pointed, and

internal denticle with rounded tip (Fig. 35).

Measurements (n=10). L of idiosoma 570-650; L of genital plate 80-85, width 80-100; L of basal segment of chelicera 115-140, L of cheliceral stylet 45-48; L of pedipalpal segment 25-33, 73-80, 40-45, 65-75, 25-32; L of leg segments: I-Leg-1-6: 40-50, 75-80, 73-80, 90-100,



Figs. 28-29. *Pionacercus anadyrensis* Tuzovskij, 1990, female: 28 – dorsal view; 29 – ventral view

Рис. 28-29. *Pionacercus anadyrensis* Tuzovskij, 1990, самка: 28 – дорсальная сторона; 29 – вентральная сторона

105–115, 120–140; II–Leg- 1–6: 50–65, 80–90, 80–90, 105–115, 130–140, 140–150; III–Leg-1–6: 60–65, 80–90, 80–90, 115–120, 145–165, 145–165; IV–Leg-1–6: 95–100, 95–100, 105–110, 135–140, 155–165, 155–165.

**Deutonymph.** See Tuzovskij [1990].

**Larva.** See Tuzovskij [2001a].

**Habitat.** Thermocarstic lake.

**Distribution.** Asia, Russia: Magadan Province, Chukotka.

**Remarks.** The present species is similar to *P. tundrosum*, but the genital hollow in male is triangular (Fig. 20), distance between the anterior and medial acetabula less than diameter of one acetabulum; dorsum with single lateral strip (Fig. 19), IV–Leg-6 with 9–10 peg-like setae (Figs 24). Females differ in the medial margin of coxal plates III longer than that of coxal plates IV (Fig. 29), and the excretory pore usually with only anterior sclerite (Fig. 32).

***Pionacercus major* Tuzovskij, 2005**

(Figs. 36–46)

**Material examined.** Holotype female (IBIW 5058), Russia, Magadan Province, Yagodninsky District, small lake near Jack London Lake, 27 June 1987, leg. P.V. Tuzovskij. Paratypes: 5 females, the same data and locality as holotype.

**Female.** Idiosoma almost round, integument soft. Dorsum with four pairs of plates, three anterior pairs comparatively well-developed, and posterior pairs very small (Fig. 36). Bases of setae *Oi* on soft integument. All five pairs of lyriform organs situated along lateral margins of dorsum.

Anterior groups of coxal plates (Fig. 37) with relatively long apodemes. Suture line between coxal plates III and IV complete; medial margin of coxal plates III and IV subequal in length. Posteromedial margin of coxal plates IV straight or slightly concave; apodemes very short or almost absent. Three pairs of plates lateral to posterior coxal plates, anterior pairs considerable larger than posterior. Genital plates triangular (Figs 38, 39), a little shorter than genital opening. Anterior genital sclerite short and wide, with convex anterior and concave posterior margin. Poste-

rior genital sclerite moderate in size, more or less rectangular, wider than long. Genital acetabula of moderate size, occupying about half of area of plates. Distance between anterior and medial acetabula usually less than diameter of one acetabulum. Excretory pore with large anterior sclerite and relatively small posterior one (Figs. 40–41).

Pedipalp (Fig. 42) short and massive: P-1 with one short dorsodistal seta; ventral margin of P-2 slightly concave or straight, with five dorsal setae; P-3 with three unequal setae, external lateral seta located near middle of segment; P-4 relatively short, with straight ventral margin, dorsal surface with single spine and several thin setae, bases of ventral setae situated at the very distal margin of segment. Distolateral spine on P-4 0.20 times as long as P-5 (Fig. 43).

Basal segment of chelicera (Fig. 44) strongly thickened and curved in proximal part and tapering to distal end. Cheliceral stylet short, crescent shaped.

Legs slender (Figs 45–46). Terminal segments of all legs of equal thickness along the whole length. Swimming setae distributed as follows: 2–3 on genu II, 3 on genu III, 3–5 on genu IV, 2–4 on tibia II, 3–6 on tibia III, 6–7 on tibia IV. Claws with wide internal and thin external denticles (Fig. 47).

Measurements (n=6). L of idiosoma 730–815; L of genital plate 115–130, width 105–120; L of basal segment of chelicera 140–180, L of cheliceral stylet 50–57; L of pedipalpal segment 30–40, 95–100, 50–60, 90–100, 48; L of leg segments: I–Leg-1–6: 50–65, 95–115, 105–115, 120–140, 145–145, 165–180; II–Leg-1–6: 65–80, 105–130, 115–120, 145–165, 180–195, 185–205; III–Leg-1–6: 75–85, 105–140, 115–140, 155–170, 195–220, 195–210; IV–Leg-1–6: 115–130, 120–145, 135–155, 185–210, 205–230, 205–230.

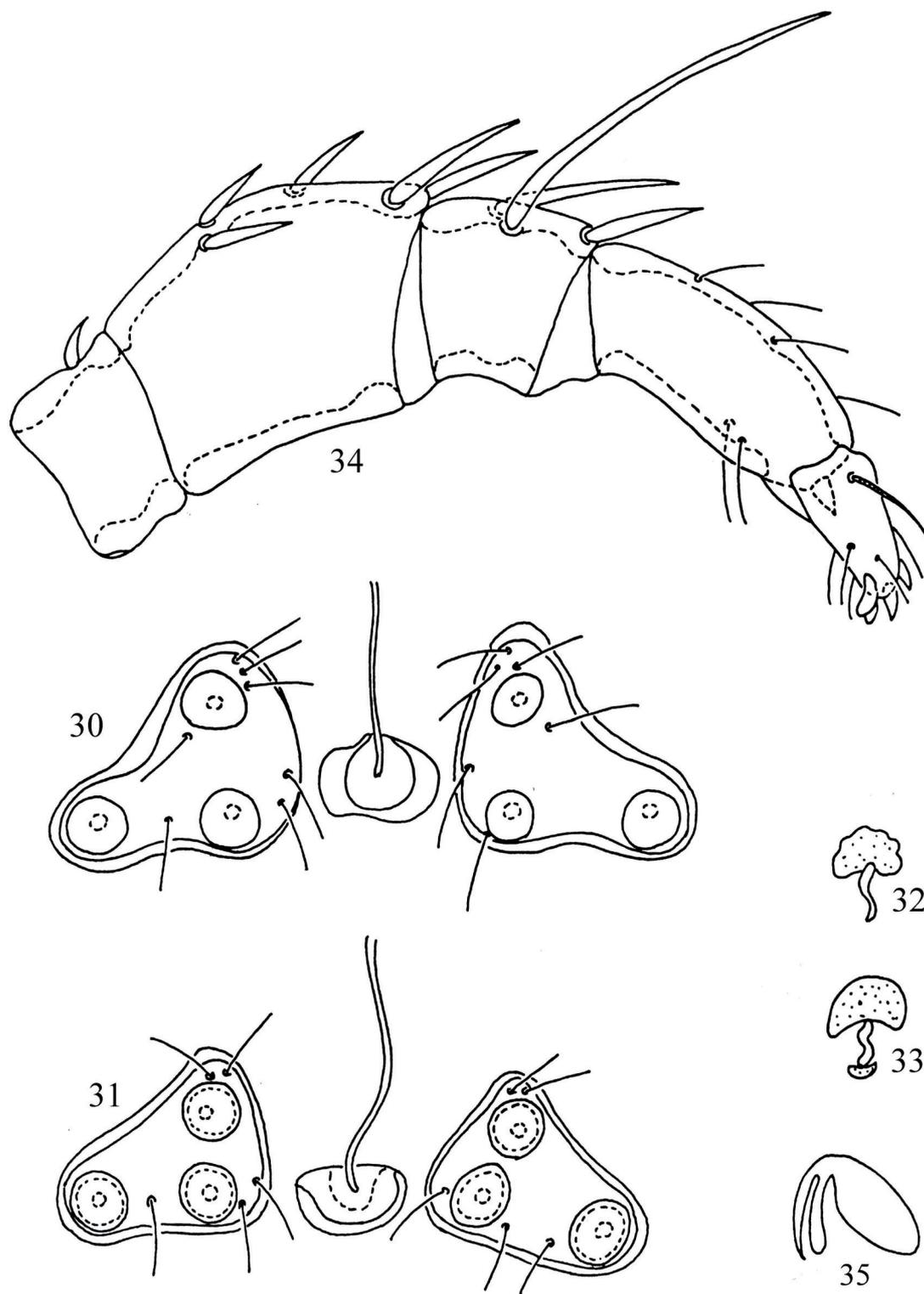
**Male.** Unknown.

**Deutonymph.** Unknown.

**Larva.** See Tuzovskij [2005].

**Habitat.** Lakes.

**Distribution.** Asia, Russia: Magadan Province.



Figs. 30-35. *Pionacercus anadyrensis* Tuzovskij, 1990, female: 30-31 – genital plate; 32-33 – excretory pore; 34 – pedipalp; 35 – claw of leg I

Рис. 30-35. *Pionacercus anadyrensis* Tuzovskij, 1990, самка: 30-31 – генитальная пластинка; 32-33 – экскреторная пора; 34 – педипальпа; 35 – коготок ноги I

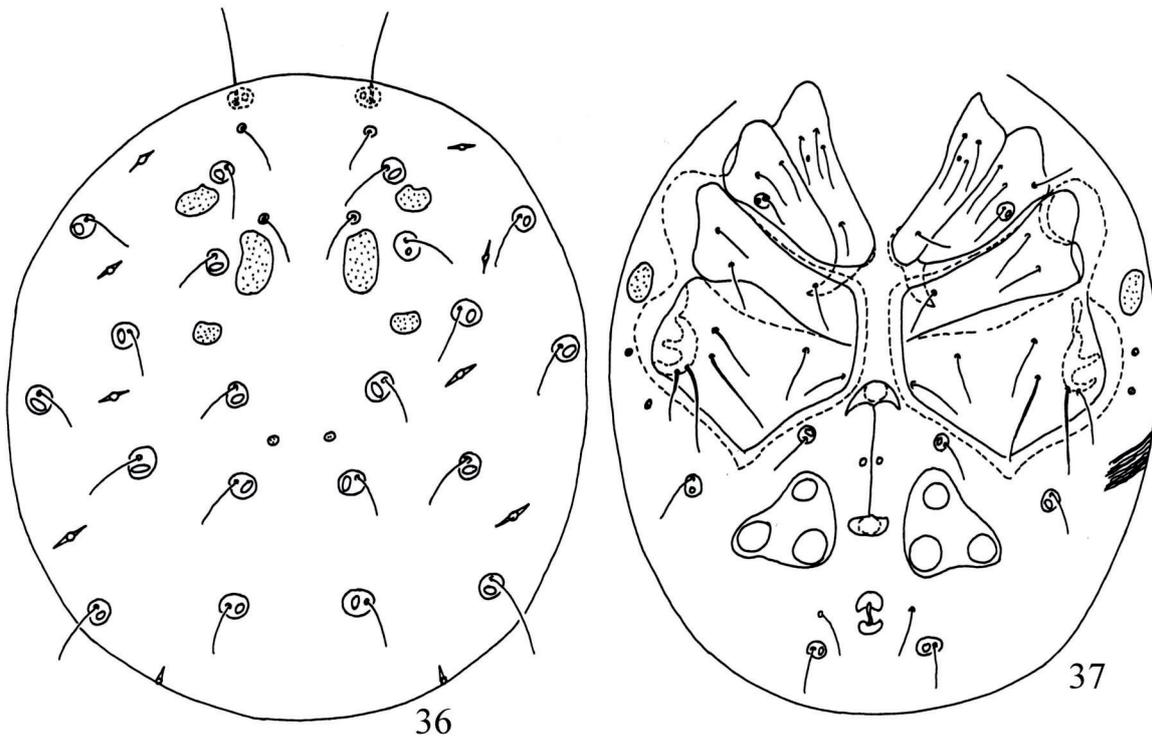
***Pionacercus norvegicus* Thor, 1898**

(Figs. 48-63)

**Material examined.** Two females and one male: Russia, Yaroslavl Province, Nekouz District, rain pools near settlement Borok, May-June 1977 (females), August 2004 (male). In addition, two males and one female in a collection of Senckenberg Natural History Museum (Naturmu-

seum Senckenberg), Frankfurt on Main (Germany).

**Female.** Idiosoma almost round, integument soft. All dorsal setae thin and approximately equal in length), but setae *Fch* (Fig. 48) thicker and much longer than other idiosomal setae associated with glandularia (Fig. 49) and trichobothria (Fig. 50). Dorsum with two pairs of plates, anterior pair large and elongate, posterior pair small and



Figs. 36-37. *Pionacercus major* Tuzovskij, 2005, female: 36 – dorsal view; 37 – ventral view

Рис. 36-37. *Pionacercus major* Tuzovskij, 2005, самка: 36 – дорсальная сторона; 37 – вентральная сторона

transverse (Fig. 51). Bases of setae *Oi* on soft integument.

Coxae cover about half of ventral surface (Fig. 52). Anterior coxal plates with short narrow apodemes. Suture line between coxal plates III and IV complete; medial margin of coxal plates III longer than that of coxal plates IV. Posteromedial margins of coxal plates IV straight or slightly concave; apodemes very short. Two pairs of subequal lateral plates present, anterior pair laterally to coxal plates II, posterior pair laterally to coxal plates IV. Genital plates triangular, shorter than genital opening. Anterior genital sclerite wide, with convex anterior and concave posterior margin; posterior genital sclerite moderate in size, more or less rectangular, wider than long. Genital acetabula of moderate size, occupying lesser than half of area of plates. Distance between anterior and medial acetabula usually longer than diameter of one acetabulum. Excretory pore with anterior and posterior sclerites, anterior sclerite larger than posterior one.

Pedipalp (Fig. 53) short: P-1 with one short dorsodistal seta; ventral margin of P-2 straight, with 5-6 dorsal setae; P-3 with three unequal setae, external lateral seta very long, located interiorly from the middle of segment; P-4 tapering distally, with small ventroproximal tubercle bearing proximal ventral setae, distal ventral setae located distally to middle of segment, dorsal surface with several thin setae. Distolateral spine on P-4 very short with rounded tip (Fig. 54).

Basal segment of chelicera (Fig. 55) thickened and curved in proximal part and tapering to distal end. Cheliceral stylet short, crescent shaped.

Legs slender (Figs 56-57). Terminal segments of all legs of equal thickness along the whole length. Swimming setae distributed as follows: 1-2 on genu I, 0-1 on genu II, 2 on tibia I, 3 on genu II, 4-5 on tibia III and IV. Claws with wide internal and thin external denticles (Fig. 58).

Measurements (n=3). L of idiosoma 710-815; L of genital plate 85-105, W 75-105; L of basal segment of chelicera 180-190, L of cheliceral stylet 55-60; L of pedipalpal

segment (P-1-5): 35-40, 80-100, 40-57, 95-120, 35-42; L of leg segments: I-Leg-1-6: 45-60, 70-95, 75-80, 90-105, 100-115, 125-140; II-Leg-1-6: 54-65, 70-90, 75-95, 95-115, 120-130, 130-150; III-Leg-1-6: 50-72, 80-105, 85-100, 115-125, 145-165, 145-160; IV-Leg-1-6: 95-105, 75-115, 95-125, 155-170, 180-190, 180-195.

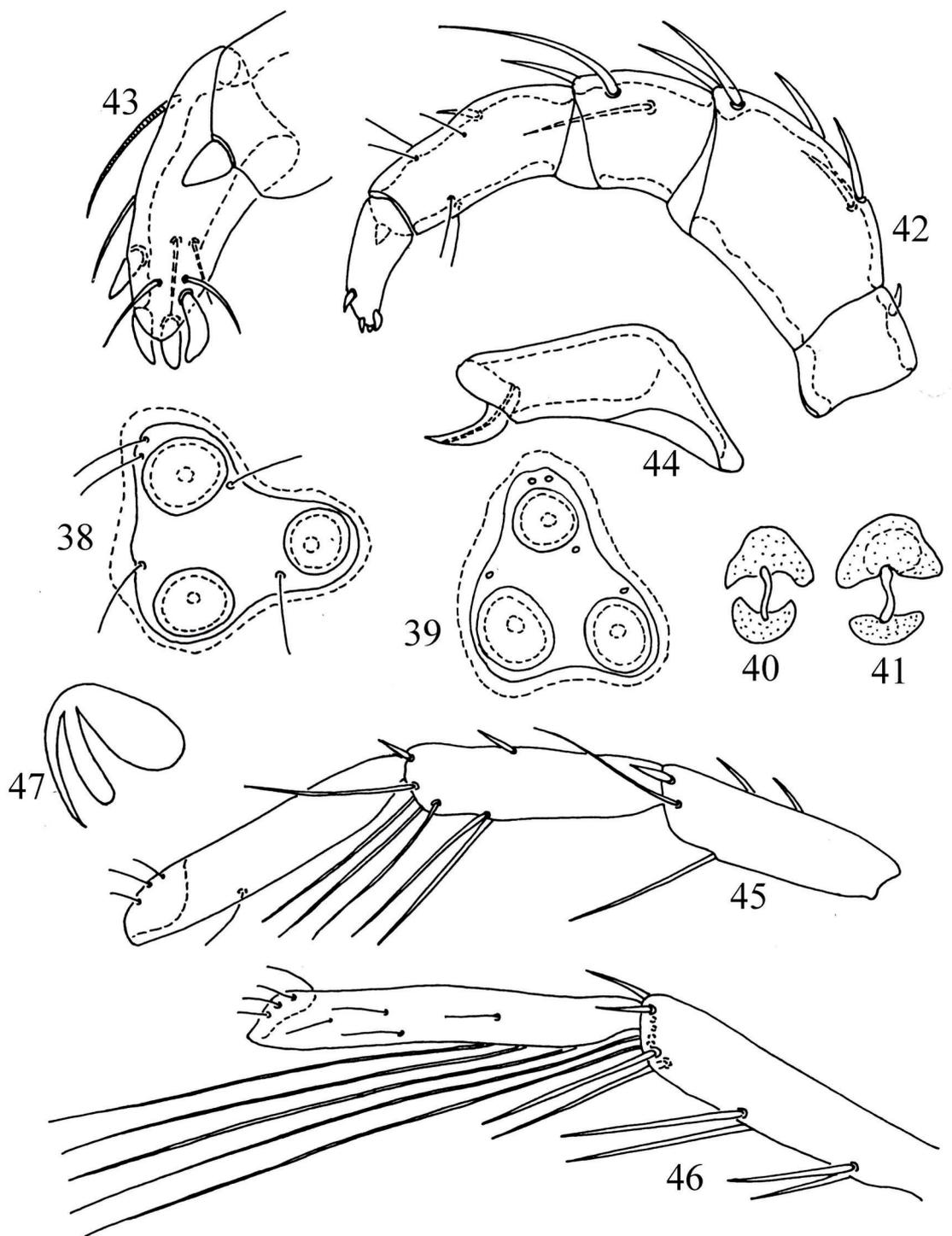
Male. Dorsum and chelicera as in female. Coxal plates, especially posterior ones, enlarged, fused with each other and with external genital organ and forming a monolithic shield (Fig. 59). Suture line between coxal plates IV and in posterior half of coxal plates III well developed. Coxal plates II with distinct borders on whole perimeter. Posteromedial parts of coxal plates IV forming a rather deep triangular indentation, in which the genital field is situated. Anterior and medial acetabula close together, distance between them less than diameter of one acetabulum. Anterior anal sclerite free or fused with ventral shield.

Pedipalps (Fig. 60) as in female, but P-4 with a numerous dorsal solenidia.

Anterior two pairs of legs and their claws as in female. III-Leg-4 shorter than III-Leg-5, III-Leg-6 of equal thickness along the whole length (Fig. 61). IV-Leg-3 shorter than IV-Leg-4 (Fig. 62). Swimming setae on III-Leg-5 and IV-Leg-5 very long. Ventral edge of IV-Leg-6 with 7-8 short peg-like setae rounded at apex and 1-2 distal setae situated somewhat apart. Claws of legs III (Fig. 63) with short plate, long external and relatively short internal denticles.

Measurements (n=3). L of idiosoma 420-465; basal segment of chelicera 115-135, L of cheliceral stylet 43-55; L of pedipalpal segment (P-1-5): 22-30, 75-85, 42-53, 90-105, 30-33; L of leg segments: I-Leg-1-6: 48-57, 55-80, 70-80, 90-105, 105-115, 145-160; II-Leg-1-6: 52-57, 60-80, 70-90, 100-115, 115-145, 145-160; III-Leg-1-6: 52-65, 65-90, 60-75, 75-85, 100-120, 105-125; IV-Leg-1-6: 85-115, 55-70, 65-75, 100-120, 120-145, 125-140.

**Deutonymph.** Unknown.



Figs. 38-47. *Pionacercus major* Tuzovskij, 2005, female: 38-39 – genital plate; 40-41 – excretory pore; 42 – pedipalp; 43 – distal part of tibia and tarsus of pedipalp; 44 – chelicera; 45 – genu, tibia and tarsus of leg I; 46 – genu, tibia and tarsus of leg IV; 47 – claw of leg I

Рис. 38-47. *Pionacercus major* Tuzovskij, 2005, самка: 38-39 – генитальная пластинка; 40-41 – экскреторная пора; 42 – педипальпа; 43 – дистальная часть голени и лапка педипальпы; 44 – хелицера; 45 – колено, голень и лапка ноги I; 46 – колено, голень и лапка ноги IV; 47 – коготок ноги I

**Larva.** See Tuzovskij [2008].

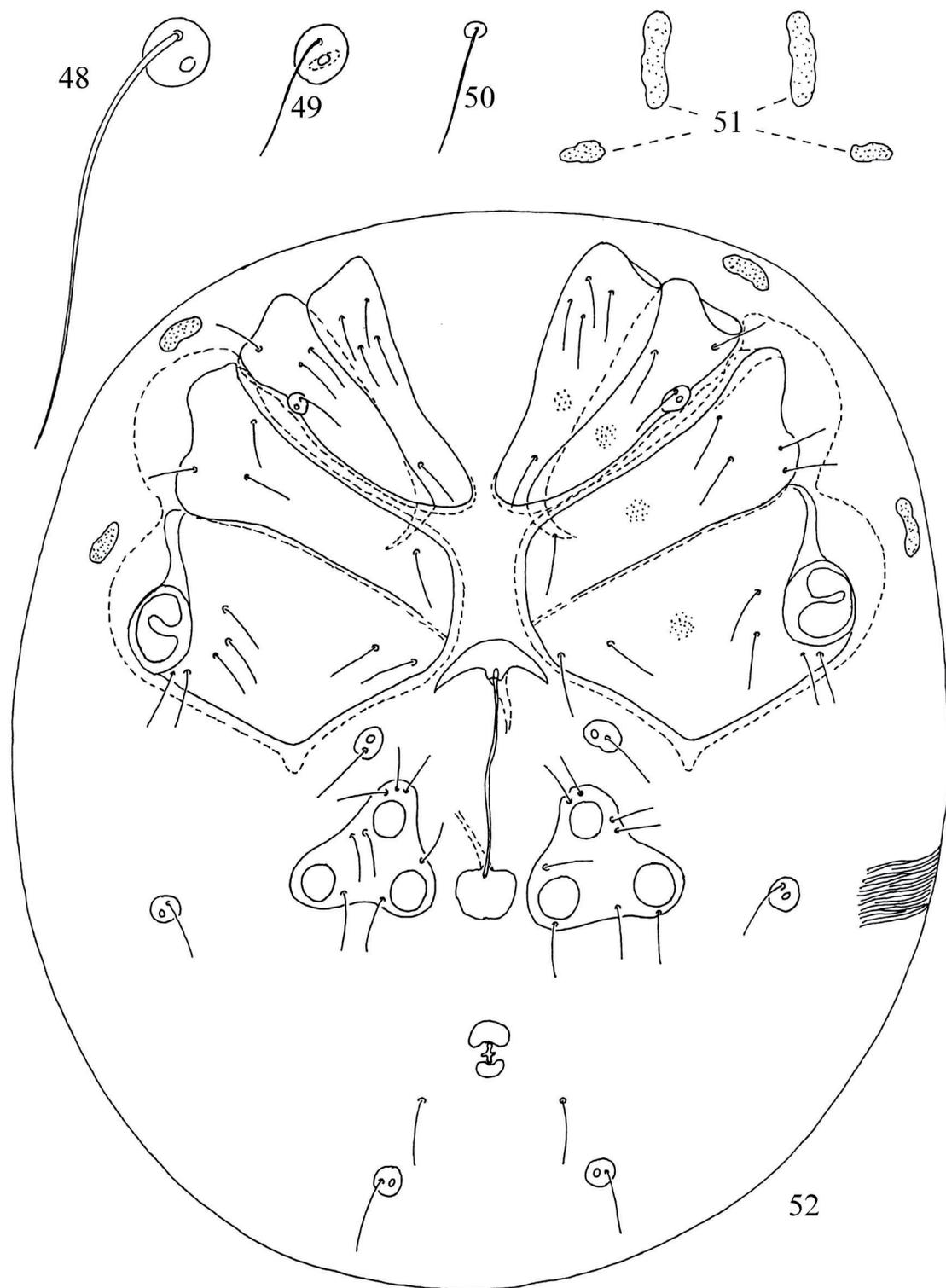
**Habitat.** Lakes, pools, brooks [Lundblad, 1968].

**Distribution.** Europe, Russia: Kaliningrad Province [Viets, 1918; Lundblad, 1968] and Yaroslavl Province [Tuzovskij, 1977, 2008].

*Pionacercus colymicus* Tuzovskij, 1982  
(Figs. 64-76)

**Material examined.** Holotype male (IBIW 2601), Russia, Magadan Province, Tenkinsky District, small thermocarstic lake near village Agrobasa on the left bank of the Kolyma River, 28 July 1982, leg. P.V. Tuzovskij. Paratypes: 4 males, 9 females in the same locality as holotype, June-July 1982.

**Male.** Color brown, idiosoma almost round. Dorsal shield



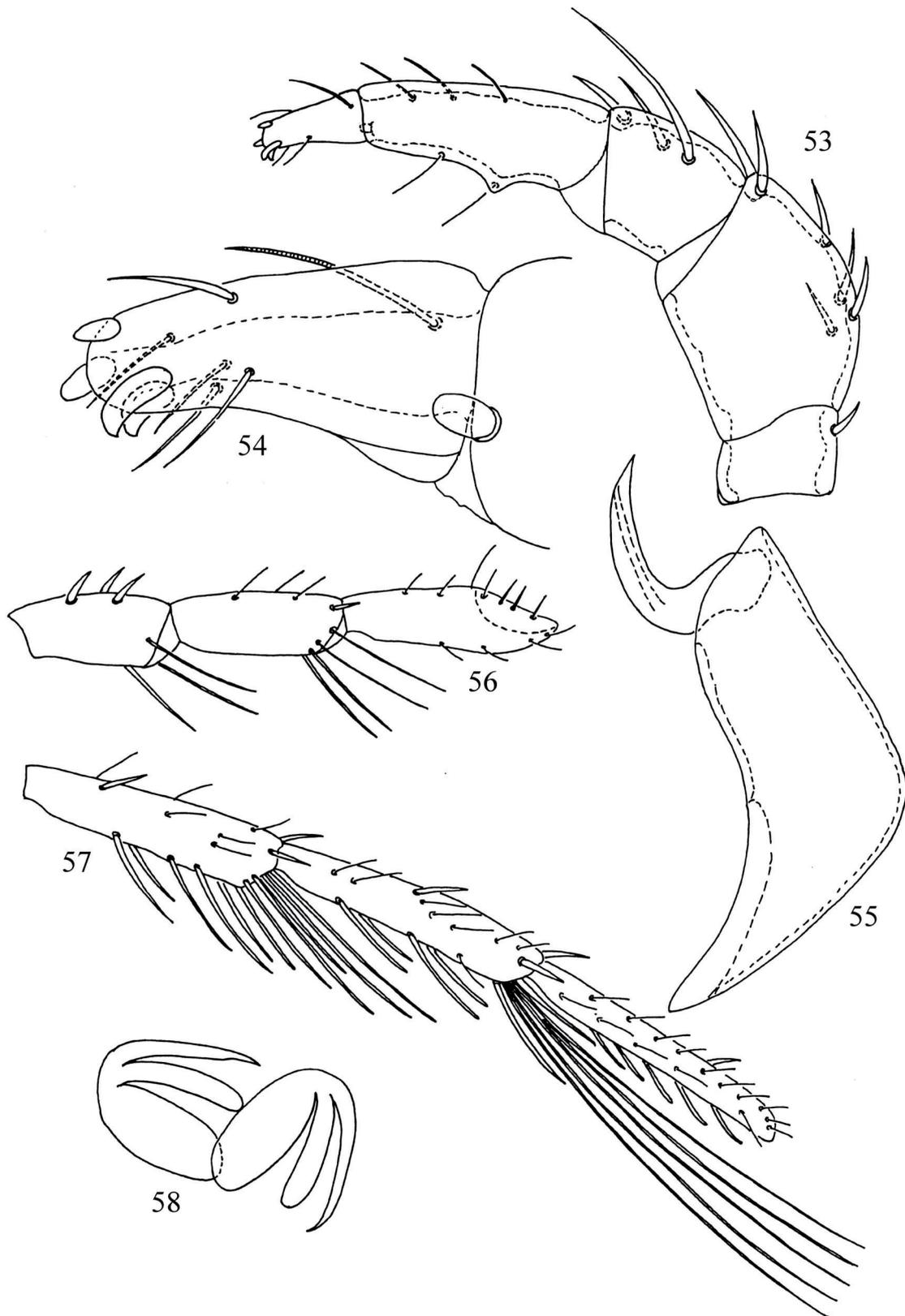
Figs. 48-52. *Pionacercus norvegicus* Thor, 1898, female: 48 – seta *Fch*; 49 – idiosomal seta with glandularium, 50 – trichobothrium *Oi*; 51 – dorsal plates; 52 – idiosoma, ventral view

Рис. 48-52. *Pionacercus norvegicus* Thor, 1898, самка: 48 – щетинка *Fch*; 49 – идиосомальная щетинка с железой; 50 – трихоботрия *Oi*; 51 – дорсальные пластинки; 52 – идиосома, вентральная сторона

very large, covering almost all dorsal surface and bearing 10 pairs of setae: *Vi*, *Ve*, *Oi*, *Oe*, *Hi*, *Sci*, *Sc*, *Li*, *Le* and *Si* (Fig. 64). Setae *Fch*, *Fp* and *He* placed on soft integument. All five pairs of lyriform organs on dorsal side of body.

Coxal plates, especially posterior ones, enlarged, fused with each other and with external genital organ and forming a monolithic shield (Fig. 65). Setae *Fch* longer than other idiosomal setae and located ventrally between capitulum

and anteromedial margins of coxal plates I. Coxal plates IV fused to each other, with suture between disappearing; coxal plates II with distinct borders on whole perimeter. Suture line between coxal plates III and IV incomplete, slightly not reaching their median margin. Medial border between coxal plates IV complete, that between coxal plates III distinct only in their posterior part. Posteromedial parts of coxal plates IV forming a deep, reaching to their middle, angular



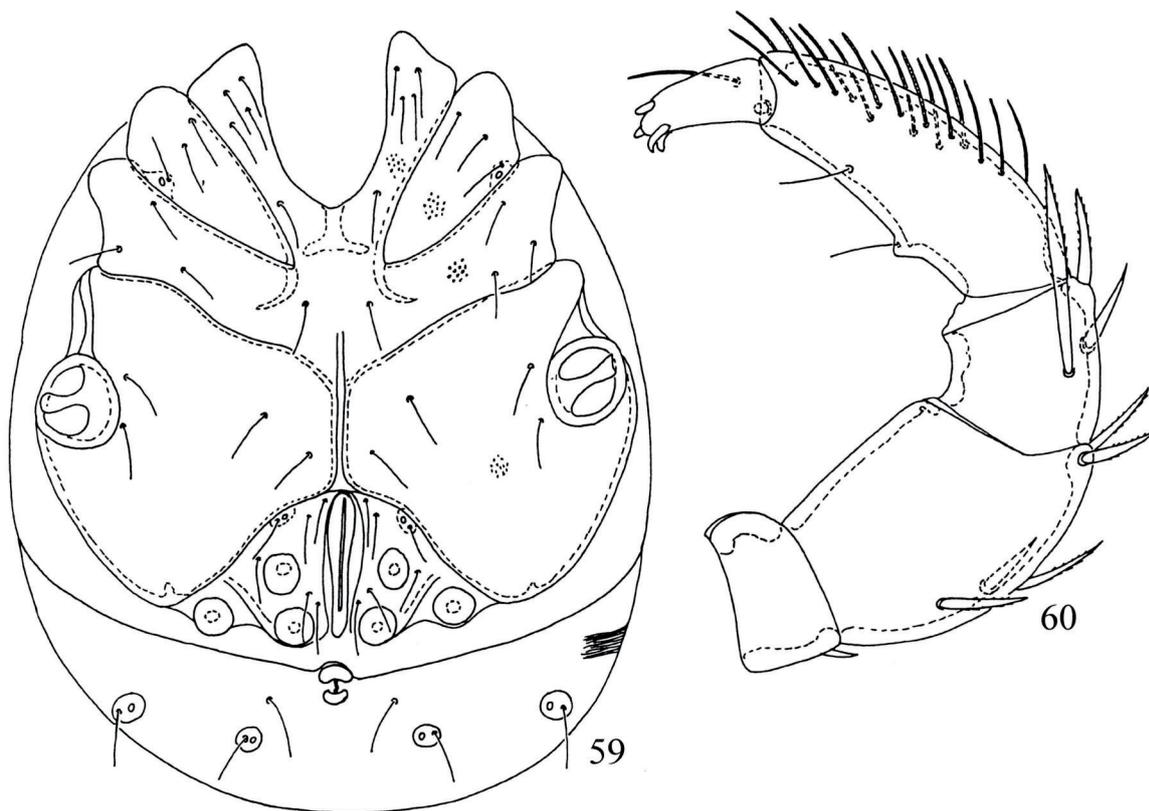
Figs. 53-58. *Pionacercus norvegicus* Thor, 1898, female: 53 – pedipalp, lateral view; 54 – distal part of tibia and tarsus of pedipalp; 55 – chelicera; 56 – tibia and tarsus of leg I; 57 – tibia and tarsus of leg IV; 58 – claw of leg I

Рис. 53-58. *Pionacercus norvegicus* Thor, 1898, самка: 53 – педипальпа; 54 – дистальная часть голени и лапка педипальпы; 55 – хелицера; 56 – голень и лапка ноги I; 57 – голень и лапка ноги IV; 58 – коготок ноги I

indentation, in which the genital opening and anterior pair of genital acetabula are situated. Setae *Pe* located on coxal plates IV. Anterior and median acetabula close together, distance between median and posterior acetabula longer than diameter of one acetabula. Setae *Ci*, *Pi* and *Se* situated in

secondary sclerotization zone of ventral shield. Capitulum with long anchoral projection.

Basal segment of chelicera (Fig. 66) strongly thickened and curved in proximal part. Cheliceral stylet short, crescent shaped.



Figs. 59-60. *Pionacercus norvegicus* Thor, 1898, male: 59 – idiosoma, ventral view; 60 – pedipalp  
 Рис. 59-60. *Pionacercus norvegicus* Thor, 1898, самец: 59 – идиосома, вентральная сторона; 60 – педипальпа

Pedipalps (Fig. 67) short and massive: P-1 with short dorsodistal seta; P-2 large with straight ventral margin, with 3 (rarely 4) dorsoproximal and two dorsodistal short setae; P-3 short with 2 dorsoproximal (rarely one seta) setae and one dorsodistal one; P-4 long, tapering distally, with straight ventral margin, laterodorsal surface covered with rather numerous solenidia, bases of ventral setae situated near distal margin of segment. Distolateral spine on P-4 very short, 0.07 times as long as P-5.

Posterior legs with swimming setae. IV-Leg-4 (Fig. 68) short, its dorsodistal part with short, thick setae splitted at apex. Swimming setae on IV-Leg-5 very long and projecting well beyond distal part of IV-Leg-6. Anterior and posterior parts of IV-Leg-6 forming a right angle, ventral edge of this segment with 7-8 short peg-like setae, one or two distal setae situated somewhat apart (Figs 68-69). Claws of two anterior pairs of legs (Fig. 70) each with a well-developed plate, wide internal and thin external denticles of subequal length. Claws of legs III with short plates and denticles, slightly differing from each other in shape and size (Fig. 71).

Measurements (n=5). L of idiosoma 400-465; basal segment of chelicera 95-110, L of cheliceral stylet 30-40; L of pedipalpal segment (P-1-5): 24-30, 68-72, 25-30, 70-80, 24-26; L of leg segments: I-Leg-1-6: 50-55, 60-65, 70-75, 85-80, 90-100, 140-150; II-Leg- 1-6: 55-60, 65-75, 70-80, 85-92, 120-130, 155-165; III-Leg-1-6: 55-60, 65-72, 60-65, 70-76, 100-110, 130-140; IV-Leg-1-6: 70-80, 60-65, 60-65, 75-80, 120-125, 125-135.

**Female.** Idiosoma almost round, integument soft, dorsum with one well-developed pair of plates and three pairs of small medial sclerites: anterior pair in front of setae *Oi*, second pair posterior to large plates and third pairs posterior to setae *Sci* (Fig. 72). In addition, on dorsum two pairs of lateral plates present: relatively large anterior and

very small posterior. Bases of setae *Oi* on soft integument. Anterior fourth pairs of lyriform organs situated along lateral margins of dorsum.

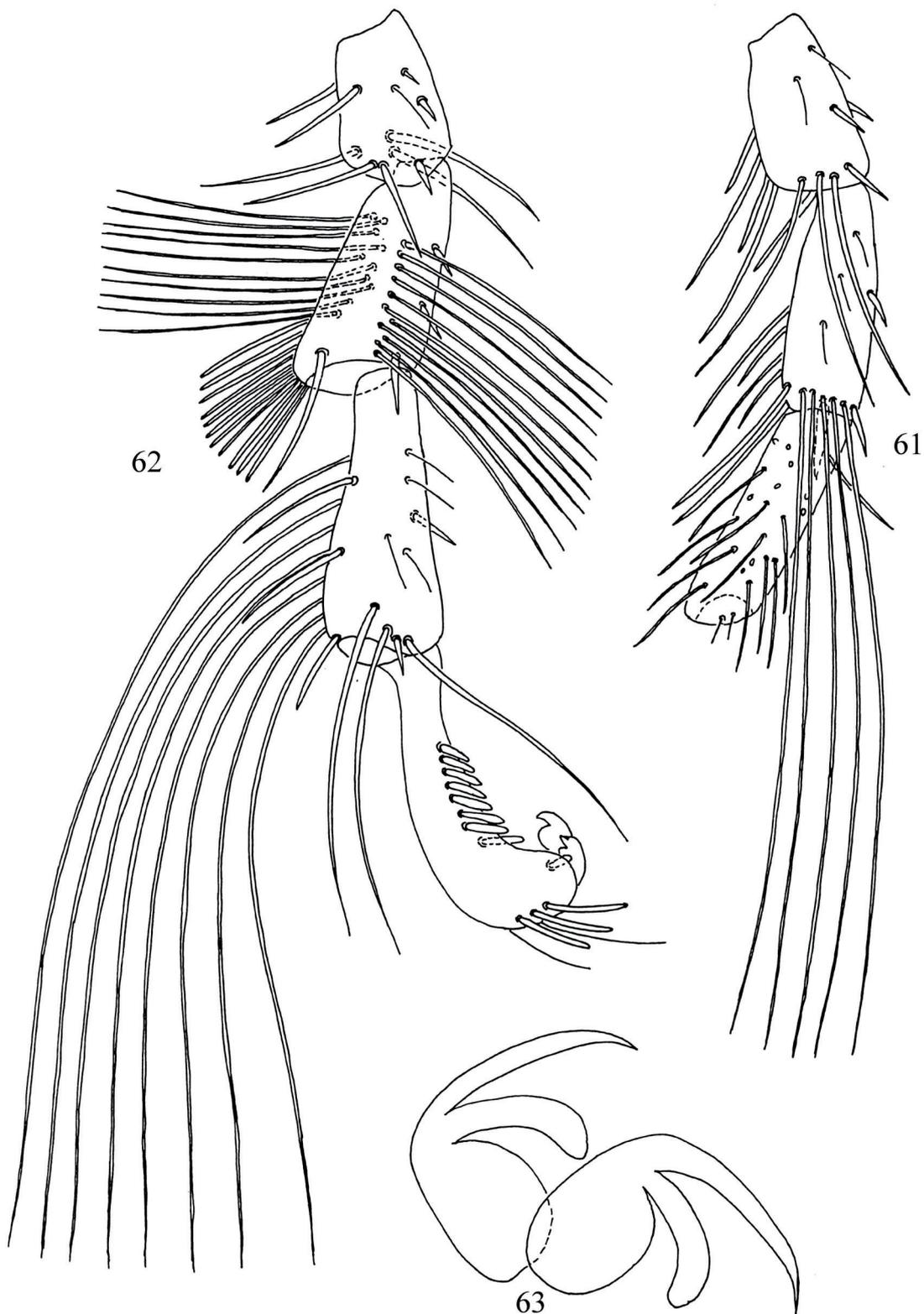
Anterior groups of coxal plates (Fig. 73) with short apodemes. Suture line between coxal plates III and IV incomplete. Posteromedial and posterolateral margins of coxal plates IV forming an obtuse angle, apodemes not developed. Four pairs of small plates lateral to posterior coxal plates. Acetabular plates triangular, genital opening longer than these plates. Anterior genital sclerite narrow, wide, with convex anterior and concave posterior margin. Posterior genital sclerite large, more or less rectangular, wider than long. Genital acebula of moderate size, occupying about half of area of plates. Distance between anterior and median acetabula usually less than diameter of one acetabulum. Fifth pair of lyriform organs situated near distal end of ventrum. Excretory pore opens on oval plate.

Pedipalp (Fig. 74) as in male, but P-4 with several setae. Terminal segments of anterior legs almost of equal thickness along the whole length (Fig. 75). Swimming setae present only on tibiae of all legs: 3-4 on tibia II, 1 on genu III and IV, 5-6 on tibia III and IV; setae on tibia I short, on tibia II-IV long (Fig. 76).

Measurements (n=9). L of idiosoma 595-685; L of genital plate 75-85, width 80-90; L of basal segment of chelicera 145-155, L of cheliceral stylet 42-47; L of pedipalpal segment (P-1-5): 28-32, 80-85, 42-47, 80-90, 30; L of leg segments: I-Leg-1-6: 50-52, 80-90, 80-95, 85-105, 100-110, 120-130; II-Leg-1-6: 55-70, 80-90, 85-95, 105-120, 140-155, 140-150; III-Leg-1-6: 65-70, 80-85, 80-95, 110-130, 150-170, 140-160; IV-Leg-1-6: 85-95, 85-85, 100-120, 135-150, 160-185, 150-170.

**Larva.** See Tuzovskij [1982].

**Deutonymph.** Unknown.



Figs. 61-63. *Pionacercus norvegicus* Thor, 1898, male: 61 – genu, tibia and tarsus of leg III; 62 – genu, tibia and tarsus of leg IV; 63 – claws of leg III

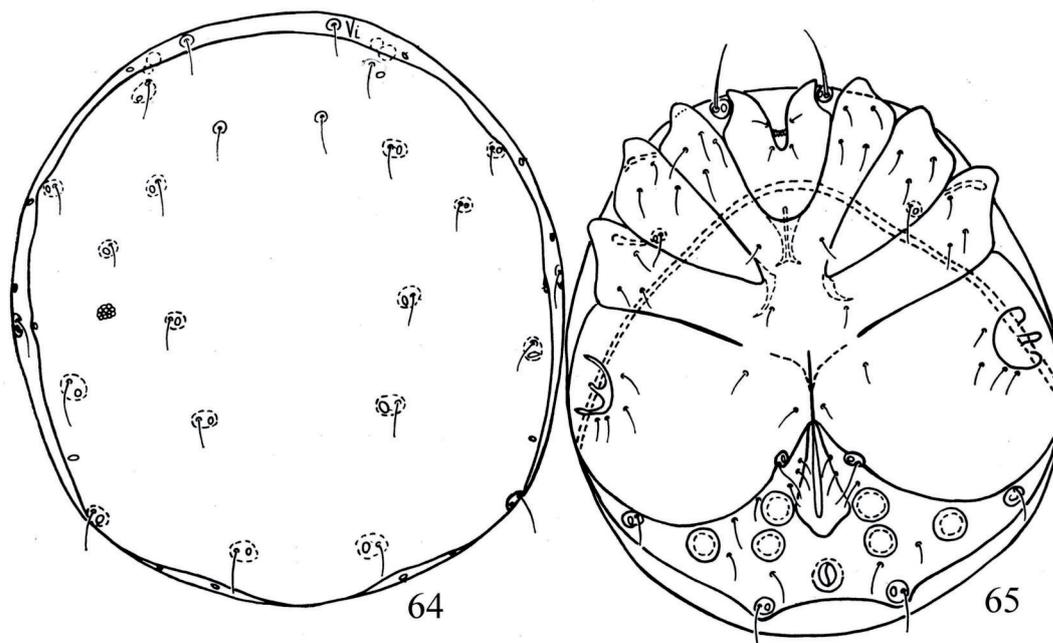
Рис. 61-63. *Pionacercus norvegicus* Thor, 1898, самец: 61 – колено, голень и лапка ноги III; 62 – колено, голень и лапка ноги IV; 63 – коготок ноги III

**Habitat.** Thermocarstic lake.

**Distribution.** Asia: Russia, Magadan Province.

**Remarks.** The species is similar to *P. uncinatus*. The adults of *P. uncinatus* are characterized by the following features: male – anterior and posterior parts of IV–Leg-6 (Figs 89) forming an obtuse angle, ventral edge of this seg-

ment with 5–6 short peg-like setae, IV–Leg-4 with large leaf-like setae; leg claws III with unequal clawlets (Fig. 90), sclerite bearing seta and glandularia *Pe* not fused with posteromedial margin of coxal plate IV (Fig. 87); female – posteromedial and posterolateral margins of coxal plate IV forming an acute angle (Fig. 93), anterior and posterior



Figs. 64-65. *Pionacercus colymicus* Tuzovskij, 1982, male: 64 – dorsal view; 65 – ventral view

Figs. 64-65. *Pionacercus colymicus* Tuzovskij, 1982, самец: 64 – дорсальная сторона; 65 – вентральная сторона

genital sclerites subequal in width. In contrast, the adults of *P. colymicus* are characterized by the following features: male – anterior and posterior parts of IV–Leg-6 forming a right angle, ventral edge of this segment with 7–8 short peg-like setae (Figs 68–69), claws of leg III with subequal clawlets (Fig. 71), IV–Leg-4 without leaf-like setae, sclerite bearing seta and glandularia *Pe* fused with posteromedial margin of coxal plate IV (Fig. 65); female – posteromedial and posterolateral margins of coxal plate IV forming obtuse angle (Fig. 73), anterior and posterior genital sclerites subequal in width.

***Pionacercus leuckartii* Piersig, 1894**  
(Figs 77–84)

**Material examined.** 3 males and 3 females in a collection of Naturmuseum Senckenberg, Frankfurt on Main (Germany).

**Male.** Idiosoma almost round. Dorsal shield very large, covering almost all dorsal surface and bearing 8 pairs of setae (Fig. 77). Setae *Fch*, *Fp* and *Vi* placed on soft integument at anterior end of idiosoma. Setae *Fch* longer and thicker than others idiosomal setae.

Coxal plates, especially posterior ones, enlarged, fused with each other and with external genital organ and forming a monolithic shield (Fig. 78). Anterior coxal plates with well developed apodemes; coxal plates II with distinct borders on whole perimeter. Suture line between coxal plates III and IV incomplete, not reaching their median margin. Medial margins of coxal plates IV close together, these in coxal plates III distinct only in their posterior part. Posteromedial parts of coxal plates IV forming a deep rectangular indentation, in which the genital opening and anterior pair of genital acetabula are situated. Genital acetabula relatively large, median and posterior acetabula close together forming transverse row; distance between anterior and median acetabula less than diameter of one acetabulum. Setae *Ci* and *Pi* situated in secondary sclerotization zone of ventral shield. Excretory pore with rather large anterior sclerite and small posterior one.

Pedipalp (Fig. 79) rather slender: P-1 with short dorso-distal seta; P-2 large with concave ventral margin, with 3

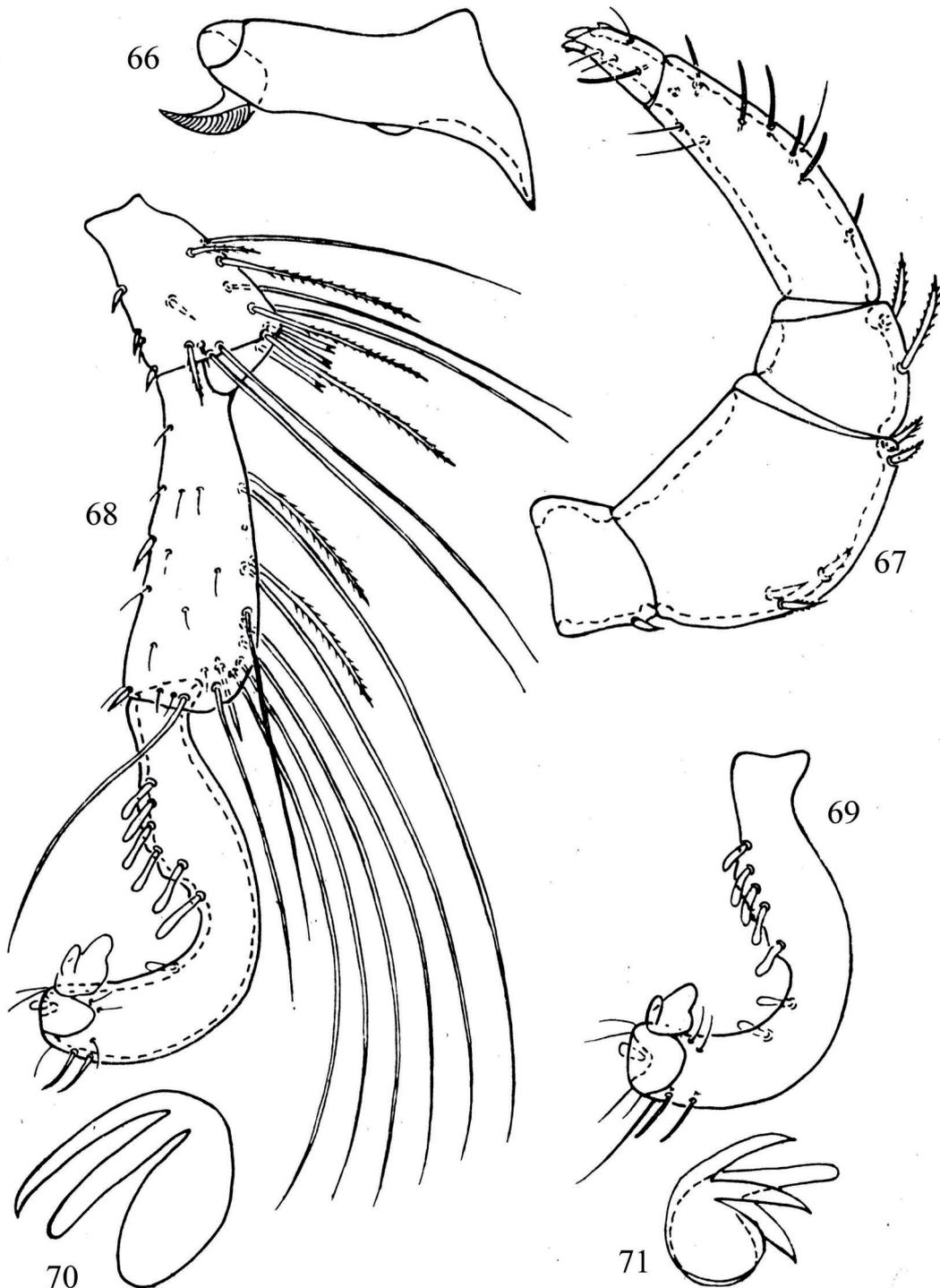
dorsoproximal and two dorsodistal unequal setae; P-3 short with one dorsoproximal seta and two dorsodistal setae, lateral from them considerably longer than both dorsal ones; P-4 long, tapering distally, with straight ventral margin, laterodorsal surface covered with numerous solenidia, bases of ventral setae situated near distal margin of segment. Disto-lateral spine on P-4 short, 0.3 times as long as P-5.

Posterior legs with swimming setae. IV–Leg-3 shorter than IV–Leg-4 (Fig. 80). Swimming setae on IV–Leg-5 very long, projecting well beyond distal part of IV–Leg-6. Ventral edge of IV–Leg-6 with 11–12 short peg-like setae, two or three distal setae situated somewhat apart (Fig. 81). Claws of legs III with short plate and two denticles, well differing from each other in shape and size (Fig. 82).

Measurements (n=3). L of idiosoma 465–505; basal segment of chelicera 100–110, L of cheliceral stylet 38–42; L of pedipalpal segment (P-1–5): 23–29, 75–80, 38–42, 80–85, 35–38; L of leg segments: I–Leg-1–6: 42–47, 70–85, 85–90, 110–115, 130–140, 170–180; II–Leg-1–6: 47–63, 85–105, 95–105, 120–125, 150–165, 170–190; III–Leg-1–6: 55–62, 95–110, 75–80, 80–85, 120–130, 120–135; IV–Leg-1–6: 115–135, 90–95, 85–95, 105–130, 145–165, 165–180.

**Female.** Idiosoma almost round, integument soft, dorsum with two pairs of well-developed plates: large elongate anterior and small transverse posterior; setae *Oi* on soft integument (Fig. 83).

Anterior groups of coxal plates (Fig. 84) with relatively long apodemes. Suture line between coxal plates III and IV complete. Posteromedial and posterolateral margins of coxal plates IV forming acute angle; apodemes very small. Acetabular plates triangular, genital opening longer than these plates. Anterior genital sclerite narrow, wide, with convex anterior and concave posterior margin. Posterior genital sclerite smaller than anterior one, more or less rectangular, wider than long. Genital acetabula of moderate size, occupying about half of area of plates. Distance between anterior and median acetabula usually smaller than diameter of one acetabulum.



Figs. 66-71. *Pionacercus colymicus* Tuzovskij, 1982, male: 66 – chelicera; 67 – pedipalp, lateral view; 68 – genu, tibia and tarsus of leg IV; 69 – tarsus of leg IV; 70 – claw of leg I; 71 – claws of leg III

Рис. 66-71. *Pionacercus colymicus* Tuzovskij, 1982, самец: 66 – хелицера; 67 – педипальпа, боковая сторона; 68 – колено, голень и лапка ноги IV; 69 – лапка ноги IV; 70 – коготок ноги I; 71 – коготки ноги III

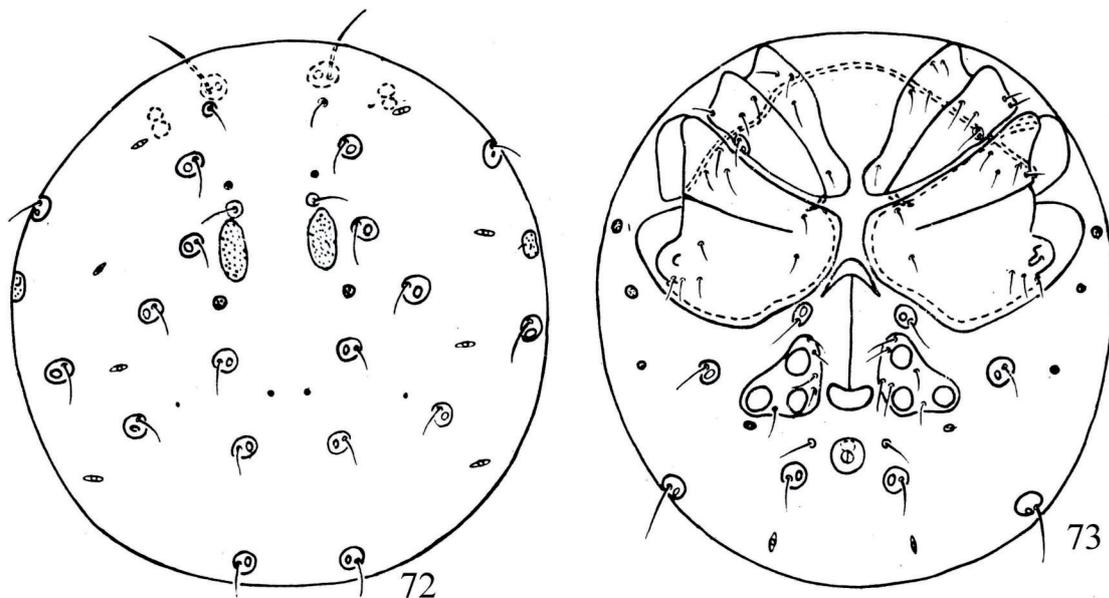
Pedipalp (Fig. 85) as in male, but P-4 with several setae, ventral setae situated near middle of segment.

Terminal segments of anterior legs of equal thickness along the whole length (Fig. 86). Swimming setae present on tibiae of all legs: 1-3 on tibia I, 3-5 on tibia II, 6-7 on genu III, 7-8 on tibia IV. Swimming setae on tibia I shorter than on tibia II-IV.

Measurements (n=3). L of idiosoma 570-810; L of genital plate 75-80, width 75-110; L of basal segment

of chelicera 125-135, L of cheliceral stylet 42-47; L of pedipalpal segment (P-1-5): 28-33, 85-90, 40-50, 75-90, 35-45; L of leg segments: I-Leg-1-6: 45-50, 85-105, 90-100, 110-130, 120-145, 130-140; II-Leg-1-6: 45-55, 100-110, 100-120, 125-150, 165-195, 150-190; III-Leg-1-6: 60-65, 115-120, 100-110, 130-160, 175-205, 165-195; IV-Leg-1-6: 120-135, 105-115, 120-135, 160-200, 185-215, 170-215.

**Larva.** See Piersig [1901], Lundblad [1927]. The larva



Figs. 72-73. *Pionacercus colymicus* Tuzovskij, 1982, female: 72 – dorsal view; 73 – ventral view

Рис. 72-73. *Pionacercus colymicus* Tuzovskij, 1982, female: 72 – дорсальная сторона; 73 – вентральная сторона

does not parasitize [Lundblad, 1927].

**Deutonymph.** See Piersig [1894, 1897–1900].

**Habitat.** Ponds, lakes, brooks.

**Distribution.** Europe [Viets, 1936, 1956; Lundblad, 1968; K.O. Viets, 1978]; Asia, Russia: Karelia, Baikal [Sokolow, 1940]; Nord America [Habeeb, 1955].

***Pionacercus uncinatus* (Koenike, 1895)**

(Figs 87–94)

**Material examined.** 1 male and 1 female in a collection of Naturhistorisches Museum Basel (Switzerland) and 1 female in a collection of Naturmuseum Senckenberg, Frankfurt on Main (Germany).

**Male.** Idiosoma almost round. Dorsal shield very large, covering almost all dorsum. Setae *Fch*, *Fp* and *Vi* placed on soft integument at anterior end of idiosoma. Coxal plates, especially posterior ones, enlarged, fused with each other and with external genital organ and forming a monolithic shield (Fig. 87). Anterior coxal plates with short apodemes, coxal plates II with distinct borders on whole perimeter. Suture line between coxal plates III and IV incomplete, not reaching their median margin. Medial margins of coxal plates IV close together, these in coxal plates III distinct only in their posterior part. Posteromedial parts of coxal plates IV forming a deep triangular indentation, in which the genital opening and anterior pair of genital acetabula are situated. Genital acetabula relatively large, located on short bases, median and posterior acetabula close together and forming transverse row, distance between anterior and median acetabula smaller than diameter of one acetabulum. Excretory pore lies terminally in secondary sclerotization zone of ventrum.

Posterior legs with long swimming setae. IV–Leg-4 shorter than IV–Leg-5, bears large leaf-like seta (Fig. 88). Anterior and posterior parts of IV–Leg-6 form obtuse angle, anterior portion longer than posterior one; ventral edge of this segment with 5–6 short peg-like setae (Fig. 89). Claws of legs III with short plates and two unequal clawlets: long external and short internal (Fig. 90).

Pedipalp (Fig. 91) rather slender: P-1 with short dorsodistal seta; P-2 large, with almost ventral margin, with three dorsoproximal and two dorsodistal subequal setae;

P-3 short with one relatively long dorsoproximal seta and one short dorsodistal seta; P-4 long, tapering distally, with slightly concave ventral margin, laterodorsal surface with a few solenidia, bases of ventral setae well separated and situated distally to middle of segment; distolateral spine on P-4 short, 0.1 times as long as P-5.

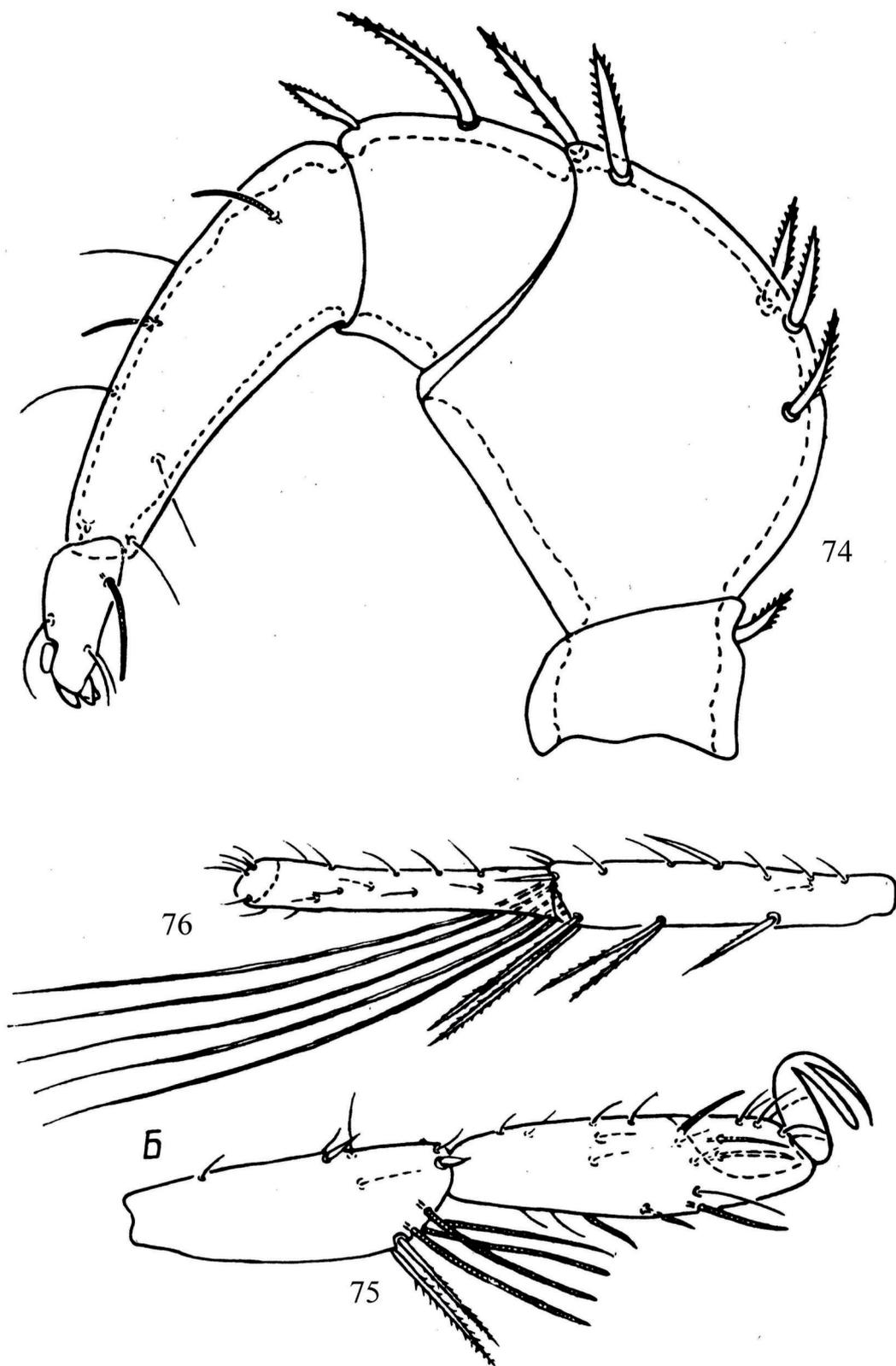
Measurements (n=1). L of idiosoma 375; L of pedipalpal segment (P-1-5): 25, 67, 30, 67, 22; L of leg segments: I–Leg-1-6: 35, 55, 65, 70, 80, 115; II–Leg-1-6: 40, 70, 67, 80, 110, 130; III–Leg-1-6: 40, 70, 60, 70, 105, 130; IV–Leg-1-6: 67, 65, 65, 75, 115, 125.

**Female.** Idiosoma almost round, integument soft, dorsum with two pairs of plates: large elongate anterior and small transverse posterior; setae *Oi* on soft integument (Fig. 92). Anterior groups of coxal plates (Fig. 93) with short apodemes. Suture line between coxal plates III and IV incomplete, obliterated medially. Posteromedial and posterolateral margins of coxal plate IV forming acute angle; apodemes very small. Genital plates triangular, shorter than genital opening. Anterior and posterior genital sclerites narrow and equal in width to each other. Genital acetabula relatively small, occupying less than half of plates. Distance between anterior and median acetabula approximately equal to diameter of one acetabulum.

Pedipalp as in male, but P-4 with several dorsal setae; ventral setae situated distally to middle of segment.

Terminal segments of anterior legs of equal thickness along the entire length (Fig. 94). Swimming setae present on tibiae of all legs: 1-3 on tibia I, 3-5 on tibia II, 6-7 on genu III, 7-8 on tibia IV. Swimming setae on tibia I shorter than on tibia II-IV. Leg claws with wide internal and thin external denticles.

Measurements (n=2). L of idiosoma 475–600; L of genital plate 70–90, width 75–90; L of basal segment of chelicera 125–135, L of cheliceral stylet 45–50; L of pedipalpal segment (P-1-5): 25–33, 75–80, 35–45, 80–85, 30–35; L of leg segments: I–Leg-1-6: 45–52, 67–80, 80–85, 85–90, 90–105, 110–120; II–Leg-1-6: 45–52, 75–80, 85–95, 100–105, 135–145, 120–145; III–Leg-1-6: 50–57, 70–75, 75–90, 100–105, 140–150, 140–165; IV–Leg-1-6: 90–95, 75–85, 95–105, 130–145, 165–175, 160–170.



Figs. 74-76. *Pionacercus colymicus* Tuzovskij, 1982, female: 74 – pedipalp, lateral view; 75 – tibia and tarsus of leg I; 76 – tibia and tarsus of leg IV

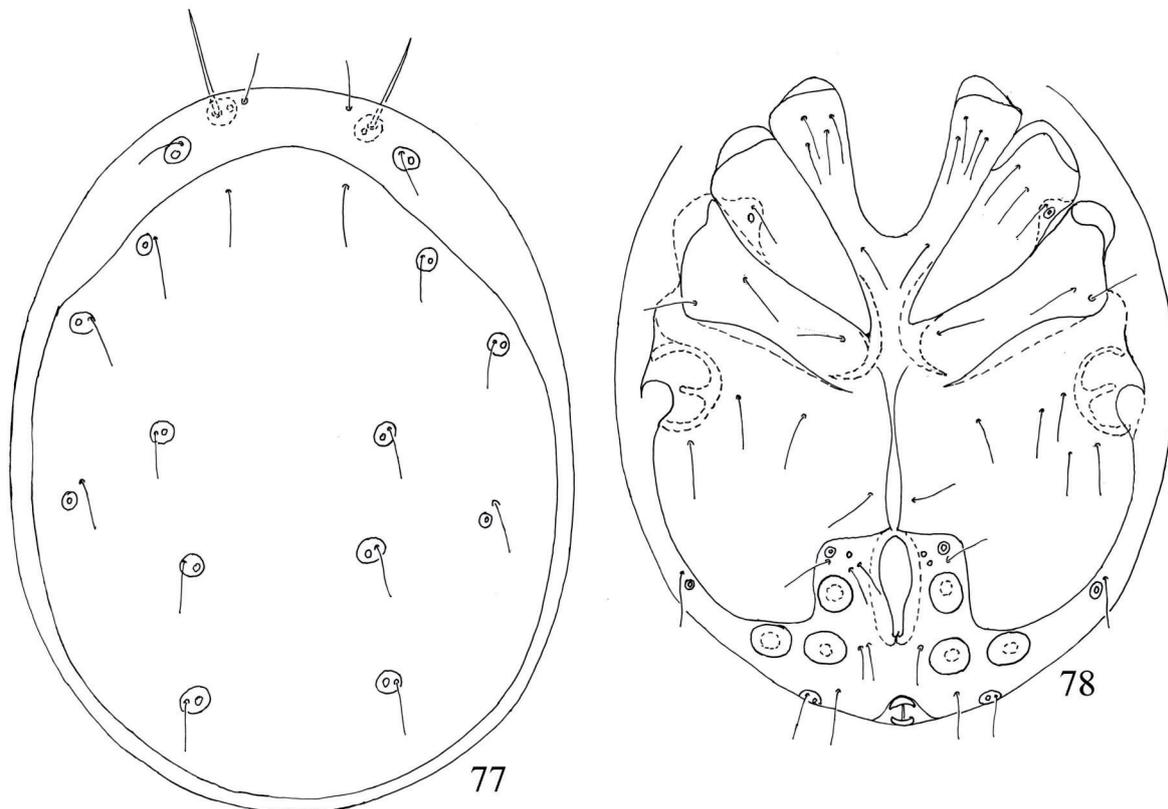
Рис. 74-76. *Pionacercus colymicus* Tuzovskij, 1982, female: 74 – педипальпа, боковая сторона; 75 – голень и лапка ноги I; 76 – голень и лапка ноги IV

**Larva.** Unknown.

**Deutonymph.** Unknown.

**Habitat.** Ponds, lakes, brooks [Lundblad, 1968].

**Distribution.** Europe [Viets, 1936, 1956; K.O. Viets, 1978; Lundblad, 1968], Russia: Karelia, Ivanovskaya Province [Sokolow, 1940].



Figs. 77-78. *Pionacercus leuckartii* Piersig, 1894, male: 77 – dorsal view; 78 – ventral view

Рис. 77-78. *Pionacercus leuckartii* Piersig, 1894, male: 77 – дорсальная сторона; 78 – вентральная сторона

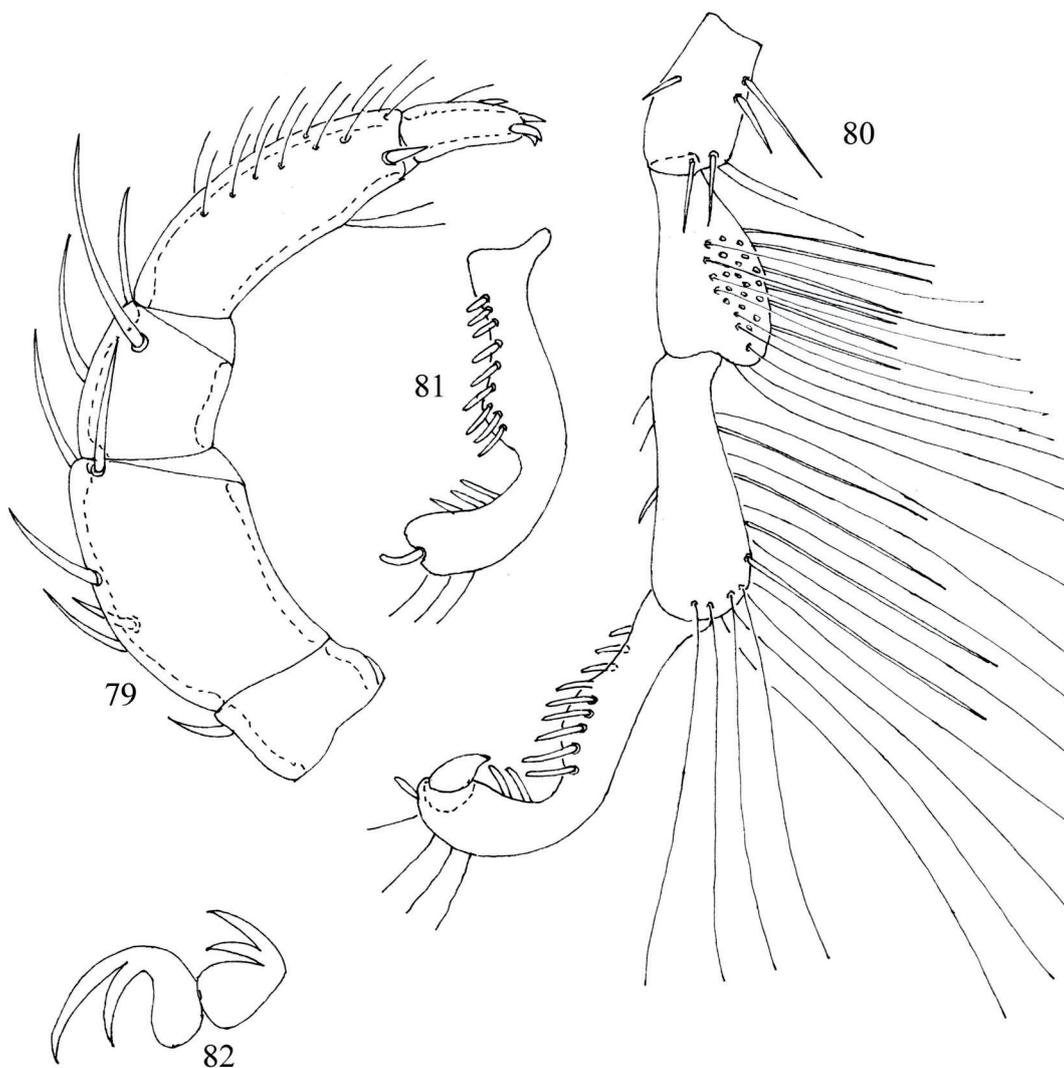
**Key to adults of the species  
of *Pionacercus* found in Russia  
Males**

- 1 (6) Dorsal surface almost completely covered by large shield
- 2 (3) Genital bay rectangular (Fig. 78) ..... *P. leuckartii* Piersig, 1894
- 3 (2) Genital bay triangular
- 4 (5) IV-Leg-6 curved under an obtuse angle, ventral edge of this segment with 5–6 short peg-like setae (Fig. 89), IV-Leg-4 with large leaf-like seta, sclerites bearing setae Pe not fused with posteromedial margins of coxal plates IV (Fig. 87) ..... *P. uncinatus* (Koenike, 1895)
- 5 (4) IV-Leg-6 curved under a right angle, ventral edge of this segment with 7–8 short peg-like setae (Figs. 68–69), IV-Leg-4 without leaf-like seta, sclerites bearing setae Pe fused with posteromedial margins of coxal plates IV (Fig. 65) ..... *P. colymicus* Tuzovskij, 1982
- 6 (1) Dorsal surface soft with two pairs of small anteromedial plates or one or two wide sclerotized lateral strip(s)
- 7 (8) Dorsal surface with two pairs of anteromedial plates only, P-4 with ventroproximal tubercle (Fig. 60) ..... *P. norvegicus* Thor, 1898
- 8 (7) Dorsal surface with two pairs of anteromedial plates, P-4 without ventroproximal tubercle
- 9 (10) Dorsal surface with two lateral strips (Fig. 1), genital bay rectangular (Fig. 2), IV-Leg-6 with 10–12 peg-like setae (Fig. 8) ..... *P. tundrosum* Tuzovskij, 2001
- 10 (9) Dorsal surface with one U-shaped lateral strip (Fig.

- 19), genital bay triangular (Fig. 20), IV-Leg-6 with 7–8 peg-like setae (Fig. 24) ..... *P. anadyrensis* Tuzovskij, 2001

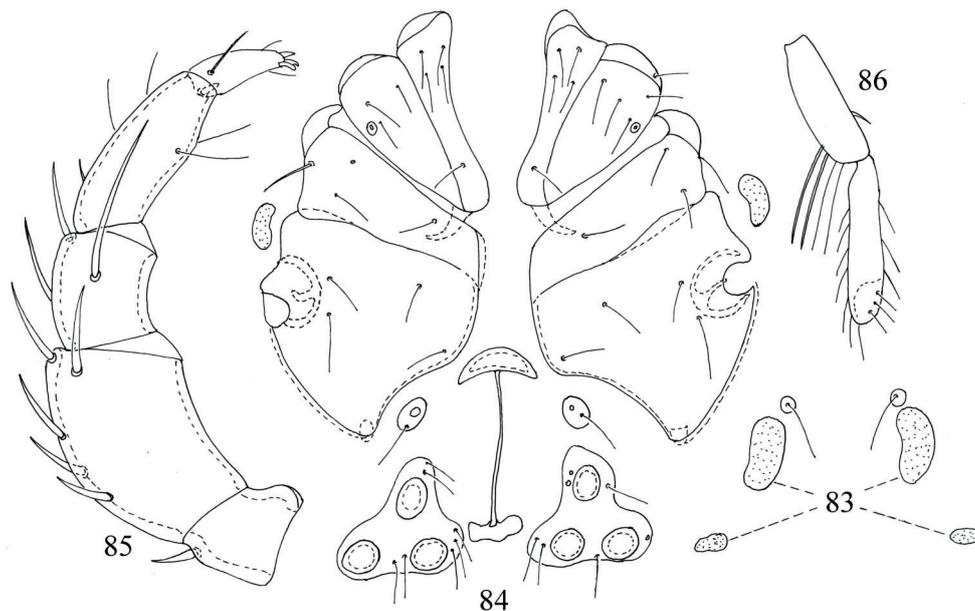
**Females**

- 1 (6) Excretory pore surrounded by sclerotized ring
- 2 (3) Coxal plate IV with an acute posteromedial angle (Fig. 93) ..... *P. uncinatus* (Koenike, 1895)
- 3 (2) Coxal plate IV with an obtuse posteromedial angle (Figs 11, 73)
- 4 (5) P-3 lateral seta shorter than length of segment (Fig. 74) ..... *P. colymicus* Tuzovskij, 1982
- 5 (4) P-3 lateral seta considerably longer than length of segment (Fig. 15) ..... *P. tundrosum* Tuzovskij, 2001
- 6 (1) Excretory pore with anterior and posterior sclerites or only with anterior sclerite
- 7 (8) Dorsal surface with three pairs of anteromedial plates (Fig. 36) ..... *P. major* Tuzovskij, 2005
- 8 (7) Dorsal surface with two pairs of anteromedial plates
- 9 (10) P-4 with ventroproximal tubercle, ventral setae widely separated (Fig. 53) ..... *P. norvegicus* Thor, 1898
- 10 (9) P-4 without ventroproximal tubercle, ventral setae close together
- 11 (12) Medial margin of coxal plate IV longer than that of coxal plate III (Fig. 29), excretory pore only with anterior sclerite (Fig. 32), rarely rudimentary posterior sclerite presents (Fig. 33) ..... *P. anadyrensis* Tuzovskij, 2001
- 12 (11) Medial margin of coxal plate IV shorter than that of coxal plate III (Fig. 84), excretory pore with anterior and posterior sclerites ..... *P. leuckartii* Piersig, 1894



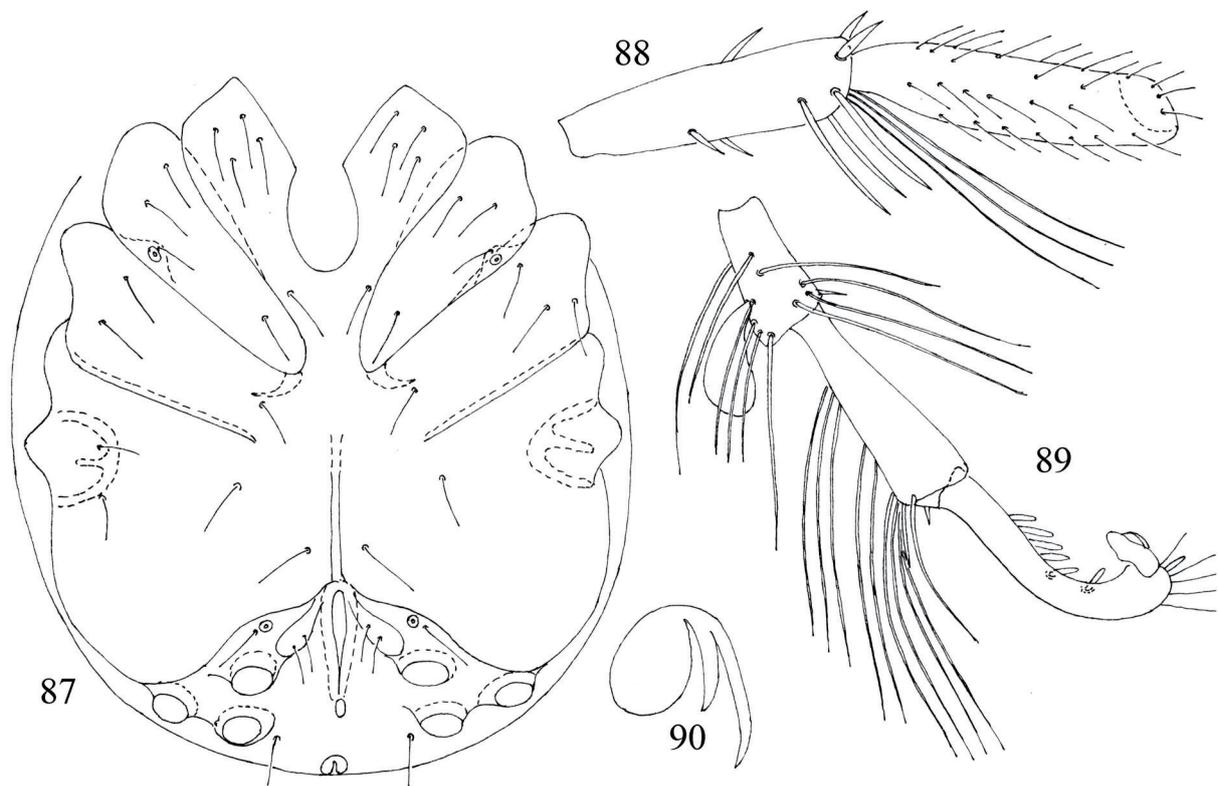
Figs. 79-82. *Pionacercus leuckartii* Piersig, 1894, male: 79 – pedipalp, lateral view; 80 – femur II, genu, tibia and tarsus of leg IV; 81 – tarsus of leg IV; 82 – claws of leg III

Рис. 79-82. *Pionacercus leuckartii* Piersig, 1894, male: 79 – педипальпа, боковая сторона; 80 – бедро II, колено, голень и лапка ноги IV; 81 – лапка ноги IV; 82 – коготки ноги III



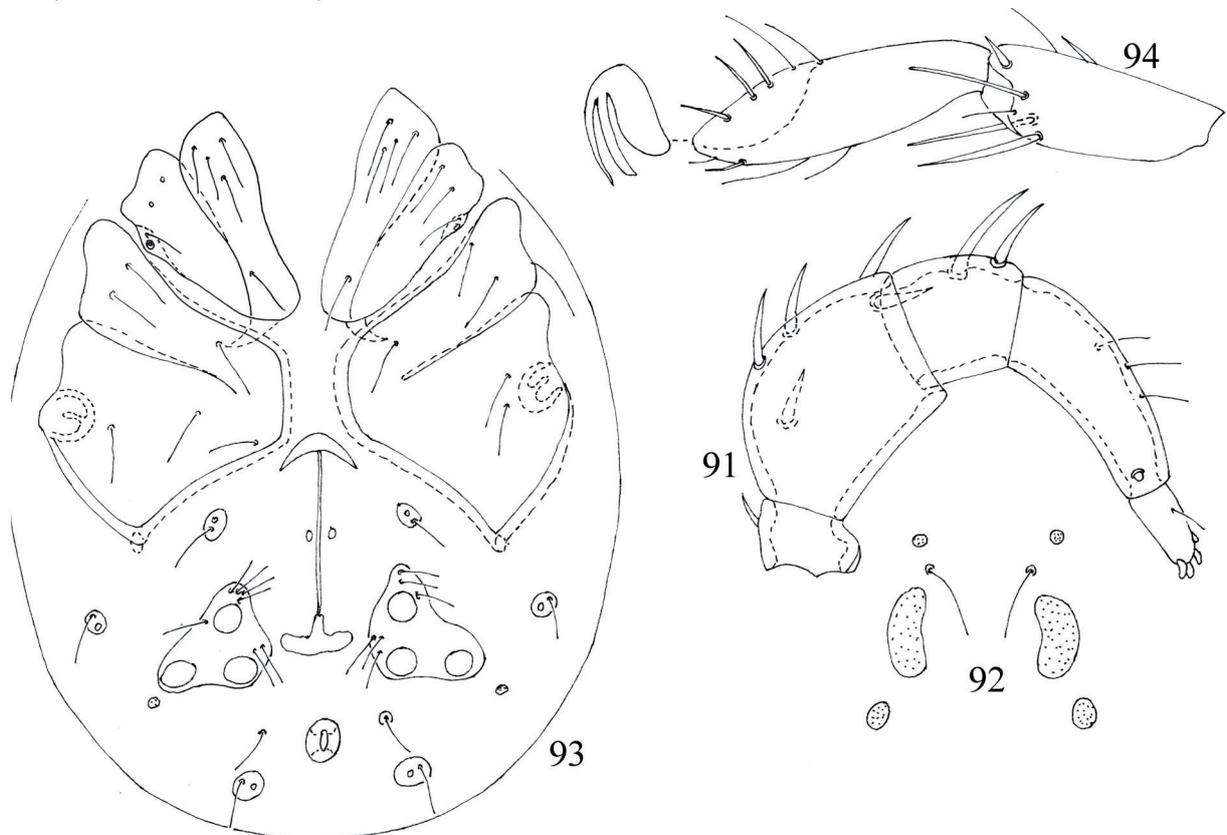
Figs. 83-86. *Pionacercus leuckartii* Piersig, 1894, female: 83 – dorsal plates; 84 – idiosoma, ventral view, 85 – pedipalp, lateral view; 86 – tibia and tarsus of leg I

Рис. 83-86. *Pionacercus leuckartii* Piersig, 1894, female: 83 – дорсальные пластинки; 84 – идиосома, вентральная сторона; 85 – педипальпа, боковая сторона; 86 – голень и лапка ноги I



Figs. 87-90. *Pionacercus uncinatus* (Koenike, 1895), male: 87 – ventral view; 88 – tibia and tarsus of leg III; 89 – genu, tibia and tarsus of leg IV, 90 – claws of leg III

Рис. 87-90. *Pionacercus uncinatus* (Кoenike, 1895), самец: 87 – вентральная сторона; 88 – голень и лапка ноги III; 89 – колено, голень и лапка ноги IV; 90 – коготки ноги III



Figs. 91-94. *Pionacercus uncinatus* (Koenike, 1895): 91 – pedipalp, lateral view; 92 – dorsal plates; 93 – idiosoma, ventral view; 94 – tibia and tarsus of leg I; 91 – male; 92–94 – female

Рис. 91-94. *Pionacercus uncinatus* (Кoenike, 1895): 91 – педипальпа, боковая сторона; 92 – дорсальные пластинки; 93 – идиосома, вентральная сторона; 94 – голень и лапка ноги I; 91 – самец; 92–94 – самка

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