

UDC 595.4:57.063.7

TWO NEW SPECIES OF THE GENUS *NEOSEIULUS* (PARASITIFORMES, PHYTOSEIIDAE) WITH REDESCRIPTIONS OF *N. BICAUDUS* AND *N. MICMAC* BASED ON HOLOTYPES

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urn:lsid:zoobank.org:pub:C3D3FE8F-1BFA-41F0-AD5D-007DB9C558CF

Two New Species of the Genus *Neoseiulus* (Parasitiformes, Phytoseiidae) with Redescriptions of *N. bicaudus* and *N. micmac* Based on Holotypes. Kolodochka, L. A. — Phytoseiid mites of the genus *Neoseiulus* (Parasitiformes, Phytoseiidae), *N. brachychaetus* Kolodochka, sp. n. and *N. akimovi* Kolodochka, sp. n. from Georgia and Russia are described. Re-examination of the holotypes of *N. bicaudus* (Wainstein, 1962) and *N. micmac* (Chant & Hansell, 1971) revealed new characters for differentiation between similar species were found and proposed. The name *N. micmac* (Chant & Hansell, 1971) restored from synonymy here. A key to species similar to *Neoseiulus bicaudus* is given.

Key words: Parasitiformes, Phytoseiidae, phytoseiid mites, *Neoseiulus*, new species, redescription, Georgia, Russia.

Introduction

Predaceous mites of the family Phytoseiidae are a good object as a source of biological control agents of phytophagous mites and small insects for a long time. Structure of this family continually changes because of frequent descriptions of new species. Two new species described here were found among of slides marked as *N. bicaudus* in B. A. Wainstein's memorial collection (Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine, Kyiv) (SIZK). A new species may be found sometimes even among type materials.

Neoseiulus bicaudus (Wainstein, 1962) was described from Kazakhstan. Its short original description and drawings of *N. bicaudus* did not contain several details important for correct identification and comparison with similar species. *Neoseiulus bicaudus* was redescribed more than once on the base of material from different locations but its holotype has not been revisited. As the result, several species were misidentified and species names were erroneously synonymized.

Chant and Hansell (1971) described *N. micmac* from Canada. Later Congdon (2002) synonymized *N. micmac* with *N. bicaudus*. Chant and McMurtry (2003) restored *N. micmac* as a valid name. Denmark and Evans (2011) supported of Congdon's opinion.

Nevertheless, the re-examination of *N. bicaudus* and *N. micmac* have never been based on holotypes to validate those taxonomic actions until this study. In this paper the holotypes were revisited, redescribed including measurements and illustrated in detail.

Finally, study of B. A. Wainstein's memorial collection (Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine, Kyiv) has shown that the specimens on slides marked as "*N. bicaudus*" represent two additional new species non-conspecific with the holotype of *N. bicaudus*. They are described below.

In addition, several *Neoseiulus* species similar to *N. bicaudus*, namely, *N. neoparaki* Ehara 1972 from Japan, as well as *N. dissipatus* (Kolodochka, 1991), *N. perspectus* (Kolodochka, 1992), *N. ponticus* Kolodochka & Bondarev, 2017, and *N. probatus* Kolodochka & Bondarev, 2017 from Ukraine, were compared and included in the key to species.

Material and methods

In total, 29 slides with 93 specimens (78 females, 15 males) labelled by B. A. Wainstein as *N. bicaudus* in Wainstein's memorial collection were examined. Specimens were found in different locations of Ajaria (Georgia), Germany, Kazakhstan, Russia (Krasnodar Region), Tajikistan in 1957–1973 by several collectors. Descriptions, drawings and measurements of two new species and two redescribed species as well as a key for identification of studied species were given.

Mites were mounted on microscope slides in Hoyer's medium and examined under a research microscope MBI-3 (LOMO). A phase contrast attachment KF-1 (LOMO) and a camera Lucida apparatus RA-6 (LOMO) were used for the drawings. A position of the genus *Neoseiulus* in the structure of the family are follows that of Chant and McMurtry (2007). Setal nomenclature and idiosomal setal pattern follows that proposed by Lindquist and Evans (1965), as adapted by Rowell et al. (1978) for the Phytoseiidae. Nomenclature of setae on legs follows Evans and Till (1979). Nomenclature of dorsal solenostomes follows Athias-Henriot (1975). The nomenclature of spermatheca structures follows Kolodochka (1990). The apical tooth is not included in the number of teeth on cheliceral digits. Measurements are presented in micrometers (μm). Width of dorsal shield measured at the level of seta Z1.

Material is deposited in Wainstein's memorial collection of phytoseiid mites at the I. I. Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine, Kyiv, Ukraine (SIZK) and the Canadian National Collection, Ottawa, Canada (CNC).

Wainstein based the description of *Neoseiulus bicaudus* on the type series containing five females found on grass in Kazakhstan. The holotype is present but other four females have not been found in the collection. Besides these specimens, Wainstein mentioned four additional specimens of this species without applying to them any type specimen status (see above).

Results and discussions

Neoseiulus bicaudus (Wainstein, 1962) (fig. 1, 2)

Amblyseius bicaudus Wainstein, 1962: 237¹.

Type material. Holotype ♀: [**Kazakhstan**:] environs of Alma-Ata [Almaty], [43°13' N, 76°51' E], # 1863, 27.05.1957, on cereal, Kargalinka² [B. Wainstein]³ (SIZK).

Non-type material examined. **Russia**: [environs of] Volgograd, on wheat, # 4844, data 26.05.1972, 1 ♂ (A. Badulin) (illustrated); Sochi, Adler, plum tree (*Prunus*), # 1304, [date unknown] 1954, 1 ♀, (G. Begljarov). **Kazakhstan**: Karaganda Region: Balkhash, (former as "Dzjezkazghan district"), 1 ♀, on melon (*Citrullus*), # 261, 08.02.1952 (B. Parfentiev). **Tajikistan**: Kuliab Region, Piandj, # 1525, 05.06.1955, on mulberry (*Morus*), 1 ♀, (I. Lindt); same locality, # 1528, 31.05.1955, 1 ♀ (Z. Strunkova) (SIZK).

Additional 87 specimens (14 ♂, 73 ♀) identified by Wainstein as *N. bicaudus* were also examined in this study. These mites were found on plants, mainly herbaceous: alfalfa (*Medicago*), bindweed (*Convolvulus*), cane (*Phragmites*), cereals, clover (*Trifolium*), *Paspalum dilatatum*, oat (*Avena*), soya beans, wheat (*Triticum*), as well as apple, blackberry, rose, tea in different locations of Georgia (Ajara), Germany, Kazakhstan, Russia (Krasnodar Region), and Tajikistan during 1957–1973 by several collectors.

Description. Female. Dorsal shield (fig. 1, A) elongated, with constrictions at level of R1, weakly sclerotized, with thin net-like sculpture areas better evident on posterior part of

¹ See more details in Demite et al. (2016).

² Correct spelling of this geographical name.

³ Hereinafter data lacking on the original slide labels are added in square brackets.

shield, 7 pairs of small solenostomes (*gd1*, *gd2*, *gd4*, *gd5*, *gd6*, *gd8*, *gd9*), 16 pairs of poroids, and 17 pairs of setae acute, thin, short and slightly different in length except Z5 elongated. Dorsal setae smooth except S4, S5, Z4, Z5 weakly serrated. Setae Z5 much longer than others postlateral setae S4, S5, Z4. Seta *j3* equal to distance of seta *z2* but not extend beyond it. Setae *z2* and *z4* half of distance to bases of next setae. Seta Z4 longer than distance to solenostome *gd9* and equal to distance to base of following seta S5. Setae J5 acute, short and smooth (fig. 1, B).

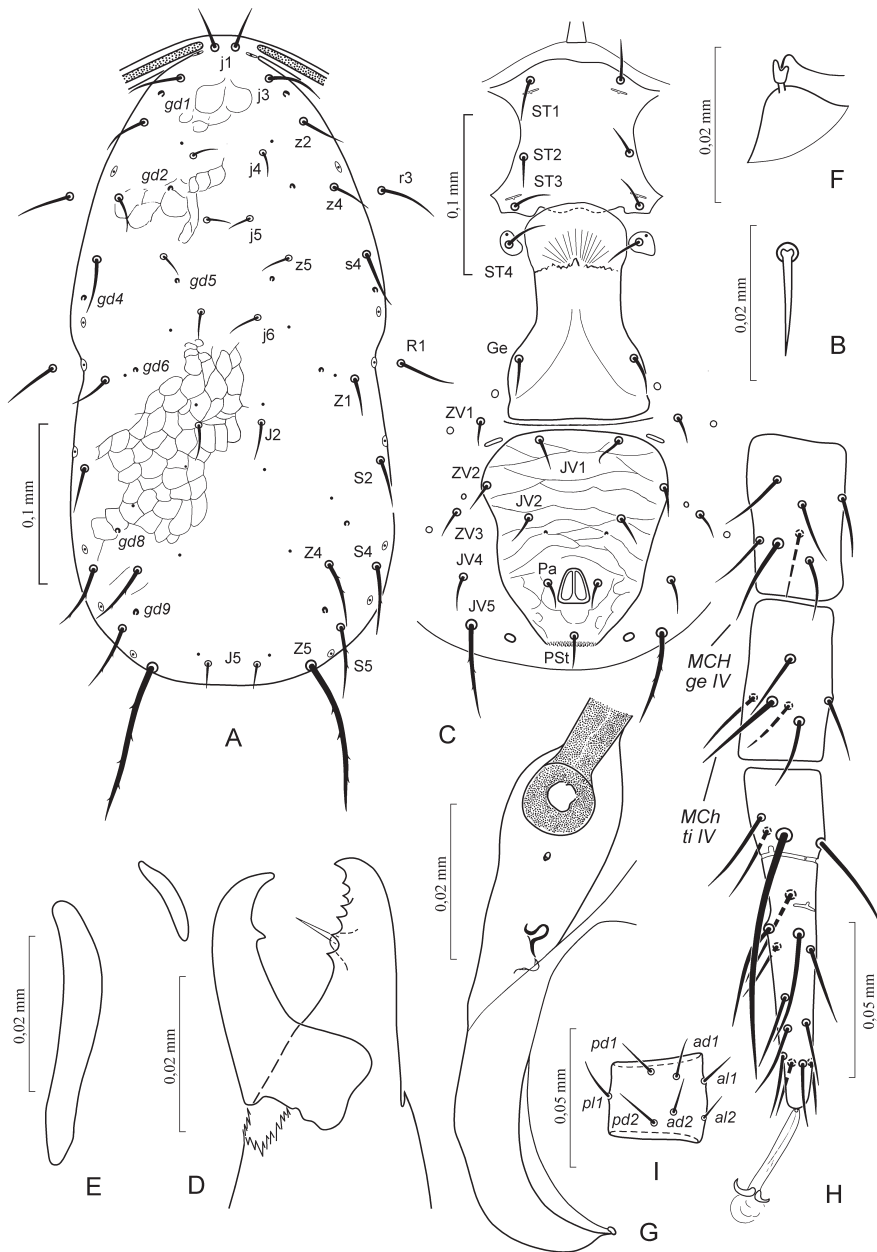


Fig. 1. *Neoseiulus bicaudus* (Wainstein). Female: A — dorsal shield; B — setae J5; C — fragment of ventral body surface; D — chelicera; E — metapodal plates; F — spermatheca; G — caudal part of peritremal shield; H — fragment of leg IV; I, genu II (setal abbreviation: *ad* — antero-dorsal, *pd* — post-dorsal; *al* — antero-lateral, *pl* — post-lateral; *av* — antero-ventral).

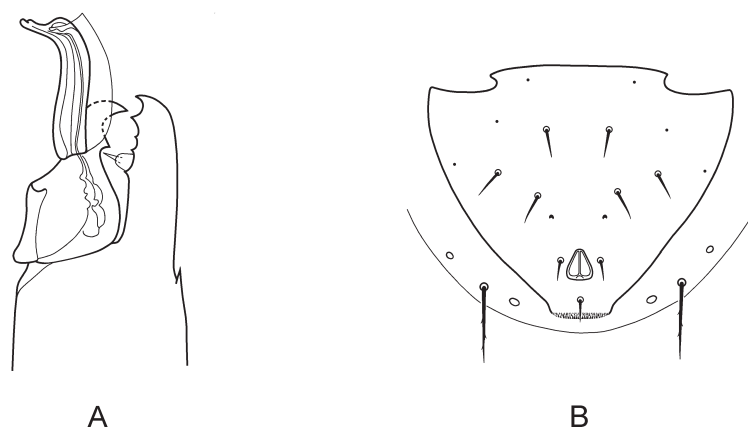


Fig. 2. *Neoseiulus bicaudus* (Wainstein). Male: A — chelicera; B — ventrianal shield.

All ventral setae thin, acute, and smooth with the exception of seta JV5 weakly serrated. Sternal shield with 3 pairs of setae (St1–St3) and 2 pairs of lyrifissures. Setae St4 on separate metasternal platelets each with pore (fig. 1, C). Genital shield with pair of seta (Ge). Narrow transversal sclerotized stria between genital and ventrianal shields. One pair narrow straight-line plates posteroparaxially to setae ZV1 (fig. 1, C).

Ventrianal shield wider than genital shield, elongated, with convex anterior margin, near sub-triangular with lateral constrictions, all finely striated. Three pairs of short pre-anal setae JV1, JV2, ZV2, one pair of para-anal (Pa) and unpaired post-anal setae (Pst) on ventrianal shield (fig. 1, C). Pre-anal solenostomes (*gv3*) small, round and disposed posteroparaxially of setae JV2 (fig. 1, C). Four pairs of setae, ZV1, ZV3, JV4 and JV5, 4 pairs of small oval platelets on the integument surrounding the ventrianal shield. Chelicerae normal in size. Fixed digit with 6 (7 on digit of other chelicera) denticles equal in size in two separate rows (2 in distal and 4 or 5 in medial row), movable digit with 1 tooth (fig. 1, D). Metapodal plates elongate, anterior platelet smaller and narrower than posterior plate (fig. 1, E). Infundibulum of spermatheca cup-shaped, atrium large, cervix short (fig. 1, F). Peritremes long, extending forward to level of bases of setae *j1* (fig. 1, A). Posterior part of peritremal shield curved and pointed (fig. 1, G). Leg IV with three smooth acute macrosetae: longest on basitarsus, short on tibia and genu (fig. 1, H). Macrosetae on other legs missing. Genu II with 7 setae (2 *a-2 ad*, 2 *pd* / 0 *av*, 0 *pv-1 pl*) (setae: *ad* — antero-dorsal, *pd* — post-dorsal; *al* — antero-lateral, *pl* — post-lateral; *av* — antero-ventral); seta *al2* shorter than other setae on the segment (fig. 1I).

Measurements. Length of dorsal shield from *j1* to end of shield, Lds 400; width of dorsal shield at R1 level, Wds 180; length of ventrianal shield, Lvas 135; max width of ventrianal shield, Wvas 117; distance between pre-anal solenostomes *gv3*, Lgv3 38; length of tarsus of leg IV, Ltar IV 104. Length of setae: *j1* 25, *j3* 31, *j4* 15, *j5* 15, *j6* 17, *J2* 21, *J5* 14, *s4* 34, *z2* 23, *z4* 20, *z5* 14, *S2* 35, *S4* 43, *S5* 45, *Z1* 20, *Z4* 40, *Z5* 98, *r3* 34, *R1* 30, *JV5* 63; macrosetae on leg IV, MCh IV: *ge* 27, *ti* 32, *tar* 73.

Male from type locality unknown. Non-type male, mentioned above has been studied and drawn here. Dorsal setal pattern in general as in female, chelicera as in fig. 2, A; fixed digit of chelicerae with 5 denticles, movable digit with 1 denticle; spermatodactyle L-shaped; ventrianal shield reticulated with 3 pairs of setae and one pair of small round pre-anal solenostomes *gv3* (fig. 2, B).

As opposite to Wainstein (1962) who indicated only one macrosetae, *N. bicaudus* has really three macrosetae on leg IV.

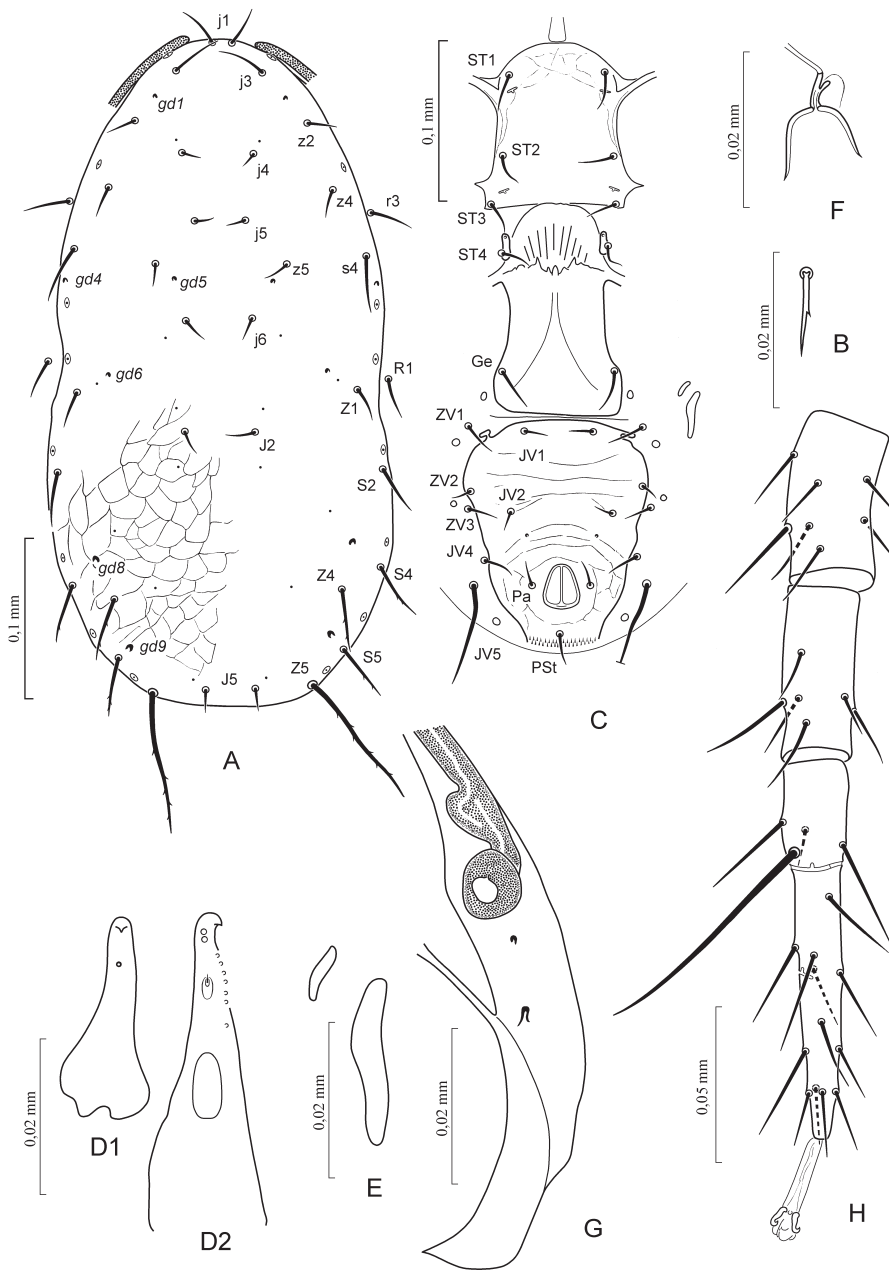


Fig. 3. *Neoseiulus micmac* (Chant et Hansell). Female: A— dorsal shield; B — setae J5; C — fragment of ventral body surface; D 13–14, chelicerae (D — moveable digit; D — fixed digit); E — metapodal plates; F — spermatheca; G — caudal part of peritremal shield; H — fragment of leg IV.

Neoseiulus micmac (Chant & Hansell, 1971) (fig. 3)
Amblyseius micmac Chant, Hansell, 1971: 719⁴.

Type material. Holotype ♀: [Canada:] “Nova Scotia, Lakeville, Lawrence orchard, Benzenhexachloride plot, on Apple leaves”, [45°06' N, 64°36' W], unnumbered, 18.08.1942, [coll. unknown, later mounted by June Herbert (Eiko Shaul, personal communication)] (CNC).

⁴ See more details in Demite et al. (2016).

Description. Female. Dorsal shield (fig. 3, A) elongated, with constrictions at level of R1, weakly sclerotized, with net-like sculpture on posterior part of shield, 6 pairs of small solenostomes (*gd1*, *gd4*, *gd5*, *gd6*, *gd8*, *gd9*), 16 pairs of poroids, and 17 pairs of setae acute, thin, short and slightly different in length except elongated Z5. Dorsal setae smooth except S4, S5, Z4, Z5 weakly serrated. Setae Z5 much longer than others, setae S4, S5, Z4 longer than setae on anterior part of shield. Seta *j3* reaches to base of seta *z2* but not extend out of it. Setae *z2* and *z4* one third of distance to bases of next setae. Seta Z4 longer than distance to solenostome *gd9* and equal to distance to base of seta S5. Setae of pair J5 short, one smooth and other with one barb (fig. 3, B). All ventral setae thin, acute, and smooth (seta JV5 included). Sternal shield with 3 pairs of setae (St1–St3) and 2 pairs of lyrifissures; setae St4 placed on separate metasternal platelets with small pore on each (fig. 3, C). Genital shield with pair of seta Ge. Narrow transversal sclerotized stria between genital and ventrianal shields. One pair narrow straight-line plates, semi-separate because partly fused with ventrianal shield, posteroparaxially to setae ZV1 (fig. 3, C). Ventrianal shield elongated, wider than genital shield, with convex anterior margin, subtriangular with lateral constrictions feebly marked, finely striated. Ventrianal shield with three pairs of short setae JV1, JV2 and ZV2. Pre-anal solenostomes *gv3* very small, round and disposed posteroparaxially of setae JV2 (fig. 3, C). Ventrianal shield surrounded by four pairs of setae, ZV1, ZV3, JV4 and JV5, and 4 pairs of small oval platelets on the integument. Chelicerae normal in size. Fixed digit with 9 denticles (2 large distal and 7 smaller in separate medial row), movable digit with 1 tooth (figs 3, D1, D2). Metapodal plates elongated, anterior platelet smaller and narrower than posterior platelet (fig. 3, E). Infundibulum of spermatheca cup-shaped and thicken-walled, atrium on thickened cervix (fig. 3, F). Peritremes long, extending to level of bases of setae *j1* (fig. 3). Posterior part of peritremal shield curved and acuminate (fig. 3, G). Leg IV with three smooth acute macrosetae: longest on basitarsus, short on tibia and genu (fig. 3, H). Macrosetae on other legs absent. Genu II with 7 setae (2 *al*–2 *ad*, 2 *pd* / 0 *av*, 0 *pv*–1 *pl*) (according to original description).

Measurements. Length of dorsal shield from *j1* to end of shield, Lds 405; width of dorsal shield at R1 level, Wds 188; length of ventrianal shield, Lvas 142; max width of ventrianal shield, Wvas 117; distance between pre-anal solenostomes *gv3*, Lgv3 43; length of tarsus of leg IV, Ltar IV 113. Length of setae: *j1* 22, *j3* 29, *j4* 12, *j5* 12, *j6* 14, J2 14, J5 13, *s4* 36, *z2* 20, *z4* 20, *z5* 12, S2 30, S4 32, S5 36, Z1 22, Z4 38, Z5 86, *r3* 30, R1 25, JV5 61; macrosetae on leg IV: *ge* 29, *ti* 27, *tar* 77.

Male from type locality of the species unknown.

Study of the holotype of *N. micmac* gave possibility to solve several taxonomic questions in this two mites. *Neoseiulus micmac* has many characters, which do it similar to *N. bicaudus*, so Congdon (2002) considered it to be a synonym of *N. bicaudus*. Chant & McMurtry (2003) restored *N. micmac* as a valid species name, but Denmark & Evans (2011) supported Congdon's opinion. However, detailed comparison of *N. micmac* and *N. bicaudus* holotypes reveals significant differences between them. Actually, *N. bicaudus* has 7 pairs of dorsal solenostomes (*gd2* present), 6 or 7 large teeth on fixed digit of chelicera, smooth J5, and serrated JV5 setae, whereas *N. micmac* has only 6 pairs of dorsal solenostomes (*gd2* absent), 9 teeth (2 distal large teeth and 7 tiny denticles) on Df, seta J5 serrated with 1 jag and seta JV5 smooth. Besides that, infundibulum of spermatheca of *N. micmac* U-form and thick-walled, whereas infundibulum of *N. bicaudus* cup-shaped and thin-walled. Thus, these morphological differences convincingly indicated that *N. micmac* should be considered a valid name.

***Neoseiulus brachychaetus* Kolodochka, sp. n. (fig. 4)**

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Type material. Holotype ♀: # 1, Russia, [environs of] Volgograd, [48°41' N, 44°28' E], on cane (*Phragmites*), in colony of tarsonemid mite *Steneotarsonemus panshini*, # 4735 a, 04.04.1972 (A. Badulin) (SIZK).

Paratypes: 5 ♀ on the same slide with holotype; 6 ♀, from the same sample with holotype, # 4735 b; 29 ♀, 4 ♂, same location, on cane, # 5715, 5717, 5719, 5728, 5934, 08.08.1973; 1 ♂ (illustrated), same location in colony of tarsonemid mites, # 5716, 08.08.1973 (A. Badulin) (SIZK).

Description. Female (holotype). Dorsal shield (fig. 4, A) weakly sclerotized, elongate-oval, with constrictions on level of R1, reticulation in posterior part feebly marked,

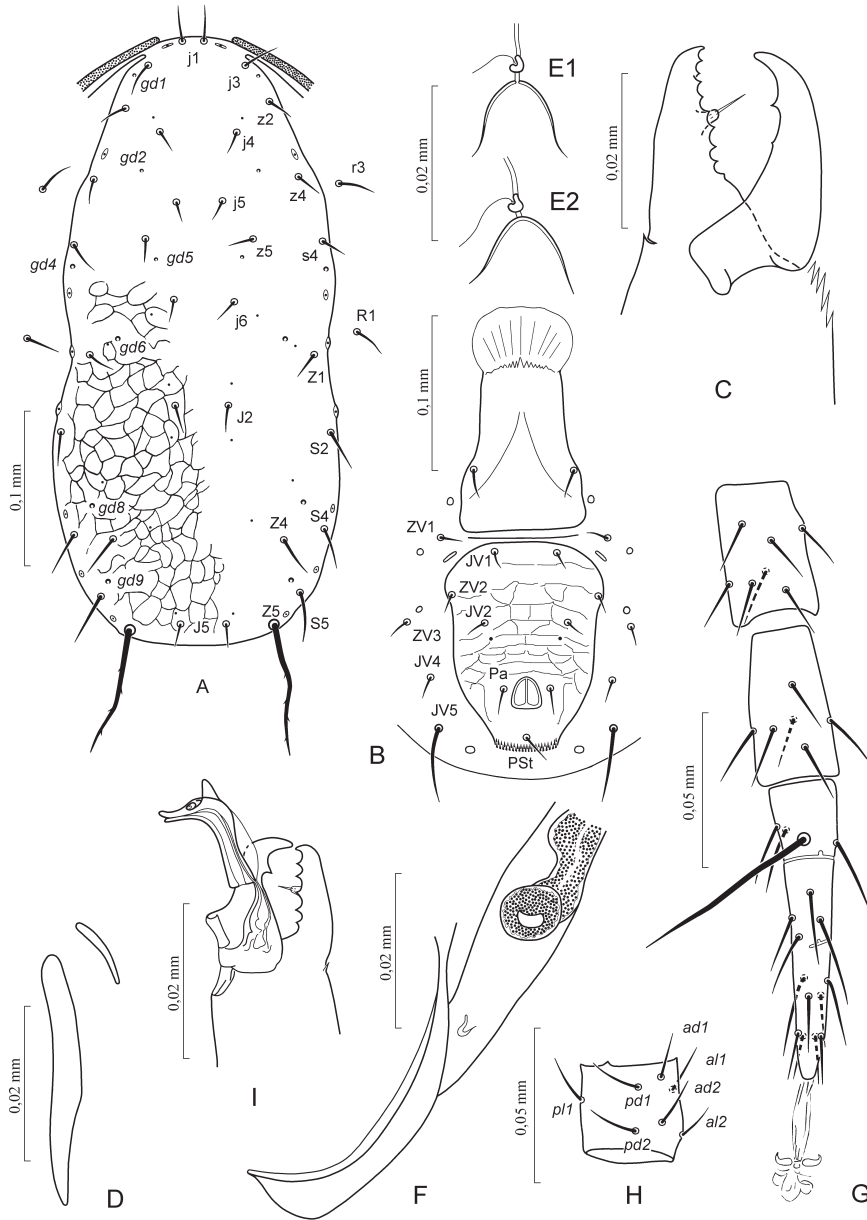


Fig. 4. *Neoseiulus brachychaetus* Kolodochka, sp. n. Female: A — dorsal shield; B — fragment of ventral body surface; C — chelicera; D — metapodal plates; E1, E2 — spermatheca; F — caudal part of peritremal shield; G — fragment of leg IV; H — genu II (setal abbreviation the same on fig. 1). Male: I — chelicera.

with 7 pairs of distinct solenostomes (*gd1*, *gd2*, *gd4*, *gd5*, *gd6*, *gd8*, and *gd9*), 16 pairs of poroids, and 17 pairs distinctly short setae acute, smooth, thin, and slightly different in length except Z5 elongated and weakly serrated. Setae J5 short. Seta j3 shorter than distance its base and base of seta z2. Setae z2 and z4 each one-third of distance to base of next seta. Seta S5 slightly longer than other postlateral setae in row Z1, S2, S4, and S5. Seta Z4 equal to distance between its base and solenostome *gd9* and shorter than distance to base of seta S5.

All ventral setae thin, acute, and smooth including JV5. Sternal shield with 3 pairs of setae (St1–St3) and 2 pairs of lyrifissures. Setae St4 on separate metasernal platelets each with pore. Ventrianal shield wider than genital shield, elongated, near pentagonal in form with convex anterior margin, lateral margins with slight constrictions, all striated (fig. 3, B). Narrow transversal sclerotized stria between genital and ventrianal shields. One pair narrow straight-line plates posteroparaxially to setae ZV1. Three pairs of short pre-anal setae JV1, JV2, ZV2 on ventrianal shield. Pre-anal solenostomes (*gv3*) minute and widely disposed. Setae ZV1, ZV3, JV4 and JV5 on the integument surrounding the ventrianal shield, 4 pairs of small oval platelets on the integument surrounding the ventrianal shield (fig. 4, B).

Chelicera normal in size. Fixed digit with 9 denticles, movable digit with 2 (proximal minute) pointed tooth (fig. 4, C). Metapodal plate elongate and narrow, anterior platelet very small and narrow (fig. 4, D). Infundibulum of spermatheca of moderate size, cup-shaped with moderately thickened wall, atrium on cervix (fig. 4, E1, E2). Peritreme long, extending beyond base of seta j3 (fig. 4, A). Posterior part of peritremal shield narrow, curved with acute end (fig. 4, F). Leg IV with a single long and acute macrosetae on basitarsus; tibia and genu without macrosetae (fig. 4, G). No macrosetae on other legs. Genu II with 7 setae (2 *al*–2 *ad*, 2 *pd* / 0 *av*, 0 *pv*–1 *pl*). Seta *al2* somewhat shorter than other setae on genu II (fig. 4, H).

Measurements. Length of dorsal shield from j1 to end of shield, Lds 390; width of dorsal shield, Wds 160; length of ventrianal shield, Lvas 130; max width of ventrianal shield, Wvas 102; distance between pre-anal solenostomes *gv3*, Lgv3 40; length of tarsus of leg IV, Ltar IV 94. Length of setae: j1 20, j3 20, j4 12, j5 11, j6 9, J2 13, J5 13, s4 33, z2 15, z4 13, z5 9, S2 26, S4 28, S5 36, Z1 17, Z4 30, Z5 78, r3 25, R1 23, JV5 46; macroseta on leg IV: tar 62.

Male. Dorsal setal pattern as in female in general. Ventrianal shield with 3 pairs of pre-anal setae; solenostomes *gv3* pointed and widely placed, disposed posteroparaxially of setae JV2; fixed digit of chelicerae with 5 denticles, movable digit with 1 denticle, spermatodactyle L-shaped (fig. 4, I). Ventrianal shield reticulated with 3 pairs of setae and one pair of small round pre-anal solenostomes *gv3*.

Neoseiulus brachychaetus sp. n. resembles *N. bicaudus* in elongated dorsal shield; form of ventrianal shield; and small pre-anal solenostomes *gv3*. New species differs from the latter by dorsal setae (besides Z5) distinctly short; setae JV5 smooth and comparatively short, only 1 macrosetae on leg IV, by 9 denticles on fixed digit of chelicera; against 6 denticles on fixed digit of chelicerae, setae JV5 long and serrate, and 3 macrosetae on leg IV in *N. bicaudus*. Males of two species have different form of spermatodactyl.

A key to *Neoseiulus* species similar to *N. bicaudus*

1. Seven pairs of solenostomes (*gd1*, *gd2*, *gd4*, *gd5*, *gd6*, *gd8*, *gd9*) on dorsal shield 2
- Less than seven pairs of solenostomes on dorsal shield. 3
2. Dorsal setae z2 half as long as distance z2–z4; leg IV with three macrosetae (on basitarsus longest, on tibia and genu shorter); setae JV5 serrated. *N. bicaudus* (Wainstein, 1962)
- Dorsal setae z2 one third as long as distance z2–z4; leg IV with one long macrosetae (on basitarsus); setae JV5 smooth. *N. brachychaetus* sp. n.
3. Six pairs of dorsal solenostomes. 4
- Less than six pairs of dorsal solenostomes. 7

- 4 Dorsal solenostomes *gd2* or *gd4* absent. 5
 — Dorsal solenostomes *gd5* absent. 6
 5 Dorsal solenostomes *gd2* absent; pre-anal solenostomes *gv3* on ventrianal shield rounded, very small and associated with setae JV2; Df with 9 denticles (2 subapical and 7 median).
 *N. micmac* (Cant & Hansell, 1971).
 — Dorsal solenostomes *gd4* absent; pre-anal solenostomes *gv3* on ventrianal shield crescentic and approximate; Df with 4 subapical denticles. *N. dissipatus* (Kolodochka, 1991)
 6 Setae J5 long (27 μ m) and serrated; pre-anal solenostomes *gv3* minute and widely disposed; Df with 7 denticles, Dm with 1 denticle. *N. ponticus* Kolodochka & Bondarev, 2017
 — Setae J5 short (13 μ m) and smooth; pre-anal solenostomes *gv3* crescentic and approximated; Df with 9 denticles, Dm with 2 denticles. *N. neoparaki* Ehara 1972
 7 Five pairs of dorsal solenostomes (*gd4* and *gd5* absent); infundibulum of spermatheca rather cylindrical with thin wall; Df with 4 denticles (3 subapical and 1 basal). *N. perspectus* (Kolodochka, 1992)
 — Four pairs of dorsal solenostomes (*gd4*, *gd5*, and *gd8* absent); infundibulum of spermatheca bell-shaped with thickened wall; Df with 5 denticles. *N. probatus* Kolodochka & Bondarev, 2017

Neoseiulus akimovi Kolodochka, sp. n. (fig. 5)

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Type material. Holotype ♀: [Georgia: Ajaria, environs of] Kobuleti, [41°48' N, 41°46' E], peat bog, on blackberry bush (*Rubus*), # 4411 (20), 29.04.1970, (S. Vartapetov) (SIZK).

Description. Female (holotype). Dorsal shield (fig. 5, A) weakly sclerotized, elongated, with constrictions on level of R1, feebly reticulate in posterior part, with 5 pairs of distinct solenostomes (*gd1*, *gd2*, *gd6*, *gd8*, *gd9*), 16 pairs of poroids, and 17 pairs of setae acute, smooth (seta Z4 too), thin, short and slightly different in length except Z5 elongated and weakly serrated. Setae J5 short (fig. 5, B). Length of seta j3 approximately sub-equal to distance to base of seta z2. Setae z2 near half distance between its base to base of z4 which longer than 0.5 distance to seta s4. Seta S5 shorter than other postlateral setae (Z1, S2, S4). Seta Z4 longer than distance between its base and solenostome *gd9* and almost reaches base of seta S5.

All ventral setae thin, acute, and smooth. Sternal shield with 3 pairs of setae (St1–St3) and 2 pairs of lyrifissures. Setae St4 on separate metasernal platelets each with pore. Ventrianal shield wider than genital shield, elongated, near pentagonal with anterior margin slightly convex, lateral margins slight constricted, circum-anal area of shield with insignificant striation. Narrow transversal sclerotized stria between genital and ventrianal shields. One pair narrow straight-line plates posteroparaxially to setae ZV1. Ventrianal shield with three pairs of short pre-anal setae JV1, JV2, ZV2. Pre-anal solenostomes *gv3* small and disposed posteroparaxially of setae JV2 (fig. 4, C). Setae ZV1, ZV3, JV4, JV5, and 4 pairs of small oval platelets on the integument surrounding the ventrianal shield. Chelicerae normal in size. Fixed digit with 3 subapical denticles, movable digit with 1 blunt tooth (fig. 3, D). Metapodal plates elongated, anterior platelet smaller than posterior platelet (fig. 4, E). Infundibulum of spermatheca relatively large, asymmetrically bell-shaped with wall moderately thickened. Infundibulum gradually narrows from vesicle (sacculus) towards atrium and then suddenly creates progressively convergent part like cervix to clear-cut small atrium (fig. 5, F1, 5, F2). Peritremes long, extending beyond bases of setae j3 (fig. 5, A). Posterior part of peritremal shield widened, curved (fig. 5, G). Leg IV with three acute macrosetae: on basitarsus — longest, and on tibia and genu markedly shorter (fig. 4, H). No macrosetae on other legs. Genu II with 8 setae (2 *al*–2 *ad*, 2 *pd* / 1 *av*–1 *pl*); setae *al1* and *al2* markedly shorter than the rest of the setae on genu II (fig. 5, I).

Measurements. Length of dorsal shield from j1 to end of shield, Lds 390; width of dorsal shield, Wds 188; length of ventrianal shield, Lvas 133; max width of ventrianal shield, Wvas 108; distance between pre-anal solenostomes *gv3*, Lgv3 39; length of tarsus of leg IV, Ltars IV 109. Length of setae: j1 25, j3 34, j4 20, j5 15, j6 20, J2 23, J5 10, s4 31, z2 30,

z4 34, z5 11, S2 37, S4 37, S5 31, Z1 27, Z4 35, Z5 68, r3 29, R1 29, JV5 43; macrosetae on leg IV: ge 27, ti 30, tar 49.

Male unknown.

Neoseiulus akimovi sp. n. was also misidentified by B. A. Wainstein as "*N. bicaudus*". These species resembles each other to some extent but *N. akimovi* sp. n. differs by the presence of 5 pair of dorsal solenostomes (gd4 and gd5 absent), setae JV5 smooth and

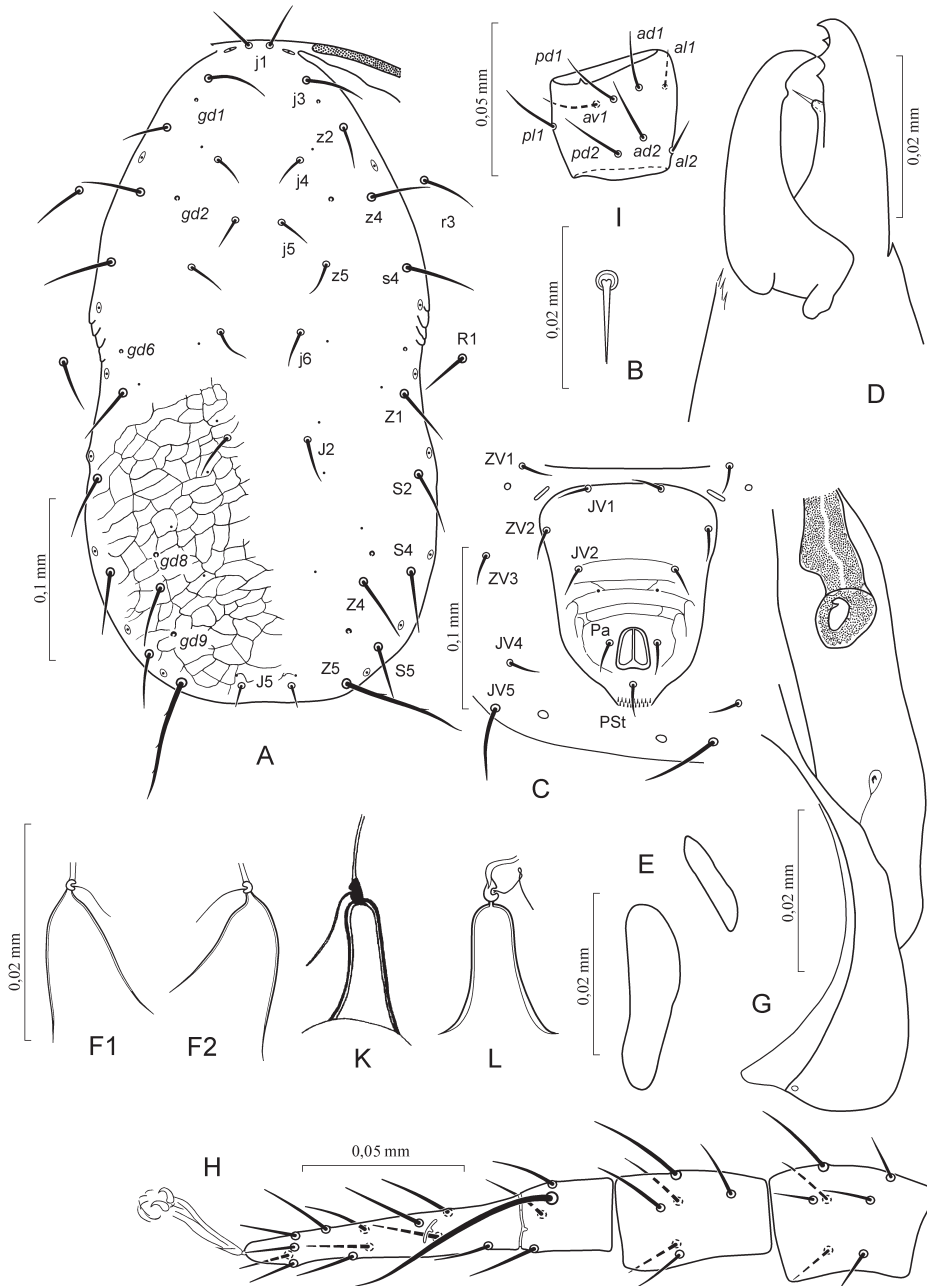


Fig. 5. *Neoseiulus akimovi* Kolodochka, sp. n. Female: A — dorsal shield; B — setae J5; C — fragment of ventral body surface; D — chelicera; E — metapodal plates; F1, F2 — spermatheca; G — caudal part of peritremal shield; H — fragment of leg IV; I — genu II (setal abbreviation the same on fig. 1). *N. cucumeris* (Oudemans, 1930). Female, spermatheca: K — from Karg (1993); L — sample from commercial mite culture.

comparatively shorter, 8 setae on genu II, funnel of spermatheca bell-shaped with wall thickened (in *N. bicaudus*, 7 pairs dorsal solenostomes present, setae JV5 long and serrate, 7 setae on genu II, funnel of spermatheca cup-shaped with thin walls).

Neoseiulus akimovi sp. n. is similar to *N. cucumeris* (Oudemans, 1930) in general but differs by setae Z4 smooth, by thin-walled of broad infundibulum of spermatheca which narrows from vesicle (sacculus) towards atrium at first gradually but suddenly creates progressively convergent part like cervix to clear-cut small atrium, against Z4 serrate, another form and narrower infundibulum of thick-walled spermatheca, atrium relatively larger and connected to infundibulum by a very short true cervix in *N. cucumeris* (fig. 5, K, L).

The new species is named in honour of Prof. Igor A. Akimov, the eminent Ukrainian acarologist.

Author is deeply thankful to anonymous reviewers as well S. Kreiter (Montpellier SupAgro, France) and M. S. Tixier (University of Montpellier, France), and Dr. F. Faraji (University of Amsterdam, The Netherlands) for providing valuable comments and criticism that improved the quality of the article. Furthermore, I am grateful personally to Harold A. Denmark (Gainesville, U.S.A.), for reading of this manuscript, and his remarks that helped to improve it.

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Received 15 May 2018

Accepted 17 May 2018