



# THREE NEW BAT ECTOPARASITE SPECIES OF THE GENUS *MACRONYSSUS* FROM WESTERN SIBERIA (WITH AN IDENTIFICATION KEY FOR FEMALES OF THE GENUS *MACRONYSSUS* FROM THE PALEARCTIC BOREAL ZONE)

M. V. Orlova and A. V. Zhigalin

National Research Tomsk State University, 36, Lenina str., Tomsk, 634050, Russia. Correspondence should be sent to: [Masha\\_orlova@mail.ru](mailto:Masha_orlova@mail.ru)

**21 ABSTRACT:** Three new gamasid mite species belonging to the genus *Macronyssus* Kolenati, 1858 (Acari: Macronyssidae), namely, *Macronyssus sibiricus* n. sp., *Macronyssus stanyukovich* n. sp., and *Macronyssus tigirecus* n. sp., are described (females only; males, protonymphs, and larvae remain unknown). All species are known from Western Siberia and belong to the Siberian–Far Eastern bat ectoparasite fauna complex. The parasite hosts are the eastern water bat *Myotis petax* Hollister, 1912, and Hilgendorf’s tube-nosed bat *Murina hilgendorfi* Peters, 1880 (Chiroptera: Vespertilionidae). An identification key for females of the genus *Macronyssus* Kolenati, 1858, in the boreal Palearctic region is presented.

Eastern Palearctic bats and the mites of the family Macronyssidae Oudemans, 1936 (Mesostigmata, Gamasina), that are associated with them are insufficiently studied animal groups (Radovsky, 2010; Orlova, 2014). However, some macronyssids cause tick-borne dermatitis and are involved in the transmission of diseases (encephalitis, rickettsiosis, hemorrhagic fevers, tularemia, etc.), many bats shelter in buildings, and they can possibly pass on these diseases to humans (Balashov, 2009). Thus, a complex investigation of the mites of the genus *Macronyssus* Kolenati, 1858, is of particular interest.

## MATERIALS AND METHODS

Bats were observed during the overwintering period in caves at 2 sites in the boreal zone of Western Siberia (Russia): the State Natural Reserve “Tigirek” (Altay Krai) (51°09’N, 83°01’E) and Barsukovskaya Cave (Maslyaninsky district, Novosibirsk region; 54°22’N, 83°57’E). Three bat species were examined: Hilgendorf’s tube-nosed bat (11 individuals) in Strashnaya Cave and the eastern water bat (28 individuals) and pond bat (2 individuals) in Barsukovskaya Cave. Bat identification was based on the species descriptions in the electronic directory “Russian Bats.” After examination, all bats were returned to their overwintering sites.

The collected ectoparasites were stored in 70% ethanol. Permanent preparations of mites and fleas were prepared using Faure-Berlese medium. Mite preparations were made following standard methods (Whitaker, 1988). Ectoparasite identifications were made under a light microscope (Nikon Eclipse 50i, Nikon Corp., Tokyo, Japan) using identification keys and taxonomic publications (Dusbabek, 1966; Dusbábek and Radovsky, 1972; Uchikawa, 1979; Stanyukovich, 1997; Radovsky, 2010).

Chaetotaxy was determined according to Lindquist and Evans (1965). Measurements (in  $\mu\text{m}$ ) were taken from the holotype and paratypes (presented in parentheses in the descriptions below).

Holotypes are deposited in the Museum of Medical Arachnology, a component of the Laboratory of Arbovirus Infections of the Department of Feral Herd Infections of the Omsk Research Institute of Feral Herd Infection (Nos. Ap[m]-18.3.4/1–Ap[m]-18.3.4/3). Paratypes are housed in the private collection of M. V. Orlova.

## DESCRIPTION

### *Macronyssus sibiricus* n. sp. (Fig. 1)

**Diagnosis:** Female. Large relative to other members of the genus (idiosoma approximately  $980 \times 650 \mu\text{m}$ ). Dorsal plate with 28 setal pairs. Sternal glands (a pair of small organs in the anterolateral corners of sternal shield; Radovsky, 1967) consisting of numerous short lines, forming unequal cells. St1 do not reach the posterior margin of the sternal plate.

Received 18 July 2014; revised 1 February 2015; accepted 12 February 2015.

DOI: 10.1645/14-609.1

Dorsum (Fig. 1A). Dorsal plate  $835 \mu\text{m}$  (812–849,  $n = 5$ ) long by  $475 \mu\text{m}$  (452–491,  $n = 4$ ) wide with 28 pairs of smooth spinous setae, distributed as shown in figure. Seventeen pairs of podonotal setae long (j2, j3, s1, z2, r2, z3, s4, r2; length about 48–55  $\mu\text{m}$ ) and moderately long (j1, j4, j5, j6, z5, z6, s5, s6, r6; length about 23–28); z3–z5 ratio approximately 2:1. Setae s6 and r6 widely separated. Ten of 11 pairs of opisthonotal setae moderately long (J1, J2, J3, J5, S2, S3, Z1, Z2, Z3, Z4, Z5; length about 26–32  $\mu\text{m}$ ), J5 microseta. Distinct reticulate sculpturing. Posterior margin of dorsal plate curved. Dorsal opisthosomal unsclerotized integument with approximately 20 pairs of spinous setae equal in length.

Peritreme reaching the middle of coxa II.

Ventrum (Fig. 1B). Sternal shield  $72 \mu\text{m}$  (69–76,  $n = 7$ ) long by  $274 \mu\text{m}$  (261–283,  $n = 7$ ) wide. St1 long by  $59 \mu\text{m}$  (55–62,  $n = 7$ ) almost reach posterior margin of sternal plate. Sternal plate posterior margin slightly concave and does not reach level of the St2. Sternal plate with well-developed anterolateral sculpturing consisting of short lines, forming irregular quadrilateral patterning (sternal glands), reminiscent of floral bud (Fig. 1C). Epigynal plate  $298 \mu\text{m}$  (292–308,  $n = 6$ ) long by  $126 \mu\text{m}$  (121–128,  $n = 6$ ) wide. Ventral opisthosoma with approximately 30 pairs identical in length spinous setae.

Anal plate is obovate,  $180 \mu\text{m}$  (178–184,  $n = 5$ ) long and  $140 \mu\text{m}$  (132–148,  $n = 5$ ) wide. Paranal setae  $37 \mu\text{m}$  (35–39,  $n = 5$ ) long; postanal seta  $39 \mu\text{m}$  (36–41,  $n = 4$ ) long.

Gnatosoma. Total length, including palps,  $185 \mu\text{m}$  (179–198,  $n = 5$ ), width of base  $62 \mu\text{m}$  (60–64,  $n = 5$ ). Nine small deutosternal teeth in a single row. Chelicerae (Fig. 1D)  $136 \mu\text{m}$  (130–141,  $n = 5$ ) long (including fixed digit and posterior short basal part), movable digit  $38 \mu\text{m}$  (36–39,  $n = 4$ ) with massive base sharply narrowed tip and expressed sculpturing. Fixed digit chela with 1 ventral claw. Tritosternum well developed with base  $23 \mu\text{m}$  and laciniae  $89 \mu\text{m}$  long.

Coxal ridges absent. Chaetotaxy of legs is normal for the genus. Tarsus I setation is typical for the *Macronyssus crosbyi* spp. group (Radovsky, 1967; Stanyukovich, 1997).

Males, protonymphs, and larvae were not found.

## Taxonomic summary

**Type material:** ♀ holotype from Barsukovskaya Cave collected from the eastern water bat, 6 ♀ paratypes collected from the eastern water bat and pond bat (8 November 2013) by O. L. Orlov and A. V. Zhigalin.

**Etymology:** The species is named after the region of discovery (Siberia).

## Remarks

*Macronyssus sibiricus* n. sp. differs from *Macronyssus heteromorphus* Dusbabek and Radovsky, 1972, in the short peritreme, widely separating setae S4 and S5, the sculpturing on the sternal plate, and the chelicerae configuration.

### *Macronyssus stanyukovich* n. sp. (Fig. 2)

**Diagnosis:** Female. Idiosoma approximately  $700 \times 420 \mu\text{m}$ . Dorsal plate with 25 setal pairs. Sternal plate with anterolateral sculpturing consisting of points, forming oblong zones. St1 reach the posterior margin of the sternal plate.

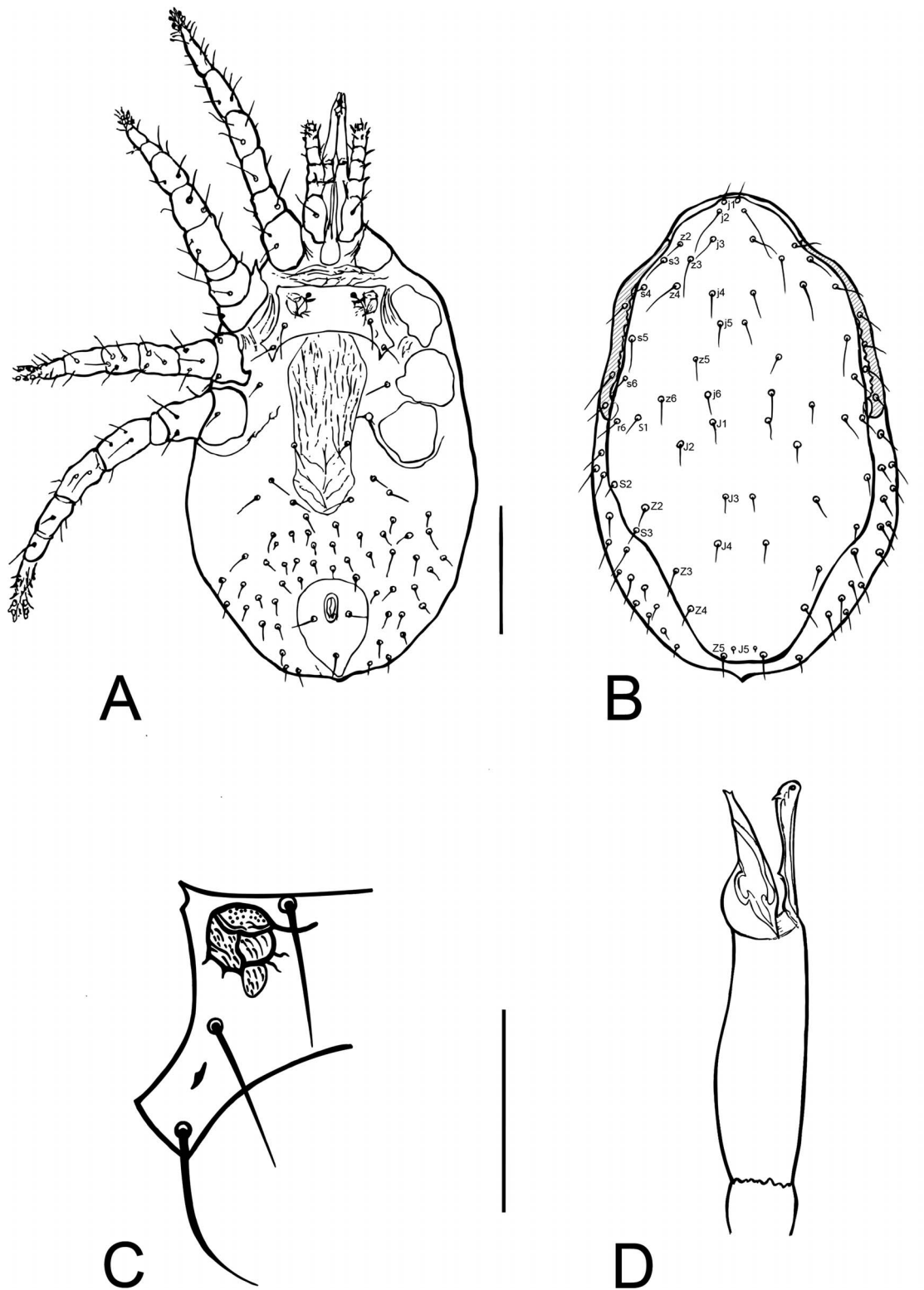


FIGURE 1. *Macronyssus sibiricus* n. sp., female. (A) Dorsal idiosoma. (B) Ventral idiosoma. (C) Sternal plate. (D) Chelicera. Scale bar: A, B = 200  $\mu$ m; C, D = 50  $\mu$ m.

Dorsum (Fig. 2A). Dorsal shield 625  $\mu$ m (612–637, n = 5) long by 288  $\mu$ m (274–304, n = 5) wide, with 25 pairs of smooth spinous setae and several pairs of pores. Seta j1 on opisthosomal soft integument, moderately long. Ten of 14 pairs of podonotal setae long (j2, s2, s3, s4, s5, s6, z2, z3, r2, r3;

length about 37–42  $\mu$ m), 4 pairs short (j4, j5, j6, z5; length about 10–12); z3–z5 ratio approximately 3:1. Four of 11 pairs of opisthonotal setae long (S1, S2, S3, Z5; length about 35–38  $\mu$ m), Z3 and Z4 moderately long (length about 17–19  $\mu$ m), 4 setal pairs short (J1, J2, Z1, Z2; length about 7–10  $\mu$ m),

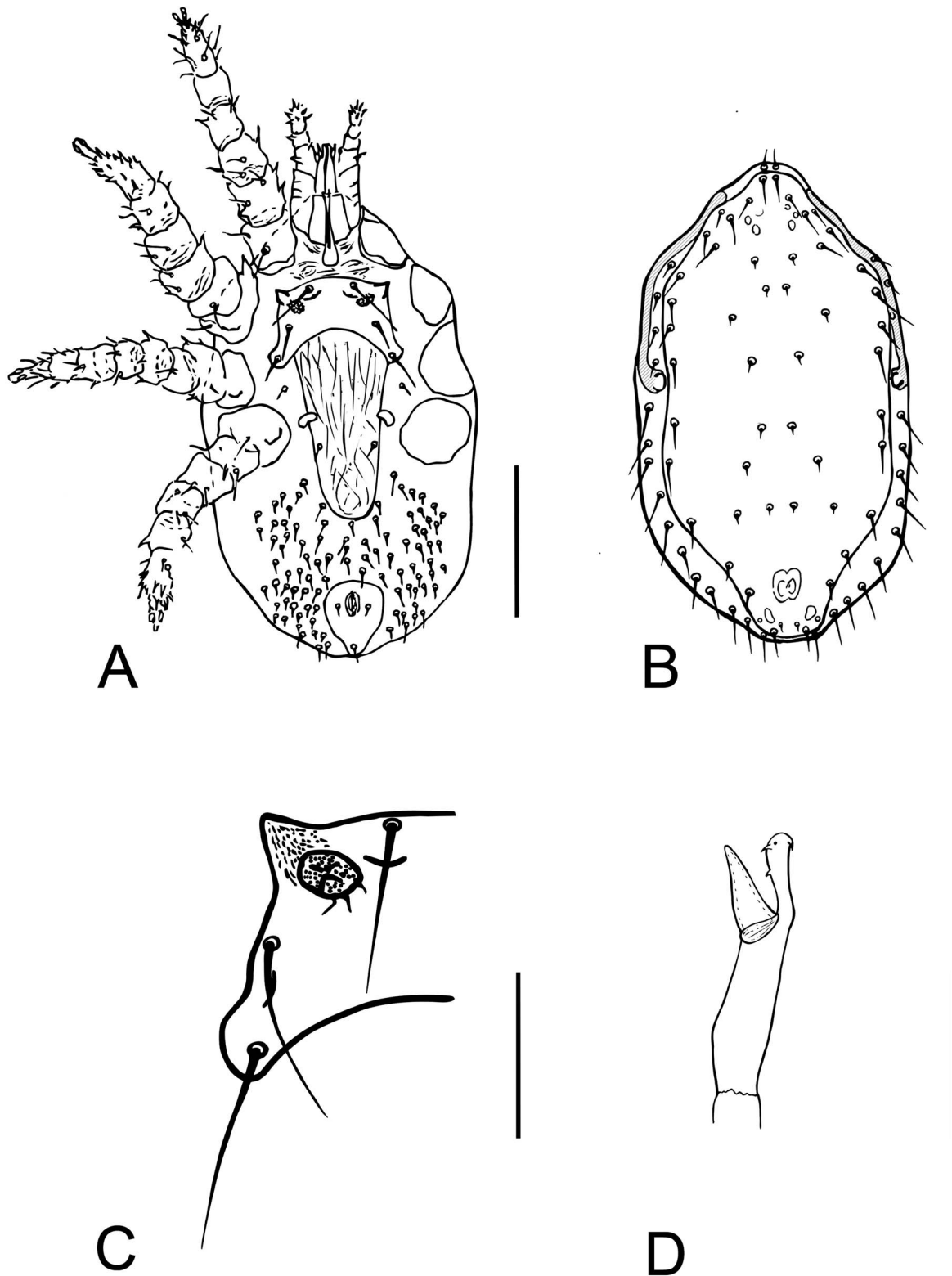


Figure 2. *Macronyssus stanyukovichi* n. sp., female. (A) Dorsal idiosoma. (B) Ventral idiosoma. (C) Sternal plate. (D) Chelicera. Scale bars: A, B = 200  $\mu$ m; C, D = 50  $\mu$ m.

J5 microseta. Distinct reticulate sculpturing. Posterior margin of dorsal plate is straightened. Dorsal opisthosomal unsclerotized integument with approximately 27 pairs of spinous setae.

Peritreme long and reaches middle of coxa I.

Ventrum (Fig. 2B). Sternal shield 73  $\mu$ m (69–76, n = 4) long by 189  $\mu$ m (180–201, n = 4) wide. St1 almost reach the posterior margin of the sternal plate. Posterior margin is slightly concave, does not reach the level of St2. Sternal plate with indistinct anterolateral sculpturing consisting of points,

forming oblong zones with cross in the center (Fig. 2C). Epiginial plate 272 µm (261–281, n = 6) long by 124 µm (119–129, n = 5) wide, lacking weakly sclerotized extension of tip; genital seta is on opisthosomal integument. Ventral opistosoma with approximately 37–40 pairs of spinous setae.

Anal plate is obovate, 125 µm (120–128, n = 5) long and 90 µm (86–92, n = 5) wide. Paranal setae moderately 12 µm (11–13, n = 5) long, postanal seta 26 µm (25–28, n = 4) long.

Gnatosoma. Total length, including palps, 232 µm (227–236, n = 5), width of base 102 µm (99–104, n = 5). Nine to 10 small deutosternal teeth situated on 1 row. Chelicerae (Fig. 2D) 123 µm long (130–141, n = 5), fixed chela with 2 ventral unequal hooks, movable chela conical, 36 µm (34–37, n = 4). Tritosternum with base 22 µm and laciniae 102 µm long.

Coxal ridges II–IV strong, slightly curved. Chaetotaxy of legs is normal for the genus. Tarsus I setation is typical for the *M. crosbyi* group.

Males, protonymphs, and larvae were not found.

**Taxonomic summary**

*Type material:* ♀ holotype and 4 ♀ paratypes from Strashnaya Cave (“Tigirek” State Natural Reserve; collected by O. L. Orlov and A. P. Golovanova) (4 December 2012), 1 ♀ from Barsukovskaya Cave (8 November 2013) (collected by O. L. Orlov and A. V. Zhigalin). Holotype and paratypes collected from Hilgendorf’s tube-nosed bat.

*Etymology:* The species is named in honor of Dr. M. K. Stanyukovich (Zoological Institute of the Russian Academy of Science, Saint Petersburg, Russia), the distinguished specialist in bat ectoparasites.

**Remarks**

*Macronyssus stanyukovichii* n. sp. has clear differences from the boreal Palearctic macronyssid: 25 pairs setae on the dorsal shield, particular anterolateral sculpturing. The principal host of *Macronyssus stanyukovichii* n. sp. is likely Hilgendorf’s tube-nosed bat *Murina hilgendorfi*.

***Macronyssus tigirecus* n. sp.**  
(Fig. 3)

*Diagnosis:* Female. Idiosoma approximately 590 × 325 µm (n = 5). Dorsal plate with 26 setal pairs. Sternal glands consisting of curved wavy lines. St1 do not reach the posterior margin of the sternal plate.

Dorsum (Fig. 3A). Female. Dorsal shield 569 µm (558–591, n = 7) long by 260 µm (251–272, n = 7) wide with 26 setal pairs; setae S6 are absent. Seta j1 on opisthosomal soft integument, moderately long. Ten of 14 pairs of podonotal setae long (j2, s2, s3, s4, s5, s6, z2, z3, r2, r3; length about 22–27 µm), 4 pairs short (j4, j5, j6, z5; length about 7–10); z3–z5 ratio approximately 3:1. Four of 11 pairs of opisthonotal setae long (S1, S2, S3, Z5; length about 35–38 µm), Z3 and Z4 moderately long (length about 17–19 µm), 4 setal pairs short (J1, J2, Z1, Z2; length about 7–10 µm), J5 microseta. Reticulate sculpturing indistinct and apparent on only on a few areas of shield. Sc-D3 ratio is approximately 4:1. Posterior margin of dorsal plate is straight. Unarmed dorsum with approximately 35–40 spinous setae. Peritreme terminating in anterior part of coxa I.

Ventrum (Fig. 3B). Sternal shield 53 µm (50–57, n = 5) long by 167 µm (156–176, n = 5) wide. St1 almost reach the posterior margin of the sternal plate. Posterior margin is concave but does not reach the level of St2. Sternal plate with well-developed anterolateral sculpturing consisting of curved wavy lines, forming closed figures or patterns resembling deep folds (in some paratypes) (Fig. 3C). Epiginial plate 252 µm (241–259, n = 5) long by 150 µm (146–159, n = 4) wide has weakly sclerotized extension of tip, with seta. Ventral opistosoma has approximately 30 pair of spinous setae.

Anal shield obovate, 96 µm (90–101, n = 4) long and 74 µm (70–78, n = 5) wide.

Gnatosoma. Total length, including palps, 180 µm (178–183, n = 5), width of base 56 µm (55–59, n = 5). Nine small deutosternal teeth in a single row. Chelicerae (Fig. 3D) 129 µm (127–131, n = 5) long, movable digit 33 µm (32–35, n = 4) teardrop-shaped with gradually narrowed tip. Fixed digit chela with 1 ventral claw and 2 points near it (Fig. 4C). Tritosternum well developed with base 21 µm and laciniae 64 µm long.

Coxal ridges II–IV strong, weakly curved. Chaetotaxy of legs is normal for the genus.

Males, protonymphs, and larvae were not found.

**Taxonomic summary**

*Type material:* ♀ holotype from Yashchur cave (“Tigirek” State Natural Reserve, collected by O. L. Orlov and A. P. Golovanova), 6

paratypes ♀♀ (from Yashchur and Strashnaya Caves); all collected from Hilgendorf’s tube-nosed bat (4 December 2012).

*Etymology:* The species is named after the region of discovery (Tigiretskiy Ridge).

**Key to the female of the genus *Macronyssus* Kolenati, 1858, of the boreal Palearctic region**

1. Dorsal plate with 30 setal pairs.....  
..... *M. hosonoi* Uchicawa, 1979  
Dorsal plate with no more than 28 setal pairs..... 2
2. Setae St1 do not reach the posterior margin of the sternal plate ..... 3  
Setae St1 reach the posterior margin of the sternogenital plate..... 9
3. Dorsal plate with 26–28 setal pairs..... 4  
Dorsal plate with 20–25 setal pairs..... 6
4. Dorsal plate with 28 setal pairs. Sternal setae and most of the other ventral idiosomal setae are with marked subbasal inflations. Sternal glands with striae enclosed in a regular elliptical zone. *M. kolenatii* (Oudemans, 1902)  
Dorsal plate with 26 setal pairs. Sternal and other setae are ordinary ..... 5
5. Sternal glands with 5–6 cells.. *M. flavus* (Kolenati, 1856)  
Sternal glands with short lines forming 3 unequal cells..... *M. sibiricus* n. sp.
6. Dorsal plate with 25 setal pairs. Sternal glands with short lines and points, forming rounded zones .....  
..... *M. stanyukovichii* n. sp.  
Dorsal plate with 20–24 setal pairs..... 7
7. Dorsal plate with 20 setal pairs. Seta Z5 are long. Sternal glands with striae resembling a fingerprint .....  
..... *M. ellipticus* (Kolenatii, 1856)  
Dorsal plate with 22–24 setal pairs. Setae Z5 are not long. Sternal glands with many wavy striae .....  
..... *M. cyclaspis* (Oudemans, 1906)
8. Dorsal plate with 28 setal pairs ..... 9  
Dorsal plate with 25–27 setal pairs..... 12
9. The posterior margin of the sternal plate is concave to the level of the setae st2 ..... 10  
The posterior margin of the sternal plate is slightly concave ..... 11
10. Sternal glands with striae and crosspieces within an oval zone.....  
..... *M. charusnurensis* Dusbabek, 1966  
Sternal glands with distinct, irregular, striae-like wrinkled folds... *M. corethroproctus* (Oudemans, 1902)
11. Sternal glands resemble cells, some of which exhibit dot-and-dash lines; 10 deutosternal teeth with 1 denticle in a row (may be 2 denticles in lower row).  
..... *M. heteromorphus* Dusbabek and Radovsky, 1972  
Sternal glands with V-shaped striae; 6 deutosternal teeth with 1 denticle in a row.....  
..... *M. barbastellinus* Dusbabek, et Pinchuk, 1971
12. Dorsal plate with 25 setal pair; setae J3 are absent .....  
..... *M. rhinolphi* (Oudemans, 1902)  
Dorsal plate with 26–27 setal pair; setae J3 are present..... 13
13. Dorsal plate with 26. Sternal glands are well developed and consist of curved wavy lines that form closed figures..... *M. tigirecus* n. sp.

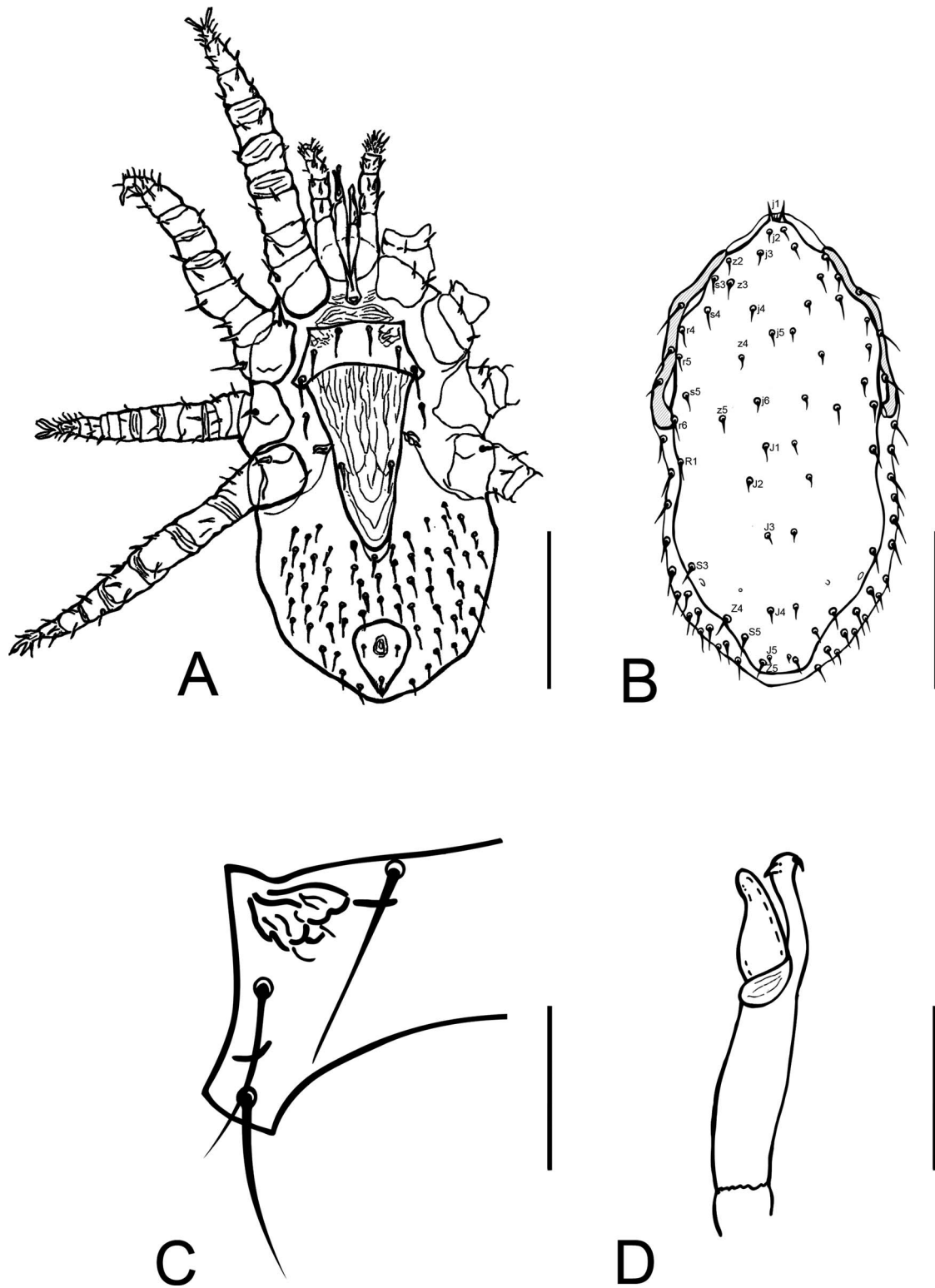


FIGURE 3. *Macronyssus tigirecus* n. sp., female. (A) Dorsal idiosoma. (B) Ventral idiosoma. (C) Sternal plate. (D) Chelicera. Scale bars: A, B = 200  $\mu$ m; C, D = 50  $\mu$ m.

- Dorsal plate with 27 setal pair. Sternal glands with some cells..... 14
14. Sternal glands composed of 4 curved granular lines in a regular pattern; setae j–J-seria are the same length as microsetae..... *M. granulosis* (Kolenatii, 1856)  
Sternal glands small and oval; lengths of setae D-seria increase from j3 to J3 .. *M. diversipilis* (Vitzthum, 1920)

**ACKNOWLEDGMENTS**

We are grateful to the Director of the Tigirek State Reserve P. V. Golyakov, Dr. O. L. Orlov, and A. P. Golovanova for help with fieldwork and to L. A. Vinnik for assistance with editing the illustrations.

**LITERATURE CITED**

BALASHOV, Y. S. 2009. Acari and insect parasitism on terrestrial vertebrates. Nauka, St. Petersburg, Russia, 357 p. (in Russian).

DUSBABEK, F. 1966. A contribution to the knowledge of parasitic mites from Mongolia (Acarina, Gamasides). *Mitteilungen aus dem Zoologischen Museum in Berlin* **42**: 43–58.

———, AND F. J. RADOVSKY. 1972. *Macronyssus heteromorphus* (Acarina: Macronyssidae) a new species from the Kuril Islands. *Journal of Medical Entomology* **9**: 575–579.

Electronic directory “Russian Bats.” Available at: <http://zmmu.msu.ru/bats/rusbats/rusbats.html>. Accessed 10 February 2015.

LINDQUIST, E. E., AND G. O. EVANS. 1965. Taxonomic concepts in the Ascidae, with a modified setal nomenclature for the idiosoma of the Gamasina (Acari: Mesostigmata). *Memoires of the Entomological Society Canada* **47**: 1–64.

ORLOVA, M. V. 2014. Invasion of specific ectoparasites of Siberian–Far Eastern bat species to the Urals. *Russian Journal of Biological Invasions* **5**: 29–31.

RADOVSKY, F. 1967. The Macronyssidae and Laelapidae (Acarina: Mesostigmata) parasitic on bats. University of California, Berkeley, California, 288 p.

———. 2010. Revision of Genera of the parasitic mite family Macronyssidae (Mesostigmata: Dermanyssoidea) of the world. Indra Publishing House, West Bloomfield, Michigan, 170 p.

STANYUKOVICH, M. K. 1997. Keys to gamasid mites (Acari, Parasitiformes, Mesostigmata, Macronyssoidea et Laelaptoidea) parasitizing bats (Mammalia, Chiroptera) from Russia and adjacent countries. *Rudolstadter Naturhistorische Schriften* **7**: 13–46.

UCHIKAWA, K. 1979. Bat mites of the genus *Macronyssus* Kolenati (Acari, Macronyssidae). *Annotationes Zoologicae Japonenses* **52**: 246–256.

WHITAKER JR., J. O. 1988. Collecting and preserving ectoparasites for ecological study. *In* Ecological and behavioral methods for the study of bats, T. H. Kunz (ed.). Smithsonian Institution Press, Washington, D.C., p. 459–474.

Queries for para-101-03-07

1. Author: This article has been lightly edited for grammar, style, and usage. Please compare it with your original document and make any corrections on these pages. Please limit your corrections to substantive changes that affect meaning. If no change is required in response to a question, please write "OK as set" in the margin. CE