

## TAXONOMIC STATUS OF *LAELAPS PETRISCHEVAE* ZEMSKAYA ET LANGE, 1979 (ACARI: PARASITIFORMES: GAMASINA)

N. P. Korollo-Vinarskaya<sup>1,2</sup> and M. V. Vinarski<sup>3</sup>

<sup>1</sup>Laboratory of Arthropod-Borne Viral Infections, Omsk Research Institute of Natural Foci Infections, Mira str. 7, 644080 Omsk, RUSSIA, e-mail: vinarskayan@inbox.ru

<sup>2</sup>Omsk Branch of the All-Russia Institute of Textile & Light Industry, Pushkin Str., 63, 644010 Omsk, RUSSIA

<sup>3</sup>Department of Zoology and Physiology, Omsk State Pedagogical University, Tukhachevskogo emb. 14, 644099 Omsk, RUSSIA, e-mail: radix.vinarski@gmail.com

**ABSTRACT:** *Laelaps petrischevae* Zemskeya et Lange, 1979 was described ex *Microtus* voles from the northern parts of Western and Middle Siberia. However, the species has not been mentioned later in taxonomic and faunistic papers dealing with the ectoparasitic gamasid mites of Siberia. Examination of newly collected laelapid mites from the Yamal Peninsula as well as the comparison with the published data led to conclusion that *L. petrischevae* Zemskeya et Lange, 1979 (syn. n.) is a junior synonym of *L. alaskensis* Grant, 1947. Key for identification of females of the *Laelaps* species inhabiting the northern regions of Western and Middle Siberia is given.

**KEY WORDS:** gamasid mites, Laelapidae, *Laelaps petrischevae*, *Laelaps alaskensis*, synonymy, identification key

### INTRODUCTION

*Laelaps petrischevae* Zemskeya et Lange, 1979, an ectoparasitic gamasid mite infests small mammals of the Yamal Peninsula (the north of Western Siberia) and northern regions of Middle Siberia (Zemskeya and Lange 1979). However, since its description the species has not been mentioned in papers devoted to the gamasid mites fauna of northern Siberia (El'shin 1992; Mal'kova 2005, 2010). It also is omitted in the resumptive monograph "Gamasid mites of Western Siberia" (Davydova and Nikolsky 1986) as well as in the catalogue of parasitic gamasid mites of Northern Eurasia compiled by Nikulina (2004). The original description of *L. petrischevae* is until now the only source of information on its morphology, taxonomic position, bionomics and host range.

Having examined a vast collection of ectoparasitic gamasid mites from small mammals of the Yamal Peninsula, we obtained some new data about species of the genus *Laelaps* C.L. Koch, 1836 of this region that allow us to clarify the taxonomic position of *L. petrischevae*.

### MATERIALS AND METHODS

We examined collections of gamasid mites sampled in the southern subarctic tundra zone of the Yamal Peninsula (samples made by Drs. V.V. Yakimenko and M.G. Mal'kova, Omsk Research Institute of Natural Foci Infections, ORINF hereafter). The mites were taken in 2005 from Middendorff's voles (*Microtus middendorffi* Poljakov, 1881). Voucher specimens are kept in the Museum of Medical Arachnoentomology of ORINF.

For the comparative purposes, collections of mites of the genus *Laelaps* of some scientific insti-

tutions of Russia were used. We examined mites from acarological collections of the Zoological Institute of the Russian Academy of Sciences (Saint Petersburg, ZIN hereafter), the Department of Entomology of the Moscow State University (Moscow, MGU hereafter), the N.F. Gamaleya Research Institute of Epidemiology and Microbiology (Moscow, GRIEM hereafter), and the Institute of Systematics and Ecology of Animals of the Siberian Branch of the Russian Academy of Sciences (Novosibirsk).

Mite measurements were made by using Mikmed-1 microscope. In total, 17 females and 2 males of *Laelaps alaskensis* from the Yamal Peninsula were measured. 18 measurements of external skeleton were taken from each female. These measurements serve for characterization of main elements of external skeleton of mites which includes in *Laelaps* females four shields (dorsal, sternal, epigynal and anal). The scheme of female measurements includes: (1–2) length and width of the dorsal shield (LD and WD respectively); (3) length of the sternal shield in the middle (LS); (4–5) width of the sternal shield between its anterior and posterior ledges (WS<sub>1</sub>; WS<sub>2</sub>); (6–8) distance between sternal shield setae in pairs (DSt1–St1, DSt2–St2, DSt3–St3); (9) length of the epigynal shield (LE); (10) width of the epigynal shield ahead of its broadening (WE<sub>1</sub>); (11) width of the epigynal shield in its widest part (WE<sub>2</sub>); (12–15) distance between epigynal shield setae in pairs (DGen–Gen; DZv1–Zv1; DJv1–Jv1; DJv2–Jv2); (16–17) length and width of the anal shield (LA; WA); (18) distance between of the paranal setae (DparA–parA). Also, we measured the lengths of setae on the dorsal and the ventral

shields (Lj1, LZ4, LSt<sub>1</sub>, LSt<sub>2</sub>, LSt<sub>3</sub>, LGen, LZv1, LJv1, LJv2).

The males were measured under the reduced scheme as compared with the females. Only length and width of the dorsal shield was taken. Besides, the length of the legs (LLI, LLII, LLIII, LLIV) was determined in individuals of either sexes.

The setal nomenclature follows Lindquist and Evans (1965), Evans and Till (1966, 1979).

## RESULTS AND DISCUSSION

According to the statement of the authors of *L. petrischevae* (Zemskaya and Lange 1979), the type series consists of two specimens (holotype and paratype) collected from *Microtus gregalis* (Pallas, 1779). The type locality is designated as "Yamal Peninsula, valley of the Schchuchya River". Another known locality of this species mentioned by Zemskaya and Lange (1979) is the vicinity of Norilsk City (north of Middle Siberia). It was stated that the type specimens are kept in the GRIEM collection (Zemskaya and Lange 1979). Unfortunately, we were not able to find these specimens in GRIEM in May of 2007, and, most probable, the types of *L. petrischevae* are lost (E.I. Kornerberg, personal communication). Zemskaya and Lange (1979) pointed that certain additional specimens of *L. petrischevae* were given to the ZIN and MGU collections. We failed to find any materials on *L. petrischevae* in the both of collections mentioned. Thus, there are no specimens of this species in the acarological collections available to us and therefore we can judge about its taxonomic position only on the ground of data published in the original description.

The analysis of these data allowed us to suggest that *L. petrischevae* is no other but a synonym of *Laelaps alaskensis* Grant, 1947, first described from North America (type locality — Jack River, Alaska; see Tipton 1960) and later found in Western Siberia (Davydova and Nikolsky 1986).

The grounds in favor of such opinion are as follows.

**1. Morphological similarity.** The original picture of *L. alaskensis* (Fig. 1) is somewhat sketchy; it does not give the full information about details of its external morphology. The illustration of *L. alaskensis* given by Tipton (1960) exhibits more characters of a taxonomic value. Davydova (1968) also gives some morphological information (including illustrations) about *L. alaskensis* found in Western Siberia. Comparing the data from the original description of *L. petrischevae*

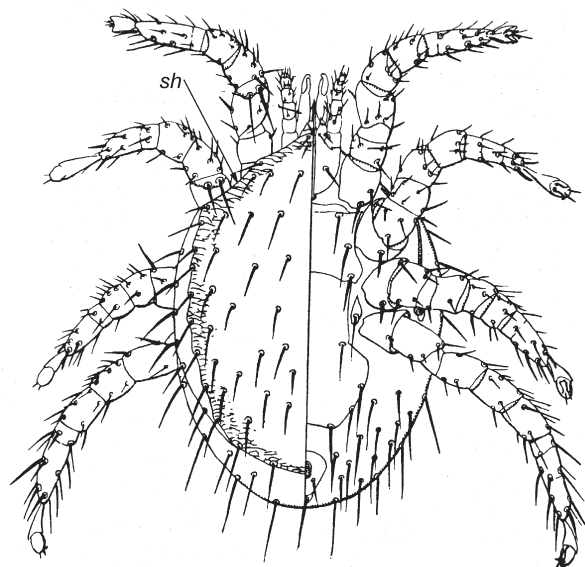


Fig. 1. *L. alaskensis* (after Grant 1947). sh — shoulder.

with the data on *L. alaskensis* morphology (figs. 2–3), following similarities between these species could be mentioned.

**Female. Sternal shield** (Fig. 2). The shape of the sternal shield in both species is typical for the genus *Laelaps*. Its width is nearly two times larger than the length (Table). The posterior margin of the shield is concave. The shield bears three pairs of sternal setae (see Table), and their location is typical for the genus *Laelaps*. The first pair is situated on the front margin of the shield and their tips almost reach its posterior margin.

**Epigynal shield** (see Fig. 2, Table). The shape of the shield as well as an assortment and location of the setae are characteristic for the genus *Laelaps*. In the two species under comparison, the ventral part of the epigynal shield is sharply widened on the level of the genital setae (gen). The posterior margin of the shield is almost straight or slightly concave between the fourth pair of setae. The pattern of shield ornamentation is also analogous in *L. alaskensis* and *L. petrischevae*. The front margin of the shield is continued in a folded membrane.

**Anal shield** (see Fig. 2). The shield is of nearly triangular shape, its margins are well sclerotized. The paranal setae are positioned below the posterior margin of the anal opening and are much longer than the latter. The postanal seta is long and strong.

In both species there are rather strong opisthogastric setae beyond the plates. These setae are not equal in their length and thickness.

Table

Measurements of *Laelaps alaskensis* female (n = 17) from the south of Yamal Peninsula (in millimeters)

Character*	Limits of variation	Mean ± standard deviation (σ)
LD	0.57–0.64	0.59 ± 0.01
WD	0.41–0.47	0.45 ± 0.02
Lj1	0.01–0.02	0.02 ± 0.01
LZ4	0.12–0.14	0.13 ± 0.01
LS	0.07–0.09	0.09 ± 0.01
WS1	0.17–0.20	0.19 ± 0.01
WS2	0.23–0.25	0.24 ± 0.01
LS/WS2	0.33–0.40	0.38 ± 0.02
DSt1–St1	0.07–0.09	0.09 ± 0.01
DSt2–St2	0.14–0.17	0.16 ± 0.01
DSt3–St3	0.15–0.18	0.17 ± 0.01
LSt1	0.08–0.09	0.09 ± 0.01
LSt2	0.09–0.1	0.09 ± 0.01
LSt3	0.08–0.1	0.09 ± 0.01
LE	0.26–0.29	0.28 ± 0.01
WE1	0.17–0.19	0.18 ± 0.01
WE2	0.23–0.24	0.24 ± 0.01
DGen–Gen	0.13–0.14	0.14 ± 0.01
DZv1–Zv1	0.18–0.20	0.20 ± 0.01
DJv1–Jv1	0.14–0.16	0.15 ± 0.01
DJv2–Jv2	0.07–0.09	0.08 ± 0.01
LGen	0.08–0.09	0.09 ± 0.01
LZv1	0.09–0.10	0.10 ± 0.01
LJv1	0.09–0.11	0.10 ± 0.01
LJv2	0.09–0.11	0.10 ± 0.01
LA	0.11–0.13	0.12 ± 0.01
WA	0.09–0.1	0.10 ± 0.01
DparA–parA	0.03–0.05	0.04 ± 0.01
LLI	0.36–0.39	0.37 ± 0.01
LLII	0.32–0.36	0.34 ± 0.01
LLIII	0.32–0.36	0.35 ± 0.01
LLIV	0.48–0.55	0.50 ± 0.02

\*For abbreviations decoding see Material and Methods

**Dorsal shield** (Fig. 3). It is of ovoid shape, with clearly pronounced shoulders. The setae on this shield are of similar appearance (all needle-shaped), but some anterior pairs smaller than others and the length of marginal setae increases posteriorly. j1 setae have the minimum length, and Z4 setae — maximum one (see Table).

**Legs.** Judging from the published data, the coxal armament also is similar in *L. alaskensis* and *L. petrischevae*. Coxa II bears one thickened seta of spicular shape and another hook-like one. Legs IV are the most thin and long (see Table). The for-

mula of genu IV is  $3\frac{3}{1}\frac{0}{1}$ . The apical setae of tarsi II–III are thickened.

**Male** (Fig. 5). Smaller and more slender as compared with female (size of the dorsal shield is 0.56–0.64 mm × 0.35–0.41 mm, its shape is identical with that in female), and our results correspond well to the literary data (Grant, 1947). Legs II are somewhat thicker than all the rest, legs IV are the longest (I 0.37–0.47 mm, II 0.34–0.36 mm, III 0.37–0.41 mm, IV 0.53–0.55 mm). Tarsi IV with four thickened setae, of which pl<sub>1</sub>, pl<sub>2</sub>, av<sub>1</sub> are short and spicular (Fig. 6). The spermatodactyl is illustrated on Fig. 7.

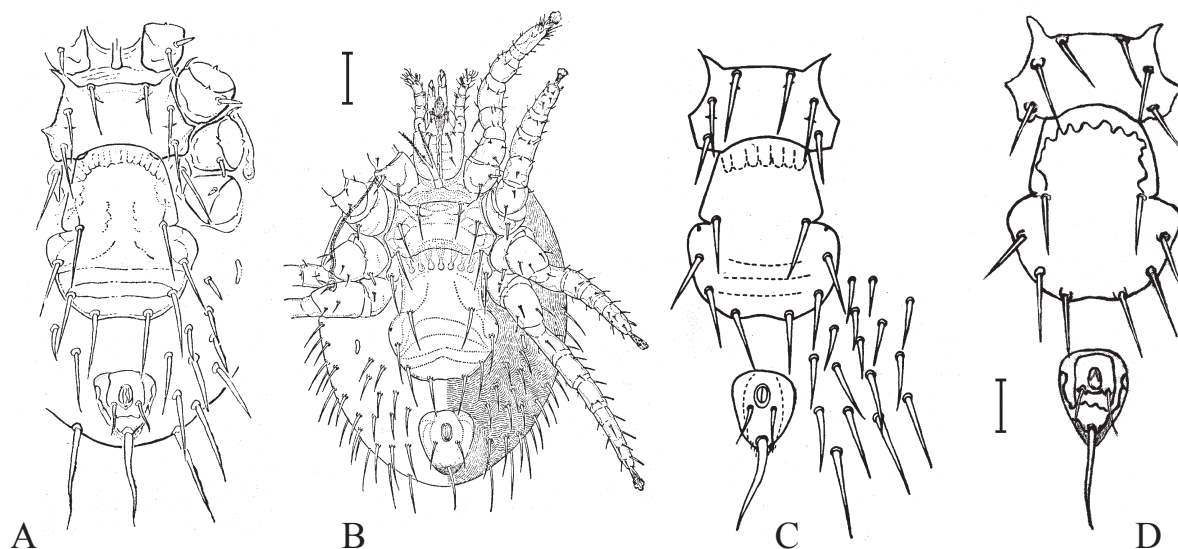


Fig. 2. *Laelaps* spp., female, ventral view; A — *L. petrischevae* (after Zemskaya and Lange 1979), B — *L. alaskensis* (after Tipton 1960), C — *L. alaskensis* (after Davydova 1968), D — *L. alaskensis* (original; Southern Yamal, bank of the Yerkuta-Yakha River). Scale bars: 0.1 mm (B, D). Scale bars are absent in the original papers (A, C).

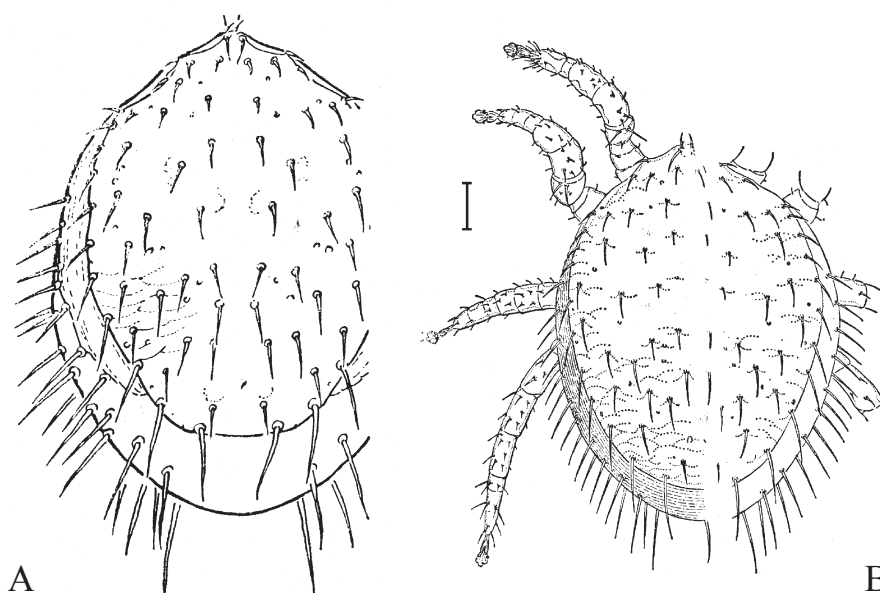


Fig. 3. *Laelaps* spp., dorsal view; A — *L. petrischevae* (after Zemskaya and Lange 1979), B — *L. alaskensis* (after Tipton 1960). Scale bar 0.1 mm (B), or absent in the original paper (A).

At last, the body sizes of both species should be compared. Zemskaya and Lange (1979) reported that LD in *L. petrischevae* is equal to 0.60–0.64 mm, and WD varies between 0.45 and 0.50 mm. *L. alaskensis* from the southern Yamal demonstrate almost the same values of LD and WD (Table). In North America, LD in *L. alaskensis* is 0.57 mm and WD is 0.465 mm (Grant 1947). Hence, there are no clear distinctions in absolute sizes of the two mite species.

**2. Ecological similarity.** It is known that the mites of the genus *Laelaps* are mostly mono- or oligohostal parasites with limited range of hosts

(Zemskaya 1973; Korralo 2004, 2005). Hence, the similarity between sets of small mammals parasitized by *L. alaskensis* and by *L. petrischevae* may serve as an indirect evidence for their conspecificity. According to Zemskaya and Lange (1979), the hosts of *L. petrischevae* are several species of *Microtus* vole (*M. middendorffi* Poljakov, 1881, *M. oeconomus* Pallas, 1776, *M. gregalis*) as well as two lemming species (*Lemmus sibiricus* Kerr, 1792, *Dicrostonyx torquatus* Pallas, 1778). Besides, the species has been (accidentally?) found in *Sorex* shrew (Zemskaya and Lange 1979).

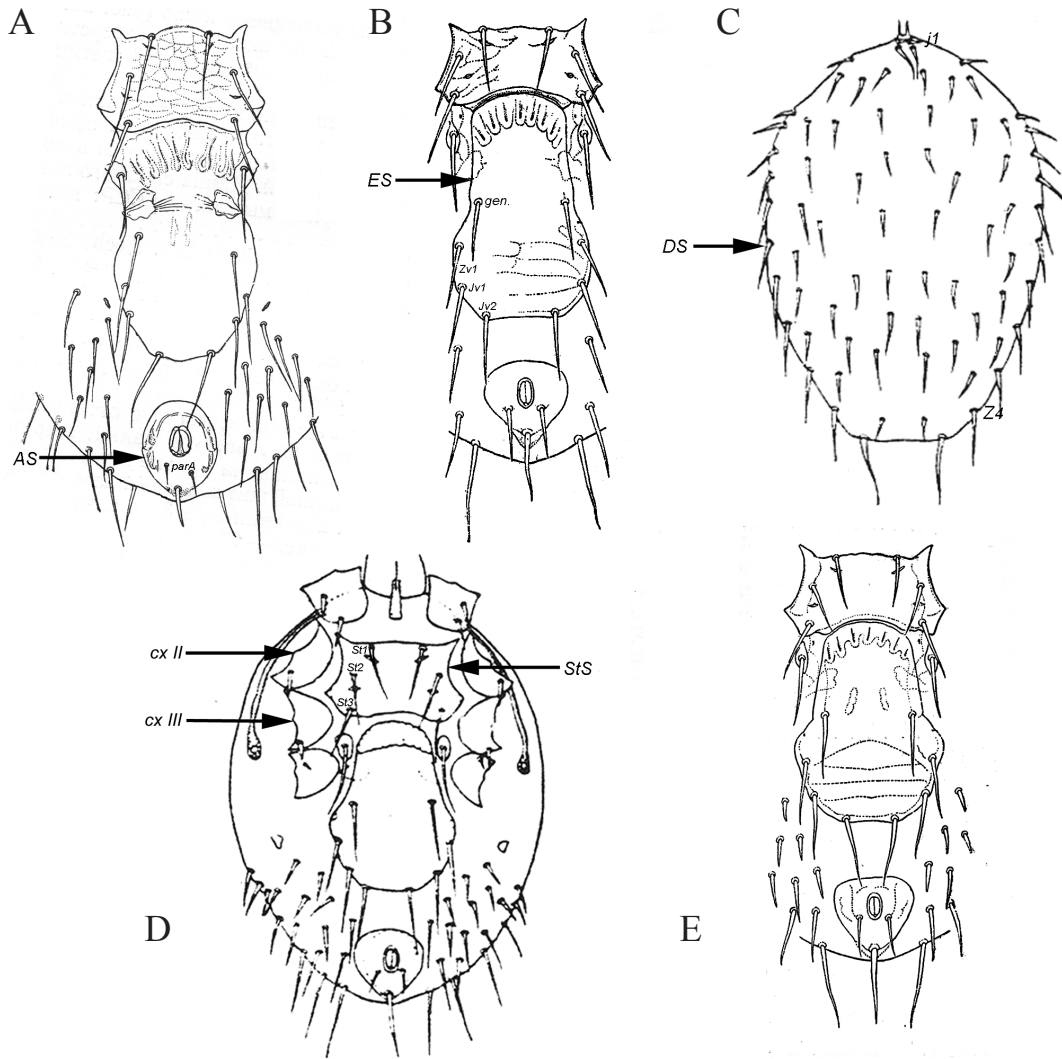


Fig. 4. *Laelaps* spp., female, certain diagnostic features used for identification purposes: A — *L. lemmi*, ventral view (after Bregetova 1956); B — *L. hilaris*, ventral view (after Bregetova 1956); C — *L. semitectus*, dorsal shield (after Grokhovskaya 1960); D — *L. semitectus*, ventral view (after Grokhovskaya 1960); E — *L. clethrionomydis*, ventral view (Bregetova 1956). AS — anal shield; ES — epigynal shield; CX II–III — coxae II–III; DS — dorsal shield; StS — sternal shield; parA — paranal setae.

*L. alaskensis* possesses, in essence, the same circle of small mammal hosts in the Eurasiatic part of its range. It is recorded from *Microtus voles* (*M. middendorffi* and *M. gregalis*) as well as from red-backed vole (*Clethrionomydis rutilus* Pallas, 1779) and tundra shrew, *Sorex tundrensis* Merriam, 1900 (Zemskaya 1973; Davydova et al. 1980; Davydova and Nikolsky 1986). We found *L. alaskensis* in the mite collection sampled in the southern Yamal from *M. middendorffi*. Mal'kova (2010) believes this vole species to be the main host of *L. alaskensis* in the Yamal Peninsula.

**3. Geographical distribution.** Only two records of *L. petrischevae* are known to the date. Both of these are located in the northern part of Siberia northward to the Polar circle (Zemskaya and Lange 1979). The geographical distribution of *L. alaskensis* in Palearctic is confined to the rela-

tively narrow band from the Komi Republic eastward to Yakutia (Zemskaya 1973; Davydova et al. 1980; Davydova and Nikolsky 1986; Mal'kova 2010). Therefore, the range of *L. petrischevae* is much less than that of *L. alaskensis* and is situated within the borders of the latter.

All the considerations above brought us to conclusion that there are no morphological or ecological differences between the two species, and their ranges of distribution are overlapping. We regard *L. petrischevae* (syn. n.) to be a junior synonym of *L. alaskensis*.

**Key for identification of females of the *Laelaps* species inhabiting the arctic and subarctic regions of Western Siberia**

- 1 (2) Anal shield ovoid. Adanal setae situated behind anal opening (Fig. 4 A) ..... *L. lemmi* Grube, 1851

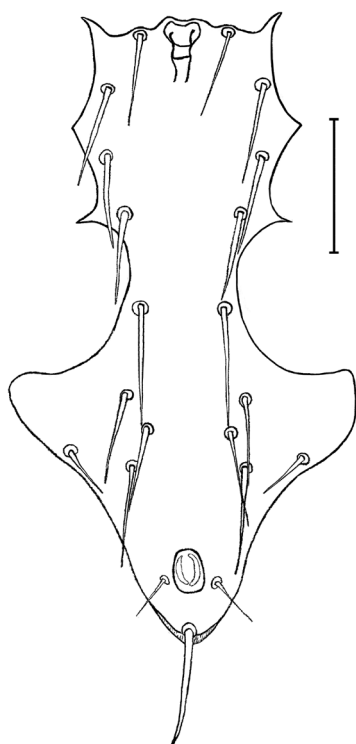


Fig. 5. *L. alaskensis*, male, ventral view (original; Southern Yamal, bank of the Yerkuta-Yakha River). Scale bar 0.1 mm.

2 (1) Anal shield triangular. Adanal setae situated at level of posterior margin of anal opening (Fig. 4 B).

3 (4) Dorsal shield with well developed shoulders and setae thickened (see Fig. 1, 3 A) .....

..... *L. alaskensis*

4 (3) Dorsal shield without pronounced shoulders, its setae not thickened (Fig. 4 C).

5 (6) Epigynal shield smoothly widened between transversal levels of setae *gen.* and *Zv1*. Distance between *gen.-gen.* almost equal to distance between *Jv2-Jv2* (Fig. 4 B) .....

..... *L. hilaris* C.L. Koch, 1836

6 (5) Epigynal shield sharply widened between transversal levels of setae *gen.* and *Zv1*. Distance between *gen.-gen.* significantly more than distance setae between *Jv2-Jv2* (Fig. 4 D, E)

7 (8) Ratio between length (in central part) and width (at level of posterior ledges) of sternal plate 1.5–1.6 (Fig. 4 D) .....

..... *L. semitectus* (L. Koch, 1878)

8 (7) Ratio between length and width of sternal plate is 2.0 and more (Fig. 4 E) .....

..... *L. clethrionomydis* Lange, 1955

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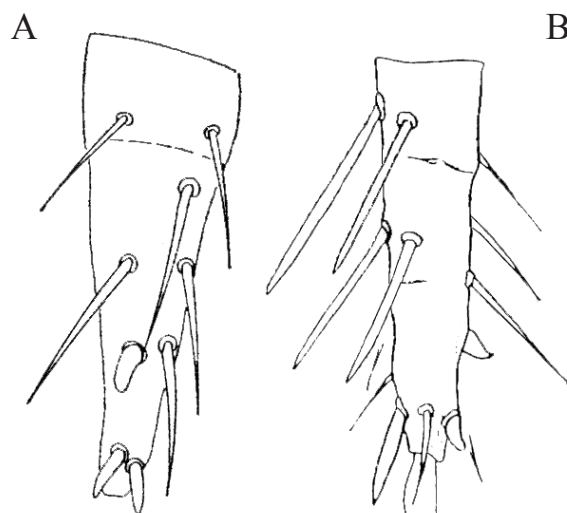


Fig. 6. *Laelaps* spp., male, tarsi IV: A — *L. alaskensis* (after Tipton 1960), B — *L. petrischevae* (after Zemskaya and Lange 1979).



Fig. 7. *L. petrischevae*, male, spermatodactyl (after Zemskaya and Lange 1979).

sion to work with acarological collections. Also authors are grateful to Dr. Olga L. Makarova (Moscow, Severtsov Institute of Ecology and Evolution of the Russian Academy of Sciences) and Dr. Irina I. Marchenko (Novosibirsk, Institute of Systematics and Ecology of Animals of the Siberian Branch of the Russian Academy of Sciences) for sending us copies of some taxonomic papers devoted to the genus *Laelaps*. We thank Dr. V.V. Yakimenko and Dr. M.G. Mal'kova (Omsk Research Institute of Natural Foci Infections) provided mites from the Yamal Peninsula for the study.

#### REFERENCES

Davydova, M.S. 1968. *Gamazovyye kleshchi Zapadnoy Sibiri* [Gamasid mites of Western Siberia]. MS thesis. Institute of Biology of the Siberian Branch

- of the USSR Academy of Sciences, Novosibirsk. 440 pp. [In Russian]
- Davydova, M.S., Nikolsky, V.V., Yudin, B.S., Dudareva, G.V., and Belova, O.S. 1980. [Gamasiid mites of tundra of Middle Siberia]. In: M.S. Davydova (Ed.). Paraziticheskie nasekomyye i kleshchi Sibiri. Nauka, Novosibirsk, p. 141–148. [In Russian]
- Davydova, M.S. and Nikolsky, V.V. 1986. *Gamazovyye kleshchi Zapadnoy Sibiri* [Gamasiid mites of Western Siberia]. Nauka, Novosibirsk, 128 pp. [In Russian]
- El'shin, S.V. 1992. [The dependence of the quantitative indices of the infections of rodents from Yamal with ectoparasites on the method of catching]. *Parazitologiya*, 26: 338–340. [In Russian]
- Evans, G.O. and Till, W.M. 1966. Studies on the British Dermansyidae (Acari: Mesostigmata). Part II Classification. *Bulletin of the British Museum (Natural History) Zoology*, 5: 107–370.
- Evans, G.O. and Till, W.M. 1979. Mesostigmatic mites of Britain and Ireland (Chelicerata: Acari, Parasitiformes). An introduction to their external morphology and classification. *Transaction of the Zoological Society of London*, 35: 139–270.
- Grant, C.D. 1947. North American mites of the genus *Laelaps* (Arachnida: Acarina: Parasitidae). *Micronotomology*, 12: 1–21.
- Grokhovskaya, I.M. 1960. [Contribution to knowledge of the ectoparasites of arctic lemming (*Dicrostonyx torquatus* Pall.)]. *Zoologicheskii Zhurnal*, 39 (7): 1093–1095. [In Russian]
- Korallo, N.P. 2004. *Biotsenoticheskie svyazi gamazovykh kleshchei s melkimi mlekopitayushchimi na yuge Zapadnoi Sibiri* [Biocenotic relationships between gamasiid mites and small mammals in the southern part of Western Siberia]. PhD thesis. Omsk State Pedagogical University, Omsk. 148 pp. [In Russian]
- Korallo, N.P. 2005. [Characteristics of host-parasite relationships in gamasiid mites of the genus *Laelaps* C.L. Koch (Acari: Parasitiformes: Gamasina) in Omsk region]. *Estestvennyye nauki i ekologiya. Ezhegodnik OmGPU*, 9: 177–182. [In Russian]
- Lindquist, E.E. and Evans, G.O. 1965. Taxonomic concepts in the Ascidae, with a modified setal nomenclature for the idiosoma of the Gamasina (Acarina: Mesostigmata). *Memoirs of the Entomological Society of Canada*, 47: 5–59.
- Mal'kova, M.G. 2005. [Ectoparasites of small mammals of the subarctic tundra zone of Western Siberia]. In: V.D. Gulyaev (Ed.). Parazitologicheskie issledovaniya v Sibiri i na Dalnem Vostoke. Materialy II mezhhregionalnoi nauchnoi konferentsii (15–20 September 2005, Novosibirsk, Russia). Novosibirsk, p. 126–128. [In Russian]
- Mal'kova, M.G. 2010. [Characteristics of zonal distribution of the gamasiid mites connected with small mammals and their nests in Western Siberia]. *Parazitologiya*, 44: 297–309. [In Russian]
- Nikulina, N.A. 2004. *Katalog paraziticheskikh gamazovykh kleshchei mlekopitayushchikh severnoi Evrazii* [Catalogue of parasitic gamasiid mites of mammals of northern Eurasia]. Aktsioner and K°, Saint Petersburg, 170 pp. [In Russian]
- Tipton, V.J. 1960. The genus *Laelaps* with a review of the Laelaptinae and a new subfamily Alphalaelaptinae (Acarina: Laelaptidae). *University of California Publications in Entomology*, 16: 233–356.
- Zemskaya, A.A. 1973. *Gamazovyye kleshchi i ikh meditsinskoe znachenie* [Gamasiid mites and their medical significance]. Meditsina, Moscow, 167 pp. [In Russian]
- Zemskaya, A.A. and Lange, A.B. 1979. [A new species of gamasiid mites *Laelaps petrischevae* sp. nov. (Gamasoidea, Laelaptidae) from the north part of Western Siberia]. In: I.M. Grokhovskaya and M.A. Meledzhaeva (Eds.). Razvitie parazitologicheskoy nauki v Turkmenistane. Ashkhabad, p. 81–83. [In Russian]