

ON THE SYSTEMATICS OF THE GENUS *EUTONELLA* KUDRYASHOVA, 1988
(ACARI: TROMBICULIDAE)

К СИСТЕМАТИКЕ РОДА *EUTONELLA* KUDRYASHOVA, 1988 (ACARI:
TROMBICULIDAE)

A.A. Stekol'nikov
А.А. Стекольников

Zoological Institute, Russian Academy of Sciences, St. Petersburg, 199034 Russia
Зоологический институт Российской академии наук, Санкт-Петербург, 199034 Россия

Key words: chigger mites, systematics, new species, fauna, *Eutonella*
Ключевые слова: клещи-красотелки, систематика, новый вид, фауна, *Eutonella*

ABSTRACT

A new species, *Eutonella kudryashovae* sp. n., is described from the North-Eastern Turkey. Five species formerly included into the genus *Neotrombicula* Hirst, 1925 are transferred to the genus *Eutonella*. One species, *Neotrombicula iranensis* Goff et Saboori, 1998, is synonymized with *Eutonella blanfordi* (Kudryashova, 1977) comb. n. *Eutonella crinita* (Schluger, 1966) is recorded in Turkey for the first time. The ecogeographical variability is revealed in the latter species: the specimens from high-mountain localities show greater values of the lengths of setae.

РЕЗЮМЕ

Описан новый вид, *Eutonella kudryashovae* sp. n., из северо-восточной Турции. Пять видов, ранее входивших в род *Neotrombicula* Hirst, 1925, перемещены в род *Eutonella*. Один вид, *Neotrombicula iranensis* Goff et Saboori, 1998, сведен в синоним к *Eutonella blanfordi* (Kudryashova, 1977) comb. n. *Eutonella crinita* (Schluger, 1966) впервые отмечается в Турции. У этого вида выявлена экогеографическая изменчивость: экземпляры из высокогорных местобитаний обнаруживали большие значения длин щетинок.

The chigger mites of the genus *Eutonella* Kudryashova, 1988 (Acari: Trombiculidae) are a common component of the fauna of ectoparasites of rodents in the Middle and Western Asia, the Caucasus, the Southern and Eastern Europe. The paper with the original description of *Eutonella* [Kudryashova, 1988] was limited by the territory of the former USSR. Same species were reviewed in the monograph, published later [Kudryashova, 1998]. Based on morphology, several species are trans-

ferred from the genus *Neotrombicula* to *Eutonella*. The author's trip to Turkey (1998) yielded a new species and one new faunistic record for Turkey.

The present paper is based on the material from the collections of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia (ZISP) and the Zoological Museum of Moscow State University (ZMMU). Our terminology follows that of Goff et al. [1982], with some modifications used by Kudryashova [1998]: "ventral setae" (V) are the setae of ventral surface of idiosoma excluding coxal and sternal setae, VS — number of ventral setae, D — dorsal idiosomal setae (and their lengths), DS — number of D. The original additions [Stekolnikov, 1993, 1995, 1997] are as follows: TaIII — length of leg III tarsus, TaW — width of leg III tarsus, mt — ratio between distance from mastitarsala to the base of leg III tarsus and length of leg III tarsus. In the formulas of dorsal idiosomal setae arrangement (fD) the double rows are given in square brackets. The arrangement of the setae in the caudal rows are usually not shown (in this case the formula is terminated by the dots), because this rows cannot be separated unambiguously. All measurements are given in micrometers (μm).

GENUS *EUTONELLA* KUDRYASHOVA, 1988

The genus is closely related to *Neotrombicula* Hirst, 1925 and *Hirsutiella* Schluger et Vysotskaya, 1970 and characterized by following features: 2 genualae on leg I, double rows of dorsal idiosomal setae (at least the first row is double, usually the first 2 rows are double), nude galeal seta (galeal seta branched in *Eutonella kudryashovae* sp. n. only), presence of anterolateral shoulders of the scutum (anterolateral shoulders absent in *E. armeniensis* [Schluger, 1966], *E. kudryashovae* sp.

n. and *E. serbovae* [Kolebinova, 1972] comb. n.) and greatly convex rounded posterior margin of the scutum. Five species of *Eutonella* — *E. brevisetigera* (Schluger, 1957), *E. tumida* (Schluger, 1957), *E. storkani* (Daniel, 1956), *E. armeniensis* and *E. darskayae* Kudryashova, 1988 — have specific setae placed on ventro-lateral surface of idiosoma, under the humeral setae and between coxae of legs II and legs III. These setae were called by Schluger [1966] and Kudryashova [1988, 1998] as “under-humeral” ones.

In the original description of the genus 13 species have been included in *Eutonella*. One more species, *E. boomium* Kharadov, 1996, was described later from Kirghizia [Kharadov, 1996]. According to our data, the genus *Eutonella* includes 20 species. In addition to 14 mentioned species, in the present paper one new species is described and 5 species are transferred from the genus *Neotrombicula* to *Eutonella*. Moreover, 3 following species probably belong to *Eutonella*.

1) The species identified by Kolebinova as “*Neotrombicula ditricha* (Feider, 1955)” [Kolebinova, 1972a, 1992] is probably also *Eutonella* species, being similar to *E. horti* (Kudryashova, 1977) comb. n. and *E. muljarskajae* Kudryashova, 1988. However, the result of the species identification is dubious. In the original description of *Trombicula ditricha* Feider, 1955 from Roumania, it was stated that the leg III coxa bears 2 setae (fCx=1.1.2). One can see in the figures [Feider, 1955: P. 218, Fig. 19 and P. 220, Fig. 20] that SB is located distinctly anterior to the level of PL bases and the posterior margin of the scutum is angular (subpentagonal scutum). At the same time, in the description given by Kolebinova, fCx=1.1.1, SB lie posterior to the level of PL bases and the posterior margin of scutum is greatly convex and rounded. Measured characters and numbers of idiosomal setae are also quite different in the descriptions given by Feider [1955] and Kolebinova [1992].

2) “*Neotrombicula desaleri* (Methlagl, 1927)” of Kolebinova [1969, 1992] obviously belongs to the genus *Eutonella* and is closely related to *E. iolderiensis* (Amanguliev, 1973) and *E. brevis* (Schluger et Amanguliev, 1975). Regrettably, Kolebinova did not provide clear evidence that the mites, she has been working with, have belonged to *Trombicula desaleri* Methlagl, 1928 (moreover, the year of description was given incorrectly — 1927 instead of 1928). According to the original description [Methlagl, 1928], the mites *T. desaleri* possess 3 genualae I, whereas the chiggers examined by Kolebinova

have 2, as in all other *Eutonella*. In the same way, Kepka [1964] identified a chigger mite with 2 genualae I as “*Neotrombicula desaleri*” with no clear support for this. It should be emphasized that the type host for *Trombicula desaleri* is a human. Therefore, if the placement of this species into the genus *Eutonella* will be proved, it would be stated that the genus has some medical importance.

3) *Neotrombicula kanzalwanensis* (Womersley, 1952) from Kashmir, India can also belong to the genus *Eutonella*, but the original description of this species is too incomplete [Womersley, 1952; Womersley, Audy, 1957].

Eutonella kudryashovae Stekolnikov sp. n.

Figs. 1–2.

Type material. Holotype larva (No. 4804, T-Tr-13) and 1 paratype larva from *Apodemus mystacinus* (Danford et Alston), NE Turkey, Gumushane province, Zigana range (Kalkanli Daglari), southern slope, Ugurtasi Koyu Muchtari village (not far from Olucak), 1700 m, 12.06.1998, Coll. A.A. Stekol'nikov.

The holotype and paratype of new species are deposited in ZISP.

Diagnosis: SIF=7BS-B-3-2111.1000; fPp=B/B/NBB, B/B/BBB; fsp=7.7.7; fCx=1.1.1; (PT', PT", ST, pST)=N; fSt=2.2; fSc: PL>AL>=AM; Ip=969; fD=2H-[10-6]-[(8-10)-(6-9)]-(10-11)-9-...; DS=64; VS=56; NDV=119.

DESCRIPTION OF LARVA

Gnathosoma. Cheliceral blade with tricuspid cap; gnathobase densely punctate, bearing pair of branched setae; galeal seta branched; palpal claw 3-pronged; setae on palpal femur and genu branched; palpal tibial setae: ventral and lateral setae branched, dorsal seta nude or branched.

Idiosoma. Eyes 2+2, on ocular plate. One pair of humeral setae; 62–65 dorsal idiosomal setae, densely covering with rather thick and long barbs, arrangement in holotype: [10-6]-[8-9]-11-9-5-4-1; 2 pairs of sternal setae and 55–56 ventral setae; under-humeral setae absent; total idiosomal setae 117–121.

Scutum. Densely punctate, without anterolateral shoulders, with shallowly biconcave anterior margin and greatly convex rounded posterior margin; AM base posterior to level of AL bases; SB posterior to level of PL bases; PL>AL>=AM; sensillae broken in both specimens examined.

Legs. All 7-segmented, with a pair of claws and a claw-like empodium. Leg I. Coxa with 1

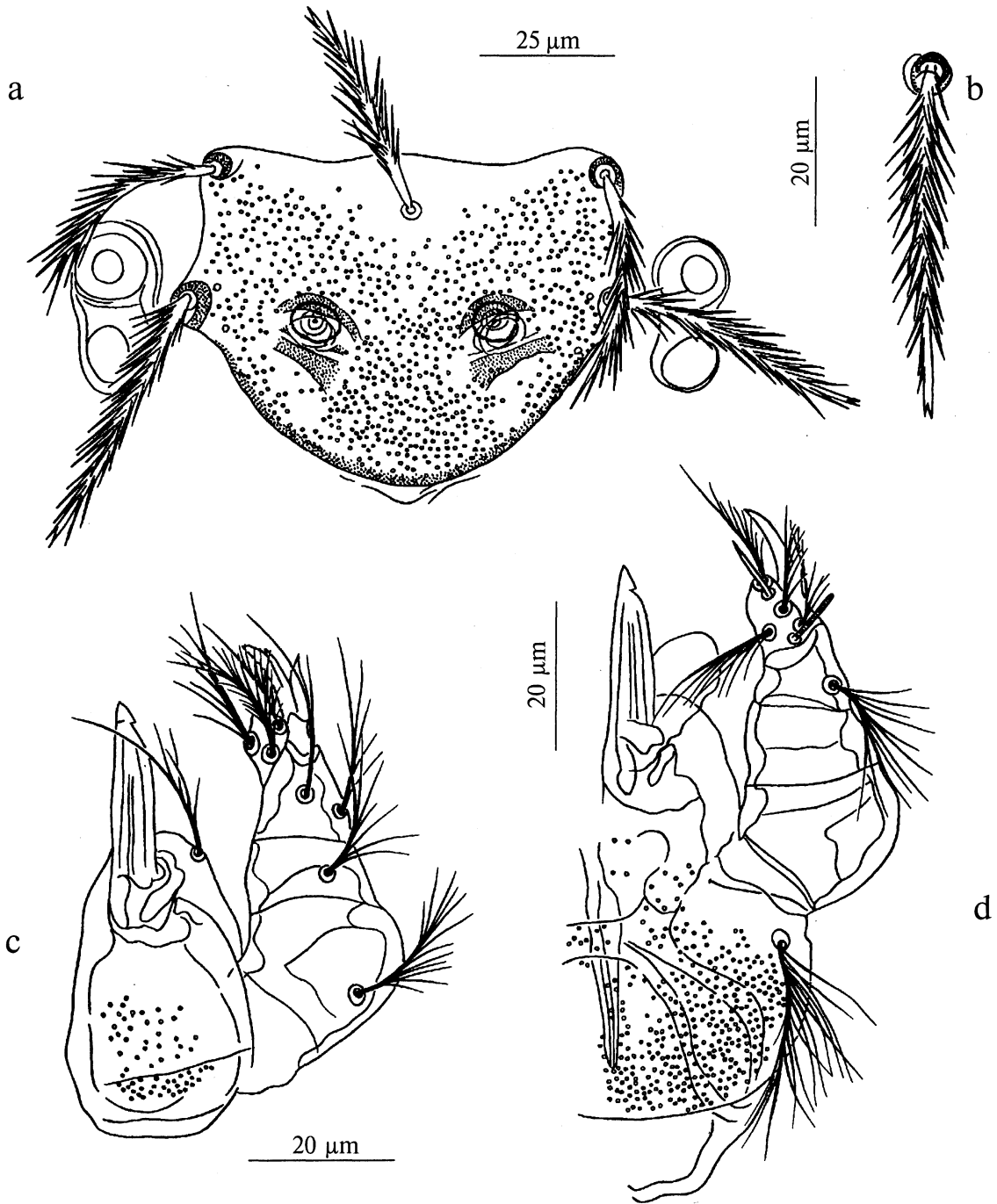


Fig. 1. *Eutonella kudryashovae* sp. n., larva: a — scutum; b — dorsal idiosomal seta of first row; c — gnathosoma, dorsal view; d — gnathosoma, ventral view.

Рис. 1. *Eutonella kudryashovae* sp. n., личинка: а — щит; б — спинная щетинка идиосомы первого ряда; с — гнатосома дорсально; д — гнатосома вентрально.

branched seta (1B); trochanter 1B; basifemur 1B; telofemur 5B; genu 4B, 2 genualae, microgenuala; tibia 8B, 2 tibialae, microtibiala; tarsus 22B, tarsala, microtarsala, subterminala, parasubterminala, pretarsala. Leg II. Coxa 1B; trochanter 1B; basife-

mur 2B; telofemur 4B; genu 3B, genuala; tibia 6B, 2 tibialae; tarsus 16B, tarsala, microtarsala, pretarsala. Leg III. Coxa 1B; trochanter 1B; basifemur 2B; telofemur 3B; genu 3B, genuala; tibia 6B, tibiala; tarsus 14B, mastitarsala.

STANDARD MEASUREMENTS

	AW	PW	SB	ASB	PSB	SD	P-PL	AP	AM	AL	PL	H
Holotype	71	77	32	32	29	61	34	23	41	41	49	54
Paratype	72	77	34	31	26	57	31	23	43	45	51	57

	D	V	pa	pm	pp	Ip	DS	VS	NDV	TaIII	TaW	mt
37-54	26-53	335	286	328	949	65	56	121	90	18	0.190	
40-56	31-56	347	304	338	990	62	55	117	95	17	0.198	

DIFFERENTIAL DIAGNOSIS

The new species differs from all other *Eutonella* by presence of the branched galeal seta. It is most similar to *E. muljarskajae* and differs from the latter species, besides the branched galeal seta, by the absence of anterolateral shoulders of the scutum, slightly more numerous idiosomal setae (NDV=117-121 against 93-105), less broad scutum (PW=77 against 80-91) and shorter scutal and idiosomal setae (PL=49-51 against 56-65, H=54-57 against 59-67)*.

***Eutonella blanfordi* (Kudryashova, 1977)
comb. n.**

Kudryashova, 1977: 47, fig. 2 (*Neotrombicula*; Iran, Markazi province, 16 km N from Delijan; holotype in ZMMU). — *iranensis* Goff et Saboori, 1998: 859, fig. 2 (*Neotrombicula*; Iran, Hamedan, Asad Abad; holotype in the Smithsonian Institution, U.S.A.), syn. n.

Material. Holotype larva (H-142-1787) of *Neotrombicula blanfordi* from *Meriones persicus* (Blanford), Iran, Markazi Prov., 16 km N from Delijan, 1600 m, 14.11.1969. Coll. V.M. Neronov.

Diagnosis: SIF=7BS-N-3-2111.1000; B/B/BBB; fCx=1.1.1; fSt=2.2; fSc: PL>AL>AM; Ip=922; fD=2H-[11-7]-[8-6]-10-9-6-2; DS=61; VS=40; NDV=101.

Standard measurements of holotype: AW=72, PW=83, SB=30, ASB=30, PSB=32, SD=62, P-PL=25, AP=26/27, AM=29, AL=39, PL=41, S=63, H=48, D=31-50, V=26-43, pa=331, pm=274, pp=317, Ip=922, DS=61, VS=40, NDV=101, TaIII=86, TaW=14, mt=0.183.

REMARKS

1) In the redescription of *Eutonella kugitangica* Amanguliev, 1984 [Kudryashova, 1988], it was characterised as a "very similar" to *Neotrombicula blanfordi*. Thus, Kudryashova practically stated that *N. blanfordi* is really a species of the genus *Eutonella*, but this was not followed by the formal taxonomic act of transferring to a proper genus.

2) *Neotrombicula iranensis*, according to the original description [Goff, Saboori, 1998], differs from *E. blanfordi* by nude dorsal palpal tibial seta only. This single character does not constitute a difference of specific rank. For example, in *E. kudryashovae* sp. n. dorsal palpal tibial seta may be nude or branched. Therefore, I regard *N. iranensis* as a synonym of *E. blanfordi*.

***Eutonella tadjikistanica* (Kudryashova et
Abou-Taka, 1987) comb. n.**

Kudryashova, Abou-Taka, 1987: 621, figs. 1-3 (*Neotrombicula*; Tadjikistan, Gissarskij range, Romit reserve; holotype and paratypes in ZMMU); Kudryashova, 1988: 56; 1998: 150, fig. 111. — *acomys* (non Radford, 1957; *Neotrombicula*): Kolebinova, 1974: 262; 1992: 101, fig. 51. — *crinita* (non Schluger, 1966; *Neotrombicula*; part.): Kudryashova, 1973: 5, tab. 1; 1979: 69.

Material. 2 paratypes larvae and 1 specimen larva from *Rattus turkestanicus* (Satunin), Tadjikistan, Gissarskij range, Romit reserve, 30-31.10.1966. Coll., det. N.I. Kudryashova (ZMMU).

Diagnosis: SIF=7BS-N-3-2111.1000; fPp=B/B/NBB, fCx=1.1.1; fSt=2.2; fSc: PL>AL>AM; Ip=805-904; fD=2H-[(10-14)-(5-7)]-[(8-10)-(5-

*The following material on *E. muljarskajae* is examined. Holotype larva (K-1-99) and 2 paratype larvae from *Microtus majori* Thomas, Azerbaijan, Astarinskij district, Biljasary village, 8.06.1961, N.I. Kudryashova coll. (ZMMU); 2 specimens larvae from *Microtus socialis* (Pallas), Azerbaijan, Astrakhan-Bazarskij district, 23.11.1965 and 27.01.1966. Coll. L.V. Muljarskaja. Det. N.I. Kudryashova (ZMMU).

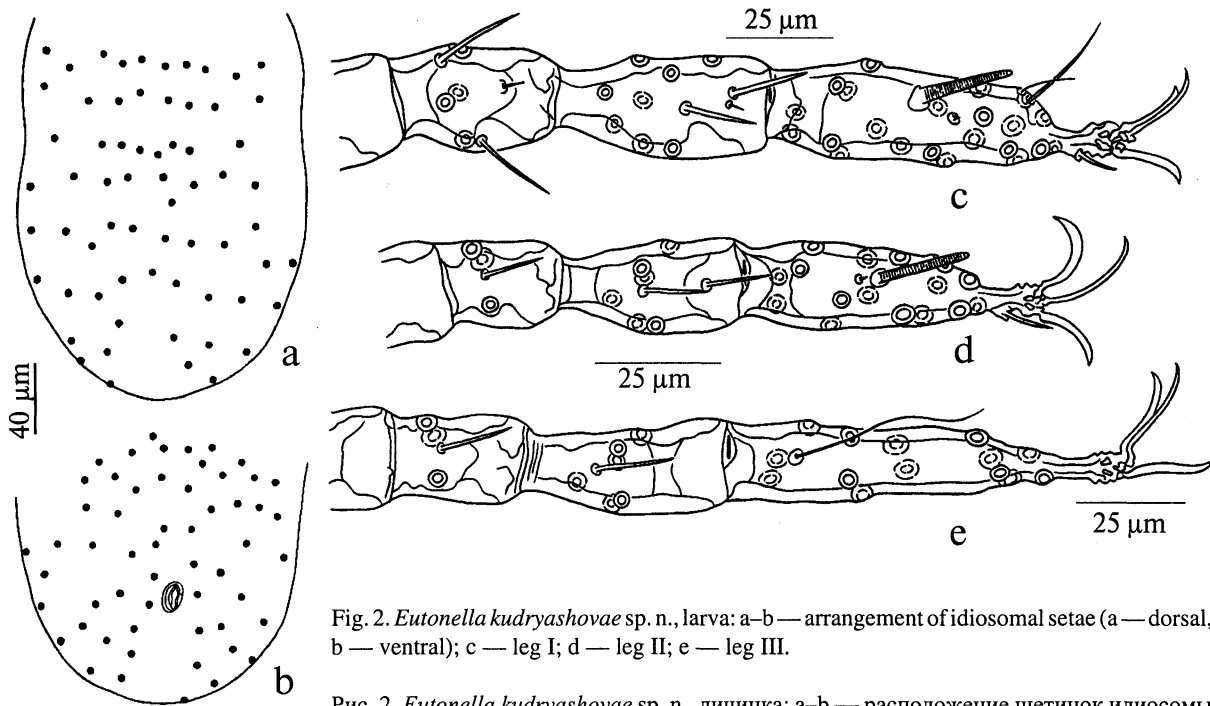


Fig. 2. *Eutonella kudryashovae* sp. n., larva: a-b — arrangement of idiosomal setae (a — dorsal, b — ventral); c — leg I; d — leg II; e — leg III.

Рис. 2. *Eutonella kudryashovae* sp. n., личинка: a-b — расположение щетинок идиосомы (a — спинных; b — брюшных); c — нога I; d — нога II; e — нога III.

STANDARD MEASUREMENTS (n=3)

	AW	PW	SB	ASB	PSB	SD	P-PL	AP	AM	AL	PL	S	H
Min	67	79	30	27	28	55	25	22	32	42	47	63	48
Max	72	82	31	30	29	59	26	27	33	47	52	74	52
m	69	81	30	28	29	57	25	25	33	44	49	67	50

	D	V	pa	pm	pp	Ip	DS	VS	NDV	TaIII	TaW	mt
	32-49	30-45	281	239	284	805	60	42	102	77	14	0.163
	34-49	30-47	319	279	308	904	62	49	111	83	16	0.178
	32-49	30-46	306	265	296	868	61	47	108	80	15	0.172

8)]-(11-12)-(7-9)-...; DS=60-62; VS=42-49; NDV=102-111.

REMARKS

1) "*Neotrombicula acomys* (Radford, 1957)" according to the description based on the material from Bulgaria [Kolebinova, 1992], is a typical *Eutonella* species, not different from *E. tadjikistanica*. At the same time, the original description of *Trombicula acomys* Radford, 1957 from Israel is rather incomplete. The redescription based on the material from Turkey [Kepka, 1966] represents

several *Neotrombicula* species having 3 genualae on leg I. Thus, there are no enough evidence exists to attribute mites examined by Kolebinova [1974, 1992] and Radford [1957]. Neither Kolebinova [1992] nor Kepka [1966] reported whether they studied the type material of *Trombicula acomys*.

2) The species is closely related to *E. blanfordi* and differs from the latter by the nude dorsal palpal tibial seta and some measured characters (PL=47-52 against 41, Ip=805-904 against 922, SD=55-59 against 62, etc.). Perhaps, *E. tadjikistanica* is a case of intraspecific variability in *E. blanfordi*.

***Eutonella crinita* (Schluger, 1966)**

Schluger, 1966: 210, fig. 2 (*Neotrombicula*; Ukraine, Odessa province, Zelenoe village; type material not found); Kudryashova, 1988: 58; 1998: 151, fig. 112.

Material. 2 larvae from *Microtus socialis*, Ukraine, Crimea, Kirovskiy district, Sofievka village, 22–23.10.1957 and 1 larva from *M. arvalis* (Pallas), Simferopolskiy district, Polyarnoe village, 31.10.1957. Coll. F.N. Vshivkov, det. E.G. Schluger (ZMMU); 3 larvae from *Clethrionomys glareolus* (Schreber), Moldova, Kalarashskiy district, Lozovo village, 26.09.1962. Coll., det. N.I. Kudryashova (ZMMU); 16 larvae from *Chionomys nivalis* (Martins), NE Turkey, Trabzon province, Zigana range (Kalkanli Daglari), 2550 m, 11.06.1998. Coll., det. A.A. Stekol'nikov (ZISP).

Diagnosis: SIF=7BS-N-3-2111.1000; fPp=B/B/NBB; fCx=1.1.1; fSt=2.2; fSc: PL>AL>AM;

Ip=997; fD=[(11–14)-(8–11)]-[(8–13)-(8–13)]-(9–14)-...; DS=72; VS=48; NDV=120.

REMARK

The specimens of *E. crinita* from Turkey have slightly longer scutal and dorsal idiosomal setae than in the material from other localities: PL=58–71(64) against 50–55(53), H=60–74(67) against 50–60(55). This peculiarity can be interpreted as a case of ecogeographical variability, similar to this one, revealed by the author in the genus *Neotrombicula* [Stekolnikov, 1998, 1999]. Similar to other species of *Neotrombicula*, the specimens of *E. crinita* from high-mountain localities show greater values of some measured characters, for example, the lengths of setae as it is demonstrated in our case.

DISTRIBUTION

Ukraine, Moldova, Georgia, Armenia, Azerbaijan. Recorded in Turkey for the first time.

STANDARD MEASUREMENTS (n=18)

	AW	PW	SB	ASB	PSB	SD	P-PL	AP	AM	AL	PL	S	H
Min	78	89	32	31	27	59	28	21	37	41	50	62	50
Max	87	99	38	36	32	68	36	30	48	55	71	83	74
m	82	94	35	34	31	64	32	25	42	47	60	72	63
D	V	pa	pm	pp	Ip	DS	VS	NDV	TaIII	TaW	mt		
31–50	31–50	333	286	331	950	64	40	108	82	16	0.134		
47–65	37–63	360	322	369	1046	78	63	133	101	21	0.220		
40–59	33–54	346	305	346	997	72	48	120	88	18	0.187		

***Eutonella horti* (Kudryashova, 1977) comb. n.**

Kudryashova, 1977: 55, fig. 7 (*Neotrombicula*; Iran, 20 km W from Meshhed; holotype and paratypes in ZMMU).

Material. Holotype larva (И-157-3852) and 2 paratypes larvae from *Chionomys nivalis*, Iran, 20

km W from Meshhed, 1100 m, 15–19.10.1970. Coll. V.M. Neronov.

Diagnosis: SIF=7BS-N-3-2111.1000; fPp=B/B/NBB; fCx=1.1.1; fSt=2.2; fSc: PL>AL>AM; Ip=1143; fD=2H-[(6–7)-(7–8)]-[7–6]-10-...; DS=54; VS=43; NDV=97.

STANDARD MEASUREMENTS (n=3)

	AW	PW	SB	ASB	PSB	SD	P-PL	AP	AM	AL	PL	S	H
Min	81	93	35	36	28	67	31	23	37	49	60	79	65
Max	85	96	37	39	33	69	36	30	45	54	73	83	79
m	83	95	36	38	31	68	33	28	40	51	66	81	73

D	V	pa	pm	pp	Ip	DS	VS	NDV	TaIII	TaW	mt
41-66	38-67	389	337	400	1125	48	40	93	104	16	0.121
50-78	41-71	394	356	409	1154	60	45	100	112	17	0.148
47-73	39-69	391	347	405	1143	54	43	97	109	16	0.137

***Eutonella sciuricola* (Kolebinova, 1970)
comb. n.**

Kolebinova, 1970: 105 (*Neotrombicula*; nom. nov. pro *Neotrombicula sciuri* Kolebinova, 1969, non Taufflieb, 1966); 1992: 97, fig. 49. — *sciuri* Kolebinova, 1969: 16, fig. 4 (*Neotrombicula*; nom. praeocc., non Taufflieb, 1966; Bulgaria, Sofia Prov., Kalotino village, Tchaplensky monastery; holotype in the Zoological Institute and Museum of the Bulgarian Academy of Sciences, Sofia).

Diagnosis: SIF=7BS-N-3-2111.1000; fPp=B/B/NBB; fCx=1.1.1; fSt=2.2; fSc: PL>AL>AM; Ip=822; fD=2H-[10-8-4]-[12-8]-10-12-6-4-2; DS=78; VS=46; NDV=124.

Standard measurements of holotype [Kolebinova, 1992]: AW=74, PW=84, SB=29, ASB=32, PSB=25, SD=57, AP=21, AM=34, AL=42, PL=46, S=80, H=50, D=38-46, V=34-38, pa=281, pm=239, pp=302, Ip=822.

***Eutonella serbovae* (Kolebinova, 1972)
comb. n.**

Kolebinova, 1972b: 673, fig. 1-5 (*Neotrombicula*; Bulgaria, Sofia Prov., 11 km from Sofia, Vrana farm; holotype in the Zoological Institute and Museum of the Bulgarian Academy of Sciences, Sofia); 1992: 103, fig. 52 (*Neotrombicula*).

Diagnosis: SIF=7BS-N-3-2111.1000; fPp=B/B/NBB; fCx=1.1.1; fSt=2.2; fSc: PL>AL>AM; Ip=743; fD=2H-[8-6]-[8-7]-8-8-6-2-2; DS=57; VS=44; NDV=101.

Standard measurements of holotype [Kolebinova, 1992]: AW=67, PW=84, SB=31, ASB=25, PSB=27, SD=52, AM=32, AL=38, PL=46, S=67, H=42, D=34-40, V=29-34, pa=244, pm=239, pp=260, Ip=743.

ACKNOWLEDGEMENTS

The author wishes to express the appreciation to Dr. N.I. Kudryashova (ZMMU) for her kind help when he was studying the Moscow University Museum of Zoology collections. The author thanks Prof., Dr. Hikmet Özbek, Drs. Levent Gültekin and Göksel Toslü (Atatürk University, Erzurum, Turkey) for the assistance with the collection trip to Turkey. The author is grateful to his expedition

companions, Drs. B.M. Kataev and A.Y. Solodovnikov (ZISP). The identifications of the hosts were made by Drs. G.I. Baranova and F.N. Golenishchev (ZISP). The study was supported by the Russian Foundation for Basic Research (Grant "Scientific Schools" — "The School of E.N. Pavlovsky"), the International Soros Science Educational Program (Grant No. a97-954), the Administration of St.Petersburg, the Ministry of Education of Russia and the Russian Academy of Sciences (Grant No. M97-2.4K-15).

REFERENCES

Goff M.L., Loomis R.B., Welbourn W.C., Wrenn W.J. 1982. A glossary of chigger terminology (Acari: Trombiculidae) // *Journal of Medical Entomology*. Vol. 19. No. 3. P. 221-238.

Goff M.L., Saboori A. 1998. Two new species of chiggers (Acari: Trombiculidae and Leeuwenhoekiiidae) from Iran // *Journal of Medical Entomology*. Vol. 35. No. 5. P. 857-860.

Feider Z. 1955. Des larves nouvelles du genre *Trombicula* (Acariens) parasites sur des Vertebres // *Studii si cercetari stiintifice al Academiei Republicii Populare Romane, Filiala Iasi*. 1955. Anul 6. No. 3-4. P. 209-226. [In Roumanian]

Kepka O. 1964. Die Trombiculinae (Acari, Trombiculidae) in Österreich // *Zeitschrift für Parasitenkunde*. Bd. 23. Hf. 6. S. 548-642.

Kepka O. 1966. Trombiculidae (Acari) aus der Türkei. 2. // *Zeitschrift für Parasitenkunde*. Bd. 27. Hf. 1-4. S. 43-63.

Kharadov A.V. 1996. [Three new species of chigger mites (Acariformes, Trombiculidae) from Kyrgyzstan] // *Echo nauki. Izvestija NAN Kyrgyzstana. Bishkek: Ilim*. No. 1. P. 47-49. [In Russian]

Kolebinova M.G. 1969. Beitrag zur Kenntnis der Trombiculidenfauna des West-Balkangebirges (Acarina, Trombiculidae) // *Bulletin de l'Institut de Zoologie et Musee Academie bulgare des Sciences*. T. 29. P. 5-27.

Kolebinova M.G. 1970. Larves des Trombiculidae (Acarina) de la Corse, des Pyrenees et de la Crete // *Bulletin de l'Institut de Zoologie et Musee Academie bulgare des Sciences*. T. 32. P. 93-105.

Kolebinova M.G. 1972a. A contribution to the study of the trombiculidae (Acarina, Trombiculidae) in the Srebarna reservation // *Bulletin de l'Institut de Zoologie et Musee Academie bulgare des Sciences*. T. 34. P. 141-146. [In Bulgarian]

- Kolebinova M.G. 1972b. *Neotrombicula (Neotrombicula) serbovae*, a new trombiculid larva from Bulgaria (Acarina: Trombiculidae) // Comptes rendus de l'Academie bulgare des Sciences. T. 25. No. 5. P. 673–675.
- Kolebinova M.G. 1974. Studies on the trombiculid fauna (Acarina, Trombiculidae) from the Central and Eastern Balkan Mountains // Bulletin de l'Institut de Zoologie et Musee Academie bulgare des Sciences. T. 41. P. 257–285. [In Bulgarian]
- Kolebinova M.G. 1992. Acariformes, Trombidioidea, Trombiculidae, Leeuwenhoekidae // Fauna Bulgaria. Sofia: In Aedibus Academie Scientiarum Bulgaricae. T. 21. 172 p. [In Bulgarian]
- Kudryashova N.I. 1973. [Tajikistan chiggers] // Vestnik Moskovskogo Universiteta. Biologia, Pochvovedenie. T. 28. Vyp. 1. P. 3–9. [In Russian]
- Kudryashova N.I. 1977. [New species of the genus *Neotrombicula* (Acariformes, Trombiculidae) from Iran] // Bulletin' Moskovskogo Obshchestva ispytateley prirody. Otdel Biol. T. 82. Vyp. 3. P. 46–59. [In Russian]
- Kudryashova N.I. 1979. [Modern state of investigations of chigger mites (Acariformes, Trombiculidae) from the fauna of the USSR] // Itogi nauki i tehniki. Zooparazitologiya. Moscow. T. 5. S. 5–112. [In Russian]
- Kudryashova N.I. 1988. [To the revision of the genus *Neotrombicula* (Trombiculidae) in the fauna of the USSR. The separation of *Eutonella* gen. n.] // Bulletin' Moskovskogo Obshchestva ispytateley prirody. Otdel Biol. T. 93. Vyp. 3. P. 54–66. [In Russian]
- Kudryashova N.I. 1998. [Chigger mites (Acariformes, Trombiculidae) of East Palaearctics] / Moscow: KMK Scientific Press. 342 p. (Archives of the Zoological museum of the Moscow State University. Vol. 39) [In Russian]
- Kudryashova N.I., Abou-Taka S.M. 1987. [New species and findings of mites of the genus *Neotrombicula* (Acariformes, Trombiculidae) from Tajikistan] // Zoologicheskij Zhurnal. T. 66. No. 4. P. 619–624. [In Russian]
- Methlagl A. 1928. Über die Trombidiose in den Österreichischen Alpenländern // Denkschriften Österreichischen Akademie der Wissenschaften (Wien). Mathematisch-naturwissenschaftliche Klasse. Bd. 101. S. 213–250.
- Radford C.D. 1957. New larval mites of the family Trombiculidae (Acarina: Prostigmata) // Parasitology. Vol. 47. No. 1–2. P. 138–144.
- Schluger E.G. 1966. [New species of mites of the subfamily Trombiculinae Ewing (Acariformes, Trombiculidae)] // Mazurmovich B.N. (ed.): Parasity, Promezhutochnye Khozyaeva i Perenoschiki [Parasites, Intermediate Hosts and Vectors]. Naukova Dumka, Kiev. P. 208–215. [In Russian]
- Stekolnikov A.A. 1993. [Two new species of mites of the genus *Neotrombicula* (Trombiculidae) from Western Caucasus] // Parazitologiya. T. 27. Vyp. 4. P. 289–295. [In Russian]
- Stekolnikov A.A. 1995. [Fauna and systematics of chiggers of the *minuta* group, genus *Neotrombicula* (Trombiculidae)] // Parazitologiya. T. 29. Vyp. 4. P. 250–266. [In Russian]
- Stekolnikov A.A. 1997. [Geographical variability of the chigger species *Neotrombicula autumnalis* and its interrelationships with *N. caucasica* stat. nov. (Trombiculidae)] // Parazitologiya. T. 31. Vyp. 5. P. 397–413. [In Russian]
- Stekolnikov A.A. 1998. [Ecogeographical variability of the chigger species *Neotrombicula delijani* Kudryashova, 1977 (Acari, Trombiculidae)] // Entomologicheskoye Obozreniye. T. 77. Vyp. 1. P. 229–237. [In Russian]
- Stekolnikov A.A. 1999. [A revision of the chigger mites species group *vulgaris* (Trombiculidae: *Neotrombicula*)] // Parazitologiya. 1999. T. 33. Vyp. 5. P. 387–403. [In Russian]
- Womersley H. 1952. The scrub-typhus and scrub-itch mites of the Asiatic-Pacific region // Records of the South Australian Museum. Vol. 10. Part 1–2. P. 1–435, 438–673.
- Womersley H., Audy J.R. 1957. The Trombiculidae (Acarina) of the Asiatic-Pacific region: a revised and annotated list of the species in Womersley, 1952, with descriptions of larvae and nymphs // Audy J.R. (ed.): Malaysian Parasites XVI–XXXIV (Studies from the Institute for Medical Research, Federation of Malaya. No. 28). Part 27. P. 231–296.