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MITES OF THE FAMILY MYOBIIDAE (ACARI: PROSTIGMATA) PARASITIZING RODENTS OF THE FORMER USSR

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ABSTRACT: Records of myobiid mites parasitizing rodents of the former USSR are summarized. Totally, 46 myobiid species belonging to 4 genera were recorded in the fauna of the former USSR: *Austromyobia* (2 species), *Cryptomyobia* (10 species), *Myobia* (7 species), and *Radfordia* with the 3 subgenera, *Radfordia* s.str. (4 species), *Graphiurobia* (6 species), and *Microtimyobia* (17 species). Seventy one rodent species were recorded as hosts of myobiids. More than 60% of potential myobiid hosts occurring in the fauna of the former USSR were examined. Keys to all recorded genera, subgenera, and species (males, females, and tritonymphs of most subgenera) are provided and supplied by figures where it is necessary. The emended diagnoses of all recorded mite genera and subgenera are provided. One species, *Radfordia* (*Graphiurobia*) *selevinia* sp. nov. from *Selevinia betpakdalensis* (Gliridae) is described as a new for science. The host-parasite relationships of myobiids and rodents of the former USSR are briefly discussed. In the examined region, myobiids are absent on representatives of the suborders Castorimorpha and Hystricomorpha. Among Sciuromorpha, myobiids (subgenus *Graphiurobia*) are recorded only on representatives of the family Gliridae. The suborder Myomorpha harbors myobiids of the 3 genera: *Cryptomyobia* — parasites of Dipodidae, excluding Sicistinae); *Austromyobia* — parasites of Gerbillinae, *Myobia* and *Radfordia* s.str. — parasites of Murinae, *Radfrodia* (*Microtimyobia*) — parasites of Cricetidae. Among the superfamily Muroidea, myobiids are absent on representatives of the families Calomyscidae and Spalacidae. Finally, myobiids have, probably, been extinct on some cricetids having the subterranean mode of life, such as *Ellobius* spp. and *Prometheomys schaposchnikovi*. Their absence on species of the genus *Lagurus* (Cricetidae) is, probably, the result of the "missing of the boat".

KEY WORDS: Myobiidae, mites, parasites, rodents, fauna of the former USSR, systematics

INTRODUCTION

The family Myobiidae includes about 585 species and subspecies belonging to 53 genera. All myobiids are permanent mono- or ologoxenous ectoparasites associated with small marsupial or placental mammals of 11 orders (Bochkov 2008). The phylogenetic relationships of myobiids with other members of the parvorder Eleutherengona are not quite clear, although, most probably, they belong to the early derivative Raphignathae (Bochkov et al. 2008; Mironov and Bochkov 2009).

According to the classification proposed by Bochkov (1997c), the family Myobiidae contains four subfamilies, the two of them, Archemyobiinae and Xenomyobiinae are associated with marsupials and the two others, Myobiinae and Protomyobiinae, — with placental mammals.

Myobiids and their hosts demonstrate the high level of the phylogenetic congruence (Bochkov 2008). The myobiid subfamilies associated with marsupials are much more archaic than mites parasitizing placental hosts. Based on the wide distribution of myobiid mites on both marsupial and placental hosts and the presence of the specific mite faunas on these hosts it is possible to hypothesize that parasitism in myobiids originated not later than in the early Cenozoic, the time of the probable divergence of marsupial and placental mammals (Carroll 1993).

Mites of the subfamily Myobiinae parasitize rodents (Rodentia) being recorded on representatives of 12 from 33 recognized rodent families (Carleton and Musser 2005). According to the system by Carleton and Musser (2005), the order Rodentia is divided into the five suborders, Anomaluromorpha, Hystricomorpha, Castoriomorpha, Myomorpha, and Sciuromorpha. Myobiids are known from representatives of all rodent suborders. The fauna of the former USSR includes rodents of 10 families belonging to four suborders, representatives of Anomalumorpha are absent.

Earlir data about myobiids associated with rodents of the fauna USSR were published by Dubinin and Volgin (1955). Later on, several special papers concerning myobiids parasitizing various rodent families on territory of the former USSR were published: parasites of Cricetidae (Bochkov 1995, 1999a; Bochkov and Mironov 1998), parasites of Gliridae (Bochkov 1994), parasites of jerboas and gerbils (Bochkov et al. 1990; Bochkov 1997b), parasites of Muridae (Bochkov 1997b; Bochkov and Labrzycka 2003). In addition, a few faunistic papers containing data about myobiids from rodents of the former USSR were published: Ukraine (Donetsk Prov.) (Sklyar 1975), Crimea (Dubinina and Sosnina 1977); Kirghizia (Chirov et al. 1997), Volzhsko-Kamsky Reservation (Dubinin 1953), parasites of *Microtus miurus egorovi*

from Pleistocene of Yakutia (Dubinina and Bochkov 1996).

In this paper, I summarize all records of myobiid mites parasitizing rodents of the former USSR based on published data, acarological collection of the Zoological Institute of the Russian Academy of Sciences, Saint-Petersburg (ZISP), personally collected materials from freshly trapped hosts in expeditions and from dry and ethanol preserved hosts housing in ZISP. Keys to all recorded genera, subgenera, and species (males, females, and tritonymphs of most subgenera) are provided and supplied with figures where it is necessary. The myobiid tritonymphs are the most often numerous on rodents, therefore keys to this stage are very important. The emended diagnoses of all recorded mite genera and subgenera are provided. One new species, *Radfordia* (*Graphiurobia*) *selevinia* sp. nov. from *Selevinia betpakdalensis* (Gliridae) is described. The host-parasite associations of myobiids and rodents of the former USSR are briefly discussed. Recorded myobiid species along with the lists of their hosts and their distribution on rodents of the former USSR are summarized in Tables 1 and 2, respectively.

MATERIAL AND METHODS

The materials used in this paper were obtained from two main sources: acarological and mammal collections housed in ZISP and from hosts captured in nature.

Some materials were kindly loaned to ZISP by Drs. P.A. Chirov (Kirghizia), A. Fain (from various regions), G.I. Gushcha and S.A. Zabludovskaya (Ukraine), and F. Lukoschus (Europe).

In the field work, mites were collected from hosts captured with snap traps (Gerro's traps) or trap cylinders. The trapped hosts were placed individually in cotton fabric bags and delivered to the lab. The hosts were determined by either mammologists or by me; in the latter case my determinations were checked later by experts from the Department of Theriology (ZISP).

Mites were collected from host in the field or from specimens housed in museums (dry skins and alcohol preserved individuals) under the dissection microscope by means of pincers for electron microscopy or sharpened dissecting needles and put in laboratory microtubes (up to 500 μL) with 70–96% ethanol. In many cases, when the immediate field collecting of mites was not possible, the alcohol preserved host specimens were wrapped into bandages by collectors to prevent any technical contamination of parasites.

Mites collected from freshly killed or ethanol preserved hosts were cleaned, if necessary, in lactophenol or lactic acid before mounting. Mites collected from dry skins were initially put in the Nesbitt solution to mollify and clear them for 10–20 hours at the home temperature or for 4–5 minutes in the hot solution.

In the descriptions, the idiosomal chaetotaxy follows Grandjean (1939) as interpreted by Bochkov et al. (2008). The leg chaetotaxy follows Grandjean (1944). All measurements are in micrometres (μm).

Host systematics follows the check list of Carleton and Musser (2005). Authors and years of host species occurring in the fauna of the former USSR are given in Table 2.

SYSTEMATICS

Family Myobiidae Megnin, 1878

Subfamily Myobiinae Megnin, 1878

Type genus: *Myobia* van Heyden, 1826

Adults. Coxae I with 4 setae (in *Myobia machadoi* Fain, 1972, with 3 setae). Three apical segments of legs I (tarsus, tibia, and genu) completely fused; genua I each with large external clasping projection; tarsal claws absent. Legs I significantly shorter than legs II–IV.

Female. Vulvar lobes distinctly developed, their apices bearing seta *ps3*, which claw-like in most genera. Setae *h1* whip-like.

Male. Genital shield bearing maximally 8 setae, *ps1–ps3*, *g1, g2*, *c1, d1*, and *d2*. Other hysteronotal setae *c2*, *e1*, *e2*, *f1*, and *h1*.

Immature instars. Idiosomal setae *vi* present. Inner side of tarsi I bearing large clasping projection; femora-genu I bearing thickened club-like seta on the inner side; this club-like seta and clasping projection forming chela-like structure.

This subfamily includes eight genera other than the type genus: *Anuncomyobia* Fain, 1972, *Austromyobia* Lawrence, 1954, *Cryptomyobia* Radford, 1954, *Gundimyobia* Fain et Lukoschus, 1976, *Idiurobia* Fain, 1973, *Lavoimyobia* Paran, 1966, *Proradfordia* Lukoschus, Dusbabek et jameson, 1973, and *Radfordia* Ewing, 1938.

Remark. The fauna of the former USSR includes four genera: *Myobia, Austromyobia, Cryptomyobia*, and *Radfordia*.

Hosts. Species of this subfamily associated exclusively with Rodentia (Bochkov 1997c).

Key to genera of Myobiidae parasitizing rodents of the former USSR

1. Tarsi II with 2 claws each 2
— Tarsi II with 1 claw each .... *Myobia* van Heyden, 1826
2. Coxae II with 4 setae. Setae *vi* short filiform (in *Cryptomyobia baranovae,* long lanceolate). In males genital shield rounded in outline, bearing 7–8 pairs of setae, setae *d1* situated on this shield 3
— Coxae II with 3 setae. Setae *vi* thickened or lanceolate. In males, genital shield cone-like, bearing 2–3 pairs of setae, setae *d1* situated behind this shield ..... *Radfordia* Ewing, 1938
3. In females, setae *e2* lanceolate. In males, setae *si* closely situated to *se*, distance *si–se* much shorter than *si*–genital shield .... *Austromyobia* Lawrence, 1954
— In females, setae *e2* filiform. In males, distance *si–se* and *si*–genital shield subequal .... *Cryptomyobia* Radford, 1951

Genus *Austromyobia* Lawrence, 1954

Type species: *Radfordia forcipifer* Lawrence, 1954

Diagnosis. Gnathosoma shorter than legs I. Subcapitulum without ventral projections. Subcapitular setae *n* filiform. Setation of legs II–IV: coxae 4–3–2, trochanters 3–3–3, femora 5–3–3, genua 7+ 1 solenidion–6 (or 5)–5, tibiae 6–6 (or 5)–6 (or 5), tarsi 7+1 solenidion–6–6. Coxal setae *1b*, *1c*, and *1d* not thickened. Dorsal seta of trochanters III–IV whip-like. Apical segment of legs I without ventral hook. Tarsi II with 2 claws, tarsi III and IV with 1 claw each.

Female. Vulvar lobes distinctly developed. Vulvar region slightly ornamented. Full set of idiosomal setae. Setae *vi* short filiform, much narrower than lanceolate setae *e2*.

Male. Genital shield rounded in outline bearing 8 pairs of setae; setae *ps1* thickened scale-like. Setae *c1*, *d1* and *d2* present, situated at genital shield, setae *f2*, and *h2* absent. Other hysteronotal setae *c2, e1, e2, f1,* and *h1*. Seta *si* closely situated to *se,* distances *si–se* much shorter than *si* –genital shield. Cuticular ornamentation near bases of setae *h1* present.

Tritonymph. Idiosomal dorsum with 16 pairs of setae, setae *f2* and *h2* short, pseudoanal setae represented by indistinct alveoli. Legs I symmetrical or assymetrical to each other. Legs IV fully segmented. Tarsi II–III with 1 claw, tarsi IV without claw.

This genus includes two subgenera: the type subgenus (9 species) and *Dendromyobia* Bochkov, 1997 (2 species).

Remark. In the fauna of the former USSR, species of the only type subgenus are recorded.

Hosts. Species of this genus are known exclusively from rodents of the family Muridae.

Subgenus *Austromyobia* Lawrence, 1954

Type species: *Radfordia forcipifer* Lawrence, 1954

Diagnosis. Tibiae III and IV with 5 setae each.

Male. Genital shield with 8 pairs of setae.

Tritonymph. Legs I symmetrical to each other.

This subgenus includes eight species other than the type species: *A. aegyptica* (Radford, 1951), *A. desmodillus* (Fain, 1973), *A. merioni* (Bochkov, Dubinina et Chirov, 1990), *A. dusbabeki* (Fain, 1974), *A. gerbillus* (Fain et Lukoschus, 1977), *A. pachyuromys* (Fain et Lukoschus, 1973), *A. dubinini* (Bochkov, Dubinina et Chirov, 1990), *A. persica* (Bochkov, 2000).

Remark. This subgenus includes nine species belonging to the two species groups, *forcipifer* (7 species) and *pachyuromys* (2 species). In the fauna of the former USSR, two species of the subgenus *Austromyobia* belonging to both species groups are recorded (Bochkov 1997a).

Hosts. Species of this subgenus are associated with gerbils of the subfamily Gerbillinae (Murinae) (Bochkov 1997a; Bochkov et al. 2000).

Key to species of the subgenus *Austromyobia* Lawrence, 1954 of the former USSR

Females and males

1. Genu III with 5 setae. Setae *4a* short, subequal in length to *4b*. In females, setae *f2* at least 2 times shorter than *f1* ..... *A. dubinini* (Bochkov et al. 1990) (Figs. 1C; 2 and 3)
— Genu III with 6 setae. Setae *4a* whip-like, much longer than *4b*. In females, setae *f1* and *f1* subequal ..... *A. merioni* (Bochkov et al. 1990) (Fig. 1A, B)

Tritonymphs

1. Setae *e2* long, 2.5–3 times longer than *d2*. Setae *se* reaching to level of *h2* bases. Setae *4a* short, subequal to *3b* ..... *A. dubinini* (Bochkov et al. 1990) (Fig. 4B)
— Setae *e2* short, subequal to *d2*. Setae *se* reaching to level of *h2* bases. Setae *4a* short, subequal to *3b* ..... *A. merioni* (Bochkov et al. 1990) (Fig. 4A)

Species group *pachyuromys*

Genua III with 5 setae each.

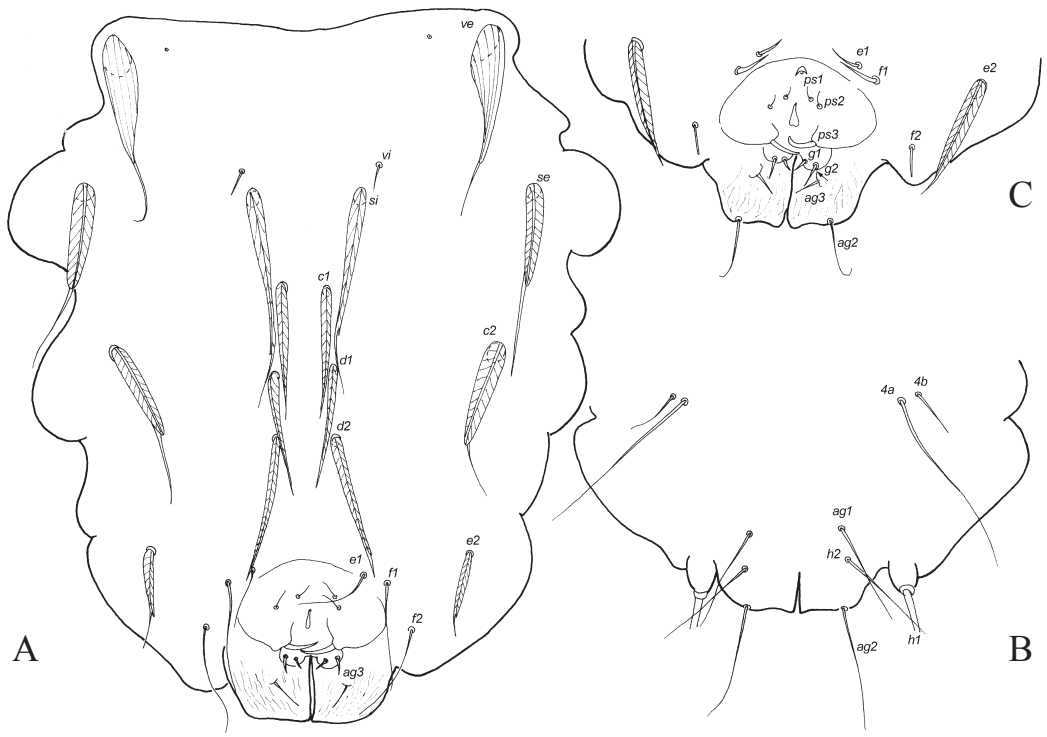


Fig. 1. *Austromyobia* spp., females: *Austromyobia merioni* (Bochkov et al., 1990) (A, B), A — dorsal view, B — opisthosoma in ventral view; C — *Austromyobia dubinini* (Bochkov et al., 1990), opisthosoma in dorsal view.

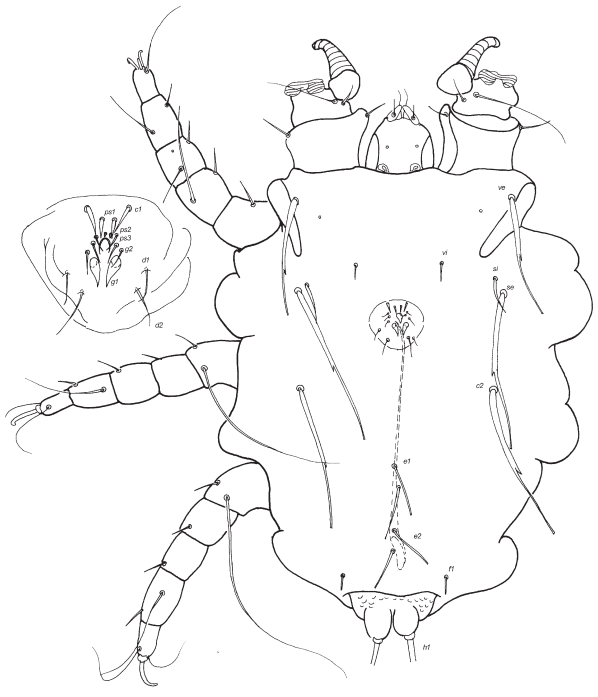


Fig. 2. *Austromyobia dubinini* (Bochkov et al., 1990), male in dorsal view.

Fig. 3. *Austromyobia dubinini* (Bochkov et al., 1990), male in ventral view.

1. *Austromyobia (Austromyobia) merioni* (Bochkov, Dubinina et Chirov, 1990)
Figs. 1A, B, 4A

This species was described from *Meriones tamariscinus* from Khirgizia (Bochkov et al. 1999; Bochkov 1997a).

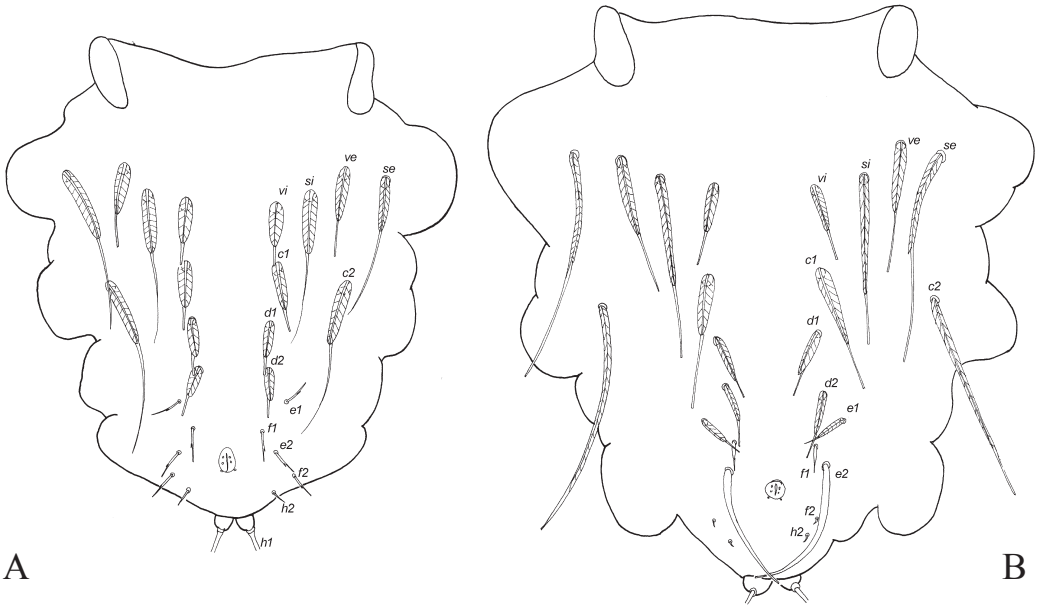


Fig. 4. *Austromyobia* spp., tritonymphs in dorsal view: A — *Austromyobia merioni* (Bochkov et al., 1990), B — *Austromyobia dubinini* (Bochkov et al., 1990).

Hosts and distribution. This species parasitizes jirds of the genus *Meriones*. It was recorded from *Meriones libycus* from Iran (Bochkov et al. 2000) and Turkmenia (present paper), *Meriones tamariscinus* from Khirgizia (Bochkov 1990), from *Meriones meridianus* from Uzbekistan (Bochkov 1990), from *Meriones unguiculatus* (new host) from Mongolia and Russia (present paper).

Material examined. *Meriones tamariscinus* — female holotype (ZISP T-My-1), 4 tritonymph paratypes, KIRGHIZIA: Chuyskaya valley, Tokmak, 28 June 1974, coll. E. Dubinina.

Meriones meridianus — 2 females, 1 male, 3 tritonymphs, UZBEKISTAN: near Bukhara city, ecocentre "Dzheyran", 1 August 1993, coll. A. Bochkov.

Meriones libycus — 1 tritonymph, IRAN: Markazi Prov., near Arak, 7. January 1996, coll. H. Bogdanova and V. Malikov; 1 male, 2 tritonymphs, TURKMENIA: South East Karabil', 2–3 June 1973, coll. P. Strelkov.

Meriones unguiculatus — 2 females, MONGOLIA: Central Gobi, 18 September 1880, coll. Przhevalsky; 2 females, RUSSIA: Tuva, 25 April 1963, coll. M. Meyer.

Species group *forcipifer*

Genua III with 6 setae each.

2. *Austromyobia (Austromyobia) dubinini* (Bochkov, Dubinina et Chirov, 1990)

Figs. 1C, 2–4B

This species was described from *Meriones persicus* from Turkmenia (Bochkov et al. 1990; Bochkov 1997a).

Hosts and distribution. This species parasitizes jirds of the genus *Meriones*. It was recorded from *Meriones persicus* from Turkmenia (Bochkov 1990) and *Meriones zarudnyi* (new host) from Uzbekistan (present paper).

Material examined. *Meriones persicus* — female holotype (ZISP T-My-2), 3 female and 2 tritonymph paratypes, TURKMENIA: Kopetdag, Malyi Balkhan, June 1988, coll. M. Meyer.

Meriones zarudnyi — 2 females, 1 male, 11 tritonymphs, UZBEKISTAN: Kushka, West Margulovka village, 26 April 1958, coll. V. Fokanov.

Genus *Cryptomyobia* Radford, 1951

Type species: *Myobia rotundata* Lawrence, 1951

Diagnosis. Gnathosoma shorter than legs I. Subcapitulum ventrally without pair of retrorse projections. Apical segment of legs I without ventral spur. Setation of legs II–IV: coxae 3–3 (or 4)–3 (or 2), trochanters 3–3–3, femora 5–3–3, genua 7 + 1 solenidion–7–7 (or 6 or 5), tibiae 6–6–6, tarsi 7+1 solenidion–6 (or 5)–6 (or 5). Setae *d* of trochanters III and IV whip-like. Tarsi I with 2 claws, tarsi III and IV with 1 claw each.

Female. Setae *vi* minute filiform or lanceolate. Vulva with pair of distinctly developed lobes. Setae *ps3* claw like. Full set of idiosomal setae.

Male. Genital shield rounded or rhomboid in outline, bearing 7–8 pairs of setae. Setae *d1, d2*, and *c1* (if present), situated on this shield. Other hysteronotal setae: *c2*, *e1*, *e2*, *f1*, and *h1*.

Tritonymph. Idiosoma maximally bearing 13–14 pairs of setae, excluding pseudoanals.

Pseudoanal setae microchetae, 2–3 pairs. In some species, anal opening bearing additional pair of setae ?*g* or *ag*. Setae *f2* and *h2* very short. Legs I symmetrical to each other. Tarsi II and III with claw, tarsi IV with or without claw.

Remark. This subgenus includes two subgenera, the type subgenus with a single species and the subgenus *Dipodomyobia* Bochkov, 1997. The fauna of the former USSR includes only species of the subgenus *Dipodomyobia*.

Hosts. Species of this genus are known from the two rodent families, Bathyergidae and Dipodidae.

Subgenus *Dipodomyobia* Bochkov, 1997

Type species: *Radfordia allactaga* Fain et Lukoschus, 1979

Diagnosis. Setae *vi* short filiform (long lanceolate in *C. baranovae*). Genua IV with 7 or 6 setae.

Female. All coxal setae filiform.

Male. Seta *si* far distant from *se,* distances *si–se* and *si* –genital shield subequal.

Tritonymph. Setae *h2* present.

This subgenus includes 10 species other than the type species: *C. majori* (Bochkov, 1997), *C. paralactaga* (Bochkov, 1997), *C. allactodipi* (Bochkov, 1997), *C. pygeretmusi* (Bochkov, 1997), *C. alactaguli* (Bochkov, 1997), *C. dipi* (Bochkov, 1997), *C. stylodipi* (Bochkov, 1997), *C. jaculus* (Fain et Lukoschus, 1976), *C. paradipi* (Bochkov, 1997), and *C. baranovae* (Bochkov, 1997).

Remark. This subgenus includes two species groups, *allactaga* (6 species) and *dipi* (5 species). In the fauna of the former USSR, ten species belonging to both groups were recorded (Bochkov 1997a).

Hosts. Species of this genus are associated with jerboas of the family Dipodidae. Species of the group *allactaga* are associated with jerboas of the subfamily Allactaginae; species of the group *dipi* are associated with jerboas of the subfamilies Dipodinae and Cardiocraniinae (Bochkov 1997a, 2001).

Key to species of the subgenus *Dipodomyobia* Bochkov, 1997 of the former USSR

Females

1. Genu IV with 6 setae 2
— Genu IV with 7 setae 7
2. Setae *4a* more than 3 times shorter than *1a* ... 3
— Setae *4a* not shorter than *1a* 5
3. Setae *f1* 2 times or less shorter than *e2* 4
— Setae *f1* 3 times shorter than *e2* .... *C. allactodipi* (Bochkov, 1997)
4. Setae *f1* 1.6 times shorter than *e2* .... *C. majori* (Bochkov, 1997)
— Setae *f1* 2 times shorter than *e2* ..... *C. allactaga* (Fain et Lukoschus, 1979), *C. paralactaga* (Bochkov, 1997)
5. Setae *2a* not shorter than *1a* 6
— Setae *2a* 3 times shorter than *1a* .... *C. alactaguli* (Bochkov, 1997) (Fig. 7)
6. Setae *2b* 3 or more times shorter than *2a* ..... *C. pygeretmusi* (Bochkov, 1997)
— Setae *2b* subequal or 1.3 times shorter than *2a* . ..... *C. dipi* (Bochkov, 1997)
7. Coxal I–IV setation 4–4–3–2. Setae *vi* setiform 8
— Coxal I–IV setation 4–4–4–3. Setae *vi* lanceolate ..... *C. baranovae* (Bochkov, 1997) (Fig. 10)
8. Setae *e2* 3 times longer than *f2* .... *C. stylodipi* (Bochkov, 1997)
— Setae *e2* subequal to *f2* .... *C. paradipi* (Bochkov, 1997)

Males

(Males of *C. majori* (Bochkov, 1997), *C. alactaguli* (Bochkov, 1997), *C. dipi* (Bochkov, 1997), and *C. stylodipi* (Bochkov, 1997) unknown)

1. Coxal I–IV setation 4–4–3–2 2
— Coxal setation I–IV 4–4–4–3 .... *C. baranovae* (Bochkov, 1997) (Fig. 8F)
2. Setae *d2* far not reaching to level of seta *e1* bases 3
— Setae *d2* reaching to level of seta *e1* bases ... 4
3. Setae *d2* and *c2* subequal .... *C. pygeretmusi* (Bochkov, 1997) (Fig. 8C)
— Setae *d2* 1.5 times longer than *c2* .... *C. paralactaga* (Bochkov, 1997) (Fig. 8B)
4. Setae *ps1–ps3* filiform. Genu IV with 6 setae 5
—Setae *ps1–ps3* finger-like. Genu IV with 7 setae ..... *C. paradipi* (Bochkov, 1997) (Fig. 8E)
5. Bases of setae *e1'* situated significantly anterior to level of bases *e1"* ..... *C. allactaga* (Fain et Lukoschus, 1979) (Figs. 5, 8D)
— Bases of setae *e1'* and *e1"* situated almost at same level ..... *C. allactodipi* (Bochkov, 1997) (Fig. 8A).

Tritonymphs

1. Setae *1a–4a* finger-like 2
— Setae *1a–4a* filiform 7
2. Setae *f1* short filiform, at least 3 times shorter than *e2* 3
— Setae *f1* lanceolate or thickened filiform, slightly shorter, subequal or longer than *e2* 5

3. Lengths of setae *c1* and *d1* subequal 4
— Setae *c1* more than 2 times shorter than *d1* ..... *C. allactaga* (Fain et Lukoschus, 1979) (Fig. 6A, B)
4. Setae *c1* reaching to level of seta *d2* bases. Setae *e1* and *e2* widely lanceolate, subequal in width to *d2* ..... *C. allactodipi* (Bochkov, 1997) (Fig. 9A)
— Setae *c1* far not reaching to level of seta *d2* bases. Setae *e1* and *e2* narrowly lanceolate, at least 1.5 times narrower than *d2* .... *C. majori* (Bochkov, 1997) (Fig. 6C)
5. Setae *e1* and *e2* subequal 6
— Setae *e1* at least 3 times longer than *e2* subequal ..... *C. paralactaga* (Bochkov, 1997) (Fig. 9D)
6. Setae *d2* distinctly wider and more than 2 times longer than *e1* and *f1* ..... *C. alactaguli* (Bochkov, 1997) (Fig. 9C)
— Setae *d2* subequal in length and width to *e1* and *f1* ..... *C.pygeretmusi* (Bochkov, 1997) (Fig. 9B)
7. Setae *c2* reaching to level of seta *f2* bases 8
— Setae *c2* far not reaching to level of seta *f2* bases ..... *C. baranovae* (Bochkov, 1997) (Fig. 11A)
8. Setae *si* far not reaching to level of seta *d2* bases 9
— Setae *si* reaching to level of seta *d2* bases ..... *C. stylodipi* (Bochkov, 1997) (Fig. 11C)
9. Setae *vi* 2.5 times shorter than *ve* .... *C. paradipi* (Bochkov, 1997) (Fig. 11D)
— Setae *vi* and *ve* subequal .... *C. dipi* (Bochkov, 1997) (Fig. 11B)

Species group *allactaga*

Genua IV with 6 setae. In males, setae *ps1–ps3* finger-like or thickened filiform. In tritonymphs, setae *1a–4a* finger-like.

1. *Cryptomyobia (Dipodomyobia) allactaga* (Fain et Lukoschus, 1979)

Figs. 5, 8D, 6A, B

This species was described from *Allactaga sibirica* from Mongolia (Fain and Lukoschus 1979).

Hosts and distribution. This species is known only from the type host from Mongolia (Fain and Lukoschus 1979) and Kirghizia (Bochkov et al. 1990; Bochkov 1997a).

Material examined. *Allactaga sibirica* — 2 females, 1 tritonymph, KIRGHIZIA: Boomskoe Gorge, 22 June 1988, coll. P. Chirov; 1 female, 1 male, same data, 10 August 1988; 4 females, 1 male, 8 tritonymphs, KIRGHIZIA: Issyk-Kul' Lake, Ottuk village, 9 August 1988, coll. P. Chirov.

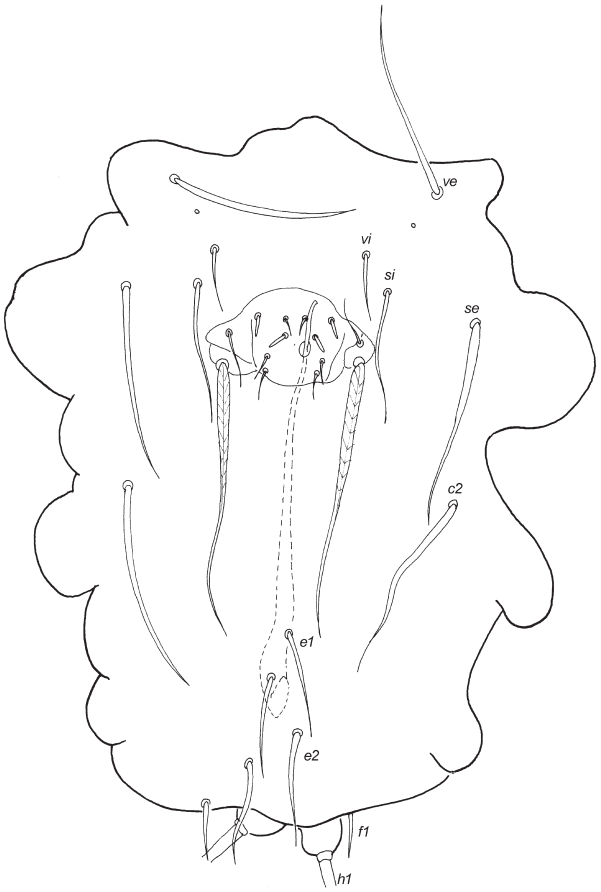


Fig. 5. *Cryptomyobia allactaga* (Fain et Lukoschus, 1979), male idiosoma in dorsal view.

2. *Cryptomyobia (Dipodomyobia) majori* (Bochkov, 1997)

Fig. 6C

This species was described from *Allactaga major* from Crimea (Bochkov 1997a).

Hosts and distribution. This species is known only from the type host from Crimea (Bochkov 1997a) and Kirghizia (Chirov et al. 1997 — determined as *C. allactaga*).

Material examined. *Allactaga major* — female holotype (ZISP T-My-7), 3 tritonymph paratypes, UKRAINE: Crimea, Kuyuk-Tuk, 22 Jule 1965, coll. G. Gushcha; 1 female, KIRGHIZIA: Chuyskaya valley, other data unknown.

3. *Cryptomyobia (Dipodomyobia) paralactaga* (Bochkov, 1997)

Figs. 8B, 9D

This species was described from *Allactaga williamsi* (originally determined as *euphratica*) from ?Persian (=IRAN) (Bochkov 1997a).

Hosts and distribution. This species is known only from the type host and locality.

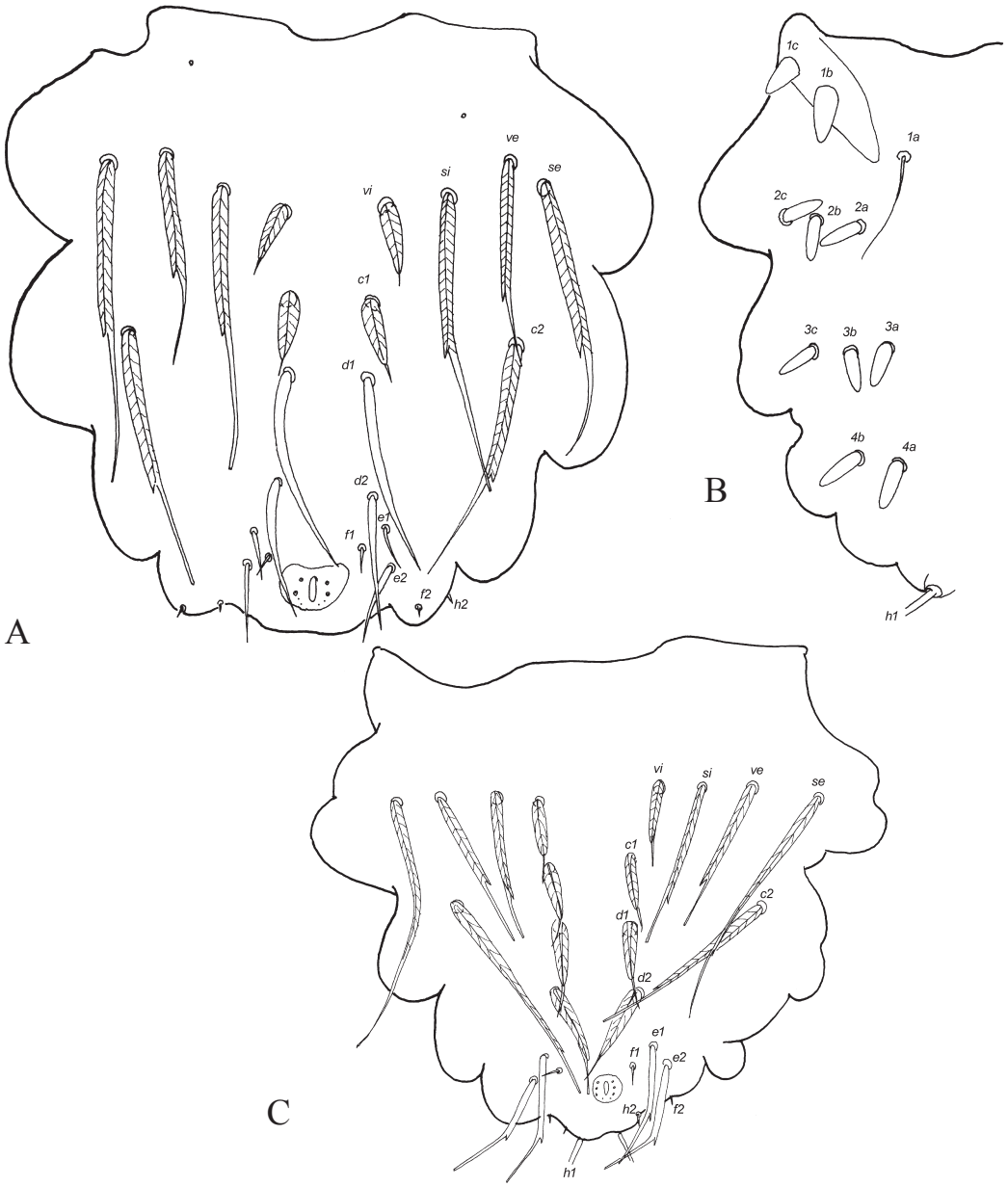


Fig. 6. *Cryptomyobia* spp., idiosoma of tritonymphs: *Cryptomyobia allactaga* (Fain et Lukoschus, 1979) (A, B), A — dorsal view, B — ventral view; C — *Cryptomyobia majori* (Bochkov, 1997) in dorsal view.

Material examined. *Allactaga williamsi* — female holotype (ZISP T-My-13), 4 female, 1 male, 2 tritonymph paratypes, IRAN: June 1913, coll. K. Satunin.

4. *Cryptomyobia (Dipodomyobia) allactodipi* (Bochkov, 1997)

Figs. 8A, 9A

This species was described from *Allactodipus bobrinskii* from Turkmenia (Bochkov 1997a).

Hosts and distribution. This species is known only from the type host and locality.

Material examined. *Allactodipus bobrinskii* — female holotype (ZISP T-My-14), 2 female, 1 male, and 2 tritonymph paratypes, TURKMENIA: Dauban-Kala, coll. I. Fokin.

5. *Cryptomyobia (Dipodomyobia) alactaguli* (Bochkov, 1997)

Figs. 7, 9C

This species was described from *Pygeretmus pumilio* from Kazakhstan (Bochkov 1997a).

Hosts and distribution. This species is known only from the type host and locality.

Material examined. *Pygeretmus pumilio* — female holotype (ZISP T-My-26), 5 tritonymph paratypes, KAZAKHSTAN: near Gur'evsk city, July 1962, coll. expedition of ZISP.

Fig. 7. *Cryptomyobia alactaguli* (Bochkov, 1997), female: A — in dorsal view, B — in ventral view.

6. *Cryptomyobia (Dipodomyobia) pygeretmusi* (Bochkov, 1997)

Figs. 8C, 9B

This species was described from *Pygeretmus platyurus* from Kazakhstan (Bochkov 1997a).

Hosts and distribution. This species is associated with species of the genus *Pygeretmus*, *P. platyurus* and *P. shitkovi* from Kazakhstan (Bochkov 1997a).

Material examined. *Pygeretmus platyurus* — female holotype (ZISP T-My-16), 4 female, 1 male, and 15 tritonymph paratypes, KAZAKHSTAN: Zaysanskaya Hollow, 17 June 1961, coll. expedition of ZISP.

Pygetermus shitkovi — 6 tritonymphs, KAZAKHSTAN: Zaysanskaya Hollow, 6 July 1961, coll. expedition of ZISP.

Species group *dipi*

Genua IV with 7 setae (in *C. dipi* with 6 setae). In males, setae *ps1–ps3* filiform. In tritonymphs, setae *1a–4a* filiform.

7. *Cryptomyobia (Dipodomyobia) stylodipi* (Bochkov, 1997)

Fig. 11C

This species was described from *Stylodipus telum* from Kazakhstan (Bochkov 1997a).

Hosts and distribution. This species is known only from the type host and locality.

Material examined. *Stylodipus telum* — female holotype (ZISP T-My-17), 5 tritonymph paratypes, KAZAKHSTAN: West Kazakhstan, 26 August 1973, coll. expedition of ZISP.

8. *Cryptomyobia (Dipodomyobia) dipi* (Bochkov, 1997)

Fig. 11B

This species was described from *Dipus sagitta* from Kazakhstan (Bochkov 1997a).

Hosts and distribution. This species is known only from the type host and locality.

Material examined. *Dipus sagitta* — female holotype (ZISP T-My-18), 2 female, 5 tritonymph paratypes, KAZAKHSTAN: Aytyr-Kum Sand, May 1961, coll. expedition of ZISP.

9. *Cryptomyobia (Dipodomyobia) paradipi* (Bochkov, 1997)

Figs. 8E, 11D

This species was described from *Paradipus ctenodactylus* from Turkmenia (Bochkov 1997a).

Hosts and distribution. This species is known only from the type host and locality.

Material examined. *Paradipus ctenodacylus* — female holotype (ZISP T-My-19), 9 female, 1 male, 2 tritonymph paratypes, TURKMENIA: Shakh-Senem village, 1985, coll. E. Letitskaya.

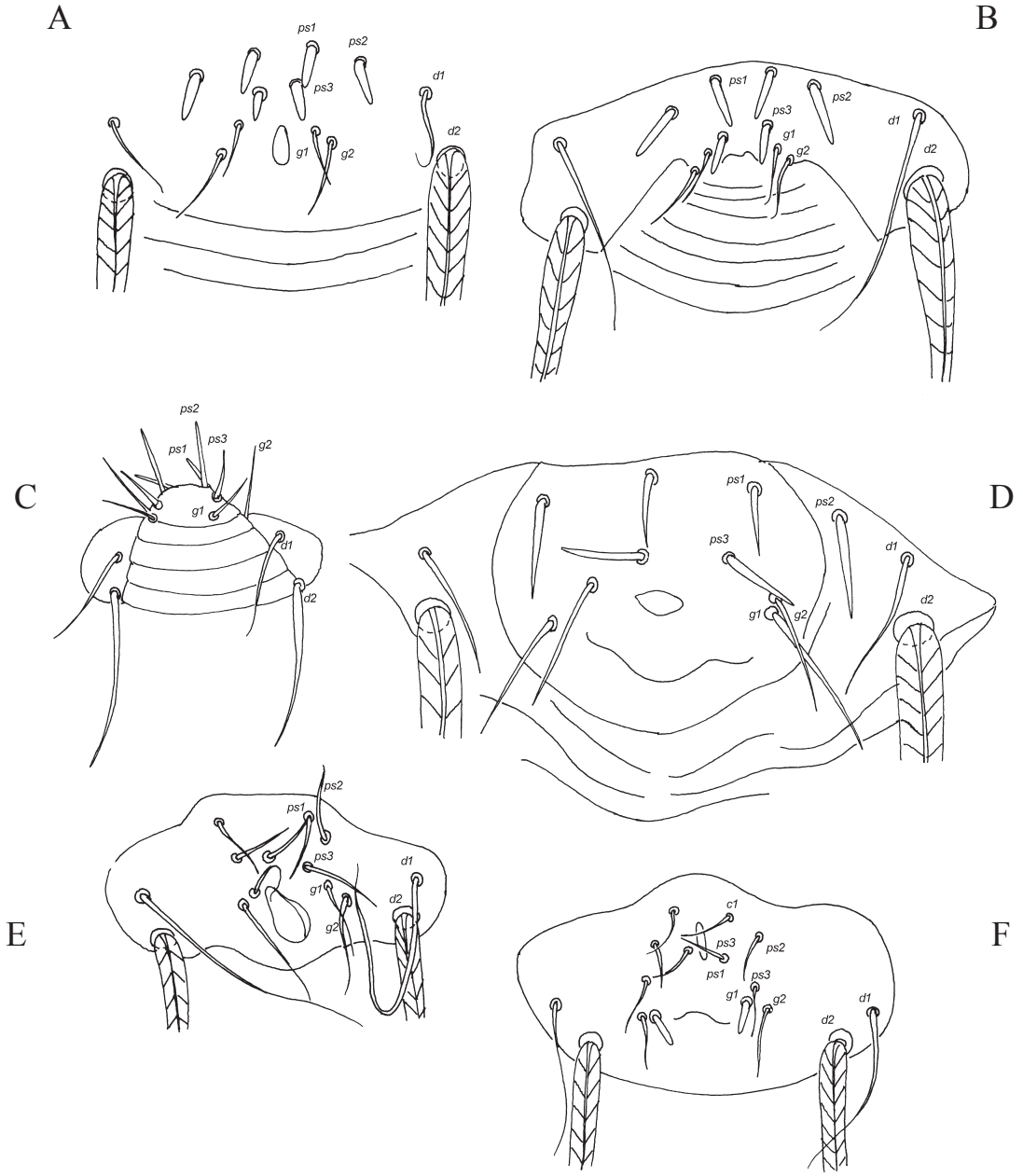


Fig. 8. *Cryptomyobia* spp., male genital shield: A — *Cryptomyobia allactodipi* (Bochkov, 1997), B — *Cryptomyobia paralactaga* (Bochkov, 1997), C — *Cryptomyobia pygeretmusi* (Bochkov, 1997), D — *Cryptomyobia allactaga* (Fain et Lukoschus, 1979), E — *Cryptomyobia paradipi* (Bochkov, 1997), F — *Cryptomyobia baranovae* (Bochkov, 1997).

10. *Cryptomyobia (Dipodomyobia) baranovae* (Bochkov, 1997)

Figs. 8F, 10, 11A

This species was described from *Salpingotus crassicauda* from Kazakhstan (Bochkov 1997a).

Hosts and distribution. This species is known only from the type host and locality.

Material examined. *Salpingotus crassicauda* — female holotype (ZISP T-My-22), 5 female, 5 male, 2 tritonymph paratypes, KAZAKHSTAN: West Kazakhstan, 1961, coll. expedition of ZISP.

Genus *Myobia* van Heyden, 1826

Type species: *Pediculus muris-musculi* Schrank, 1781

Diagnosis. Gnathosoma shorter than legs I. Subcapitulum with pair of retrorse basal projections ventrally. Subcapitular setae *n* filiform (in subgenus *Otomyobia*, membranous lanceolate). Setation of legs II–IV: coxae 3–2–2 (or 1), trochanters 3–3 (or 2)–3 (or 2), femora 5–3–3, genua 7+ 1 solenidion–6 (or 5)–6 (or 5), tibiae 6–6–6, tarsi 7+1 solenidion–6–6. Coxal setae *1b*, *1c*, and *1d* not thickened. Dorsal seta of trochanters III–IV

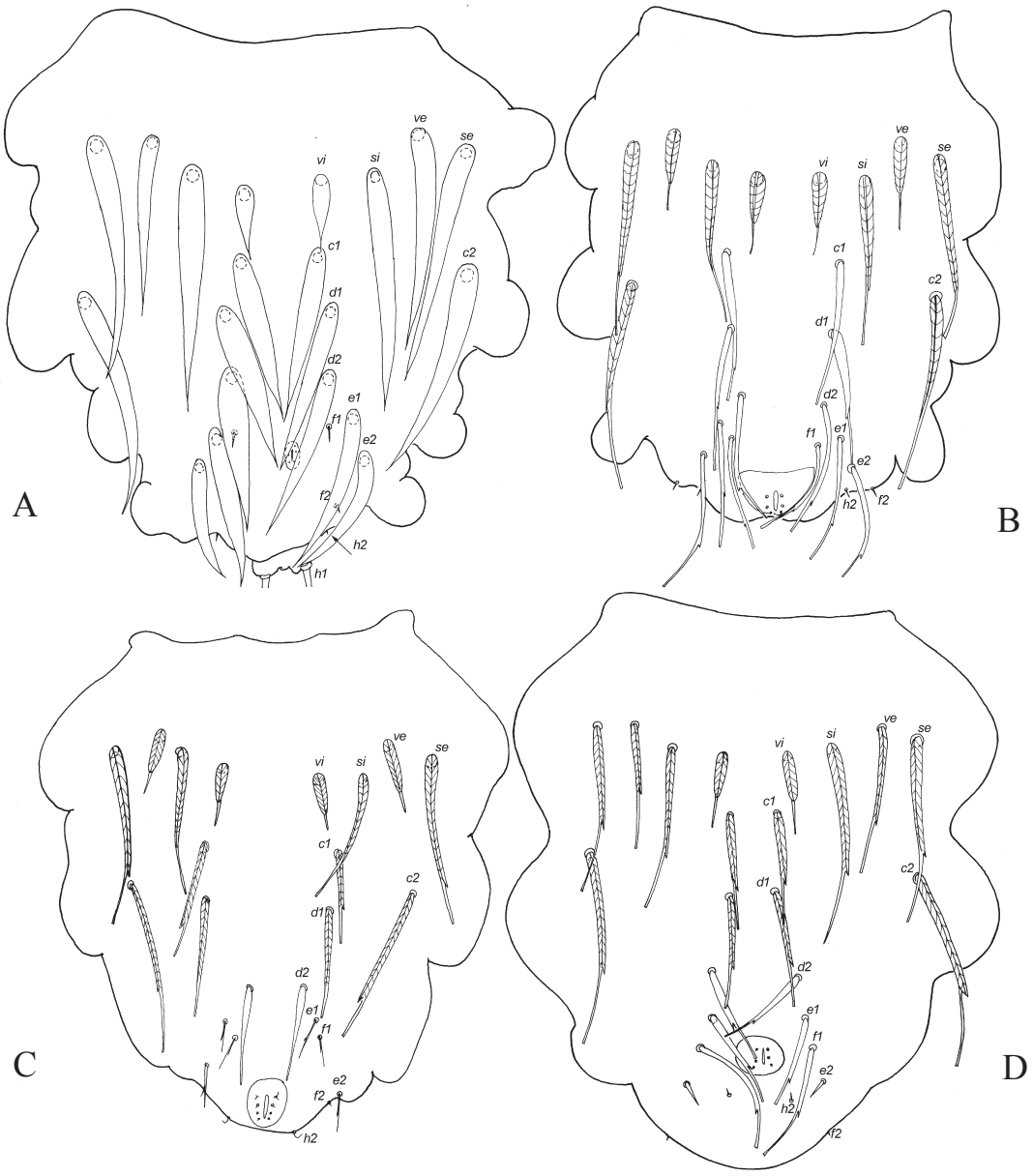


Fig. 9. *Cryptomyobia* spp., tritonymph idiosoma (*allactaga* group) in dorsal view: A — *Cryptomyobia allactodipi* (Bochkov, 1997), B — *Cryptomyobia pygeretmusi* (Bochkov, 1997), C — *Cryptomyobia alactaguli* (Bochkov, 1997), D — *Cryptomyobia paralactaga* (Bochkov, 1997).

whip-like. Apical segment of legs I with ventral hook. Tarsi II–IV with 1 claw each.

Female. Vulvar lobes distinctly developed. Vulvar region not ornamented. Full set of idiosomal setae. Setae *vi* narrow lanceolate not wide than setae *e2*.

Male. Genital shield in shape of short cone bearing 3 pairs of pseudoanal setae; setae *ps1* thickened setiform. Setae *d1* and *d2* present, situated immediately behind genital shield, setae *c1, f2*, and *h2* absent. Seta *si* far distant from *se,* distances *si–se* and *si* – genital shield subequal. Cuticular ornamentation near bases of setae *h1* absent.

Tritonymph. Idiosomal dorsum with 14–16 pairs of setae (in some species, setae *f2* and *h1* microsetae), excluding pseudoanals. Anal opening with 2 pairs of pseudoanal setae or without them. Legs IV fully segmented. Tarsi II–III with 1 claw, tarsi IV with or without claw.

This genus includes 2 subgenera other than the type subgenus: *Angomyobia* Fain, 1973 (2 species) and *Otomyobia* Fain et Bochkov, 2003 (1 species).

Remark. The fauna of the former USSR includes species only of the subgenus.

Hosts. Species of this genus are known exclusively from rodents of the family Muridae.

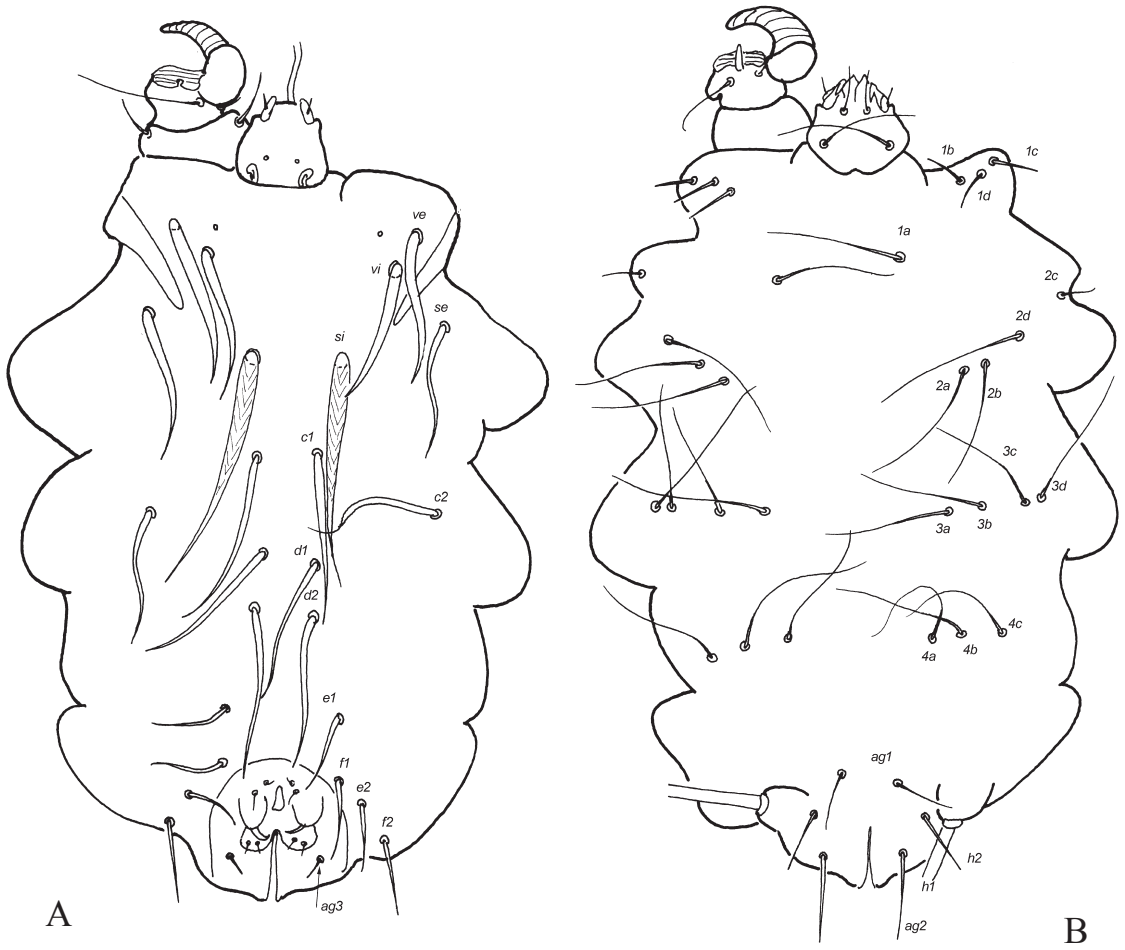


Fig. 10. *Cryptomyobia baranovae* (Bochkov, 1997), female: A — dorsal view, B — ventral view.

Subgenus *Myobia* van Heyden, 1826

Type species: *Pediculus muris-musculi* Schrank, 1781

Diagnosis. Length and width of subcapitulum subequal. Trochanters III and IV with 3 setae each. Genua III with 6 or 5 setae; genua IV with 5 setae.

Female. Setae *e1*, *e2*, and *f1* narrowly lanceolate.

Tritonymph. Pseudoanal setae present.

This subgenus includes 11 species other than the type species, and one species *Myobia stewardi* Radford, 1948 is species inquirenda: *M. multivaga* Poppe, 1808, *M. nodae* Matuzaki, 1965, *M. apodemi* Uchikawa, 1973, *M. kobayashii* Uchikawa et Mizushima, 1975, *M. annae* Haitlinger, 1987, *M. agraria* Gorissen et Lukoschus, 1982, *M. micromydis* Lukoschus et Driessen, 1970, *M. apomys* Uchikawa, OConnor et Klompen, 1991, *M. malaysiensis* Fain, Lukoschus et Nadchatram, 1980, *M. hyatti* Fain, 1973, and *M. afromuris* Fain, 1972.

Remark. The fauna of the former USSR includes seven species of the subgenus *Myobia* (Bochkov 1997b).

Hosts. Species of this subgenus are associated with Old World rodents of the subfamily Murinae. One species of this genus *Myobia murismusculi* is worldwide distributed on *Mus musculus* (Bochkov and Labrzycka 2003).

Key to species of the subgenus *Myobia* van Heyden, 1826 of the former USSR

Females

1. Setae *4a* long, subequal to whip-like setae *2a* and *3a* 2
— Setae *4a* microchaetae, setae *2a* and 3a whip-like ... *M. murismusculi* (Schrank, 1781) (Fig. 12)
2. Setae *1b* longer than *1a* 3
— Setae *1a* subequal or shorter than *1b* 4
3. Setae *vi* about 1.2 times shorter than *ve*. Setae *d4* not exceeding 25 ..... *M. micromydis* Lukoschus et Driessen, 1970
— Setae *vi* about 1.6 shorter than *ve*. Setae *d4* longer 30 ... *M. agraria* Gorissen et Lukoschus, 1982

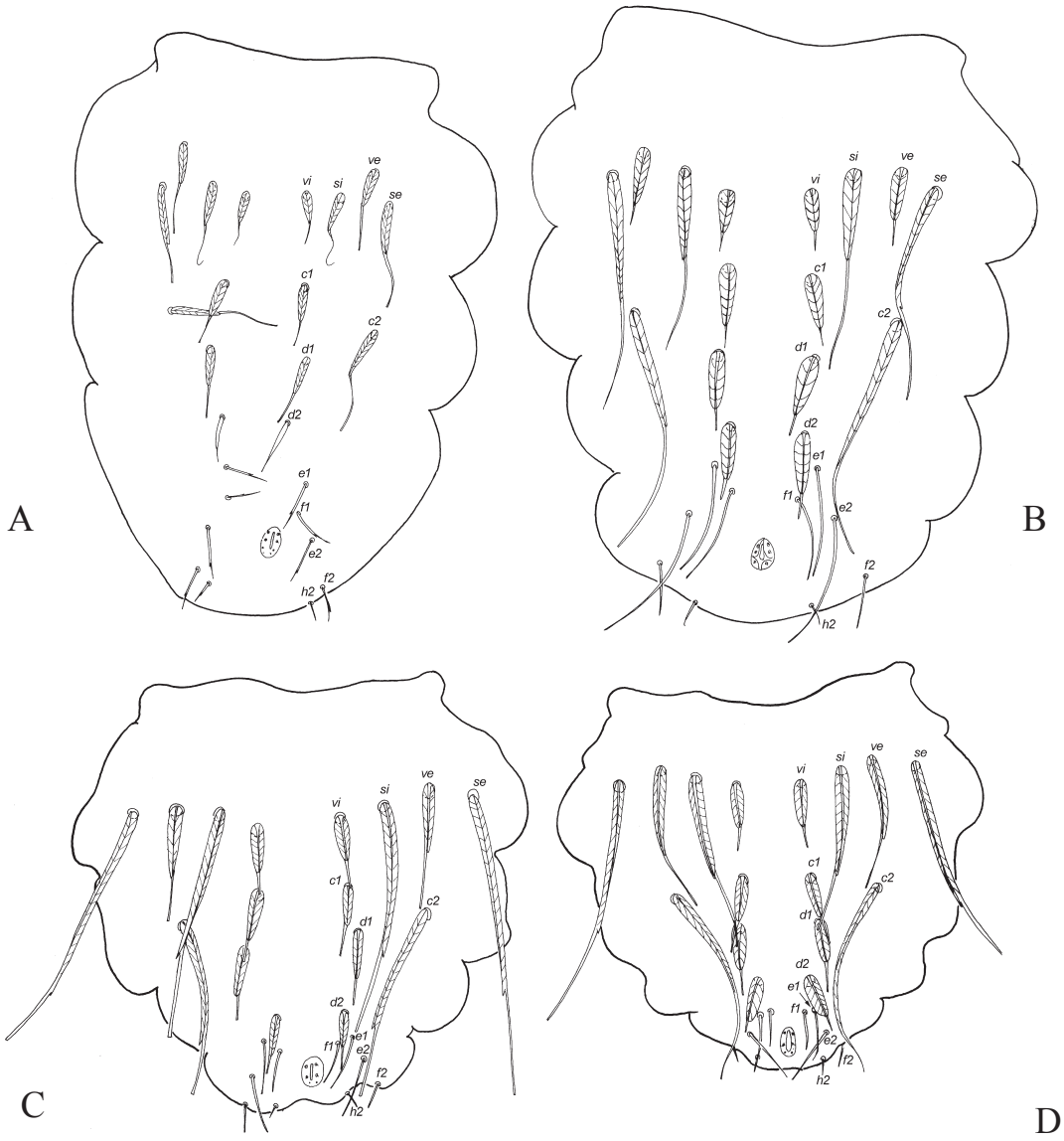


Fig. 11. *Cryptomyobia* spp., tritonymphs idiosoma (dipi group) in dorsal view: A — *Cryptomyobia baranovae* (Bochkov, 1997), B — *Cryptomyobia dipi* (Bochkov, 1997), C — *Cryptomyobia stylodipi* (Bochkov, 1997), D — *Cryptomyobia paradipi* (Bochkov, 1997).

4. Setae *4b* present 5
— Setae *4b* absent ..... *M. annae* Haitlinger, 1987
5. Setae *si* and *se* subequal, with dull apices. Setae *vi* narrower than *si* 6
— Setae *si* slightly shorter than *se*, with tine apices. Setae *vi* and *si* subequal in width ..... *M. kobayashii* Uchikawa et Mizushima, 1975 (Fig. 16)
6. Distances *vi–vi* and *si–si* subequal. Bases of setae *se* situated slightly anterior to bases *si*. Bases of setae *c1* situated at level of legs III insertion .... *M. multivaga* Poppe, 1808
— Distance *vi–vi* slightly shorter than *si–si*. Bases of setae *se* situated slightly posterior to bases *si*. Bases of setae *c1* situated slightly anterior to level of legs III insertion ..... *M. nodae* Matuzaki, 1965 (Fig. 19)

Males

1. Setae *4a* long, subequal to whip-like setae *2a* and *3a* 2
— Setae *4a* microchaetae, setae *2a* and 3a whip-like .. *M. murismusculi* (Schrank, 1781) (Fig. 13)
2. Apex of genital cone situated at level of seta *si* bases or slightly posterior 3
— Apex of genital cone situated distinctly anterior to level of seta *si* bases ..... *M. agraria* Gorissen et Lukoschus, 1982 (Fig. 15C)
3. Setae *ps1* not more than 1.5 times longer than *ps2* 4

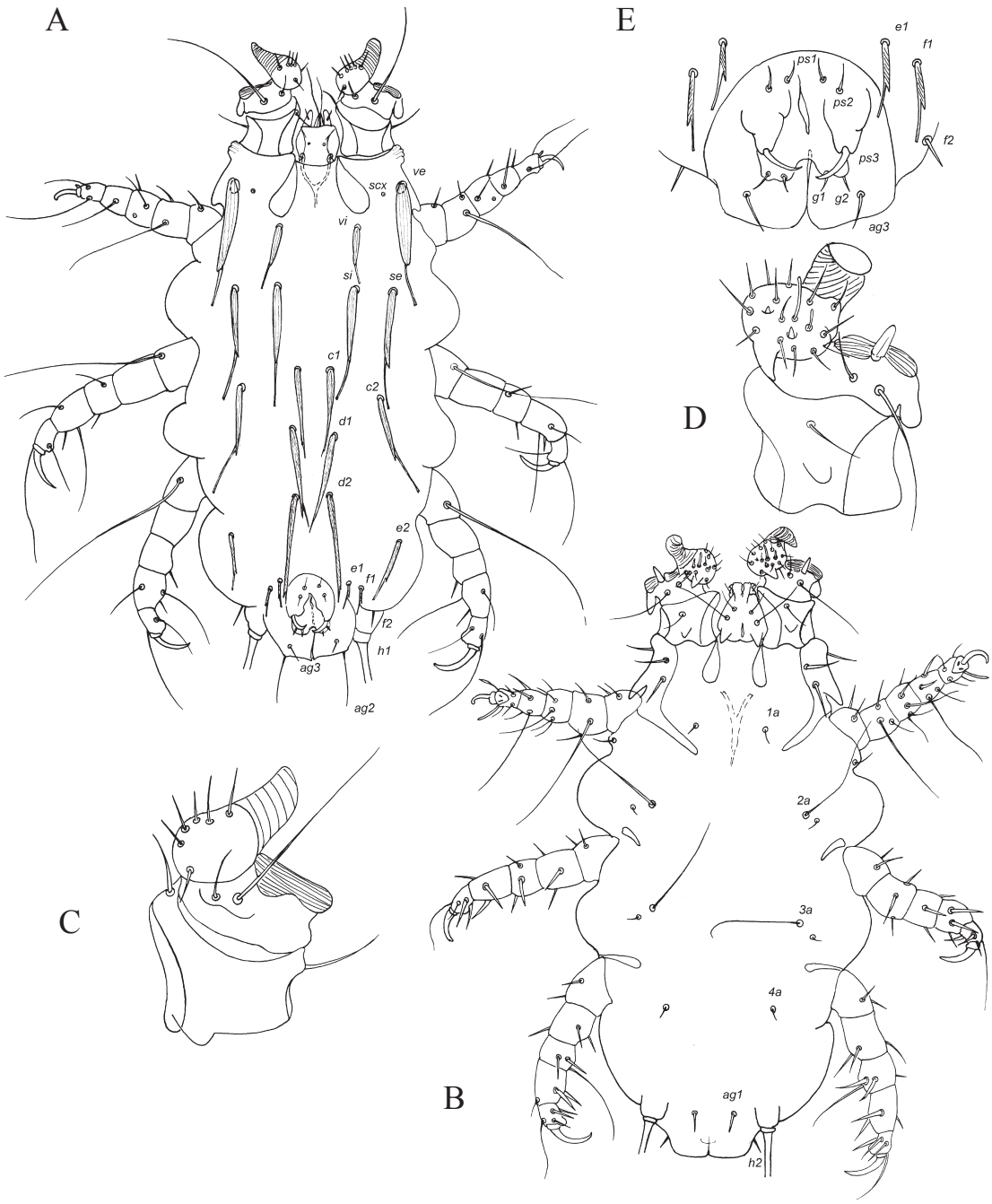


Fig. 12. *Myobia murismusculi* (Schrank, 1781), female: A — dorsal view, B — ventral view, C — leg I — dorsal view, D — same in ventral view, E — vulva.

— Setae *ps1* 2.5 times longer than *ps2* ..... *M. micromydis* Lukoschus et Driessen, 1970 (Fig. 15D)
4. Setae *4b* present 5
— Setae *4b* absent .... *M. annae* Haitlinger, 1987 (Fig. 15B)
5. Setae *d2* 1.2–1.5 longer than *d1*. 6
— Setae *d2* 2 times longer than *d1* ... *M. kobayashii* Uchikawa et Mizushima, 1975 (Fig. 17)
6. Setae *ps2* slightly thickened .... *M. multivaga* Poppe, 1808 (Fig. 15A)
— Setae *ps2* filiform ..... *M. nodae* Matuzaki, 1965 (Fig. 20)

Tritonymphs

1. Setae *c2* 1.1–1.6 times longer than *c1, d1*, and *d2* 2
— Setae *c2* 3–4 times longer than *c1, d1*, and *d2* 5
2. Propodonotal setae only 1.2–1.3 times longer than *c1, d1,* and *d2* 3
— Propodonotal setae about 2 times longer than *c1, d1,* and *d2* ..... *M. annae* Haitlinger, 1987
3. Setae *f2* and *h2* represented almost indistinct microchaetae 4
— Setae *f2* and *h2* distinct, 6–7 long .... *M. micromydis* Lukoschus et Driessen, 1970

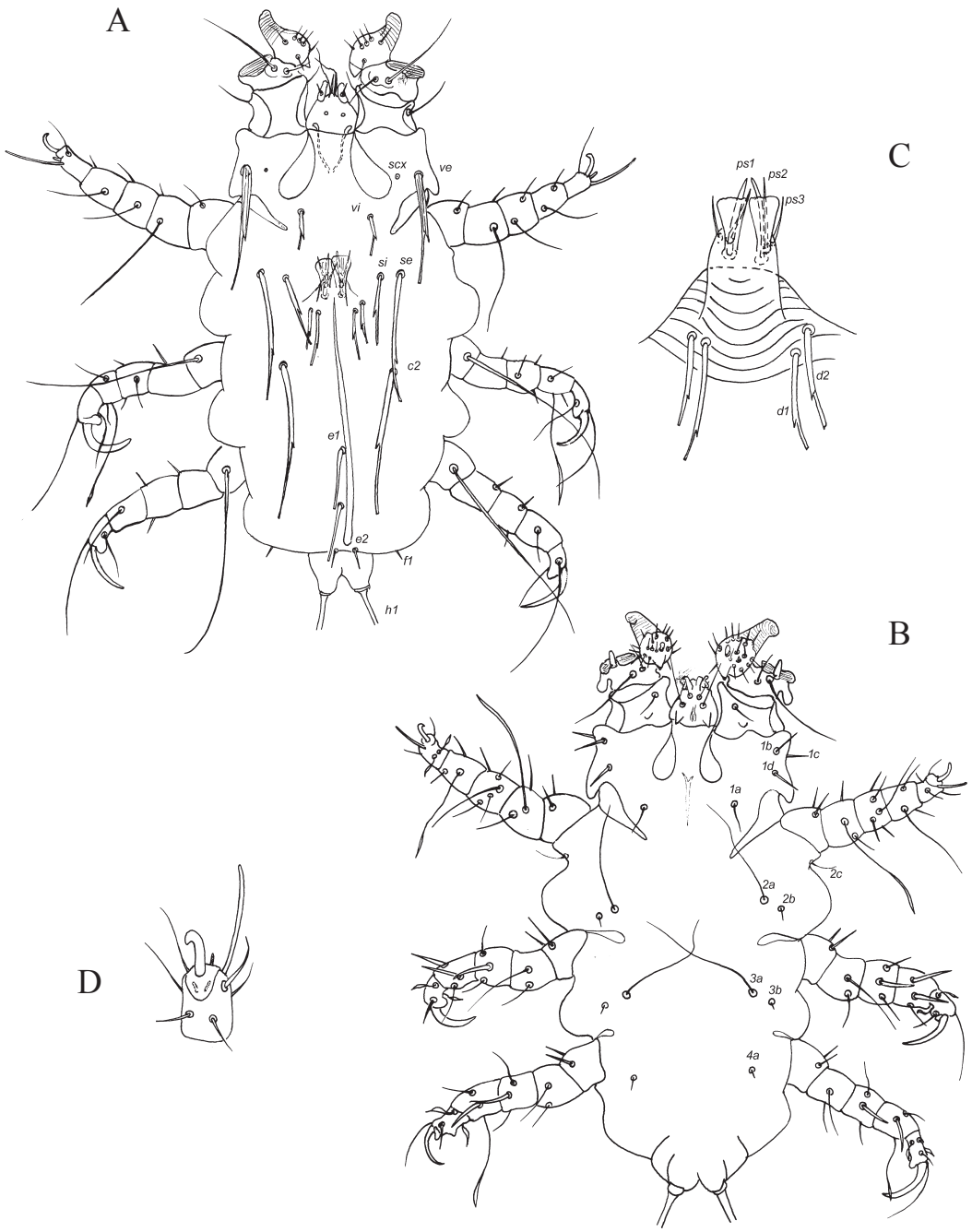


Fig. 13. *Myobia murismusculi* (Schrank, 1781), male: A — dorsal view, B — ventral view, C — genital shield, D — tarsus II in ventral view.

4. All dorsal idiosomal setae shorter than 30. Setae *vi, c1, d1, d2, e1, e2*, and *f1* shorter than other dorsal idiosomal setae, excluding microchaetae *f2* and *h2* ..... *M. agraria* Gorissen et Lukoschus, 1982
— Setae *se* and *c1* longer than 30. Setae *e1* and *f1* distinctly shorter than other dorsal idiosomal setae, excluding microchaetae *f2* and *h2* .... *M. kobayashii* Uchikawa et Mizushima, 1975 (Fig. 18) (Fig. 21)
5. Setae *vi* and *si* subequal 6
— Setae *vi* about 2 times shorter than *si* .... *M. murismusculi* (Schrank, 1781) (Fig. 14)
6. Setae *e2* at least 5 times longer than *e1* .... *M. nodae* Matuzaki, 1965
— Setae *e2* 1.2–1.5 times longer than *e1* .... *M. multivaga* Poppe, 1808

1. *Myobia (Myobia) murismusculi* (Schrank, 1781)

Figs. 12–14

This species was described from *Mus musculus* from Germany (Schrank, 1781).

Hosts and distribution. This species is associated with mice of the genus *Mus* (species

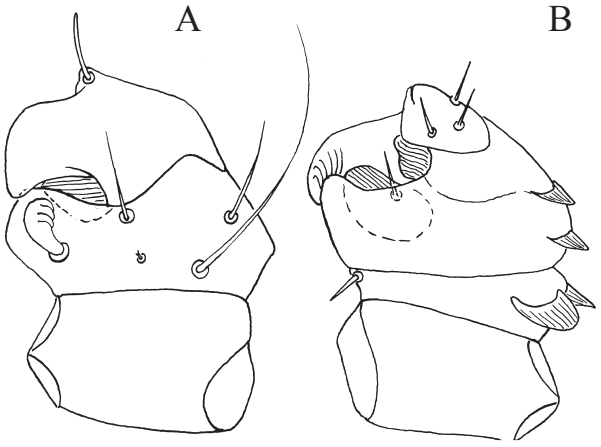


Fig. 14. *Myobia murismusculi* (Schrank, 1781), tritonymph, leg I: A — dorsal view, B — ventral view.

group *musculus*), being worldwide distributed on synanthropic species *Mus musculus* (Bochkov 1997b), and the genus *Apodemus* (subgenus *Sylvaemus*) (Bochkov and Labrzycka 2003). Many hosts of this species determined as *Apodemus sylvaticus*, probably, belong to other closely related species of the subgenus *Sylvaemus*. It was recorded from *Apodemus sylvaticus* from England (Radford 1935), Germany (Poppe 1896), Sweden (Edler 1972 cited after Dubinina and Sosnina 1977), Czech Republic (Rupes 1965 cited after Dubinina and Sosnina 1977), Bulgaria (Beron 1973), Ukraine (Dubinina and Sosnina 1977; Bochkov 1997b), Russia (Pskov Prov.) (Bochkov and Labrzycka 2003); from *Apodemus flavicollis* from Czech Republic (Rupes 1965 cite from Dubinina and Sosnina 1977), Bulgaria (Beron 1973), Russia (Pskov Prov.) (Bochkov 1997b); from *Apodemus uralensis* from Russia (various regions) (Dubinin and Volgin 1955; Bochkov 1997b; Bochkov and Labrzycka 2003); from *Apodemus ponticus* and from *Apodemus witherbyi* from Russia (Krasnodar Territory) (Bochkov and Labrzycka 2003); from *Apodemus pallipes* (new host) from Tadzhikistan (present paper); from *Apodemus* sp. from Khirgizia and Armenia (Bochkov 1997b).

Material examined. *Mus musculus* — 9 females, 2 males, UZBEKISTAN: Tashkent, 18 June 1993, coll. A. Bochkov; 3 females, 6 males, UZBEKISTAN: near Bukhara, ecocentre "Dzheyran", 15 June 1993, coll. A. Bochkov; 7 females, 4 males, UZBEKISTAN: Chimgan, 17 June 1993, coll. A. Bochkov; 15 females, 17 males, 35 tritonymphs, UKRAINE: Crimea, September 1961, coll. E. Sosnina; 5 females, 5 males, UKRAINE: Saint-Petersburg, may 1994, coll. A. Bochkov; 54 females, 10 males, 20 tritonymphs, POLAND: Siemianice, 27 October 2001, coll. A. Labrzycka; 22 females, 4 males, 14 tritonymphs, POLAND: Mosina, 22 October 2001, coll. A. Labrzycka; 8 females, 4 males, FRANCE: Paris, February 1959, coll. J. Gaud; 14 females, 5 males, IRAN: Tehran, May 1997, coll. V. Malikov.

Apodemus uralensis — 10 females, 10 males, 10 tritonymphs, RUSSIA: Novgorod Prov., Oskuy village, July 1999, coll. A. Bochkov.

Apodemus sylvaticus — 10 females, 10 males, 10 tritonymphs, RUSSIA: Pskov Prov., Scbczh Distr., near Aninskoe Lake, May 1991, coll. A. Bochkov.

Apodemus flavicollis — 10 females, 10 males, 10 tritonymphs, UKRAINE: Crimea, August-September 1961, leg. E. Sosnina; 20 females, 20 males, 15 tritonymphs, RUSSIA: Pskov Prov., Sebezh Distr., near Aninskoe Lake, May 1991, coll. A. Bochkov.

Apodemus ponticus — 10 females, 10 males, 5 tritonymphs, RUSSIA: Krasnodar Territory, Black Sea coast, Bol'shoy Utrish village, 13 July 1992, coll. A. Bochkov.

Apodemus witherbyi — 20 females, 5 males, 15 tritonymphs, RUSSIA: Krasnodar Territory, Caucasus Reservation, July 1991, coll. A. Bochkov.

Apodemus pallipes — 1 female, TADZHIKISTAN: Ziddy, 7 July 1953, coll. E. Sosnina.

Apodemus sp. — 8 females, 3 males, KIRGHIZIA: Ala-Archa, 30 May 1985, coll. E. Dol'nik; 10 females, 10 males, KIRGHIZIA: Sary-Chelek, June 1998, coll. A. Stekol'nikov; 1 female, 1 male, ARMENIA: Ekhegnadzor Distr., 24 July 1988, coll. E. Dubinina.

2. *Myobia (Myobia) multivaga* (Poppe, 1909)

Fig. 15A

This species was described from *Mus musculus* from Germany (Poppe in Fahrenholz 1909).

Hosts and distribution. This species parasitizes mice of the genus *Apodemus* (subgenus *Sylvaemus*) (Bochkov and Labrzycka 2003). Poppe (in Fahrenholz 1909) and Radford (1935) reported about records of this species on *Mus musculus* in Germany and England, respectively; Gallego and Portus (1987) collected one specimen on *Mus musculus* in Spain. It is probable what *Mus musculus* is secondary host for this species (Bochkov and Labrzycka 2003). Some hosts of this species determined as *Apodemus sylvaticus*, probably, belong to other closely related species of the subgenus *Sylvaemus*. This species was recorded from *Apodemus sylvaticus* from Eng-

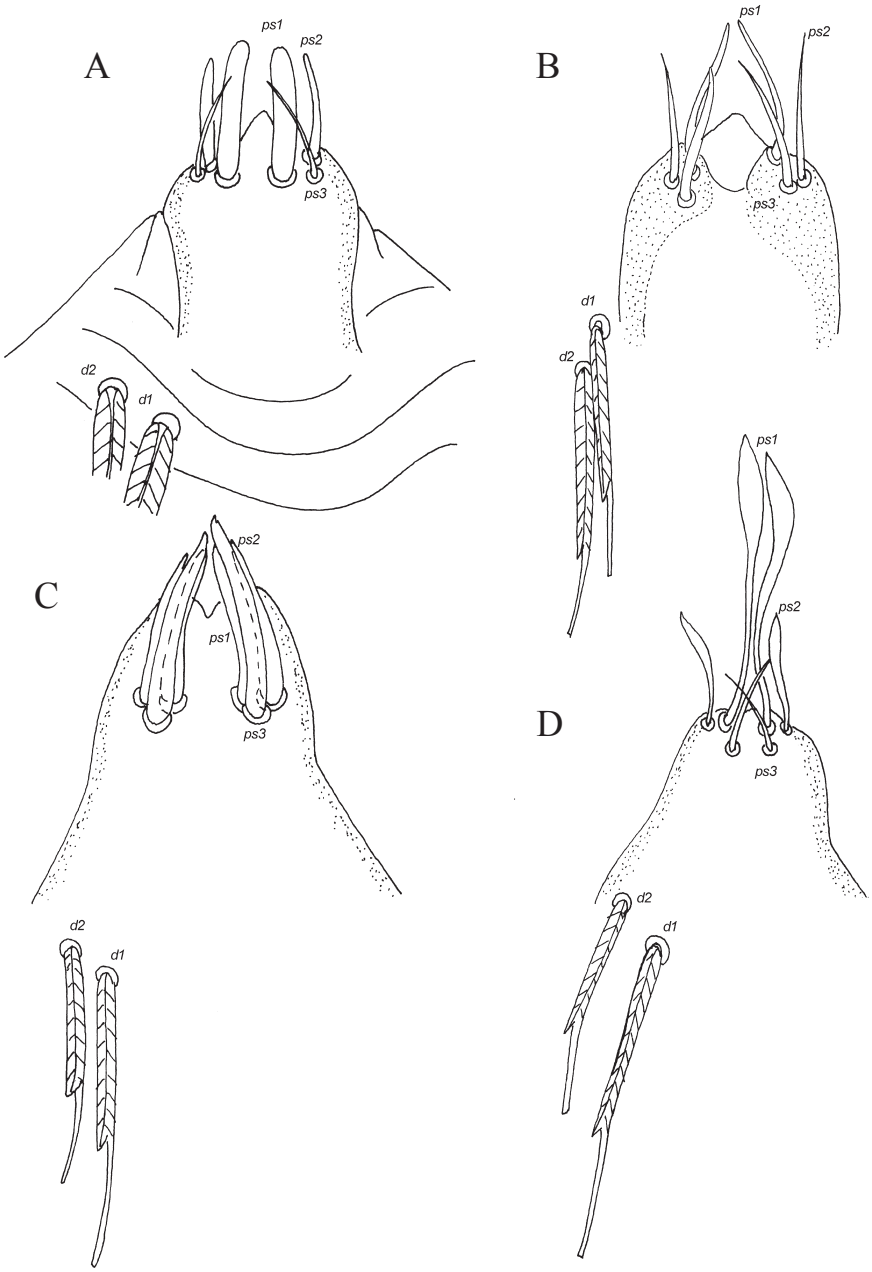


Fig. 15. *Myobia* spp., male genital shield: A — *Myobia murismusculi* (Schrank, 1781), B — *Myobia annae* Haitlinger, 1987, C — *Myobia agraria* Gorissen et Lukoschus, 1982, D — *Myobia micromydis* Lukoschus et Driessen, 1970.

land (Radford 1935), Spain (Gallego and Portus 1987), Italy, Switzerland, Holland, Belgium (Fain and Lukoschus 1977), Germany (Fahrenholz 1909), Czech Republic (Kratochvil and Rosicky 1953 cited after Dubinina and Sosnina 1977), Poland (Haitlinger 1988), Bulgaria (Beron 1973), Ukraine (Sklyar 1975; Dubinina and Sosnina 1977); from *Apodemus flavicollis* from Ukraine (Dubinina and Sosnina 1977; Bochkov 1977); from *Apodemus uralensis* from Russia (Novgorod Prov.), from *Apodemus ponticus* and *Apodemus witherbyi* from Russia (Krasnodar Territory) (Bochkov and Labrzycka 2003); from *Apodemus pallipes* from Tadzhikistan (present paper); from *Apodemus* sp. from Uzbekistan and Kirghizia (Bochkov 1997b; Chirov et al. 1997).

Material examined. *Apodemus uralensis* — 10 females, 10 males, 10 tritonymphs, RUSSIA: Novgorod Prov., Oskuy village, July 1999, coll. A. Bochkov.

Apodemus sylvaticus — 10 females, 10 males, UKRAINE: Crimea, September 1961, coll. E. Sosnina; 5 females, 5 males, RUSSIA: Pskov Prov., Sebezh Distr., Aninskoe Lake, May 1991, coll. A. Bochkov.

Apodemus flavicollis — 5 females, 5 males, RUSSIA: Volga-Kama Reservation, others data unknown; 16 females, 3 males, UKRAINE: Za-

karpatie Prov., May-June 1959, coll. S. Vysotskaya; 10 females, 10 males, 10 tritonymphs, UKRAINE: Crimea, September 1961, leg. E. Sosnina.

Apodemus ponticus — 20 females, 5 males, 10 tritonymphs, RUSSIA: Krasnodar Territory, Black Sea coast, Bol'shoy Utrish village, July 1992, coll. A. Bochkov.

Apodemus witherbyi — *5* females, 5 males, RUSSIA: Krasnodar Territory, Caucasus Reservation, July 1991, coll. A. Bochkov.

Apodemus pallipes — 4 females, TADZHIKISTAN: Ziddy, 25 July 1953, coll. E. Sosnina; 5 females, 2 males, 10 tritonymphs, TADZHIKISTAN: Sary-Khosor, Khozratisho Tract, 20 May 1967, coll. P. Strelkov.

Apodemus sp. — 2 females, 3 males; KAZAKHSTAN: other data unknown; 1 female, UZBEKISTAN: Bukhara, 15 July 1993, coll. A. Bochkov; 11 females, 3 males, KIRGHIZIA: Ala-Archa, 30 May 1985, coll. E. Dol'nik.

3. *Myobia (Myobia) annae* Haitlinger, 1987

Fig. 15B

This species was described from *Apodemus mystacinus* from Greece (Haitlinger 1987).

Hosts and distribution. This species is known only from the type host from Greece (Haitlinger 1987) and Georgia (Bochkov 1997b).

Material examined. 4 females, 5 males, 2 tritonymphs, GEORGIA: Adzharia, Merisi village, 13 August 1982, coll. A. Aristov.

4. *Myobia (Myobia) agraria* Gorissen et Lukoschus, 1982

Fig. 15C

This species was described from *Apodemus agrarius* from Poland and Germany (Gorissen and Lukoschus 1982).

Hosts and distribution. This species is known only from the type host from Germany and Poland (Gorissen and Lukoschus 1982), Ukraine, Russia, and Kirghizia (Bochkov 1997b; Chirov et al. 1997).

Material examined. *Apodemus agrarius* — 3 female, 1 male, 1 tritonymph paratypes (ZISP), POLAND: Bialowieza, 22 November 1974, coll. F. Lukoschus; 18 females, 1 male, UKRAINE: Kiev, Teremki, 8 August 1957, coll. G. Gushcha; 1 female, RUSSIA: Vologda Prov., 23 March 1957, coll. unknown; 10 females, 10 males, 10 tritonymphs, RUSSIA: Pskov Prov., Sebezh Distr., Aninskoe Lake, 14 June 1991, coll. A. Bochkov; 23 females, RUSSIA: Chelyabinsk Prov., Shugunyak Lake, 17 June 1975, coll. E. Dubinina; 1 female, 1 male, RUSSIA: Khabarovsk Prov., 11 June 1952, coll. M. Paulkina; 1 female, 1 male, RUSSIA: Krasnodar Territory, Maykop, 29 July 1991, coll. A. Bochkov; 1 female, KIRGHIZIA: Tokmak, 22 August 1973, coll. E. Dubinina.

5. *Myobia (Myobia) micromydis* Lukoschus et Driessen, 1982

Fig. 15D

This species was described from *Micromys minutus* from Holland (Lukoschus and Driessen 1970).

Hosts and distribution. This species is known only from the type host from England (Radford 1936) and Germany (Fahrenholz 1909) — determined as *M. multivaga*, Austria and Holland (Lukoschus and Driessen 1970), Belgium (Fain and Lukoschus 1977), Poland (Haitlinger 1988), Belorussia (Bochkov and Labrzycka 2003), Russia (Karelia and Chelyabinsk Prov.) (Bochkov 1997b).

Material examined. *Microtus minutus* —1 female, 1 male paratypes (ZISP), HOLLAND: Nijmegen, 15 September 1964, coll. F. Lukoschus; 8 females, 2 males, 2 tritonymphs, BELORUSSIA: Bobruysk Prov., Yazin' village, 10 July 1910, coll. Mordvilko;1 female, RUSSIA: Karelia, Sel'ga, 8 October 1955, coll. Al'bova; 4 females, RUSSIA: Chelyabinsk Prov., Shugunyak Lake, 17 June 1975, coll. E. Dubinina.

6. *Myobia (Myobia) kobayashii* Uchikawa et Mizushima, 1977

Figs. 16–18

This species was described from *Apodemus peninsulae* from Japon (Uchikawa and Mizushima 1975).

Hosts and distribution. This species is known only from the type host from Japan, South Korea (Uchikawa and Mizushima 1975; Uchikawa et al. 1988) and Russia (Amur Prov.) (Bochkov 1997b).

Material examined. *Apodemus peninsulae* — 2 females, RUSSIA: Amur Prov., Korsakov stanitsa, 2 July 1959, coll. Serdyukova; 2 females, 3 males, 6 tritonymphs, RUSSIA: Krasnoyarsk Territory, Sayany, Kazyr-Sun River, 1918, coll. Balashov; 6 females, 5 males, 8 tritonymphs, RUSSIA: Krasnoyarsk Territory, Usinsky highway (along Us River), Kulumys station, 13 July 1940, coll. Serdyukova; 3 females, 1 male, 15 tritonymphs, RUSSIA: Buryatia, Kyakhtinskiy Distr., 1995, coll. Khabaeva; 1 male, 10

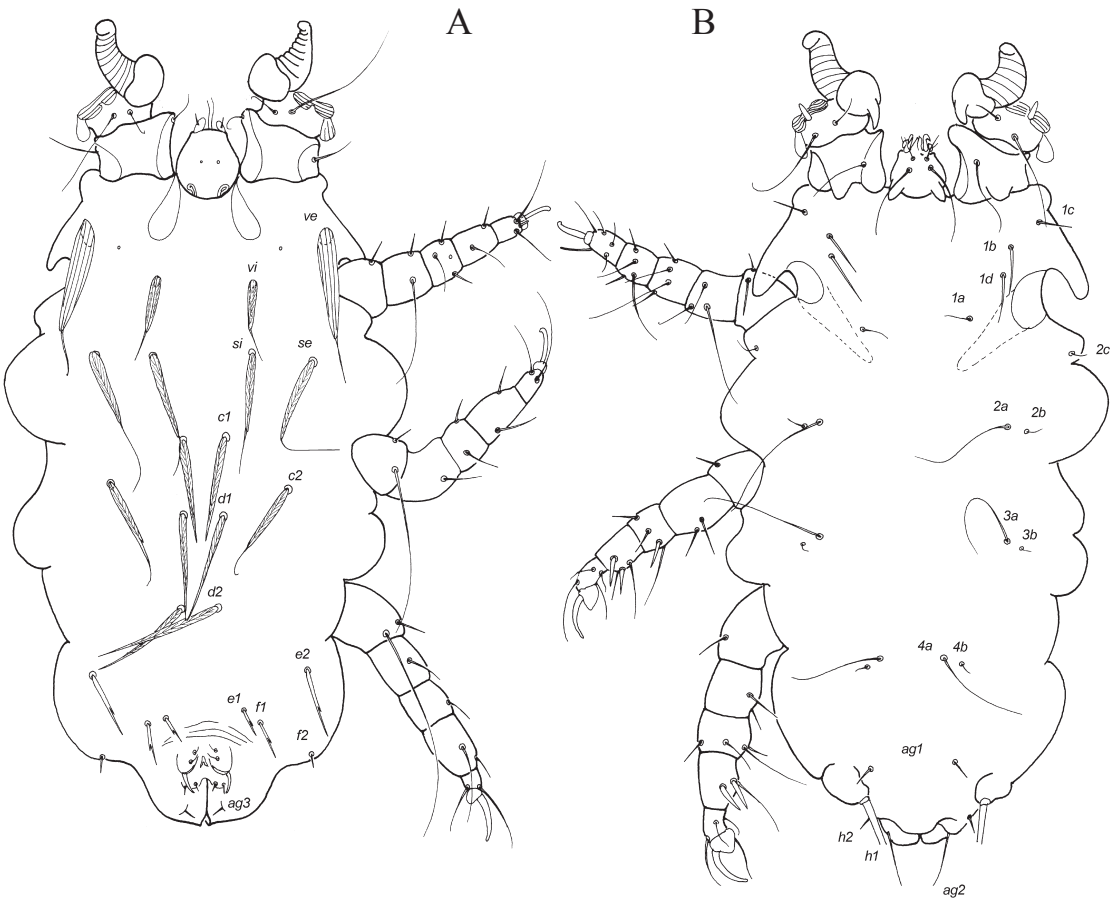


Fig. 16. *Myobia kobayashii* Uchikawa et Mizushima, 1977, female: A — dorsal view, B — ventral view.

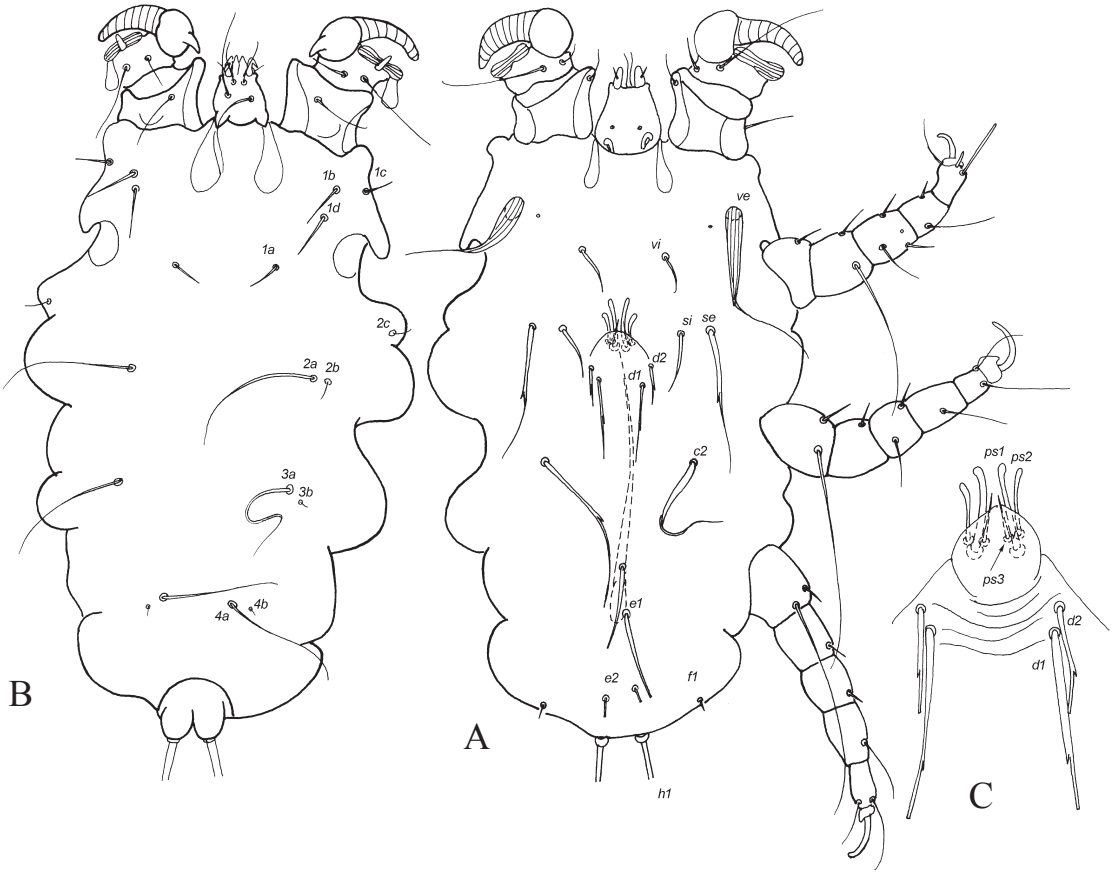


Fig. 17. *Myobia kobayashii* Uchikawa et Mizushima, 1977, male: A — dorsal view, B — ventral view, C — genital shield.

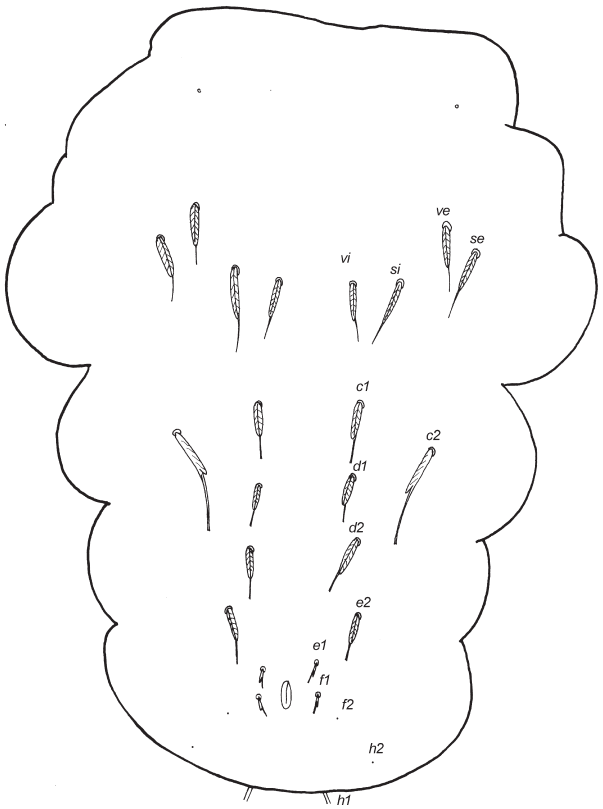


Fig. 18. *Myobia kobayashii* Uchikawa et Mizushima, 1977, tritonymph idiosoma in dorsal view.

tritonymphs, RUSSIA: Altay, Teletskoye Lake, 1910, coll. Ignatov; 4 females, 1 male, 1 tritonymph, RUSSIA: Buryatia, Selenga Distr., West bank of Gusinoe Lake, 4 km West Murtoy station, 19–20 August 1998, coll. A. Abramov; 1 female, 5 tritonymphs, RUSSIA: Gorno-Altay Autonomic Prov., Artybash village, 15 August 1984, coll. M. Zaitzev.

7. *Myobia (Myobia) nodae* Matuzaki, 1965

Figs. 19–21

This species was described from *Apodemus speciosus* from Japan (Matuzaki 1965).

Hosts and distribution. This species is known only from the type host from Japan (Matuzaki 1965; Ono 1969; Uchikawa 1973; Uchikawa et al. 1988) and Russia (Kunashir Island) (Bochkov 1997b).

Material examined. *Apodemus speciosus* — 3 females, 1 male, RUSSIA: Kunashir Island, 1985, coll. M. Pavlenko; 2 females, 4 males, 10 tritonymphs, RUSSIA: Kunashir Island, near Otradnoe village, 7 October 1980, coll. M. Pavlenko; 1 female, 1 male, RUSSIA: Kunashir Island, vicinity of Yuzhno-Kuril'sk, 3 August 1985, coll. A. Aristov.

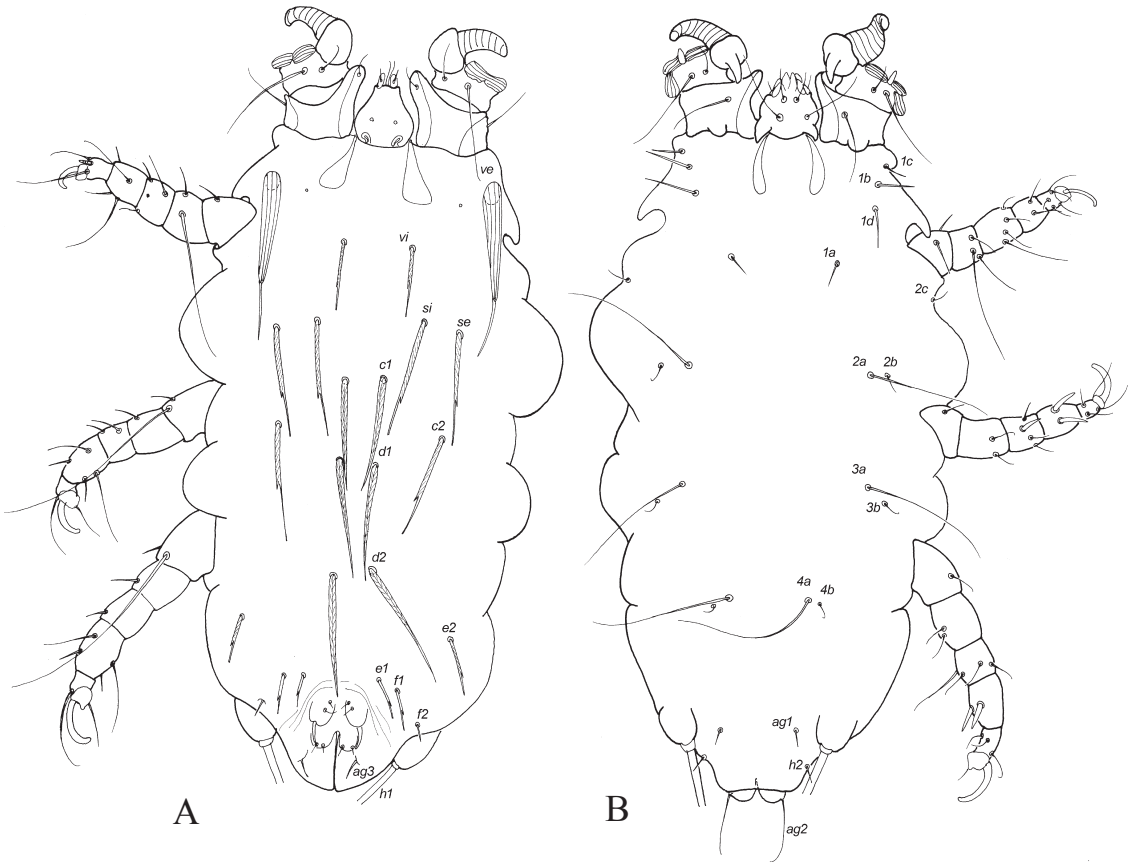


Fig. 19. *Myobia nodae* Matuzaki, 1965, female: A — dorsal view, B — ventral view.

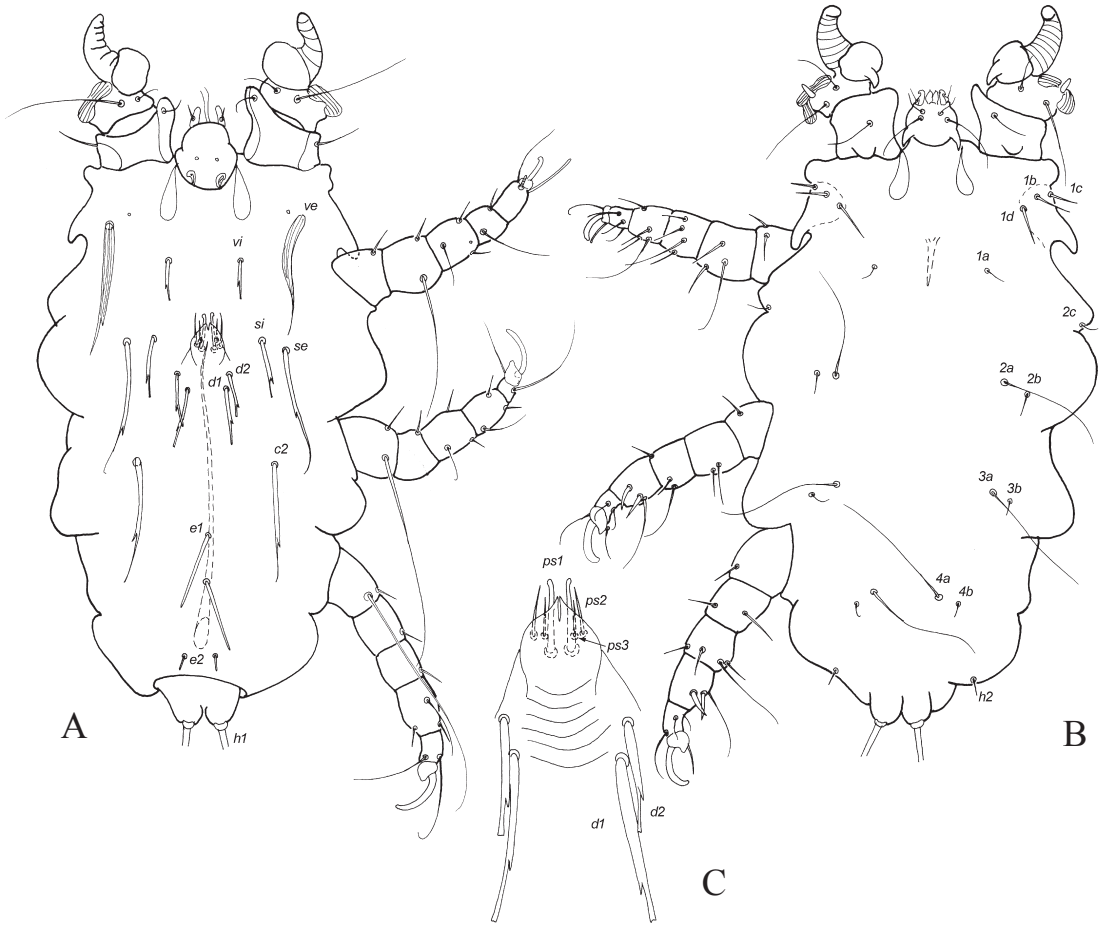


Fig. 20. *Myobia nodae* Matuzaki, 1965, male: A — dorsal view, B — ventral view, C — genital shield.

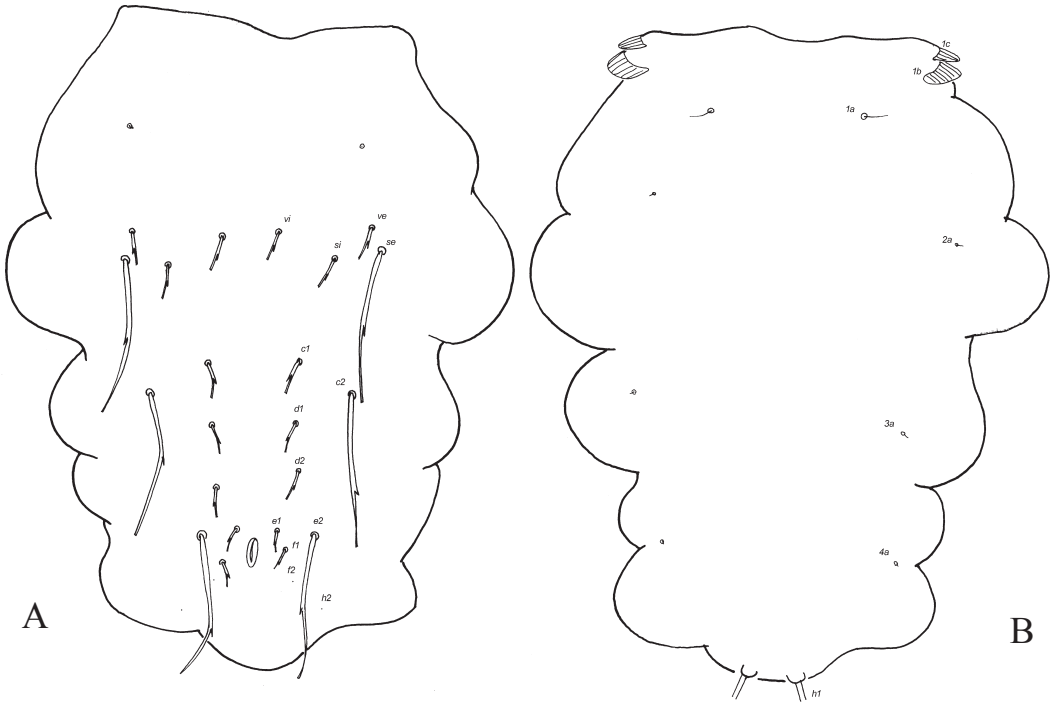


Fig. 21. *Myobia nodae* Matuzaki, 1965, tritomymph idiosoma: A — dorsal view, B — ventral view.

Genus *Radfordia* Ewing, 1938

Type species: *Myobia ensifera* Poppe, 1896

Diagnosis. Gnathosoma shorter than legs I. Subcapitulum ventrally with or without pair of retrorse projections. Apical segment of legs I with or without ventral spur. Setation of legs II–IV: coxae 3–0–0 (or 1), trochanters 3–3 (or 2)–3 (or 2), femora 5–3–3, genua 7 + 1 solenidion–6–5 (or 6), tibiae 6–6–6, tarsi 7+1 solenidion–6 (or 5)–6 (or 5). Setae *d* of trochanters III and IV (if present), with few exceptions whip-like. Tarsi II with 2 claws, tarsi III and IV with 1 claw each.

Female. Setae *vi* narrow or wide lanceolate, in some species thickened filiform. Vulva with pair of distinctly developed lobes. Setae *ps3* claw like. Full set of idiosomal setae, in some species setae *h2* and *e2* absent.

Male. Genital shield cone-shape (genital cone) (in subgenera *Acomyobia* and *Petromyscobia*, it rounded in outline), bearing 3–2 pairs of pseudoanal setae. Setae *d1* and *d2* present (or only *d1* present) and situated immediately behind genital shield. Other hysteronotal setae: *c2*, *e1*, *e2*, and *h1* (in *Acomyobia*, *c1* present).

Tritonymph. Idiosoma maximally bearing 14 pairs of setae, excluding pseudoanals. In some subgenera, pseudoanal setae (*ps1* and *ps2*) and setae *f2*, and *h2* absent. Legs I symmetrical to each other. Tarsi II and III with claw, tarsi IV with or without claw.

This genus is, probably, not monophyletic and includes seven subgenera other than the type subgenus: *Rattimyobia* Fain, Lukoschus et Nadchatram, 1980, *Graphiurobia* Fain, 1972, *Microtimyobia* Fain et Lukoschus, 1976, *Hesperomyobia* Bochkov, 1996, *Petromyscobia* Bochkov et Fain, 2003, *Acomyobia* Bochkov et Fain, 2003, *Lophurmyobia* Fain, 1973, species group *subuliger* incertae sedis within the genus *Radfordia*, and two species inquirenda, *R. floridensis* Ewing, 1938 and *Radforida sicula* Willmann, 1955.

Remark. In the fauna of the former USSR, the three subgenera, *Radfordia*, *Graphiurobia*, and *Microtimyobia* are recorded.

Hosts. Species of this genus are known from four rodent families, i.e. Cricetidae, Muridae, Nesomyidae, and Gliridae.

Key to subgenera of the genus *Radfordia* of the fauna of the former USSR

1. Subcapitulum without ventro-basal retrorse projections (in *R. (G.). glis*, pair of ventro-lateral projections of subcapitulum present). In females, setae *vi* and *e2* wide lanceolate. In males, setae *ps1* finger-like. Setae *d2* absent. Distance *se–si* much shorter than *si* – genital shield. Apical segment of legs I without projection 2
— Subcapitulum with pair of vento-basal retrorse projections. In females, setae *vi* and *e2* narrowly lanceolate or thickened filiform. In males, setae *ps1* in different shape, but not finger-like. Setae *d2* present. Distances *se–si* and *si* – genital shield subequal. Apical segment of legs I with projection ..... *Radfordia* Ewing, 1938
2. Subcapitular setae *n* membranous. Setae *1b, 1c,* and *1d* strongly thickened. In females, vulvar region ornamented. In males, setae *ps3* absent ..... *Microtimyobia* Fain et Lukoschus, 1976
— Subcapitular setae *n* filiform. Setae *1b, 1c,* and *1d* not thickened. In females, vulvar region without ornamentation. In males, setae *ps3* present .... *Graphiurobia* Fain, 1972

Subgenus *Radfordia* Ewing, 1938

Type species: *Myobia ensifera* Poppe, 1896

Diagnosis. Subcapitulum with pair of retrorse basal projections ventrally. Subcapitular setae *n* filiform. Setation of legs II–IV: coxae 3–2 (or 1)–2 (or 1), trochanters 3–3 (or 2)–3 (or 2), femora 5–3–3, genua 7+ 1 solenidion–6–5, tibiae 6–6–6, tarsi 7+1 solenidion–6–6. Coxal setae *1b*, *1c*, and *1d* not thickened. Dorsal seta of trochanters III–IV whip-like (absent in species from Australian Muridae or short in species of subgroup *praomys*). Apical segment of legs I with ventral hook.

Female. Vulvar lobes distinctly developed. Vulvar region not ornamented. Full set of idiosomal setae, excluding *h2* absent in some species. Setae *vi* narrow lanceolate or thickened filiform not wide than setae *e2*.

Male. Genital shield in shape of short cone bearing 3 pairs of pseudoanal setae; setae *ps1* setiform. Setae *d1* and *d2* present, situated immediately behind genital shield, setae *c1, f2*, and *h1* absent. Seta *si* far distant from *se,* distances *si–se* and *si* – genital shield subequal. Cuticular ornamentation near bases of setae *h1* absent.

Tritonymph. Idiosomal dorsum with 8–14 pairs of setae, excluding pseudoanals. Iin some species, setae *f2* and *h1*, more rarely *d2*, *e1*, *e2*, and *f2*, absent. Anal opening without setae or with setal alveoli. Legs IV in different shape, sometimes weakly developed, with completely or partially fused apical segments. Tarsi II–III with 1 claw, tarsi 1V with or without claw.

This subgenus includes 39 species other than the type species: *R. davisi* (Radford, 1938), *R. hornerae* (Domrow, 1963), *R. jalorensis* Fain, Lukoschus et Nadchatram, 1980, *R. expansa* Jameson et Whitaker, 1975, *R. australiana* Fain et Lukoschus, 1979, *R. niviventris* Bochkov et Fain, 1997, *R. berylmysi* Bochkov et Fain, 1997, *R. lukoschusi* Bochkov et Fain, 1997, *R. pogonomys* Fain et Lukoschus, 1976, *R. chiropodomys* Fain, 1974, *R. angolensis* Fain, 1972, *R. aethomys* Curfs et al., 1986, *R. thamnomys* Fain, 1972, *R. grammomys* Fain, 1972, *R. eburneensis* Fain, 1972, *R. malacomys* Fain, 1972, *R. hystricosa* Fain, 1972, *R. elengatula* Zumpt et Coffee, 1971, *R. lancearia* (Poppe, 1909), *R. mironovi* Bochkov, 1997, *R. affinis* (Poppe, 1896), *R. praomys* Zumpt et Coffee, 1971, *R. daltoni* Scheperboer et al., 1987, *R. delectori* Bochkov et Fain, 2003, *R. colomys* Bochkov et Fain, 2003, *R. myomysci* Bochkov et Fain, 2003, *R. dephomys* Bochkov et Fain, 2003, *R. hylomyscus* Fain, 1972, *R. zelotomys* Fain, 1976, and *R. bukokoensis* Fain et Lukoschus, 1976, *Radfordia syconycteris* Fain, 1973, *Radfordia fanningi* Domrow, 1963, *Radfordia pseudomys* Fain, 1974, *Radfordia mastacomys* Fain et Lukoschus, 1979, *Radfordia notomys* Fain et Lukoschus, 1979, *Radfordia zyzomys* Fain et Lukoschus, 1979, *Radfordia latior* Fain et Lukoschus, 1979, *Radfordia vesca* Fain et Lukoschus, 1979, and *Radfordia hydromys* Fain, 1991.

Remark. This subgenus includes now two species groups, *ensifera* (28 species) and *lancearia* (12 species). In the fauna of the former USSR, four species belonging to both groups were recorded (Bochkov 1997b).

Hosts. Species of this genus are associated with Old World rodents of the subfamily Murinae (Muridae). Some species parasitizing synanthropic rodents, *Radfordia ensifera* from *Rattus norvegicus* and *Rattus rattus*, and *Radfordia affinis* from *Mus musculus* are cosmopolites (Bochkov and Fain 2003).

Key to species of the subgenus *Radfordia* Ewing, 1938 of the former USSR

Females

1. Coxae III with 2 setae, *3a* and *3b* .... *R. ensifera* (Poppe, 1896) (Figs. 22–24)
— Coxae III with 1 seta, *3a* 2
2. Setae *c1*, *d1*, and *d2* foliate, about 3 times wider than setae *se* 3
— Setae *c1*, *d1*, and *d2* narrow lanceolate, not significantly wide than *se*. Setae *h2* absent ....*R. affinis* (Poppe, 1896) (Fig. 31)
3. Setae *c1*, *d1*, and *d2* 20–25 wide. Setae *c2* about 1.3 times shorter than *c1* .... *R. mironovi* Bochkov, 1997 (Fig. 30)
— Setae *c1*, *d1*, and *d2* 14–18 wide. Setae *c1* and *c2* subequal .... *R. lancearia* (Poppe, 1909) (Fig. 27)

Males

1. Coxae III with 2 setae, *3a* and *3b*. Setae *4a* thickened, longer than other coxal setae .... *R. ensifera* (Poppe, 1896) (Fig. 25)
— Coxae III with 1 seta, *3a*. Setae *4a* not thickened, whip-like or short 2
2. Distance *e1–e1* 1.8–2 times shorter than *e2–e2*. Setae *4a* whip-like, much longer than *4b* 3
— Distance *e1–e1* about 3 times shorter than *e2–e2*. Setae *4a* short, subequal to *4b* ....*R. affinis* (Poppe, 1896) (Fig. 32)
3. Setae *3a* short, subequal to *2a* .... *R. mironovi* Bochkov, 1997
— Setae *3a* whip-like, much longer than *2a* .... *R. lancearia* (Poppe, 1909) (Fig. 28)

Tritonymphs

1. Setae *e1*, *e2*, and *f2* foliate ....*R. ensifera* (Poppe, 1896) (Fig. 26)
— Setae *e1*, *e2*, and *f2* not foliate 2
2. Legs IV with distinct spur ....*R. affinis* (Poppe, 1896) (Fig. 33)
— Legs IV without spur ..... *R. lancearia* (Poppe, 1909) (Fig. 29) and *R. mironovi* Bochkov, 1997

Species group *ensifera*

Coxal I–IV setation 4–3–2–2. Species subgroup *ensifera*: in females, setae *2a, 3a,* and *4a* short, *dl, d2* and *12* widely lanceolate, seta *d1* bases 2 times close to *d2* than to *c1* bases. Setae *e2* short, mostly hair-like. In tritonymphs, setae *f2* and *h2* absent.

1. *Radfordia (Radfordia) ensifera* (Poppe, 1896)

Figs. 22–26

This species was described from *Rattus norvegicus* from Germany (Poppe 1896).

Hosts and distribution. This species is associated with rats of the genus *Rattus*. It is worldwide distributed on synanthropic species *Rattus norvegicus* and *Rattus rattus* (Bochkov 1997b). It is also recorded on *Rattus pyctoris* from Turkmenia (Bochkov 1997b) and from *Rattus tiomanicus* (Miller, 1900) and *Rattus tanezumi* (Temminck, 1844) from Malaysia (Fain et al. 1980).

Material examined. *Rattus norvegicus* — 33 females, 2 males, UKRAINE: Crimea, Odessa Prov., Belyaevka, 6 June 1984, coll. G. Gushcha; 8

Fig. 22. *Radfordia ensifera* (Poppe, 1896), female: A — dorsal view, B — ventral view.

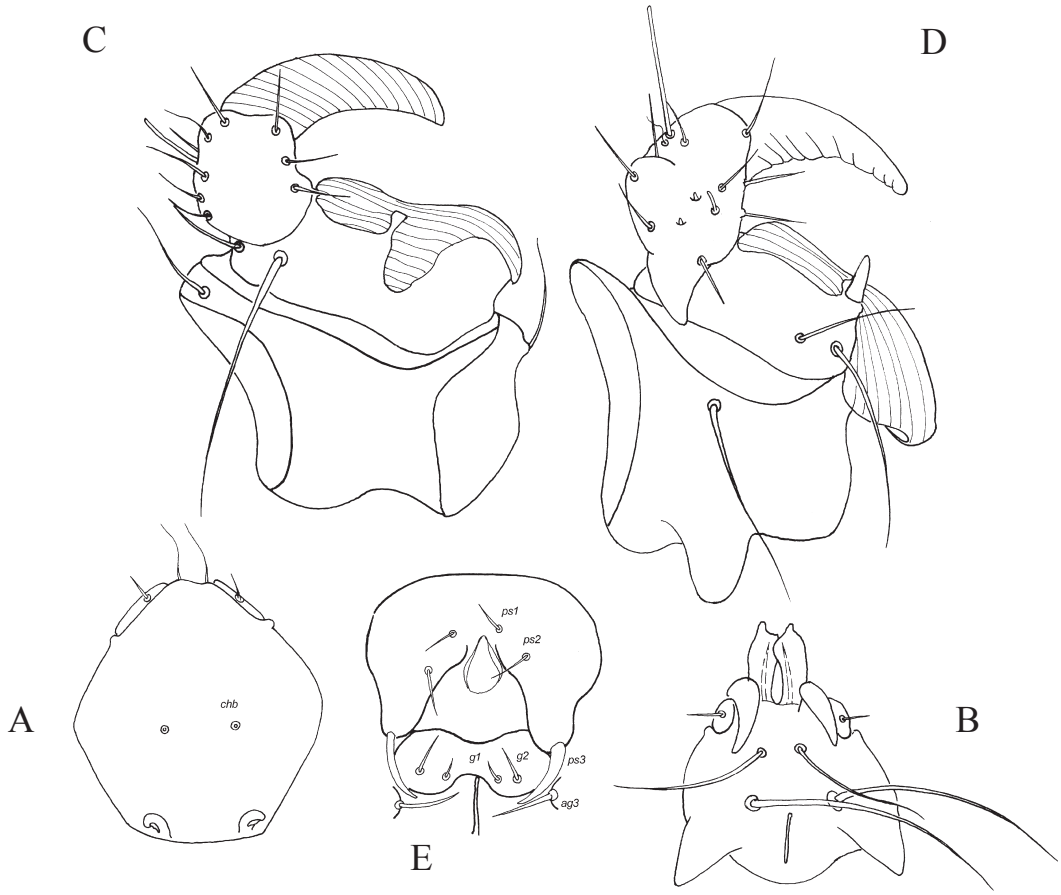


Fig. 23. *Radfordia ensifera* (Poppe, 1896), details of female: A — gnathosoma in dorsal view, B — same in ventral view, C — leg I in dorsal view, D — same in ventral view, E — vulva.

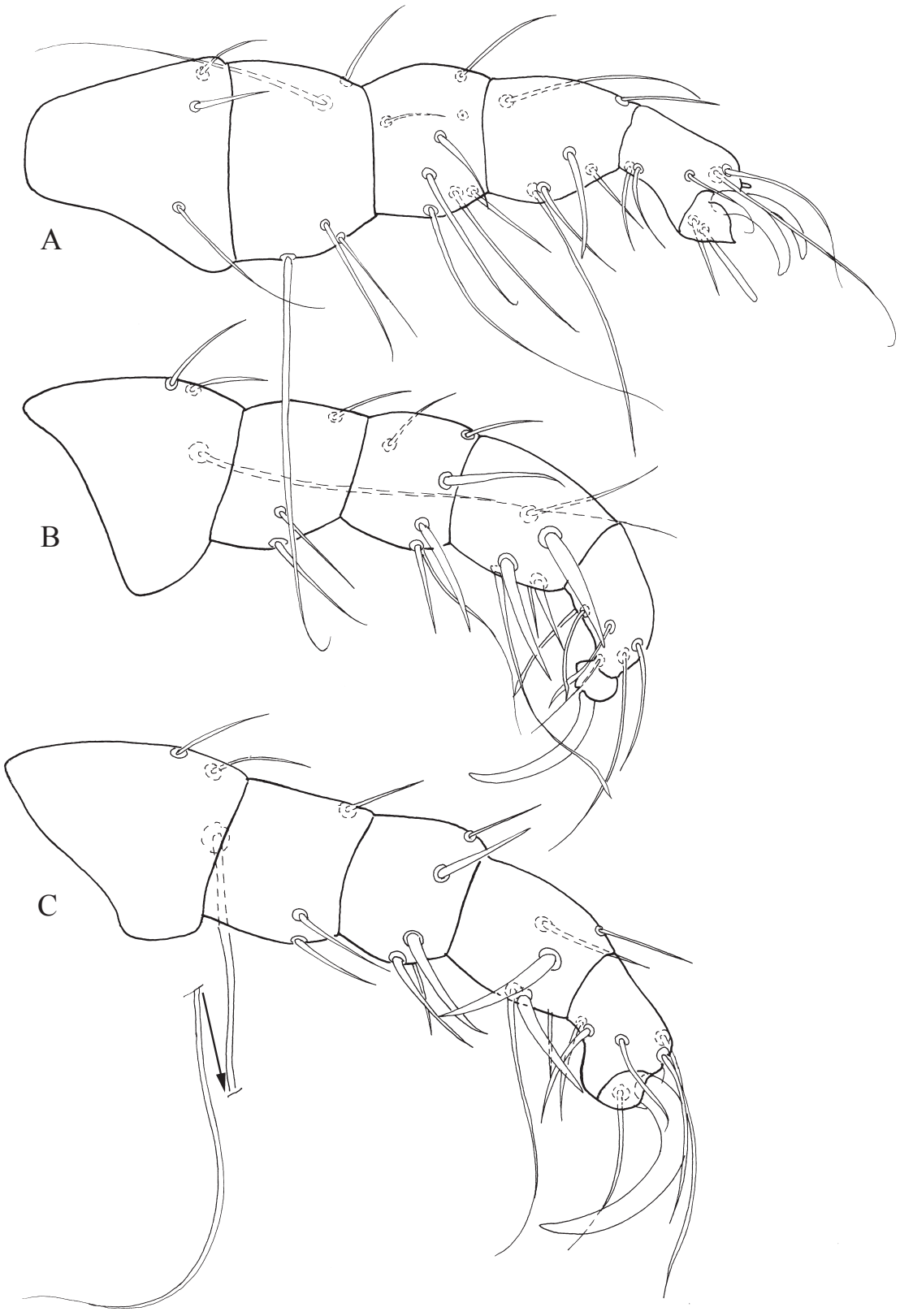


Fig. 24. *Radfordia ensifera* (Poppe, 1896), female legs II–IV in ventral view: A–C, respectively.

females, RUSSIA: Pskov Prov., Sebezh Distr., Aninskoe Lake, 10 June 1991, coll. A. Bochkov; 1 female, 2 males, RUSSIA: Bashkiria, Salavat Distr., Kukshik Mountain, 9 Jule 1973, coll. E. Dubinina.

Rattus rattus — 19 females, 3 males, 10 tritonymphs, RUSSIA: St. Petersburg, 28. Jule 1995, coll. A. Bochkov; 4 females, 1 male, RUSSIA: Leningrad Prov., Luga, August 1962, coll. Gureev.

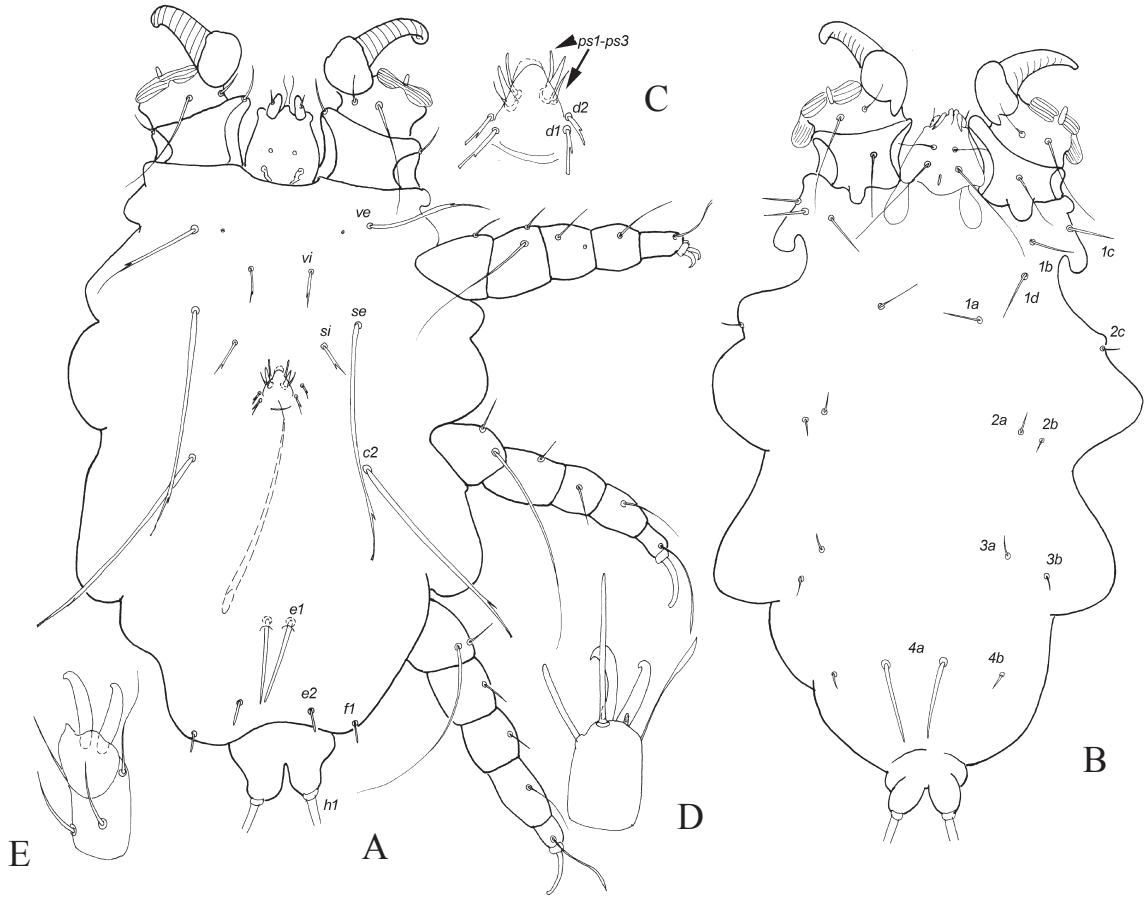


Fig. 25. *Radfordia ensifera* (Poppe, 1896), male: A — dorsal view, B — ventral view, C — genital shield, D — tarsus II in dorsal view, E — same in ventral view.

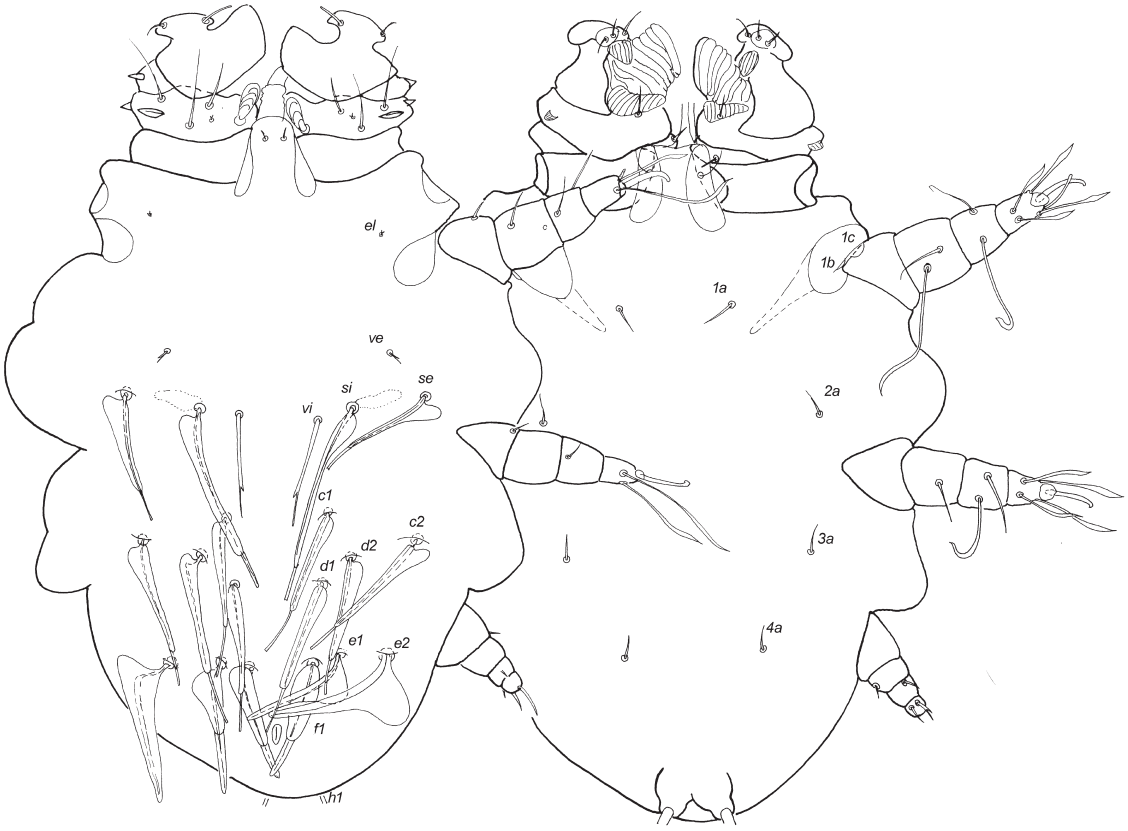


Fig. 26. *Radfordia ensifera* (Poppe, 1896), tritonymph idiosoma: A — dorsal view, B — ventral view.

Fig. 27. *Radfordia lancearia* (Poppe, 1909), female: A — dorsal view, B — opisthosoma in ventral view.

Rattus pyctoris — 4 females, TURKMENIA: Stalinabad [Dushanbe now], 26 November 1947, coll. E. Sosnina.

Species group *lancearia*

Coxal I–IV setation 4–3–1–2. Subgroup *lancearia*: In females, setae *3a* and *4a* whip-like. In tritonymphs, setae *f2* and *h2* present. Legs IV normally developed, without spur.

2. *Radfordia (Radfordia) lancearia* (Poppe, 1909)

Figs. 27–29

This species was described from *Apodemus sylvaticus* from Germany (Poppe in Fahrenholz 1909).

Hosts and distribution. This species is associated with Eurasian mice of the genus *Apodemus*. Many hosts of this species determined as *Apodemus sylvaticus*, probably, belong to other closely related species of the subgenus *Sylvaemus*. It was recorded from *Apodemus sylvaticus* from England (Radford 1935), Bulgaria (Beron 1973), Ukraine (Dubinina and Sosnina 1977; Bochkov 1997b), Russia (Pskov Prov., Krasnodar Territory, Bashkiria) and Kirghizia (Chirov et al. 1997; Bochkov 1997b). This species was also recorded from *Apodemus agrarius* from Russia (Astrakhan Prov.) (Dubinin and Volgin 1955).

Material examined. *Apodemus "sylvaticus"* — 297 females, 44 males, 10 tritonymphs, UKRAINE: Crimea, 1961, coll. Sosnina; 3 females, UKRAINE: Odessa Prov., 7 June 1984, coll. G. Gushcha; 3 females, UKRAINE: Zakarpatie Prov., Yasinya, 5 August 1959, coll. S. Vysotskaya, 1 female, UKRAINE: Kiev, Teremki, 6 August 1957, coll. G. Gushcha; 1 female, 1 male, RUSSIA: Pskov Prov., Sebezh Distr., Aninskoe Lake, 29 May 1991, coll. A. Bochkov; 36 females, 2 males, RUSSIA: Bashkiria, Salavat Distr., Kukshik Mountain, 9 July 1973, coll. E. Dubinina; 2 females, 2 males, RUSSIA: Krasnodar Territory, Caucasian Reservation, Mastakan Meadows, 24 July 1977, coll. E. Dubinina; 8 females, 2 males, KIRGHIZIA: Issyk-Kul Lake, Kara-Bulun, 2 August 1973, coll. E. Dubinina.

3. *Radfordia (Radfordia) mironovi* Bochkov, 1997

Fig. 30

This species was described from *Apodemus flavicollis* from Ukraine (Crimea) (Bochkov 1997b).

Hosts and distribution. To date this species is known only from the type host and locality.

Material examined. *Apodemus flavicollis* — male holotype (ZISP T-My-15), 23 female, 8 male, and 1 tritonymph paratypes, UKRAINE: Crimea, April 1961, coll. E. Sosnina.

4. *Radfordia (Radfordia) affinis* (Poppe, 1896)

Figs. 31–33

This species was described from *Mus musculus* from Germany (Poppe 1896).

Hosts and distribution. This species is associated with mice of the genera *Mus* and *Apodemus*. It is worldwide distributed on synanthropic species *Mus musculus*. It was recorded from *Mus booduga* (Gray, 1837) from India (Fain and Lukoschus 1977), from *Apodemus sylvaticus* from Belgium (Fain and Lukoschus 1977), Ukraine, Russia (Bashkiria), Uzbekistan, Kirghizia, and Tadzhikistan (Chirov et al. 1997; Bochkov 1997b), and from *Apodemus flavicollis* from Ukraine (Crimea) (Bochkov 1997b).

Material examined. *Mus musculus* — 15 females, 3 males, 6 tritonymphs, UKRAINE: Crimea, July 1961, coll. E. Sosnina; 20 females, 5

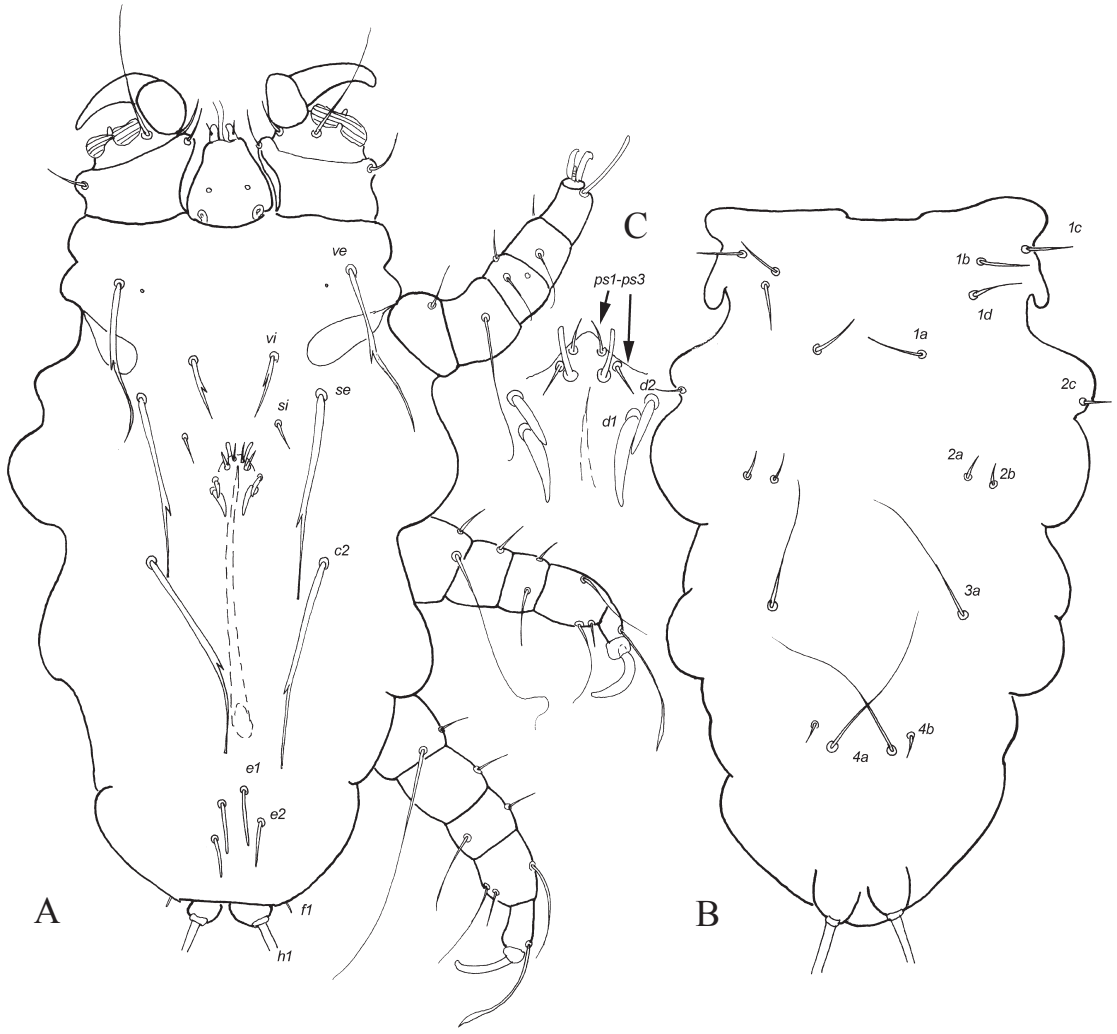


Fig. 28. *Radfordia lancearia* (Poppe, 1909), male: A — dorsal view, B — ventral view, C — genital shield.

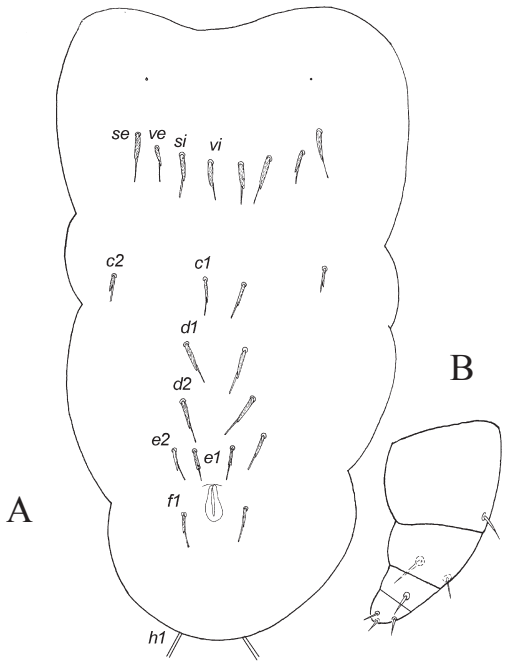


Fig. 29. *Radfordia lancearia* (Poppe, 1909), tritonymph: A — idiosoma in dorsal view, B — leg IV in ventral view.

males, UKRAINE: unknown locality, 9 May 1962, coll. G. Gushcha; 2 females, RUSSIA: Bashkiria, Salavat Distr., Kukshik Mountain, 8 July 1973, coll. E. Dubinina, 7 females, 7 males, UZBEKISTAN: Bukhara vicinity, "Dzheiran" ecocentre, 25 July 1993, coll. A. Bochkov; 6 females, 2 males, KIRGHIZIA: Issyk-Kul Lake, Ottuk, 28 July 1975, coll. E. Dubinina; 106 females, 5 males, TADZHIKISTAN: "?Soyuz NIKHI", May-July 1951, coll. E. Sosnina.

Apodemus ?sylvaticus — 15 females, 2 males, 5 tritonymphs, KIRGHIZIA: Issyk-Kul Lake, other data unknown.

Apodemus flavicollis — 1 male, UKRAINE: Crimea, 2 August 1961, coll. E. Sosnina.

Subgenus *Graphiurobia* Fain, 1972

Type species: *Radfordia* (*Graphiurobia*) *graphiuri* Fain, 1972

Diagnosis. Subcapitulum without projections or with pair of ventro-lateral projections. Subca-

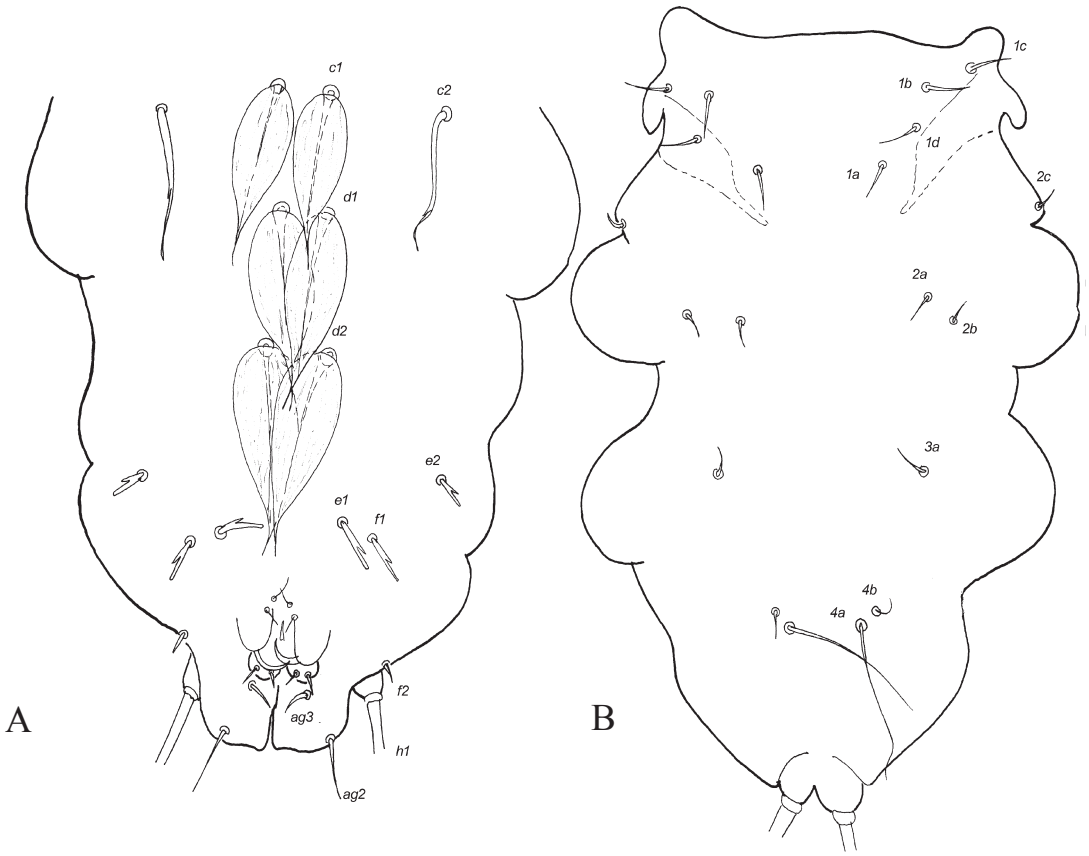


Fig. 30. *Radfordia mironovi* Bochkov, 1997, female idiosoma: A — dorsal view, B — ventral view.

Fig. 31. *Radfordia affinis* (Poppe, 1896), female: A — dorsal view, B — ventral view.

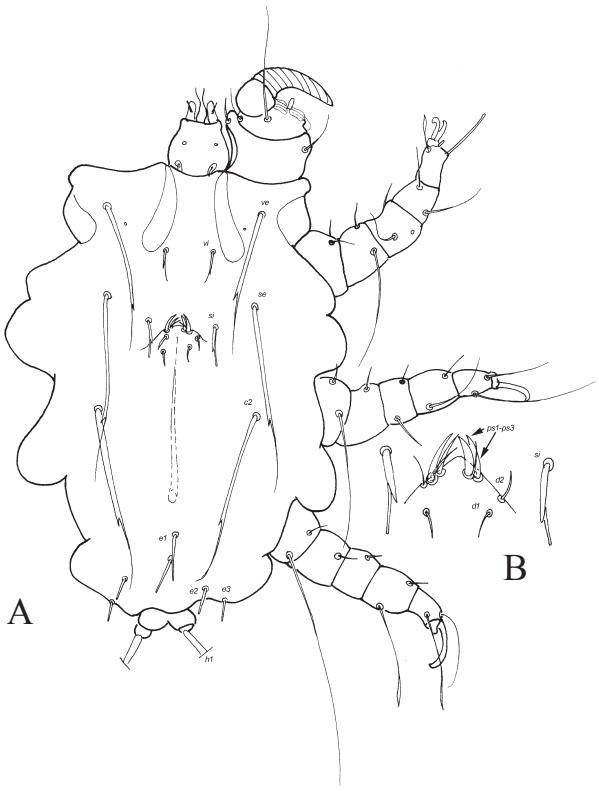


Fig. 32. *Radfordia affinis* (Poppe, 1896), male: A — dorsal view, B — genital shield.

pitular setae *n* filiform. Setation of legs II–IV: coxae 3–1–1, trochanters 3–3–3, femora 5–3–3, genua 7+ 1 solenidion–6–6 (or 5), tibiae 6–6–6, tarsi 7+1 solenidion–6 (or 5)–6 (or 5). Coxal setae *1b*, *1c*, and *1d* not thickened. Dorsal seta of trochanters III–IV whip-like. Apical segment of legs I without hook.

Female. Vulvar lobes distinctly developed. Vulvar region not ornamented. Full set of idiosomal setae present. Setae *vi* widely lanceolate, distinctly wide than setae *e2*.

Male. Genital shield in shape of short cone bearing 3 pairs of pseudoanal setae grouped into 2 clusters situated in apical part of this shield; setae *ps1* finger-like. Setae *d1* present, situated immediately behind genital shield, setae *c1, d2, f2*, and *h2* absent. Seta *si* close located to *se,* distances *si–se* distinctly shorter than *si* – genital shield. Cuticular ornamentation near bases of setae *h1* absent.

Tritonymph. Idiosomal dorsum 14 pairs of distinctly developed setae, excluding pseudoanals. Anal opening with 2 pair of pseudoanal setae. Legs IV with full set of segments. Tarsi II–III with 1 claw, tarsi 1V without claw.

This subgenus includes nine species and one subspecies other than the type species: *R. graphiuri kivuana* Fain et Lukoschus, 1973, *R. oude-*

Fig. 33. *Radfordia affinis* (Poppe, 1896), tritonymph: A — dorsal view, B — ventral view.

mansi (Poppe, 1909), *R. dryromys* Fain et Lukoschus, 1973, *R. eliomys* Fain et Lukoschus, 1973, *R. myomimusi* Bochkov, 1994, *R. gliricola* Vesmanis et Lukoschus, 1978, *R. gliruli* Uchikawa, 1977, *R. ewingi* (Fox, 1937), and *R. selevinia* sp. nov.

Remark. In the fauna of the former USSR seven species belonging to this subgenus were recorded; all of them are associated with Gliridae (Bochkov 1997; present data).

Hosts. Eight species and one subspecies of this genus are associated with hosts of the family Gliridae (Old World excluding Australia) (Bochkov 1994), one species *R. ewingi* parasitizes *Zapus hudsonius* Zimmerman, 1780 (Dipodidae) from North America (Fain and Lukoschus 1977).

Key to species of the subgenus *Graphiurobia* Fain, 1972 of the former USSR

Females

1. Tarsus IV with 6 setae 2
— Tarsus IV with 5 setae ....*R. myomimusi* Bochkov, 1994 (Fig. 34)
2. Genu IV with 6 setae 5
— Genu IV with 5 setae 3
3. Setae *vi* and *ve* not 1.5 times wider than setae *se*. Setae *ve* without outer lateral projection in basal part (shoulder). Setae *d* of trochanters I 15–25 long 4
— Setae *vi* and *ve* 2–3 times wider than setae *se*. Setae *ve* with outer lateral projection in basal part (shoulder). Setae *d* of trochantesr I longer 40 ..... *R. gliricola* Vesmanis et Lukoschus, 1978 (Fig. 43)
4. Claws of tarsus I subequal. Setae *2a* short, subequal to *2b* ..... *R. oudemansi* (Poppe, 1909) (Fig. 40)
— Claws of tarsus I unequal in size. Setae *2a* whip-like, much longer than *2b* .... *R. eliomys* Fain et Lukoschus, 1973 (Fig. 46)
5. Setae *si* about 2 times shorter than *se*. Setae *c1* far not reaching to level of seta *d2* bases .... *R. dryromys* Fain et Lukoschus, 1973 (Fig. 47)
— Setae *si* about 1.3 times shorter than *se*. Setae *c1* almost reaching to level of seta *d2* bases ..... *R. selevinia* Bochkov sp. nov. (Fig. 49)

Males

1. Genu IV with 5 setae 2
— Genu IV with 6 setae 5
2. Tarsus IV with 6 setae 3
— Tarsus IV with 5 setae .... *R. myomimusi* Bochkov, 1994 (Fig. 35)

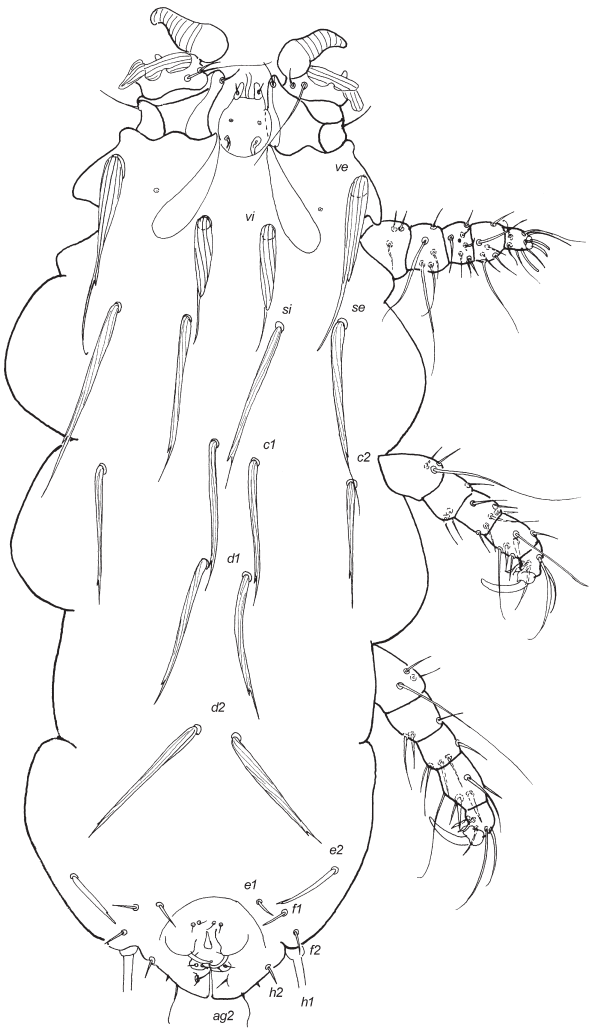


Fig. 34. *Radfordia myomimusi* Bochkov, 1994, female in dorsal view.

3. Setae *2a* whip-like, much longer than *2b*. Setae *c2* reaching to level of seta *e2* bases 4
— Setae *2a* short, subequal to *2b*. Setae *c2* far not reaching to level of seta *e2* bases .... *R. oudemansi* (Poppe, 1909) (Fig. 41)
4. Apices of setae *ps1* reaching to setae *vi*. Setae *ps2* and *ps3* completely covered by genital cone. Setae *d1* much shorter than setae *si*. Setae *vi* narrow lanceolate. Setae *c2* far not reaching to level of seta *f1* bases .... *R. eliomys* Fain et Lukoschus, 1973 (Fig. 47)
— Apices of setae *ps1* far not reaching to setae *vi*. Setae *ps2* and *ps3* situated on genital cone. Setae *d1* much longer than setae *si*. Setae *vi* thickened filiform. Setae *c2* reaching to level of seta *f1* bases ..... *R. gliricola* Vesmanis et Lukoschus, 1978 (Fig. 44)
5. Setal bases of compliment *e2* situated almost at same level. Setae *vi* 1.2 longer or subequal to *si*. Setae *ps2* at least 2 times shorter than *ps3* and *d1* ... *R. dyromys* Fain et Lukoschus, 1973 (Fig. 38)

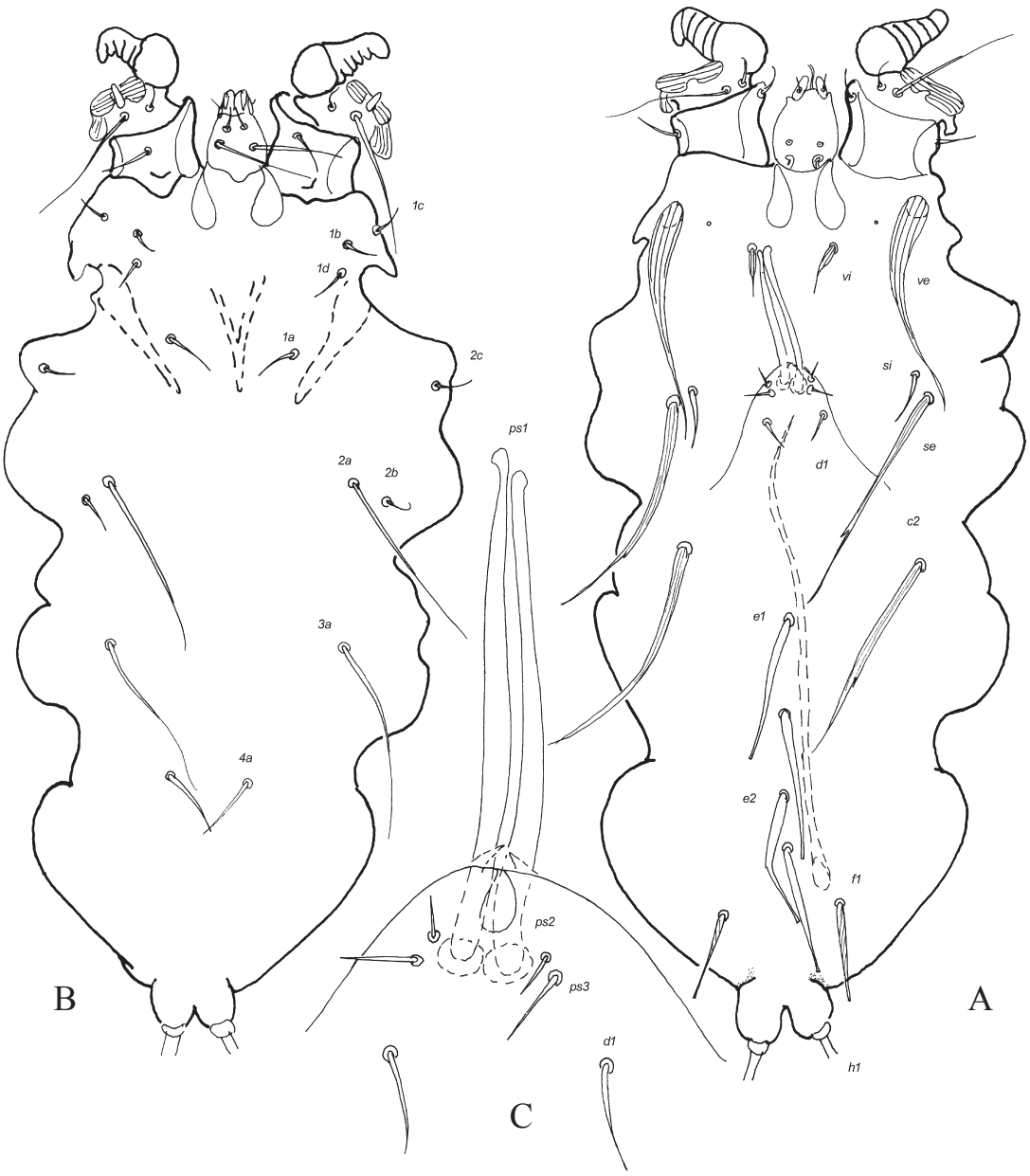


Fig. 35. *Radfordia myomimusi* Bochkov, 1994, male: A — dorsal view, B — ventral view, C — genita shield.

— Setal bases of compliment *e2* situated one after another. Setae *vi* 1.7 times longer than *si*. Setae *ps2, ps3,* and *d1* subequal .... *R. selevinia* Bochkov sp. nov. (Fig. 50)

Tritonymphs

1. Setae *d2* 1.1–1.6 times shorter or subequal to setae *d1* 2
— Setae *d2* about 3 times shorter than *d1* 5
2. Setae *ve* far not reaching to level of seta *c2* bases 3
— Setae *ve* reaching to level of seta *c2* bases 4
3. Setae *2a* and *3a* short, subequal to *2b*. Setae of tarsi IV shorter than this segment .... *R. eliomys* Fain et Lukoschus, 1973 (Fig. 48)
— Setae *2a* and *3a* whip-like, much longer than *2b*. Most setae of tarsi IV distinctly longer than this segment .... *R. selevinia* Bochkov sp. nov. (Fig. 51)
4. Setae *c2* far not reaching to level of seta *d2* bases. Setae *d2* and *e2* subequal .... *R. myomimusi* Bochkov, 1994 (Fig. 36)
— Setae *c2* reaching to level of seta *d2* bases. Setae *d2* 2 times longer than *e2* .... *R. dryromys* Fain et Lukoschus, 1973 (Fig. 39)
5. Setae *3a* and *4a* subequal, slightly thickened .... *R. gliricola* Vesmanis et Lukoschus, 1978 (Fig. 45)
— Setae *3a* only thickened, at least 5 times longer than *4a* .... *R. oudemansi* (Poppe, 1909) (Fig. 42)

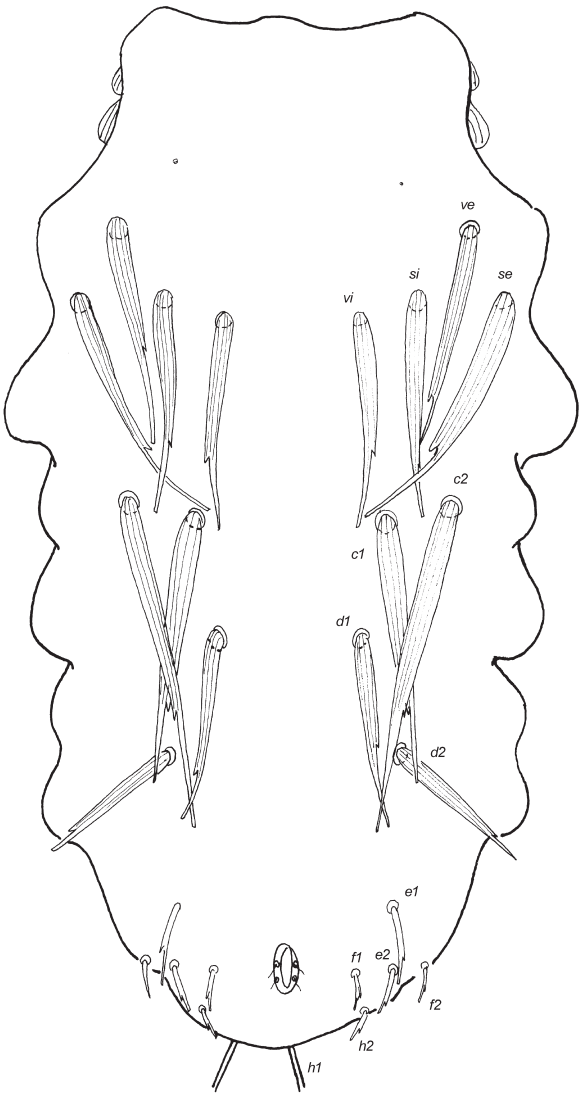


Fig. 36. *Radfordia myomimusi* Bochkov, 1994, tritonymph idiosoma in dorsal view.

1. *Radfordia (Graphiurobia) myomimusi* Bochkov, 1994

Figs. 34–36

This species was described from *Myomimus personatus* from Turkmenia (Bochkov 1994).

Hosts and distribution. To date this species is known only from the type host and locality.

Material examined. *Myomimis personatus* — male holotype (T-My-9), 4 female, 3 male, and 5 tritonymph paratypes, TURKMENIA: Bolshoy Balkhan Mountain Ridge, 4 April 1988, coll. A. Gorbunov.

2. *Radfordia (Graphiurobia) dryomys* Fain et Lukoschus, 1973

Figs. 37–39

This species was described from *Dryomys nitedula* from Turkey (Fain and Lukoschus 1973a).

Hosts and distribution. This species is known only from the type host from Poland, Turkey (Fain and Lukoschus 1973a) and Russia (Krasnodar Territory) (Bochkov 1994).

Material examined. *Dryomys nitedula* — 9 females, 3 males, 25 tritonymphs, RUSSIA: Krasnodar Territory, Anapa Distr., Bolshoy Utrish, July 1992, coll. A. Bochkov and A. Stekolnikov.

3. *Radfordia (Graphiurobia) oudemansi* (Poppe, 1909)

Figs. 40–42

This species was described from *Muscardinus avellanarius* from Germany (Poppe in Fahrenholz 1909).

Hosts and distribution. This species is known only from the type host from Germany (Fahrenholz 1909) and Ukraine (Bochkov 1994).

Material examined. *Muscardinus avellanarius* — 2 females, UKRAINE: Zakarpatie Prov., Khustsky Distr., 6 October 1958, coll. S. Visotskaya; 4 females, 3 males, 6 tritonymphs, UKRAINE: Zakarpatie Prov., Brustury, May 1954, coll. Koleshev.

4. *Radfordia (Graphiurobia) gliricola* Vesmanis et Lukoschus, 1978

Figs. 43–45

This species was described from *Glys glys* from Germany (Vesmanis and Lukoschus 1973).

Hosts and distribution. This species is known only from the type host from Germany (Vesmanis and Lukoschus 1973) and Russia (Krasnodar Territory) (Bochkov 1994).

Material examined. 23 females, 23 males, 10 tritonymphs, RUSSIA: Krasnodar Territory, Anapa Distr., Bolshoy Utrish, July 1992, coll. A. Bochkov.

5. *Radfordia (Graphiurobia) eliomys* Fain et Lukoschus, 1973

Figs. 46–48

This species was described from *Eliomys quercinus* from Tunis (Fain and Lukoschus 1973b).

Hosts and distribution. This species is known only from the type host from Tunis, Italy, Switzerland, Holland (Fain and Lukoschus 1973b), and France (Beron 1971 — originally determined as *R. oudemansi*).

Material examined. *Eliomys quercinus* — 6 females, 2 males, RUSSIA: Pskov Prov., other data unknown, coll. Eversman; 2 females, RUS-

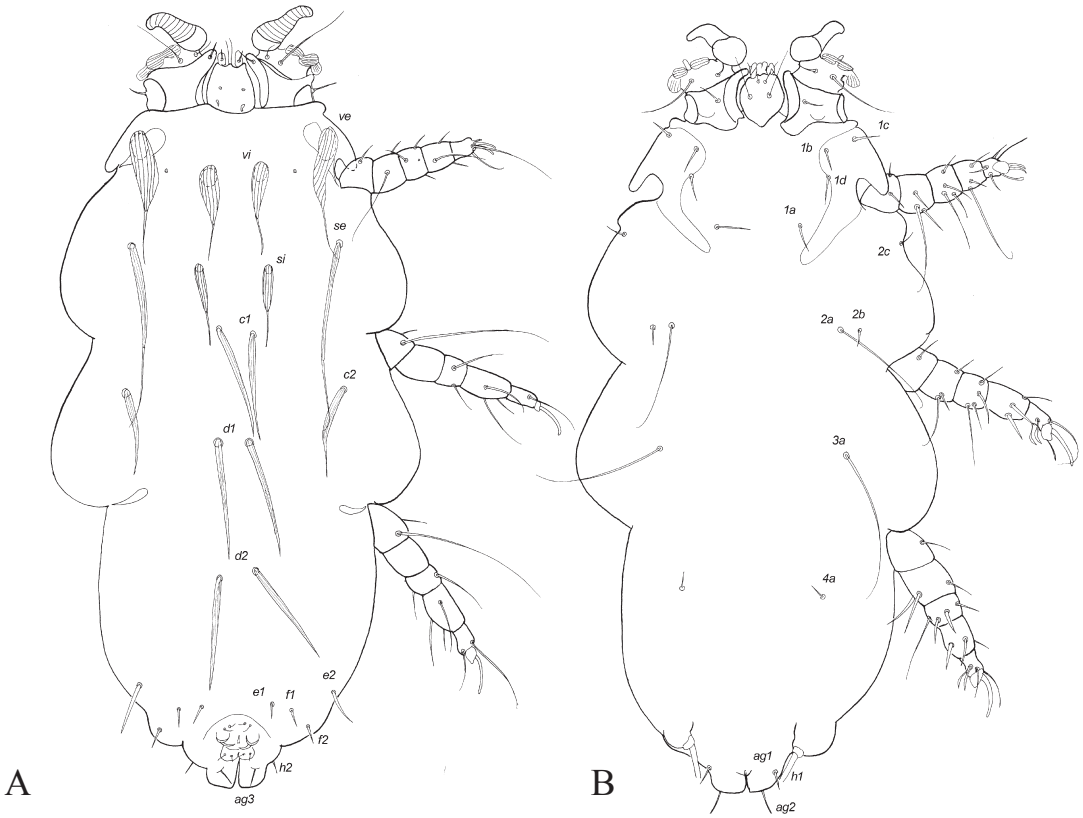


Fig. 37. *Radfordia dryomys* Fain et Lukoschus, 1973, female: A — dorsal view, B — ventral view.

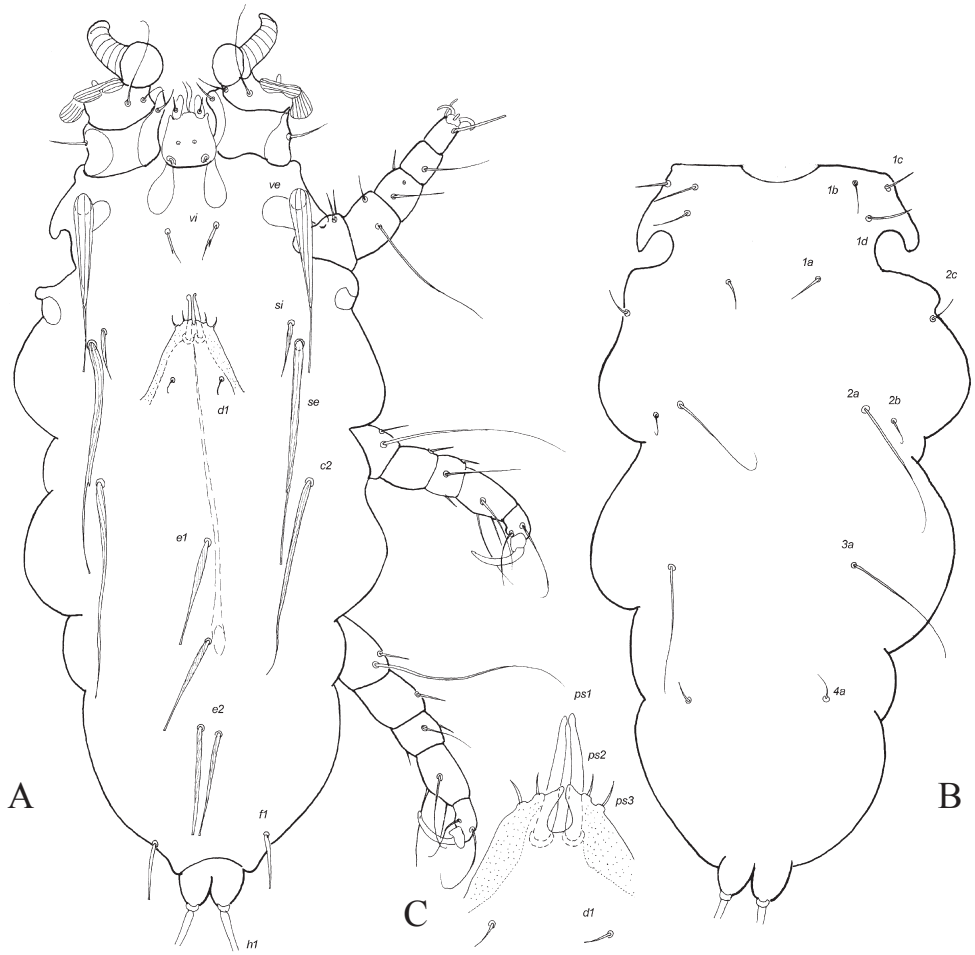


Fig. 38. *Radfordia dryomys* Fain et Lukoschus, 1973, male: A — dorsal view, B — ventral view, C — genita shield.

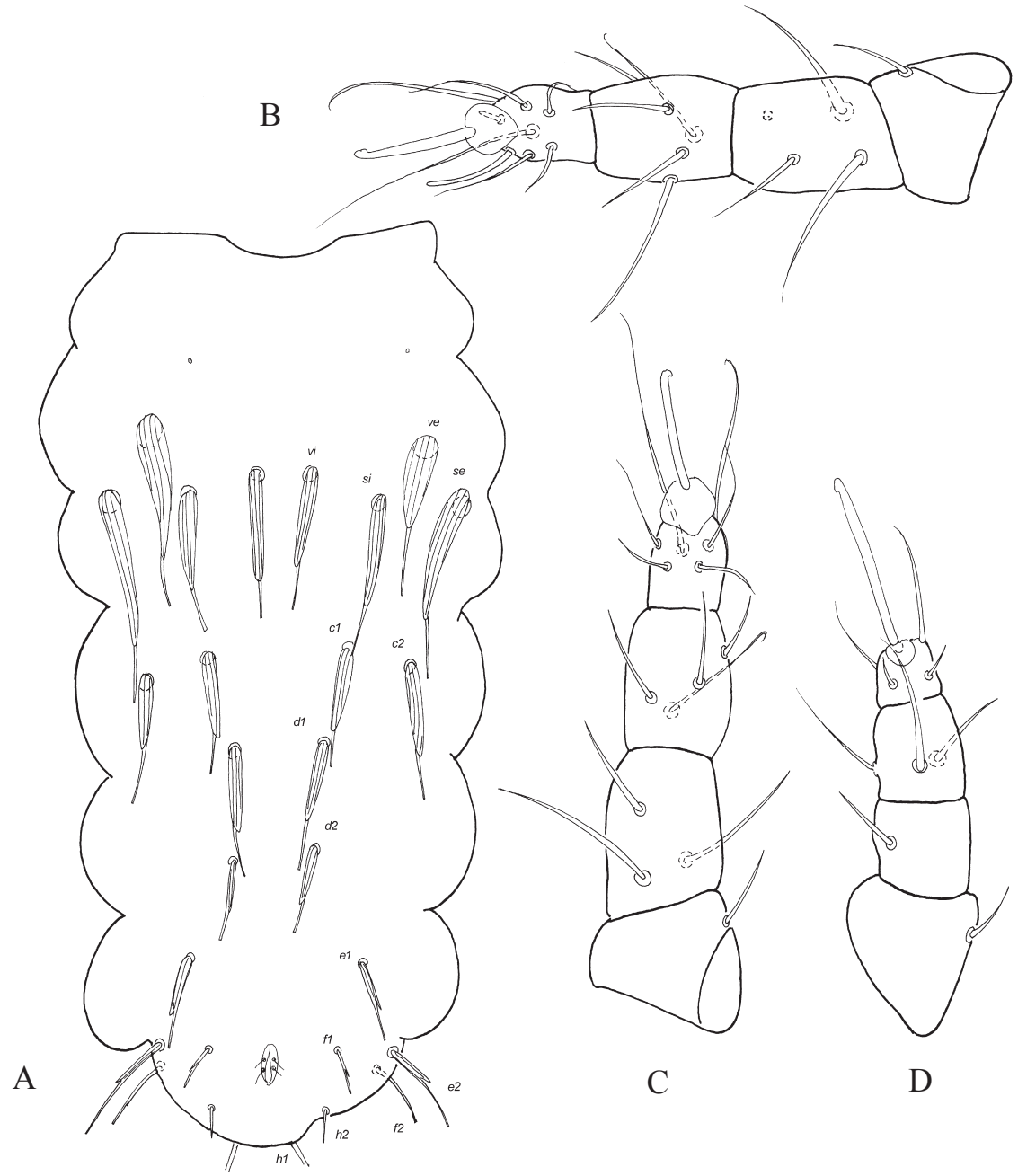


Fig. 39. *Radfordia dryomys* Fain et Lukoschus, 1973, tritonymph: A — idiosoma in dorsal view, B–D — legs II–IV in ventral view, respectively.

SIA: Saint Petersburg Prov., Luga Distr., Betkovo village, 5 November 1957, coll. A. Gureev.

6. *Radfordia (Graphiurobia) selevinia* Bochkov, sp. nov.

Figs. 49–51

Female (holotype). Body, including gnathosoma, 470 long (530 in 1 paratype), 275 wide (285). Gnathosoma about 55 long. Ventral projections of subcapitulum absent. Setae *ve* without shoulder (outer projection in basal part). Lengths of idiosomal setae: *vi* 60 (55), *ve* 120 (110), *si* 120 (110), *c1* 77 (85), *c2* 95 (100), *d1* 75 (80), *d2* 70 (75), *e1* 25 (25), *e2* 42 (36), *f1* 22 (24), *f2* 17 (16), *h2* 20 (18), *ag1* 15 (18), *ag2* 28 (27), *ag3* 10 (9), *1a* 30 (33), *2a* 65 (75), *2b* 13 (11), *3a* 80 (75), *4a* 19 (17). Setae *ve* about 13 wide, setae *vi*, *si*, and *se* about 2 times narrower than *ve*. Setae *c2* almost reaching to level of seta *d2* bases. Claws of tarsi II subequal to each other. Genua III and IV with 6 setae each. Tarsi III with 5 setae, tarsi IV with 6 setae.

Male (2 paratypes). Body, including gnathosoma, 355–380, 180–185 wide. Gnathosoma 37–45 long. Lengths of idiosomal setae: *vi* 24–26, *ve* 90–110, *si* 55–57, *se* 120–135, *c2* 110–115, *e1*

Fig. 40. *Radfordia oudemansi* (Poppe, 1909), female: A — dorsal view, B — ventral view.

and *e2* about 50, *f1* about 15, *1a* 24, *2a* 65 (70), *2b* 10 (8), *3a* 85 (80), *4a* 17 (16). Setae *ve* about 10 wide; setae *vi*, *si*, and *se* about 2, 3, and 5 wide, respectively. Setae *c2* reaching to level of seta *e2'* bases. Setae *e1'*, *e1"*, *e2'*, and *e2"* situated one after another. Distances between setae *e1–e1* and *e2–e2* 26–30, *f1–f1* 57–60. Setae *ps2* and *ps3* situated at genital cone. Setae *ps1* about 22 long, their apices far not reaching to level of seta *vi* bases, situated at level of seta *si* bases. Setae *ps2* about 2 times shorter than *ps3*. Aedeagus 185–190 long. Leg setation as in female. Claws of tarsi II subequal.

Tritonymph (1 paratype). Lengths of setae: *vi* and *si* 45, *ve* 50, *se* 55, *c1* 39, *c2* 55, *d1* 55, *d2* 24, *e1, e2, f1, f2,* and *h2* 9–13, *1a* 17, *2a* 57, *3a* 77, and *4a* 25. Setae *4a* slightly thickened. Setae *ve* far not reaching to level of seta *c2* bases. Setae *c2* reaching to level of seta *d1* bases. Most setae of tarsi IV distinctly longer than this segment.

Type material. *Selevinia betpakdalensis* (ZISP 54342) — female holotype (ZISP T-My-31), 1 female, 2 male, 1 tritonymph and 1 larva paratypes (AVB 09-0208-001), KAZAKHSTAN: Karaganda Prov., Betpak-Dala Desert, 18 km North Bulat-Tau Mountain, 1 May1950, coll. Nasonov.

Type deposition. Holotype and paratypes are deposited at ZISP.

Etymology. The species name is derived from the generic name of the host and is a noun in apposition.

Differential diagnosis. This species is closely related to *R. dryomys*. In both these species genua III bear 6 setae each. It differs from *R. dryomys* by the following characters. In females of *R. selevinia* sp. nov., setae *si* are about 1.3 times shorter than *se,* setae *c1* almost reach to the level of seta *d2* bases; in males, the setal bases of com-

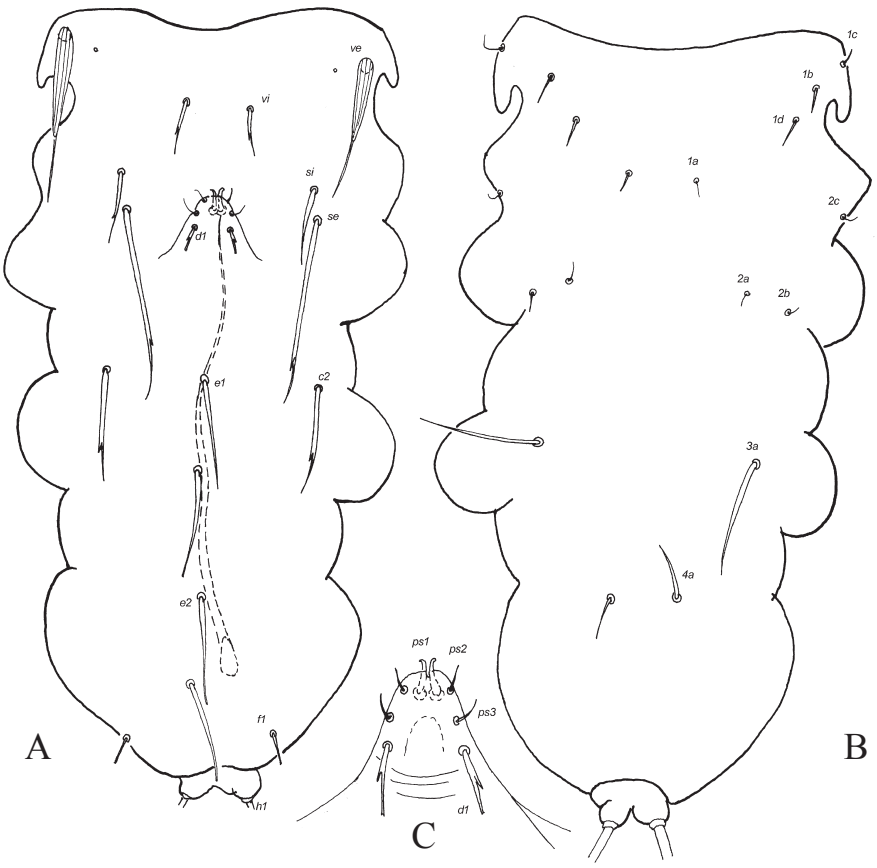


Fig. 41. *Radfordia oudemansi* (Poppe, 1909), male: A — dorsal view, B — ventral view, C — genital shield.

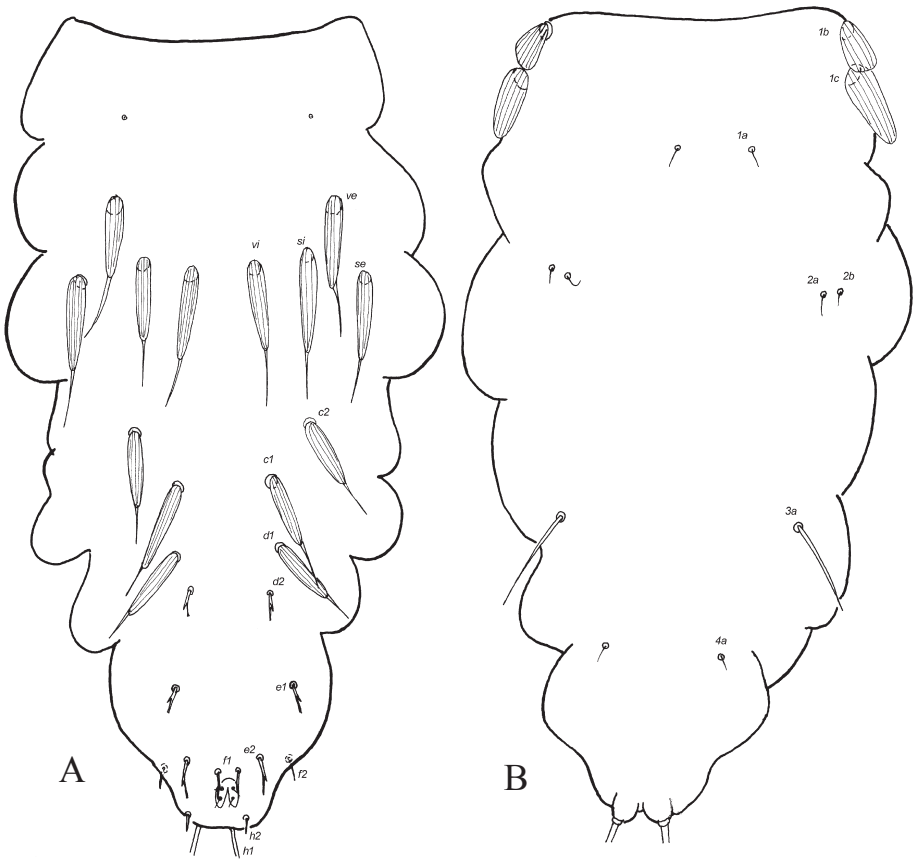


Fig. 42. *Radfordia oudemansi* (Poppe, 1909), tritonymph idiosoma: A — dorsal view, B — ventral view.

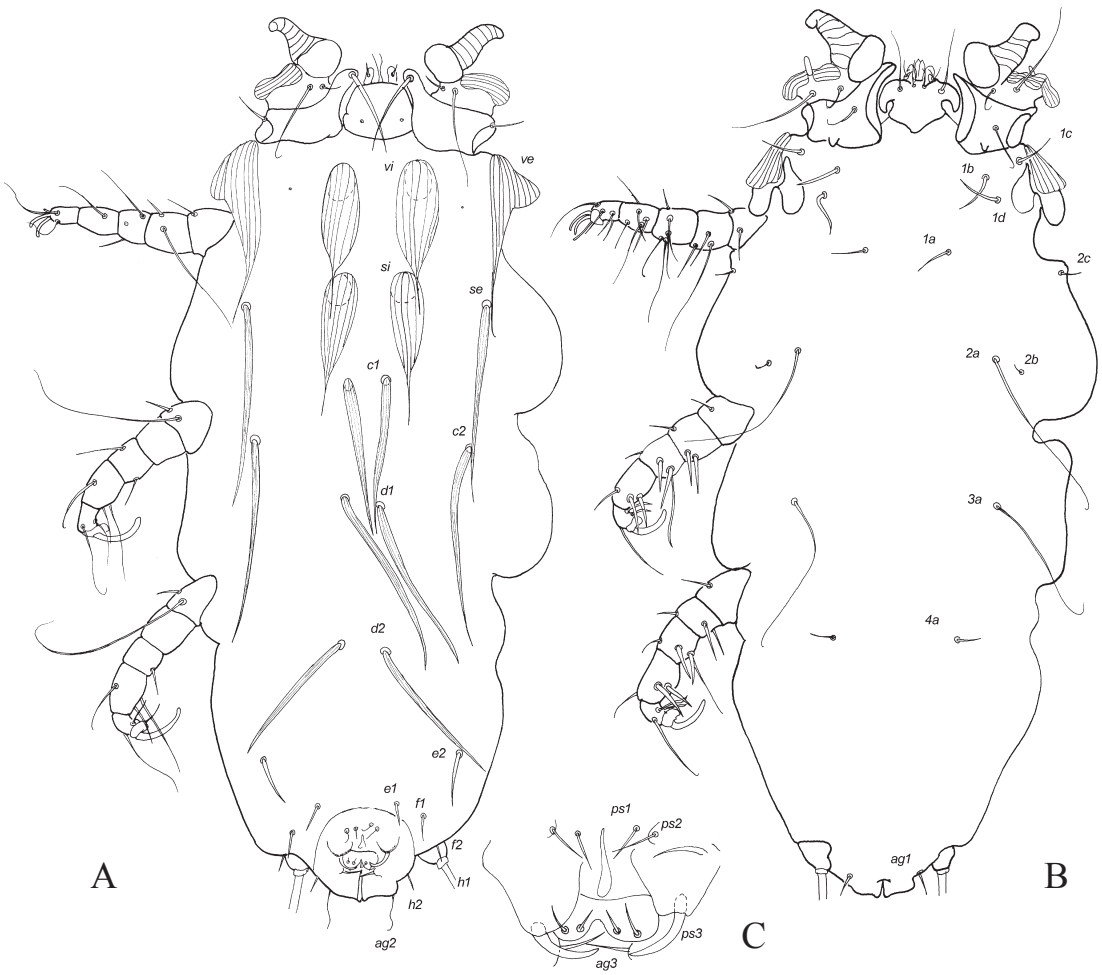
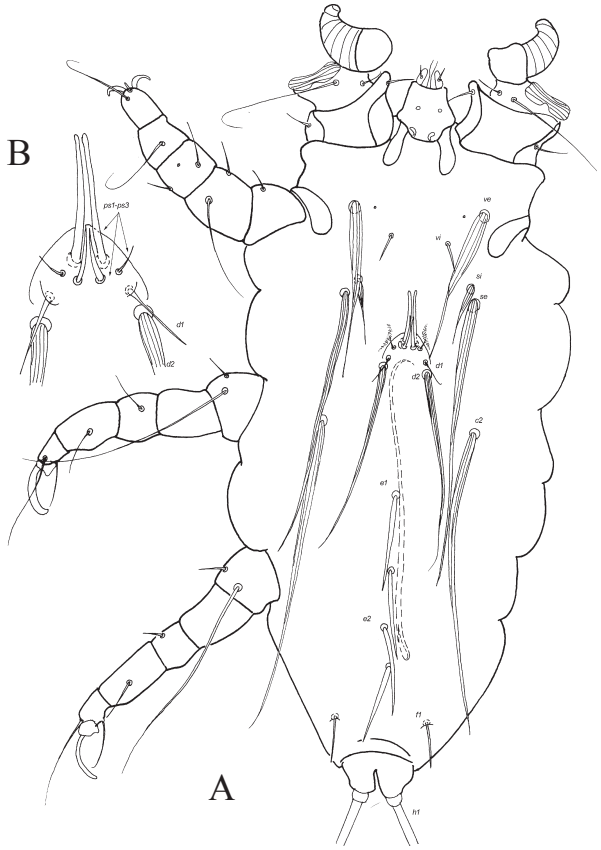


Fig. 43. *Radfordia gliricola* Vesmanis et Lukoschus, 1978, female: A — dorsal view, B — ventral view, C — vulva.



pliment *e2* are situated one after another, setae *vi* are 1.7 times longer than *si*, setae *ps2, ps3,* and *d1* are subequal; in tritonymphs, setae *ve* far do not reach to the level of seta *c2* bases. In females of *R. dryomys*, setae *si* are about 2 times shorter than *se,* setae *c1* far do not reach to the level of seta *d2* bases; in males, the setal bases of compliment *e2* are situated almost at the same level, setae *vi* are 1.2 longer or subequal to *si*, setae *ps2* are at least 2 times shorter than *ps3* and *d1*; in tritonymphs, setae *ve* reach to the level of seta *c2* bases.

Subgenus *Microtimyobia* Fain et Lukoschus, 1976

Type species: *Dermaleichus lemninus* Koch, 1841 (*Radfordia lemnina*)

Diagnosis. Subcapitulum without projections. Subcapitular setae *n* membranous lanceolate or fan-like with several teeth (in males of some species filiform). Setation of legs II–IV: coxae 3–1–1, trochanters 3–3–3, femora 5–3–3, genua 7+ 1 so-

Fig. 44. *Radfordia gliricola* Vesmanis et Lukoschus, 1978, male: A — dorsal view, B — genital shield.

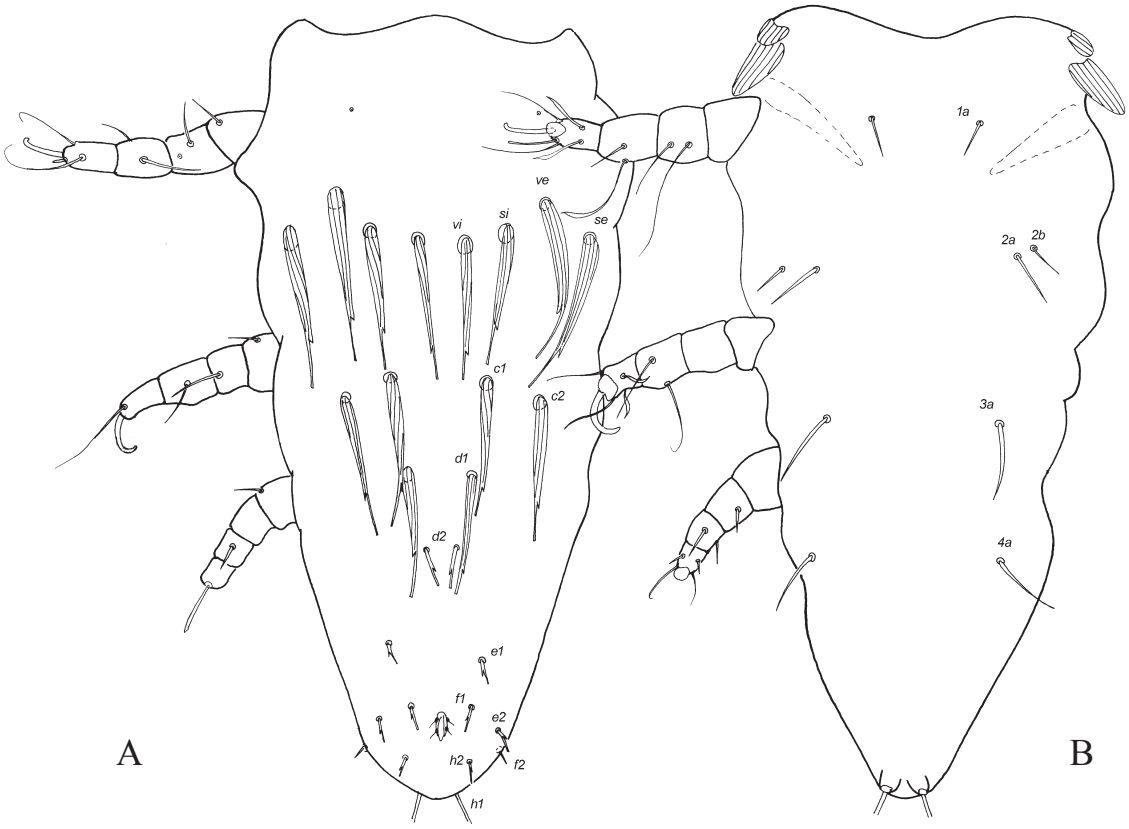


Fig. 45. *Radfordia gliricola* Vesmanis et Lukoschus, 1978, tritonymph idiosoma: A — dorsal view, B — ventral view.

Fig. 46. *Radfordia eliomys* Fain et Lukoschus, 1973, female: A — dorsal view, B — ventral view.

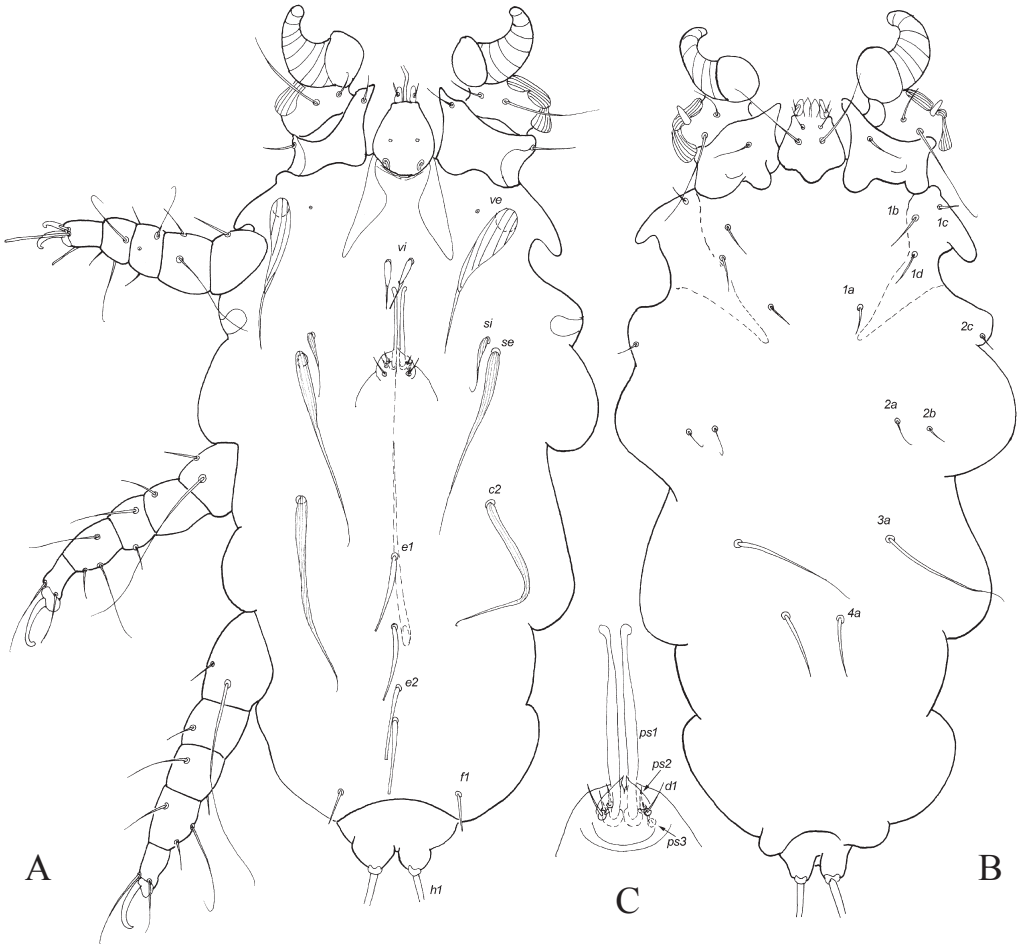


Fig. 47. *Radfordia eliomys* Fain et Lukoschus, 1973, male: A — dorsal view, B — ventral view, C — genital shield.

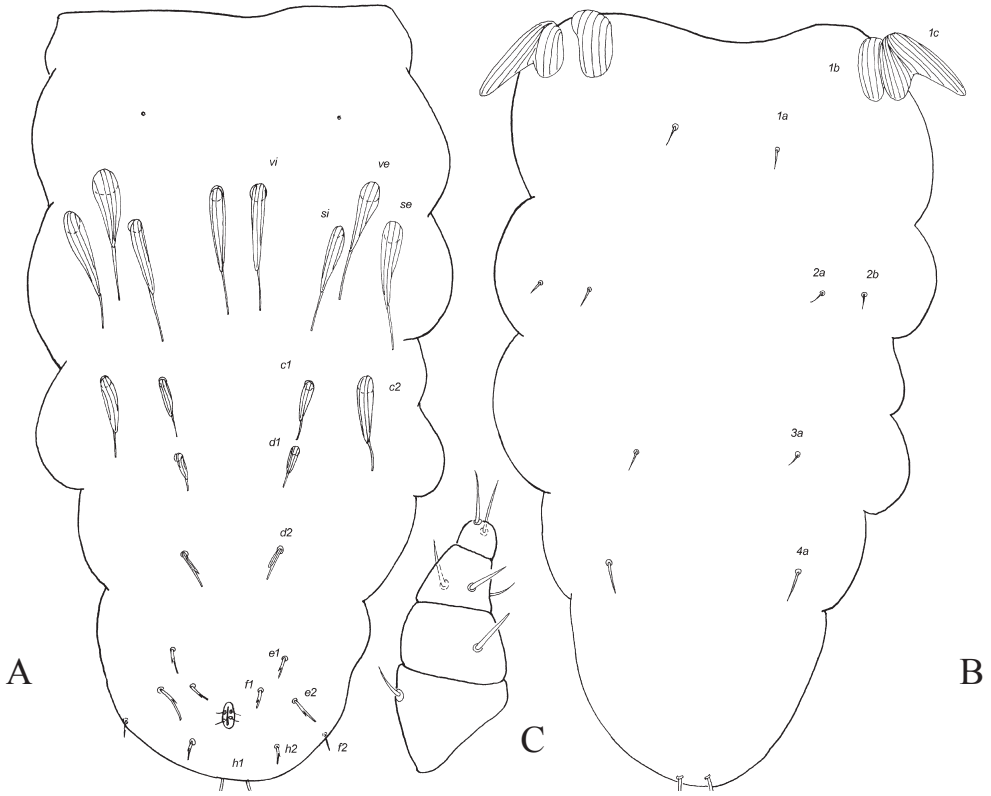


Fig. 48. *Radfordia eliomys* Fain et Lukoschus, 1973, tritonymph: A — idiosoma in dorsal view, B — same in ventral view, C — leg IV in ventral view.

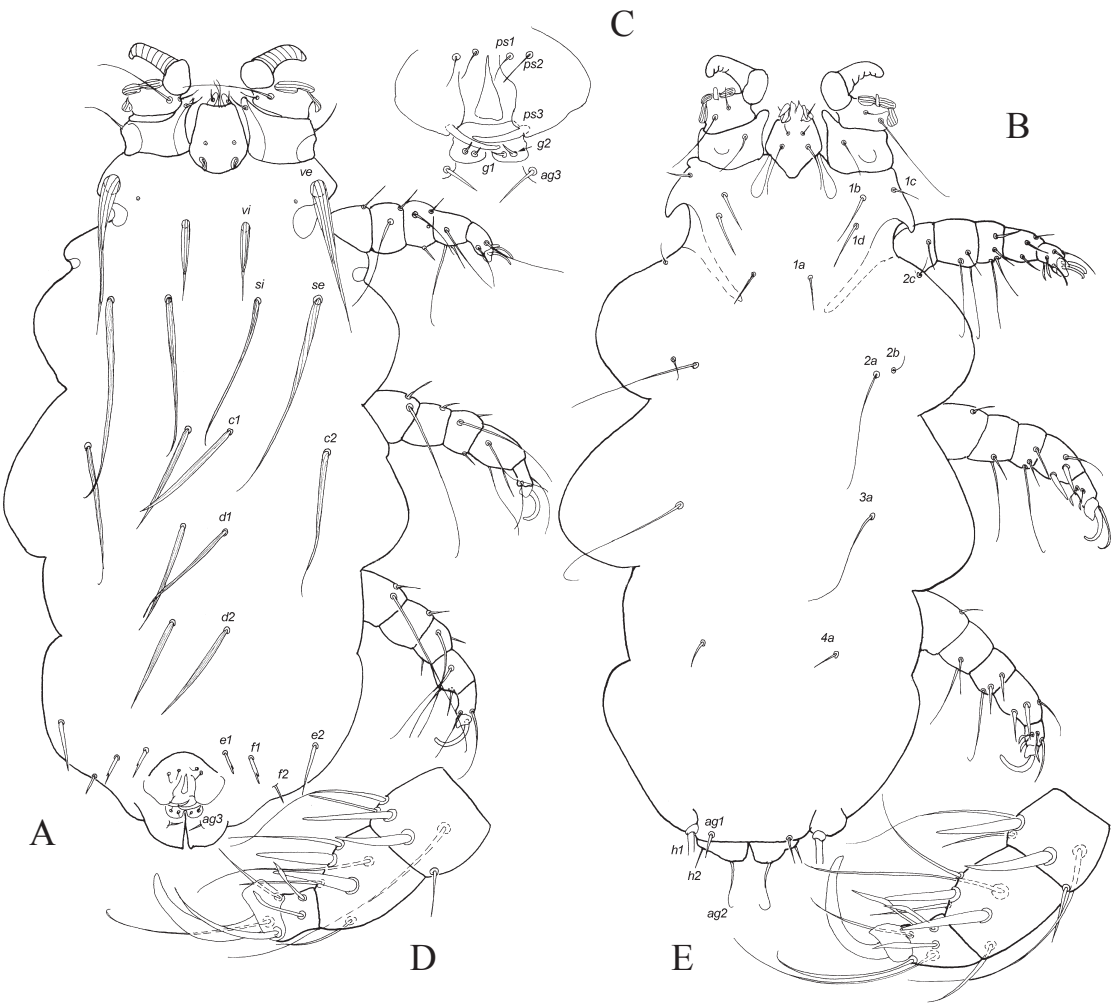


Fig. 49. *Radfordia selevinia* Bochkov, sp. nov., female: A — dorsal view, B — ventral view, C — vulva, D — tarsus-genu III in ventral view, E — tarsus-genu IV in ventral view.

lenidion–6–5, tibiae 6–6–6, tarsi 7+1 solenidion–6–6. Coxal setae *1b*, *1c*, and *1d* thickened. Dorsal seta of trochanters 1II–IV whip-like. Apical segment of legs I without hook.

Female. Vulvar lobes distinctly developed. Vulvar region covered by warty ornamentation. Full set of idiosomal setae present. Setae *vi* lanceolate, wider or subequal in width to setae *e2*.

Male. Genital shield in shape of elongated cone bearing 2 pairs of pseudoanal setae grouped into 2 clusters situated in apical part of this shield; setae *ps1* finger-like. Setae *d1* present, situated immediately behind genital shield, setae *c1, d2 f2*, and *h2* absent. Seta *si* close located to *se,* distance *si–se* distinctly shorter than *si* – genital shield. Cuticular ornamentation near bases of setae *h1* present.

Tritonymph. Idiosomal dorsum 14 pairs of distinctly developed setae, excluding pseudoanals. Anal opening with 2 pair of pseudoanal setae. Legs IV with full set of segments. Tarsi II–III with 1 claw, tarsi IV without claw.

This subgenus includes 21 species other than the type species: *R. stenocrani* Bochkov et Mironov, 1988, *R. ladakensis* Fain et Lukoschus, 1976, *R. stekolnikovi* Bochkov et Mironov, 1998, *R. clethrionomys* Fain et Lukoschus, 1977, *R. rutila* Fain et Lukoschus, 1977, *R. rufocani* Bochkov, 1995, *R. alticolae* Bochkov, 1995, *R. eothenomys* Fain et Lukoschus, 1976, *R. cricetulus* Fain, 1973, *R. hylandi* Fain et Lukoschus, 1977, *R. arvicolae* Fain et Lukoschus, 1977, *R. arctica* Fain et Lukoschus, 1977, *R. lemmus* Fain et Lukoschus, 1977, *R. synaptomysi* Bochkov et Mironov, 1998, *R. myopusi* Bochkov et Mironov, 1998, *R. zibethicalis* (Radford, 1936), *R. arborimus* Fain et Whitaker, 1975, *Radfordia triton* Fain et Lukoschus, 1977, *R. abramovi* Bochkov et Mironov, 1998, and *R. cricetuliphila* Bochkov, 1999

Remark. This subgenus includes four species groups, i.e. *lemnina* (10 species and 2 subspecies), *hylandi* (6 species), *zibethicalis* (2 species), and *triton* (3 species). The fauna of the former USSR includes 16 species belonging to all four groups of

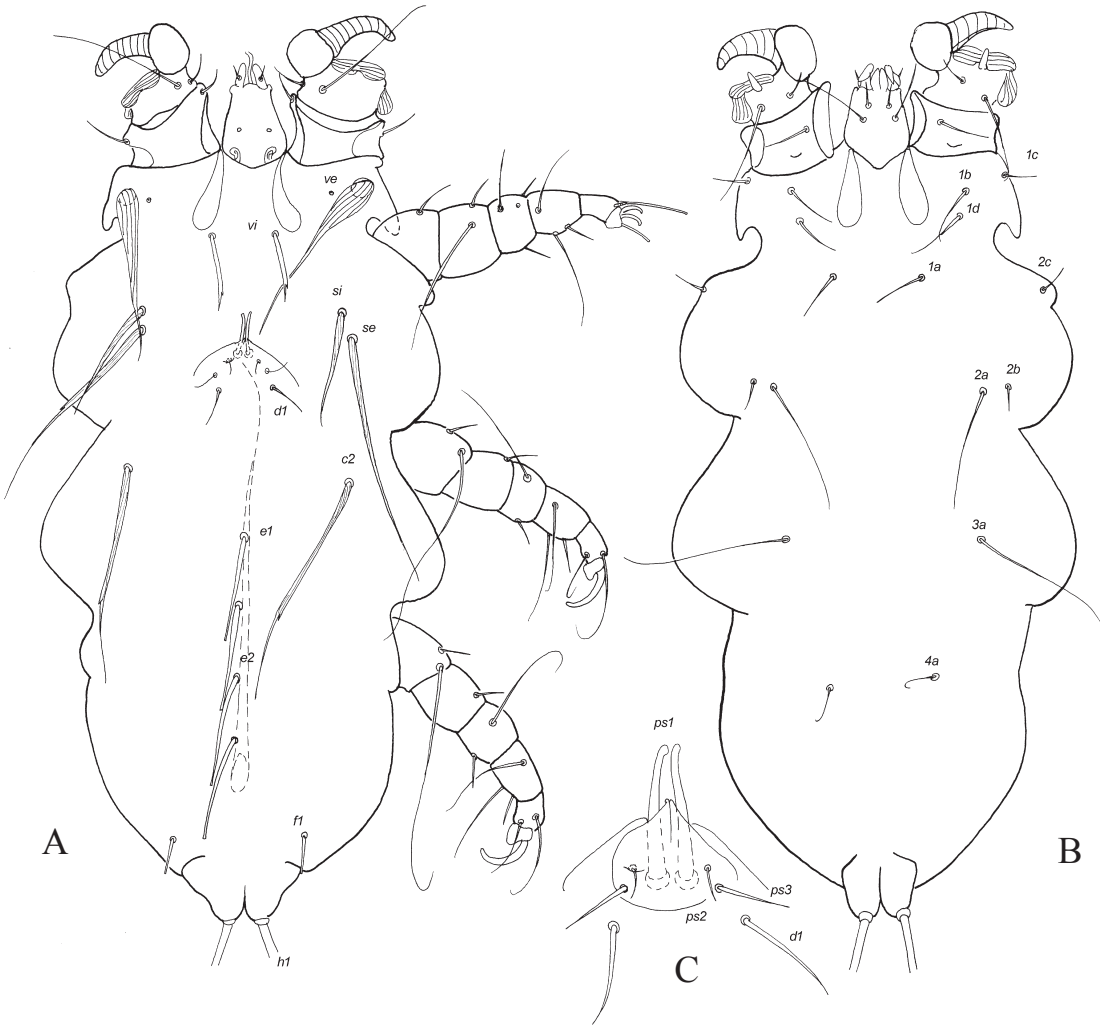


Fig. 50. *Radfordia selevinia* Bochkov, sp. nov., male: A — dorsal view, B — ventral view, C — genital shield.

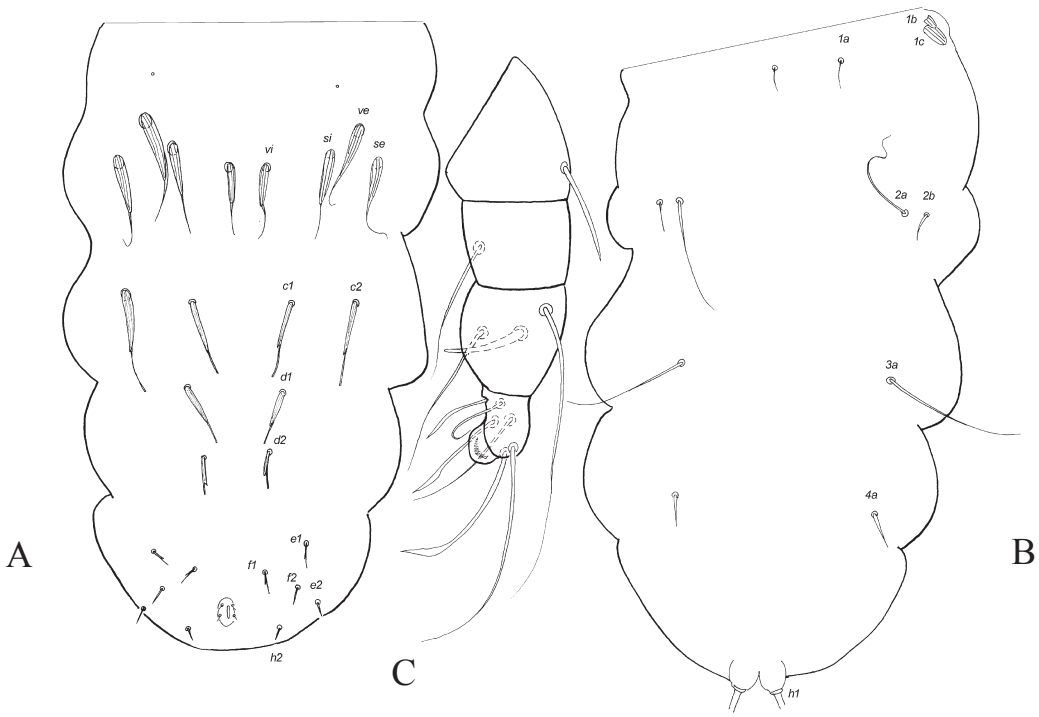


Fig. 51. *Radfordia selevinia* Bochkov, sp. nov., tritonymph: A — idiosoma in dorsal view, B — same in ventral view, C — leg IV in ventral view.

this subgenus, and the presence of one more species, *R. triton* Fain et Lukoschus, 1977 is highly probable (Bochkov and Mironov 1999; Bochkov 1999a).

Hosts. Seventeen species and one subspecies of this genus are associated with hosts of the subfamily Arvicolinae, four species parasitize hosts of the subfamily Cricetinae (Bochkov and Mironov 1998; Bochkov 1999a).

Key to species of the subgenus *Microtimyobia* Fain et Lukoschus, 1976 of the former USSR

Females

1. Setae *2a* more than 3 times longer than *2b* 2
— Setae *2a* more than 2 times shorter than *2b* .... *R. zibethicalis* (Radford, 1936)
2. Setae *e1* and *f1* thickened filiform 3
— Setae *e1* and *f1* narrow lanceolate 6
3. Subcapitular setae *n* lanceolate 4
— Subcapitular setae *n* with several teeth 5
4. Idiosoma 1.6–1.9 longer than wide. Setae *vi* 60–70 long. In female tritonymph, *4a* about 20 long, tarsi IV with 3 setae each .... *R. myopusi* Bochkov et Mironov, 1998
— Idiosoma 1.4–1.5 longer than wide. Setae *vi* 60–70 long. In female tritonymph, *4a* about 40–50 long, tarsi IV without setae ....*R. arctica* Fain et Lukoschus, 1977 (Fig. 54F)
5. Subcapitular setae *n* with 3 teeth. Idiosomal 1.6–1.9 longer than wide. Setae *vi* 5–9 wide ..... *R. hylandi* Fain et Lukoschus, 1977 and *R. lemmus* Fain et Lukoschus, 1977
— Subcapitular setae *n* with 5 teeth. Idiosoma 1.4–1.5 longer than wide. Setae *vi* 10–12 wide .... *R. arvicolae* Fain et Lukoschus, 1977
6. Setae *2b* and *2d* narrow lanceolate or thickened filiform 7
— Setae *2b* and *2d* scale-like .... *R. abramovi* Bochkov et Mironov, 1998
7. Setae *1a* about 1.5 times shorter than *2b* and *2d* 8
— Setae *1a* at least 2 times shorter than *2b* and *2d* ..... *R. alticolae* Bochkov, 1995
8. Subcapitular setae *n* with 2, 3 or 5 teeth. Setae *si* slightly wider or subequal to *se* 9
— Subcapitular setae *n* lanceolate. Setae *si* about 3 times wider than *se* ....*R. triton* Fain et Lukoschus, 1976
9. Subcapitular setae *n* with 2 teeth 10
— Subcapitular setae *n* with 3 or 5 teeth 12
10. Setae *se* 1.4–1.5 times longer than *c2*. Setae *vi* 1.2–2 times longer than *e2* 11
— Setae *se* and *c2* subequal in length. Setae *vi* and *e2* subequal in length ..... *R. rutila* Fain et Lukoschus, 1977 and *R. stekolnikovi* Bochkov et Mironov, 1998
11. Setae *vi* 2 times longer than *e2*; setae *e2* about 20 long ..... *R. cricetulus* Fain, 1973 (Fig. 54G)
— Setae *vi* 1.2 times longer than *e2*; setae *e2* about 40 long ..... *R. cricetuliphila* Bochkov, 1999
12. Subcapitular setae *n* with 3 teeth 13
— Subcapitular setae *n* with 5 teeth .... *R. rufocani* Bochkov, 1995
13. In female tritonymph, setae *4a* short filiform, not longer than *1a* ..... *R. lemnina* (Koch, 1814) (Fig. 52) and *R. clethrionomys* Fain et Lukoschus, 1977
— In female tritonymph, setae *4a* whip-like, thickened, much longer than *1a* ....*R. stenocrani* Bochkov et Mironov, 1998

Males

(Males of *R. myopusi* unknown)

1. Setae *2a* more than 3 times longer than *2b* 2
— Setae *2a* more than 2 times shorter than *2b* ..... *R. zibethicalis* (Radford, 1936) (Fig. 54D)
2. Setae *2b* 70–100 long 3
— Setae *2b* 10–20 long 6
3. Subcapitular setae *n* narrow lanceolate 4
— Subcapitular setae *n* with 2–4 teeth 5
4. Setae *vi* and *si* subequal in width. Setae *e2* 1.5 times longer than *f1* ....*R. arctica* Fain et Lukoschus, 1977
— Setae *vi* very thin, thinner than *si*. Setae *e2* about 4 times longer than *f1* ....*R. lemmus* Fain et Lukoschus, 1977
5. Subcapitular setae *n* with 2 teeth. Lateral margins of genital cone slanting, without lateral shoulders ..... *R. arvicolae* Fain et Lukoschus, 1977
— Subcapitular setae *n* with 3–4 teeth. Lateral margins of genital cone with lateral shoulders ....*R. hylandi* Fain et Lukoschus, 1977 (Fig. 54C)
6. Genital cone 4–6 times longer than wide. Apex of genital cone reaching to level of seta *vi* bases 7
— Genital cone 2–2.5 times longer than wide. Apex of genital cone far not reaching to level of seta *vi* bases 9
7. Setae *2b* and *2d* setiform 8
— Setae *2b* and *2d* scale-like ....*R. abramovi* Bochkov et Mironov, 1998
8. Setae *2b* and *2c* thickened, about 4 wide. subcapitular setae *n* filiform. Setae *si* 35–40 long ....*R. cricetuliphila* Bochkov, 1999
— Setae *2b* and *2c* not thickened, about 2 wide. subcapitular setae *n* lanceolate. Setae *si* 80 long ... . *R. triton* Fain et Lukoschus, 1976 (Fig. 54E)

9. Genital cone without triangular lateral shoulders 10
— Genital cone with almost triangular lateral sholders ..... *R. clethrionomys* Fain et Lukoschus, 1977 (Fig. 54B) and *R. rutila* Fain et Lukoschus, 1977
10. Anterior margin of genital cone attenuated 11
Anterior margin of genital cone widely rounded ..... *R. lemnina* (Koch, 1814) (Figs. 53, 54A), *R. stenocrani* Bochkov et Mironov, 1998, and *R. stekolnikovi* Bochkov et Mironov, 1998
11. Setae *1a* subequal to *2b* and *2d* .... *R. rufocani* Bochkov, 1995
— Setae *1a* about 2 times shorter than *2b* and *2d* ... . *R. alticolae* Bochkov, 1995

Species group *lemnina*

In females, setae *2a* whip-like, much longer than *2b*; setae *e1* and *f1* narrow lanceolate. In males, anterior margin of genital cone far not reaching to level of seta *vi* bases; setae *2b* much shorter than *2a*. Parasites of voles (Arvicolinae), excluding *R. cricetulus* recorded from *Cricetulus migratorius* (Cricetinae).

1. *Radfordia (Microtimyobia) lemnina* (Koch, 1841)

Figs. 52–54A

This species was described from *Microtus arvalis* from Germany (Koch 1841).

Remarks. This species includes five subspecies, *R. lemnina lemnina* from different voles, *R. lemnina micromys* Fain et Lukoschus, 1976 from *Micromys minutus* (Muridae), *R. lemnina hata* Uchikawa et al., 1997 from *Microtus montebelli* (Milne-Edwards, 1872), *R. lemnina mikado* Uchikawa et al., 1997 from *Myodes rutilus,* and *R. lemnina japonica* Uchikawa et al., 1997 from *Myodes rufocanus*, *Myodes rex, Myodes andersoni* (Thomas, 1905), and *Myodes smithii* (Thomas, 1905) from Japan (Uchikawa et al. 1997).

Hosts and distribution. This species is associated with voles of the genera *Microtus* and *Myodes*; it probably secondarily switched on *Micromys minutus* (Muridae). Mites from *Chionomys roberti* from Russia (North Caucasus) recorded by Bochkov (1995) probably do not belong to *R. lemnina* but examination of additional material is necessary. The record of *R. lemnina* on *Apodemus sylvaticus* from Czech Republic by Dusbabek and Daniel (1975) is obviously accidental.

It was recorded from *Microtus subterraneus* from Czech Republic (Dusbabek and Daniel 1975); from *Microtus majori* and *Microtus daghestanicus* from Russia (North West Caucasus) (Bochkov 1995); from *Microtus tatricus* from Poland (Haitlinger 1988); from *Microtus socialis* from Turkmenia (Bochkov 1995); from *Microtus arvalis* from England (Radford 1935), Belgium and Holland (Fain and Lukoschus 1977), Germany (Koch 1834; Poppe 1896), Rumania (Faider and Solomon 1963), Czech Republic (Dusbabek and Daniel 1975), Poland (Haitlinger 1988), Ukraine (Dubinin and Volgin 1955; Sklyar 1975; Dubinina and Sosnina 1977; Bochkov 1995), Russia (Volzhsko-Kamskiy Reservation) (Dubinin and Volgin 1995) and Karelia (Bochkov 1995); Armenia (Bochkov 1995); from *Microtus ilaeus* from Kirghizia (Chirov et al. 1997); from *Microtus agrestis* from England (Radford 1935), Holland and Belgium (Fain and Lukoschus 1977), Czech Republic (Dusbabek and Daniel 1975), Russia (Karelia, Chelyabinsk Prov., Bashkiria) (Bochkov 1995); from *Microtus middendorfi* from Russia (Yakutia) (Bochkov 1995); from *Microtus transcaspicus* from Turkmenia (Fain and Lukoschus 1977); from *Microtus fortis* from China (Fain and Lukoschus 1977); from *Microtus oeconomus* from Holland (Fain and Lukoschus 1977), Poland (Haitlinger 1988), Russia (Chelyabinsk Prov.) and Armenia (Bochkov 1995), USA (Alaska) (Fain and Lukoschus 1977); from *Microtus ochrogaster* (Wagner, 1842) from USA (Indiana) (Fain and Lukoschus 1977); from *Microtus montebelli* from Japan (Uchikawa et al. 1997); from *Myodes rutilus* from Japan (Uchikawa et al. 1997); from *Micromys minutus* (Muridae) from Holland (Fain and Lukoschus 1977) and Russia (Chelyabinsk Prov.) (Bochkov and Mironov 1998); from *Chionomys roberti* from Russia (North West Caucasus) (Bochkov and Mironov 1998).

Material examined. *Microtus majori* — 50 females, 2 males, 15 tritonymphs, RUSSIA: Krasnodar Territory, Caucasus Reservation, near Guseripl' village, Abago Mountain, July 1991, coll. A. Bochkov.

Microtus daghestanicus — 30 females, 24 males, 20 tritonymphs, same data as for previous host; *Microtus subterraneus* — 1 female, UKRAINE: Vinnitsy Prov., Bilki village, 9 July 1957, coll. G. Gushcha.

Microtus socialis — 1 female, UKRAINE: Askaniya-Nova, 24 July 1984, coll. S. Zabludovskaya; same host — 1 female, 1 male, TURKMENIA: ?Amamly, 6 June 1940, coll. unknown.

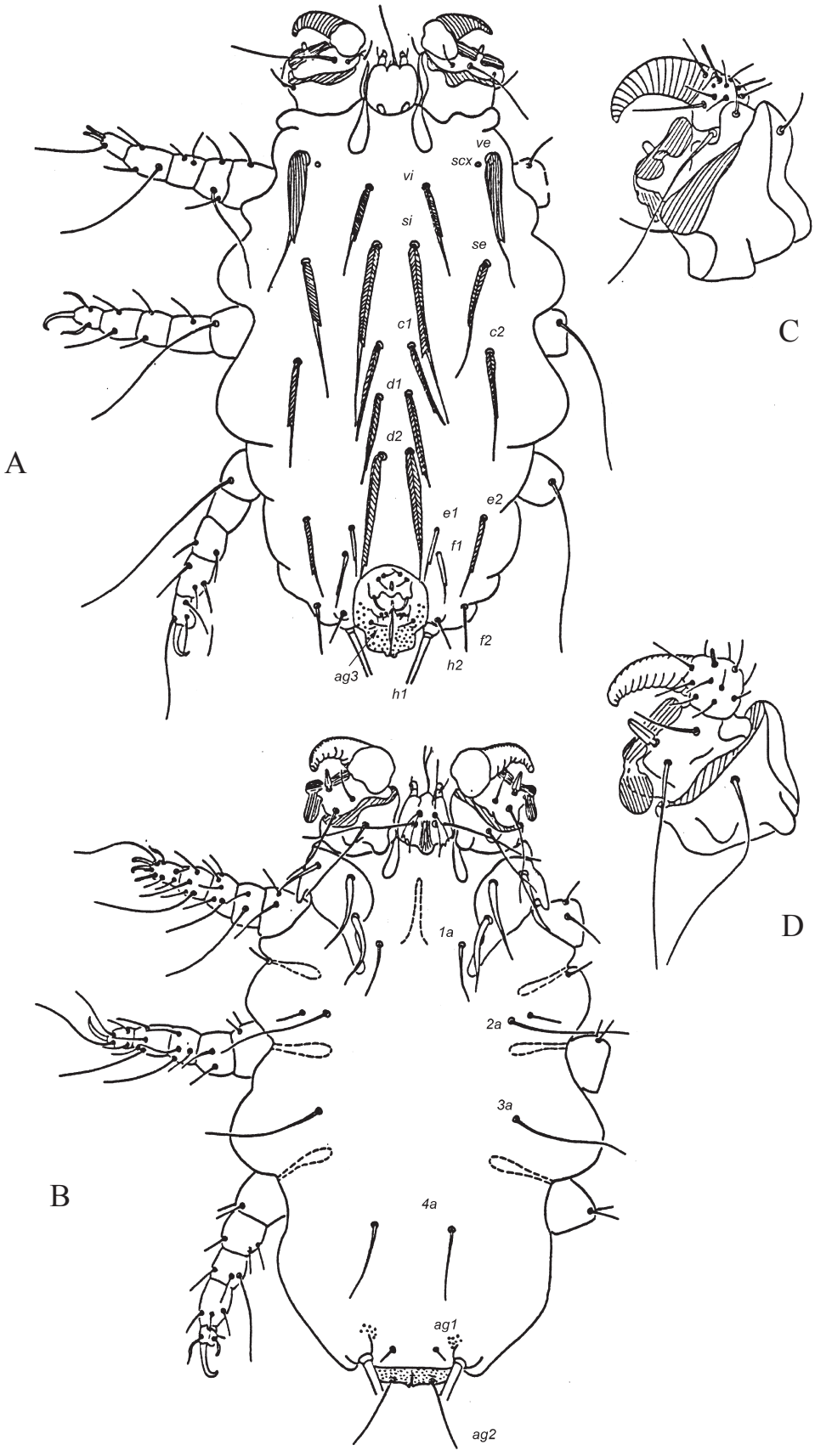


Fig. 52. *Radfordia lemnina lemnina* (Koch, 1841), female: A — dorsal view, B — ventral view, C — leg I in dorsal view, D — same in ventral view.

Microtus oeconomus — 9 females, 9 males, RUSSIA: Chelyabinsk Prov, near Shuguhyak Lake, 20 June 1975, coll. E. Dubinina; same host — 10 females, 2 males, ARMENIA: Razdan Distr., Takerli village, 24 June 1988, coll. E. Dubinina.

Microtus arvalis — 9 females, 5 males, UKRAINE: Zakarpatie Prov., Petros Mountain, 27 August 1959, coll. S. Vysotskaya; same host — 25 females, 25 males, 14 tritonymphs, UKRAINE: Crimea, July 1961, coll. E. Sosnina; same host — 6 females, 2 males, RUSSIA: Karelia, Petrozavodsk, 31 May 1956, coll. R. Albova; same host — 9 females, RUSSIA: Volzhsko-Kamskiy Reservation, 25 May 1956, coll. unknown; same host 1 — male, ARMENIA: Razdan Distr., Takerli village, 27 June 1988, coll. E. Dubinina.

Microtus ilaeus — 3 females, KIRGHIZIA: Issyk-Kul' Lake, other data unknown.

Microtus agrestis — 22 females, 7 males, RUSSIA: Karelia, Kalevala Distr., Krivoy Porog village, 20 August 1956, coll. R. Albova; same host — 1 female, RUSSIA: Chelyabinsk Prov., near Shugunyak Lake, 8 June 1975, coll. E. Dubinina; same host — 1 female, RUSSIA: Bashkiria, Kukshik Mountain, 2 July 1975, coll. E. Dubinina.

Microtus middendorfi — 1 female, 2 males, RUSSIA: Yakutia, head of Gadaralon River, 24 June 1956, coll. Kapitonov.

Micromys minutus — 3 females, RUSSIA: Chelyabinsk Prov., near Shugunyak Lake, 14 June 1975, coll. E. Dubinina.

Chionomys roberti — 10 females, 3 males, 3 tritonymphs, RUSSIA: Krasnodar Territory, Caucasus Reservation, near Guseripl' village, Abago Mountain, July 1991, coll. A. Bochkov.

2. *Radfordia (Microtimyobia) stekolnikovi* Bochkov et Mironov, 1998

This species was described from *Chionomys nivalis* from Russia (North West Caucasus) (Bochkov and Mironov 1998).

Hosts and distribution. This species is associated with voles of the genus *Chionomys*. It was recorded from *Chionomys nivalis* and *Chionomys gud* from North West Caucasus (Bochkov and Mironov 1998).

Material examined. *Chionomys nivalis* — tritonymph holotype (ZISP T-My-10), 1 female paratype, RUSSIA: Krasnodar Territory, Caucasus Reservation, near Guzeripl' village, Abago Mountain, 25 July 1991, coll. A. Bochkov and A. Stekolnikov; same host — 4 female and 9 tritonymph paratypes, same data, 18 July 1991; same host — 4 female, 4 male, and 1 tritonymph paratypes, same data, 21 July 1991; same host — 1 female and 4 tritonymph paratypes, same data, 24 July 1991.

3. *Radfordia (Microtimyobia) stenocrani* Bochkov et Mironov, 1998

This species was described from *Microtus gregalis* from Russia (Chelyabinsk Prov.) (Bochkov and Mironov 1998).

Hosts and distribution. This species is known only from the type host from Russia (Chelyabinsk Prov.) and Kirghizia (Bochkov and Mironov 1998).

Material examined. *Microtus gregalis* — tritonymph holotype (ZISP T-My-11), 4 female, 1 male, and 7 tritonymph paratypes, RUSSIA: Chelyabinsk Prov., near Shugunyak Lake, 17 June 1976, coll. E. Dubinina; same host — 1 female, 1 male, 1 tritonymph, KIRGHIZIA: Kungey Ala-Too mountain ridge, 25 August 1973, coll. E. Dubinina.

4. *Radfordia (Microtimyobia) clethrionomys* Fain et Lukoschus, 1977

Fig. 54B

This species was described from *Myodes glareolus* from Belgium as subspecies of *R. lemnina* (Fain and Lukoschus 1977) and raised to the species rank by Bochkov (1995).

Hosts and distribution. This species is associated with Palaearctic voles of the genus *Myodes* (Bochkov and Mironov 1998). It was recorded from *Myodes glareolus* from Italy, Holland, and Belgium (Fain and Lukoschus 1977), Bulgaria (Beron 1973), Ukraine and various parts of Russia (Bochkov 1995); from *Myodes centralis* from Kazakhstan and Kirghizia (Bochkov 1995; Chirov et al. 1997).

Material examined. *Myodes glareolus* — 1 female and 1 male paratypes (ZISP), BELGIUM: Pescasseroli, 16 October 1972, coll. F. Lukoschus; same host — 28 females, 18 males, 15 tritonymphs, RUSSIA: Karelia, Sredniy Is., 24–29 July 1979, coll. E. Dubinina; same host — 4 females, 4 males, RUSSIA: Kaliningrad Prov., 12 May 1979, coll. E. Dubinina; same host — 1 female, 1 male, RUSSIA: vicinity of Saint-Petersburg, 3 April 1981, coll. E. Dubinina; same host — 28 females, 29 males, 26 tritonymphs, RUSSIA: Pskov Prov., Sebezh Distr., near Anninskoe Lake, May 1991, coll. A. Bochkov; same host — 4 females, RUSSIA: Ivanovo Prov., 23 June 1953, coll. unknown; same host — 10 females, 13 males, RUSSIA: Vol-

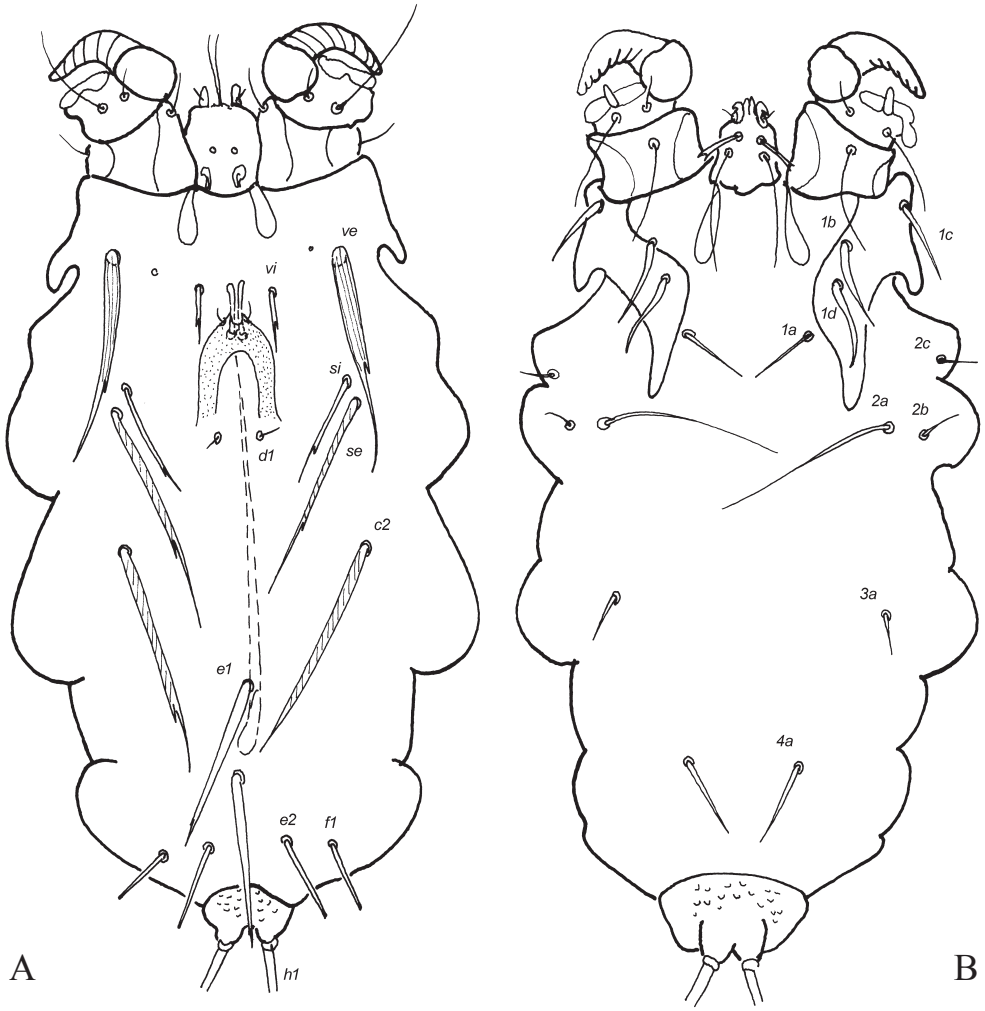


Fig. 53. *Radfordia lemnina lemnina* (Koch, 1841), A — dorsal view, B — ventral view.

zhsko-Kamskiy Reservation, 4 October 1968, coll. E. Dubinina; same host — 27 females, 18 males, RUSSIA: Chelyabinsk Prov., near Shugunyak Lake, June 1975, coll. E. Dubinina; same host — 2 females, RUSSIA: Bashkiria, Kukshik Mountain, 3 July 1975, coll. E. Dubinina; same host — 24 females, 18 males, 20 tritonymphs, UKRAINE: Kiev Prov., 1957, coll. G. Gushcha; same host — 22 females, 23 males, 8 tritonymphs, UKRAINE: Zakarpatie Prov., Polonina Rovnaya Mountain, July 1959, coll. S. Vysotskaya.

Myodes centralis — 7 females, 3 males, 4 tritonymphs, KAZAKHSTAN: vicinity of Bol'shoe Alma-Atinskoe Lake, August 1981, coll. E. Dubinina; same host — 8 females, 5 males, 7 tritonymphs, KIRGHIZIA: Terskey Ala-Tau Mountain ridge, Chon-Kyzyl-Su Canion, 9 July 1953, coll. A. Petrova.

5. *Radfordia (Microtimyobia) rutila* Fain et Lukoschus, 1977

This species was described from *Myodes rutilus* from Sweden as subspecies of *R. lemnina* (Fain and Lukoschus 1977) and raised to species rank by Bochkov and Mironov (1998).

Hosts and distribution. This species is known only from the type host from Sweden (Fain and Lukoschus 1977) and Russia (Chelyabinsk Prov.) (Bochkov and Mironov 1998).

Material examined. *Myodes rutilus* — 1 female and 1 male paratypes (ZISP), SWEDEN: Bjorkliden, 11 August 1966, coll. Edler; same host — 14 females, 2 tritonymphs, RUSSIA: Chelyabinsk Prov., near Shugunyak Lake, 19 June 1975, coll. E. Dubinina.

6. *Radfordia (Microtimyobia) alticolae* Bochkov, 1995

This species was described from *Alticola argentatus* from Kirghizia (Bochkov 1995).

Hosts and distribution. This species is known from the type host from Kirghizia. The record of *R. lemnina* from *Alticola roylei* (Gray, 1842) from Nepal by Dusbabek and Daniel (1975) should be referred to *R. alticolae* based on measurements provided in the referred work.

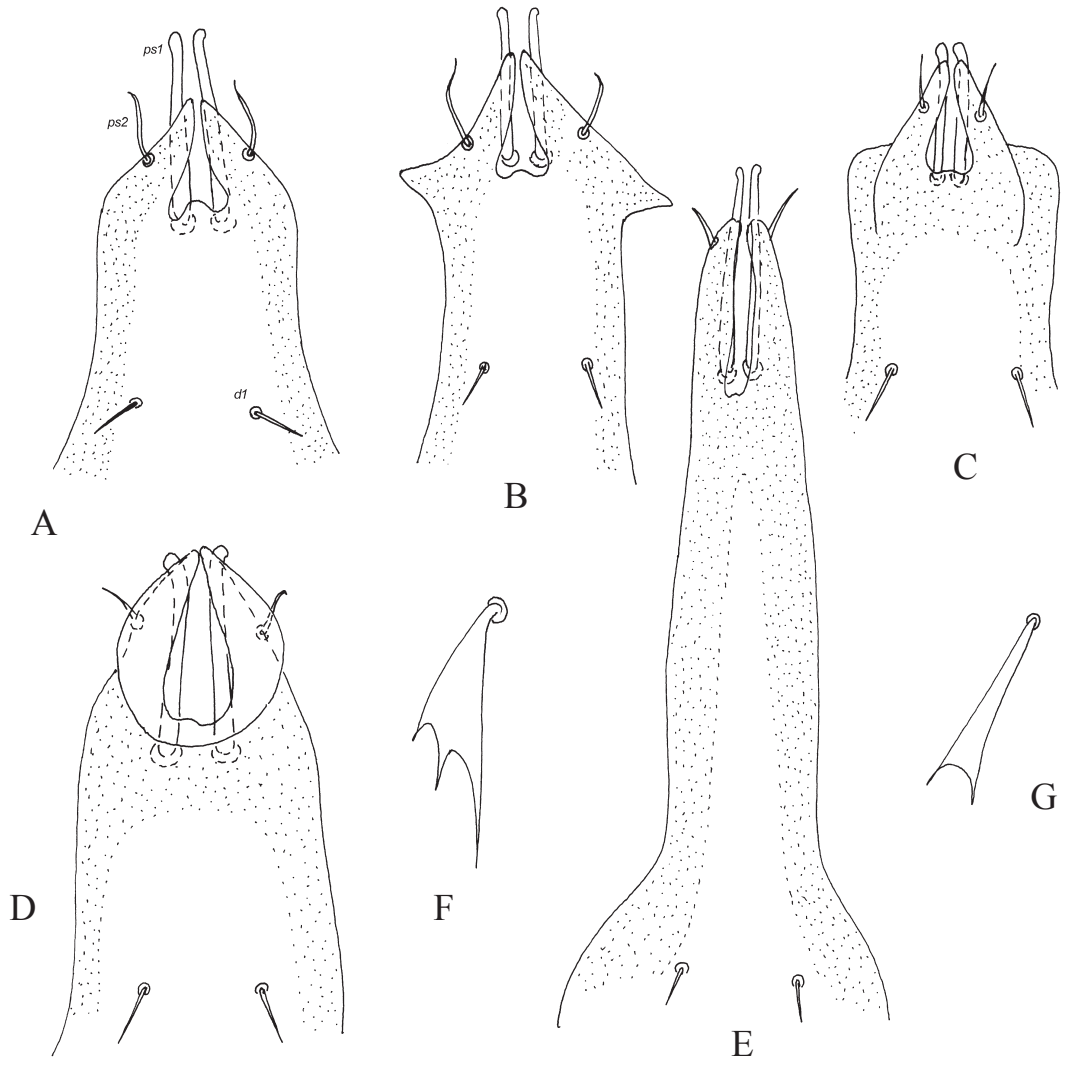


Fig. 54. *Radfordia* (*Microtimyobia*) spp., details: male genital shield (A–E), A — *Radfordia lemnina lemnina* (Koch, 1841), B — *Radfordia clethrionomys* Fain et Lukoschus, 1977, C — *Radfordia hylandi* Fain et Lukoschus, 1977, D — *Radfordia zibethicalis* (Radford, 1938), E — *Radfordia triton* Fain et Lukoschus, 1976; subcapitular setae *n* of females (F, G), F — *Radfordia arvicolae* Fain et Lukoschus, 1977, G — *Radfordia cricetulus* Fain, 1973.

Material examined. *Alticola argentatus* — male holotype (ZISP T-My-3), 7 female and 1 male paratypes, KIRGHIZIA: near Chatyr-Kul' Lake, 18 July 1990, coll. A. Bochkov; same host — 1 male paratype, KIRGHIZIA: Bormoldoy Mountain ridge, 22 August 1992, coll. P. Chirov.

7. *Radfordia (Microtimyobia) rufocani* Bochkov, 1995

This species was described from *Myodes rufocanus* from Russia (Bashkiria) (Bochkov 1995).

Hosts and distribution. This species is known only from the type host and locality.

Material examined. *Myodes rufocanus* — male holotype (ZISP T-My-8), 52 female, 26 male, and 3 tritonymph paratypes, RUSSIA: Bashkiria, Kukshik Mountain, 2–17 July 1975, coll. E. Dubinina.

8. *Radfordia (Microtimyobia) cricetulus* Fain, 1973

Fig. 54G

This species was described from *Cricetulus migratorius* (Cricetinae) from Iran (Fain 1973, 1975).

Hosts and distribution. This species is known from the type host from Iran (Fain 1973, 1975), Ukraine, Armenia, Kirghizia, and Tadzhikistan (Bochkov 1995; Chirov et al. 1997). The record of a single female specimen of this species on an alcohol preserved example of *Ochotona rufescens* (Gray, 1842) (Lagomorpha: Ochotonidae) from Pakistan is obviously accidental. Even the authors of this record, Fain and Hyland (1980) expressed the same opinion (p. 230: Possible this host was accidentally infested …).

Material examined. *Cricetulus migratorius* — 49 females, 20 males, 3 tritonymphs, UKRAINE: Poltava Distr., Zazhitochnoe village, 22 May 1968, coll. S. Sklyar; same host — 6 females, UKRAINE: Donetskaya step' Reservation, 5 November 1968, coll. S. Sklyar; same host — 8 females, 3 males, UKRAINE: Khomutovskaya step', 16 June 1968, coll. S. Sklyar; same host — 1 female, UKRAINE: Alekhino village, 18 May 1967, coll. unknown; same host — 3 females, 1 male, 2 tritonymphs, ARMENIA: Erevan, 5 June 1989, coll. E. Dubinina; same host — 4 females, 2 males, 4 tritonymphs, KIRGHIZIA: Osh Prov., 9 June 1974, coll. S. Rybin; same host — 2 males, KIRGHIZIA: Aksay Valley, 14 July 1990, coll. A. Bochkov; same host — 1 female, 1 male, TADZHIKISTAN: Ziddy, 7 August 1953, coll. E. Sosnina.

Species group *hylandi*

In females, setae *2a* whip-like, much longer than *2b*; setae *e1* and *f1* slightly thickened filiform. In males, anterior margin of genital cone far not reaching to level of seta *vi* bases; setae *2b* much longer than *2a*. Parasites of voles (Arvicolinae).

9. *Radfordia (Microtimyobia) hylandi* Fain et Lukoschus, 1977

Fig. 54C

This species was described from *Microtus pennsylvanicus* (Ord, 1815) from USA (Patience Is.) (Fain and Lukoschus 1977).

Hosts and distribution. This species is associated with Nearctic arvicolines of the genera *Microtus* and *Myodes* (Fain and Lukoschus 1977). It was recorded by Fain and Lukoschus (1977) from *Microtus pennsylvanicus* from various localities in USA and Canada, from *Microtus mexicanus* (Saussure, 1861) from USA (Texas), from *Microtus pinetorum* (Le Conte, 1830) from USA (Indiana), and from *Myodes gapperi* (Vigors, 1830) from USA (Rhode Island) and Canada (St. Zenon). The fossil record of this species is known from the extinct subspecies *Microtus miurus* Osgood, 1901 (spp. *egorovi*) from Russia (Yakutia) (Dubinina and Bochkov 1996).

Material examined. *Microtus pennsylvanicus* — 1 female and 1 male paratypes (ZISP), USA: Michigan, Roberts Lake, 18 June 1967, coll. Wrenn.

†*Microtus miuris egorovi* (Pleistocene, about 35 thousand years) — 8 females, 3 males, 1 tritonymph, RUSSIA: Yakutia, basin of Indigirka River, Surovy Spring (tributary of Dyurin'-Yuryakh River), summer 1968, coll. G. Feigin.

10. *Radfordia (Microtimyobia) lemmus* Fain et Lukoschus, 1977

This species was described from *Lemmus lemmus* from Sweden as subspecies of *R. arctica* (Fain and Lukoschus 1977) and raised to species status by Bochkov (1995).

Hosts and distribution. This species is associated with voles of the genus *Lemmus* (Bochkov 1995). It was recorded from *Lemmus lemmus* from Sweden (Fain and Lukoschus 1977) and from *Lemmus sibiricus* from Russia (Taymyr Peninsula) (Bochkov 1995).

Material examined. *Lemmus lemmus* — 1 female and 1 male paratypes (ZISP), SWEDEN: Sitojaure, Lulelappmark, 16 June 1966, coll. Forstroem.

Lemmus sibiricus — 60 females, 20 males, 10 tritonymphs, RUSSIA: Taymyr peninsula, Tareya-Pyasina River, June-July 1976, coll. E. Dubinina.

11. *Radfordia (Microtimyobia) myopusi* Bochkov et Mironov, 1998

This species was described from *Myopus schisticolor* from Russia (Amur Prov.) (Bochkov and Mironov 1998).

Hosts and distribution. This species is known only from the type host and locality.

Material examined. *Myopus schisticolor* — tritonymph holotype (ZISP T-My-21), 3 female and 1 tritonymph paratypes, RUSSIA: Amur Prov., Yablonevy Mountain ridge, head of Malaya River, 3 July 1914, coll. Dorogostayskiy.

12. *Radfordia (Microtimyobia) arctica* Fain et Lukoschus, 1977

Fig. 54F

This species was described from *Dicrostonyx groenlandicus* (Traill, 1823) from Greenland (Fain and Lukoschus 1977).

Hosts and distribution. This species is associated with voles of the genus *Dicrostonyx* (Bochkov 1995). It was recorded from *Dicrostonyx groenlandicus* from Greenland (Fain and Lukoschus 1977) and *Dicrostonyx torquatus* from Russia (Taymyr) (Bochkov 1995) and Canada (Bathurst Is.) (Gill and Strandtmann 1977).

Material examined. *Dicrostonyx groenlandicus* — 1 female paratype (ZISP), GREENLAND: Jamesoland, 1932, coll. unknown.

Dicrostonyx torquatus — 5 females, 1 male, 2 tritonymphs, RUSSIA: Taymyr, Tareya-Pyasina River, June-July 1976, coll. E. Dubinina.

13. *Radfordia (Microtimyobia) arvicolae* Fain et Lukoschus, 1977

This species was described from *Arvicola amphibius* from Belgium (holotype), Holland, and France (Fain and Lukoschus 1977)

Hosts and distribution. This species is known only from the type host from France, Holland, Belgium (Fain and Lukoschus 1977), Poland (Haitlinger 1988), and Russia (various localities) (Bochkov 1995).

Material examined. *Arvicola amphibius* — 1 female and 1 male paratypes (ZISP), HOLLAND: Hamert, 24 July 1972, coll. F. Lukoschus; same host — 4 females, 3 males, RUSSIA: Chuvashiya, Vetluga River, 22 August 1965, coll. M. Tikhvinskaya; same host — 34 females, 9 males, RUSSIA: Tatarstan, Kovalevskoe Lake, Stolbishchi, 30 May 1966, coll. M. Tikhvinskaya; same host — 8 females, 7 males, RUSSIA: Chelyabinsk Prov., near Shugunyak Lake, June 1975, coll. E. Dubinina.

Species group *zibethicalis*

In females, setae *2a* short, *2b* whip-like; setae *e1* and *f1* slightly thickened filiform or lanceolate. In males, anterior margin of genital cone far not reaching to level of seta *vi* bases; setae *2b* short, much shorter than *2a*. Parasites of Nearctic voles (Arvicolinae).

14. *Radfordia (Microtimyobia) zibethicalis* (Radford, 1938)

This species was described from *Ondatra zibethicus* from England (Radford 1936).

Hosts and distribution. This species is known only from the type host from England (Radford 1936), Switzerland, France, Holland, and Belgium (Fain and Lukoschus 1977), Russia (Irkutsk Prov.) (Bochkov 1995), USA (various parts) (Radford 1954; Fain and Lukoschus 1977; Whitaker and Maser 1985).

Material examined. *Ondatra zibethicus* — 1 female, RUSSIA: Irkutsk Prov., other data unknown.

Species group *triton*

In females, setae *2a* whip-like, much longer than *2b*; setae *e1* and *f1* narrow lanceolate. In males, anterior margin of genital cone reaching to level of seta *vi* bases; setae *2b* short, much shorter than *2a*. Parasites of Old World hamsters (Cricetinae).

15. *Radfordia (Microtimyobia) triton* Fain et Lukoschus, 1976

This species was described from *Tscherskia triton* from South Korea (Fain and Lukoschus 1976, 1977).

Hosts and distribution. This species is known only from the type host and locality. The host of this species occurs on the Russian Far East and, therefore, the record of *R. triton* at this territory is highly probable.

Material examined. *Tscherskia triton* — 1 female and 1 male paratypes (IRSNB), SOUTH KOREA: Yongpyong, 13 April 1954, coll. unknown.

16. *Radfordia (Microtimyobia) abramovi* Bochkov et Mironov, 1998

This species was described from *Phodopus roborovskii* from Russia (Tuva) (Bochkov and Mironov 1998).

Hosts and distribution. This species is associated with hamsters of the genus *Phodopus*. It was recorded from *Phodopus roborovskii* from Russia (Tuva) (Bochkov and Mironov 1998) and from *Phodopus campbelli* from Mongolia (new host).

Material examined. *Phodopus roborovskii* — female holotype (ZISP T-My-20), 3 female, 3 male and 3 tritonymph paratypes, RUSSIA: South Tuva, near Tere Khol' Lake, 13 June 1995, coll. A. Abramov.

Phodopus campbelli — 1 male, MONGOLIA: Namdeyge-Khole Hole, 25 January 1908, coll. P. Kozlov.

17. *Radfordia (Microtimyobia) cricetuliphila* Bochkov, 1999

This species was described from *Cricetulus barabensis* from Russia (Buryatia) (Bochkov 1999a).

Host and distribution. This species is known only from the type host and locality.

Material examined. *Cricetulus barabensis* — male holotype (ZISP T-My-30), 3 female, 3 male, and 12 tritonymph paratypes, RUSSIA: Buryatia, Selenga Distr., Western bank of Gusinoe Lake, 4 km W. Murgoy, September 1998, coll. A. Abramov.

DISCUSSION

Totally, 46 species of rodent associated myobiids belonging to the four genera, *Austromyobia* (2 species), *Cryptomyobia* (10 species), *Myobia* (7 species), and *Radfordia* (27 species) were recorded in the fauna of the former USSR. Seventy one rodent species were recorded as hosts of myobiids. In the examined region, myobiids are absent on representatives of the suborders Castorimorpha and Hystricomorpha (see Table 3 for distribution of myobiid mites on rodent families). The absence

of myobiids on Castoridae could be explained by the semiaquatic mode of life of these rodents. On the other hand, myobiid mites are presented on some voles, which are semiaquatic too, for example, *Ondatra zibethicus* or *Chionomys roberti*. Thus, it is highly probable what these mites were initially absent on a common ancestor of castorids.

The suborder Hystricomorpha is represented in the examined region by two species only, *Hystrix indica* Kerr, 1792 and *Myocastor coypus* (Molina, 1782). In the first species, the dorsal hairs have largely undergone strong modification into spines. Such hair modification is probably the main reason of the myobiid absence. For example, among the family Erinaceidae, these mites are present only on hosts of the subfamily Galericinae, those hairs are not modified (Bochkov and OConnor 2006). The absence of myobiids on the nutria is more difficult to explain as in the case with castorids. It is possible that these mites were initially absent on the ancestor of Myocastoridae.

Among Sciuromorpha, myobiids are recorded only on representatives of the family Gliridae (mites of the subgenus *Graphiurobia* of the genus *Radfordia*). Mites of this subgenus are closely related to the subgenera *Microtimyobia* and *Hesperomyobia* associated with Cricetidae (Bochkov 1999b). Myobiid mites are widely distributed on glirids of all subfamilies. Their parasitism on hosts of this family could be explained by the secondary transfer from cricetids at the early stage of the evolution of glirids. The family Gliridae, however, is one of the most ancient rodent families and its origin is dated by the Late Paleocene — Early Eocene (Hartenberger 1998), whereas the family Cricetidae, probably, originated not earlier than the Late Pliocene (McKenna and Bell 1997).

Thus, the two alternative hypotheses explaining parasitism of myobiids on Gliridae may be suggested. According to the first hypothesis, myobiids switched to cricetids from glirids at the early stage of the evolution of cricetids or even earlier, from the common ancestor of cricetids and murids. The paleontological data give us evidence that the Miocene glirids and myomorph rodents had the similar mode of life (Hartenberger 1994). This hypothesis, however, does not explain, why myobiid mites are absent on other Sciurognatha, which should probably inherit myobiids from a common ancestor with glirids.

The second hypothesis suggests that the family Gliridae belongs to the myomorph rodents or represents the separate evolutionary branch of sciurognaths. Some researchers include Gliridae into the suborder Myomorpha (Chaline and Mein 1979; Gambaryan 1983) or consider dormouses as a separate infraorder (Yakhontov and Potapova 1991) or suborder (Pavlinov and Rossolimo 1987), although most authors adhere to the alternative point of view and include glirids in Sciurognatha (see Carleton and Musser 2005).

The suborder Myomorpha is the most numerous among rodents and in the fauna of the former USSR and harbors myobiids of three genera. Mites of the subgenus *Dipodomyobia* (genus *Cryptomyobia*) parasitize hosts of the family Dipodidae (Dipodoidea). The minutely reconstructed phylogenies of these hosts and corresponding myobiids allow comparing their cladogeneses and showing strong similarity of their patterns (Bochkov 2001). Among host of this family, myobiids for unknown reasons are evidently absent on representatives of the genus *Sicista* (Sicistinae). It is possible what myobiids just did not colonize the ancestor of this subfamily (missing of the boat). On hosts of the superfamily Muroidea, the second superfamily of the myomorph rodents, myobiids are absent only on representatives of the two families, Calomyscidae and Spalacidae. Among hosts of the family Muridae, myobiids present on all host genera, excluding *Nesokia*. It is also probable what myobiids are absent on *Nesokia indica* only in studied part of the host ranges or not enough material was examined (49 specimens).

Finally, myobiids are, probably, extinct on some cricetids with the subterranean mode of life, such as species of the genus *Ellobius* or *Prometheomys schaposchnikovi*. Their absence on species of the genera *Lagurus* and *Eulagurus* is, however, enigmatic and as in the case with *Sicista*, I believe what it is result of the "missing of the boat".

Thus, more than 60% of potential myobiid hosts occurring in the fauna of the former USSR were examined and host-parasite associations of these mites and rodents of the examined region aremore or less accurate established. I assume what these mites could be recorded additionally on 46 rodent species, which are potential hosts for myobiids in the studied region. Most of these hosts are rare or poorly represented in domestic collections.

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Table 1

Myobiid mites (Myobiidae) of the fauna of the former USSR associated with rodents (Rodentia)

Mite species	*Host species*	Host family	Region
Austromyobia Lawrence, 1954			
Austromyobia merioni (Bochkov, Dubinina et Chirov, 1990)	*Meriones tamariscinus*	Muridae	Asia
“	*Meriones meridianus*	Muridae	Asia
“	*Meriones libycus*	Muridae	Asia
“	*Meriones unguiculatus*	Muridae	Asia
Austromyobia dubinini (Bochkov, Dubinina et Chirov, 1990)	*Meriones persicus*	Muridae	Asia
“	*Meriones zarudnyi*	Muridae	Asia
Cryptomyobia Radford, 1954			
Cryptomyobia allactaga (Fain et Lukoschus, 1979)	*Allactaga sibirica*	Dipodidae	Asia
Cryptomyobia majori (Bochkov, 1997)	*Allactaga major*	Dipodidae	Europe
Cryptomyobia paralactaga (Bochkov, 1997)	*Allactaga williamsi*	Dipodidae	Asia
Cryptomyobia allactodipi (Bochkov, 1997)	*Allactodipus bobrinskii*	Dipodidae	Asia
Cryptomyobia pygeretmusi (Bochkov, 1997)	*Pygeretmus platyurus*	Dipodidae	Asia
“	*Pygeretmus shitkovi*	Dipodidae	Asia
Cryptomyobia alactaguli (Bochkov, 1997)	*Pygeretmus pumilio*	Dipodidae	Asia
Cryptomyobia dipi (Bochkov, 1997)	*Dipus sagitta*	Dipodidae	Asia
Cryptomyobia stylodipi (Bochkov, 1997)	*Stylodipus telum*	Dipodidae	Asia
Cryptomyobia paradipi (Bochkov, 1997)	*Paradipus ctenodactylus*	Dipodidae	Asia
Cryptomyobia baranovae (Bochkov, 1997)	*Salpingotus crassicauda*	Dipodidae	Asia
Myobia von Heyden, 1826			
Myobia murismusculi (Schrank, 1781)	*Mus musculus*	Muridae	Cosmopolite
“	*Apodemus sylvaticus*	Muridae	Europe
“	*Apodemus uralensis*	Muridae	Europe
“	*Apodemus ponticus*	Muridae	Europe
“	*Apodemus witherbyi*	Muridae	Europe
“	*Apodemus flavicollis*	Muridae	Europe
Myobia multivaga Poppe, 1808	*Apodemus sylvaticus*	Muridae	Europe
“	*Apodemus uralensis*	Muridae	Europe
“	*Apodemus ponticus*	Muridae	Europe
“	*Apodemus witherbyi*	Muridae	Europe
“	*Apodemus flavicollis*	Muridae	Europe
“	*Mus musculus*	Muridae	Europe
Myobia nodae Matuzaki, 1965	*Apodemus speciosus*	Muridae	Asia
Myobia kobayashii Uchikawa et Mizushima, 1975	*Apodemus peninsulae*	Muridae	Asia
Myobia annae Haitlinger, 1987	*Apodemus mystacinus*	Muridae	Euroasia
Myobia agraria Gorissen et Lukoschus, 1982	*Apodemus agrarius*	Muridae	Eurasia
Myobia micromydis Lukoschus et Driessen, 1970	*Micromys minutus*	Muridae	Eurasia

Radfordia Ewing, 1938			
Radfordia s.str.			
Radfordia ensifera (Poppe, 1896)	*Rattus norvegicus*	Muridae	Cosmopolite
“	*Rattus rattus*	Muridae	Cosmopolite
“	*Rattus pyctoris*	Muridae	Asia
“	*Rattus tanezumi*	Muridae	Asia
“	*Rattus tiomanicus*	Muridae	Asia
Radfordia lancearia (Poppe, 1909)	*Apodemus sylvaticus*	Muridae	Europe
“	*Apodemus agrarius*	Muridae	Europe
Radfordia mironovi Bochkov, 1997	*Apodemus flavicollis*	Muridae	Eurasia
Radfordia affinis (Poppe, 1896)	*Mus musculus*	Muridae	Cosmopolite
“	*Mus booduga*	Muridae	Asia
“	*Apodemus sylvaticus*	Muridae	Europe
Radfordia (*Graphiurobia*) Fain, 1972			
Radfordia oudemansi (Poppe, 1909)	*Muscardinus avellanarius*	Gliridae	Europe
Radfordia dryomys Fain et Lukoschus, 1973	*Dryomys nitedula*	Gliridae	Eurasia
Radfordia eliomys Fain et Lukoschus, 1973	*Eliomys quercinus*	Gliridae	Europe, Africa
Radfordia gliricola Vesmanis et Lukoschus, 1978	*Glis glis*	Gliridae	Eurasia
Radfordia myomimusi Bochkov, 1994	*Myomimus personatus*	Gliridae	Asia
Radfordia selevinia Bochkov sp. nov.	*Selevinia betpakdalensis*	Gliridae	Asia
Radfordia (*Microtimyobia*) Fain et Lukoschus, 1976			
Radfordia lemnina (Koch, 1841)	*Microtus arvalis*	Cricetidae	Eurasia
“	*Microtus agrestis*	Cricetidae	Eurasia
“	*Microtus subterraneus*	Cricetidae	Europe
“	*Microtus tatricus*	Cricetidae	Europe
“	*Microtus majori*	Cricetidae	Europe
“	*Microtus daghestanicus*	Cricetidae	Europe
“	*Microtus socialis*	Cricetidae	Asia
“	*Microtus oeconomus*	Cricetidae	Europe
“	*Microtus ilaeus*	Cricetidae	Europe
“	*Microtus middendorfii*	Cricetidae	Asia
“	*Microtus fortis*	Cricetidae	Asia
“	*Microtus transcaspicus*	Cricetidae	Asia
“	*Microtus montebelli*	Cricetidae	Asia
“	*Microtus ochrogaster*	Cricetidae	North America
“	*Myodes rutilus*		
“	*Myodes rex*	Cricetidae	Asia
“	*Myodes andersoni*	Cricetidae	Asia
“	*Myodes smithii*	Cricetidae	Asia
!“	*Chionomys roberti*	Cricetidae	Europe
“	*Micromys minutus*	Muridae	Europe
Radfordia stenocrani Bochkov et Mironov, 1988	*Microtus gregalis*	Cricetidae	Eurasia
Radfordia stekolnikovi Bochkov et Mironov, 1998	*Chionomys nivalis*	Cricetidae	Europe
“	*Chionomys gud*	Cricetidae	Europe
Radfordia clethrionomys Fain et Lukoschus, 1977	*Myodes glareolus*	Cricetidae	Europe
“	*Myodes centralis*	Cricetidae	Asia
Radfordia rutila Fain et Lukoschus, 1977	*Myodes rutilus*	Cricetidae	Europe
Radfordia rufocani Bochkov, 1995	*Myodes rufocanus*	Cricetidae	Asia
Radfordia alticolae Bochkov, 1995	*Alticola argentatus*	Cricetidae	Asia

Radfordia alticolae	*Alticola roylei*	Cricetidae	Asia
Radfordia cricetulus Fain, 1973	*Cricetulus migratorius*	Cricetidae	Asia
“	*? Ochotona rufescens*	Leporidae	Asia
Radfordia hylandi Fain et Lukoschus, 1977	*Microtus pennsylvanicus*	Cricetidae	North America
“	*Microtus mexicanus*	Cricetidae	North America
“	*Microtus pinetorum*	Cricetidae	North America
“	*Microtus miurus egorovi* (extinct subspecies)	Cricetidae	Asia
“	*Myodes gapperi*	Cricetidae	North America
Radfordia arvicolae Fain et Lukoschus, 1977	*Arvicola amphibius*	Cricetidae	Europe
Radfordia arctica Fain et Lukoschus, 1977	*Dicrostonyx groenlandicus*	Cricetidae	Europe
“	*Dicrostonyx torquatus*	Cricetidae	Europe, North America
Radfordia lemmus Fain et Lukoschus, 1977	*Lemmus lemmus*	Cricetidae	Europe
“	*Lemmus sibiricus*	Cricetidae	Europe
Radfordia myopusi Bochkov et Mironov, 1998	*Myopus schisticolor*	Cricetidae	Europe
Radfordia zibethicalis (Radford, 1936)	*Ondatra zibethicus*	Cricetidae	Eurasia, North America
**Radfordia triton* Fain et Lukoschus, 1977	*Tscherskia triton*	Cricetidae	Asia
Radfordia abramovi Bochkov et Mironov, 1998	*Phodopus roborovskii*	Cricetidae	Asia
“	*Phodopus campbelli*	Cricetidae	Asia
Radfordia cricetuliphila Bochkov, 1999	*Cricetulus barabensis*	Cricetidae	Asia

? occasional contamination: Fain and Hyland (1980); ! doubtful mite determination; * mite presumably occurring in the fauna of Russia (the Far East).

Table 2

Distribution of myobiid mites (Myobiidae) on rodents (Rodentia) of the fauna of the former USSR

Host genus	Host species	Mite species
CRICETIDAE		
Ellobius Fischer, 1814		–
Prometheomys Satunin, 1901		–
Myodes Pallas, 1811		
Myodes	*glareolus* (Schreber, 1780)	*Radfordia clethrionomys* Fain et Lukoschus, 1977
Myodes	*centralis* (Miller, 1906)	*Radfordia clethrionomys* Fain et Lukoschus, 1977
Myodes	*rutilus* (Pallas, 1779)	*Radfordia rutila* Fain et Lukoschus, 1977
Myodes	*rufocanus* (Sundevall, 1846)	*Radfordia rufocani* Bochkov, 1995
Myodes	*rex* (Imaizumi, 1971)	*Radfordia lemnina* (Koch, 1841)
Alticola Blanford, 1881		
Alticola	*argentatus* (Severtzov, 1879)	*Radfordia alticolae* Bochkov, 1995
Alticola	*barakshin* Bannikov, 1947	?
Alticola	*semicanus* (G.M.Allen, 1924)	?
Alticola	*tuvinicus* Ognev, 1950	?
Alticola	*strelzowi* (Kastchenko, 1899)	?
Alticola	*lemminus* (Miller, 1898)	?
Alticola	*macrotis* (Radde, 1862)	?
Alticola	*olchonensis* Litvinov, 1960	?
Lagurus Gloger, 1841		–
Eolagurus Argyropulo, 1946		–

Dicrostonyx Gloger, 1841		
Dicrostonyx	*torquatus* (Pallas, 1778)	*Radfordia arctica* Fain et Lukoschus, 1977
Dicrostonyx	*vinogradovi* Ognev, 1948	?
Lemmus Link, 1795		
Lemmus	*amurensis* Vinogradov, 1924	?
Lemmus	*lemmus* (Linnaeus, 1758)	?
Lemmus	*sibiricus* (Kerr, 1792)	*Radfordia lemmus* Fain et Lukoschus, 1977
Lemmus	*trimucronatus* (Richardson, 1825)	*Radfordia lemmus* Fain et Lukoschus, 1977
Lemmus	*portenkoi* Tchernyavsky, 1967	?
Myopus Miller, 1910		
Myopus	*schisticolor* (Lilljeborg, 1844)	*Radfordia myopusi* Bochkov et Mironov, 1998
Arvicola Lacepede, 1799		
Arvicola	*amphibius* (Linnaeus, 1758)	*Radfordia arvicolae* Fain et Lukoschus, 1977
Ondatra Link, 1795		
Ondatra	*zibethicus* Linnaeus, 1766	*Radfordia zibethicalis* (Radford, 1936)
Blanfordimys Argyropulo, 1933		?
Chionomys Miller, 1908		
Chionomys	*gud* (Satunin, 1909)	*Radfordia stekolnikovi* Bochkov et Mironov, 1998
Chionomys	*nivalis* (Martins, 1842)	*Radfordia stekolnikovi* Bochkov et Mironov, 1998
Chionomys	*roberti* (Thomas, 1906)	*Radfordia lemnina* (Koch, 1841)
Lasiopodomys Lataste, 1887		?
Microtus Schrank, 1798		
Microtus	*gregalis* (Pallas, 1779)	*Radfordia stenocrani* Bochkov et Mironov, 1988
Microtus	*agrestis* (Linnaeus, 1761)	*Radfordia lemnina* (Koch, 1841)
Microtus	*arvalis* (Pallas, 1778)	*Radfordia lemnina* (Koch, 1841)
Microtus	*ilaeus* Thomas, 1912	*Radfordia lemnina* (Koch, 1841)
Microtus	*transcaspicus* Satunin, 1905	*Radfordia lemnina* (Koch, 1841)
Microtus	*levis* Miller, 1908	?
Microtus	*socialis* (Pallas, 1773)	*Radfordia lemnina* (Koch, 1841)
Microtus	*schidlovskii* Argyropulo, 1933	?
Microtus	*daghestanicus* (Shidlovskii, 1919)	*Radfordia lemnina* (Koch, 1841)
Microtus	*majori* Thomas, 1906	*Radfordia lemnina* (Koch, 1841)
Microtus	*schelkovnikovi* (Satunin, 1907)	?
Microtus	*tatricus* Kratochvil, 1952	*Radfordia lemnina* (Koch, 1841)
Microtus	*subterraneus* (de Selys-Longchamps, 1836)	*Radfordia lemnina* (Koch, 1841)
Microtus	*maximowiczii* (Schrenk, 1859)	?
Microtus	*mujanensis* Orlov et Kovalskaya, 1978	?
Microtus	*fortis* Büchner, 1889	*Radfordia lemnina* (Koch, 1841)
Microtus	*evoronensis* Kovalskaya et Sokolov, 1980	?
Microtus	*sachalinensis* Vasin, 1955	?
Microtus	*mongolicus* (Radde, 1861)	?
Microtus	*middendorffi* (Poljakov, 1881)	*Radfordia lemnina* (Koch, 1841)
Microtus	*oeconomus* (Pallas, 1776)	*Radfordia lemnina* (Koch, 1841)
Allocricetulus Argyropulo, 1932		?
Cricetulus Milne-Edwards, 1867		

Cricetulus	*barabensis* (Pallas, 1773)	?
Cricetulus	*longicaudatus* (Milne-Edwards, 1867)	*Radfordia cricetuliphila* Bochkov, 1999
Cricetulus	*migratorius* (Pallas, 1773)	*Radfordia cricetulus* Fain, 1973
Cricetus Leske, 1779		?
Mesocricetus Nehring, 1898		?
Phodopus Miller, 1910		
Phodopus	*campbelli* (Thomas, 1905)	*Radfordia abramovi* Bochkov et Mironov, 1998
Phodopus	*roborovskii* (Satunin, 1903)	*Radfordia abramovi* Bochkov et Mironov, 1998
Phodopus	*sungorus* (Pallas, 1773)	?
Tscherskia Ognev, 1914		
Tscherskia	*triton* (de Winton, 1899)	*Radfordia triton* Fain et Lukoschus, 1977
CALOMYSCIDAE		–
MURIDAE		
Meriones Illiger, 1811		
Meriones	*tamariscinus* (Pallas, 1773)	*Austromyobia merioni* (Bochkov, Dubinina et Chirov, 1990)
Meriones	*libycus* Lichtenstein, 1823	*Austromyobia merioni* (Bochkov, Dubinina et Chirov, 1990)
Meriones	*meridianus* (Pallas, 1773)	*Austromyobia merioni* (Bochkov, Dubinina et Chirov, 1990)
Meriones	*tristrami* Thomas, 1892	?
Meriones	*unguiculatus* (Milne-Edwards, 1867)	*Austromyobia merioni* (Bochkov, Dubinina et Chirov, 1990)
Meriones	*vinogradovi* Heptner, 1931	?
Meriones	*zarudnyi* Heptner, 1937	*Austromyobia dubinini* (Bochkov, Dubinina et Chirov, 1990)
Meriones	*dahli* Shidlovski, 1962	?
Meriones	*persicus* (Blanford, 1875)	*Austromyobia dubinini* (Bochkov, Dubinina et Chirov, 1990)
Rhombomys Wagner, 1841		?
Apodemus Kaup, 1829		
Apodemus	*agrarius* (Pallas, 1771)	*Myobia agraria* Gorissen et Lukoschus, 1982, *Radfordia lancearia* (Poppe, 1909)
Apodemus	*flavicollis* (Melchior, 1834)	*Myobia murismusculi* (Schrank, 1781), *Myobia multivaga* Poppe, 1808, *Radfordia mironovi* Bochkov, 1997
Apodemus	*hyrcanicus* Vorontsov, Boyeskorov et Mezhzherin, 1992	?
Apodemus	*pallipes* (Barrett-Hamilton, 1900)	*Myobia murismusculi* (Schrank, 1781), *Myobia multivaga* Poppe, 1808
Apodemus	*ponticus* (Sviridenko, 1936)	*Myobia murismusculi* (Schrank, 1781), *Myobia multivaga* Poppe, 1808
Apodemus	*sylvaticus* (Linnaeus, 1758)	*Myobia murismusculi* (Schrank, 1781), *Myobia multivaga* Poppe, 1808, *Radfordia lancearia* (Poppe, 1909), *Radfordia affinis* (Poppe, 1896)
Apodemus	*witherbyi* (Thomas, 1902)	*Myobia murismusculi* (Schrank, 1781), *Myobia multivaga* Poppe, 1808
Apodemus	*speciosus* (Temminck, 1844)	*Myobia nodae* Matuzaki, 1965
Apodemus	*mystacinus* (Danford et Alston, 1877)	*Myobia annae* Haitlinger, 1987
Apodemus	*peninsulae* (Thomas, 1906)	*Myobia kobayashii* Uchikawa et Mizushima, 1975

Apodemus	*uralensis* (Pallas, 1811)	*Myobia murismusculi* (Schrank, 1781), *Myobia multivaga* Poppe, 1808
Micromys Dehne, 1841		
Micromys	*minutus* (Pallas, 1771)	*Radfordia lemnina* (Koch, 1841), *Myobia micromydis* Lukoschus et Driessen, 1970
Mus Linnaeus, 1758		
Mus	*musculus* Linnaeus, 1758	*Myobia murismusculi* (Schrank, 1781), *Radfordia affinis* (Poppe, 1896)
Mus	*macedonicus* Petrov et Ruzic, 1983	?
Mus	*spicilegus* Petenyi, 1882	?
Rattus Fischer, 1803		
Rattus	*rattus* (Linnaeus, 1758)	*Radfordia ensifera* (Poppe, 1896)
Rattus	*norvegicus* (Berkenhout, 1769)	*Radfordia ensifera* (Poppe, 1896)
Rattus	*pyctoris* (Hodgson, 1845)	*Radfordia ensifera* (Poppe, 1896)
Nesokia Gray, 1842		?
DIPODIDAE		
Allactaga F. Cuvier, 1836		
Allactaga	*elater* (Lichtenstein, 1825)	?
Allactaga	*major* (Kerr, 1792)	*Cryptomyobia majori* (Bochkov, 1997)
Allactaga	*severtzovi* Vinogradov, 1925	?
Allactaga	*vinogradovi* Argyropulo, 1941	?
Allactaga	*sibirica* (Forster, 1778)	*Cryptomyobia allactaga* (Fain et Lukoschus, 1979)
Allactaga	*williamsi* Thomas, 1897	*Cryptomyobia allactodipi* (Bochkov, 1997)
Allactodipus Kolesnikov, 1937		
Allactodipus	*bobrinskii* Kolesnikov, 1937	*Cryptomyobia allactodip*i (Bochkov, 1997)
Pygeretmus Gloger, 1841		
Pygeretmus	*platyurus* (Lichtenstein, 1823)	*Cryptomyobia pygeretmusi* (Bochkov, 1997)
Pygeretmus	*shitkovi* (Kuznetsov, 1930)	*Cryptomyobia pygeretmusi* (Bochkov, 1997)
Pygeretmus	*pumilio* (Kerr, 1792)	*Cryptomyobia alactaguli* (Bochkov, 1997)
Cardiocranius Satunin, 1903		?
Salpingotus Vinogradov, 1922		
Salpingotus	*crassicauda* Vinogradov, 1924	*Cryptomyobia baranovae* (Bochkov, 1997)
Salpingotus	*heptneri* Vorontsov et Smirnov, 1969	?
Salpingotus	*pallidus* Vorontsov et Shenbrot, 1984	?
Dipus Zimmermann, 1780		
Dipus	*sagitta* (Pallas, 1773)	*Cryptomyobia dipi* (Bochkov, 1997)
Eremodipus Vinogradov, 1930		?
Paradipus Vinogradov, 1930		
Paradipus	*ctenodactylus* (Vinogradov, 1929)	*Cryptomyobia paradipi* (Bochkov, 1997)
Stylodipus G.M. Allen, 1925		
Stylodipus	*telum* (Lichtenstein, 1823)	*Cryptomyobia stylodipi* (Bochkov, 1997)
Jaculus Erxleben, 1777		?
Sicista Gray, 1827		–
SPALACIDAE		–
SCIURIDAE		–
CASTORIDAE		–

HYSTRICIDAE		–
MYOCASTORIDAE		–
GLIRIDAE		
Muscardinus Kaup, 1829		
Muscardinus	*avellanarius* (Linnaeus, 1758)	*Radfordia oudemansi* (Poppe, 1909)
Dryomys Thomas, 1906		
Dryomys	*nitedula* (Pallas, 1778)	*Radfordia dryomys* Fain et Lukoschus, 1973
Eliomys Wagner, 1843		
Eliomys	*quercinus* (Linnaeus, 1766)	*Radfordia eliomys* Fain et Lukoschus, 1973
Myomimus Ognev, 1924		
Myomimus	*persomatus* Ognev, 1924	*Radfordia myomimusi* Bochkov, 1994
Glis Brisson, 1762		
Glis	*glis* (Linnaeus, 1766)	*Radfordia gliricola* Vesmanis et Lukoschus, 1978
Selevinia Belosludov et Bazhanov, 1938		
Selevinia	*betpakdalensis* Belosludov et Bazhanov, 1938	*Radfordia myomimusi* Bochkov, 1994

– Myobiidae absent; ? Myobiidae unknown

Table 3

System of the order Rodentia (after: Carleton and Musser 2005) and host distribution of myobiids

Rodent suborder	Rodent family	Myobiid taxa
Sciuromorpha	Aplodontidae	–
	Sciuridae	–
	Gliridae	*Radfordia* (*Graphiurobia*)
Castorimorpha	Castoridae	–
	Heteromyidae	*Lavoimyobia*
	Geomyidae	?
Myomorpha	Dipodidae	*Cryptomyobia* (*Dipodomyobia*) — Dipodinae, Allactaginae, and Cardiocraninae; *Radfordia* (*Graphiurobia*) *ewingi* —subfamily Zapodidae
	Muridae	*Austromyobia* (s.str.) — Gerbillinae; *Myobia* — Murinae and Otomyinae; *Radfordia* (s.str.) and *Radfordia* (*Rattimyobia*) — Murinae; *Radfordia* (*Acomyobia*) and *Radfordia* (*Lophurmyobia*) — Deomyinae
	Cricetidae	*Radfordia* (*Microtimyobia*) — Cricetinae and Arvicolinae; *Radfordia* (*Hesperomyobia*) — Sigmodontinae; *Radfordia* group "*subuliger*" — Neotominae
	Nesomyidae	*Austromyobia* (*Dendromyobia*) — Dendromurinae; *Radfordia* (*Petromyscobia*) — Petromyscinae
	Calomyscidae	–
	Spalacidae	–
	Placanthomyidae	*Anuncomyobia*
Hystricomorpha	Ctenodactylidae	*Gundimyoboa*
	Bathyergidae	*Cryptomyobia* (s.str.)
	Hystricidae	–
	Petromuridae	?
	Thryonomyidae	?
	Erethizontidae	?
	Chinchilidae	?
	Dinomyidae	?

Hystricomorpha	Caviidae	–
	Dasyproctidae	?
	Cuniculidae	?
	Ctenomyidae	?
	Octodontidae	*Proradfordia*
	Abrocamidae	?
	Echimyidae	*Proradfordia*
	Myocastoridae	–
	Capromyidae	?
	Heptaxodontidae	?
Anomaluromorpha	Anomaluridae	*Idiurobia*
	Pedetidae	?

– Myobiidae absent; ? Myobiidae not recorded

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