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**SCHIZOCARPUS SAVELJEVI SP. NOV. (ACARIFORMES: CHIRODISCIDAE)
PARASITIZING THE EURASIAN BEAVER – *CASTOR FIBER* LINNAEUS, 1758
(RODENTIA: CASTORIDAE) FROM LENINGRAD PROVINCE (RUSSIA)**

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ABSTRACT

Eight species of the fur-mite genus *Schizocarpus* Trouessart, 1896 (Acariformes: Chirodiscidae) were collected from one skin of the Eurasian beaver supposedly belonging to the subspecies *Castor fiber* (?) *orientoeuropaeus* Lavrov, 1981 (Rodentia: Castoridae) from Boksitogorsk District of Leningrad Province (Russia). Among them, *Schizocarpus saveljevi* sp. nov. is described as a new for science, *S. zurovskii* Bochkov et al., 2012 and *S. heatherae* Bochkov et al., 2012 are recorded from this beaver subspecies for the first time, and other five species are the same as on beavers of this subspecies from the Voronezh Reserve (Bochkov and Dubinina 2011), i.e. *S. brachyurus* (Dubinina, 1964), *S. capitis* (Dubinina, 1964), *S. fedjushini* (Dubinina, 1964), *S. gozdziowskii* Bochkov et al., 2012, and *S. radiatus* Fain et Lukoschus, 1985. The beaver skin was without head and therefore some *Schizocarpus* species specialized to this microhabitat were not collected.

Key words: acariform mites, *Castor fiber*, ectoparasites, Leningrad Province, *Schizocarpus*, systematics

**SCHIZOCARPUS SAVELJEVI SP. NOV. (ACARIFORMES: CHIRODISCIDAE),
ПАРАЗИТИРУЮЩИЙ НА ЕВРАЗИЙСКОМ БОБРЕ – *CASTOR FIBER* LINNAEUS, 1758
(RODENTIA: CASTORIDAE) В ЛЕНИНГРАДСКОЙ ОБЛАСТИ (РОССИЯ)**

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РЕЗЮМЕ

Восемь видов волосяных клещей рода *Schizocarpus* Trouessart, 1896 (Acariformes: Chirodiscidae) собраны с одной шкуры евразийского бобра *Castor fiber* (?) *orientoeuropaeus* Lavrov, 1981 (Rodentia: Castoridae) из Бокситогорского района Ленинградской области (Россия). Среди них, *Schizocarpus saveljevi* sp. nov. описан как новый для науки, *S. zurovskii* Bochkov et al., 2012 и *S. heatherae* Bochkov et al., 2012 зарегистрированы с бобров этого подвида впервые, а пять других видов оказались теми же, что и на бобрах данного подвида из Воронежского заповедника (Bochkov and Dubinina 2011): *S. brachyurus* (Dubinina, 1964), *S. capitis* (Dubinina, 1964), *S. fedjushini* (Dubinina, 1964), *S. gozdziowskii* Bochkov et al., 2012 и *S. radiatus* Fain et Lukoschus, 1985. Голова у изученной шкуры отсутствовала, и поэтому некоторые виды клещей, обычно населяющих данную микростаию, собрать не удалось.

Ключевые слова: акариформные клещи, *Castor fiber*, , эктопаразиты, Ленинградская область, *Schizocarpus*, систематика

INTRODUCTION

Mites of the genus *Schizocarpus* Trouessart, 1896 (Acariformes: Chirodiscidae) are permanent parasites of beavers (Rodentia: Castoridae) inhabiting undercoat of these hosts. To date, thirty nine species of *Schizocarpus* are known from the Eurasian beaver (*Castor fiber* Linnaeus, 1758). The systematics of the genus is entirely based on the male characters (Fain and Lukoschus 1985). To date, thirty nine species of *Schizocarpus* are known from the Eurasian beaver.

For the cases of synhospitality when the whole monophyletic species complex of permanent parasites evolves entirely within the limits of a single host species, a special term – “phylogenetic synhospitality” has been recently proposed (Bochkov and Mironov 2008). In the case of *Schizocarpus* species occurring on *Castor fiber*, the combination of two independent factors has apparently led to the phenomenon of the phylogenetic synhospitality: a disjunctive range of this host was the reason for allopatric speciation in these mites; high specialization of mites to local microhabitats on the host body was the reason for their sympatric (synxenic) speciation (see Bochkov and Mironov 2008 for detailed discussion and references).

Several subspecies are recognized within the species *C. fiber* (Lavrov 1981; Heidecke 1986; Gabrys and Wazna 2003; Durka et al. 2005; Helgen 2005). Investigations of *Schizocarpus* species associated with four subspecies of the Eurasian beaver have shown that mite faunas from these subspecies are significantly different from each other (Fain and Lukoschus 1985; Bochkov and Dubinina 2011; Bochkov et al. 2012; Bochkov and Saveljev in press). It was also shown, that more than ten mite species can simultaneously parasitize a host individual, inhabiting different fur zones (Dubinina 1964).

In the Leningrad Province (Russia), Eurasian beavers were exterminated in the end of the 19th – beginning of the 20th centuries. Most beavers living in this region now derive from individuals reintroduced to this province in the middle of the 20th century and belonged to the subspecies *Castor fiber orientoeuropaeus* Lavrov, 1981, but some beavers independently entered again to this region from unknown locality (-ies) and could belong to the subspecies *Castor fiber belorussicus* Lavrov, 1981 (Saveljev, personal communication). Thus, the modern beavers populated this region have the East European origin and could be only conventionally assigned to *C. f. orientoeuropaeus*.

Fifteen *Schizocarpus* species were recorded on *C. f. orientoeuropaeus* from the Voronezh Reserve relict population (Bochkov and Dubinina 2011). In the paper I provide data concerning *Schizocarpus* species for the first time, inhabiting beavers probably belonging to this host subspecies in the Leningrad Province. Eight *Schizocarpus* species were collected from the skin of beaver shouted in Boksitogorsk District (spring of 2011). Among them, a new species *Schizocarpus saveljevi* sp. nov. was detected and two species were recorded from this host subspecies for the first time, i.e. *S. zurovskii* Bochkov et al., 2012 and *S. heatherae* Bochkov et al., 2012; other five mite species are the same as on *C. f. orientoeuropaeus* from the Voronezh Reserve recorded by Bochkov and Dubinina (2011). Unfortunately, the head of this beaver skin was cut off and, therefore, some mite species usually inhabiting this microhabitat, were probably missed.

MATERIAL AND METHODS

The skin (without head) of the freshly shouted beaver *Castor fiber* (?) *orientoeuropaeus* was examined. This beaver was shouted in outskirts of Pikalevo City, Boksitogorsk District, Leningrad Province, in May 2011. Mites were collected directly from the skin with sharp and tine tweezers in laboratory conditions using a dissecting microscope, and mounted in Hoyer's medium. Drawings were made with a Leica microscope equipped with DIC optics and a camera lucida.

In species descriptions, the scheme for opisthosomal setation follows Griffiths et al. (1990) as applied recently by Bochkov and Dubinina (2011). Morphological terminology follows Bochkov et al. (2012). All measurements are in micrometers (μm) and were taken as follows: body length = the total length from the palpal extremities to the posterior border of the opisthosoma, excluding the membrane; body width = the width at the midlevel between legs II and III; length of hysteronotal shield = maximum length measured along the longitudinal line running via base of seta *d1*; width of hysteronotal shield = measured at the midlevel of the shield; the diameter of adanal sucker includes the corolla.

The systematics of beaver subspecies is given according to Heidecke (1986) and Helgen (2005).

Institutional abbreviations. IRSNB, Institute royal des Sciences naturelles de Belgique, Brussels, Belgium; UMMZ, Museum of Zoology, University

of Michigan, Ann Arbor, USA; ZISP, Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia.

SYSTEMATICS

Family Chirodiscidae Trouessart, 1892

Genus *Schizocarpus* Trouessart, 1896

1. *Schizocarpus saveljevi* sp. nov.

(Fig. 1)

Description. MALE (holotype). Idiosoma slightly flattened dorso-ventrally. Hysterosoma outline in shape of inverted trapezium. Body 320 long (320–335 in 10 paratypes) and 150 wide (150–155); body length/width ratio about 2.1:1. Hysteronotal shield about 70 long and 85 wide. Anterior margin of hysteronotal shield uneven. Setae *d1* situated slightly posterior (7–10) to anterior margin of this shield, distance *d1-d1* 35. Setae *e1* situated on posterior margin of hysteronotal shield, distance *e1-e1* about 30. Setae *h1* situated distinctly posterior to setae *e1*, distance *h1-h1* approximately 1.2 times longer than *e1-e1*. Alveoli of setae *h1* normally developed, but bodies of these setae very short. Setae *f2* absent. Setae *h3* slightly displaced ventrally; distance *h3-h3* about 20. Opisthosomal membranes very short. Setae *ps3* situated medially. Setae *ps2* displaced posteriorly, located

distinctly posterior to adanal suckers. Adanal shields roughly rounded outline, distinctly and monotonously punctated. Minimal distance between these shields 20. Adanal suckers situated in median part of adanal shields, about 6 in diameter, with smooth corolla (type A), without external sclerotized ring around. Setae *ad1* represented by alveoli, situated at adanal shields inside of adanal suckers and almost at same transverse level with these suckers. Alveoli *ad2* present, with external sclerotized rings around, situated between adanal shields almost at same transverse level with alveoli *ad1* and adanal suckers. Setae *ps1* pedunculate, situated at adanal shields near anterior borders of these shields, almost at same longitudinal level with alveoli *ad1*; distance *ps1-ps1* 30 long. Ventral anal sclerite narrow but distinct, 3 times longer than wide. Lengths of some setae: *h2* 45, *h3* 10, *ps2* 35, *ps1* and *ps3* about 5. Tarsus III 20 long, 15 wide; tarsus IV 1.2 times longer than wide.

Type material. Holotype male (ZIN T-Chir-27) and 11 male paratypes (ZISP AVB-2012-0401-001, #1-11) ex *Castor fiber* (?) *orientoeuropaeus*, **RUSSIA**: Leningrad Province, Boksitogorsk District, Pikalevo City, May 2011, mites removed by A. Bochkov.

Type depositions. Holotype and 8 paratypes – at ZISP, 1 paratype – at IRSNB, 2 paratypes – at UMMZ.

Microhabitat. Posterior abdomen.

Distribution. Type locality only.

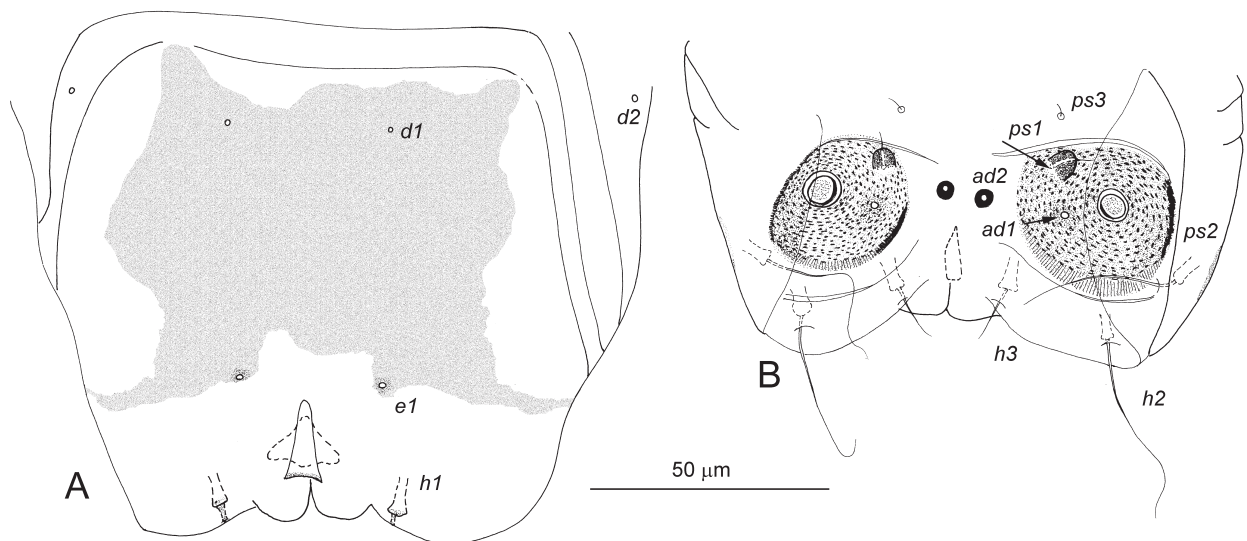


Fig. 1. *Schizocarpus saveljevi* sp. nov., male: A – opisthosoma dorsally; B – same, ventrally.

Etymology. The new species is named after Dr. A.P. Saveljev (Russian Research Institute of Game Management and Fur Farming, Kirov, Russia), the leading researcher of beavers in Russia.

Differential diagnosis. This new species is most similar to *Schizocarpus hexapilis* Fain et Lukoschus, 1985 from *Castor fiber albicus* Matschie, 1907 from Germany (Fain and Lukoschus 1985). In both species, alveoli *ad2* are present and situated between adanal shields almost at the same level with the adanal suckers, setae *ps3* are short, setae *ps2* are situated posterior to and inside of the adanal suckers, setae *ps1* are pedunculate, setae *f2* are absent, the ventral anal sclerite is narrow, the opisthosomal membrane is very short, and the total body length is less 350. These species differ from each other by the following characters. In *S. saveljevi* sp. nov., setae *ps1* are situated anterior to the level of the adanal suckers and distinctly inside of these suckers, alveoli *ad1* are situated almost at the same level with the adanal suckers, setae *h3* are displaced ventrally and situated close to each other, bodies of setae *h1* almost reduced. In *S. hexapilis*, setae *ps1* are situated posterior to the level of the adanal suckers and at the same longitudinal level with these suckers, alveoli *ad1* are situated posterior to the level of the adanal suckers, setae *h3* are located laterally close to the posterior margin of the opisthosoma, bodies of setae *h1* are short but quite discernible.

2. *Schizocarpus fedjushini* (Dubinina, 1964)

Material examined. 5 males (ZISP AVB-2012-0401-002, #1-5).

Microhabitat. Anterior half of dorsum.

Distribution. Recorded on *C. f. orientoeuropaeus* from Russia from the Voronezh Reserve (Dubinina 1964) and Leningrad Province (present paper), from *C. f. fiber* (undetermined subspecies) from unknown locality in Europe (Fain and Lukoschus 1985), from *C. f. belorussicus* from Belorussia (Berezina River) (Fedjushin 1935), Poland (Suwałki) (Bochkov et al. 2012), and from *C. f. tuvinicus* Lavrov, 1981 from Russia (Azas River) (Bochkov and Saveljev in press).

3. *Schizocarpus capitis* (Dubinina, 1964)

Material examined. 10 males (ZISP AVB-2012-0401-008, #1-10).

Microhabitat. Anterior half of dorsum.

Distribution. Recorded from *C. f. orientoeuropaeus* from Russia (Voronezh Reserve) (Dubinina 1964) and Leningrad Province (present paper), from *C. f. albicus* from Germany (Elba River) and *C. f. fiber* (undetermined subspecies) from unknown locality in Europe (Fain and Lukoschus 1985), and from *C. f. belorussicus* from Poland (Suwałki) (Bochkov et al. 2012).

4. *Schizocarpus brachyurus* (Dubinina, 1964)

Material examined. 4 males (ZISP AVB-2012-0401-003, #1-4).

Microhabitat. Median part of dorsum.

Distribution. Recorded from *C. f. orientoeuropaeus* from Russia from the Voronezh Reserve (Dubinina 1964) and Leningrad Province (this paper), from the Eurasian beaver (undetermined subspecies) from unknown locality in Europe (Fain and Lukoschus 1985), from *C. f. belorussicus* from Poland (Suwałki) (Bochkov et al. 2012), and from *C. f. tuvinicus* from Russia (Azas River) (Bochkov and Saveljev in press).

5. *Schizocarpus radiatus* Fain et Lukoschus, 1985

Material examined. 2 males (ZISP AVB-2012-0401-004, #1, 2).

Microhabitat. Posterior dorsum.

Distribution. Recorded from the Eurasian beaver (undetermined subspecies) from unknown locality in Europe (Fain and Lukoschus 1985), from *C. f. orientoeuropaeus* from Russia from the Voronezh Reserve (Bochkov and Dubinina 2011) and Leningrad Province (this paper), from *C. f. belorussicus* from Poland (Suwałki) (Bochkov et al. 2012), and from *C. f. tuvinicus* Russia (Azas River) (Bochkov and Saveljev in press).

6. *Schizocarpus gozdziowskii*

Bochkov, Labrzycka, Skoracki et Saveljev, 2012 (Fig. 2)

Material examined. 46 males (ZISP AVB-2012-0401-005, #1-46).

Microhabitat. Posterior half of dorsum.

Distribution. Recorded from *C. f. orientoeuropaeus* from Russia (Voronezh Reserve) (Bochkov and Dubinina 2011) and Leningrad Province (present paper), from *C. f. belorussicus* from Poland (Suwałki) (Bochkov et al. 2012), and from *C. f. tuvinicus* from

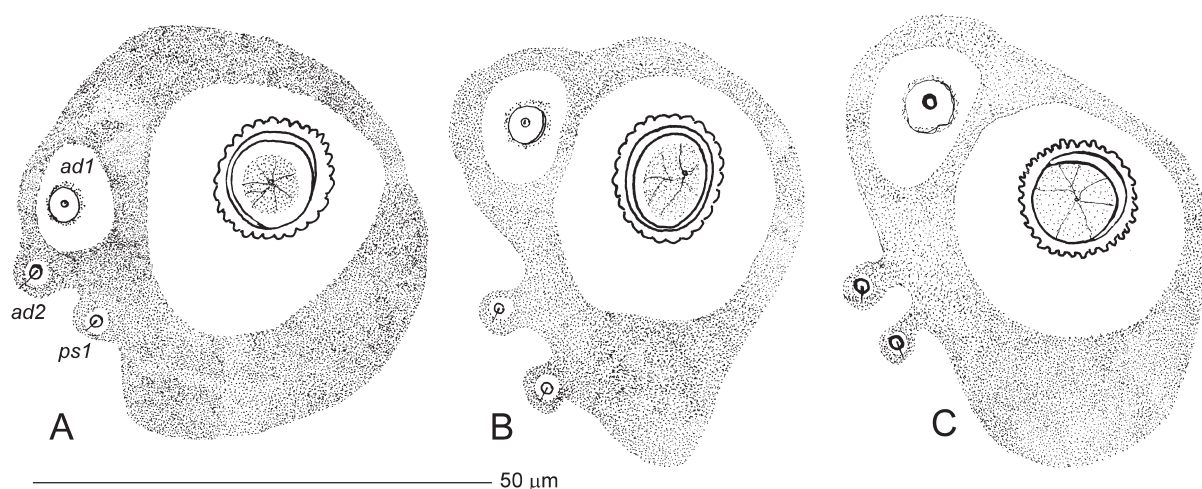


Fig. 2. *Schizocarpus gozdziwskii* Bochkov et al., 2012, adanal shield of male: A – holotype ex *Castor fiber belorussicus* from Suwałki, Poland, B – paratype ex the same host and locality; C – specimen from *Castor fiber orientoeuropaeus* from the Leningrad Province, Russia.

Russia (Azas River) (Bochkov and Saveljev in press).

Remark. In this species, the position of *ad2* alveoli is noticeably variable (Fig. 2). In some *Schizocarpus* species, examples of high variability of particular morphological structures located on opisthogaster were described by Fain and Whitaker (1988) and Bochkov et al. (2012).

7. *Schizocarpus zurowskii*

Bochkov, Labrzycka, Skoracki et Saveljev, 2012

Material examined. 24 males (ZISP AVB-2012-0401-006, #1-24).

Microhabitat. Abdomen.

Distribution. Recorded from *C. f. belorussicus* from Poland (Suwałki) (Bochkov et al. 2012), from *C. f. orientoeuropaeus* from Russia (Leningrad Province) (this paper), and from *C. f. tuvinicus* Russia (Azas River) (Bochkov and Saveljev in press).

8. *Schizocarpus heatherae*

Bochkov, Labrzycka, Skoracki et Saveljev, 2012

Material examined. 4 males (ZISP AVB-2012-0401-007, #1-4).

Microhabitat. Median part of dorsum.

Distribution. Recorded from *C. f. belorussicus* from Poland (Suwałki) (Bochkov et al. 2012) and from *C. f. orientoeuropaeus* from Russia (Leningrad Province) (this paper).

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REFERENCES

- Bochkov A.V. and Dubinina H.V. 2011. Mites of the genus *Schizocarpus* (Acariformes: Chirodiscidae) parasitizing the Eurasian beaver *Castor fiber* (Rodentia: Castoridae) in the Voronezh National Reserve. *Acarina*, **19**: 53–66.
- Bochkov A.V., Labrzycka A., Skoracki M. and Saveljev A.P. 2012. Fur mites of the genus *Schizocarpus* Trouessart (Acari: Chirodiscidae) parasitizing the Eurasian beaver *Castor fiber belorussicus* Lavrov (Rodentia: Castoridae) in NE Poland (Suwałki). *Zootaxa*, **3162**: 39–59.
- Bochkov A.V. and Mironov S.V. 2008. The phenomenon of “phylogenetic synhospitality” in acariform mites (Acari: Acariformes) – the permanent parasites of vertebrates. *Parazitologiya*, **42**: 81–100. [In Russian with English Summary]
- Bochkov A.V. and Saveljev A.P. In press. Fur mites of the genus *Schizocarpus* Trouessart (Acari: Chirodiscidae) parasitizing the Eurasian beaver *Castor fiber tuvinicus* Lavrov (Rodentia: Castoridae) in Tuva (Azas River). *Zootaxa*.

- Dubinina H.V. 1964.** Mites of the genus *Histiophorus* (Lis-trophoridae) parasites of beavers. *Parazitologicheskii Sbornik*, **22**: 111–152. [In Russian]
- Durka W., Babik W., Ducroz J.-F., Heidecke D., Ros-sell F., Samjaa R., Saveljev A., Ulevicous A. and Stubbe M. 2005.** Mitochondrial phylogeography of the Eurasian beaver *Castor fiber* L. *Molecular Ecology*, **14**: 3843–3856.
- Fain A. and Lukoschus F.S. 1985.** The genus *Schizocarpus* Trouessart, 1896 (Acari, Chirodiscidae) from the beaver *Castor fiber* L. An example of multiple speciation. *Entomologische Abhandlungen des Staatliches Museum für Tierkunde Dresden*, **49**: 35–68.
- Fain A. and Whitaker J.O.Jr. 1988.** Mites of the genus *Schizocarpus* Trouessart, 1896 (Acari, Chirodiscidae) from Alaska and Indiana, USA. *Acarologia*, **29**: 395–409.
- Fedjushin A.V. 1935.** Rechnoy bobr [Riverine beaver]. Glavpushnina, Moscow, 342 p. [In Russian]
- Gabrys G. and Wazna A. 2003.** Subspecies of the Euro-pean beaver *Castor fiber* Linnaeus, 1758. *Acta Therio-logica*, **48**: 433–439.
- Griffiths D.A., Atyeo W.T., Norton R.A. and Lynch C.A. 1990.** The idiosomal chaetotaxy of astigmatid mites. *Journal of Zoology (London)*, **220**: 1–32.
- Heidecke D. 1986.** Taxonomische Aspekte der Arten-schutzes am Beispiel der Biber Eurasiens. *Hercynia*, *N.F.* (Leipzig), **22**: 146–161.
- Helgen K.M. 2005.** Family Castoridae. In: D.E Wilson and D.M. Reeder (Eds). *Mammal Species of the World. A Taxonomic and Geographic Reference*. Third edition. Johns Hopkins University Press, Baltimore: 842–843.
- Lavrov L.S. 1981.** Bobry Palearktiki [Beavers of Palaearctic]. VSU Press, Voronezh, 272 p. [In Russian]

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