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Article

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Fur mites of the genus *Schizocarpus* Trouessart (Acari: Chirodiscidae) from the Eurasian beaver *Castor fiber tuvinicus* Lavrov (Rodentia: Castoridae) in the Azas River (Tuva Republic, Russia)

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Abstract

Sixteen species of the genus *Schizocarpus* Trouessart, 1896 (Acari: Chirodiscidae) are recorded from six live individuals of the Eurasian beaver *Castor fiber tuvinicus* Lavrov (Rodentia: Castoridae) captured at the Azas River (Tuva, Russia). Six species are described as new: *Schizocarpus azasicus* **sp. nov**., *S. daberti* **sp. nov**., *S. heideckei* **sp. nov**., *S. lavrovi* **sp. nov**., *S. unzhakovi* **sp. nov**., and *S. tuvinicus* **sp. nov**. Ten previously described species are as follows: *S. brachyurus* (Dubinina, 1964), *S. grandis* (Dubinina, 1964), *S. fedjushini* (Dubinina, 1964), *S. gozdziewskii* Bochkov *et al*., 2012, *S. insignis* Fain and Lukoschus, 1985, *S. modestus* Fain and Lukoschus, 1985, *S. pusillus* Fain and Lukoschus, 1985, *S. radiatus* Fain and Lukoschus, 1985, *S. subornatus* Fain and Lukoschus, 1985, and *S. zurowskii* Bochkov *et al*., 2012. *Schizocarpus intercalatus* Fain and Lukoschus, 1985 **syn. nov**. and *S. parabrachyurus* Fain and Lukoschus, 1985 **syn. nov**. are considered as junior synonyms of *S. brachyurus*; *S. ventricosus* Fain and Lukoschus, 1985 **syn. nov**. is considered as a junior synonym of *S. latus* (Dubinina, 1964).

Key words: Chirodiscidae, fur-mites, Eurasian beaver, Tuva, *Schizocarpus*, systematics

Introduction

Mites of the genus *Schizocarpus* Trouessart, 1896 (Acariformes: Chirodiscidae) are permanent and highly specialized parasites of beavers (Rodentia: Castoridae) inhabiting the undercoat of these hosts. The systematics of this genus is entirely based on male characters (Fain & Lukoschus 1985). To date, 38 species of the genus *Schizocarpus* are known from the Eurasian beaver (*Castor fiber* Linnaeus) and 18 species are known from the American beaver (*Castor canadensis* Kuhl) (Dubinina 1964; Fain & Lukoschus 1985; Bochkov *et al*. 2012). More than ten mite species can simultaneously parasitize a host individual, where they inhabit different fur zones (Dubinina 1964).

Based on exploration of three of the eight extant subspecies of the Eurasian beaver (for subspecies distribution see Durka *et al*. 2005), i.e. *C. f. orientoeuropaeus* Lavrov, *C. f. albicus* Matschie, and *C. f. belorussicus* Lavrov, it was predicted that faunas of *Schizocarpus* spp. on the other five beaver subspecies could significantly differ from each other (Bochkov *et al*. 2012). Newly obtained data on parasites of *C. f. tuvinicus* Lavrov from Tuva support this assumption.

In this paper we give the results of the examination of *Schizocarpus* specimens collected from *C. f. tuvinicus* captured at the Azas River (Upper Yenisei basin, Tuva, South Siberia). *Castor f. tuvinicus* is a critically endangered subspecies under protection of the Red Data books of the Russian Federation (Prisazhnuk 2001) and the Tuva Republic (Shurygin & Saveljev 2002). Beavers of this subspecies were widespread across the Upper Yenisei basin 150-200 years ago. During the end of the 19th and beginning of the 20th centuries, these animals were extirpated from all rivers except for the Azas River (Lavrov 1981). The present distribution of these beavers includes the orig-

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inal population inhabiting the Azas River and two introduced populations—at the Bash-Khem River (since 1989) and the Belin River (since 2002). The population inhabiting the Azas River, being the basis of this subspecies gene pool, includes approximately 80 individuals (Saveljev *et al*. 2002). Beavers of the Azas River population belong to two subpopulations, "upper" and "lower", and inhabit the upstream and downstream sections of the river, respectively. Ranges of these subpopulations are separated by 15 km of a white-water section and genetic exchanges between them are very low—two registered cases of migrated individuals over ten years (see Saveljev *et al*. 2002, 2010 for details).

Sixteen *Schizocarpus* spp. were recorded from six live beaver individuals belonging to both subpopulations; among them, six species appeared new to science (Table 1). Below we provide descriptions of these new species and records of all recognized species. Data on the geographical distribution and localization of *Schizocarpus* spp. found on *C. f tuvinicus* from the Azas River are summarized in Table 1.

FIGURE 1. *Castor fiber tuvinicus* Lavrov from Azas River, Tuva, Russia, October 2011: A—freshly caught beaver in the hands of A.P. Saveljev; B— dry beaver; C—A.P. Saveljev combs sample of undercoat from beaver's head; D—same but from beaver's abdomen.

Material and methods

Beavers were captured at the Azas River, the Azas State Nature Reserve, Todzhinskii kozhuun (district), Tuva Republic (Russia) in October 2011. In total, six live beavers were captured with a hand net from a motorboat using a searchlight at night (see Saveljev *et al*. 2002, 2003 for description this method in detail), examined for parasites and released back to the wild. Two host individuals from the "upper" (beavers #1, 2; 52º25'N, 96º38'E) and four

TABLE 1. *Schizocarpus* species parasitizing *Castor fiber tuvinicus* Lavrov at the Azas River (Russia: Tuva)
* – type host taxon

Mite species	Host subspecies	Locality	Microhabitat	Reference
Species recorded from beavers of both subpopulations				
S. lavrovi **sp. nov.**	*C. f. tuvinicus**	Russia (Azas River)	Head dorsally, posterior dorsum	Present paper
S. heideckei **sp. nov.**	*C. f. tuvinicus**	Russia (Azas River)	Anterior legs, anterior abdomen	Present paper
S. modestus Fain and Lukoschus, 1985	*C. f. albicus**	Germany (Elba River)	Posterior legs	Fain and Lukoschus (1985)
	C. f. tuvinicus	Russia (Azas River)	Throat and anterior legs	Present paper
S. pusillus Fain and Lukoschus, 1985	*C. f. albicus**	Germany (Elba River)	Chest	Fain and Lukoschus (1985)
	C. f. tuvinicus	Russia (Azas River)	Chest and anterior abdomen	Present paper
S. fedjushini (Dubinina, 1964)	*C. f. orientoeuropaeus**	Russia (Voronezh Reserve)	Mostly on flanks	Dubinina (1964)
	C. fiber, unknown subspecies	Europe (no further details)	Mostly on head	Fain and Lukoschus (1985)
	C. f. belorussicus	Belorussia (Berezina River)	Unknown	Fedjushin (1935)
		Poland (Suwałki)	Head and neck	Bochkov *et al.* (2012)
	C. f. tuvinicus	Russia (Azas River)	Head and neck	Present paper
S. brachyurus (Dubinina, 1964) (=*S. intercalatus* Fain and Lukoschus, 1985 and *S. parabrachyurus* Fain and Lukoschus, 1985 **syn. nov**.)	*C. f. orientoeuropaeus**	Russia (Voronezh Reserve)	Head ventrally, abdomen, legs	Dubinina (1964)
	C. f. belorussicus	Poland (Suwałki)	Head ventrally, abdomen, legs	Bochkov *et al.* (2012)
	C. fiber, unknown subspecies	Europe (no further details)	Head	Fain and Lukoschus (1985)
	C. f. albicus	Germany (Elba River)	Unknown	Fain and Lukoschus (1985)
	C. f. tuvinicus	Russia (Azas River)	Anterior legs	Present paper
S. gozdziewskii Bochkov *et al*., 2012	*C. f. belorussicus**	Poland (Suwałki)	Dorsum and flanks	Bochkov *et al.* (2012)
	C. f. orientoeuropaeus	Russia (Voronezh Reserve)	Unknown	Bochkov and Dubinina (2011)
	C. f. tuvinicus	Russia (Azas River)	Dorsum	Present paper

continued next page

TABLE 1. (continued)

Mite species	Host subspecies	Locality	Microhabitat	Reference
S. radiatus Fain and Lukoschus, 1985	*C. fiber*,* unknown subspecies	Europe (no further details)	Dorsum, flanks, posterior legs	Fain and Lukoschus (1985)
	C. f. belorussicus	Poland (Suwałki)		Bochkov *et al.* (2012)
	C. f. orientoeuropaeus	Russia (Voronezh Reserve)	Unknown	Bochkov and Dubinina (2011)
	C. f. tuvinicus	Russia (Azas River)	Posterior dorsum, flanks	Present paper
S. insignis Fain and Lukoschus, 1985	*C. fiber*,* unknown subspecies	Europe (no further details)	Ears	Fain and Lukoschus (1985)
	C. f. albicus	Germany (Elba River)		
	C. f. birulai	Mongolia (Bulgan River)		
	C. f. belorussicus	Poland (Suwałki)	Unknown	Bochkov *et al.* (2012)
	C. f. tuvinicus	Russia (Azas River)	Posterior dorsum	Present paper
Species recorded only from beavers of "upper" Azas subpopulation				
S. daberti **sp. nov.**	*C. f. tuvinicus**	Russia (Azas River)	Posterior legs	Present paper
S. unzhakovi **sp. nov.**	*C. f. tuvinicus**	Russia (Azas River)	?Anterior abdomen	Present paper
S. tuvinicus **sp. nov.**	*C. f. tuvinicus**	Russia (Azas River)	?Tail base ventrally	Present paper
S. zurowskii Bochkov *et al.*, 2012	*C. f. belorussicus**	Poland (Suwałki)	Abdomen	Bochkov *et al.* (2012)
	C. f. tuvinicus	Russia (Azas River)	Anterior abdomen	Present paper
S. subornatus Fain and Lukoschus, 1985	*C. fiber*,* unknown subspecies	Europe (no further details)	Mostly on posterior legs	Fain and Lukoschus (1985)
S. grandis (Dubinina, 1964)	*C. f. orientoeuropaeus**	Russia (Voronezh Reserve)	anterior legs, groin	Dubinina (1964)
	C. fiber, unknown subspecies	Europe (no further details)	Head, chest, throat	Fain and Lukoschus (1985)
	C. f. tuvinicus	Russia (Azas River)	?Anterior dorsum	Present paper
Species recorded only from beavers of "lower" Azas subpopulation				
S. azasicus **sp. nov**.	*C. f. tuvinicus**	Russia (Azas River)	?Posterior legs	Present paper

individuals from the "lower" (beavers #3-6; 52º32'N, 97º15'E) subpopulations were examined by APS. Samples of the undercoat from 14 microhabitats on the beaver body (see Bochkov *et al*. [2012] for sampling scheme) were combed out by APS and colleagues with a fine-toothed comb (10 teeth/cm) (see Fig. 1) and put in separate vials containing 96% ethanol. All males were selected from the fur samples by AVB in laboratory conditions using a dissecting microscope, cleared in lactophenol and mounted in Hoyer's medium (samples from a single individual [beaver #6] did not contain mites of the genus *Schizocarpus*). 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 the 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).

Specimen depositories are cited using the following abbreviations:

IRSNB	Institute royal des Sciences naterulles de Belgique, Brussels, Belgium
UMMZ	Museum of Zoology, University of Michigan, Ann Arbor, USA;
ZISP	Zoological Institute, Russian Academy of Sciences, Saint-Petersburg, Russia.

Systematics

Family Chirodiscidae Trouessart

Genus *Schizocarpus* Trouessart, 1896

1. *Schizocarpus daberti* sp. nov.

(Fig. 2)

Description. MALE (holotype). Body 350 long (350–365 in ten paratypes) and 175 wide (170–175); body length/width ratio about 2:1. Idiosoma egg-shaped, strongly concave dorsally. Hysteronotal shield 110 long and 85 wide. Anterior margin of hysteronotal shield uneven. Setae *d1* situated on anterior margin of hysteronotal shield or immediately anterior to this margin, distance *d1-d1* 50. Setae *e1* situated on posterior margin of hysteronotal shield or immediately posterior to this margin. Distance *e1-e1* about 25. Setae *h1* situated laterally on posterior margin of hysteronotal shield, distance *h1-h1* about 2.7 times longer than *e1-e1*. Setae *f2* situated ventro-laterally. Setae *h3* situated on distinct peduncles and strongly displaced ventrally, being located between posterior ends of adanal shields, distance *h3-h3* 20. Opisthosomal membranes moderately developed, about 20 long. Setae *ps3* situated laterally, anterior to transverse level of adanal suckers. Adanal shields elongated, 1.6 longer than wide, with distinctly sclerotized external and weakly sclerotized internal borders and non-punctate central areas. Minimal distance between these shields 25. Setae *ad1* represented by alveoli and situated in posterior third of adanal shields slightly inside of longitudinal level of adanal suckers, distance between adanal suckers and setae *ad1* subequal to diameter of adanal suckers. Adanal suckers situated in anterior half of adanal shields, 10–12 in diameter, with dentate corolla (type E), without external sclerotized ring around. Setae *ps1* situated on distinct peduncles, which almost adjoin peduncles bearing setae *h3*. Adanal setae *ad2* absent. Ventral anal sclerite very large, asymmetrically rhomboid-like in outline, its anterior end reaching to level of alveoli *ad1*. Lengths of some setae: *f2* 35, *h1* 7, *h2* 180, *h3* 2, *ps2* 95, *ps3* 70. Tarsus III 20 long and 12 wide; tarsus IV 10 long and 9 wide.

Type material. Holotype male (ZIN T-Chir-21) and 12 male paratypes (ZISP AVB-2012-0203-001, #1-12) ex *Castor fiber tuvinicus* [beaver #2, sample 12], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 9 October 2011, coll. A.P. Saveljev.

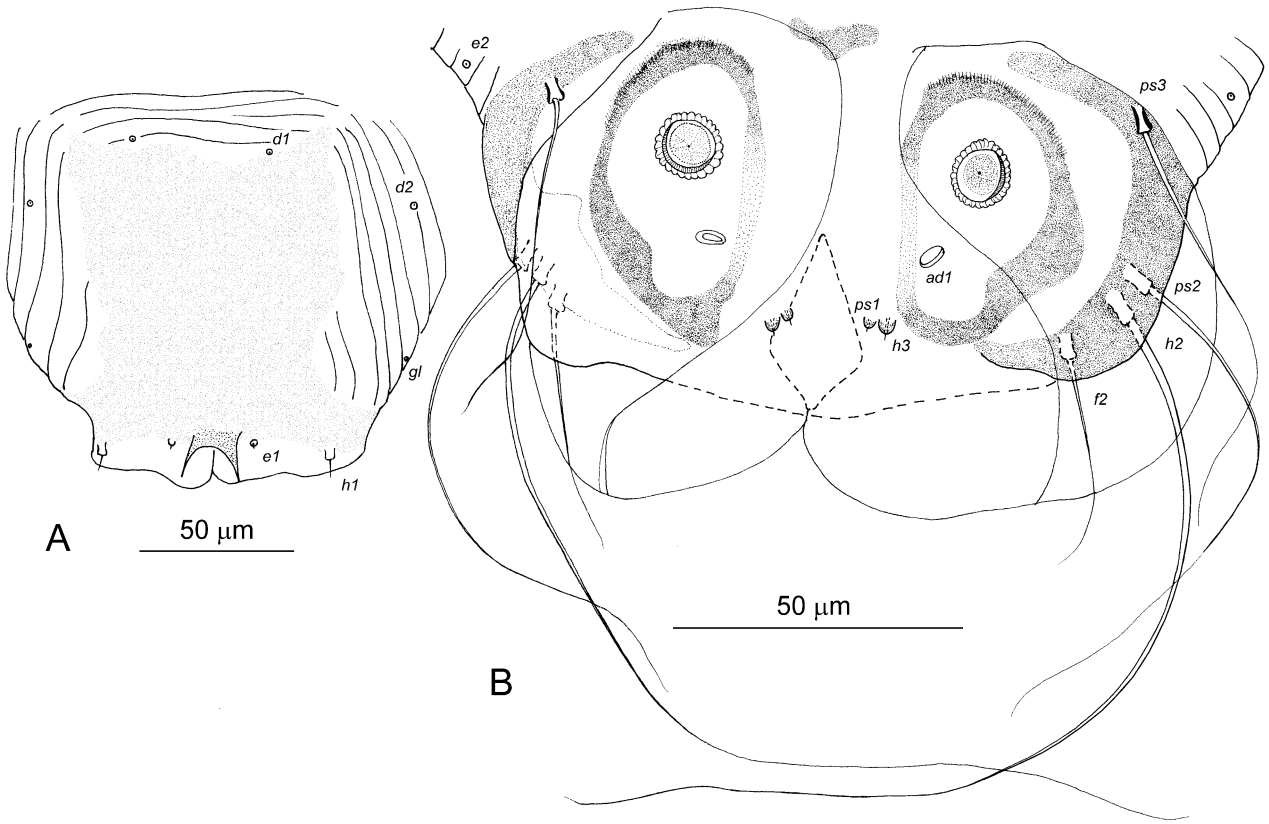

FIGURE 2. *Schizocarpus daberti* **sp. nov**., male: A—opisthosoma in dorsal view; B—same, in ventral view.

Type depositions. Holotype and ten paratypes—in ZISP, 1 paratype—in UMMZ, 1 paratype—in IRSNB.

Microhabitat. Posterior legs.

Distribution. Type locality only.

Etymology. This species is dedicated to the well known Polish acarologist Dr. Jacek Dabert (Adam Mickiewicz University, Poznan, Poland).

Differential diagnosis. This species is close to *S. latus* (Dubinina, 1964) from *C. f. orientoeuropaeus* from the Voronezh Reserve (Russia) (Dubinina 1964). In both species, the idiosoma is egg-shaped, the corolla of adanal suckers is dentate, setae *ps3* are situated laterally, and setae *f2* are present. These species differ from each other by the following characters. In *S. daberti* **sp. nov**., setae *ad1* are situated distinctly posterior to the adanal suckers, setae *ps1* are situated off the adanal shields, setae *h3* are very short (2-3 long), situated on distinct peduncles and strongly displaced ventrally, immediately adjacent to the peduncles bearing setae *ps1*. In *S. latus*, setae *ad1* are situated at the same transverse level with the adanal suckers, setae *ps1* are situated on the adanal shields, setae *h3* are 40 long, not pedunculate and situated close to the posterior margin of the opisthosoma far posterior to the peduncles bearing setae *ps1*.

Remark. We have reinvestigated the lectotype of *S. latus* and found that it is indiscernible from *S. ventricosus* Fain and Lukoschus, 1985 described from the Eurasian beaver of unknown origin (Fain & Lukoschus 1985). Since the type specimens of *S. latus* were not available for these authors and some crucial characteristics of this species were missed in the original description (Dubinina 1964; see Bochkov & Dubinina 2011 for redescription), Fain and Lukoschus (1985) considered *S. ventricosus* and *S. latus* as two distinctly separated species. We consider here *S. ventricosus* **syn. nov**. as a junior synonym of *S. latus*.

2. *Schizocarpus lavrovi* sp. nov.
(Fig. 3)

Description. MALE (holotype). Body 455 long (440-460 in nine paratypes) and 210 wide (210-215); body length/width ratio about 2.1:1. Idiosoma slightly flattened dorso-ventrally. Hysterosoma subparallel sided. Hysteronotal shield 90 long and 115 wide. Anterior margin of hysteronotal shield uneven and distinctly concave in median part. Setae *d1* situated close to anterior margin of hysteronotal shield, distance *d1-d1* 50. Setae *e1* situated at posterior margin of hysteronotal shield. Distance *e1-e1* about 65. Setae *h1* situated laterally off posterior margin of hysteronotal shield, distance *h1-h1* about 1.5 times longer than *e1-e1*. Setae *f2* and *h3* situated ventro-laterally, distance *h3-h3* 110. Ventro-lateral parts of opisthosoma strongly developed, distinctly longer than mid-part of opisthosomal venter. Opisthosomal membranes moderately developed, about 20 long. Setae *ps3* situated laterally, at level of setae *e2* and distinctly anterior to transverse level of adanal suckers. Setae *ps2* posteriorly displaced, situated at level of posterior margin of opisthosoma. Adanal shields widely separated (minimal distance between them 25), evenly sclerotized, irregular in shape, connected to each other with 2 distinct transverse ridges, anterior ridge located at level of seta *ps3* bases, posterior ridge located at level of posterior end of opisthosoma. Setae *ad1* represented by alveoli and situated in anterior third of adanal shields, close to anterior ridge. Adanal suckers situated in posterior half of adanal shields, 12-14 in diameter, with smooth corolla (type A), without external sclerotized ring. Setae *ps1* situated on distinct peduncles located on adanal shields, inside and close to alveoli *ad1*. Small area around setae *ps1* and *ad1* not punctate. Adanal setae *ad2* absent. Ventral anal sclerite indistinct. Lengths of some setae: *f2* 38, *h1* 35, *h2* 185, *h3* 100, *ps2* 70, *ps3* 65. Tarsus III 30 long and 15 wide; tarsus IV 15 long and 12 wide.

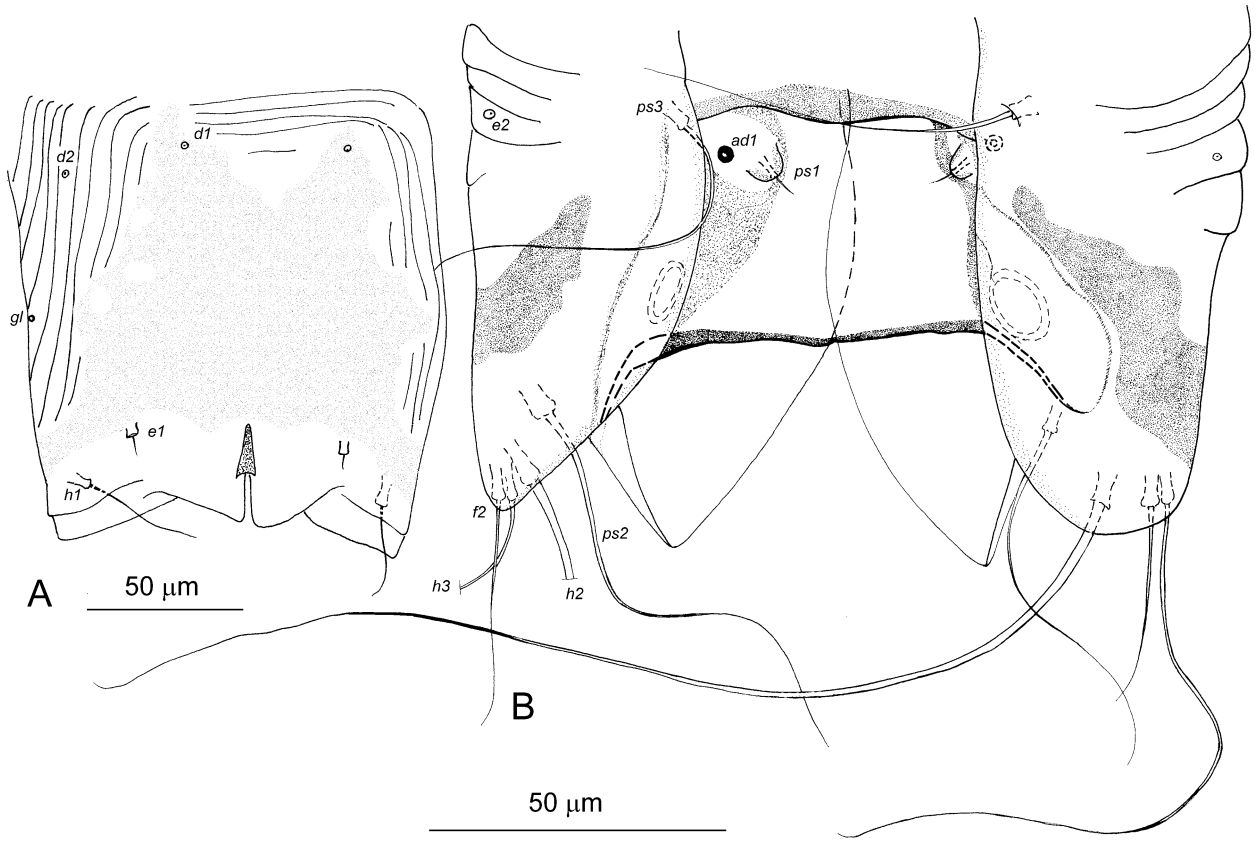

FIGURE 3. *Schizocarpus lavrovi* **sp. nov.**, male: A—opisthosoma in dorsal view; B—same, in ventral view.

Type material. Holotype male (ZIN T-Chir-22) and 9 male paratypes (ZISP AVB-2012-0203-022, #1-9) ex *Castor fiber tuvinicus* [beaver #2, sample 5], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 9 October 2011, coll. A.P. Saveljev; 4 males (AVB-2012-0203-023, #1-4), beaver #1, sample 6, same locality, 8 October 2011, coll. A.P. Saveljev; 2 males (AVB-2012-0203-024, #1, 2), beaver #3, sample 2,

downstream water Azas River, 52º32'N, 97º15'E, 15 October 2011, coll. A.P. Saveljev; 1 male (AVB-2012-0203-025), beaver #4, sample 1, same locality, 16 October 2011, coll. A.P. Saveljev.

Type depositions. Holotype and seven paratypes—in ZISP, 1 paratype—in UMMZ, 1 paratype—in IRSNB.

Microhabitat. Head dorsally, posterior dorsum.

Distribution. Azas River.

Etymology. This species is dedicated to the well known Russian researcher of beavers, Dr. Leonid Lavrov (1911-1992).

Differential diagnosis. This new species is very close to *S. brevicauda* (Dubinina, 1964) from *C. f. orientoeuropaeus* from Voronezh Reservation (Russia) (Dubinina 1964). In both these species, the ventro-lateral parts of the opisthosoma are well developed, distinctly longer than the central part of the opisthosomal venter, the adanal shields are widely separated, setae *ad1* and pedunculate setae *ps1* are situated distinctly anterior to the adanal suckers, and setae *ps2* are located at the level of posterior margin of the opisthosoma. These species differ from each other by the following characters. In *S. lavrovi* **sp. nov**., setae *ps1* are situated inside and close to alveoli *ad1*. In *S. brevicauda*, setae *ps1* are situated outside alveoli *ad1* and much closer to setae *ps3* than to *ad1*.

3. *Schizocarpus unzhakovi* sp. nov.

(Fig. 4)

Description. MALE (holotype). Body 425 long and 200 wide; body length/width ratio about 2.1:1. Idiosoma slightly flattened dorso-ventrally. Hysterosoma subparallel sided. Hysteronotal shield 100 long and 95 wide. Anterior margin of hysteronotal shield uneven and distinctly concave in median part. Setae *d1* immediately anterior to anterior margin of hysteronotal shield, distance *d1-d1* 55. Setae *e1* situated immediately posterior to posterior margin of hysteronotal shield. Distance *e1-e1* about 45. Setae *h1* situated laterally off posterior margin of hysteronotal shield, distance *h1-h1* about 2 times longer than *e1-e1*. Setae *f2* and *h3* situated ventro-laterally, distance *h3-h3* 100. Ventro-lateral parts of opisthosoma strongly developed, distinctly longer than mid-part of opisthosomal venter. Opisthosomal membranes distinctly developed, about 40 long. Setae *ps3* situated laterally, slightly anterior to level of setae *e2* and distinctly anterior to transverse level of adanal suckers. Setae *ps2* posteriorly displaced, situated at level of posterior margin of opisthosoma. Adanal shields widely separated (minimal distance between them 20), evenly sclerotized, comma-shaped in outline, connected to each other with 2 distinct transverse ridges, anterior ridge located at level of seta *ps3* bases, posterior ridge at level of posterior end of opisthosoma. Setae *ad1* represented by distinct alveoli, adjoining each other and situated between adanal shields slightly posterior to level of seta *ps3* bases. Adanal suckers situated in posterior half of adanal shields, 12 in diameter, with smooth corolla (type A), without external sclerotized ring. Setae *ps1* situated on distinct peduncles located on median part of anterior sclerotized ridge at same longitudinal level with setae *ad1*, distance *ps1-ps1* 5 long. Adanal setae *ad2* absent. Ventral anal sclerite distinctly developed, pointed apically. Lengths of some setae: *f2* 35, *h1* 25, *h2* 150, *h3* 90, *ps2* 75, *ps3* 45. Tarsus III 30 long and 15 wide; tarsus IV 15 long and 12 wide.

Type material. Holotype male (ZISP T-Chir-26) ex *Castor fiber tuvinicus* [beaver #2, sample 11], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 9 October 2011, coll. A.P. Saveljev.

Type deposition. Holotype—in ZISP.

Microhabitat. ?Anterior abdomen.

Distribution. Type locality only.

Etymology. The species is named after V.V. Unzhakov, a Russian zoologist, who had been investigating the Tuvinian beaver for many years.

Differential diagnosis. This new species is very close to *S. lavrovi* sp. nov. described above. In both of these species, the ventro-lateral parts of the opisthosoma are well developed, distinctly longer than the mid part of the opisthosomal venter, the adanal shields are widely separated, setae *ad1* and pedunculate *ps1* are situated distinctly anterior to the adanal suckers, and setae *ps2* are located at the level of the posterior margin of the opisthosoma. These species differ from each other by the following characters. In *S. unzhakovi* **sp. nov**., setae *ad1* and *ps1* are situated off the adanal shields, setae *ps1* are located close to each other, setae *ad1* adjoin each other and located distinctly posterior to setae *ps1*, the ventral anal sclerite is distinctly developed. In *S. lavrovi*, setae *ad1* and *ps1* are situated on the adanal shields very close to each other, and the ventral anal sclerite is indistinct.

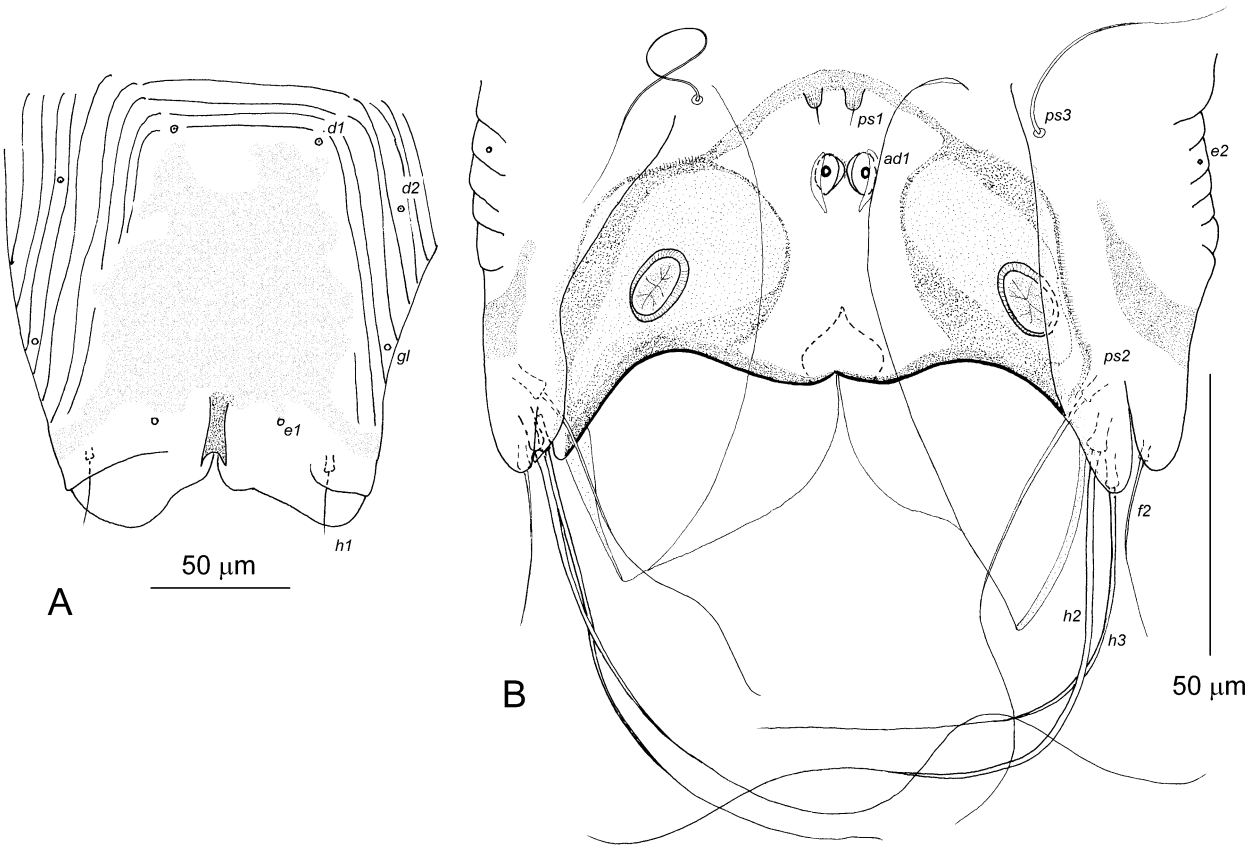

FIGURE 4. *Schizocarpus unzhakovi* **sp. nov.**, male: A—opisthosoma in dorsal view; B—same, in ventral view.

4. *Schizocarpus heideckei* sp. nov.
(Fig. 5)

Description. MALE (holotype). Body 375 long (370–380 in ten paratypes) and 175 wide (170-175); body length/width ratio about 2.1:1. Idiosoma slightly flattened dorso-ventrally. Hysterosoma subparallel sided. Hysteronotal shield 105 long and 90 wide. Anterior margin of hysteronotal shield distinctly concave in median part. Setae *d1* situated close to anterior margin of hysteronotal shield, distance *d1-d1* 50. Setae *e1* situated at posterior margin of hysteronotal shield. Distance *e1-e1* about 40. Setae *h1* widely separated from each other, distance *h1-h1* about 1.7 times longer than *e1-e1*. Setae *f2* situated dorsally, distance *h1-f2* about 15. Setae *h3* widely separated from each other, distance *h3-h3* 80. Opisthosomal membranes moderately developed, about 15 long. Setae *ps3* situated laterally, anterior to transverse level of adanal suckers. Adanal shields poorly sclerotized. Setae *ad1* represented by alveoli and situated posterior to adanal suckers. Centre of alveoli *ad1* located slightly inside than centre of adanal suckers. Distance between adanal sucker and seta *ad1* less than diameter of adanal sucker. Adanal suckers situated in median part of adanal shields, 10-12 in diameter, with smooth corolla (type A), each surrounded by highly sclerotized punctate ring, this ring at least 2 times narrower than adanal suckers. Large almost 'butterfly-shaped' median sclerite present between adanal shields. Adanal suckers and alveoli *ad1* enclosed between lateral arms of this sclerite. Setae *ps1* pedunculate, located on posterior arms of median sclerite immediately posterior to alveoli *ad1*. Adanal setae *ad2* absent. Ventral anal sclerite indistinct. Lengths of some setae: *f2* and *h1* about 20, *h2* 180, *h3* 70, *ps2* and *ps3* about 50. Tarsus III 25 long and 12 wide; tarsus IV about 12 long and 12 wide.

Type material. Holotype male (ZISP T-Chir-24) and 15 male paratypes (ZISP AVB-2012-0203-037, #1-15) ex *Castor fiber tuvinicus* [beaver #2, sample 11], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 9 October 2011, coll. A.P. Saveljev; 7 male paratypes (ZISP AVB-2012-0203-038, #1-7), beaver #2, sample 10, same data; 1 male paratype (ZISP AVB-2012-0203-039), beaver #2, sample 3, same data; 1

male paratype (ZISP AVB-2012-0203-040), beaver #2, sample 5, same data; 1 male paratype (ZISP AVB-2012-0203-041), beaver #5, sample 12, downstream of Azas River, 52º32'N, 97º15'E, 17 October 2011, coll. A.P. Saveljev.

Type depositions. Holotype and 20 paratypes—in ZISP, three paratypes—in UMMZ, two paratypes—in IRSNB.

Microhabitat. Anterior legs and anterior abdomen, one mite from neck dorsally, posterior dorsum, and flank.

Distribution. Azas River.

Etymology. This species is dedicated to the well known German zoologist Dr. Dietrich Heidecke (1945-2011).

Differential diagnosis. This new species is very close to form *intercalatus* of the species *S. brachyurus* (Dubinina, 1964) known from several hosts: *C. f. orientoeuropaeus* in Voronezh Reserve (Russia) (Dubinina 1964), a Eurasian beaver of unknown origin (Fain & Lukoschus 1985), *C. f. belorussicus* from Poland (Bochkov *et al*. 2012), and *C. f. tuvinicus* from Tuva (present paper) (see Fig. 8 and remarks on this species below). In the new species and this form, alveoli *ad1* and pedunculate setae *ps1* are situated posterior to the adanal suckers, setae *ps1* are located immediately posterior to alveoli *ad1*, setae *f2* are situated dorsally, setae *ps3* are located laterally, anterior to the transverse level of adanal suckers, and each adanal sucker is surrounded by a highly sclerotized punctate ring. These species differ from each other in the following characters. In *S. heideckei* **sp. nov**., the adanal shields are weakly sclerotized, including borders, a large 'butterfly-shaped' median sclerite is present, the adanal suckers and alveoli *ad1* are enclosed between the lateral arms of this sclerite. In *S. brachyurus* (form *intercalatus*), the borders of the adanal shields are distinctly sclerotized and the 'butterfly-shaped' median sclerite is absent.

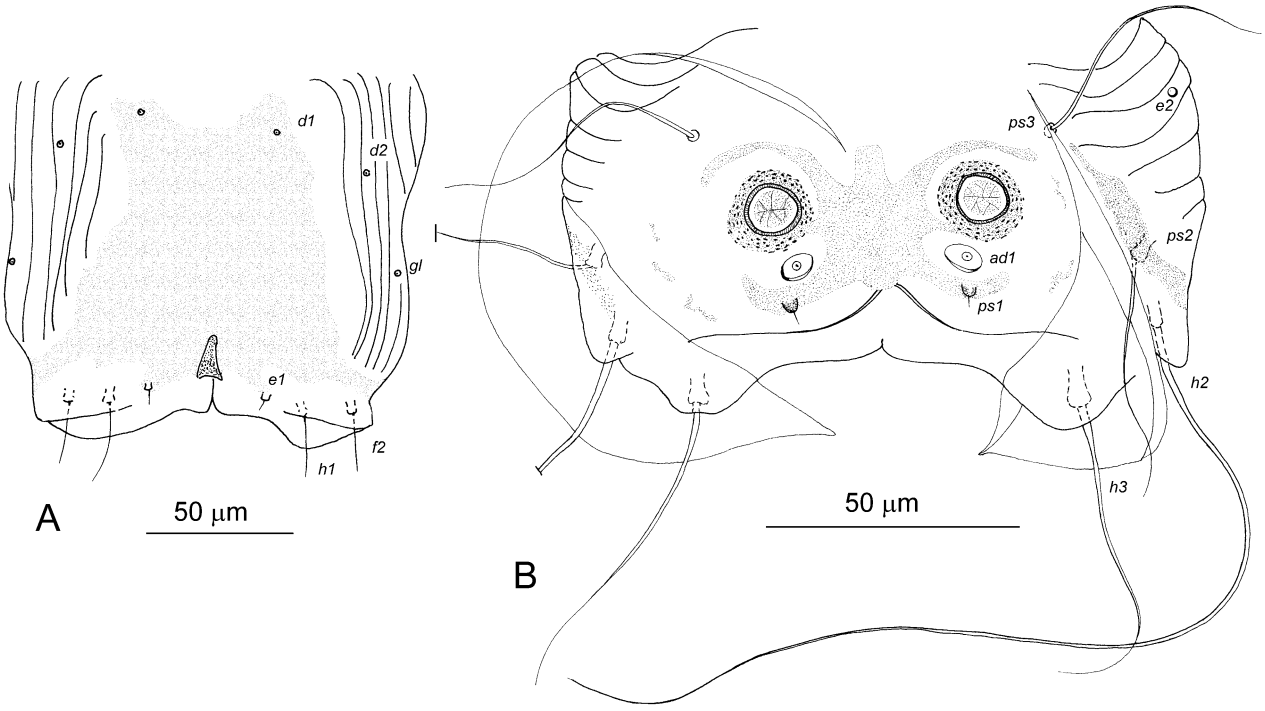

FIGURE 5. *Schizocarpus heideckei* **sp. nov**., male: A—opisthosoma in dorsal view; B—same, in ventral view.

5. *Schizocarpus tuvinicus* sp. nov.

(Fig. 6)

Description. MALE (holotype). Idiosoma slightly flattened dorso-ventrally. Hysterosoma outline in shape of inverted trapezium. Body 325 long and 170 wide; body length/width ratio about 1.9:1. Hysteronotal shield 80 long and 85 wide. Anterior margin of hysteronotal shield widely concave. Setae *d1* situated slightly posterior to anterior margin of this shield, distance *d1-d1* 40. Setae *e1* situated on posterior margin of hysteronotal shield, distance *e1-e1* 35. Setae *h1* situated very close to setae *e1*, distances *e1-e1* and *h1-h1* subequal. Setae *f2* absent. Distance *h3-h3*

35. Opisthosomal membranes weakly developed, 10 long. Setae *ps3* situated laterally. Setae *ps2* displaced posteriorly, located distinctly posterior to adanal suckers. Adanal shields roughly subsquare in outline, evenly punctated with strongly sclerotized borders. Minimal distance between these shields 15. Adanal suckers situated in median part of adanal shields, about 7 in diameter, with smooth corolla (type A), without external sclerotized ring. Setae *ad1* represented by alveoli covered with fine membranes, adjoining each other and situated between adanal shields almost at same transverse level with adanal suckers. Membranous pocket-like structure situated immediately posterior to these alveoli. Setae *ps1* pedunculate, situated at level of posterior borders of adanal shields and between them, distance *ps1-ps1* 15. Adanal alveoli *ad2* absent. Ventral anal sclerite narrow but distinct. Lengths of some setae: *h1* 4, *h2* 120, *h3* and *ps2* about 60, *ps1* 9, *ps3* 40. Tarsus III 20 long, 12 wide; tarsus IV 12 long, 11 wide.

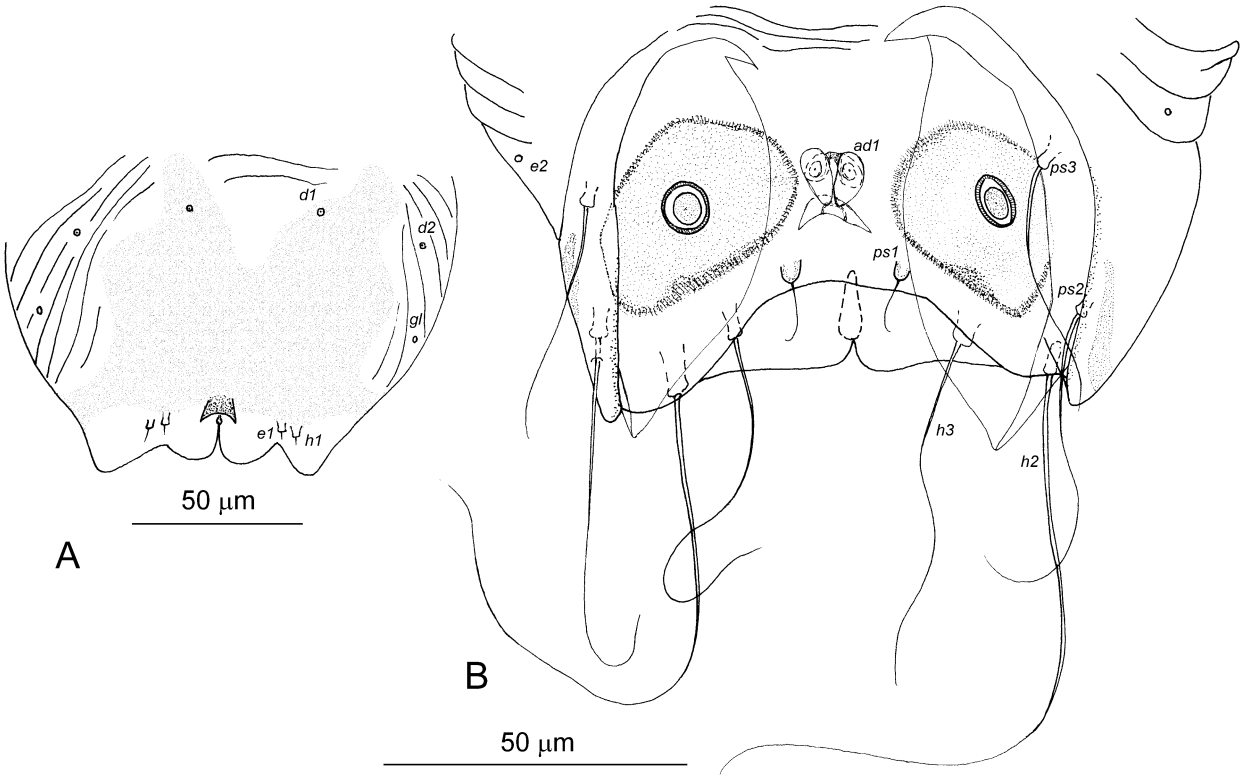

FIGURE 6. *Schizocarpus tuvinicus* **sp. nov**., male: A—opisthosoma in dorsal view; B—same, in ventral view.

Type material. Holotype male (ZIN T-Chir-23) ex *Castor fiber tuvinicus* [beaver #2, sample 7], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 9 October 2011, coll. A.P. Saveljev.
Type deposition. Holotype—in ZISP.

Microhabitat. ?Tail base ventrally.

Distribution. Type locality only.

Etymology. The species epithet derives from the subspecies name of the host and is a noun in apposition.

Differential diagnosis. This new species occupies a solitary position among species of the genus with the smooth adanal suckers without the external sclerotized ring around and lacking alveoli *ad2*. Among previously known species, it is most similar to *S. subornatus* Fain and Lukoschus, 1985 from the Eurasian beaver of unknown origin (Fain & Lukoschus 1985). In both these species, bases of setae *h1* are closely situated to seta *e1* bases, setae *ps2* are situated laterally, the adanal shields are evenly punctated with strongly sclerotized borders. These species differ from each other by the following characters. In *S. tuvinicus* **sp. nov**., setae *e1* are situated on the hysteronotal shield, setae *f2* are absent, the adanal shields are roughly subsquare in outline, setae *ps1* are relatively long (9), alveoli *ad1* are smaller than the adanal suckers, membranous pocket-like structure is present immediately posterior to alveoli *ad1*, an M-shaped sclerotized band surrounding alveoli *ad1* is absent. In *S. subornatus*, setae *e1* are situ-

ated off the hysteronotal shield, setae *f2* are present, the adanal shields are irregular in outline, setae *ps1* are microsetae, alveoli *ad1* are larger than the adanal suckers, the membranous pocket-like structure is absent, an M-shaped sclerotized band surrounding alveoli *ad1* is present.

6. *Schizocarpus azasicus* sp. nov.
(Fig. 7)

Description. MALE (holotype). Idiosoma slightly flattened dorso-ventrally. Hysterosoma outline in shape of inverted trapezium. Body 350 long and 175 wide; body length/width ratio about 2:1. Hysteronotal shield 80 long and 90 wide. Anterior margin of hysteronotal shield uneven with distinct incision in median part. Setae *d1* situated slightly anterior to anterior margin of this shield, distance *d1-d1* 30. Setae *e1* situated distinctly posterior to posterior margin of hysteronotal shield, almost at posterior margin of opisthosoma, distance *e1-e1* 30. Bases of setae *h1* adjoining bases of seta *e1*. Setae *f2* situated ventro-medially. Setae *h3* situated close to each other, distance *h3-h3* 35. Opisthosomal membranes weakly developed, 5 long. Setae *ps3* situated laterally and along with setae *ps2* strongly displaced posteriorly being located posterior to level of adanal suckers. Adanal shields subtriangular in outline, evenly punctated with strongly sclerotized anterior, internal and external borders. Minimal distance between these shields 25. Adanal suckers situated in anterior half of adanal shields, about 8 in diameter, with smooth corolla (type A), without external sclerotized ring. Setae *ad1* represented by large alveoli, about 2.5 times larger than adanal suckers, located between adanal shields. M-shaped sclerite situated between adanal shields and surrounding these alveoli present. Setae *ps1* not pedunculate, situated at lateral ends of M-shaped sclerite, at same transverse level with adanal suckers; distance *ps1-ps1* 20 long. Adanal alveoli *ad2* absent. Ventral anal sclerite distinct. Lengths of some setae: *f2* and *h3* about 15, *h1* 3, *h2* 60, *ps2* and *ps3* about 45. Tarsus III 20 long, 12 wide; tarsus IV 10 long, 10 wide.

Type material. Holotype male (ZISP T-Chir-25) ex *Castor fiber tuvinicus* [beaver #5, sample 8], **RUSSIA**: Tuva, Todzhinskii District, downstream of Azas River, 52º32'N, 97º15'E, 17 October 2011, coll. A.P. Saveljev.

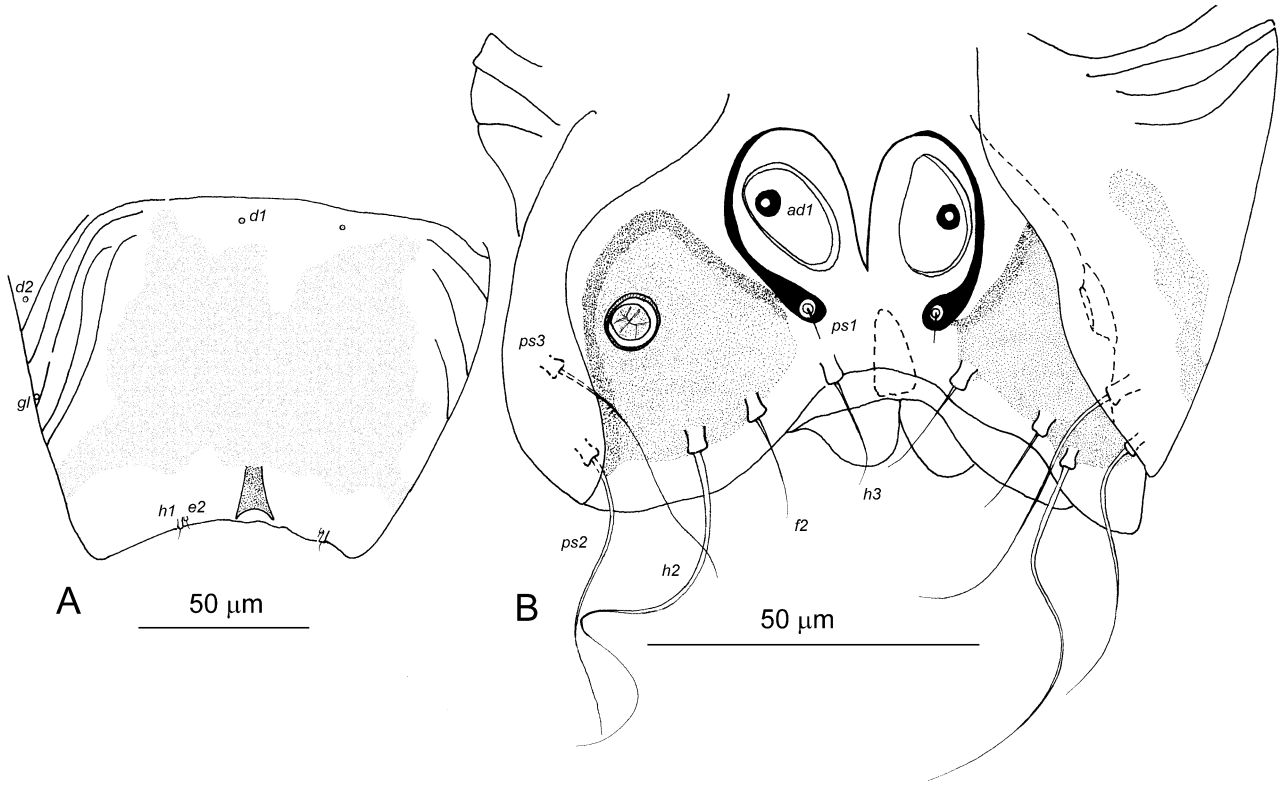

FIGURE 7. *Schizocarpus azasicus* **sp. nov.**, male: A—opisthosoma in dorsal view; B—same, in ventral view.

Type deposition. Holotype—in ZISP.

Microhabitat. ?Posterior leg.

Distribution. Type locality only.

Etymology. The species epithet derives from the name of Azas River, the type locality of this species.

Differential diagnosis. This new species is very close to *S. subornatus* Fain and Lukoschus, 1985, found on a Eurasian beaver of unknown origin (Fain & Lukoschus 1985) and *C. f. tuvinicus* (present paper), and differs from this species mostly by shorter setae *h3* and *f2* of about 15 long (versus 50 and 45 long, respectively, in *S. subornatus*).

7. *Schizocarpus subornatus* Fain and Lukoschus, 1985

Schizocarpus subornatus Fain and Lukoschus, 1985: 52, figs, 28, 31, 32

Material examined. 1 male (ZISP AVB-2012-0203-044) ex *Castor fiber tuvinicus* [beaver #2, sample 8, **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 9 October 2011, coll. A.P. Saveljev.

Microhabitat. ?Posterior leg.

Distribution. Recorded from a Eurasian beaver (undetermined subspecies) from an unknown locality in Europe (Fain & Lukoschus 1985) and from *C. f. tuvinicus* from Tuva (Azas River) (present paper).

8. *Schizocarpus fedjushini* (Dubinina, 1964)

Histiophorus fedjushini Dubinina, 1964: 123, fig. 9.1–4
Schizocarpus fedjushini, Fain & Lukoschus 1985: 45, figs. 8, 9, 11; Dubinina *et al*. 1993: 451; Bochkov *et al*. 2012: 55
Schizocarpus mingaudi Trouessart, 1896, Fedjushin 1935: 337, fig. 110 (incorrect determination)

Material examined. 2 males (ZISP AVB-2012-0203-006, #1, 2) ex *Castor fiber tuvinicus* [beaver #1, sample 1], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 8 October 2011, coll. A.P. Saveljev; 3 males (ZISP AVB-2012-0203-007, #1-3), beaver #1, sample 6, same data; 30 males (ZISP AVB-2012-0203-002, #1-30), beaver #2, sample 1, same locality, 9 October 2011, coll. A.P. Saveljev; 2 males (ZISP AVB-2012-0203-004, #1, 2), beaver #2, sample 11, same data; 1 male (ZISP AVB-2012-0203-013), beaver #2, sample 3, same data; 2 males (ZISP AVB-2012-0203-005, #1, 2), beaver #3, sample 1, downstream of Azas River, 52º32'N, 97º15'E, 15 October 2011, coll. A.P. Saveljev; 7 males (ZISP AVB-2012-0203-010, #1-10), beaver #3, sample 2, same data; 17 males (ZISP AVB-2012-0203-003, #1-17), beaver #4, sample 1, same locality, 16 October 2011, coll. A.P. Saveljev; 1 male (ZISP AVB-2012-0203-008), beaver #5, sample 12, same locality, 17 October 2011, coll. A.P. Saveljev; 11 males (ZISP AVB-2012-0203-009), beaver #5, sample 2; same data; 1 male (ZISP AVB-2012-0203-012), beaver #5, sample 3, same data.

Microhabitat. Head and neck dorsally; few mites on anterior legs, flanks, and base of tail dorsally.

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

9. *Schizocarpus brachyurus* (Dubinina, 1964)
(Fig. 8)

Histiophorus brachyurus Dubinina, 1964: 125, fig. 10, 1–4
Schizocarpus brachyurus, Fain & Lukoschus 1985: 66; Dubinina *et al*. 1993: 451; Bochkov & Dubinina 2011: 57, figs. 2B, 3B; Bochkov *et al*. 2012: 55
Schizocarpus parabrachyurus Fain and Lukoschus, 1985: 45, figs. 12, 14, 15; **syn. nov**.
Schizocarpus intercalatus Fain and Lukoschus, 1985: 46, figs. 13, 16, 17; Bochkov *et al*. 2012: 55; **syn. nov**.

Material examined. 8 males (ZISP AVB-2012-0203-042, #1-8) ex *Castor fiber tuvinicus* [beaver #2, sample 11], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 9 October 2011, coll. A.P. Saveljev; 1 male (ZISP AVB-2012-0203-043), beaver #4, sample 4, downstream of Azas River, 52º32'N, 97º15'E, 16 October 2011, coll. A.P. Saveljev.

Microhabitat. Anterior legs, one mite from anterior dorsum.

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

Remarks. Fain and Lukoschus (1985) described two species closely related to *S. brachyurus*: *S. intercalatus* Fain and Lukoschus, 1985 from a Eurasian beaver (undetermined subspecies) from an unknown locality in Europe and *S. parabrachyurus* Fain and Lukoschus, 1985 from *C. f. albicus* from Germany (Elba River). These three species slightly differed from each other by the shape of the adanal shields and positions of setae *ad1* and *ps1*. The type specimens of *S. brachyurus* were not available to Fain and Lukoschus (1985) and the original description of this species by Dubinina (1964) did not include some fine but important details (see redescription in Bochkov & Dubinina 2011). We examined a series of specimens from *C. f. belorussicus* and *C. f. tuvinicus*, which could be assigned to these three forms, and have come to the conclusion that the "species" described by Fain and Lukoschus (1985) represent extreme morphological variants of the above mentioned characters and actually belong to one species. The examples of significant variability of some characters in several *Schizocarpus* species were described by Fain and Whitaker (1988) and Bochkov *et al*. (2012). We consider here *S. parabrachyurus* **syn. nov**. and *S. intercalatus* **syn. nov**. as junior synonyms of *S. brachyurus*.

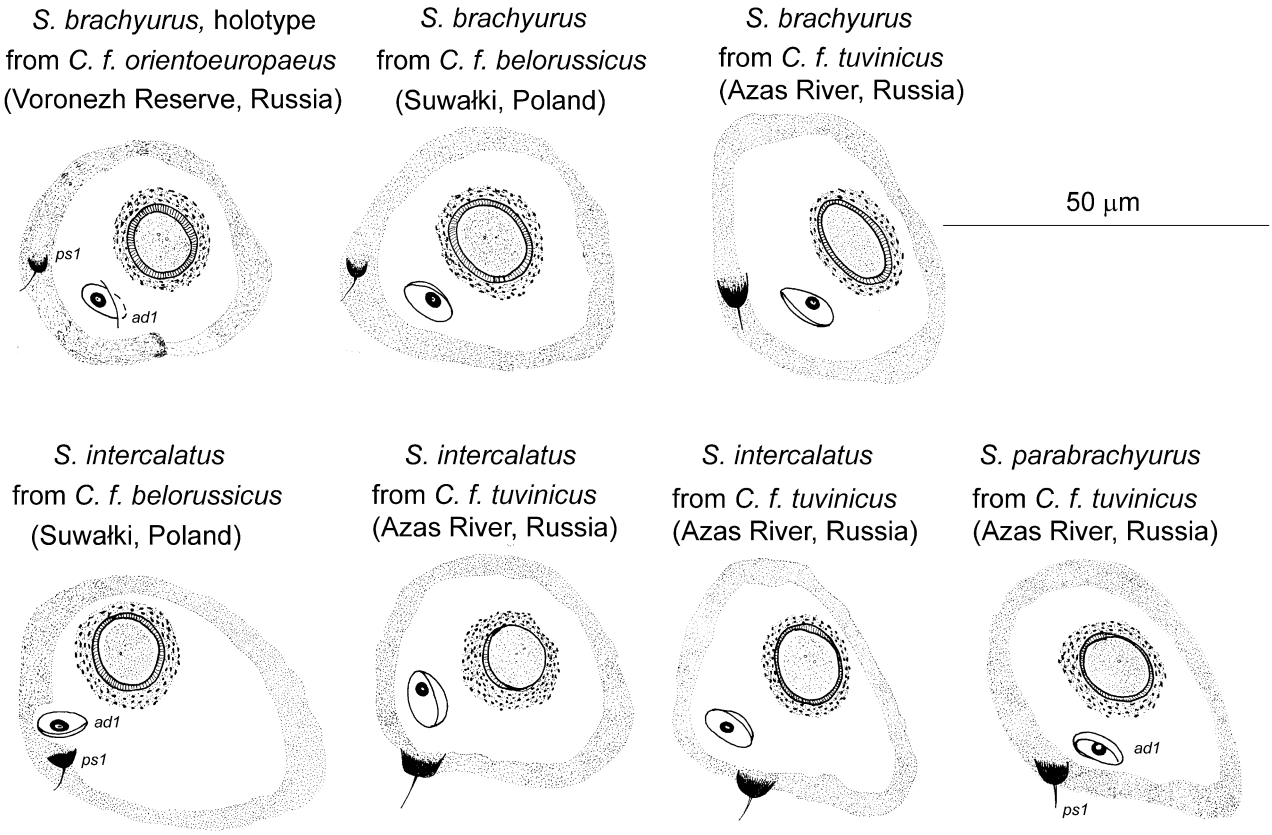

FIGURE 8. Variation in positions of ventral opisthosomal setae and shape of adanal shield in males of *Schizocarpus brachyurus* (Dubinina, 1964). Positions of these structures being typical for the forms *intercalatus* and *parabrachyurus* are labeled, respectively.

10. *Schizocarpus grandis* (Dubinina, 1964)

Histiophorus grandis Dubinina, 1964: 129, figs. 12, 1–2, 13, 1–2; Bochkov & Dubinina 2011: 69, figs. 2B, 4D
Schizocarpus grandis, Fain & Lukoschus 1985: 66; Dubinina *et al*. 1993: 451
Schizocarpus dubininae Fain and Lukoschus, 1985: 53, figs. 33–36, 38

Material examined. 1 male (ZISP AVB-2012-0203-032) ex *Castor fiber tuvinicus* [beaver #2, sample 5], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 9 October 2011, coll. A.P. Saveljev.

Microhabitat. ?Anterior dorsum.

Distribution. Recorded from *C. f. orientoeuropaeus* from Russia (Voronezh Reserve) (Dubinina 1964), from the Eurasian beaver (undetermined subspecies) from unknown locality in Europe (Fain & Lukoschus 1985), and from *C. f. tuvinicus* from Tuva (Azas River) (present paper).

11. *Schizocarpus pusillus* Fain and Lukoschus, 1985

Schizocarpus pusillus Fain and Lukoschus, 1985: 63, figs. 54, 55, 69

Material examined. 2 males (ZISP AVB-2012-0203-036, #1, 2) ex *Castor fiber tuvinicus* [beaver #1, sample 8], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 8 October 2011, coll. A.P. Saveljev, 8 males (ZISP AVB-2012-0203-034, #1-8), beaver #5, sample 10, downstream of Azas River, 52º32'N, 97º15'E, 17 October 2011, coll. A.P. Saveljev, 1 males (ZISP AVB-2012-0203-035, #1-16), beaver #5, sample 13; same data.

Microhabitat. Chest and anterior abdomen, two mites from posterior legs.

Distribution. Recorded from *C. f. albicus* from Germany (Elba River) (Fain & Lukoschus 1985) and from *C. f. tuvinicus* from Tuva (Azas River) (present paper).

12. *Schizocarpus modestus* Fain and Lukoschus, 1985

Schizocarpus modestus Fain and Lukoschus, 1985: 61, figs. 50, 51, 61

Material examined. 3 males (ZISP AVB-2012-0203-026, #1-3) ex *Castor fiber tuvinicus* [beaver #1, sample 14], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 8 October 2011, coll. A.P. Saveljev; 12 males (ZISP AVB-2012-0203-027, #1-12), beaver #2, sample 11, same locality, 9 October 2011, coll. A.P. Saveljev; 1 male (ZISP AVB-2012-0203-028), beaver #4, sample 5, downstream of Azas River, 52º32'N, 97º15'E, 16 October 2011, coll. A.P. Saveljev.

Microhabitat. Throat and anterior legs; one mite from posterior dorsum.

Distribution. Recorded from *C. f. albicus* from Germany (Elba River) (Fain & Lukoschus 1985) and from *C. f. tuvinicus* from Tuva (Azas River) (present paper).

13. *Schizocarpus radiatus* Fain and Lukoschus, 1985

Schizocarpus radiatus Fain and Lukoschus, 1985: 64, figs. 5, 73, 74, 80; Bochkov & Dubinina 2011: 63; Bochkov *et al.* 2012: 54

Material examined. 2 males (ZISP AVB-2012-0203-011, #1, 2) ex *Castor fiber tuvinicus* [beaver #1, sample 5], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 8 October 2011, coll. A.P. Saveljev; 1 male (ZISP AVB-2012-0203-015), beaver #1, sample 12, same data; 6 males (ZISP AVB-2012-0203-014, #1-6), beaver #2, sample 5, same locality, 9 October 2011, coll. A.P. Saveljev; 5 males (ZISP AVB-2012-0203-016, #1-5), beaver # 2, sample 6, same data; 5 males (ZISP AVB-2012-0203-017, #1-5), beaver #2, sample

12, same data; 2 males (ZISP AVB-2012-0203-018, #1, 2), beaver #4, sample 6, same locality, 16 October 2011, coll. A.P. Saveljev.

Microhabitat. Posterior dorsum and flanks.

Distribution. Recorded from several hosts: a Eurasian beaver (undetermined subspecies) from an unknown locality in Europe (Fain & Lukoschus 1985), *C. f. orientoeuropaeus* from Russia (Voronezh Reserve) (Bochkov & Dubinina 2011), *C. f. belorussicus* from Poland (Suwałki) (Bochkov *et al*. 2012), and *C. f. tuvinicus* from Tuva (Azas River) (present paper).

14. *Schizocarpus gozdziewskii* Bochkov, Labrzycka, Skoracki and Saveljev, 2012

Schizocarpus gozdziewskii Bochkov *et al*., 2012: 51, fig. 9
Schizocarpus sp., Bochkov & Dubinina 2011: 64

Material examined. 9 males (ZISP AVB-2012-0203-019, #1-9) ex *Castor fiber tuvinicus* [beaver #2, sample 5], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 9 October 2011, coll. A.P. Saveljev; 1 male (ZISP AVB-2012-0203-020), beaver #2, sample 12; 5 males (ZISP AVB-2012-0203-021, #1–5), beaver #5, sample 4, downstream of Azas River, 52º32'N, 97º15'E, 16 October 2011, coll. A.P. Saveljev.

Microhabitat. Dorsum, one mite from flank.

Distribution. Recorded from several hosts: *C. f. orientoeuropaeus* from Russia (Voronezh Reserve) (Bochkov & Dubinina 2011), *C. f. belorussicus* from Poland (Suwałki) (Bochkov *et al*. 2012), and *C. f. tuvinicus* from Tuva (Azas River) (present paper).

15. *Schizocarpus zurowskii* Bochkov, Labrzycka, Skoracki and Saveljev, 2012

Schizocarpus zurowskii Bochkov *et al*., 2012: 52, fig. 10

Material examined. 6 males (ZISP AVB-2012-0203-033, #1–6), ex *Castor fiber tuvinicus* [beaver #2, sample 10], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 9 October 2011, coll. A.P. Saveljev.

Microhabitat. Anterior abdomen.

Distribution. Recorded from *C. f. belorussicus* from Poland (Suwałki) (Bochkov *et al*. 2012) and *C. f. tuvinicus* from Tuva (Azas River) (present paper).

16. *Schizocarpus insignis* Fain and Lukoschus, 1985

Schizocarpus insignis Fain and Lukoschus, 1985: 65, figs. 78, 79; Bochkov *et al*. 2012: 58

Material examined. 6 males (ZISP AVB-2012-0203-029, #1-6) ex *Castor fiber tuvinicus* [beaver #1, sample 6], **RUSSIA**: Tuva, Todzhinskii District, upstream water of Azas River, 52º25'N, 96º38'E, 8 October 2011, coll. A.P. Saveljev; 4 males (ZISP AVB-2012-0203-030, #1-4), beaver #2, sample 5, same locality, 9 October 2011, coll. A.P. Saveljev; 1 male (ZISP AVB-2012-0203-031), beaver #4, sample 1, downstream of Azas River, 52º32'N, 97º15'E, 16 October 2011, coll. A.P. Saveljev.

Microhabitat. Posterior dorsum, one mite from head dorsally.

Distribution. Recorded from several hosts: *C. fiber* (undetermined subspecies) from an unknown locality in Europe, *C. f. albicus* from Germany (Elba River), *C. f. birulai* from Mongolia (Bulgan-gol River) (Fain & Lukoschus 1985), *C. f. belorussicus* from Poland (Suwałki) (Bochkov *et al*. 2012), and *C. f. tuvinicus* from Tuva (Azas River) (present paper).

Discussion

The Todzha Depression (location of Azas River) is situated in the Azas glaciation zone at an altitude of 900–1 100 m above sea level in the Bolshoi Yenisei River basin. In this region, the glaciers retreated approximately 10–13 000 years ago (Grossvald 1999). Thus, beavers could have invaded this region not earlier than 13 000 years ago, and their population at the Azas River strictly speaking is not autochthonous.

Sixteen species of *Schizocarpus* were detected on *C. f. tuvinicus* (see Table 1). Among them six species (37%) are new for science and recorded only from this subspecies. It could indicate serious distinctions of *Schizocarpus* fauna on this host from other studied beaver subspecies. Unfortunately, the fur-mite faunas of the two other subspecies which are geographically close to *C. f. tuvinicus*, i.e. *C. f. pohlei* Serebrennikov from the Konda and Sosva Rivers (West Siberia) and *C. f. birulai* Serebrennikov from the Bulgan, Chovd, and Tes Rivers (Mongolia and China) remain unexplored.

As was mentioned above, beavers from the Azas River population belong to two subpopulations, "upper" and "lower", and contact between individuals of these subpopulations occurs quite rarely (Saveljev *et al*. 2002). It would be interesting to compare sets of fur-mite species from beavers of these subpopulations (see Table 1). To date, six recognized and two new species (56%) were recorded on beavers of both subpopulations; three recognized and three new species (37%) were recorded on beavers of the "upper" subpopulation and only one species (*S. azasicus* **sp. nov.**) was recorded on a beaver of the "lower" subpopulation. Although we hope to have almost all fur-mite species associated with this host and new species records are not likely, in our samples, several species, including new ones, were represented by one or very few specimens. Diagnoses of these new species, however, are based on the stable structures and their species status, thus, has good morphological support. Their micropopulations on a beaver body are perhaps rarefied and these mite species could be simply missampled on some host individuals. The number of hosts examined (six individuals, only five of which had mites) is also not sufficient. Therefore, additional parasitological collections could reveal more uniformity of mite faunas on beavers of these two subpopulations.

According to the tentative data provided here, the relative geographical isolation of these beaver subpopulations could play a significant role in forming of their mite faunas. In this regard, a pair of the sister species *S. subornatus* and *S. azasicus* sp. nov. show an example of probable allopatric speciation. *Schizocarpus subornatus* is widely distributed and was recorded on beavers both from Europe and Tuva (Azas River, "upper" subpopulation) (Fain & Lukoschus 1985; our data), whereas *S. azasicus* is a probable endemic recorded so far only on Tuvinian beavers of the "lower" subpopulation. Taking into consideration the data about geological history of this region provided above, the time of divergence between these two mite species is less than 13 000 years (approximate time of beaver's migration to the Azas River). In fur-mites of the superfamily Sarcoptoidea, several probable examples of "high-speed evolution" were recently considered by Bochkov and Mironov (2008). Molecular investigations in this field are highly desirable and could provide more exact data about phylogenetic relationship among these fur-mites and times of their divergence and speciation.

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References

Bochkov, A.V. & 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., Ladrzycka, A., Skoracki, M. & 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. & 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]
Dubinina, H.V. (1964) Mites of the genus *Histiophorus* (Listrophoridae) parasites of beavers. *Parazitologicheskiy Sbornik*, 22, 111–152. [In Russian]
Dubinina, H.V., Bochkov, A.V. & Bobrovskaja, V.I. (1993) Notes on systematics of mites of the genus *Schizocarpus* (Acariformes: Chirodiscidae). *Parazitologiya*, 27, 450–453. [In Russian with English summary]
Durka, W., Babik, W., Ducroz, J.-F., Heidecke, D., Rosell, F., Samjaa, R., Saveljev, A., Uleviceus, A. & Stubbe, M. (2005) Mitochondrial phylogeography of the Eurasian beaver *Castor fiber* L. *Molecular Ecology*, 14, 3843–3856.
Fain, A. & 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. & 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 pp. [In Russian]
Griffiths, D.A., Atyeo, W.T., Norton, R.A. & Lynch, C.A. (1990) The idiosomal chaetotaxy of astigmatid mites. *Journal of Zoology (London)*, 220, 1–32.
Grossvald, M.G. (1999) *Evrazijskie gidrosfernye katastrofy i oledenenie Golarktiki* [Cataclysmic megafloods in Eurasia and the polar ice sheets]. Scientific World, Moscow, 120 pp. [In Russian]
Heidecke, D. (1986) Taxonomische Aspekte der Artenschutzes am Beispiel der Biber Eurasiens. Hercynia, N.F. (Leipzig), 22, 146–161.
Helgen, K.M. (2005) Family Castoridae. In: Wilson, D.E. & Reeder, D.M. (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 pp. [In Russian]
Prisazhnuk, V.E. (2001) River Beaver (Tuvinian Subspecies) *Castor fiber tuvinicus* Lavrov, 1969. In: Bartenev, O.S. (Ed.). Red Data Book of Russian Federation. Animals. Astrel, Moscow, 622–623. [In Russian]
Saveljev, A.P., Stubbe, M., Stubbe, A., Putintsev, N.I., Oleynikov, A.Yu. & Savelyev, A.A. (2010) Natural and post-release movements of the beavers. *Vestnik Okhotovedenia*, 7, 340–344. [In Russian with English Summary]
Saveljev, A.P., Stubbe, M., Stubbe, A., Unzhakov, V.V. & Kononov, S.V. (2002) Natural movements of tagged beavers in Tyva. *Russian Journal of Ecology*, 33, 434–439.
Saveljev, A.P., Unžakov, V.V., Stubbe, M., Stubbe, A. & Vasin, A.M. (2003) Siberian method of live-catching of beavers. In: Stubbe, M. & Stubbe, A. (Eds.) *Methods in Mammalian Field Ecology.* Martin-Luther-University, Halle, 2, 321–328.
Shurygin, V.V. & Saveljev, A.P. (2002) Tuvinian Beaver. In: Putuintsev, N. I. (Ed.). Red Data Book of Tyva Republic. Animals. Geo., Novosibirsk, 128–129. [In Russian]
Trouessart, E.L. (1896) Description de *Schizocarpus mingaudi* (Arachn.), nouveau sarcoptide pilicole vivant sur le *Castor. Bulletin de la Société Entomologie de France*, 4, 91–97.