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# New faunistical data on oribatid mites (Acari, Oribatida) from Altai, Russia, with description of a new species of *Sphaerozetes* (Ceratozetidae)

Sergey G. Ermilov <sup>a</sup>, Alexander A. Khaustov <sup>a</sup>, Omid Joharchi <sup>a</sup>, Ismail Döker <sup>a,b</sup>, Vladimir A. Khaustov <sup>a</sup>

<sup>a</sup> Institute of Environmental and Agricultural Biology (X-BIO), Tyumen State University, Tyumen, Russia.

<sup>b</sup> Cukurova University, Agricultural Faculty, Department of Plant Protection, Acarology Lab, Adana, Turkey.

## Original research

### ABSTRACT

The present study is based on oribatid mite material collected from Altai Krai and Altai Republic, southern part of Western Siberia, Russia. A list of 60 species, belonging to 51 genera and 29 families, is presented; of these, two species (*Moritzoppia metulifera*, *Zachvatkinibates latilamellatus*) are recorded for the first time in Russia; one new species – *Sphaerozetes parafirthensis* Ermilov n. sp. – is described from soil and moss collected in the Kosh-Agachsky District, Altai Republic. The new species differs from the closely related species, *Sphaerozetes firthensis* by the larger body size, narrowly lanceolate bothridial seta, strong lateral tooth on lamellar cusp, and broadly oval postanal porose area. An identification key to representatives of this genus from the Palaearctic region is provided.

**Keywords** Altai fauna; new record; ceratozetid mite; taxonomy; morphology

**Zoobank** <http://zoobank.org/CE4FA261-4C08-4325-B8B7-81E5A4E02394>

## Introduction


Altai is a large geographical region in southern part of Western Siberia and Central Asia. The territory of the region is characterized by a variety of altitude-belt landscapes and specific living conditions. The Russian Altai includes the Altai Krai with prevail by flat areas, and Altai Republic with mostly mountainous areas and zones of high-mountain steppes.

Until now, the fauna of oribatid mites (Acari, Oribatida) of the Altai region remains poorly studied (e.g., Grishina 1968, 1973; Vladimirova 2018), therefore, any new faunistical and taxonomic data are important and relevant. In the summer of 2021, the authors conducted an expedition to the Altai Mountains, registering the first records of one genus and three species of oribatid mites for Russia, as well as describing three new species (Ermilov 2021; Ermilov *et al.* 2021, 2022).

Our work is based on materials collected from several localities of the Altai Krai and Altai Republic during a zoological expedition performed in June of 2022. The primary goal of our paper is to present list of all identified taxa including new records. The collection of mites was carried out solely for the purpose of studying the faunal diversity (familiarization with the species composition in different localities of Altai) and was not intended for subsequent ecological and statistical analyses.

During taxonomic identification, we found one new species belonging to the genus *Sphaerozetes* Berlese, 1885 (family Ceratozetidae). Therefore, the secondary goal of our

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Corresponding author  
Sergey G. Ermilov   
ermilovacari@yandex.ru

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paper is to describe and illustrate the new species based on the adults. *Sphaerozetes* was proposed by Berlese (1885), with *Oribata orbicularis* Koch, 1835 as type species. According to Subías (2022), the genus comprises 21 species and one subspecies which have a cosmopolitan distribution except the Afrotropical region. Seniczak *et al.* (2016b) proposed a synonymy of *Sphaerozetes piriformis* (Nicolet, 1855) with *Sphaerozetes orbicularis* (Koch, 1835). They (2022) also transferred *Sphaerozetes setiger* (Trägårdh, 1910) in the genus *Fuscozetes* Sellnick, 1928; we provisionally agree with their both opinions. The main generic traits of *Sphaerozetes* were summarized by Behan-Pelletier (1986). The identification keys to some species of *Sphaerozetes* were provided by Shaldybina (1975; to four known species at that time) and Behan-Pelletier (1986; North American Arctic and Subarctic). As the number of species in this genus has much increased after that time, the tertiary goal of our paper is to present the identification key to representatives of *Sphaerozetes* known from the Palearctic region.

## Material and methods

### Material

Samples were collected by A.A. Khaustov, O. Joharchi, I. Döker, V.A. Khaustov, and R.V. Latyntsev. Localities:

9-1 (number of sample) – Altai Krai, Rubtsovsk District, wet soil near salt lake, 9.06.22, 51°23'03.5"N 80°43'46.9"E, 220 m a.s.l.;

9-2 – Altai Krai, Ust-Kalmansk District, wet soil near river, 9.06.22, 52°07'03.5"N 83°20'46.2"E, 166 m a.s.l.;

9-3 – Altai Krai, Petropavlovsk District, bark of *Salix* sp. at the base of trunk, 09.06.22, 51°59'37.6"N 84°28'37.1"E, 450 m a.s.l.;

10-1 – Altai Krai, vicinity of Belokurikha town, soil on meadow, 10.06.22, 51°58'39.1"N 84°59'26.5"E, 334 m a.s.l.;

10-2 – Altai Krai, vicinity of Belokurikha town, moss, 10.06.22, 51°57'12.3"N 84°53'37.0"E, 755 m a.s.l.;

10-3 – Altai Krai, vicinity of Belokurikha town, soil, 10.06.22, 51°57'14.0"N 84°53'32.6"E, 750 m a.s.l.;

10-4 – Altai Krai, vicinity of Belokurikha town, soil, 10.06.22, 51°57'04.0"N 84°52'30.8"E, 719 m a.s.l.;

11-2 – Altai Krai, Soloneshinsky District, soil in steppe, 11.06.22, 51°36'18.9"N 84°23'02.1"E, 455 m a.s.l.;

11-3 – Altai Republic, Ust-Kansky District, moss on the ground, 11.06.22, 51°23'28.0"N 84°40'59.9"E, 690 m a.s.l.;

12-1 – Altai Republic, Ust-Kansky District, soil and moss, 12.06.22, 50°42'49.5"N 84°56'56.5"E, 1224 m a.s.l.;

12-2 – Altai Republic, Ust-Koksinsky District, soil and moss, 12.06.22, 50°11'00.4"N 86°01'10.2"E, 940 m a.s.l.;

12-3 – Altai Republic, Ust-Koksinsky District, litter and moss in forest, 12.06.22, 50°17'00.4"N 85°30'03.4"E, 1000 m a.s.l.;

13-1 – Altai Republic, Ust-Kansky District, soil, 13.06.22, 50°54'59.1"N 84°47'45.8"E, 1026 m a.s.l.;

13-2 – Altai Republic, Ust-Kansky District, dry soil in steppe, 13.06.22, 50°56'04.0"N 84°52'38.2"E, 1060 m a.s.l.;

13-3 – Altai Republic, Kosh-Agachsky District, dry soil in steppe, 13.06.22, 50°10'05.7"N 88°11'37.0"E, 1680 m a.s.l.;

14-3 – Altai Republic, Kosh-Agachsky District, soil in steppe, 14.06.22, 49°37'59.4"N 88°27'40.7"E, 2220 m a.s.l.;

14-4 – Altai Republic, Kosh-Agachsky District, soil and moss, 14.06.22, 49°37'23.8"N 88°27'14.5"E, 2240 m a.s.l.;

14-5 – Altai Republic, Kosh-Agachsky District, mountain tundra, soil and moss, 14.06.22, 2365 m a.s.l.;

14-6 – Altai Republic, Kosh-Agachsky District, mountain tundra, soil and moss, 14.06.22, 49°30'51.8"N 88°10'57.6"E, 2450 m a.s.l.;

14-7 – Altai Republic, Kosh-Agachsky District, mountain steppe, soil and moss, 14.06.22, 49°40'50.5"N 88°27'08.4"E, 2150 m a.s.l.;

14-8 – Altai Republic, Kosh-Agachsky District, mountain steppe, soil and moss, 14.06.22, 49°42'40.0"N 88°25'15.3"E, 2230 m a.s.l.

## Observation and documentation

Mites were extracted using Berlese's funnels without electric lamps in a laboratory condition during five days and preserved in 70% of ethanol. Specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. Body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the notogaster. Notogastral width refers to the maximum width of the notogaster in dorsal view (behind pteromorphs). Lengths of body setae were measured in lateral aspect. All body measurements are presented in micrometers. Formulas for leg setation are given in parentheses according to the sequence trochanter–femur–genu–tibia–tarsus (famulus included). Formulas for leg solenidia are given in square brackets according to the sequence genu–tibia–tarsus. Drawings were made with a camera lucida using a Leica transmission light microscope "Leica DM 2500".

## Terminology

Morphological terminology used in this paper follows that of Grandjean: see Travé and Vachon (1975) for references; Norton (1977) for leg setal nomenclature; and Norton and Behan-Pelletier (2009) for overview.

## Abbreviations

Prodorsum: *lam* = lamella; *tlam* = translamella; *tu* = tatorium; *gt* = genal tooth; *ro*, *le*, *in*, *bs*, *ex* = rostral, lamellar, interlamellar, bothridial, and exobothridial seta, respectively; *Ad* = dorsosejugal porose area; *D* = dorsophragma; *P* = pleurophragma. Notogaster: *len* = lenticulus; *c*, *la*, *lm*, *lp*, *h*, *p* = setae; *Aa*, *A1*, *A2*, *A3* = porose areas; *ia*, *im*, *ip*, *ih*, *ips* = lyrifissures; *gla* = opisthonotal gland opening. Gnathosoma: *a*, *m*, *h* = subcapitular setae; *or* = adoral seta; *a.s.* = axillary saccule; *d*, *l*, *cm*, *acm*, *ul*, *su*, *lt*, *vt*, *sup*, *inf* = palp setae;  $\omega$  = palp solenidion; *cha*, *chb* = cheliceral setae; *Tg* = Trägårdh's organ. Epimeral and lateral podosomal regions: *1a*, *1b*, *1c*, *2a*, *3a*, *3b*, *3c*, *4a*, *4b*, *4c* = epimeral setae; *Am*, *Ah* = humeral porose areas; *PdI*, *PdII* = pedotectum I and II, respectively; *cus* = custodium; *dis* = discidium; *cir* = circumpedal carina. Anogenital region: *g*, *ag*, *an*, *ad* = genital, aggenital, anal, and adanal seta, respectively; *iad* = adanal lyrifissure/cupule; *Ap* = postanal porose area; *p.o.* = preanal organ. Legs: *Tr*, *Fe*, *Ge*, *Ti*, *Ta* = trochanter, femur, genu, tibia, and tarsus, respectively; *p.a.* = porose area;  $\omega$ ,  $\sigma$ ,  $\phi$  = solenidia;  $\varepsilon$  = famulus; *d*, *l*, *v*, *ev*, *bv*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl* = leg setae.

## List of identified taxa

Distribution: mostly from Subías (2022). Ptyctimous mites: not included. All examined specimens (except the holotype) are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia. References for original descriptions of species are not presented in the References section.

## Brachychthoniidae

*Sellnickochthonius immaculatus* (Forsslund, 1942). Localities: 13-1 (3 ex.), 13-2 (12 ex.), 14-5 (3 ex.), 14-4 (21 ex.), 14-8 (1 ex.). Distribution: Holarctic and Neotropical regions.

*Synchthonius elegans* Forsslund, 1956. Locality: 12-1 (1 ex.). Distribution: Holarctic region.

## Trhypochthoniidae

*Trhypochthonius tectorum* (Berlese, 1896). Localities: 12-2 (1 ex.), 14-5 (1 ex.). Distribution: Semicosmopolitan.

## Nothridae

*Nothrus borussicus* Sellnick, 1928. Localities: 12-2 (2 ex.), 12-3 (1 ex.). Distribution: Holarctic and northern Neotropical regions.

## Crotoniidae

*Camisia horrida* (Hermann, 1804). Localities: 12-1 (1 ex.), 14-4 (1 ex.). Distribution: Holarctic, northern Oriental and northern Neotropical regions, Ethiopia.

*Platynothrus peltifer* (Koch, 1839). Localities: 10-2 (1 ex.), 14-5 (2 ex.). Distribution: Semicosmopolitan.

## Gymnodamaeidae

*Gymnodamaeus bicostatus* (Koch, 1835). Locality: 12-2 (1 ex.). Distribution: Holarctic region.

## Damaeidae

*Epidamaeus munkhbayari* Bayartogtokh, Burkitbaeva and Enkhbayar, 2016. Localities: 12-1 (5 ex.), 12-2 (3 ex.), 14-8 (4 ex.). Distribution: Mongolia, Russian Altai.

*Tokukobelba compta* (Kulczynski, 1902). Locality: 12-2 (5 ex.). Distribution: Palearctic region.

## Eremaeidae

*Eremaeus insertus* Grishina, 1980. Localities: 12-1 (17 ex.), 14-4 (7 ex.). Distribution: eastern Palearctic region.

## Gustaviidae

*Gustavia microcephala* (Nicolet, 1855). Locality: 12-2 (4 ex.). Distribution: Palearctic and Oriental regions, Mexico.

## Astegistidae

*Furcoppia vtorovi* (Krivolutsky, 1971). Localities: 12-2 (8 ex.), 12-3 (5 ex.), 14-8 (9 ex.). Distribution: Holarctic region.

## Liacaridae

*Birsteinus mongolicus* (Mahunka, 1964). Localities: 12-1 (12 ex.), 12-2 (12 ex.), 12-3 (10 ex.), 13-1 (1 ex.), 14-8 (16 ex.). Distribution: southern Palearctic region.

*Liacarus inermis* Aoki, 1965. Locality: 12-2 (6 ex.). Distribution: southern Palearctic region.

*Xenillus tegeocranus* (Hermann, 1804). Locality: 12-2 (2 ex.). Distribution: Palaearctic and Oriental regions.

## Peloppiidae

*Ceratoppia bipilis* (Hermann, 1804). Localities: 12-1 (1 ex.), 12-2 (1 ex.). Distribution: Holarctic, northern Oriental and northern Neotropical regions.

## Thyrisomidae

*Banksinoma lanceolata* (Michael, 1885). Localities: 10-2 (1 ex.), 11-2 (4 ex.), 11-3 (1 ex.), 14-7 (3 ex.). Distribution: Palaearctic region.

## Autognetidae

*Autogneta (Conchogneta) traegardhi* Forsslund, 1947. Localities: 12-1 (11 ex.), 14-7 (1 ex.). Distribution: Holarctic region.

## Oppiidae

*Lalmoppia maculata* (Hammer, 1952). Localities: 9-2 (2 ex.), 12-2 (1 ex.). Distribution: Holarctic and Neotropical regions, Nepal.

*Moritzoppia metulifera* (Bayartogtokh and Gordeeva, 2001). Localities: 12-1 (42 ex.), 12-2 (9 ex.), 12-3 (18 ex.), 14-4 (90 ex.), 14-5 (5 ex.), 14-6 (1 ex.), 14-7 (17 ex.), 14-8 (31 ex.). Distribution: Mongolia. First record of the species in Russia.

*Moritzoppia uncarinata* (Paoli, 1908). Localities: 10-3 (1 ex.), 11-3 (1 ex.), 12-1 (7 ex.), 12-2 (4 ex.). Distribution: Holarctic and northern Neotropical regions.

*Oppiella nova* (Oudemans, 1902). Localities: 10-2 (2 ex.), 11-2 (1 ex.), 12-1 (34 ex.). Distribution: Cosmopolitan.

*Ramusella (Insculptoppia) furcata* (Willmann, 1928). Locality: 10-1 (4 ex.). Distribution: Holarctic region.

## Quadroppiidae

*Quadroppia quadricarinata* (Michael, 1885). Localities: 11-3 (1 ex.), 14-4 (18 ex.). Distribution: Semicosmopolitan.

## Suctobelbidae

*Suctobelbella acutidens duplex* (Strenzke, 1950). Locality: 12-1 (1 ex.). Distribution: Holarctic region.

## Tectocephidae

*Tectocephus sarekensis* Trägårdh, 1910. Localities: 9-2 (3 ex.), 10-2 (1 ex.), 10-4 (1 ex.), 11-3 (4 ex.), 14-4 (27 ex.), 14-7 (1 ex.). Distribution: Cosmopolitan.

*Tectocephus velatus* (Michael, 1880). Localities: 9-3 (9 ex.), 12-1 (41 ex.). Distribution: Cosmopolitan.

## Oribellidae

*Proteremaus chadaevae* Golosova, 1983. Localities: 12-2 (7 ex.), 14-7 (1 ex.), 14-8 (9 ex.). Distribution: Mongolia, Russian Altai.

## Phenopelopidae

*Eupelops tardus* (Koch, 1835). Localities: 11-3 (3 ex.), 12-2 (3 ex.), 14-4 (15 ex.), 14-8 (1 ex.). Distribution: Palaearctic region.

## Achipteriidae

*Achipteria acuta* Berlese, 1908. Locality: 11-3 (3 ex.). Distribution: Holarctic region.

*Parachipteria punctata* (Nicolet, 1855). Localities: 12-1 (3 ex.), 12-2 (4 ex.), 13-1 (2 ex.), 14-8 (3 ex.). Distribution: Holarctic region, Santa Helena.

## Oribatellidae

*Oribatella altaica* Ermilov, 2022. Locality: 12-3 (6 ex.). Distribution: Russian Altai.

## Tegoribatidae

*Scutozetes lanceolatus* Hammer, 1952. Localities: 12-2 (10 ex.), 14-3 (6 ex.). Distribution: Holarctic region, Surinam.

*Tegoribates americanus* Hammer, 1958. Locality: 14-5 (1 ex.). Distribution: Holarctic region, Argentina, Vietnam.

*Tectoribates ornatus* (Schuster, 1958). Localities: 9-1 (1 ex.), 9-3 (1 ex.). Distribution: eastern Holarctic and Neotropical regions.

## Ceratozetidae

*Diapterobates sitnikovae* Shaldybina, 1970. Localities: 12-1 (15 ex.), 14-8 (11 ex.). Distribution: eastern Palaearctic region.

*Ceratozetella sellnicki* (Rajski, 1958). Localities: 10-1 (9 ex.), 11-3 (1 ex.), 12-1 (17 ex.), 12-2 (11 ex.), 12-3 (9 ex.), 14-3 (1 ex.), 14-7 (2 ex.). Distribution: Palaearctic region.

*Ceratozetoides cisalpinus* (Berlese, 1908). Locality: 12-2 (1 ex.). Distribution: Holarctic region.

*Latilamellobates naltschicki* Shaldybina, 1971. Localities: 11-3 (2 ex.), 12-2 (1 ex.), 12-3 (2 ex.), 14-5 (4 ex.), 14-6 (1 ex.), 14-7 (1 ex.). Distribution: southern Palaearctic region.

*Lepidozetes singularis* Berlese, 1910. Localities: 10-3 (1 ex.), 12-3 (6 ex.), 14-4 (9 ex.), 14-8 (27 ex.). Distribution: Holarctic region.

*Sphaerozetes parafirthenis* Ermilov **n. sp.** Locality: 14-8 (11 ex.). Distribution: Russian Altai.

*Trichoribates novus* (Sellnick, 1928). Locality: 12-2 (1 ex.). Distribution: Holarctic region.

## Punctoribatidae

*Mycobates patrius* Shaldybina, 1970. Locality: 14-8 (1 ex.). Distribution: Palaearctic region.

*Punctoribates insignis* Berlese, 1910. Localities: 9-2 (8 ex.), 10-1 (1 ex.). Distribution: Tropics, subtropics.

*Punctoribates punctum* (Koch, 1839). Locality: 11-2 (2 ex.). Distribution: Semicosmopolitan.

*Punctoribates* sp. (not identified). Locality: 9-2 (1 ex.).

*Zachvatkinibates latilamellatus* Bayartogtokh and Aoki, 1998. Locality: 14-8 (14 ex.). Distribution: Mongolia. First record of the species in Russia.

## Parakalummidae

*Neoribates roubali* (Berlese, 1910). Locality: 14-5 (2 ex.). Distribution: Palaearctic and northern Oriental regions.



## Oribatulidae

*Phauloppia prominens* (Bayartogtokh and Aoki, 1998). Locality: 13-3 (3 ex.). Distribution: southwestern Palaearctic region.

*Oribatula elegantissima* Balogh and Mahunka, 1965. Locality: 13-2 (2 ex.). Distribution: eastern Palaearctic region.

*Oribatula interrupta* (Willmann, 1939). Localities: 9-3 (1 ex.), 10-3 (13 ex.), 12-2 (3 ex.), 14-4 (7 ex.), 14-8 (9 ex.). Distribution: Holarctic, Neotropical regions, Ethiopia.

*Oribatula tibialis* (Nicolet, 1855). Locality: 9-1 (5 ex.). Distribution: eastern Holarctic and northern Neotropical regions, India.

## Haplozetidae

*Peloribates angulatus* Bayartogtokh, 2000. Localities: 12-1 (7 ex.), 12-2 (1 ex.), 14-4 (3 ex.), 14-8 (7 ex.). Distribution: Mongolia, Russian Altai.

*Protoribates capucinus* Berlese, 1908. Localities: 11-3 (5 ex.), 13-3 (1 ex.). Distribution: Cosmopolitan.

## Scheloribatidae

*Hemileius montanus* (Krivolutsky and Grishina, 1970). Localities: 10-1 (1 ex.), 14-7 (3 ex.). Distribution: Palaearctic region.

*Liebstadia pannonica* (Willmann, 1951). Localities: 10-1 (1 ex.), 12-2 (2 ex.), 13-2 (2 ex.), 14-7 (3 ex.). Distribution: Holarctic and Oriental regions.

*Scheloribates latipes* (Koch, 1844). Localities: 9-2 (7 ex.), 10-1 (1 ex.), 11-2 (2 ex.), 12-1 (23 ex.), 12-3 (13 ex.), 14-5 (10 ex.). Distribution: Semicosmopolitan.

*Scheloribates (Simkinia) turanicus* (Krivolutsky, 1966). Locality: 13-2 (1 ex.). Distribution: southern Palaearctic region.

*Scheloribates (Topobates) holsaticus* (Weigmann, 1969). Locality: 13-1 (4 ex.). Distribution: western Palaearctic region.

## Galumnidae

*Galumna (Galumna) dimorpha* Krivolutskaja, 1952. Localities: 10-1 (1 ex.), 12-3 (4 ex.). Distribution: central and southern Palaearctic region.

A list of oribatid mite taxa includes 60 species, belonging to 51 genera and 29 families, including one new species and one not identified species. Two species (*Moritzoppia metulifera*, *Zachvatkinibates latilamellatus*) are recorded for the first time in Russia. Two species are known only from the Russian Altai, six species are from the Russian Altai and Mongolia, 23 species are from the Palaearctic/Holarctic region, the other 19 species have more broad distribution (more than one geographical region), and nine species are cosmopolitan or semicosmopolitan.

## Taxonomy

### Family Ceratozetidae

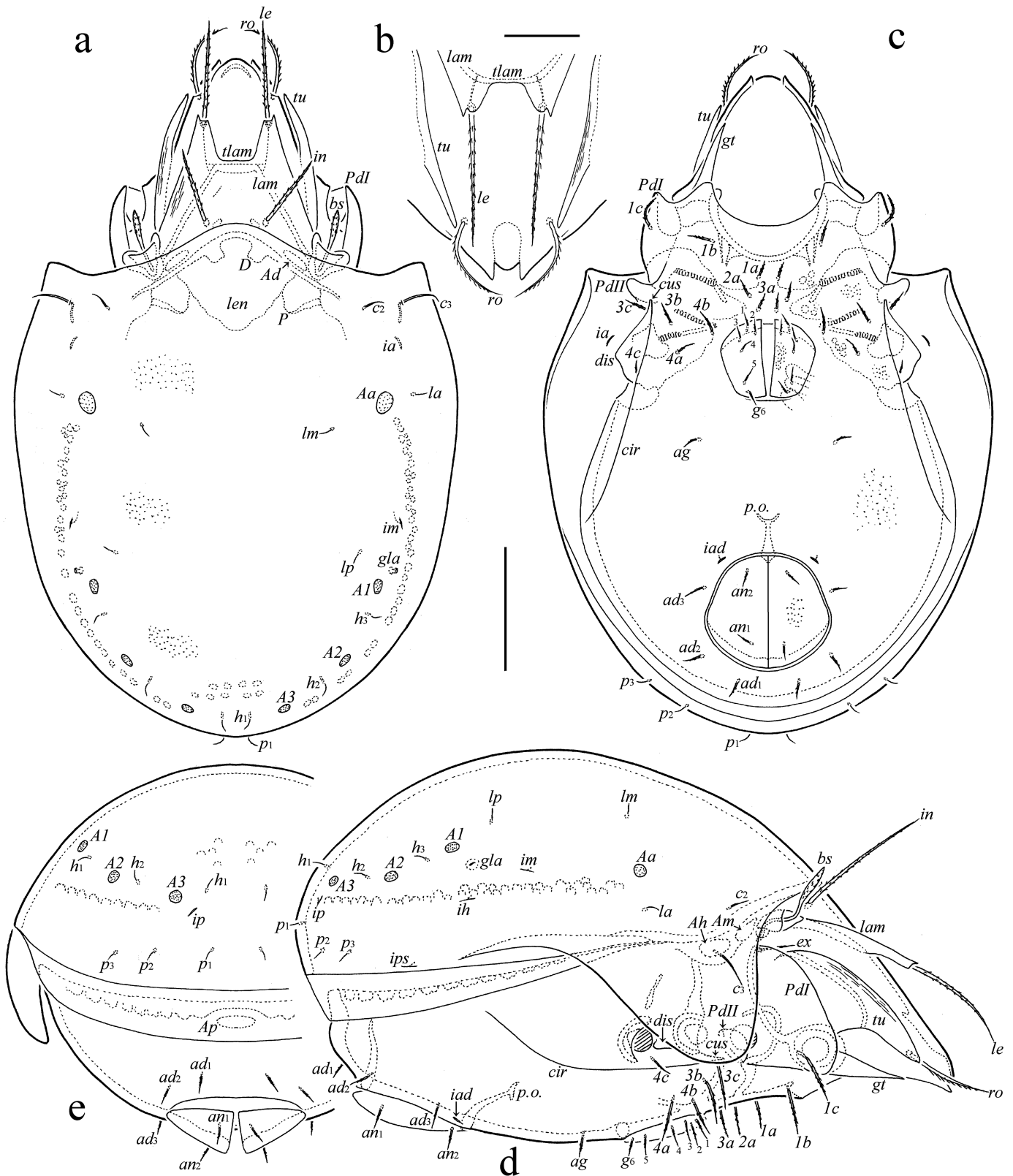
#### Genus *Sphaerozetes* Berlese, 1885

Type species: *Oribata orbicularis* Koch, 1835

#### *Sphaerozetes parafirthensis* Ermilov n. sp.

Zoobank: [1A025B01-E8ED-4748-BAE2-B053D27073C1](https://doi.org/10.24349/6cb1-bnn9)

(Figures 1, 2)



**Figure 1** *Sphaerozetes parafirthenensis* Ermilov n. sp., adult: a – dorsal view (legs omitted); b – medioanterior part of prodorsum, dorsoanterior view; c – ventral view (gnathosoma and legs omitted); d – right lateral view (gnathosoma and legs omitted); e – posterior view (right half omitted). Scale bars 100 µm (a, c–e), 50 µm (b).



**Diagnosis** — Body length: 575–600. Rostrum bidentate. Lamellar cusp about 1/3 of lamella, with strong lateral tooth. Translamella comparatively broad. Rostral, lamellar and interlamellar setae long, setiform, barbed; *ro* shortest, *in* longest; bothridial seta medium-sized, narrowly lanceolate, barbed. Notogastral porose areas rounded or slightly oval, punctiform. Eleven pairs of notogastral setae setiform, thin, smooth; *c*<sub>3</sub> longest. Epimeral and anogenital setae short, setiform, thin, barbed. Postanal porose area oval. No thick seta on leg tibiae and genua.

**Description of adult** — Measurements – Body length: 570 (holotype, female), 575–600 (10 paratypes, three males and seven females); body width: 375 (holotype), 375–390 (10 paratypes). No difference between males and females in body size.

Integument – Body colour brown. Body surface microsculpturing tuberculate (visible in dissected specimens under 10 × 100 magnification). Lamella and tutorium partially striate. Antiaxial side of femora I–IV with slight tubercles.

Prodorsum – Rostrum bidentate, lateral teeth well developed. Lamella (including cusp) about 1/2 length of prodorsum; cusp about 1/2 of lamella, with strong lateral tooth. Translamella distinct, comparatively broad. Tutorium (including cusp) about 4/5 length of prodorsum; cusp lamelliform. Porose area *Al* not observed. Genal tooth elongate triangular. Rostral (67–71), lamellar (94–101) and interlamellar (116–124) setae setiform, barbed; basal part of *ro* covered by tutorial cusp in lateral aspect. Bothridial seta (64–70) narrowly lanceolate, barbed; stalk slightly shorter than head. Opening of bothridium not covered by anterior margin of notogaster in dorsal aspect. Exobothridial seta (28–30) setiform, thin, barbed. Dorsosejugal porose area oval, poorly visible. Dorsophragmata clearly separated medially.

Notogaster – Lenticulus present, diffuse. Pteromorph broadly rounded laterally. Four pairs of porose areas; *Aa* (15–19; 17–19 × 13–15) and *Al* (11–13; 15–19 × 13) rounded or slightly oval, *A2* (11–13) and *A3* (13–15) rounded, all punctiform (without distinct borders), slightly bordered. Eleven pairs of notogastral setae developed (*c*<sub>3</sub>: 30–37; *c*<sub>2</sub>: 22–26; others: 11–15), all setiform, thin, smooth. Opisthonotal gland opening and lyrifissures (*ia*, *im*, *ip*, *ih*, *ips*) distinct.

Gnathosoma – Subcapitulum size: 135–150 × 94–105; subcapitular (*a*: 22–26; *m*: 37–41; *h*: 34–37) and adoral (17–19) setae setiform, barbed. Palp (105–112) setation: 0-2-1-3-9(+ω); postpalpal seta (9) thorn-like, roughened. Chelicera (135–150) with two setiform, barbed setae (*cha*: 45–49; *chb*: 34–36).

Epimeral and lateral podosomal regions – Epimeral setal formula: 3-1-3-3. Epimeral setae (*1a*, *2a*, *3a*: 26–37; *4c*: 17–19; others: 41–49) setiform, thin, barbed. Humeral porose areas *Am* and *Ah* oval, poorly visible. Custodium short, narrowly triangular. Discidium broadly triangular. Circumpedial carina long, apically fused to custodium. Horizontal folds in integument absent between and dorsal of acetabula II and III.

Anogenital region – Six pairs of genital, one pair of aggenital, two pairs of anal, and three pairs of adanal setae (17–19) setiform, thin, barbed. Adanal lyrifissure located close and slightly diagonal to anterior half of anal plate. Postanal porose area (26–30 × 11–15) oval.

Legs – Median claw distinctly thicker than lateral claws, all slightly barbed dorsally. Dorsoparaxial porose area on femora I–IV and on trochanters III, IV distinct; proximoventral porose area on tarsi I–IV and distoventral porose area on tibiae I–IV not observed. Genua I–IV without lateral tubercle and ventral triangular process. Formulas of leg setation and solenidia: I (1-5-3-4-20) [1-2-2], II (1-5-3-4-16) [1-1-2], III (2-3-1-3-15) [1-1-0], IV (1-2-2-3-12) [0-1-0]; homology of setae and solenidia as indicated in Table 1. Famulus short, slightly swollen distally, inserted between solenidia ω<sub>1</sub> and ω<sub>2</sub>; seta *s* on tarsus I eupathidial, located between paired setae *u* and *a*.; lateral antiaxial seta (*l''* on legs I, II; *l'* on legs III, IV) on all tibiae and genua setiform or slightly thickened (but not thick). Solenidia ω<sub>1</sub> and ω<sub>2</sub> on tarsus II and σ on genu III slightly bacilliform, other solenidia setiform; dorsodistal tubercle of tibia I absent.

**Material examined** — Holotype (female) and 10 paratypes (three males and seven females): Russia, Altai Republic, Kosh-Agachsky District, mountain steppe, soil and moss, 14.06.22,

49°42'40.0"N 88°25'15.3"E, 2230 m a.s.l. (leg. A.A. Khaustov, O. Joharchi, I. Döker, V.A. Khaustov, and R.V. Latyntsev).

**Type deposition** — The holotype is deposited in the collection of the Senckenberg Museum of Natural History, Görlitz, Germany; 10 paratypes are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia; all specimens are preserved in 70% solution of ethanol with a drop of glycerol.

**Etymology** — The name *parafirthenis* refers to the similarity between new species and *Sphaerozetes firthenis* Behan-Pelletier, 1986.

**Remarks** — In having 11 pairs of short, setiform notogastral setae with longest  $c_3$ , and well-developed lamellar cusp (1/2 of lamella) *Sphaerozetes parafirthenis* Ermilov **n. sp.** is similar to *Sphaerozetes firthenis* Behan-Pelletier, 1986 from Canada (see Behan-Pelletier 1986). However, the new species differs from the latter by the larger body size (length: 575–600 versus 473–518), narrowly lanceolate bothridial seta (versus clavate or fusiform, with large head), strong lateral tooth on lamellar cusp (versus slightly observed), and broadly oval (versus narrowly elongate oval) postanal porose area.

Distinctive characters of the new species from the other *Sphaerozetes* species in the Palaearctic region can be found in the identification key below.

### Key to species of *Sphaerozetes* of the Palaearctic region

1. Notogastral setae *la* and *lm* short but longer than diameter of bothridium . . . . . 2  
— Notogastral setae *la* and *lm* very short or vestigial, shorter than diameter of bothridium . . . 3
2. Cusp medium sized, about 1/2 of lamella; lamellar cusp with lateral tooth; surface of lamella without striations; body length: 456–528 . . . . .  
. . . . . *Sphaerozetes perezinigo* Gómez-Llusá, 1988. Distribution: Spain.  
— Cusp of lamella very short, slightly protruding; lamellar cusp rounded; surface of lamella with striations; body length: 710–820 . . . . .  
. . . . . *Sphaerozetes neglectus* (Kulijev, 1979). Distribution: Caucasus.
3. Eleven pairs of notogastral setae (*c*-row with two setae) . . . . . 4  
— Ten pairs of notogastral setae (*c*-row with one seta) . . . . . 6
4. Notogastral seta  $c_3$  distinctly longer than other notogastral setae; rostrum bidentate; bothridial seta narrowly lanceolate; body length: 575–600 . . . . .  
. . . . . *Sphaerozetes parafirthenis* Ermilov **n. sp.** Distribution: Russian Altai.  
— Notogastral seta  $c_3$  similar to other notogastral setae in length; rostrum tridentate or undulate; bothridial seta broadly clavate or fusiform . . . . . 5
5. Rostrum tridentate, with two deep shallows; interlamellar seta longer than lamellar seta; notogastral porose areas elongate oval; body length: 545–780 . . . . .

**Table 1** Leg setation and solenidia of adult *Sphaerozetes parafirthenis* Ermilov **n. sp.**

Leg	Tr	Fe	Ge	Ti	Ta
I	$v'$	$d, (l), bv'', v''$	$(l), v', \sigma$	$(l), (v), \varphi_1, \varphi_2$	$(ft), (tc), (it), (p), (u), (a), s, (pv), v', (pl), l'', \epsilon, \omega_1, \omega_2$
II	$v'$	$d, (l), bv'', v''$	$(l), v', \sigma$	$(l), (v), \varphi$	$(ft), (tc), (it), (p), (u), (a), s, (pv), l'', \omega_1, \omega_2$
III	$l', v'$	$d, l', ev'$	$l', \sigma$	$l', (v), \varphi$	$(ft), (tc), (it), (p), (u), (a), s, (pv)$
IV	$v'$	$d, ev'$	$d, l'$	$l', (v), \varphi$	$ft'', (tc), (p), (u), (a), s, (pv)$

Note: Roman letters refer to normal setae (except  $\epsilon$  = famulus); Greek letters refer to solenidia. Single quotation mark (') designates seta on the anterior and double quotation mark (") seta on the posterior side of a given leg segment; parentheses refer to a pair of setae.

..... *Sphaerozetes orbicularis* (Koch, 1835) (= *Oribata piriformis* Nicolet, 1855) (see also Pavlichenko 1994; Weigmann 2006; Seniczak *et al.* 2016b). Distribution: Palaearctic region.  
— Rostrum undulate, with two or three slight shallows; lamellar seta longer than interlamellar seta; notogastral porose areas nearly rounded; body length: 592–728. *Sphaerozetes olympicus* Seniczak, S. Seniczak & Sgardelis, 2016 (see Seniczak *et al.* 2016a). Distribution: Greece.

6. Rostrum tridentate, with two deep shallows; notogastral seta *c* similar to other notogastral setae in length; body length: 570–680 .....  
..... *Sphaerozetes tricuspидatus* Willmann, 1923 (see also Weigmann 2006). Distribution: Palaearctic region.  
— Rostrum bidentate or with indistinct medial incision; notogastral seta *c* distinctly longer than other notogastral setae ..... 7

7. Rostrum bidentate, with one pair of lateral teeth and deep shallow between them; translamella thick, not thinner than lamella; surface of lamella without striations; body length: 330–525 ...  
..... *Sphaerozetes arcticus* Hammer, 1952 (see also Behan-Pelletier 1985; Walter *et al.* 2014). Distribution: Boreal.  
— Rostrum nearly rounded, with indistinct medial incision; translamella thin, clearly thinner than lamella; surface of lamella with striations; body length: 950 .....  
..... *Sphaerozetes shogranensis* Hammer, 1977. Distribution: Pakistan.

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## ORCID

Sergey G. Ermilov  <https://orcid.org/0000-0002-0913-131X>  
Alexander A. Khaustov  <https://orcid.org/0000-0002-0306-112X>  
Omid Joharchi  <https://orcid.org/0000-0002-2741-4946>  
Ismail Döker  <https://orcid.org/0000-0002-1412-1554>  
Vladimir A. Khaustov  <https://orcid.org/0000-0003-2831-7213>

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