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Article

Eremella ryabinini (Acari, Oribatida, Eremellidae), a new oribatid mite species phoretic on *Amphotis marginata* (Coleoptera, Nitidulidae) from Russia

Sergey G. Ermilov[1*] and Vladimir V. Abramov[2]

1. *Tyumen State University, Institute of Environmental and Agricultural Biology (X-BIO), Tyumen, Russia; E-mail: ermilovacari@yandex.ru*
2. *Suvorov, Russia; E-mail: abramv3@rambler.ru*

[*] Corresponding author

ABSTRACT
The oribatid mite family Eremellidae (Oribatida) is recorded in the Russian fauna for the first time. A new species of the genus *Eremella*—*E.* (*Eremella*) *ryabinini* **sp. nov.** is described, based on phoretic adult females collected from elytron of the beetle *Amphotis marginata* (Fabricius) (Nitidulidae).

KEYWORDS: Eremellid mites, European part of Russia, morphology, new record, phoresy, taxonomy.

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INTRODUCTION

The oribatid mite genus *Eremella* (Acari, Oribatida, Eremellidae) was proposed by Berlese (1913), with *Eremella vestita* Berlese, 1913 as type species. The genus comprises 14 species belonging to two subgenera (*E.* (*Eremella*) Berlese, 1913 – 11 species; *E.* (*Archeremella*) Balogh & Mahunka, 1974 – 3 species), distributed collectively in the Afrotropical, Neotropical and Oriental regions, central and southern Europe, Iran, Japan, Tonga, U.S.A. (Louisiana) (Ermilov and Frolov 2019a, 2022); however, Subías (2022) has an alternative understanding of the taxonomic system of the genus. Most *Eremella*-species inhabiting the forest soil-litter, however, some species are associated with insects (Woolley 1969; Ermilov and Frolov 2019a). The generic diagnosis, identification key and taxonomic remarks on nominate subgenus were presented by Ermilov and Frolov (2019a).

In the course of the morphological study of the beetle *Amphotis marginata* (Fabricius) (Coleoptera, Nitidulidae) collected from European part of Russia, we found three specimens of oribatid mites belonging to the new species of *Eremella* (*Eremella*), located on this beetle. At present, species of Eremellidae were not registered in Russia; hence, it is first record of the family in the Russian fauna. The main goal of the paper is to describe a new species of *Eremella* under the name *Eremella* (*Eremella*) *ryabinini* **sp. nov.**

METHODS

Observation and documentation – Specimens were mounted in lactic acid on temporary cavity

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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. 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". Images were obtained with an AxioCam ICc3 camera using a Carl Zeiss transmission light microscope "Axio Lab.A1".

Terminology – Morphological terminology used in this paper mostly 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: *cos* = costula; *tcos* = transcostula; *tu* = tutorium; *hs* = hump-like structure; *ro*, *le*, *in*, *ex*, *bs* = rostral, lamellar, interlamellar, exobothridial, and bothridial seta, respectively; *exv* = vestige of second exobothridial seta. Notogaster: *hs* = hump-like structure; *dep* = depression; *c*, *la*, *lm*, *lp*, *h*, *p* = setae; *im*, *ip*, *ih*, *ips* = lyrifissures. Gnathosoma: *a*, *m*, *h* = subcapitular setae; *or* = adoral seta; *a.s.* = axillary saccule; *d*, *l*, *cm*, *acm*, *ul*, *su*, *lt*, *vt*, *inf*, *sup* = palp setae; ω = palp solenidion; *cha*, *chb* = cheliceral setae; *Tg* = Trägårdh's organ. Epimeral and lateral podosomal regions: *1a*, *1b*, *1c*, *2a*, *3a*, *3b*, *4a*, *4b* = epimeral setae; *PdI*, *PdII* = pedotectum I and II, respectively; *dis* = discidium. Anogenital *region*: *g*, *ag*, *an*, *ad* = genital, aggenital, anal, and adanal seta, respectively; *iad* = adanal lyrifissure. Legs: *Tr*, *Fe*, *Ge*, *Ti*, *Ta* = trochanter, femur, genu, tibia, and tarsus, respectively; *p.a.* = porose area; ε = famulus; *d*, *l*, *v*, *ev*, *bv*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl* = setae; ω, σ, φ = solenidia.

TAXONOMY

Family Eremellidae Balogh, 1961
Genus *Eremella* Berlese, 1913

Type species: *Eremella vestita* Berlese, 1913

Eremella (*Eremella*) *ryabinini* sp. nov. (Figs. 1–13)

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Diagnosis

Body length: 300–330. Notogaster and anogenital region with cerotegumental tubercles connected by cerotegumental strands, forming reticulate pattern. Costulae long, fused by two transcostulae (of them, the first is located behind lamellar setae; the second is located anteriorly to interlamellar setae). Rostral, lamellar and interlamellar setae medium-sized, slightly thickened, barbed; bothridial seta long, clavate, barbed. Dorsomedial part of notogaster hump-like; dorsolateral and posterior parts of notogaster depressed. All notogastral setae medium-sized, slightly thickened, barbed. Axillary saccule present. All epimeral and anogenital setae short, setiform, thin, roughened. Leg tarsi with three claws; tarsus II with one solenidion.

Description

Measurements – Body length: 330 (holotype, female), 300, 315 (two paratypes, two females); notogaster width: 180 (holotype), 165 (two paratypes).

Integument – Body brown. Surface microgranulate sculpturing; prodorsum, epimeral region and legs partially covered by layer of thin blocky cerotegument including dense granulate

components; notogaster and anogenital region with larger sparse cerotegumental tubercles connected by cerotegumental strands, forming reticulate pattern.

Prodorsum – Rostrum rounded. Costula about 2/3 length of prodorsum, thin, slightly divergent distally; two transcostulae present: the first is located behind lamellar setae; the second is located anteriorly to interlamellar setae. Basal part of prodorsum between insertions of interlamellar setae hump-like. Tutorium well developed, simple. Rostral (30–34), lamellar (30–34) and interlamellar (22–26) setae slightly thickened, barbed; *le* slightly thicker than *ro* and *in*, inserted on strong tubercles; exobothridial seta (7) setiform, thin, roughened; bothridial seta (49–52) clavate, barbed.

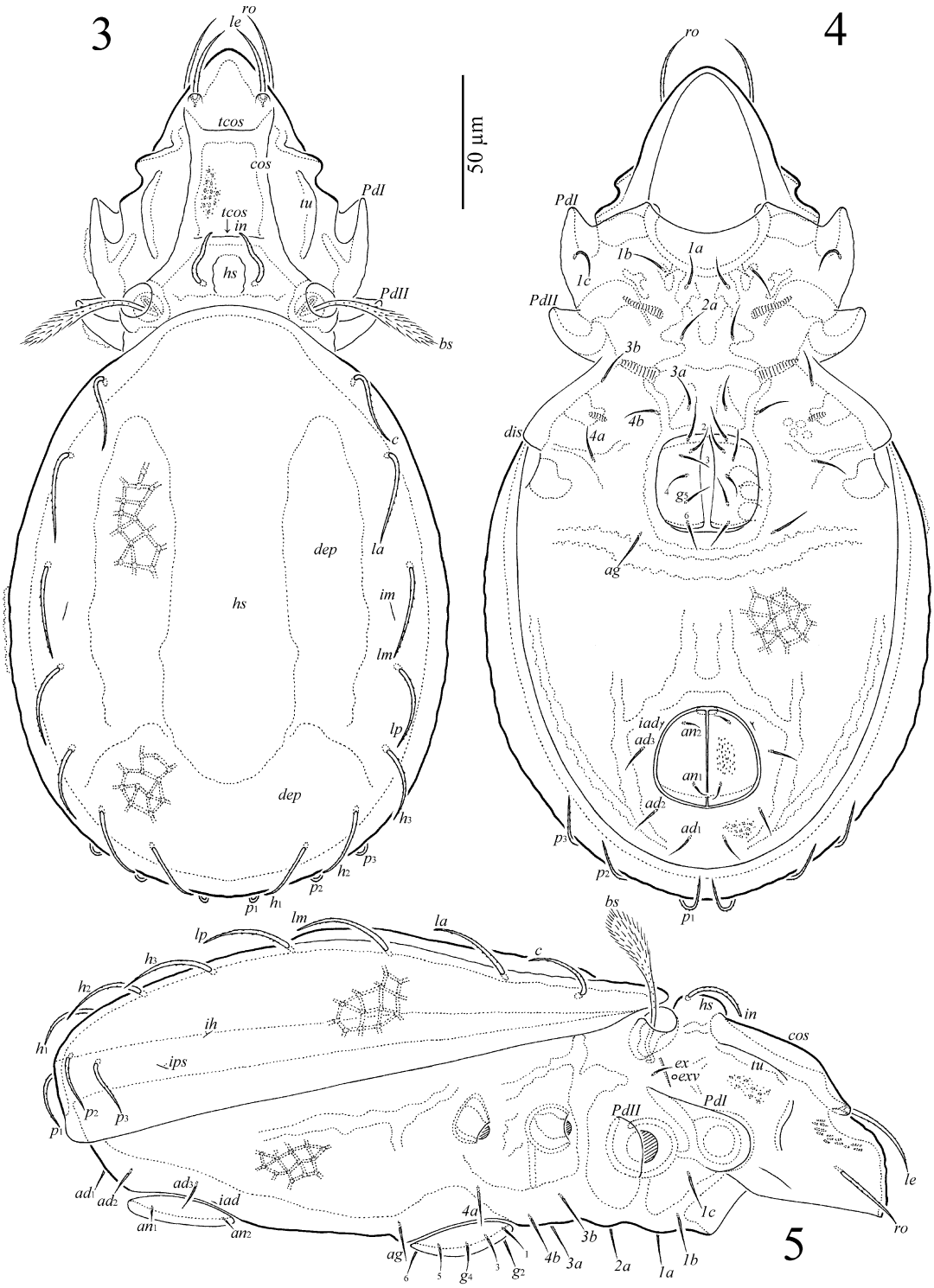
Notogaster – Elongate oval, anterior and posterior notogastral margins rounded. Dorsomedial part of notogaster hump-like; dorsolateral and posterior parts of notogaster depressed. Notogastral setae (p_1–p_3: 26–30; others: 37) slightly thickened, barbed. Opisthonotal gland opening and lyrifissure *ia* not observed; lyrifissures *im*, *ip*, *ih*, and *ips* well visible.

Figures 1–2. *Eremella* (*Eremella*) *ryabinini* **sp. nov.** (adult, microscope images) – 1. Dorsal view; 2. Ventral view.

Gnathosoma – Subcapitulum size: 60–64 × 45–49; all subcapitular setae (*m*, *h*: 17–19; *a*: 11) setiform, roughened; all adoral setae (4) setiform, thin, smooth. Palp (length: 41–45) setation: 0–2–1–3–9(+ω); postpalpal seta (4) spiniform. Axillary saccule present. Chelicera (length: 64–67) with two setiform, barbed setae (*cha*: 15–19; *chb*: 11–13).

Epimeral and lateral podosomal regions – Epimeral setal formula: 3–1–2–2; all epimeral setae (15) setiform, thin, roughened. Discidium well-developed, rounded distally.

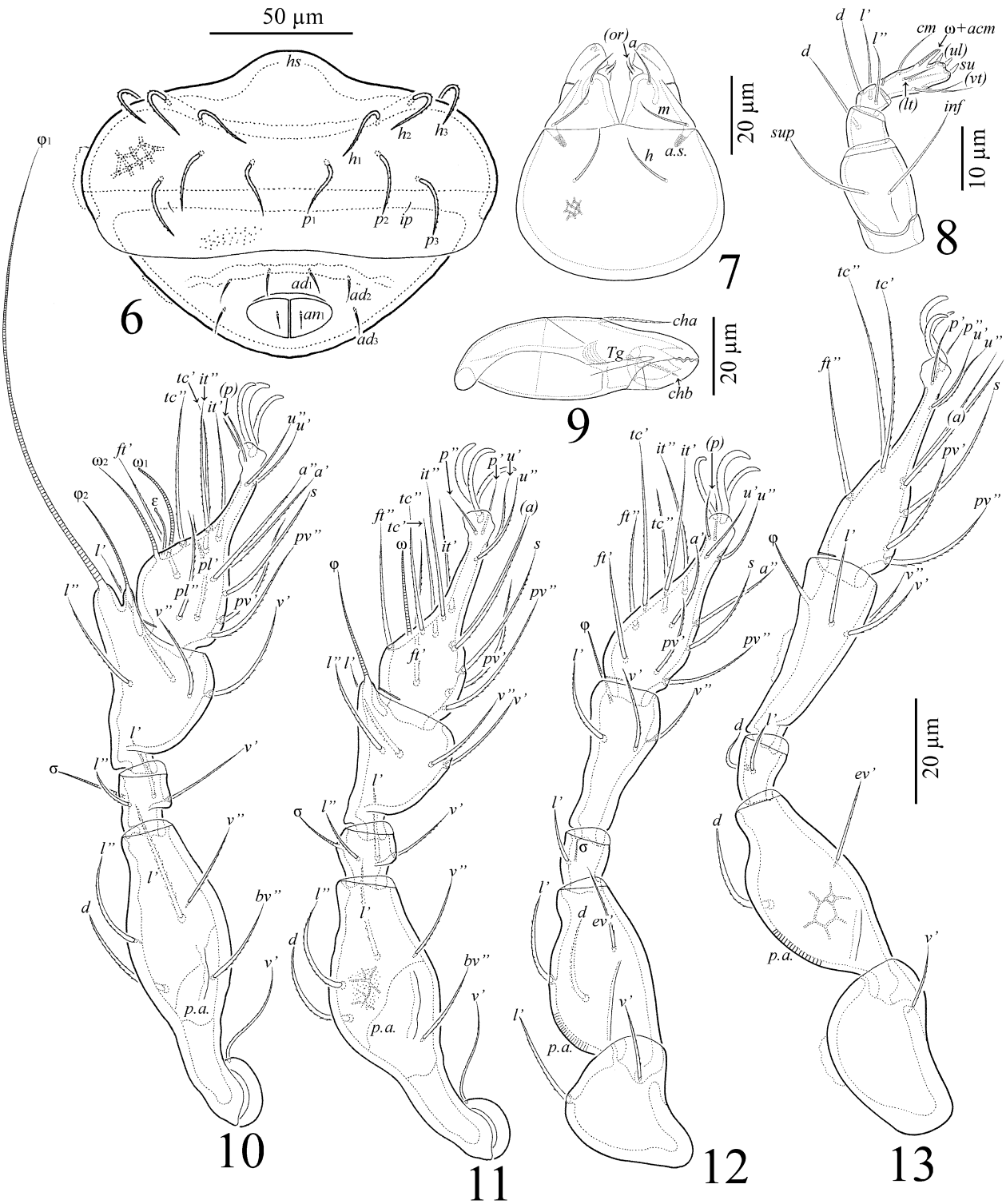
Anogenital region – Genital (g_1: 13–15; others: 11), aggenital (11), anal (5–7), and adanal (11) setae setiform, thin, roughened. Adanal lyrifissure small, located close and parallel to anal plate.



Figures 3–5. *Eremella* (*Eremella*) *ryabinini* **sp. nov.** (adult) – 3. Dorsal view (legs not shown); 4. Ventral view (gnathosoma and legs not shown); 5. Lateral view (gnathosoma and legs not shown).

Legs – Tridactylous; median claw thicker than lateral claws, all slightly barbed on dorsal side. Dorsoparaxial porose area on femora I–IV slightly visible. Formulas of leg setation and solenidia: I (1–5–3–4–17) [1–2–2], II (1–5–3–4–15) [1–1–1], III (2–3–1–3–15) [1–1–0], IV (1–2–2–3–12) [0–

1–0]; homology of setae and solenidia indicated in Table 1. Solenidion φ_1 of tibia I very long, subflagellate; other solenidia rod-like to slightly thickened.



Figures 6–13. *Eremella* (*Eremella*) *ryabinini* **sp. nov.** (adult) – 6. Posterior view; 7. Subcapitulum, ventral view; 8. Palp, right, antiaxial view; 9. Chelicera, left, antiaxial view; 10. Leg I, right, antiaxial view; 11. Leg II, right, antiaxial view; 12. Leg III, left, antiaxial view; 13. Leg IV, left, antiaxial view.

Table 1. Leg setation and solenidia of adult *Eremella* (*Eremella*) *ryabinini* **sp. nov.**

Leg	*Tr*	*Fe*	*Ge*	*Ti*	*Ta*
I	*v'*	*d*, *(l)*, *bv"*, *v"*	*(l)*, *v'*, σ	*(l)*, *(v)*, φ_1, φ_2	*ft'*, *(tc)*, *(it)*, *(p)*, *(u)*, *(a)*, *s*, *(pv)*, (*pl*), ε, ω_1, ω_2
II	*v'*	*d*, *(l)*, *bv"*, *v"*	*(l)*, *v'*, σ	*(l)*, *(v)*, φ	*(ft)*, *(tc)*, *(it)*, *(p)*, *(u)*, *(a)*, *s*, *(pv)*, ω
III	*l'*, *v'*	*d*, *l'*, *ev'*	*l'*, σ	*l'*, *(v)*, φ	*(ft)*, *(tc)*, *(it)*, *(p)*, *(u)*, *(a)*, *s*, *(pv)*
IV	*v'*	*d*, *ev'*	*d*, *l'*	*l'*, *(v)*, φ	*ft"*, *(tc)*, *(p)*, *(u)*, *(a)*, *s*, *(pv)*

Note: Roman letters refer to normal setae, Greek letters to solenidia (except ε = famulus). 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.

Comparison

In having setiform interlamellar and notogastral setae, and reticulate notogastral cerotegument, *E.* (*E.*) *ryabinini* **sp. nov.** is similar to *E.* (*E.*) *pulchella* (Balogh, 1959) from central and southern Europe and phoretic (on elaterid beetles) *E.* (*E.*) *reticulatus* (Woolley, 1969) from the U.S.A. (Louisiana). However, the new species differs from both species by the larger body size (length: 300–330 versus 240–275 in *E.* (*E.*) *pulchella*, 186–204 in *E.* (*E.*) *reticulatus*), the number and localization of transcostulae (two transcostulae developed, the first is located behind lamellar setae, the second is located anteriorly to interlamellar setae versus one transcostula developed, equally removed from lamellar and interlamellar setae in *E.* (*E.*) *pulchella*; transcostulae absent in *E.* (*E.*) *reticulatus*), and the similar length of lamellar and rostral setae (versus *ro* longer than *le* in *E.* (*E.*) *pulchella* and *E.* (*E.*) *reticulatus*). Also, *E.* (*E.*) *pulchella* has monodactylous legs (versus tridactyllous in *E.* (*E.*) *ryabinini*).

Type material

Holotype (female) and two paratypes (two females): Russia, Tula District, 54° 07' 20" N, 36° 29' 47" E, forest in the vicinity of the village of Matyukhinsky, from the edge of the right elytron of the beetle *Amphotis marginata* (Fabricius), 12.05.2022 (leg. V.V. Abramov).

Type deposition

The holotype and two 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 species name is dedicated to our colleague Dr. Nikolay A. Ryabinin, the acarologist from the Institute of Water and Ecological Problems, Far Eastern Branch, Russian Academy of Sciences, Khabarovsk, Russia, for his extensive contributions to our knowledge of fauna and taxonomy of oribatid mites.

Remarks

1. Specimens of the new species located on the edge of the right elytron of *Amphotis marginata* (Nitidulidae). They did not have specific phoretic morphological structures (e.g., Norton 1980; Ermilov and Frolov 2019b; Ermilov and OConnor 2020), however, due to the tight fit (adhesion) with the beetle, there is no doubt about phoresy.

2. The phoretic oribatid mites remains still poorly studied; available literature suggests that they prefer to use beetles of the family Passalidae for phoresy (e.g., Norton 1980; Ermilov 2019; Ermilov and Frolov 2021). The new species was found on the beetle of Nitidulidae; it is the first record of using members of this family for phoresy.

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Eremella ryabinini (Acari, Oribatida, Eremellidae)، گونهٔ جدید کنه اریباتید همسفر *Amphotis marginata* (Coleoptera, Nitidulidae) از روسیه

سرگی جی. ارمیلوف[1*] و ولادیمیر وی. آبرامف[2]

۱. دانشگاه ایالتی تیومن، موسسه زیست‌شناسی محیطی و کشاورزی (X-BIO)، تیومن، روسیه؛ رایانامه: ermilovacari@yandex.ru

۲. سووروف، روسیه؛ رایانامه: abramv3@rambler.ru

* نویسندهٔ مسئول

چکیده

خانوادهٔ کنهٔ Eremellidae (Oribatida) برای نخستین بار در جانوران روسیه ثبت شد. گونهٔ جدیدی از جنس *Eremella*—*E.* (*Eremella*) **sp. nov.** *ryabinini* بر اساس ماده‌های کامل همسفر جمع‌آوری شده از بالپوش سوسک *Amphotis marginata* (Fabricius) (Nitidulidae) توصیف می‌شود.

واژگان کلیدی: کنه‌های ارملید، بخش اروپایی روسیه، ریخت‌شناسی، گزارش جدید، همسفری، آرایه‌شناسی.

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