

NEW FAUNISTIC AND TAXONOMIC DATA ON ORIBATID MITES (ACARI, ORIBATIDA) FROM THE VICINITIES OF SALT LAKES IN RUSSIA

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ABSTRACT: The present study is based on oribatid mite material collected from soils in the vicinities of salt lakes Medvezh'ye and Gor'koye, located in the south of Western Siberia, Russia. A list of identified taxa, including 29 species, belonging to 25 genera and 20 families, is provided. A supplementary description of the sexually dimorphic species *Galumna dimorpha* Krivolutskaya, 1952 is presented. The main morphological traits of this species are specified and summarized.

KEY WORDS: fauna, salt soil, taxonomy, morphology, sexually dimorphic species, *Galumna*, Western Siberia

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INTRODUCTION

This work is part of our continuing study of oribatid mites (Acari, Oribatida) inhabiting the vicinities of salt lakes (e.g., Ermilov and Khaustov 2021; Ermilov 2023). The article includes data on materials collected from the soil samples collected near the Medvezh'ye and Gor'koye lakes located in the south of Western Siberia, Russia. The main goals of the paper are: to present a list of the identified taxa; to redescribe *Galumna dimorpha* Krivolutskaya, 1952 (Galumnidae) on the basis of the Western Siberian material; and to summarize the main morphological traits of *G. dimorpha*, which will help with the identification of this species in the future.

Galumna dimorpha was described by Krivolutskaya (1952) from pasture soils in Kazakhstan. At present, the species is widespread in the Palaearctic region. It inhabits a variety of biotopes, preferring soil-litter in forests and meadows (e.g., Karppinen *et al.* 1986, 1987; Laskova 2001; Moraza and Peña 2005; Ermilov and Chistyakov 2006; Bayartogtokh 2010; Ermilov *et al.* 2022). The original description (Krivolutskaya 1952) and the supplementary descriptions (Pérez-Íñigo 1993; Bayartogtokh and Weigmann 2005; Weigmann 2006) of *G. dimorpha* were correct and the species is well discernible. However, the above descriptions were incomplete: they lacked the lengths of the body setae, as well as certain details concerning the gnathosoma, the podosomal region and the posterior notogastral area. Additionally, leg setation, leg solenidia, as well as detailed leg figures were lacking.

MATERIALS AND METHODS

Specimens. Soil samples containing oribatid mites were collected by hand from the following locations (Figs. 1–3):

L1. Russia, south of Western Siberia, Kurganskaya Oblast, Petukhovskiy Rayon, vicinity of salt lake Medvezh'ye, 55°10'N, 67°55'E, steppe soil (a, b, c, d—10, 20, 30, 40 m from the lake, respectively), 14 October 2022, collected by A. A. Khaustov.

L2. Same, but different location, with coordinates 55°14'09.8"N, 68°01'13.6"E.

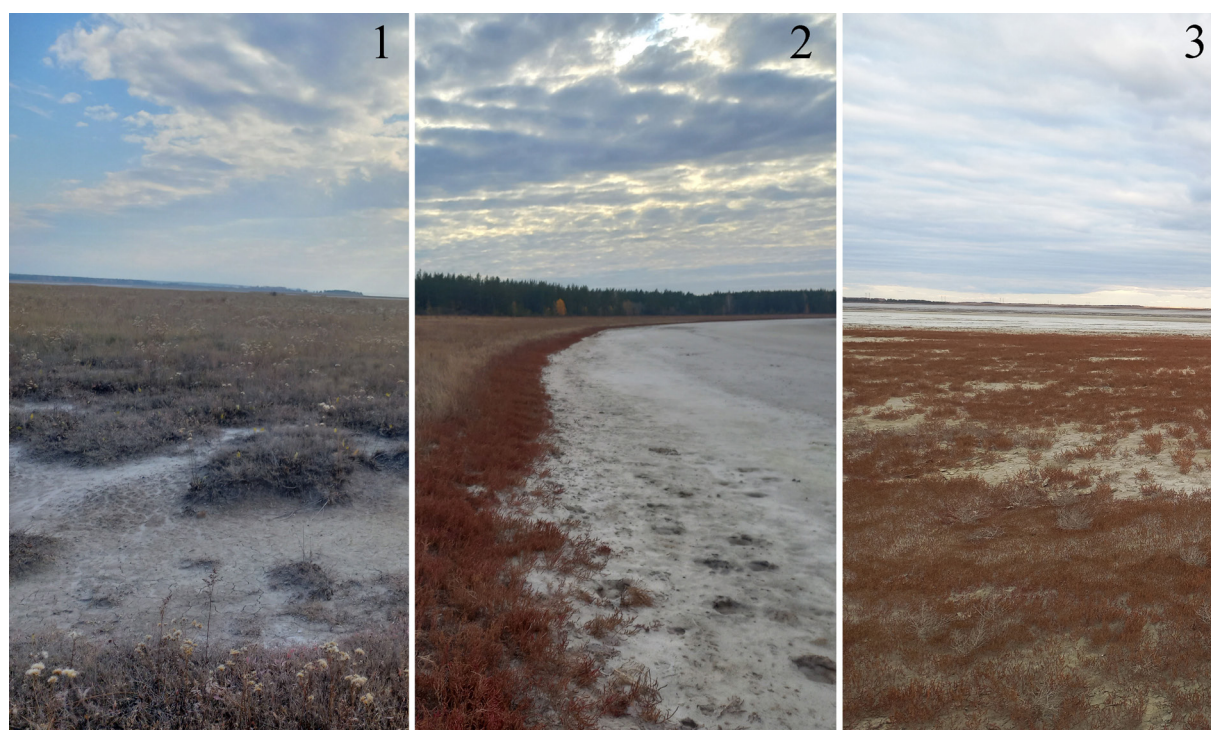
L3. Same, but different location, with coordinates 55°15'07.7"N, 67°58'55.8"E.

L4. Russia, south of Western Siberia, Kurganskaya Oblast, Shchuchanskij Rayon, vicinity of salt lake Gor'koye, 55°24'02.0"N, 66°23'04.3"E, steppe soil, 14 October 2022, collected by A. A. Khaustov.

Mites were extracted into 75% ethanol using Berlese's funnels (without electric lamps) in the course of a seven-day period, in laboratory conditions.

Observation and documentation. For measurement and illustration, specimens were mounted in lactic acid on temporary cavity slides. All body measurements are presented in micrometers (µm); body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the notogaster; body width refers to the maximum width of the notogaster in dorsal view; the lengths of body setae were measured in lateral aspect. 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 DM 2500 light microscope.

Terminology. Morphological terminology used in this paper mostly follows that used in the papers on *Galumna* (e.g., Ermilov 2022; Ermilov *et al.*



Figs. 1–3. Photos of the locations and habitats of oribatid mites: 1, 2 — vicinity of lake Medvezh'ye; 3 — vicinity of lake Gor'koye.

2023). Additionally, see Ermilov and Klimov (2017) for leg setal nomenclature and for the overview.

Abbreviations. *Prodorsum*: *L*—lamellar line; *S*—sublamellar line; *N*—prodorsal leg niche; *E*, *T*—lateral ridges of body; *ro*, *le*, *in*, *bs*—rostral, lamellar, interlamellar and bothridial setae, respectively; *Ad*—dorsosejugal porose area; *D*—dorsophragma; *P*—pleurophragma. *Notogaster*: *c*, *la*, *lm*, *lp*, *h*, *p*—setal alveoli; *Aa*, *A1*, *A2*, *A3*—porose areas; *mp*—median pore; *ia*, *im*, *ip*, *ih*, *ips*—lyrifissures; *gla*—opisthonotal gland opening. *Gnathosoma*: *a*, *m*, *h*—subcapitular setae; *or*—adoral seta; *sup*, *inf*, *d*, *l*, *cm*, *acm*, *ul*, *su*, *vt*, *lt*—palp setae; ω —palp solenidion; *as*—axillary saccule; *cha*, *chb*—cheliceral setae; *Tg*—Trägårdh's organ. *Epimeral and lateral podosomal regions*: *1a*, *3b*, *4a*, *4b*—epimeral setae; *PdI*, *PdII*—pedotecta I, II, respectively; *dis*—discidium; *cir*—circumpedal carina. *Anogenital region*: *g*, *ag*, *an*, *ad*—genital, aggenital, anal and adanal setae, respectively; *iad*—adanal lyrifissure; *Ap*—postanal porose area; *po*—preanal organ. *Legs*: *Tr*, *Fe*, *Ge*, *Ti*, *Ta*—trochanter, femur, genu, tibia, and tarsus, respectively; ω , ϕ , σ —solenidia; ε —famulus; *d*, *l*, *v*, *bv*, *ev*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl*—setae; *pa*—porose area.

Notes. References to the original descriptions of taxa are not included in the *References* section.

SYSTEMATICS

The list of identified taxa includes 29 species, belonging to 25 genera and 20 families (Table 1). The saline soils near the lakes Medvezh'ye and Gor'koye did not exhibit a unique faunal composition. On the contrary, all encountered species are widespread in the Palaearctic region (a similar situation was observed among the oribatid mites in the saline soils near lake Sivash—see Ermilov and Khaustov 2021).

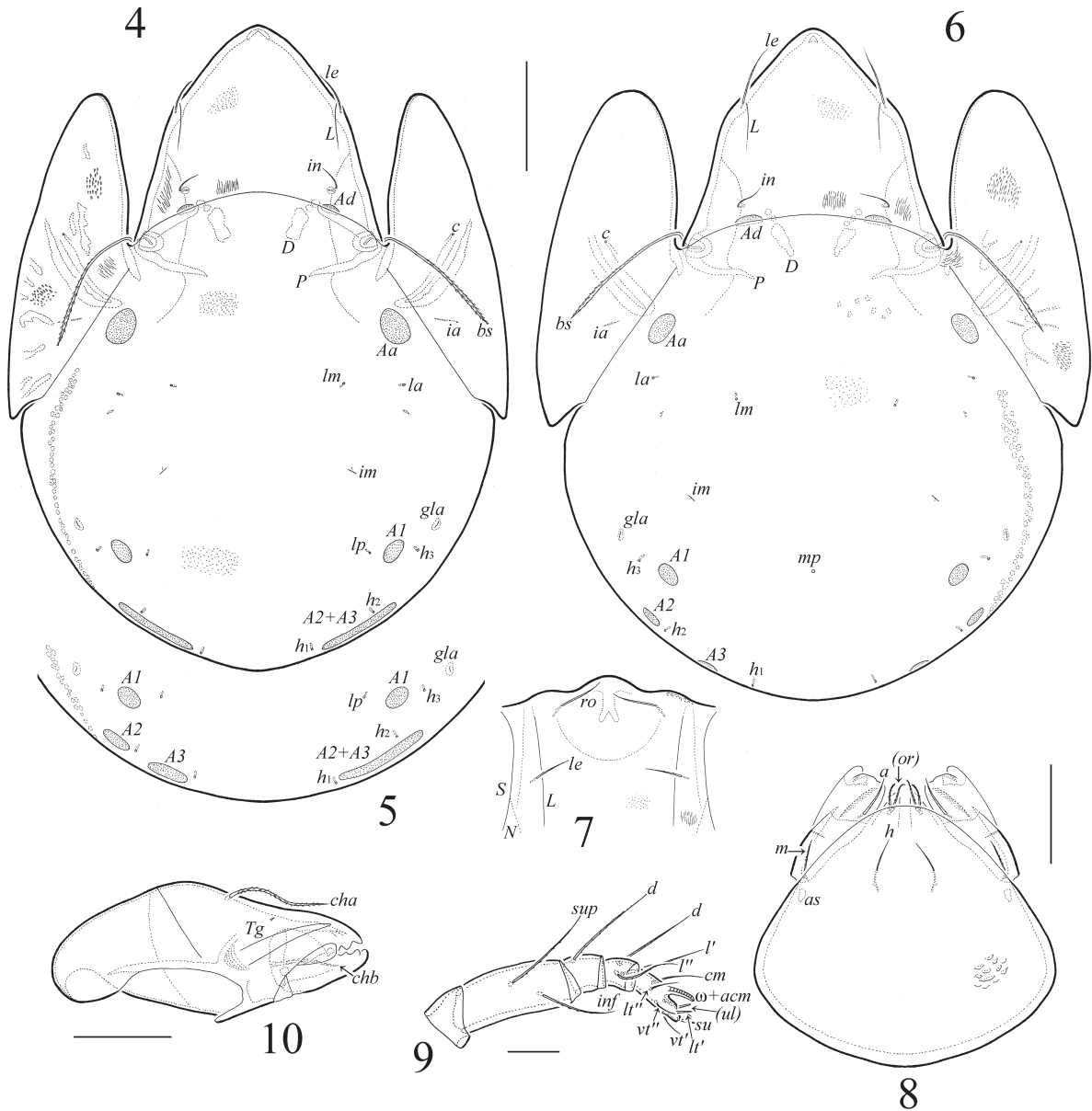
Galumna dimorpha Krivolutskaya, 1952

(Figs. 4–34)

Material. Eight specimens (four males and four females): Russia, south of Western Siberia, Kurganskaya Oblast, Petukhovskiy Rayon, vicinity of salt lake Medvezh'ye, 55°10'N, 67°55'E, steppe soil, 30 m from the water's edge, 14 October 2022, collected by A.A. Khaustov. All specimens are preserved in 70% solution of ethanol with a drop of glycerol in the personal collection of the first author.

Description of adult. *Measurements.* Body length: 570–593 (males), 600–660 (females); body width: 405–420 (males), 427–495 (females).

Integument (Figs. 22, 23, 25–34). Body color brown. Surface of pteromorph, anogenital region

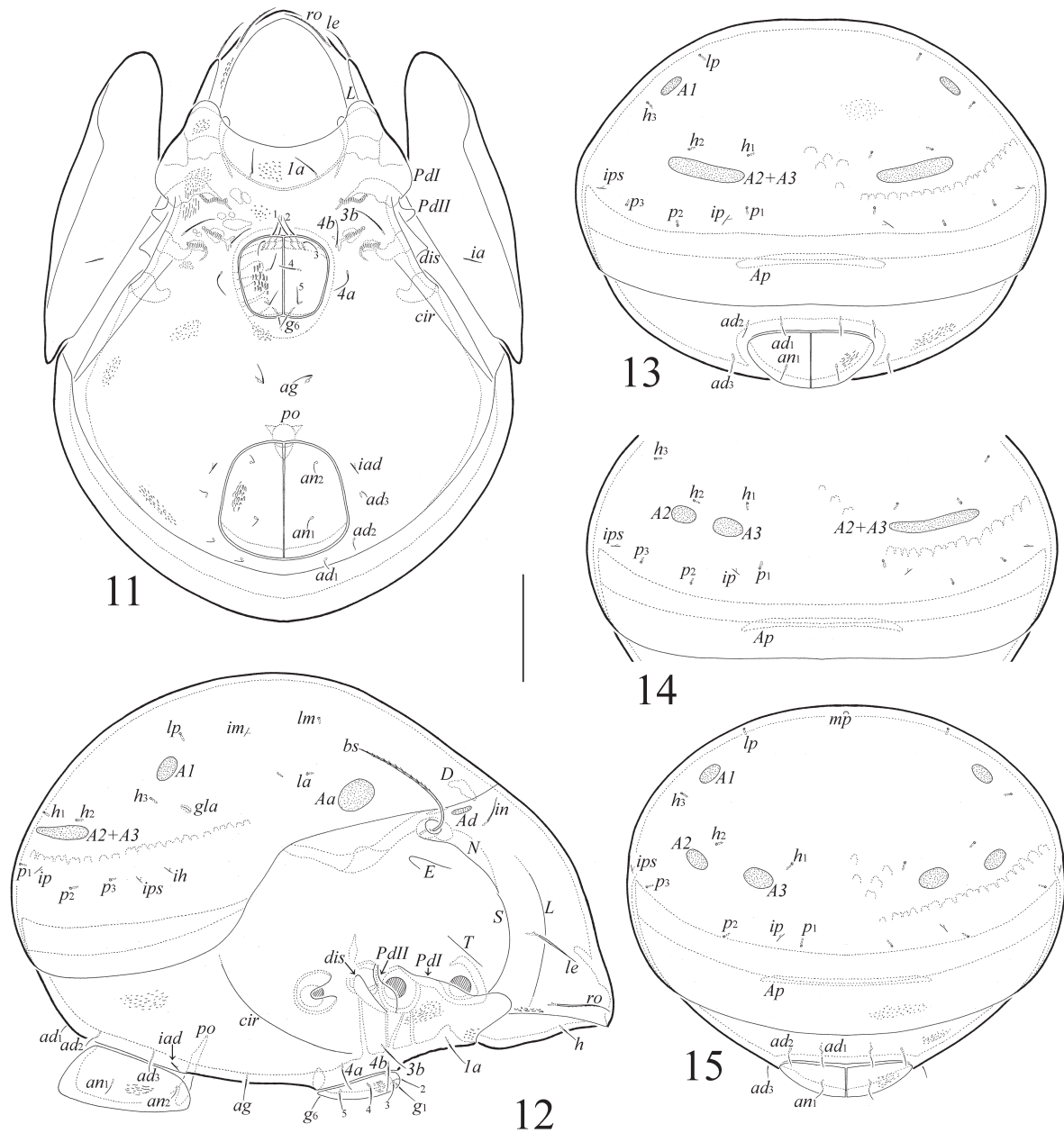


Figs. 4–10. *Galumna dimorpha* Krivolutskaya, 1952, adult: 4—male, dorsal view; 5—male, posterior part of notogaster, dorsal view; 6—female, dorsal view; 7—medioanterior part of prodorsum, dorsoanterior view; 8—subcapitulum, ventral view; 9—palp, right, antiaxial view; 10—chelicera, left, paraxial view. Scale bars: 100 μ m (4–7), 50 μ m (8, 10), 20 μ m (9).

(including subcapitar mentum, genital and anal plates), mediobasal part of prodorsum, lateral part of prodorsum and antiaxial side (partially) of femora I–IV and trochanters III and IV with strong small tubercles and/or short ridges (sculpturing variable in specimens); notogaster and mediobasal part of prodorsum microgranulate (visible under high magnification: $\times 1,000$).

Prodorsum (Figs. 4, 6, 7, 12, 20, 21). Rostrum rounded. Lamellar and sublamellar lines thin, parallel mediobasally and slightly divergent distally, *L*

directed to lateral side of prodorsum. Rostral (49–56) and lamellar (30–41) setae setiform, slightly barbed; interlamellar seta (26–30) setiform, nearly smooth; in some specimens lamellar seta distinctly longer (up to 75), and interlamellar seta distinctly shorter (up to 15) or longer (up to 60); bothridial seta (135–150) setiform (Fig. 12) or with slightly thickened lanceolate distal part (Figs. 4, 6), barbed mediolaterally; exobothridial seta not observable. Dorsosejugal porose area oval (22–34 \times 9–11). Dorsophragma distinctly elongated longitudinally.



Figs. 11–15. *Galumna dimorpha* Krivolutsкая, 1952, adult: 11—ventral view; 12—male, right lateral view; 13—male, posterior view; 14—male, posterior part of notogaster, posterior view; 15—female, posterior view. Scale bar: 100 μm .

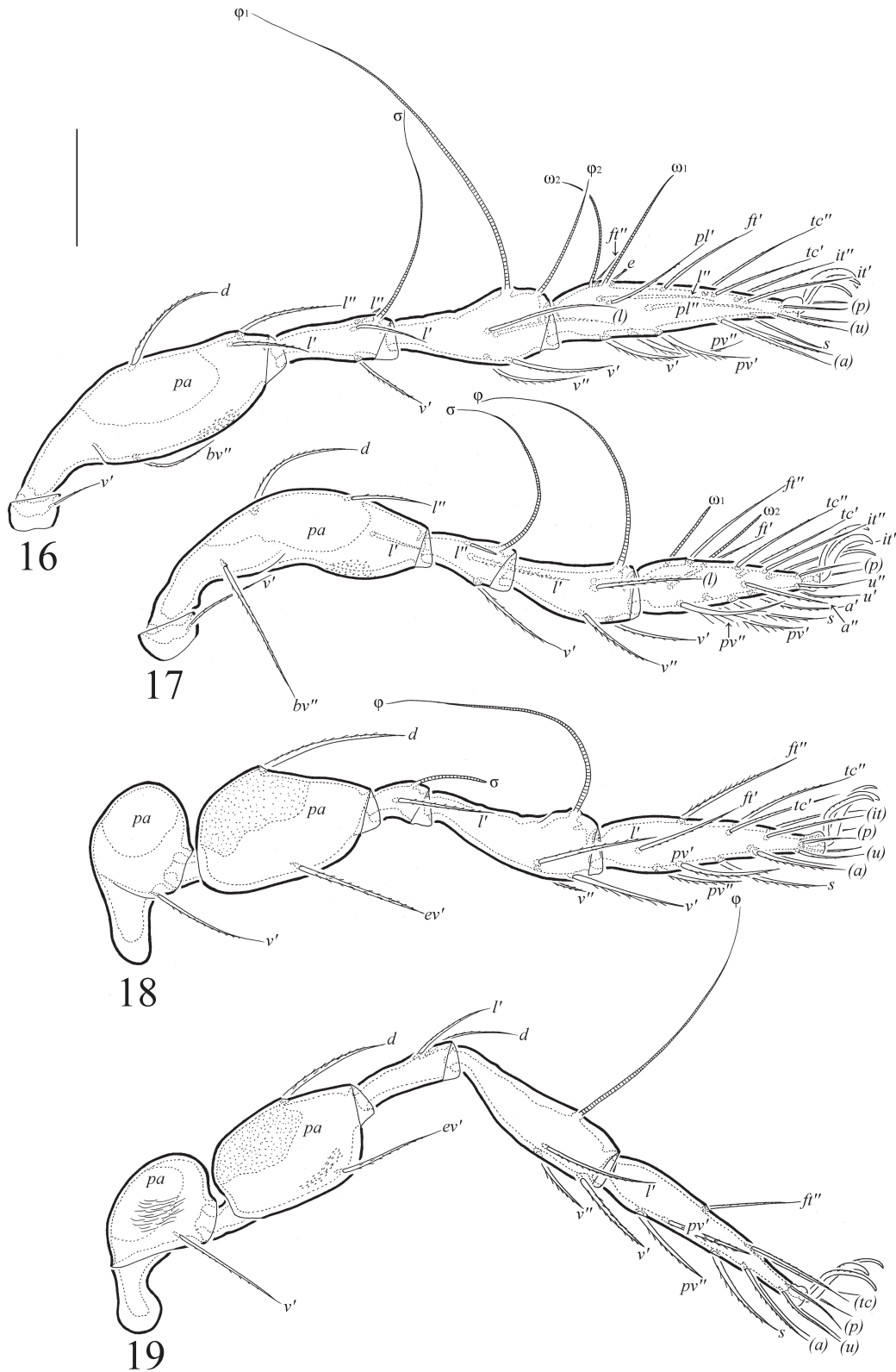
Notogaster (Figs. 4–6, 12–15, 24). Dorsosejugal suture complete, convex, with slightly developed medial part. All notogastral setae represented by setal alveoli. Three pairs of notogastral porose areas in males vs. four pairs of notogastral porose areas in females: *Aa* oval (34–41 \times 26–34), slightly elongate longitudinally, located near to pteromorphical hinge, anteriorly to *la*; *A1* rounded (19–26) or oval (24–26 \times 15–19); *A2* and *A3* in males fused into one band-like (79–94 \times 11–19) porose area vs. *A2* (24–41 \times 15–34) and *A3* (30–45 \times 19–34) separated, oval in females; in two males, left porose

area *A2+A3* (Figs. 5, 14) separated in two oval independent areas (as in females). Median pore absent in males vs. present as one foveola (between porose areas *A1*) in females. Opisthonotal gland opening and all lyrifissures distinct: *gla* anterolaterally to *A1* and distant from it; *im* between *lm* and *lp*, equally distanced from them; *ip* between setal alveoli *p*₁ and *p*₂; *ih* and *ips* comparatively close to each other, anteriorly to *p*₃.

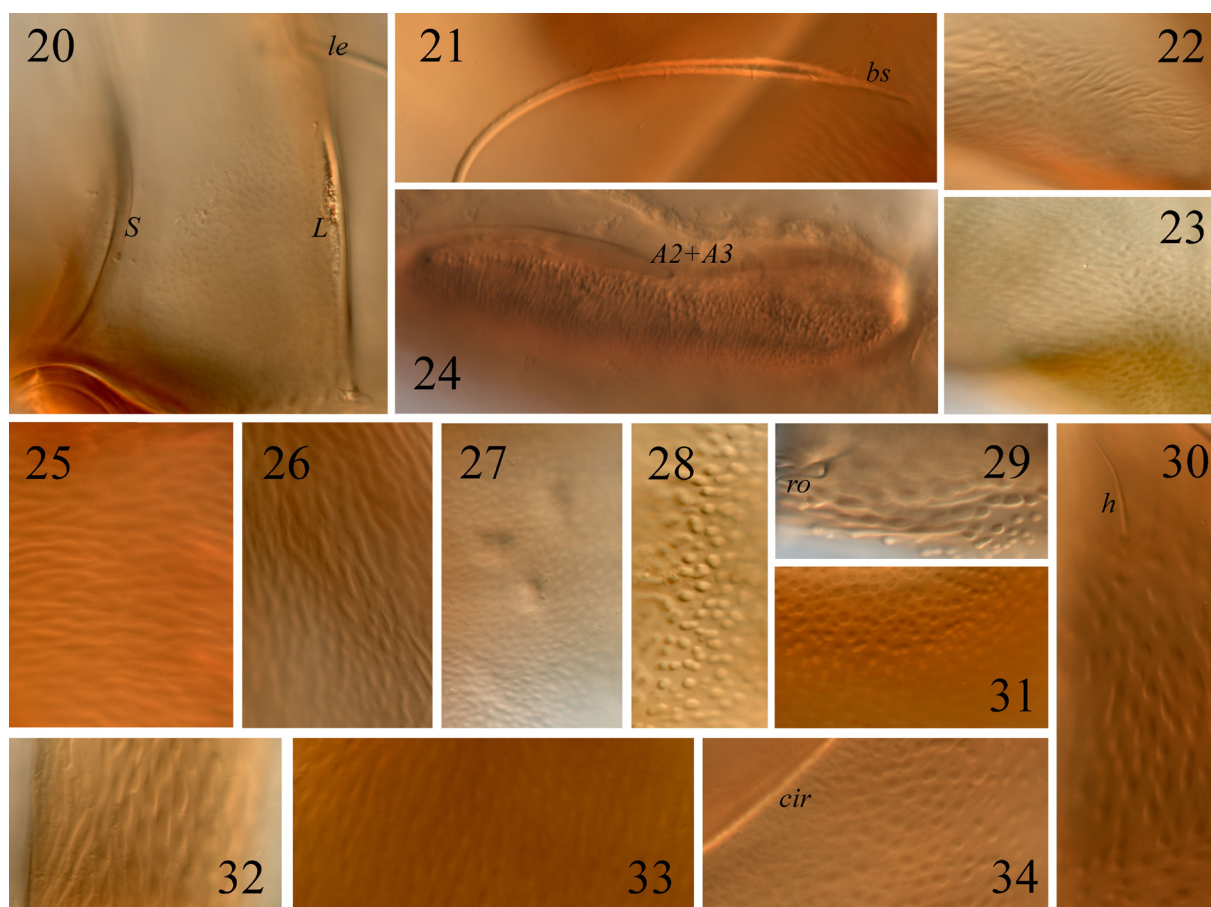
Gnathosoma (Figs. 8–10). Subcapitulum size: 150–161 \times 135–154; subcapitular (*a*: 26–30; *m*, *h*: 19–26) and adoral (15–19) setae setiform; *a*

slightly barbed; *m* and *or* barbed; *h* roughened; *h* thinner than *a* and *m*. Chelicera length: 169–187; cheliceral setae (*cha*: 56–64; *chb*: 34–37) seti-

form, barbed. Palp length: 112–120; setation 0–2–1–3–9(+ ω); postpalpal seta (7) spiniform, nearly smooth.



Figs. 16–19. *Galumna dimorpha* Krivolutskaya, 1952, dissected adult: 16—leg I, left, paraxial view; 17—leg II, right, antiaxial view; 18—leg III, left, antiaxial view; 19—leg IV, left, antiaxial view. Scale bar: 50 μ m.



Figs. 20–34. *Galumna dimorpha* Krivolutskaya, 1952, dissected adult, microscope images: 20—mediobasal parts of lamellar and sublamellar lines, lateral view; 21—bothridial seta, lateral view; 22, 23—sculpturing in laterobasal part of prodorsum; 24—porose area $A2+A3$ in male, dorsoposterior view; 25–28—sculpturing of pteromorph; 29—sculpturing of lateral part of prodorsum behind rostral seta; 30—sculpturing of subcapitular mentum; 31—sculpturing of medial part of epimere I; 32—sculpturing of genital plate; 33—sculpturing between genital and anal apertures; 34—sculpturing of lateral part of anogenital region nearly the circumpedal carina. Magnification: 1,000.

Epimeral and lateral podosomal regions (Figs. 11, 12). Epimeral setal formula: 1–0–1–2; setae (3b: 34–37; 1a, 4a, 4b: 26–30) setiform, roughened. Circumpedal carina medium-sized, directed to insertion of 3b, but distinctly not reaching it.

Anogenital region (Figs. 11–13, 15). Anogenital setal formula 6–1–2–3; genital (g_1, g_2 : 22–30; others: 15–22) and aggenital (15–22) setae setiform, roughened; anal (9–11) and adanal (9–11) setae setiform, smooth; anterior edge of genital plate with two setae, but third seta located close to them; aggenital seta located between genital and anal apertures, equally distanced from them; adanal setae ad_1 and ad_2 posteriorly, ad_3 laterally to anal plate; distance between ad_1 – ad_2 slightly shorter than ad_2 – ad_3 . Adanal lyrifissure oblique, located close to anterior half of anal plate and anteriorly to ad_3 . Postanal porose area band-like (142 – 180×9 – 13).

Legs (Figs. 16–19). Median claw distinctly thicker than lateral claws, all slightly barbed on

dorsal side. Porose area on femora I–IV and on trochanters III, IV well visible; proximoventral porose area on tarsi I–IV and distoventral porose area on tibiae I–IV not observable. Formulas of leg setation and solenidia: I (1–4–3–4–20) [1–2–2], II (1–4–3–4–15) [1–1–2], III (1–2–1–3–15) [1–1–0], IV (0–2–2–3–12) [0–1–0]; homology of setae and solenidia indicated in Table 2; famulus straight, inserted close and anterolateral to solenidion ω_1 ; seta s of tarsus I eupathidial, located between paired setae u and a ; solenidia ω_1 and ω_2 of tarsus II and σ of genu III bacilliform, other solenidia setiform or subflagellate; solenidion of tibia IV inserted in anterior part of the segment.

Remarks. Based on our redescription and on the original description (Krivolutskaya 1952) and supplementary descriptions (Pérez-Íñigo 1993; Bayartogtokh and Weigmann 2005; Weigmann 2006) of adult *G. dimorpha*, we propose the following diagnostic morphological traits for this species:

Body length: 570–660. Body surface slightly sculptured (partially with tubercles and short ridges). Rostrum rounded. Lamellar and sublamellar divergent distally, *L* directed to lateral side of prodorsum. Rostral and lamellar setae medium-sized, setiform, barbed; interlamellar seta comparatively short, setiform, nearly smooth or barbed; bothridial seta long, setiform or with slightly thickened lanceolate distal part, barbed; relative length: $bs > ro > le > in$. Dorsosejugal porose area present. Dorsosejugal suture complete. Three pairs of notogastral porose areas in males vs. four pairs of notogastral porose areas in females (*Aa* oval; *A1* rounded or oval; *A2* and *A3* in males fused into one band-like porose area vs. *A2* and *A3* separated, oval in females). Median pore absent in males vs. present in females. Opisthotal gland opening located anterolaterally to *A1*; lyrifissure *im* located between *lm* and *lp*. Epimeral and anogenital setae comparatively short, setiform, roughened or smooth. Circumpedial carina medium-sized. Aggenital setae equally distanced from genital and aggenital setae. Adanal lyrifissure close and oblique or parallel to anal plate. Postanal porose area band-like. Leg famulus straight, inserted anterolateral to solenidion ω_1 ; solenidion of tibia IV inserted in anterior part of the segment.

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Table 1. Oribatid mites from the vicinities of lakes Medvezh'ye and Gor'koye.

Taxa	Locations						
	L1				L2	L3	L4
	a	b	c	d			
Epilohmanniidae							
<i>Epilohmannia styriaca</i> Schuster, 1960	–	–	–	+	–	–	–
Euphthiracaridae							
<i>Acrotritia ardua</i> (Koch, 1841)	–	–	–	+	–	–	–
Steganacaridae							
<i>Atropacarus striculus</i> (Koch, 1835)	–	+	+	–	–	–	–
Malaconothridae							
<i>Malaconothrus monodactylus</i> (Michael, 1888)	–	–	–	+	–	–	–
Astegistidae							
<i>Astegistes pilosus</i> (Koch, 1841)	+	–	–	–	–	–	–
Thyrisomidae							
<i>Banksinoma lanceolata</i> (Michael, 1885)	–	+	+	–	–	–	–
Oppiidae							
<i>Berniniella exempta</i> (Mihelcic, 1958)	–	–	+	–	–	–	–
<i>Micropopia minus</i> (Paoli, 1908)	–	+	+	–	–	–	–
<i>Oppiella nova</i> (Oudemans, 1902)	–	+	+	–	–	–	–
Suctobelbidae							
<i>Suctobelbella acutidens</i> (Forsslund, 1941)	–	+	+	–	–	–	–
Tectocephidae							
<i>Tectocephus sarekensis</i> Trägårdh, 1910	–	–	–	–	–	+	–
Passalozetidae							
<i>Bipassalozetes bidactylus</i> (Coggi, 1900)	–	–	–	–	+	–	–
Phenopelopidae							
<i>Eupelops torulosus</i> (Koch, 1839)	–	–	+	+	–	–	–
Oribatellidae							
<i>Oribatella berlesei</i> (Michael, 1898)	–	–	–	–	–	–	+
<i>Oribatella reticulata</i> Berlese, 1916	–	+	+	+	+	–	–
Achipteriidae							
<i>Achipteria coleoprata</i> (Linnaeus, 1758)	–	–	–	–	+	+	–
Ceratozetidae							
<i>Ceratozetella bregetovae</i> (Shaldybina, 1970)	–	–	+	–	+	–	–
<i>Latilamellobates incisellus</i> (Kramer, 1897)	–	+	+	+	–	–	–
<i>Trichoribates novus</i> (Sellnick, 1928)	–	–	–	+	+	–	–
Humerobatidae							
<i>Humerobates translamellatus</i> Shaldybina, 1971	–	+	–	+	–	–	–
Punctoribatidae							
<i>Punctoribates astrachanicus</i> Shaldybina, 1973	–	–	–	–	–	+	–
<i>Punctoribates minimus</i> Shaldybina, 1969	–	+	+	+	–	–	–
<i>Punctoribates hexagonus</i> Berlese, 1908	+	–	–	–	–	–	–
Oribatulidae							
<i>Oribatula amblyptera</i> Berlese, 1916	–	–	–	–	–	–	+
Schelorbitidae							
<i>Liebstadia similis</i> (Michael, 1888)	–	–	+	+	–	–	–
<i>Schelorbitates laevigatus</i> (Koch, 1835)	–	+	+	+	–	+	–
Haplozetidae							
<i>Protoribates capucinus</i> Berlese, 1908	–	–	–	+	–	–	–
Galumnidae							
<i>Galumna dimorpha</i> Krivolutskaya, 1952	–	–	+	–	–	–	–
<i>Galumna lanceata</i> (Oudemans, 1900)	–	+	+	–	–	–	–

Note: The plus sign (+) indicates the presence, and the minus sign (–) indicates the absence of the species.

Oribatid mites from vicinities of salt lakes

Table 2. Leg setation and solenidia of adult *Galumna dimorpha* Krivolutskaya, 1952.

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

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.