Acarologia 51(3): 359–370 (2011)
DOI: 10.1051/acarologia/20112019

OCCURRENCE OF A MEDITERRANEAN SPECIES IN CENTRAL EUROPE AND ASIA, WITH NOTES ON THE GENERIC STATUS AND BIOGEOGRAPHY OF *SIMKINIA* AND *HEMILEIUS* (ACARI: ORIBATIDA)

Badamdorj BAYARTOGTOKH[1], Heinrich SCHATZ[2], Barbara M. FISCHER[3], Ilya E. SMELYANSKY[4]

(Received 14 May 2011; accepted 12 August 2011; published online 23 September 2011)

[1]*Department of Zoology, National University of Mongolia, Ulaanbaatar 210646, Mongolia. bayartogtokh@num.edu.mn*
[2]*Institute of Zoology, Leopold-Franzens University of Innsbruck, Technikerstrasse 25, A-6020 Innsbruck, Austria. heinrich.schatz@uibk.ac.at*
[3]*Institute of Ecology, Leopold-Franzens University of Innsbruck, Technikerstrasse 25, A-6020 Innsbruck, Austria. Barbara.Fischer@uibk.ac.at*
[4]*Siberian Environmental Center, P.O. Box 547, Novosibirsk 630090, Russia. oppia@yandex.ru*

ABSTRACT — The present paper deals with a species of oribatid mite, *Hemileius humeralis* Pérez-Iñigo jr., 1990, which was previously known from the Mediterranean region, and was recently found in the high mountains of Central Europe and Central Asia. The species is redescribed with detailed illustrations based on adults. Its ecology and geographical distribution places this species in varying habitats from high alpine meadow to lowland grassland in the western Palaearctic region. An extensive discussion on the taxonomic status of *Simkinia* and *Hemileius* is provided. Both taxa are treated here as subgenera of *Scheloribates*. Data on the biogeography of the members of these subgenera are discussed. It seems that the range and habitats of known species of *Scheloribates* (*Simkinia*) are in accordance with the concept of the Old Mediterranean Region. The majority of species of *Scheloribates* (*Hemileius*) show restricted distributions within one biogeographical region, mainly in the Palaearctic, Nearctic or Neotropical regions. The Mediterranean area is outstanding by a high species diversity.

KEYWORDS — Scheloribatidae; *Hemileius*; *Simkinia*; Alps; Italy; Altai Mountains; Mongolia

INTRODUCTION

The oribatid mites belonging to *Hemileius* Berlese, 1916 (sensu stricto) and *Simkinia* Krivolutsky, 1966 form smaller groups within the superfamily Oripodoidea Jacot, 1925, with 25 and 5 described species, respectively. *Hemileius* was proposed by Berlese (1916) as a subgenus of *Oribatula* Berlese, 1896 with *Protoribates (Scheloribates) initialis* Berlese, 1908 as the type species. He considered the reduction of pteromorphs and development of notogastral sacculi as main diagnostic characters of his newly proposed subgenus.

Later, Grandjean (1953a, 1953b) redescribed the type species, and elevated *Hemileius* as an independent genus, classifying it in the family Scheloribatidae. This status has been accepted later by many authors (e.g. Balogh 1963, 1965, 1972, Shaldybina 1975), placing it either in the family Oribatulidae or Scheloribatidae.

Balogh and Balogh (1984) proposed the new

family Hemileidae encompassing *Hemileius* as well as several other genera, such as *Heteroleius* Balogh et Mahunka, 1966, *Nesoribatula* Aoki, 1964, *Urubambates* Hammer, 1961 etc.. More recently, Subías (2004, 2011) followed their concept.

However, Weigmann and Miko (1998) and Weigmann (2006, 2009) replaced *Hemileius* as a subgenus in the cosmopolitan genus *Scheloribates* Berlese, 1908. These authors discussed the values of the commonly used characters, such as the presence of notogastral porose areas and sacculi, the number of notogastral setae, the development of notogastral pteromorphs, and the number of leg claws. They considered these characters as diagnostic traits at species-level within the family Scheloribatidae, but of little systematic value for separation of genera (see below in section Discussion).

The other genus discussed here, *Simkinia* was established by Krivolutsky (1966) with *S. turanica* Krivolutsky, 1966 as the type species. This is one of the smallest genera of Oripodoidea, with only five species originally assigned. The generic status was accepted by Bulanova-Zachvatkina (1975), Balogh and Balogh (1992), but recently Subías (2008) proposed *Simkinia* as a subgenus of *Hemileius*. Indeed, these two taxa seem closely related to each other sharing characters of dorsal and ventral sides of the body. But the construction of the lamellar complex of all known *Simkinia*-species is unknown yet, which is an important character at the generic level within this group.

Recently, we found the species *Hemileius humeralis* Pérez-Iñigo jr., 1990 in Central Europe (northern Italy) and Asia (western Mongolia). This species was known previously only from the Mediterranean region, and it shows characters of both *Hemileius* and *Simkinia*, except for the unknown construction of the lamellar complex of the latter taxon. The aim of the present work is to provide supplementary description of the species with extensive data on habitat and geographical distribution, and to discuss the taxonomic status of *Hemileius* and *Simkinia* along with information on their biogeography.

MATERIALS AND METHODS

The materials for the present study were collected in alpine meadows in Mts. Mongol Altai, in larch forests in Mts. Kharhiraa in Western Mongolia, and in the Schlern/Sciliar massif, Southern Alps, Province of Bolzano, Italy. The adult specimens studied here are kept in the collections of the Department of Zoology, National University of Mongolia, Ulaanbaatar, Mongolia, and the Institute of Ecology, University of Innsbruck, Austria. Amount of examined material and detailed data on localities are provided in the section "material examined".

The morphological terminology mostly follows Grandjean (e.g. 1953a). Van der Hammen (1980) and Hunt *et al.* (1998) provided glossaries of terms and an overview can be found in Norton and Behan-Pelletier (2009). Furthermore, the following abbreviations are used for designations of setae and other morphological characters: *ro* – rostral seta; *le* – lamellar seta; *in* – interlamellar seta; *ex* – exobothridial seta; *ss* – sensillus; *bo* – bothridium; *di* – discidium; c_3, *la*, *lm*, *lp*, h_1, h_2, h_3, p_1, p_2, p_3 – notogastral setae; *Sa*, S_1, S_2, S_3 – notogastral sacculi; *ia*, *im*, *ip*, *ih*, *ips* – notogastral lyrifissures; *gla* – opisthosomal gland opening; ad_1, ad_2, ad_3 – adanal setae; an_1, an_2 – anal setae; g_1, g_2, g_3, g_4 – genital setae; *ag* – aggenital seta; *1a*, *1b*, *1c* – setae of epimere I; *2a* – seta of epimere II; *3a*, *3b*, *3c* – setae of epimere III; *4a*, *4b*, *4c* – setae of epimere IV; *h*, *m*, *a* – setae of gnathosoma; *iad* – adanal lyrifissure; *l*, *s*, *u*, *p*, *tc* – leg setae; ω – solenidion of leg tarsus; φ – solenidion of leg tibia; σ – solenidion of leg genu; ε – famulus of leg I tarsus.

Specimens were cleared in lactic acid, mounted on temporary slides, and preserved in alcohol. Line drawings were made using a camera lucida attached to the compound microscope. All measurements are given as a range, with the mean in parentheses. Body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the ventral plate, to avoid discrepancies caused by different degrees of notogastral distension. Notogastral length was also measured in lateral aspect, from the anterior to the posterior edge; notogastral width refers to the maximum width in dorsal aspect. Setal formulas are given as numbers per

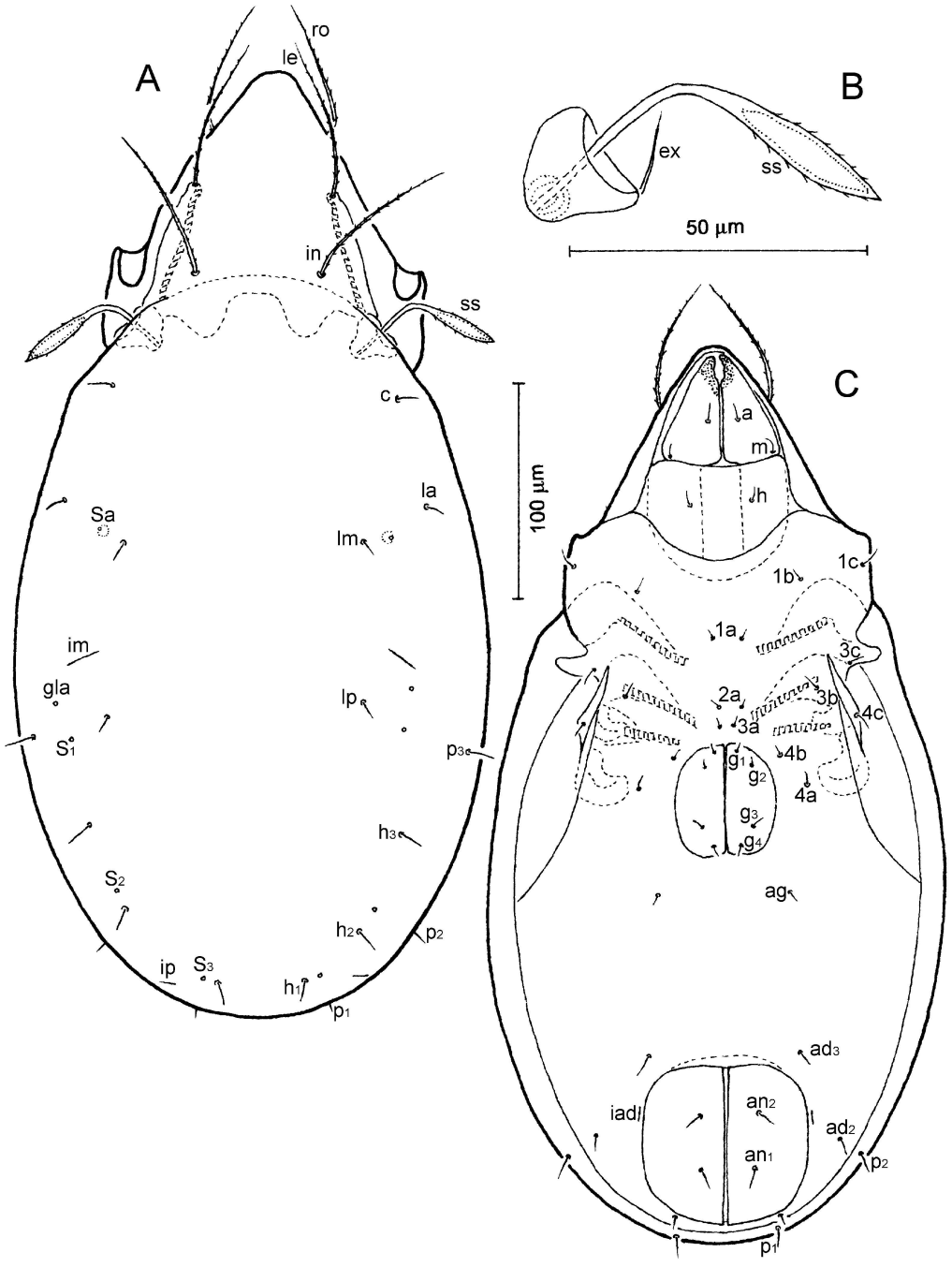

FIGURE 1: *Scheloribates* (*Hemileius*) *humeralis* Pérez-Iñigo jr., 1990 (figure is based on a specimen from Mongolia). A – Dorsal view of idiosoma; B – Sensillus, bothridium and exobothridial setae; C – Ventral view of idiosoma (legs removed).

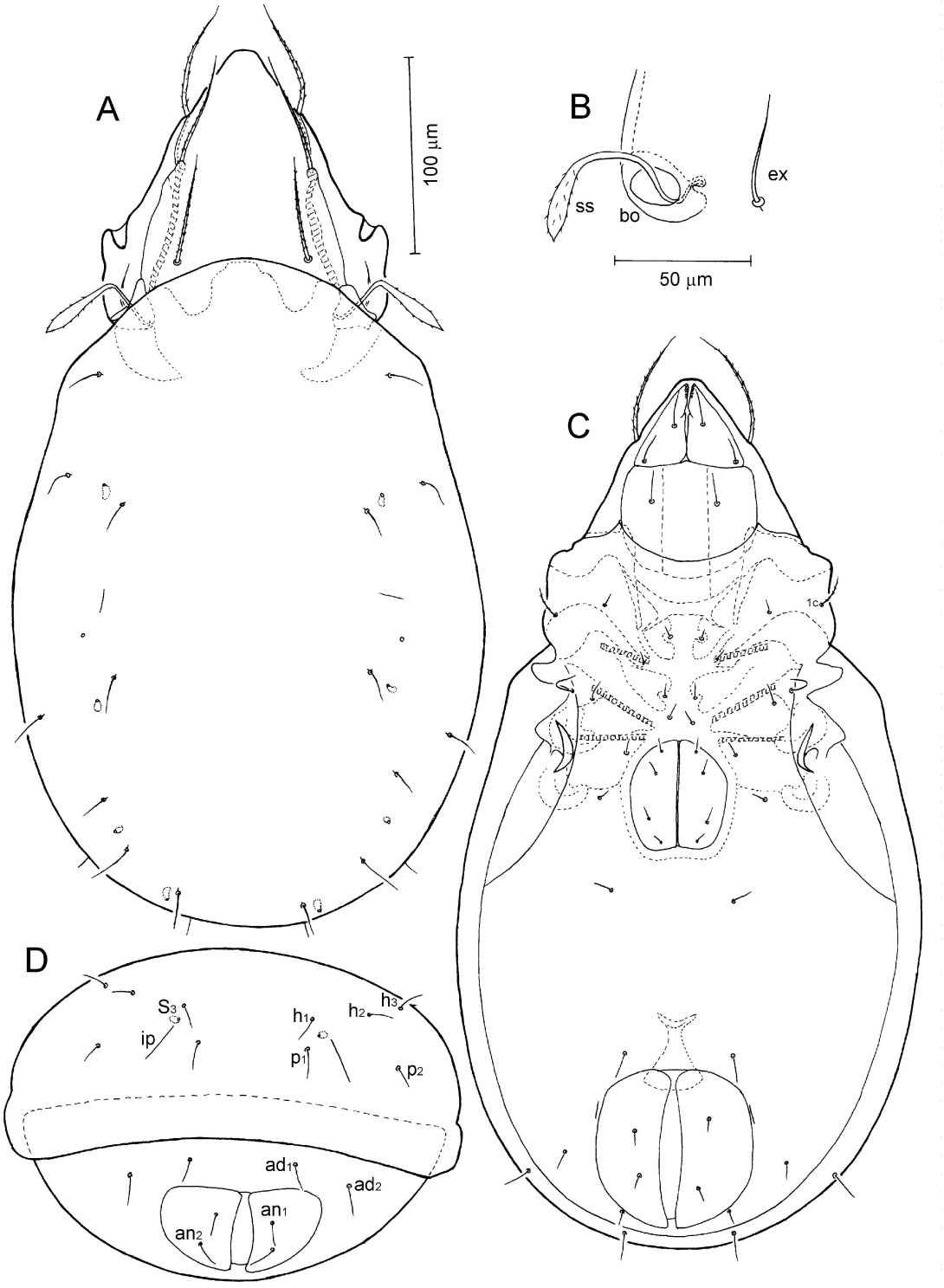

FIGURE 2: *Scheloribates* (*Hemileius*) *humeralis* Pérez-Iñigo jr., 1990 (figure is based on a specimen from Italy). A – Dorsal view of idiosoma; B – Sensillus, bothridium and exobothridial setae; C – Ventral view of idiosoma; D – Posterior view of opisthosoma (legs removed).

segment for appendages (from trochanter to tarsus) and as number per podosomal segment (I-IV) for epimeres.

RESULTS

Scheloribates (Hemileius) humeralis Pérez-Iñigo jr., 1990 (Figures 1-4)

Hemileius humeralis Pérez-Iñigo jr., 1990, p. 136, figs. 17-19. *Hemileius humeralis*: Pérez-Iñigo, 1993, p. 266; Moraza and Peña, 2005, p. 48. *Hemileius (H.) humeralis*: Subías, 2004, p. 348; Subías, 2011, p. 380. *Hemileius (H.) humeralis*: sensu Shtanchaeva and Subías, 2010, p. 221 (non *H. humeralis* Pérez-Iñigo jr., 1990).

Diagnosis

Medium sized species with general characters of Scheloribatidae. Rostrum nearly triangular, its tip rounded in dorsal view, but conspicuously projected anteroventrad in lateral view; lamella narrow, slightly tapered at distal end; all prodorsal setae moderately long, thin, finely barbed, subequal in length except short, smooth exobothridial seta; sensillus with minutely barbed fusiform head; hysterosoma relatively flat in lateral view, sometimes anterior margin of notogaster incomplete; humeral projection conspicuously developed; 10 pairs of notogastral setae, all short, thin, smooth; four pairs of genital setae, legs tridactylous.

Measurements — (n=9). Body length 408 – 441 (419) μm, length of notogaster 324 – 343 (334) μm, width of notogaster 211 – 226 (218) μm.

Integument — Yellowish to yellowish-brown in color. Surface of body and leg segments with thin cerotegument having very small granules on lateral part of prodorsum.

Prodorsum — Rostrum nearly triangular, its tip rounded in dorsal view, but conspicuously projected anteroventrad in lateral view. Rostral seta (*ro*) 60 – 65 μm long, thin, finely barbed, inserted at the end of prolamella. Lamellar seta (*le*) 62 – 68 μm long, finely barbed, reaching or slightly extending beyond the tip of rostrum. Interlamellar seta (*in*) 61 – 67 μm long, thin, finely barbed. Exobothridial seta (*ex*) 28 – 33 μm long, thin smooth. Lamella narrow, slightly tapering distally. Sublamella narrow, blade-like, extending from bothridia to sublamellar region. Prolamella well developed, extending from seta *le* to *ro* (Figures 1A, 2A, B and 3A). Sensillus (*ss*) medium long, with fusiform head and narrow stalk. Bothridium irregularly funnel shaped, with large opening, its posterior part concealed under anterior margin of notogaster. Porose areas *Al* nearly round, situated close to sublamellar ridge (Figures 1B, 2B, 3A).

Notogaster — Elongate oval in dorsal aspect, about 1.4 – 1.6 times as long as wide. Dorsosejugal suture slightly arched anteriorly, sometimes incomplete; humeral projection conspicuously developed. Ten pairs of notogastral setae 13 – 17 μm long, thin, smooth. Sacculi *Sa*, S_1, S_2 and S_3 small; *Sa* situated between setae *la* and *lm*, S_1 between setae *lp* and p_3, S_2 between setae h_2 and h_3, and S_3 situated between setae h_1 and h_2. Lyrifissures *im* and *ip* well developed, clearly visible in dorsal and posterior view, while *ia*, *ih* and *ips* not evident. Opisthosomal gland opening (*gla*) situated posterolateral to lyrifissure *im* (Figures 1A, 2A, D and 3A).

Gnathosoma — Subcapitular mentum conspicuously wider than long, without noticeable microtubercles. Hypostomal setae *h*, *a* and *m* thin, smooth, nearly same in length (Figures 1C and 2C). Chelicera chelate, moderately strong, with a few small teeth; setae *cha* and *chb* moderately long, barbed; Trägårdh's organ well developed. Palp typical for family, all setae smooth; anteroculminal euphathidium *acm* completely fused to tarsal solenidion ω; palpal setation: 0-2-1-3-10 including solenidion ω.

Epimeral region — Apodemes *apo.1*, *apo.2*, *apo.sj* and *apo.3* fairly long, but thin, obliquely oriented. All epimeral setae short, thin, only *1c* finely barbed, other setae smooth; epimeral setal formula: 3-1-3-3. Discidium well developed. Epimeral seta *4c* inserted on discidium. Custodium well developed, projecting anteriorly. Circumpedal carina reaching level of pedotectum I. Pedotecta I and II relatively small, similar in size, their surface smooth (Figures 1C and 2C).

Ano-genital region — Surface of ventral plate, as

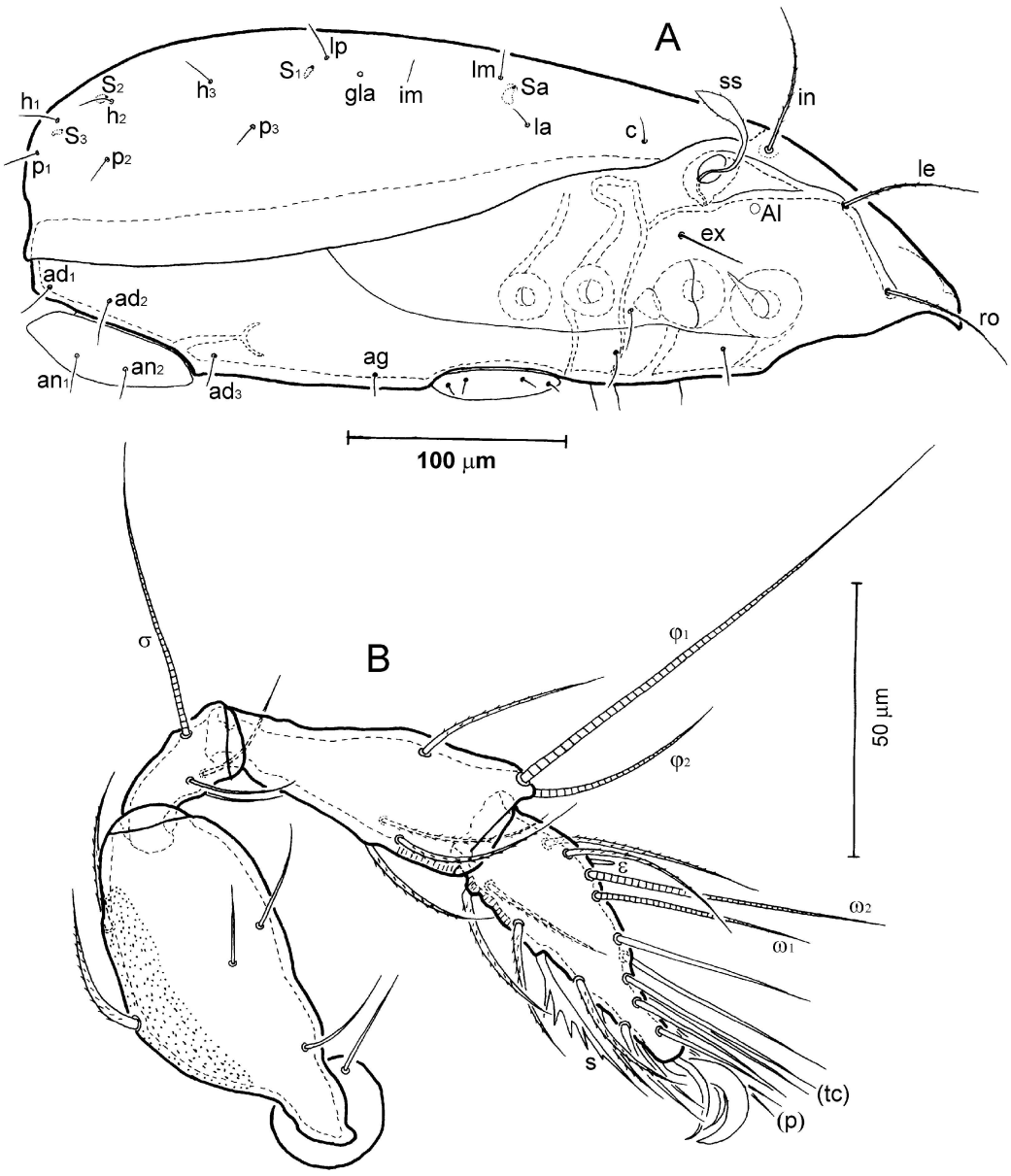

FIGURE 3: *Scheloribates* (*Hemileius*) *humeralis* Pérez-Iñigo jr., 1990. A – Lateral view of idiosoma (legs removed); B – Leg I (right, antiaxial view).

well as both anal and genital plates smooth. Anal aperture distinctly larger than genital one. Four pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae, short, thin, smooth. Distance between bases of aggenital setae nearly equal to that between setae ad_3-ad_3; seta ad_3 in preanal position. Adanal lyrifissure *iad* situated adjacent and parallel to lateral margin of anal plate, at level of seta an_2 (Figures 1B, 2C and D).

Legs — All tarsi heterotridactylous, with lateral claws much thinner than empodial claw. Femora I-IV and trochanters III and IV with large porose areas. Trochanter IV with distinct anteroventral projection in front of seta *l*. Most leg setae distinctly barbed, except paired setae *p*, *it*, *tc* and *u* of tarsus I, *p*, *it* and *u* of tarsi II and III, *p* of tarsus IV. Setae *s* on tarsi I, II and IV stout, with strong serrations. On tarsus I solenidia ω_1 conspicuously longer than ω_2; famulus ε very short, but stout. Tibia I with a distinctly projecting apophysis for solenidia; φ_1 much longer and thicker than φ_2. Genu I with fairly long, but thin solenidion σ. Solenidia ω_1 and ω_2 on tarsus II subequal in size, setiform. Tibia II without crispin for solenidion, and tibial solenidion φ distinctly shorter than φ_1 of tibia I. Formula of leg setation (including famulus): I 1-5-3-4-19; II 1-4-2-4-17; III 2-3-1-3-15; IV 1-2-2-3-12; formula of solenidia: I 1-2-2; II 1-1-2; III 1-1-0; IV 0-1-0. Setation of legs I-IV as shown in Figures 3B and 4.

Material examined — Twelve specimens (8 females and four males): Mts. Mongol Altai, District Sagsai, Province Bayan-Ulgii, Mongolia, soils of alpine meadow, 2630 m a.s.l., leg. B. Bayartogtokh, 24 July 2010; eight specimens (five females and three males): Mts. Kharkhiraa, district Ulaangom, Province Uvs, Mongolia, litter and upper soil layer in larch forest, 2550 m a.s.l., leg. B. Bayartogtokh, 16 August 2005; six specimens (four females and two males): Schlern/Sciliar massif, Southern Alps, Provincia di Bolzano, Italy, arid meadow on volcanic soil, grass and herb litter, 2250 m a.s.l., leg. H. Schatz, 1 July 2007 (SL 80).

Remarks — The body size of the Mediterranean specimens is slightly smaller than that of the material from Central Europe and Asia, and the sensilli of the specimens from the former region are more densely barbed than those of our studied material. Except for these points, all other characters of our specimens match well with the type specimens described by Pérez-Iñigo jr. (1990). For the sake of completeness, we provide here a supplementary description with detailed illustrations.

As for the geographical distribution and habitat, this species has been found in two different habitats at the type locality in the Pyrenean zone of Huesca province, north-eastern Spain. The first habitat is the soil layer of a very humid, sunny high mountain meadow near snow, without trees or shrubs. The other habitat is the litter of junipers on a sunny, steep mountain slope (with poor soil) with pines and junipers (Pérez-Iñigo jr., 1990). Later the species was found on La Gomera Island of the Canary Archipelago, where it was very abundant in wet and dry soils of grassland and open field, as well as in the litter of evergreen forest (Moraza and Peña, 2005).

It is remarkable that the species was found in such isolated localities as Central Europe (northern Italy) and Central Asia (western Mongolia). In Mongolia, the species inhabits the upper soil layer in cool and wet alpine meadows with different species of grasses, and the litter of larch forests, growing at elevation above 2500 m a.s.l. In the Alps, this species was recorded in a steep alpine meadow above the timber-line at 2250 m a.s.l. with arid vegetation as *Sempervivum* and *Sedum*. With respect to its habitat requirements, the occurrence of *Scheloribates* (*H.*) *humeralis* in the Mts. Mongol Altai and Kharkhiraa in western Mongolia, as well as in the Alps in northern Italy agrees well with the findings Pérez-Iñigo jr. (1990), who describes the species as preferring high altitudes. The strong preference for lowland soil and litter of evergreen forest as found by Moraza and Peña (2005) is neither supported by the findings from Central Europe nor from Central Asia.

Thus, from the records indicated above, the known distribution of *Scheloribates* (*H.*) *humeralis* encompasses a region within the western Palaearctic. Most collections are from open habitats, but these vary widely in composition, from high mountain alpine meadow to lowland grassland. The

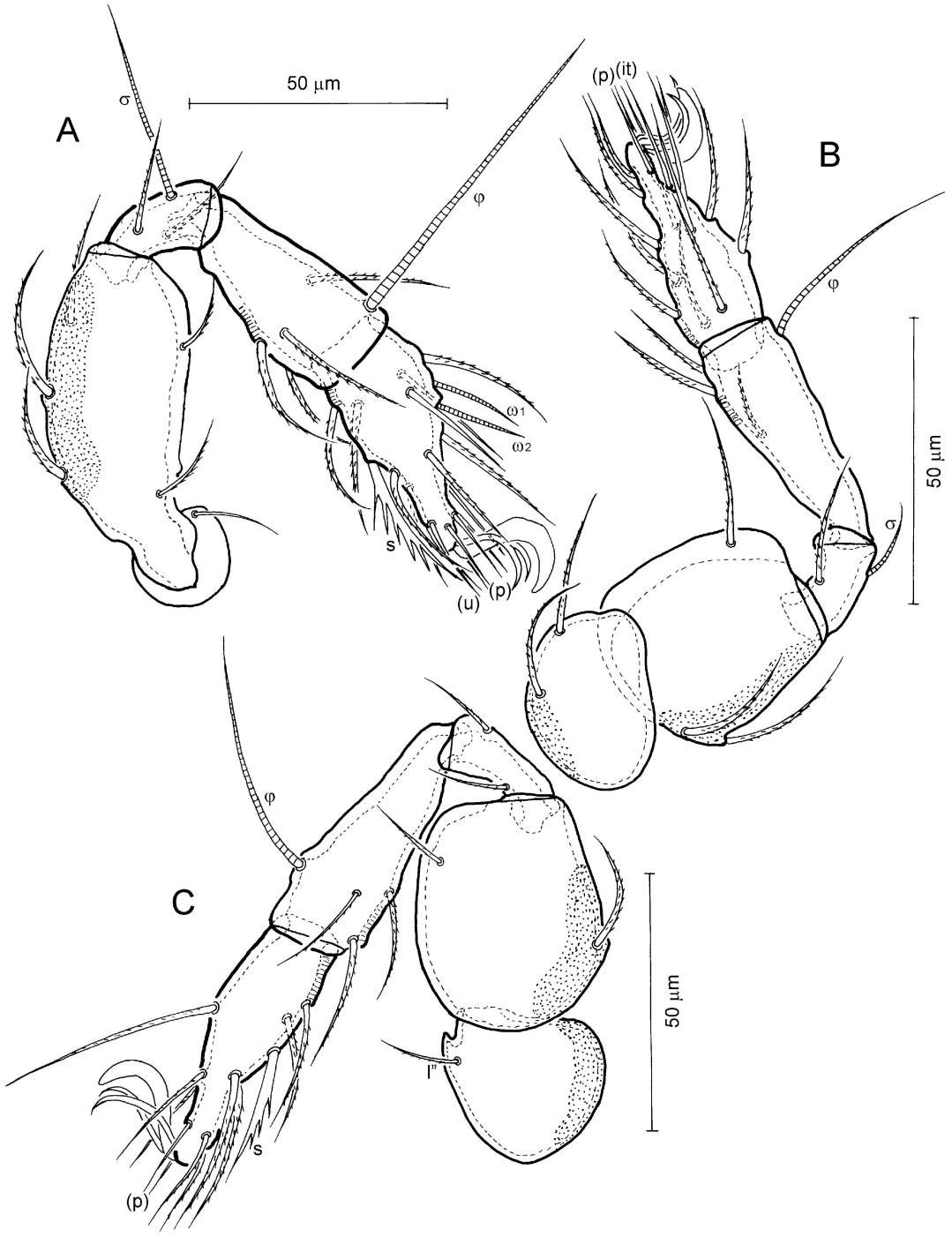

FIGURE 4: *Scheloribates* (*Hemileius*) *humeralis* Pérez-Iñigo jr., 1990. A – Leg II; B – Leg III; C – Leg IV (right, antiaxial views).

species seems to have an affinity for decaying organic substrates, including litter of various grasses, herbs, and conifers.

DISCUSSION

The genus *Simkinia* with the currently bewildering taxonomy was proposed by Krivolutsky (1966) as a member of the family Oribatulidae. He defined *Simkinia* as a distinct genus, which differs from other genera by the combination of following characters: humeral projections poorly developed; notogastral porose areas absent, but saccules developed; legs with three claws; 11 pairs of notogastral setae; two pairs of lyrifissures on notogaster; exobothridial setae sometimes long; genital plates with four pairs of setae; sensillus setiform or fusiform and slightly dilated. He designated the newly described species, *Simkinia turanica* Krivolutsky, 1966 as the type species of this genus, which shows distinct sexual dimorphism: male with larger body size (460 x 230 μm), sensillus with long distal tips, and well-developed humeral projections, females with relatively smaller body size (360 x 205 μm), fusiform head of sensillus without flagellate distal tips, and lacking humeral projections.

In the same publication Krivolutsky (1966) transferred a western Asian species, *Oribatula schachthachtinskoi* Kulijev, 1961 to *Simkinia*, which was originally described with provisional generic placement. Although the majority of morphological characters were identical, the latter species differs from the type species of *Simkinia* by the presence of small, but conspicuously developed porose areas instead of sacculi. Kulijev (1961) described this species as having three pairs of porose areas (he overlooked the fourth pair). However, Krivolutsky (1966) declared this species as sacculonotic. In fact, *Simkinia schachthachtinskoi* exhibits true porose areas as originally stated by Kulijev, as well as in the later redescription by one of us (Bayartogtokh and Akrami, 2000).

Thereafter, several other species either with porose areas or sacculi, such as *S. elongata* Krivolutsky, 1969, *S. montana* Krivolutsky and Grishina, 1970, *S. tianschanica* Krivolutsky, 1971 were included in this genus (see Zlotin and Krivolutsky, 1969; Krivolutsky and Grishina, 1970; Krivolutsky, 1971). Thus the genus became a mixture of poronotic and sacculonotic species. Later, Bulanova-Zachvatkina (1975) defined *Simkinia* as with porose areas and sacculi, and bearing 11 pairs of notogastral, 4-5 pairs of genital setae. However, most species (except *S. turanica* and *S. montana*) have 10 pairs of notogastral setae and only four pairs of genital setae, as far as the ventral structure was studied. It is worth to mention that all species, which were originally included in *Simkinia* show distinct sexual dimorphism.

Krivolutsky (1966) compared *Simkinia* in the course of its generic definition with two other closely related taxa, namely *Metaleius* Travé, 1960 and *Urubambates* Hammer 1961. According to him, *Metaleius* is distinguished from *Simkinia* by the rostrum and sensilli (the rostrum is pointed and the sensilli are clavate in *Metaleius*), while *Urubambates* differs in the structure of sensilli and legs (sensilli very slightly dilated, hence almost setiform, and legs with moniliform or more swollen podomers in *Urubambates*).

Later, Balogh and Mahunka (1981) noted the possible synonymy of *Simkinia* with *Urubambates*, and considered them as a heterogenous taxon, perhaps based on the similarity of characters such as body form and size, structure of dorsal and ventral sides of idiosoma, development of humeral projections, leg setation etc.. However, in the supraspecific review of oribatuloid mites by Balogh and Balogh (1984), both genera *Simkinia* and *Metaleius* were omitted, but *Urubambates* was considered as a member of their newly proposed family Hemileidae (as Hemileiidae in Subías 2004, 2011). In the subsequent review of world oribatid genera, Balogh and Balogh (1992) remembered all three genera and included them in the family Scheloribatidae, erroneously defining *Simkinia* with 5 pairs of genital setae. More recently, Weigmann (2006) considered *Metaleius* as a junior synonym of *Siculobata* Grandjean, 1953.

The other taxon, very similar to *Simkinia,* is *Hemileius*, erected by Berlese (1916), and later defined by Grandjean (1953a, 1953b) as a distinct

genus. These two taxa share the following character states: presence of 10 or 11 pairs of notogastral setae, four pairs of sacculi, absence of pteromorphs, occasional development of small humeral projections, and tridactylous legs. However, the lamellar-sublamellar-prolamellar complexes of the known *Simkinia*-species have not been studied yet. When we began to identify the generic status of our species using the identification book by Balogh and Balogh (1992), the keys led to either genera (accepting four pairs of genital setae in *Simkinia*).

Weigmann and Miko (1998) did not accept the generic and familial classification concepts by Balogh and Balogh (1984, 1992). Instead they proposed broader definitions of taxa, based on characters with phylogenetic value. They compared the characters of *Hemileius* and *Scheloribates* and found only a single major distinction - the well-developed pteromorphs in *Scheloribates* in contrast to the absence of pteromorphs or poorly developed humeral projections in *Hemileius*. Thus, they considered *Hemileius* as a subgenus of *Scheloribates* Berlese, 1908, noting the low systematic value of the reduction of pteromorphs in *Hemileius*, which is not sufficient to erect a separate genus (Weigmann and Miko, 1998). Moreover, Wunderle *et al*. (1990) pointed out that the species of the genera *Scheloribates* and *Hemileius* are not easily distinguishable because they exhibit high similarity in the majority of morphological features.

More recently, one of the above-mentioned authors stated that "*the species groups within* Scheloribates *sensu lato, which are differentiated from* Scheloribates *sensu stricto only by single characters of uncertain phylogenetic value, are declared provisionally as subgenera of* Scheloribates *sensu lato, which is characterized mainly by the special construction of the lamellar complex - with lamella, sublamella and normally with prolamella*" (Weigmann, 2009: 118). We agree with the concept by him, and consider *Hemileius* as a subgenus of *Scheloribates*.

In the species list of world oribatid mites, Subías (2004) included *Simkinia* (with its all known species) in the family Hemileidae Balogh et Balogh, 1984, but the status of the latter taxon is not accepted by Weigmann and Miko (1998) nor by Norton and Behan-Pelletier (2009). Even in their subsequent treatise on world oribatid genera, Balogh and Balogh (1992) themselves did not reinforce the familial status of Hemileidae, instead they assigned all genera (including both *Simkinia* and *Hemileius*) to Scheloribatidae, which have previously been included by those authors in Hemileidae.

In the subsequent updates of the above list, Subías (2008 and later) treated *Simkinia* as a subgenus of *Hemileius*, and dispersed its known species among several other subgenera, without justifying this action. Thus, *S. montana* was assigned to the nominal subgenus *Hemileius* (Subías 2008). In our opinion, this is an incorrect arrangement because this species does possess true porose areas, which is not typical for *Hemileius*. Meanwhile two other species, *S. elongatus* and *S. schachtachtinskoi*, were transferred to another subgenus, *Urubambates*, and *S. turanica* and *S. tianschanica* remained as originally assigned in *Simkinia* (Subías 2008, 2009). Moreover, the two taxa *Hemileius* (*Tenuileius*) Lee, 1989 and *Turcibates* Ayyildiz and Luxton, 1989 were synonymized with the subgenus *Hemileius* (*Simkinia*) (Subías 2008, 2011). In spite of this, the Australian species, which were originally described under subgenus *Tenuileius*, *H.* (*Tenuileius*) *minimus* Lee, 1989, *H.* (*Tenuileius*) *paratenius* Lee, 1989, as well as a Mongolian species, *H. lanceolatus* Bayartogtokh and Aoki, 1997, have been assigned to the subgenus *Hemileius* (*Simkinia*). The Turkish species, *Turcibates parvus* Ayyildiz and Luxton, 1989 was synonymized with the type species of *Simkinia* (Subías, 2008).

Later, in the next regular update of his checklist on world oribatid mites, Subías (2009) made again some modifications in the arrangement of *Simkinia*-species. Thus, *S. montana* was considered as to be junior synonym of *H. humeralis* Pérez-Iñigo jr., 1990. As mentioned above the former species has porose areas, while the latter species has sacculi, and therefore they can not be same species. Additionally, according to the article 23.1 of the International Code of Zoological Nomenclature, *H. humeralis* cannot become a senior synonym of *S. montana* as the latter species was described earlier than the former one. Another species, *H. lanceolatus* was also synonymized with *H. ovalis* Kulijev,

1968 as its junior synonym. This attempt was also incorrect, because *H. ovalis* was not a valid species anymore since Bulanova-Zachvatkina (1975) had already synonymized it with *S. turanica*. The synonymization of the Turkish species, *T. parvus* was also changed by Subías himself, who considered it in 2009 as a junior synonym of *H. ovalis.*

Although the construction of lamellar complexes of all *Simkinia*-species are neither illustrated nor verbally described, we consider this taxon (along with the only species with notogastral sacculi) provisionally as a subgenus of *Scheloribates*: *Scheloribates* (*Simkinia*) stat. nov.

The type species of *Simkinia* has four pairs of sacculi, therefore, the subsequently added species with porose areas should be transferred to another genus as Norton *et al*. (1997), and Weigmann and Miko (1998) are stated that the porose areas represent the plesiomorphic state of the cuticular glands of the octotaxic system, and that its transformation to sacculi is apomorphic. Thus, species listed in the world oribatid mites by Subías (2004, 2011), such as S. *schachthachtinskoi* and *S. montana* should be moved to another genus within the family Oribatulidae. In our view, these species are probably the members of the genus *Subphauloppia* Hammer, 1967 as they have 10 pair of notogastral setae and four pairs of genital setae, but further studies on the construction of lamellar complexes are necessary.

Regarding the biogeography of the two subgenera under scrutiny, all known species of *Scheloribates* (*Simkinia*) are distributed in the Palaearctic region, mostly in central and western Asia, as well as in eastern, southern and south-eastern Europe. They inhabit typically arid and semi-arid habitats like steppe, dry grasslands, stony and saline deserts, and phryganoid vegetation, both in lowland plains and mountains. The range of this subgenus and its habitats seem to be well in accordance with the concept of the Old Mediterranean Region, the areas around the Old Tethys Ocean, which dried up during the Paleogene and Neogene epochs (*sensu* Popov, 1963).

Most species in *Scheloribates* (*Hemileius*) have restricted distributions or are known only from their type localities. Thus, only the type species, *S.* (*Hemileius) initialis* (Berlese, 1908) shows a wide geographical range in the Palaearctic, Nearctic, Neotropical and Oriental regions. Another species, *S.* (*Hemileius) suramericanus* (Hammer, 1958) was found in Neotropical and Nearctic regions, while all other species are known to be distributed only in one biogeographical region. Among the biogeographical realms, the Palaearctic region is distinguished from other regions by its high species richness of this taxon (9 spp.), followed by the Neotropical (7 spp.), Nearctic (5 spp.), Oceania (4 spp.) and Oriental (3 spp.) regions. It is worth to mention that out of six species recorded in Europe five are distributed in the Mediterranean area.

ACKNOWLEDGEMENTS

We are grateful to Dr. Irene Schatz, Institute of Ecology, Leopold-Franzens University of Innsbruck, Austria, for reading an earlier draft of the manuscript. B. B. would like to thank the Korea Foundation for Advanced Studies and the Asia Research Center at the National University of Mongolia for financial support. Thanks also due to Dr. Lise Roy and anonymous reviewers for their valuable comments and suggestions.

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