A NEW SPECIES OF THE GENUS *EVADORHAGIDIA* (ACARI: PROSTIGMATA: RHAGIDIIDAE) FROM TALUS ECOSYSTEMS, WITH A KEY TO THE WORLD SPECIES OF THE GENUS

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RHAGIDIIDAE
EVADORHAGIDIA PYGMAEA N. SP.
EVADORHAGIDIA CORCONTICA
IDENTIFICATION KEY
TALUS

SUMMARY: *Evadorhagidia pygmaea* sp. n. is described and *Evadorhagidia oblikensis corcontica* is raised to specific rank. A key to adults of the world species of the genus *Evadorhagidia* is presented.

RHAGIDIIDAE
EVADORHAGIDIA PYGMAEA N. SP.
EVADORHAGIDIA CORCONTICA
CLÉ DE RECONNAISSANCE
TALUS
ÉBOULIS

RÉSUMÉ : *Evadorhagidia pygmaea* n. sp. est décrit et un nouveau statut est proposé pour *E. corcontica* Zacharda. Une clé mondiale de reconnaissance des adultes des espèces du genre est fournie.

INTRODUCTION

In central Europe, talus or scree formations contribute significantly to the microclimatic and biological diversity of regional landscapes (RŮŽIČKA, 1993) and support a little-known subterranean relict fauna (MOLENDA, 1996, MOLENDA *et al.*, 1997; RŮŽIČKA, 1988, 1990; RŮŽIČKA & ZACHARDA, 1994; ZACHARDA, 1993).

New species of rhagidiid mites were discovered during recent ecological research on talus slopes in mountain regions of the Czech Republic and Austria. Among these, a new species of the genus *Evadorhagidia* was discovered in subterranean spaces of talus slopes in Bohemia, while *E. corcontica* Zacharda, which had formerly been considered to be a subspecies of *E. oblikensis* Zacharda (ZACHARDA, 1993), was collected in the Oetztal Alps, Tyrol. Descriptions of these taxa are presented in this paper, which forms part of a series of taxonomic papers aimed at documenting predatory mites of the family Rhagidiidae inhabiting talus ecosystems. *E. corcontica* is illustrated for the first time.

Although *Evadorhagidia* currently contains only six species, its representatives frequently occur in such biotopes as rocky steppes (ZACHARDA, 1980) or talus formations (ZACHARDA, 1993; RŮŽIČKA & ZACHARDA, 1994; RŮŽIČKA *et al.*, 1995), where they can usually be collected in pitfall traps (ZACHARDA, 1980; RŮŽIČKA, 1988). A key to the six species discovered in the world to date is presented in this paper.

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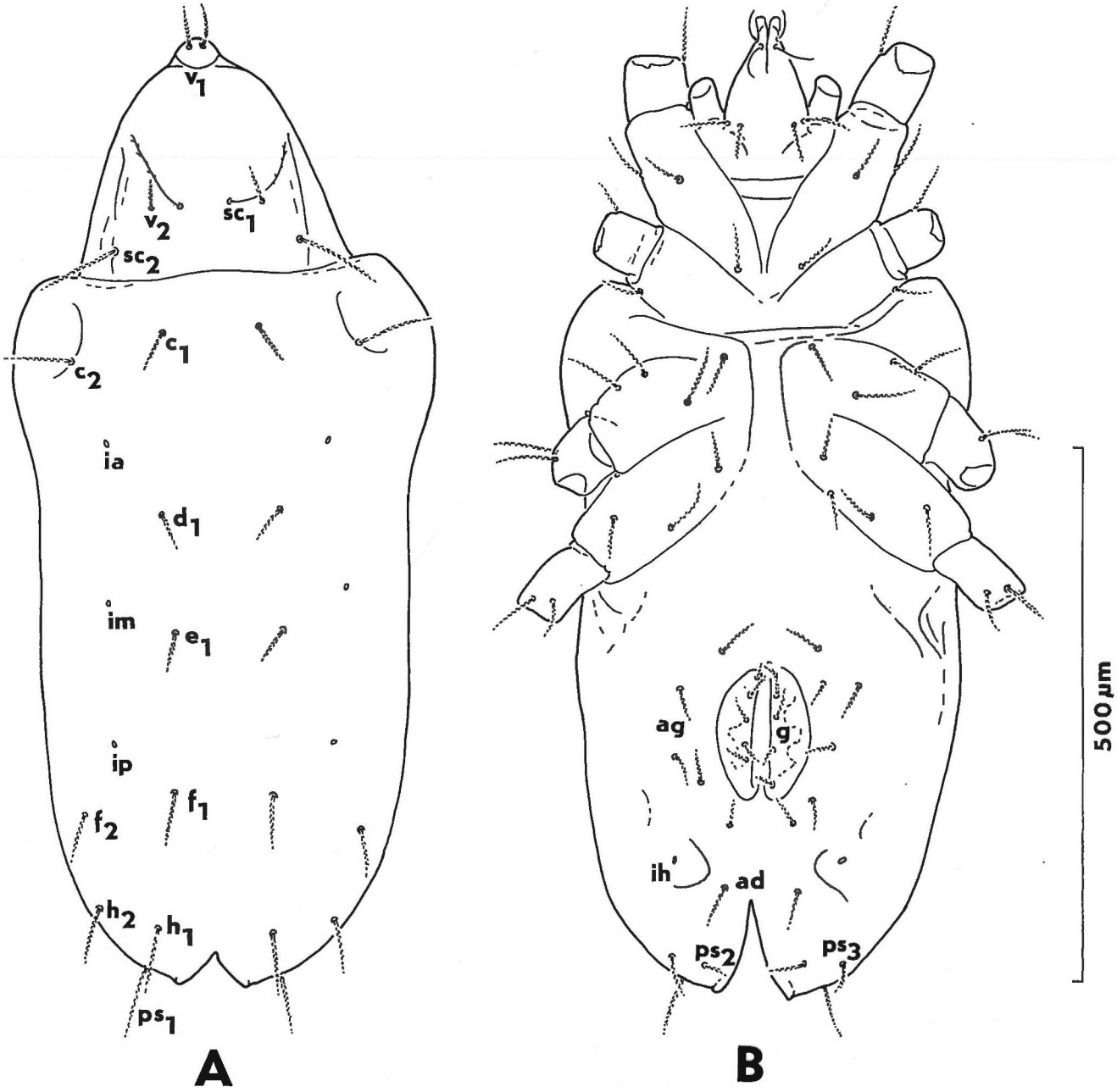

FIG. 1: *Evadorhagidia pygmaea* n. sp., body of adult female. A. — Dorsum.B. — Venter.

Material and methods

Mites were collected by using large pitfall traps made of rigid plastic, about 13 cm high and 10.5 cm in diameter (Růžička, 1988). These were positioned approximately 50–100 cm under the surface of the talus slope. The traps contained an aqueous mixture of 7% formalin and 20% glycerol, plus a few drops of detergent. They were left in place for 1 year, after which they were removed and the catch processed in the laboratory. Mites, initially preserved in ethanol, were transferred to lactic acid in temporary slide preparations (Krantz 1978), and examined under a standard compound light microscope with bright field illumination. Terminology follows Lindquist & Zacharda (1987) and Baker (1990), who applied new descriptive formats and morphological terminologies to the Rhagidiidae, largely based on the works of Grandjean (e.g. 1934, 1939). Measurements follow Zacharda (1980).

Genus *Evadorhagidia* Zacharda, 1980

Evadorhagidia Zacharda, 1980: 725–726.

Rhagidiid mites of the genus *Evadorhagidia* can easily be recognized by having long and slender chelicerae with relatively short digits, the dorsal surface of the chelicera has a distinct saddle-shaped depression, the distal cheliceral seta is inserted in an elongated laterodorsal pit which is open proximally, the masticatory surface of the movable digit is serrated, the internal and external malar processes of the subcapitulum are fused into broad membranous lips which form a funnel. The rhagidial solenidia on tarsus I and, in some species, on tarsus II, are parallel, the bothridial prodorsal setae sc_1 are finely filiform, never clavate. The coxisternal plates (epimeres) I, II, III, IV have 3-1-4-3 or 3-1-4-4 ciliated setae.

Evadorhagidia pygmaea n. sp.

(Figs 1–3)

Diagnosis. Small, length of idiosoma 655–816 μm. Rhagidial organs I and II each consist of three separate rhagidial solenidia and famulus ε which is lateral to proximal rhagidial solenidion. Tibiae I and II each with two small, spiniform, laterodorsal, medial solenidia and dorsodistal rhagidial and lanceolate solenidion, respectively. Tibia III with two small, spiniform, laterodorsal, medial solenidia positioned almost contiguously, either parallel or in tandem. Epimeres with 3-1-4-3 setae (exceptionally 3 and 4 setae asymmetrically on epimeres IV). Sperm sac in males short, almost spherical (not elongated and club-shaped as in other rhagidiids).

Description. Adult male (n=2). Length of idiosoma 655–816 μm. Ratio of leg I length to idiosomal length 0.80–0.82.

Gnathosoma. Subcapitulum slender (Fig. 2F), oval; ratio of length to breadth 1.16–1.40; distal hypostomal lips with internal and external malar processes fused into broad membranous lips forming a funnel; adoral setae nude; proximal subcapitular setae ciliate, external pair slightly longer than internal pair.

Chelicerae slender (Fig. 2A), dorsal surface with slight saddle-shaped depression slightly distal to level of bases of digits; cheliceral digits relatively small, slender; fixed digit smooth along masticatory surface and with small, distinct prebasal lobe; movable digit serrated along masticatory surface. Chelicerae with 2 setae, proximal seta inserted above articulation of movable digit; tip of proximal seta overlaps insertion of distal seta; tip of distal seta slightly overlaps apex of fixed digit. Length of chelicera 129–165 μm, dorsoventral width 49–66 μm, length of movable digit 33–53 μm, length of proximal and distal cheliceral setae 16 and 23 μm, respectively, distance between their insertions 15–20 μm. Ratios: cheliceral length to dorsoventral width 2.50–2.63; length of movable digit to length of chelicera 0.32–0.25; length of movable digit to dorsoventral width of chelicera 0.80–0.67. Palpus small and slender, with relatively slender tarsus (Fig. 2E); ratio of length to width of tarsus 2.20–2.25. Length of palpal trochanter, femorogenu, tibia and tarsus 36–43, 63–76, 26–33, 59–72 μm, respectively. Number of setae and solenidia (in brackets) on palpal trochanter, femorogenu, tibia and tarsus 0-2-3-10(1), respectively; tarsal solenidion spiniform, erect.

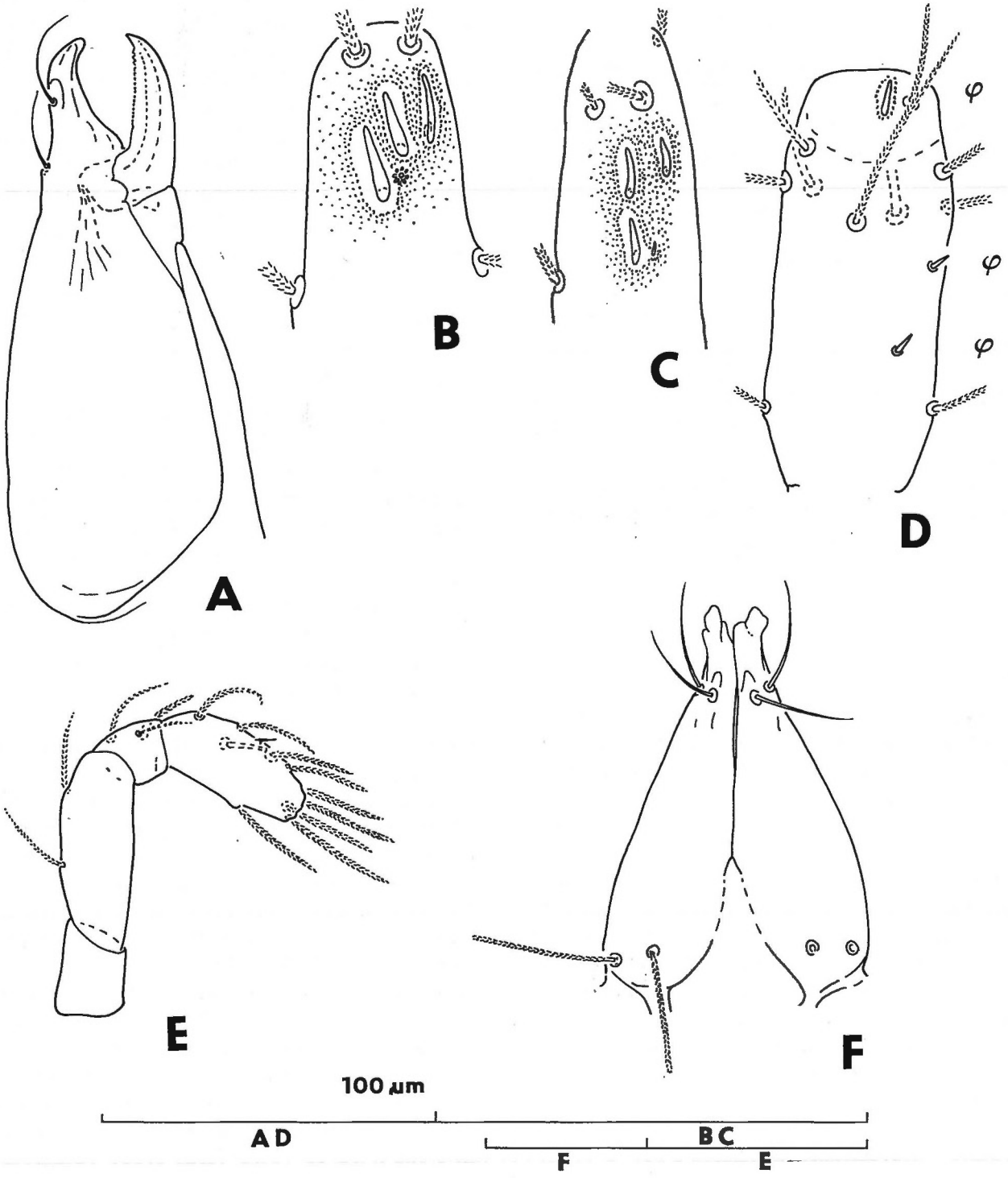

FIG. 2: *Evadorhagidia pygmaea* n. sp., adult female.

A. — Chelicera, lateral aspect. B. — Rhagidial organ I, dorsal aspect. C. — Rhagidial organ II, dorsal aspect; D. — Setal arrangement on tibia I. E. — Palpus, lateral aspect. F. — Subcapitulum, ventral aspect.

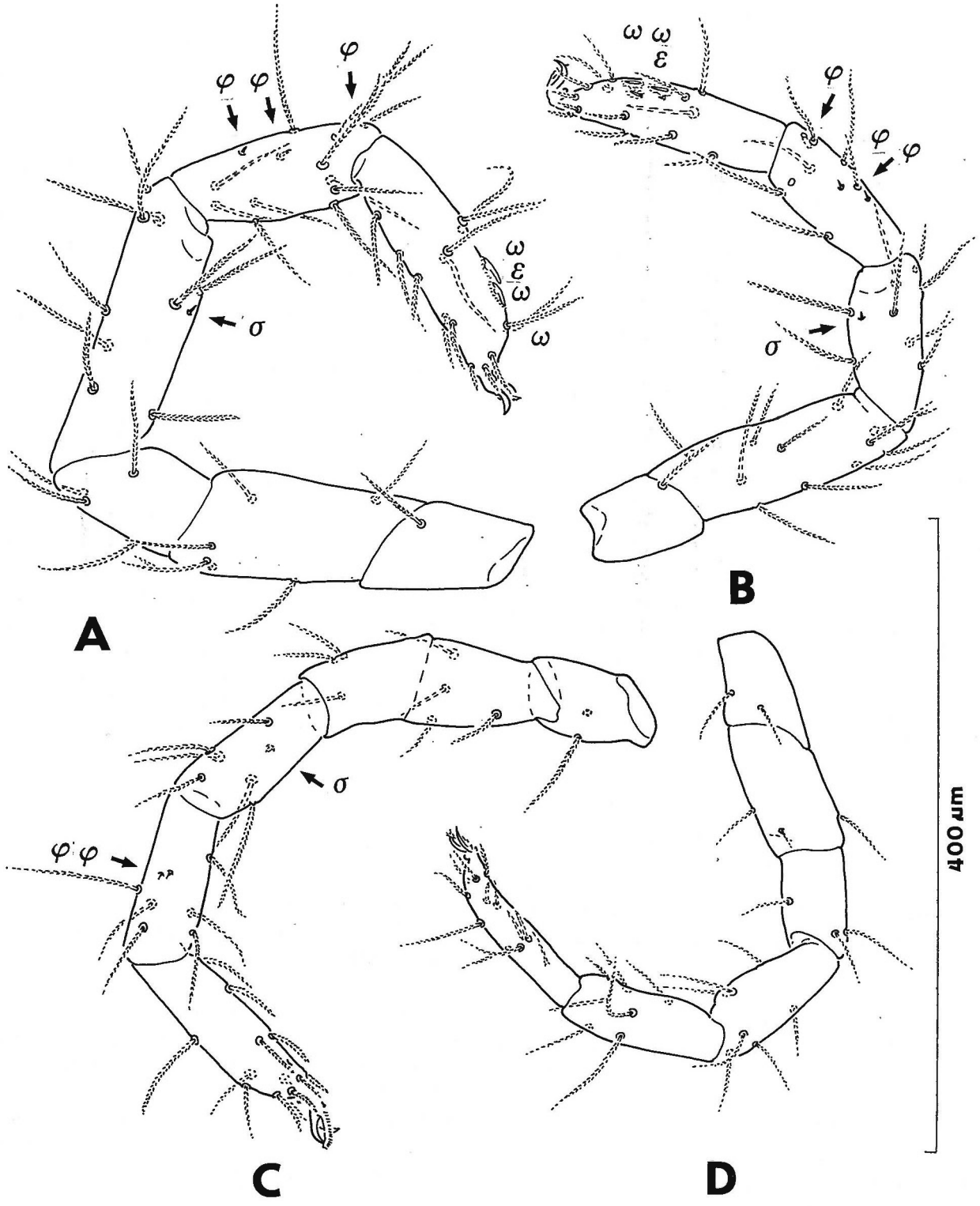

FIG. 3: *Evadorhagidia pygmaea* n. sp., adult female, setal arrangement on legs, lateral aspect.
A. — Leg I. B. — Leg II. C. — Leg III. D. — Leg IV (ω, φ, σ and ε: designations for solenidia on tarsus, tibia and genu and for famulus, respectively).

Prodorsum. Naso well-developed (Fig. 1A), with pair of internal vertical setae v_1. Bothridial setae sc_1 filiform, finely pubescent. Length of setae: v_1 30–33, v_2 30–33, sc_1 66–76, sc_2 63–79 µm.

Opisthosomal dorsum. Complement and arrangement of dorsal setae and cupules typical for Rhagidiidae (Fig. 1A); three pairs of cupules; *ia* positioned about midway between setae c_2 and d_1, im lateral and anterior to setae e_1, *ip* lateral between setae e_1 and f_1. Setae c_1, d_1, e_1, f_1 reach about 0.22, 0.35, 0.25 and 0.37 of distance to insertion of successive seta, respectively. Length of setae: c_1 30–33; c_2 49–56; d_1 30; e_1 26–33; f_1 36–46; f_2 36–46; h_1 53–66, h_2 39–49 µm.

Podosoma. Coxisternal plates (epimeres) I, II, III, IV with 3-1-4-(3-4) finely pubescent setae, respectively (Fig. 1B); IV sometimes with 3 or 4 setae asymmetrically.

Genital region. Genital valves each with five finely pubescent setae of similar length, about 25 µm, arranged evenly along medial edge of valve, or with four and three setae asymmetrically (Fig. 1B). Five pairs of aggenital (paragenital) setae of similar length, about 26–33 µm, or with six and five setae asymmetrically. Length of genital valves 109 µm. Cupules *ih* positioned ventrolaterally, posterolaterad of posteriormost pair of aggenital setae.

Legs. Leg I 528–672 µm long, about 0.80 as long as idiosoma. Empodia of all legs setulose, broadly oval in dorsoventral view, slightly longer than claws; claws each with small spur ventrobasally. Number of setae and solenidia (solenidia and famulus, ε, bracketed), respectively, on legs I-II-III-IV: trochanters 1-1-2-2; basifemora + telofemora 6 + 4-6 + 5-4 + 3-3 + 3; genua 9(1) - 8(1) - 6(1) - 7; tibiae 12(3) - 7(3) - 6(2) - 7; tarsi 17(3 + ε)-14(3 + ε) - 13-14 (Fig. 3). Genua I and II each with one erect spiniform solenidion ventrally, genu III with one lateromedial, small, spiniform solenidion. Tibia I with two erect laterodorsal, medial, spiniform solenidia, and one dorsodistal rhagidial solenidion (Fig. 2D); tibia II with two erect laterodorsal, medial, spiniform solenidia, and one lanceolate dorsodistal solenidion recessed in deep pit with small surface pore; tibia III with two erect laterodorsal, almost contiguous spiniform solenidia lying either parallel or in tandem. Tarsus I robust, its tip tapering abruptly in lateral view, length to width ratio 3.46–3.60, with three rhagidial solenidia lying obliquely in separate depressions, stellate famulus, ε, inserted between bases of first and second proximal rhagidial solenidia antiaxially (Fig. 2B); tarsus II with three rhagidial solenidia, two of them lying in tandem in separate depressions, one of them lying parallel to distal rhagidial solenidion (Fig. 2C); small spiniform famulus, ε, inserted laterad of proximal rhagidial solenidion.

Affinities. *Evadorhagidia pygmaea* sp. n. belongs to a group of species of the genus *Evadorhagidia* that has rhagidial organs I and II both consisting of only three rhagidial solenidia; the other members are *E. janetscheki* (Willmann, 1953) and *E. bezdezensis* Zacharda, 1980. *E. pygmaea* differs from both by the following characters: the idiosoma length is 655–816 µm (in *E. janetscheki* and *E. bezdezensis* it is about 1200–1600 µm); the rhagidial solenidia in rhagidial organ I are small and arranged obliquely (in *E. janetscheki* and *E. bezdezensis* they are long and arranged longitudinally). In *E. pygmaea* and *E. janetscheki*, the two spiniform solenidia on tibiae I and II are both laterodorsal, medial and positioned in tandem, while in *E. bezdezensis* tibiae I and II have one dorsoproximal and one dorsodistal spiniform solenidion (ZACHARDA, 1980). In *E. pygmaea* and *E. janetscheki*, the epimeral formula is normally 3-1-4-3, while it is 3-1-4-4 in *E. bezdezensis*.

Material examined. Holotype: adult male. Czech Republic, South Bohemia, Kraví hora mountain in the Novohradské hory Mts Protected Landscape Area, about 900 m altitude, in a pitfall trap positioned in subterranean spaces of a talus slope and left in place from 17 June 1992 to 14 May 1993. Paratype: adult male, South Moravia, Sealsfield uv kámen-granite cliff faces, about 2.5 km NW of Popice village, in a pitfall trap positioned in subterranean spaces of a bare talus slope and left in place from 27 May 1992 to 1 May 1993; collected by V. RŮŽIČKA. Deposited in the Canadian National Collection of Insects and Arachnids, Ottawa, as micropreparations, Type No. 22,439.

Etymology. The name *pygmaea* reflects the fact that *Evadorhagidia pygmaea* is the smallest species of the genus *Evadorhagidia*.

Evadorhagidia corcontica Zacharda, 1993, **new status**
(Figs 4–5)

Evadorhagidia oblikensis corcontica Zacharda, 1993, pp. 57–60.

Adult female (n=1). Length of idiosoma 1136 μm. Ratio of leg I length to idiosomal length 1.13.

Gnathosoma. Subcapitulum slender, subtriangular (Fig. 4E); ratio of length to breadth 1.30; distal hypostomal lips with internal and external malar processes fused into broad membranous lips forming a funnel; adoral setae nude; proximal subcapitular setae ciliate, external pair slightly longer than internal pair. Chelicerae slender, dorsal surface with slight saddle-shaped depression slightly distal to level of bases of digits (Fig. 4A); cheliceral digits short, slender; fixed digit smooth along masticatory surface; movable digit serrated along approximately distal third of masticatory surface. Chelicerae with 2 setae, proximal seta inserted above articulation of movable digit; tip of proximal seta just reaching insertion of distal seta; tip of distal seta overlaps apex of fixed digit. Length of chelicera 264 μm, dorsoventral width 99 μm, length of movable digit 76 μm, length of proximal and distal cheliceral setae 30 and 36 μm, respectively, distance between their insertions 30 μm. Ratios: cheliceral length to dorsoventral width 2.66; length of movable digit to length of chelicera 0.29; length of movable digit to dorsoventral width of chelicera 0.77. Palpus slender (Fig. 4D); with relatively slender tarsus, ratio of length to width 2.84. Length of palpal trochanter, femorogenu, tibia and tarsus 59, 138, 63 and 122 μm, respectively. Number of setae and solenidia (in brackets) on palpal trochanter, femorogenu, tibia and tarsus 0-2-3-10(1), respectively; tarsal solenidion spiniform, erect.

Prodorsum. Naso well-developed, with pair of internal vertical setae v_1. Bothridial setae sc_1 filiform, finely pubescent. Length of setae: v_1 53, v_2 66, sc_1 115, sc_2 145 μm. A pair of small eyes visible beneath bases of setae sc_2.

Opisthosomal dorsum. Complement and arrangement of dorsal setae and cupules typical for Rhagidiidae; three pairs of cupules; *ia* positioned at level about midway between setae c_1-d_1 laterally, im laterodistad of setae e_1, ip distad of f_2. Setae c_1, d_1, e_1 and f_1 reaching about 0.46, 0.51, 0.47 and 0.65 of distance to insertion of successive seta. Length of setae: c_1 79, c_2 148, d_1 76, e_1 86, f_1 135, f_2 89, h_1 155, h_2 86 μm.

Podosoma. Coxisternal plates (epimeres) I, II, III, IV with 3-1-4-3 finely pubescent setae, respectively.

Genital region. Genital valves each with four or five finely pubescent setae, arranged asymmetrically along medial edges; length of setae about 33–46 μm. Five pairs of aggenital (paragenital) setae of similar length, about 39–53 μm. Length of genital valves 132 μm. Cupules *ih* positioned ventrolaterally, laterodistad of posteriormost pair of aggenital setae.

Legs. Leg I 1280 μm long, about 1.13 as long as idiosoma. Empodia of all legs setulose, broadly oval in dorsoventral view, not overlapping claws; no ventrobasal spurs on claws. Number of setae and solenidia (solenidia and famulus, ε, bracketed), respectively, on legs I-II-III-IV: trochanters 1-1-2-2; basifemora + telofemora 5 + 5-6 + 5-4 + 4-3 + 3; genua 9(1)-8(1)-7(1)-7; tibiae 11(4)-7(3)-7(2)-7; tarsi 18(6 + ε)-16(4 + ε)-14-14 (Fig. 5). Genua I and II each with one erect spiniform distoventral solenidion, genu III with one lateroventral proximal small spiniform solenidion. Tibia I with three erect spiniform solenidia—two laterodorsal and proximal, one dorsodistal lying just proximad of dorsodistal rhagidial solenidion; tibia II with two laterodorsal spiniform erect solenidia—one proximal and one distal, both inserted proximally to lanceolate dorsodistal solenidion recessed in deep pit with small surface pore; tibia III with two adjacent erect spiniform solenidia located laterodorsally and medially; no solenidia on tibia IV. Tarsus I slender, its tip tapering abruptly in lateral view, ratio length to width 4.68, with four separate rhagidial solenidia (Fig. 4B) and two adjacent laterodorsal proximal spiniform solenidia (Fig. 5A); rhagidial solenidia lying almost parallel in separate shallow depressions dorsodistally, stellate famulus, ε, inserted proximally to one of the two distal rhagidial solenidia. Tarsus II with three dorsodistal rhagidial solenidia lying in separate parallel depressions and small spiniform famulus, ε, beside base of proximal rhagidial solenidion (Fig. 4C), and with one laterodorsal proximal spiniform solenidion.

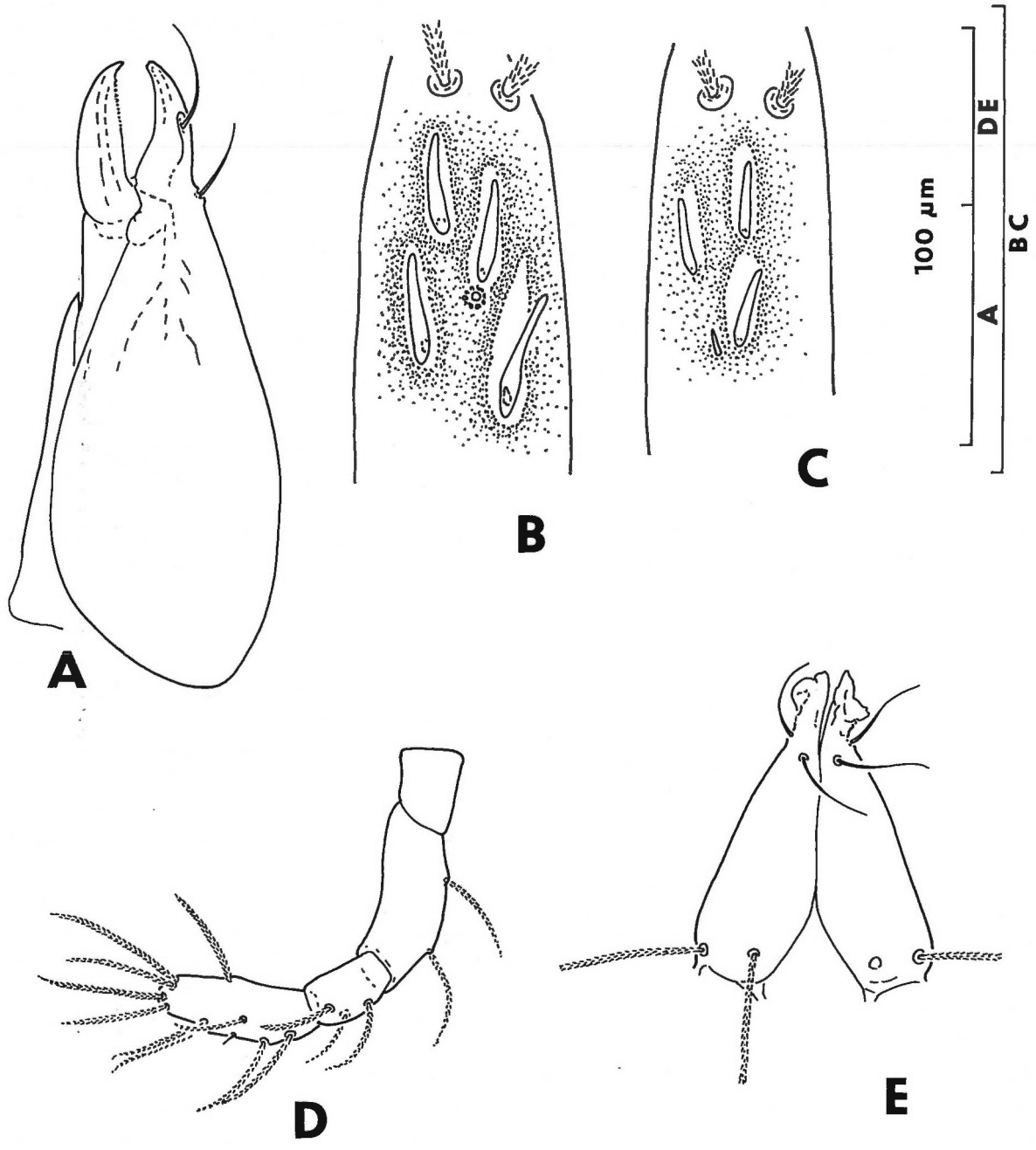

FIG. 4: *Evadorhagidia corcontica*, adult female from Oetztal Alps.

A. — Chelicera, lateral aspect. B. — Rhagidial organ I, dorsal aspect. C. — Rhagidial organ II, dorsal aspect. D. — Palpus, lateral aspect. E. — Subcapitulum, ventral aspect.

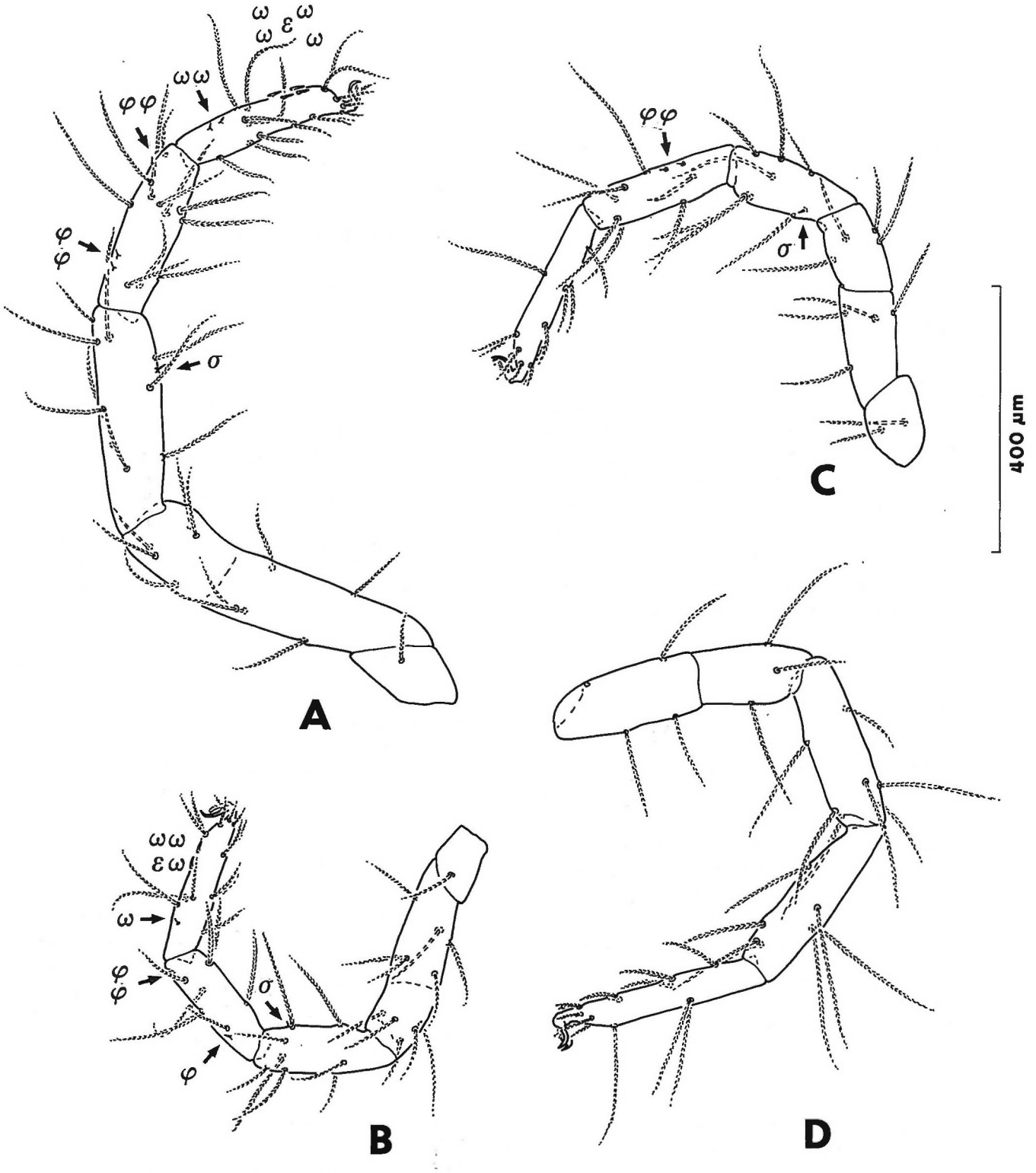

FIG. 5: *Evadorhagidia corcontica*, adult female from Oetztal Alps, setal arrangement on legs, lateral aspect. A. — Leg I. B. — Leg II. C. — Leg III. D. — Leg IV (ω, φ, σ and ε: designations for solenidia on tarsus, tibia, genu and for famulus, respectively).

Material examined: One adult female, Austria, Tyrol, Oetztal Alps, Obergurgl, Neue Karlsruher Hütte, about 2440 m altitude, collected by hand-sorting under stones at a foot of talus slope partly covered with soil, *Salix herbacea* and *Polytrichum* spp., 8 Sept. 1993; coll. M. ZACHARDA, deposited in author's collection.

REMARKS

ZACHARDA (1993) highlighted morphological differences in a localized population of the genus *Evadorhagidia* which distinguished it from *E. oblikensis* Zacharda, 1980. The mites had been collected in large numbers in subterranean spaces of a bare talus slope in the Krkonoše Mts, at an altitude of about 1400–1500 m. Specific diagnostic morphological characters, such as the number and position of the rhagidial and spiniform solenidia on the leg segments, were different in this population. However, it was not decided whether these mites represented a new species, but, instead, the new subspecies *E. oblikensis corcontica* was proposed to accommodate them. Surprisingly, however, a rhagidiid mite with some of the same diagnostic morphological characters as the specimens from the Krkonoše Mts was later collected in the Oetztal Alps. Hence, this is considered as sufficient evidence that a separate species exists which inhabits subnival alpine biotopes in high mountains; consequently, the subspecies is here given specific status.

The presence of two dorsoproximal spiniform solenidia on tarsus I in the specimen from the Oetztal Alps is the only difference from those from the Krkonoše Mts, which have none or one. However, more examples of mites from the Oetztal Alps need to be examined to understand the variability of this character.

For diagnosis, description and variability of *E. corcontica*, see ZACHARDA (1993).

KEY TO ADULTS OF THE WORLD SPECIES OF THE GENUS *Evadorhagidia*

1a) Rhagidial organ I consists of 5 parallel rhagidial solenidia; tarsus I without spiniform solenidion; tibiae I and II each with 1 dorsodistal spiniform solenidion. Northern areas of Holarctic region, Canada, N.W. Territory, Manitoba (AITCHISON, 1979, det. ZACHARDA), Chukotka (ZACHARDA, 1980). ..... *E. quinqueseta* Zacharda, 1980

1b) Rhagidial organ I consists of 3 or 4 rhagidial solenidia; tarsus I with or without spiniform solenidia; tibia I with 2 or 3 spiniform solenidia, tibia II with 1 or 2 spiniform solenidia 2

2a) Rhagidial organ I consists of 4 rhagidial solenidia. 3

2b) Rhagidial organ I consists of 3 rhagidial solenidia. 4

3a) Rhagidial organ II consists of 2 (exceptionally 3: check both tarsi) rhagidial solenidia; 4 genital setae on each genital valve; tibia II with 1 dorsodistal spiniform solenidion; ratio of tarsus I length to width: 3.60–4.20. Central Europe ..... *E. oblikensis* Zacharda, 1980

3b) Rhagidial organ II consists of 3 or 4 rhagidial solenidia; 5 genital setae on each genital valve; tibia II with 2 spiniform solenidia, one dorsoproximal (this can be absent: check both tibiae) and one dorsodistal solenidion; ratio of tarsus I length to width: 4.30–4.50. Central Europe ..... *E. corcontica* Zacharda, 1993

4a) Small, length of idiosoma 650–820 µm; rhagidial solenidia in rhagidial organ I short, lying in oblique depressions. Central Europe..... *E. pygmaea* sp. n.

4b) Large, length of idiosoma 1200–1600 µm; rhagidial solenidia in rhagidial organ I long, slender, lying in longitudinal depressions..... 5

5a) Epimeral formula 3-1-4-4; tibia I with 1 dorsolateral, proximal spiniform solenidion and 1 dorsodistal spiniform solenidion. Central Europe ..... *E. bezdezensis* Zacharda, 1980

5b) Epimeral formula 3-1-4-3; tibia I with 1 dorsolateral, proximal spiniform solenidion and 1 dorsolateral, medial spiniform solenidion. Central Europe ..... *E. janetscheki* (Willmann, 1953)

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