

A new species of *Metabelbella* (Acari: Oribatida: Damaeidae) from *Quercus* forests of southern Portugal

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In the course of studies of the oribatid fauna of oak forests from southern Portugal, we found representatives of 60 species (51 genera and 38 families) of which 39 species are registered for the first time for Portugal. One new species, *Metabelbella epidamaeiformis* sp. nov., is described. It is clearly distinguishable from all other species of the genus by the presence of spinae adnatae. An identification key to known Iberian species of *Metabelbella* is presented. A checklist, the locality and the distribution of all oribatid taxa recorded by us are presented.

Keywords: Oribatida; *Metabelbella*; new species; key; fauna; *Quercus* forests; Portugal; checklist

Introduction

The oribatid fauna of Portugal are poorly studied. Dias Bello (1949) and Baeta Neves and Brandão da Graça (1957) mention some invertebrate species, including oribatids. Sellnick (1952) and Subías and Gil (1990, 1991) described some new species and Gil and Subías (1990) presented a list of 62 species from Cape San Vicente in southern Portugal. In addition, Subías (2000) and Subías and Mínguez (2001) presented some species from Portugal while studying Iberian fauna. The pace of investigation of Portuguese oribatids has increased since then, for example, with the works of Weigmann (2008, 2009a, 2009b, 2010, 2011).

The present study is based on oribatid material collected on 4 March 1983 from oak forests from southern Portugal. In the course of taxonomical identification of oribatids we found one new species, belonging to the genus *Metabelbella* Bulanova-Zachvatkina, 1967 (Damaeidae). It is described in this article as *Metabelbella epidamaeiformis* sp. nov. At present, the known Iberian fauna of *Metabelbella* includes three species (Subías and Shtanchaeva 2011): *M. interlamellaris* Pérez-Iñigo, 1987, *M. janae* Pérez-Iñigo Jr, 1991 and *M. phalangioides* (Michael, 1890). An identification key to all Iberian species of this genus is presented below. Also checklist, locality and distribution of all recorded oribatid taxa are given.

Materials and methods

The material was collected by LS Subías on 4 March 1983 from southern Portugal. All the biotopes studied were in evergreen oak forests typical of the Mediterranean zone.

Oribatid mites were studied at five localities in the Algarve Province.

- L-1. Alvito. UTM: 29 SNC 93. *Quercus suber*
- L-2. Abela. UTM: 29 SNC 30. *Quercus rotundefolia*
- L-3. Luzianes. UTM: 29 SNB 46. *Quercus suber*
- L-4. Vila do Bispo. UTM: 29 SNB 00. *Quercus coccifera*
- L-5. Barranco do Velho. UTM: 29 SNB 92. *Quercus suber*.

All specimens of oribatid species were mounted in lactic acid on temporary cavity slides. All body measurements are presented in micrometres. 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 distortion. Notogastral width refers to the maximum width in dorsal aspect. Lengths of body setae were measured in lateral or dorsal (for rostral and lamellar setae) aspects.

In the present article, we follow the morphological terminology and abbreviations developed by Grandjean (1960) and Grandjean's notation of leg setae as reviewed by Norton (1977).

Formulae for leg setation are given in parentheses according to the sequence trochanter–femur– genu–tibia–tarsus (famulus included). Formulae for leg solenidia are given in square brackets according to the sequence genu–tibia–tarsus.

Results

In the course of studies of the oribatid mite fauna of *Quercus* forests from southern Portugal, we found representatives of 60 species, 51 genera and 38 families; 39 species are recorded for the first time for Portugal (Table 1).

Table 1. Oribatid mites of oak forests from southern Portugal.

Taxa	Localities					Distribution
	1	2	3	4	5	
Brachychthoniidae Thor, 1934						
1. <i>Poecilochthonius italicus</i> (Berlese, 1910)				+		Holarctica
Sphaerochthoniidae Grandjean, 1947						Pantropical and subtropical
2. <i>Sphaerochthonius splendidus</i> (Berlese, 1904)		+	+		+	
Epilohmanniidae Oudemans, 1923						Cosmopolite
3. <i>Epilohmannia cylindrica</i> (Berlese, 1904)					+	
Euphthiracaridae Jacot, 1930						Semicosmopolite
4. <i>Acrotitia hyeroglyphica</i> (Berlese, 1916) ^a			+	+	+	
Phthiracaridae Perty, 1841						
5. <i>Phthiracarus laevigatus</i> (Koch, 1841) ^a		+			+	Palaearctica
6. <i>Steganacarus magnus</i> (Nicolet, 1855)					+	Holarctica
7. <i>Hoplophthiracarus illinoisensis</i> (Ewing, 1909) ^a		+	+			Holarctica
Nothridae Berlese, 1896						
8. <i>Nothrus borussicus</i> Sellnick, 1928 ^a				+		Holarctica
Neoliodidae Sellnick, 1928						
9. <i>Poroliodes farinosus</i> (Koch, 1839) ^a		+		+		Palaearctica
Licnodamaeidae Grandjean, 1954						
10. <i>Licnoliodes adminensis</i> Grandjean, 1933 ^a			+	+		Palaearctica
Licnobelbidae Grandjean, 1965						
11. <i>Licnobelba latiflabellata</i> (Paoli, 1908) ^a				+		Palaearctica west
Gymnodamaeidae Grandjean, 1954						
12. <i>Adrodamaeus hispanicus</i> (Grandjean, 1928)		+	+	+	+	Palaearctica south
Aleurodamaeidae Paschoal & Johnston, 1985						
13. <i>Aleurodamaeus setosus</i> (Berlese, 1883)		+	+	+	+	Palaearctica south
Damaeidae Berlese, 1896						
14. <i>Damaeus flagellifer</i> Michael, 1890			+	+	+	Palaearctica west
15. <i>Damaeus torquisetosus</i> (Mihelčič, 1955) ^a			+			Iberia
16. <i>Belba corynopus</i> (Hermann, 1804)		+	+			Holarctica
17. <i>Metabelbella janae</i> Pérez-Íñigo jr., 1991 ^a	+					Iberia
18. <i>Metabelbella epidamaeiformis</i> sp. nov. ^a	+		+	+		Portugal
19. <i>Porobelba spinosa</i> (Sellnick, 1920) ^a			+		+	Palaearctica
Compactozetidae Luxton, 1988						
20. <i>Cepheus latus</i> Koch, 1835 ^a		+	+	+	+	Semicosmopolite
Microzetidae Grandjean, 1936						
21. <i>Microzetes viedmai</i> Subías, Ruiz & Kahwash, 1990 ^a				+		Iberia
Zetorchestidae Michael, 1898						
22. <i>Belorchestes planatus</i> Grandjean, 1951 ^a			+	+		Europa south
Gustaviidae Oudemans, 1900						
23. <i>Gustavia fusifer</i> (Koch, 1841) ^a			+			Palaearctica west
Ceratoppiidae Kunst, 1971						
24. <i>Ceratoppia bipilis</i> (Hermann, 1804)			+		+	Holarctica
Liacaridae Sellnick, 1928						
25. <i>Adoristes (Gordeeviella) krivolutskyi</i> Shtanchaeva, Subías & Arillo, 2010 ^a			+			Mediterranean
Xenillidae Woolley & Higgins, 1966						
26. <i>Xenillus tegeocranus</i> (Hermann, 1804) ^a			+	+	+	Palaearctica

(Continued)

Table 1. (Continued).

Taxa	Localities					Distribution
	1	2	3	4	5	
Oppiidae Sellnick, 1937						
27. <i>Rhinoppia subpectinata</i> (Oudemans, 1900) ^a		+	+		+	Holarctica
28. <i>Microppia minus</i> (Paoli, 1908)			+		+	Cosmopolite
29. <i>Ramusella junonis</i> Pérez-Íñigo, 1986 ^a	+	+	+	+	+	Mediterranean
30. <i>Serratoppia serrata</i> (Mihelčič, 1956) ^a			+			Palaearctica west
31. <i>Oppiella nova</i> (Oudemans, 1902)			+		+	Cosmopolite
Quadroppiidae Balogh, 1983						
32. <i>Quadroppia (Coronoquadroppia) guttata</i> (Weigmann 2010)		+	+	+	+	Portugal
Suctobelbidae Jacot, 1938						
33. <i>Suctobelbella acutidens</i> (Forsslund, 1941)		+			+	Holarctica
34. <i>Suctobelbella subcornigera</i> (Forsslund, 1941)		+	+			Semicosmopolite
Carabodidae Koch, 1837						
35. <i>Carabodes (C.) femoralis</i> (Nicolet, 1855) ^a			+	+	+	Palaearctica
36. <i>Carabodes (Klapperiches) willmanni</i> Bernini, 1975 ^a		+	+	+	+	Holarctica
37. <i>Odontocephus elongatus</i> (Michael, 1879)	+	+		+	+	Holarctica
Tectocephidae Grandjean, 1954						
38. <i>Tectocephus velatus sarekensis</i> Trägårdh, 1910 ^a		+	+	+		Cosmopolite
Cymbaeremaeidae Sellnick, 1928						
39. <i>Scapheremaeus corniger</i> (Berlese, 1908)		+	+	+	+	Mediterranean
Scutoverticidae Grandjean, 1954						
40. <i>Scutovertex inlenticulatus</i> Sitnikova, 1975 ^a				+		Caucasus and Asia central-west
Passalozetidae Grandjean, 1954						
41. <i>Passalozetes agricola</i> Mínguez & Subías, 1983 ^a				+		Mediterranean
Phenopelopidae Petrunkevitch, 1955						
42. <i>Eupelops acromios</i> (Hermann, 1804)		+	+	+	+	Palaearctica
43. <i>Peloptulus phaeonotus</i> (Koch, 1844)				+		Palaearctica
44. <i>Peloptulus reticulatus</i> Mihelčič, 1957 ^a		+			+	Palaearctica west
Oribatellidae Jacot, 1925						
45. <i>Oribatella quadricornuta</i> (Michael, 1880) ^a		+	+	+	+	Holarctica
Ceratozetidae Jacot, 1925						
46. <i>Ceratozetes mediocris</i> Berlese, 1908 ^a		+				Semicosmopolite
Chamobatidae Thor, 1937						
47. <i>Chamobates cuspidatiformis</i> (Trägårdh, 1904) ^a			+			Palaearctica west
48. <i>Chamobates dentatus</i> Mihelčič, 1956 ^a		+	+	+		Mediterranean
Punctoribatidae Thor, 1937						
49. <i>Punctoribates punctum</i> (Koch, 1839) ^a			+			Semicosmopolite
50. <i>Minunthozetes semirufus</i> (Koch, 1841) ^a		+	+	+		Holarctica
Mochlozetidae Grandjean, 1960						
51. <i>Podoribates longipes</i> (Berlese, 1887) ^a			+			Holarctica
Oribatulidae Thor, 1929						
52. <i>Lucoppia burrowsi</i> (Michael 1890)			+	+		Holarctica
53. <i>Oribatula (O.) tibialis</i> s. str. (Nicolet, 1855) ^a	+	+	+	+	+	Holarctica
54. <i>Oribatula (Zygoribatula) exarata</i> Berlese, 1916		+		+		Palaearctica south
55. <i>Oribatula (Z.) frisiae</i> (Oudemans, 1900) ^a			+		+	Holarctica
Hemileiidae J. & P. Balogh, 1984						
56. <i>Hemileius eperezinigoae</i> Subías, 2010 ^a				+		Mediterranean

(Continued)

Table 1. (Continued).

Taxa	Localities					Distribution
	1	2	3	4	5	
Liebstaadiidae J. & P. Balogh, 1984						
57. <i>Liebstadia longior</i> (Berlese, 1908) ^a	+	+	+			Holarctica
58. <i>Liebstadia similis</i> (Michael, 1888) ^a				+		
Schelorbitatidae Jacot, 1935						
59. <i>Schelorbitates minifimbriatus</i> Mínguez, Subías & Ruiz, 1986 ^a	+	+	+		+	Holarctica
Galumnidae Jacot, 1925						
60. <i>Allogalumna parva</i> (Berlese, 1916) ^a	+	+	+			Mediterranean
Total	8	28	41	33	28	

Note: ^aSpecies are registered for the first time in Portugal.

Description of new species

Metabelbella epidamaeiformis sp. nov. (Figures 1–7)

Diagnosis

Body length 415–431, body width 265–282; prodorsum with three pairs of triangular, blunt-ended tubercles (*Da*, *Ba*, *Bp*); interlamellar setae and sensilli long, flagellate, smooth; sensilli longer than interlamellar setae; anterior part of notogaster with spinae adnatae; notogastral setae p_1 longest, setiform, with short flagellate tips, smooth; other notogastral setae (except short p_1 – p_3) of medium size, setiform, smooth; discidia absent; parastigmatic tubercles (*Sa*, *Sp*) triangular, blunt-ended.

Description

Measurements. Lateral body length 431 (holotype, female), 415–431 (mean 423; four paratypes, males); notogaster width 282 (holotype, female), 265–282 (mean 273; four paratypes, males).

Integument. Body colour is brown. Surface of body and legs with poorly visible filamentous cerotegument. Lateral parts of body with cuticular microtubercles. Setae of prodorsum, notogaster and legs without cerotegument.

Prodorsum (Figures 1 and 3). Rostrum rounded in dorsal view. Prodorsal tubercles (*Da*, *Ba*, *Bp*) triangular, blunt ended; *Ba* largest. Rostral and lamellar setae of medium size (both 69–77), setiform, smooth. Interlamellar setae (114–127) and sensilli (188–205) long, flagellate, smooth. Exobothridial setae shortest (28–32), thin, smooth. Bothridia well developed, funnel shaped, with large opening, directed posterolaterad.

Notogaster (Figures 1 and 3). Notogaster weakly oval. Exuvial scalps absent. Anterior part with short (16–20), straight or weakly curved laterad in dorsal view spinae adnatae (*sa*). Notogastral setae inserted in two subparallel rows. Setae p_1 longest (90–94) among notogastral setae,

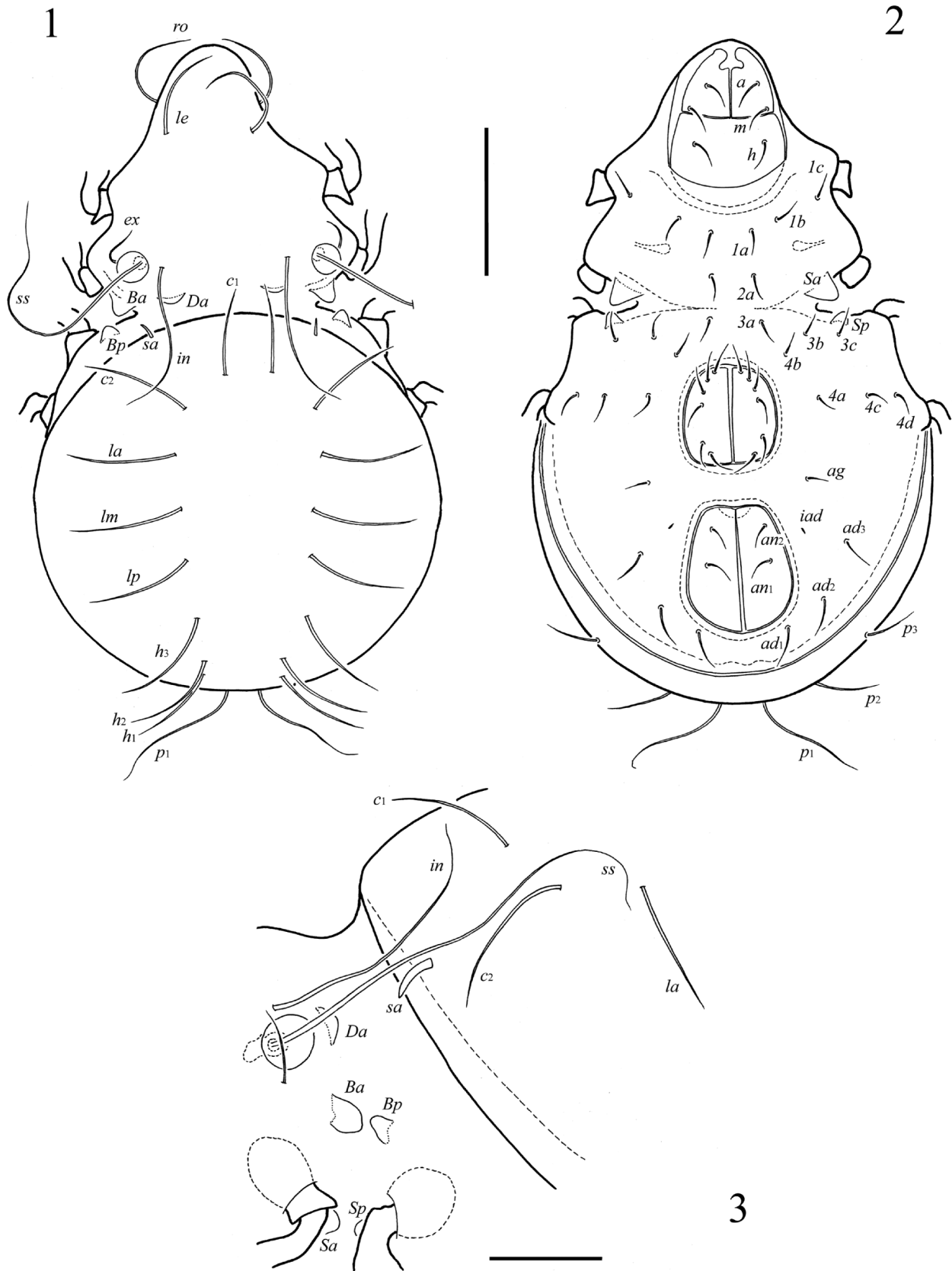
setiform, with short flagellate tip, smooth; setae p_1 – p_3 shortest (41–53), setiform, thin, smooth; other setae of medium size (73–82), setiform, smooth. All lyrifissures (*ia*, *im*, *ih*, *ips*, *ip*) and latero-opisthonotal glands opening visible in lateral view. Discidia absent.

Gnathosoma. Typical of *Metabelbella* and others Damaeidae (Norton 1978; Ermilov and Khaustov 2011). Subcapitulum longer than wide (102–110 by 73–82). Hypostomal setae *a*, *m* and *h* approximately equal length (24–32), setiform, slightly barbed. Lateral lips with two pairs setiform, slightly barbed adoral setae (20). Palps 90–98, with setation 0–2–1–3–9(+1 ω). All setae (except some on tarsus) barbed. Chelicerae 102–110, with teeth on fixed and movable digits. Cheliceral setae long, setiform, barbed; *cha* (36–41) longer than *chb* (20–24).

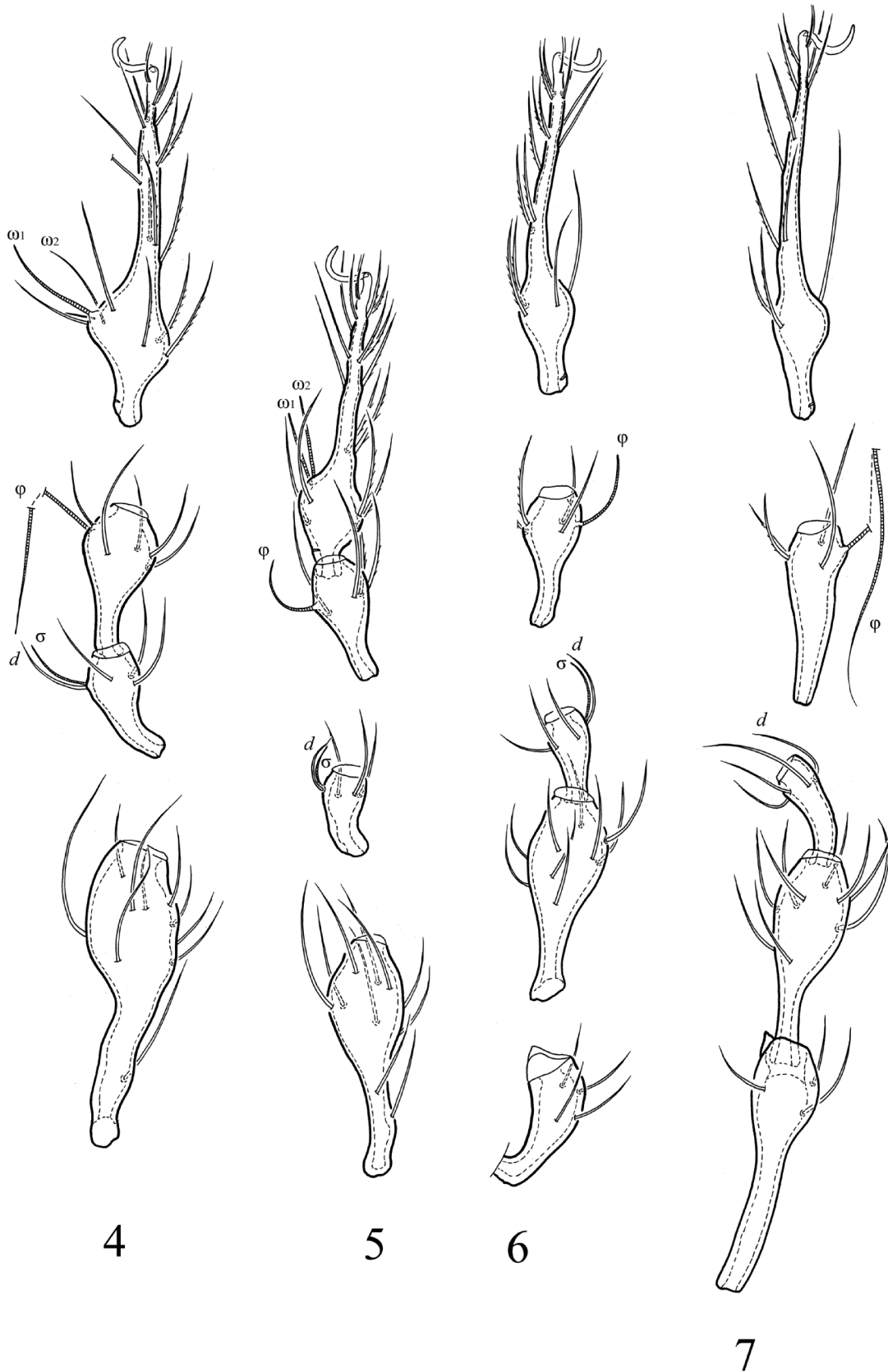
Epimeral region (Figure 2). Parastigmatic tubercles well developed, *Sa* larger than *Sp*, both triangular, blunt ended. Epimeral and ventrosejugal tubercles absent. Epimeral setal formula (from 1 to 4): 3–1–3–4. Epimeral setae 24–28, setiform, smooth or with one to three barbs.

Anogenital region (Figure 2). Setation typical for Damaeidae (Grandjean 1960; Norton 1978): six pairs of genital (g_1 – g_6 , 20–24), one pair of aggenital (*ag*, 20–24), two pairs of anal (an_1 , an_2 , 20–24) and three pairs of adanal (ad_1 – ad_3 , 24–32) setae setiform, smooth (some setae rarely with one to three barbs). Adanal lyrifissures (*iad*) clearly visible in ventral view.

Legs (Figures 4–7). Leg I approximately equal in length to body, legs II and III shorter than body length, leg IV longer than body length (Table 2). Formulae of leg setation and solenidia: I (1–10–4–4–20) [1–2–2], II (1–10–4–4–17) [1–1–2], III (4–9–4–4–17) [1–1–0], IV (3–9–4–4–13) [0–1–0]; homology of setae and solenidia indicated in Table 3. Setae setiform; most setae barbed. Famulus well developed, setiform, pointed. Solenidion φ_1 on tibia IV very long, flagellate; other solenidia shorter, setiform or slightly thickened, blunt ended. Genua I–III each with seta *d* slightly longer than solenidion.



Figures 1–3. *Metabelbella epidamaeiformis* sp. nov., adult: 1 – dorsal view, legs shown partly; 2 – ventral view, palps not shown, legs shown partly; 3 – partial slightly dorso-lateral view, sejugal area, only basal parts of legs II and III shown. Scale bars (1, 2) 100 μ m, (3) 50 μ m.



Figures 4–7. *Metabelbella epidamaeiformis* sp. nov., adult: 4 – leg I, without trochanter, left, paraxial view; 5 – leg II, right, anti-axial view; 6 – leg III, right, anti-axial view; 7 – leg IV, right, anti-axial view. Scale bar 50 μ m.

Table 2. Leg lengths (micrometres; three specimens) of *Metabelbella epidamaeiformis* sp. nov.

Parameter	Length (mean in parentheses)
Body length	415–431 (425; 5 specimens)
Leg I	408–433 (425)
Leg I: body length	1.00
Femur I	131–143 (139)
Genu I	53–57 (54)
Tibia I	65–73 (70)
Tarsus I	159–164 (162)
Leg II	327–343 (338)
Leg II: body length	0.79
Femur II	98–114 (107)
Genu II	41 (41)
Tibia II	57–61 (58)
Tarsus II	131–135 (132)
Leg III	400–416 (410)
Leg III: body length	0.96
Trochanter III	61–65 (64)
Femur III	90–94 (91)
Genu III	41 (41)
Tibia III	61–65 (64)
Tarsus III	147–151 (150)
Leg IV	496–522 (513)
Leg IV: body length	1.20
Trochanter IV	110–118 (114)
Femur IV	92–102 (97)
Genu IV	49–53 (50)
Tibia IV	77–81 (80)
Tarsus IV	168–176 (172)

Table 3. Leg setation and solenidia of adult *Metabelbella epidamaeiformis* sp. nov.

Leg	Trochanter	Femur	Genu	Tibia	Tarsus
I	v'	d, (l ₁), (l ₂), (v ₁), (v ₂), bv''	dσ, (l), v'	(l), (v), φ ₁ , φ ₂	(ft), (tc), (it), (p), (u), (a), s, (pv), (v), (pl), e, ω ₁ , ω ₂
II	v'	d, (l ₁), (l ₂), (v ₁), (v ₂), bv''	dσ, (l), v'	(l), (v), φ	(ft), (tc), (it), (p), (u), (a), s, (pv), (v), ω ₁ , ω ₂
III	d, l', v', v''	d, (l ₁), l ₂ ', (v ₁), (v ₂), ev'	dσ, l', (v)	(l), (v), φ	(ft), (tc), (it), (p), (u), (a), s, (pv), (v)
IV	d, l', v'	d, (l ₁), l ₂ ', (v ₁), (v ₂), ev'	d, l', (v)	(l), (v), φ	ft', (tc), (p), (u), (a), s, (pv), v'

Notes: Roman letters refer to normal setae (e to famulus), Greek letters to solenidia, dσ – solenidion and seta coupled. Single prime (') marks setae on anterior and double prime (') setae on posterior side of the given leg segment. Parentheses refer to a pair of setae.

Material examined

L-4, holotype (female); L-1, two paratypes (males); L-3, two paratypes (males). In addition, two paratypes (male and female) were obtained from southern Portugal, Sines, UTM: 29 SNC 10; sandy dunes, matorral, leaf litter, collected by LS Subías on 2 March 1983.

Type deposition

The holotype (female; L-4) is in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; two paratypes (males; L-3) are in the collection of the Siberian Zoological Museum, Novosibirsk, Russia; two paratypes (males; L-1) are in the personal collection of the first author; two paratypes (male and female) are in the collection of the Complutense University, Madrid, Spain.

Etymology

The specific name *epidamaeiformis* refers to the similarity of the new species to the representatives of the genus

Epidamaeus Bulanova-Zachvatkina, 1957 in the presence of spinae adnatae.

Remarks

Metabelbella epidamaeiformis sp. nov. is clearly distinguishable from all species of *Metabelbella* (*M. clavigera* (Willmann, 1954) from central Europe, *M. gratiosa* (Willmann, 1940) from central and eastern Europe, *M. interlamellaris* from the western Mediterranean region, *M. janae* from Spain, *M. kosarovi* Jeleva, 1970 from Bulgaria, *M. macerochaeta* Bulanova-Zachvatkina, 1967 from the eastern Mediterranean region, *M. phalangioides* from the western Mediterranean region, *M. soror* Bulanova-Zachvatkina, 1967 from central and eastern Europe, *M. tichonravovi* Bulanova-Zachvatkina, 1967 from Ukraine and *M. zachvatkini* Bulanova-Zachvatkina, 1967 from Caucasus) (for descriptions of the species listed above see Michael (1890), Willmann (1940, 1954), Bulanova-Zachvatkina (1967), Jeleva (1970), Pérez-Iñigo (1987), Pérez-Iñigo Jr. (1991)) by the presence of spinae adnatae (which are absent in the other species).

Miko (2006) summarized morphological characters of the genus *Metabelbella*, one of which was the absence of spinae adnatae. However, *M. epidamaeiformis* sp. nov. have spinae adnatae, hence the diagnosis of *Metabelbella* is incomplete. Thus, the diagnosis of *Metabelbella* now: apophyse *P* absent or weakly developed; prodorsal tubercles *Ba* always present, *Bp* also often present; sensilli setiform; spinae adnatae absent, rarely present; trochanter setal formula 1–1–4–3; femur setal formula 10–10(9)–8(9)–8(9); genu setal formula 4–4–4–4, seta *d* present, coupled with solenidion, except genu IV; seta *d* on tibiae absent, solenidia free.

Key to Iberian species of the genus *Metabelbella*

1. Legs IV very long, 3 times body length; notogastral setae *p*₁ not longer than others.
 ***M. phalangioides* (Michael)**
 – Legs IV only about 1–1.5 times longer than body;
 notogastral setae *p*₁ longer than others. **2**
2. Interlamellar setae longer than sensilli
 ***M. interlamellaris* Pérez-Iñigo**
 – Interlamellar setae shorter than sensilli **3**
3. Spinae adnatae present; discidia absent.
 ***M. epidamaeiformis* sp. nov.**
 – Spinae adnatae absent; discidia present.
 ***M. janae* Pérez-Iñigo Jr.**

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