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***Partnunia tabernaculata*, spec. nov.,
a new water mite from the Spanish Pyrenees**

(Acari, Actinedida, Hydryphantidae)

By R. Gerecke and H. Smit

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A diagnosis and description of the spring-dwelling water mite *Partnunia tabernaculata*, spec. nov. is given. It is most closely related to the Alpine *Partnunia angusta* (Koenike, 1893). *P. tabernaculata* is the only known species in the genus with sclerified straps supporting a tent-like structure around the male gonopore.

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Introduction

Water mites of the genus *Partnunia* are widely distributed in the palearctic region. They live under temperate climatic conditions in many different types of montane and lowland springs; in Mediterranean climate, they are found primarily in springs of the rheopsammocrenic type in the beech forest zone of the upper mountain reaches (Gerecke 1993, in prep.). For Western Europe, only two records of the genus have been published so far, both assigned to *P. steinmanni* Walter, 1906 (Migot 1926: Pyrénées-orientales; Vaillant 1955: Massif Central). Since at the time of these publications the knowledge of the specific characters in *Partnunia* was insufficient, it is not clear to which species they actually refer (Gerecke 1993). The specimens collected by Vaillant in Central France (only females available) show palp characters which differ clearly from the Central European specimens of *P. steinmanni*; there are no preparations conserved from Migot's collections.

This description of a new species from the Pyrenees is the first record of the genus from Spain. Further research is needed in order to clarify the specific identity of the *Partnunia* populations in the French Pyrenees and to locate the Western boundary of the distribution area of *P. steinmanni* in France. Furthermore, nearly no data on the mountain spring-dwelling water mites of the Iberian peninsula are available. From there, we can expect interesting additional data on the distribution of *Partnunia*-species.

Abbreviations

The following abbreviations are used: n: number, P-1: first palp segment, Cx: coxa, L-I-1: first segment of leg I. ITZA: Institute of Taxonomic Zoology of the University of Amsterdam (Zoological Museum); CGM: Collection Gerecke, München.

Partnumia tabernaculata, spec. nov.

Types. Holotype: ♂, dissected, Spain, Pyrenees, province of Huesca, Collada de Petraficha, spring near mountain lake Ibon de Acherito at about 1875 m asl. (above the tree line), 05-VIII-1990, leg. H. Smit (ITZA). - Paratypes: 2 ♀, same data, one of them dissected (ITZA); 1 ♂, 1 ♀, both dissected, (CGM). All specimens are imbedded in Hoyer's fluid.

Diagnosis. Genital organ with elongated caudal acetabula (length/width 1.3-2.0) on relatively long stalks (22-35 µm) (figs 1, 2, 5); males with relatively small mouth parts (total length capitulum 152-159 µm, chelicera 163-165 µm, palp 330-348 µm - figs 7-9); in both sexes P-2 relatively long (26.8-28.4 % of total length), P-4 relatively short (36.8-37.4 % of total length) and robust (length/height 3.6-3.8); in the membranous area surrounding the male gonopore several sclerified straps supporting a tent-like structure (figs 5, 6); genital skeleton slender, brachia distalia in acute-angled position, brachia proximalia short and equally curved, carina anterior reduced to a knob-shaped protrusion and distanced from the distal region, carina posterior absent (figs 3, 4, 6).

Description

All measurements are given in tab. 1, for general characters of *Partnumia*, see Gerecke 1993.

Male. Relatively small (total length 717-780 µm, width 480-490 µm). The anterior coxal group is 178-190 µm in length and 132-134 µm in width, with a length/width ratio of 1.3-1.4 (fig. 10). It carries a relatively low number of setae. Apart from one proximomedial and one laterodistal seta, the setae of Cx-I are limited to the apical area.

The genital flaps are well developed (total length about 175 µm), bearing a total number of about 30 setae (fig. 1). The medial border of the flaps is slightly protruded at about two thirds from the anterior margin, with a group of more densely arranged setae. The row of acetabula (n = 20) surrounding the gonopore is interrupted by several gaps. The caudal acetabula are elongated (length 25-28 µm, length/width 1.3-2.0), and placed on long stalks (length 22-28 µm); the ratio acetabulum length/stalk length varies from 0.7 to 1.1. The integument in this area is smooth, notably protruding like a tent, supported by a system of straps (fig. 5). The proximal straps ("str-1" in fig. 5) are the largest, forming a kite-like surface with conspicuously sclerified lateral angles, the area of the gonopore (with the tip of the genital skeleton, "tgs" in fig. 5) is surrounded by two weaker, interlocking straps ("str-2, str-3").

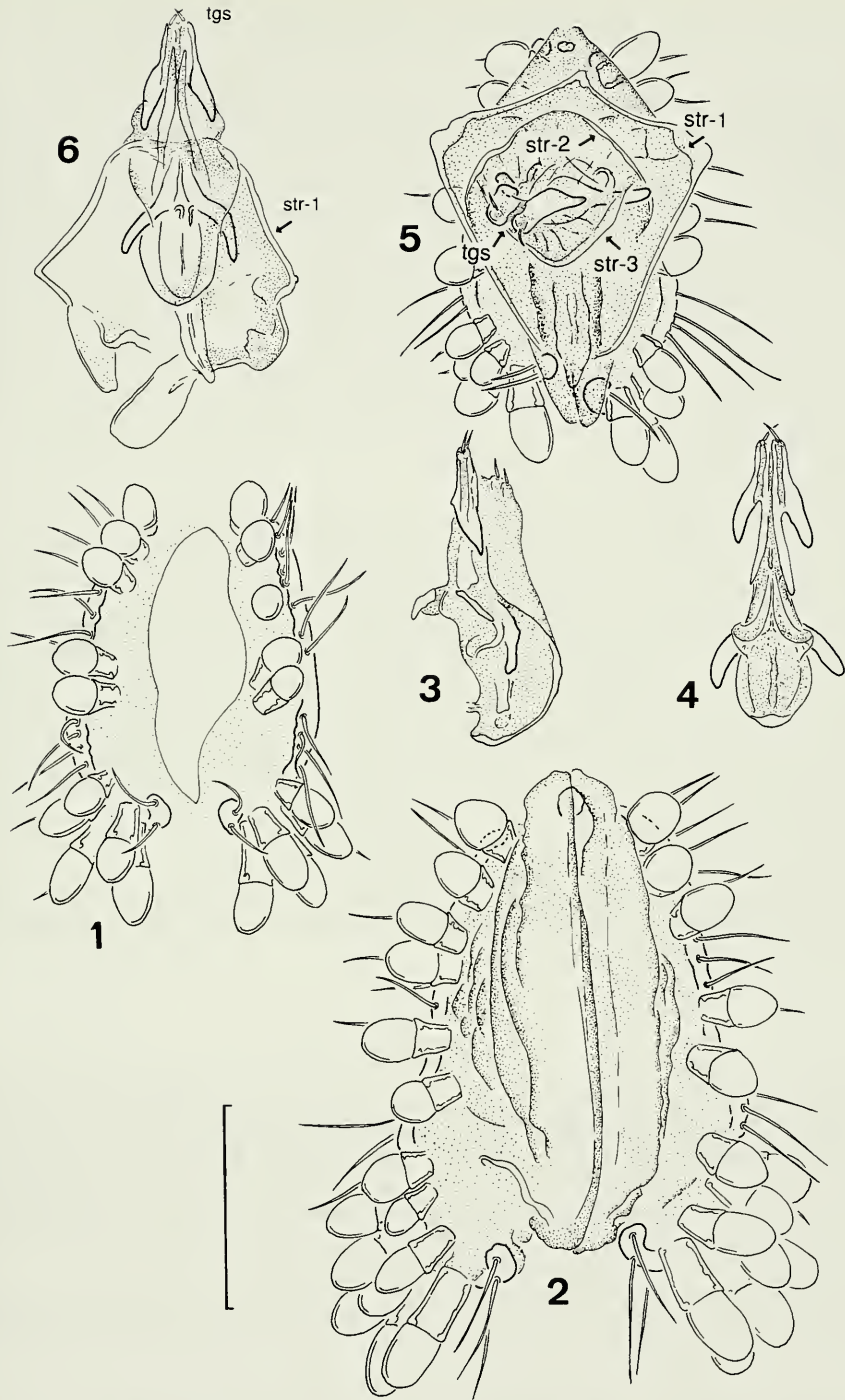
The genital skeleton is placed within this tube-like protruding structure and cannot be prepared without dissecting the membranous region between the genital flaps (fig. 6). It is relatively short (138-145 µm) and slender (width of cella proximalis 38 µm). The brachia distalia are placed in acute-angled position, the brachia proximalia are equally curved and very short, their tips end far from the level of the proximal margin of the cella proximalis (fig. 4). In lateral view, the carina anterior can be seen as a knob-shaped protrusion near the center of the organ, the carina posterior is completely reduced (fig. 3).

The mouth parts are of relatively small dimensions: total length of palp 330-348 µm, ventral length of capitulum 152-159 µm, total length of chelicera 163-165 µm. As in other species of the genus, the shape of the chelicera is very variable (length/height ratio 3.6-4.6 - fig. 7). Shape and chaetotaxy of the palp are without particular characteristics: the P-1 is rectangular, the ventral margin of P-3 is straight, the maximum height of P-4 is at the basis of the segment (fig. 8, 9).

The general leg chaetotaxy follows the scheme given for *P. regalis* (Gerecke 1993 - however, numerous setae are obviously lost in the dissected specimen of *P. tabernaculata*).

Female. Notably taller than male (total length 950-1123 µm, width 580-730 µm). The anterior coxal group measures 224-243 µm in length and 156-180 µm in width, with chaetotaxy similar in both sexes, but in females one or two setae may be placed a bit more proximally at the distal part of the medial margin, facing the capitular bay. The total length of genital flaps is 210-222 µm, with about 30 setae as in males. The row of acetabula (n = 28-39) surrounding the gonopore is nearly continuous (fig. 2). The caudal acetabula are of the same shape as in males, 31-47 µm in length, stalks 29-35 µm. The integument in this area is smooth and without sclerified straps.

The size difference between the sexes of *P. tabernaculata* is reflected also by the female mouth part measurements: total length of palp 430-444 µm, ventral length of capitulum 184-207 µm, total length of chelicera 205 µm. In comparison with *P. chenabi* Panesar & Gerecke in press, legs of females are notably shorter in *P. tabernaculata*, the fourth segment of all legs is relatively shortened (19.8-22.2 % of total length, in *P. chenabi* 22.1-24.7 %).



Figs 1-6. *Partnunia tabernaculata*, spec. nov. Genital organ. 1. ♂, external genital organ (membraneous area surrounding the gonopore dissected); 2. ♀, external genital organ; 3. ♂, genital skeleton, lateral view; 4. ♂, genital skeleton, anterior view; 5. ♂, external genital organ with tent-like structure surrounding the gonopore in situ, top view; 6. ♂, genital skeleton within the tent-like structure, dissected from the genital organ. Bar: 100 µm; "tgs": tip of genital skeleton; "str-1, str-2, str-3": strap 1, 2, 3.

Discussion

From all other species of the genus, *P. tabernaculata* differs in the characteristics of the male's external genital organ: the presence of a tent-like structure with sclerified straps in the membrane surrounding the gonopore is not found in any other *Partnunia* species. Due to its long-stalked caudal acetabula, *P. tabernaculata* differs from the Mediterranean species (Gerecke 1993) and is more similar to the Central European *P. angusta* and *P. steinmanni*, and to the Himalayan *P. chenabi*. The genital skeleton is relatively small (total length *P. angusta* 118-130 μm - in *P. chenabi* 150 μm , in *P. steinmanni* 180-230 μm). In the shape of the genital skeleton, *P. tabernaculata* is most similar to *P. angusta*: in both species, the carina posterior is completely reduced, and the carina anterior is knob-shaped and rather removed from the brachia anteriora, near the middle of the organ. In *P. steinmanni* and *P. chenabi* the carina anterior is placed on the level of the brachia anteriora, and the carina posterior is well developed. This character set probably indicates a phylogenetic relationship between *P. angusta* and *P. tabernaculata*. However, both species can be separated easily as the brachia anteriora are more robust and placed in right-angled position in *P. angusta* whereas they are more slender and in acute-angled position in *P. tabernaculata*. In lateral view, the anterior ramus of the brachia anteriora is elevated in *P. angusta*, while flattened in *P. tabernaculata*.

Also with regard to the external morphology, the other species with long-stalked caudal acetabula differ from *P. tabernaculata* in several aspects: in *P. steinmanni* the caudal acetabula are less slender (width δ 22-29 μm , η 32-54 μm) and stalks are generally longer (δ length 35-52 μm , ratio stalk length/acetabulum length 1.2-1.8; η length 32-54 μm , ratio stalk length/acetabulum length 1.3-2.5). Generally, maxima of all mouthpart measurements in *P. tabernaculata* are below the minimum values of *P. steinmanni*. Furthermore, *P. steinmanni* differs in the shape of P-1 (subquadratic) and P-4 (maximum height in the middle of the segment). In males of *P. angusta*, caudal acetabula (length 30-51 μm), palps (375-383 μm) and chelicerae (194-203 μm) are longer than in *P. tabernaculata*. However, the study of additional specimens will probably produce overlapping measurements, and the separation of females is impossible. Finally, *P. chenabi* differs from *P. tabernaculata* in longer caudal acetabular stalks (δ 35 μm , η 43-52 μm), in the longer palp (δ 362 μm , η 464 μm) and capitulum (δ 175 μm , η 220-225 μm) measurements. Further differences can be found in the shape of some palp segments: relative length P-2 δ 26.2 %, η 24.8 %, P-4 δ 40.1 %, η 39.9 %; ratio length/height P-3 δ 1.1, η 1.3, P-4 δ 4.1, η 4.6.

We would like to emphasize that the length of acetabular stalks is not a criterion for separation of species groups in the sense of phylogenetical systematics. The study of the male genital apparatus shows that long- and short-stalked "species groups" are composed by rather heterogeneous species with uncertain phylogenetic relationships.

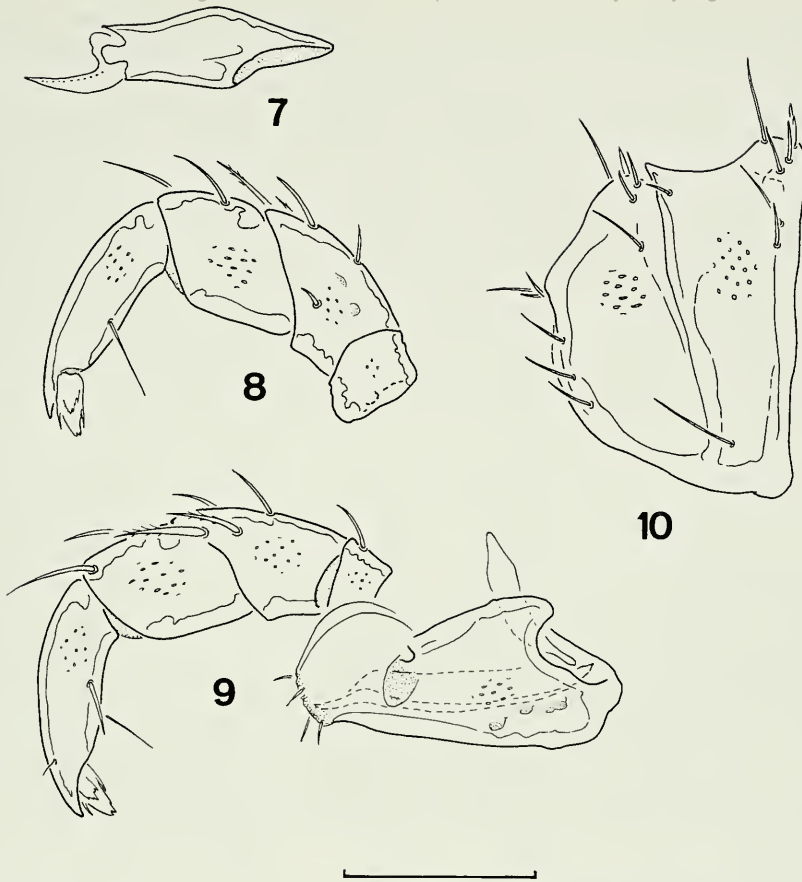
Summary

A diagnosis and description of the spring-dwelling water mite *Partnunia tabernaculata*, spec. nov. is given. Males of the new species differ from all other species of the genus in the tent-like structure of the genital field supported by sclerified straps (figs 5, 6), and in the shape of the genital skeleton (figs 3, 4). As in *P. angusta*, *P. steinmanni* and *P. chenabi*, caudal acetabular stalks are long. Palps are relatively short, P-1 subrectangular, P-3 with straight ventral margin and P-4 with maximum height at its base (figs 8, 9). The elongated caudal acetabula and characters of the genital skeleton indicate that *P. tabernaculata* probably is a sibling species of the Alpine *P. angusta*.

This is the first record of a well-defined *Partnunia* species from Western Europe. Further research is needed to understand the data previously published from this region, and to define the distribution areas of its *Partnunia* species.

Acknowledgements

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Figs 7-10. *Partnunia tabernaculata*, spec. nov. ♂. 7. Chelicera; 8. left palp laterally; 9. capitulum and right palp medially; 10. Cx-1+2. Bar: 100 µm

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prep. number	♂ ♂		♀ ♀		
	Holotype 1	Paratype 2	Paratype 3	Paratype 4	Paratype 5
Total length	717	780	1123	950	950
Total width	480	490	730	700	580
Genital acetabula. n	20	20	39	30	28
Gonoporus, length	170	160	216	225	216
Caudal acetabulum, length	25	28	47	31	32
Caudal acetabulum, w [l/w]	19 [1.3]	15 [1.9]	23 [2.0]	22 [1.4]	25 [1.3]
Stalk I [acet. I/stalk I]	28 [1.1]	22 [0.8]	32 [0.7]	29 [0.9]	35 [1.1]
Genital flaps length	174	–	220	210	222
Genital flap setae, n	27	31	29	31	31
Genital skeleton, length	145	138	–	–	–
Cella proximalis, width	38	–	–	–	–
Cx.-I+II, length	190	178	224	243	–
Cx.-I+II, width [l/w]	134 [1.4]	132 [1.3]	156 [1.4]	180 [1.4]	–
Cx.-I+II, setae, total n	20	21	21	24	–
Capitulum, ventral length	159	152	184	207	–
Capitular rostrum, length	38	29	–	45	–
Chelicera, basal segm. I	114	116	–	138	–
Claw I [basal segm./claw]	49 [2.3]	49 [2.4]	–	67 [2.1]	–
Chelicera, total length	163	165	–	205	–
Chelicera, h [total l/h]	45 [3.6]	36 [4.6]	–	49 [4.2]	–
Palp segments, dorsal length [% total length]					
P1	27 [7.8]	29 [8.8]	32 [7.4]	34 [7.7]	–
P2	99 [28.4]	90 [27.3]	116 [27.0]	119 [26.8]	–
P3	56 [16.1]	54 [16.4]	76 [17.7]	81 [18.2]	–
P4	128 [36.8]	123 [37.3]	161 [37.4]	165 [37.2]	–
P5	38 [10.9]	34 [10.3]	45 [10.5]	45 [10.1]	–
Palp, total length	348	330	430	444	–
Palp, ratio P2/P4	0.8	0.7	0.7	0.7	–
Palp segments, height [ratio dorsal length/height]					
P1	47 [0.6]	47 [0.6]	54 [0.6]	56 [0.6]	–
P2	61 [1.6]	56 [1.6]	69 [1.7]	76 [1.6]	–
P3	63 [0.9]	61 [0.9]	74 [1.0]	76 [1.1]	–
P4	36 [3.6]	34 [3.6]	43 [3.7]	43 [3.8]	–
P5	16 [2.4]	13 [2.6]	16 [2.8]	16 [2.8]	–
Leg segments, length [% total length]					
Male (prep. 2)					
	I-I	I-II	I-III	I-IV	
Segment 1	56 [10.4]	45 [7.7]	49 [8.7]	103 [12.5]	
Segment 2	63 [11.6]	74 [12.7]	67 [11.9]	87 [10.5]	
Segment 3	76 [14.0]	81 [13.9]	78 [13.9]	123 [14.9]	
Segment 4	108 [20.0]	114 [19.6]	116 [20.6]	176 [21.3]	
Segment 5	126 [23.3]	143 [24.6]	141 [25.0]	200 [24.2]	
Segment 6	112 [20.7]	125 [21.5]	112 [19.9]	136 [16.5]	
Total I:	541	582	563	825	
Female (prep. 3)					
	I-I	I-II	I-III	I-IV	
Segment 1	74 [10.4]	67 [8.5]	67 [8.6]	134 [12.3]	
Segment 2	87 [12.2]	99 [12.6]	90 [11.5]	114 [10.4]	
Segment 3	105 [14.9]	114 [14.5]	110 [14.0]	156 [14.3]	
Segment 4	141 [19.8]	160 [20.4]	168 [21.5]	242 [22.2]	
Segment 5	170 [23.9]	190 [24.2]	196 [25.0]	268 [24.5]	
Segment 6	134 [18.8]	154 [19.6]	152 [19.4]	178 [16.3]	
Total I:	711	784	783	1092	

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