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A NEW SPECIES OF THE *PIONA NODATA* COMPLEX (ACARI, PARASITENGONA, HYDRACHNIDIA) FROM THE IBERIAN PENINSULA

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Abstract: A new species of the *Piona nodata* complex, *Piona alpedretinea* **sp. nov.** is described from pit ponds in the centre of the Iberian Peninsula.
Key words: Acari, Hydrachnidia, water mites, new species, taxonomy, pit ponds, Iberian Peninsula.

Una especie nueva del complejo *Piona nodata* (Acari, Parasitengona, Hydrachnidia) de la Península Ibérica
Resumen: Una nueva especie del complejo *Piona nodata*, *Piona alpedretinea* **sp. nov.** se describe de charcas de cantera, en el centro de la Península Ibérica.
Palabras clave: Acari, Hydrachnidia, ácaros acuáticos, especie nueva, taxonomía, charcas de cantera, Península Ibérica.

Taxonomy/Taxonomía: *Piona alpedretinea* **sp. nov.**

Introduction

Knowledge of the clade Hydrachnidia (Acari, Parasitengona) has increased greatly in recent years due to the diligence of a small number of dedicated taxonomists. Their efforts have not only resulted in the description of many new taxa but also have shown the great variability of previously described species, such as those belonging to the so called *Piona nodata* (Müller, 1776) (Pionidae) complex. This complex previously included several subspecies (for a detailed treatment, see Lundblad, 1962) that have, more recently, been raised to the species level (for recent literature, see Smit *et al*., 2015; Gerecke *et al*., 2016; and Tuzovskij, 2017).

In this work, we describe a new species of the *Piona nodata* complex on the basis of morphological diagnostic characters discerned from both male and female specimens. The analyzed specimens are morphologically similar to species within the complex yet noticeably depart from the species' currently known variability limits with clear identifiable diagnostic characters.

Material and Methods

The study area is located in the small municipality of Alpedrete (Community of Madrid, Spain; Fig. 1A). *Piona* specimens were found in two of the three permanent pit ponds surveyed (Fig. 1B, C).

A rounded net with a 250-µm mesh was used to sample the pit ponds. Samples were sorted in the field and stored in Koenike's fluid. The specimens were cleared in 10% KOH for no more than 2 hours and then mounted in glycerine jelly on slides, as recommended by Cook (1974). The slides were deposited in the Hydrachnidia collection of the Museo Nacional de Ciencias Naturales (Madrid).

For the morphological description, we included, for comparison, the diagnostic characters proposed in a recent morphological analysis of *Piona nodata* by Petr V. Tuzovskij (2017). Abbreviations used in this work: L, length; W, width; P-1 to P-5, pedipalp segments; I-Leg-1 to I-Leg-6, first leg, segment 1 to segment 6 of the first leg, with the same notation format used for legs II, III and IV. All measurements are in µm.

Drawings were made and images processed as previously described by Valdecasas (2019).

Results

Family **Pionidae** Thor, 1900

Genus *Piona*

For a modern morphological delimitation of the genus, see Gerecke *et al.* (2016).

Piona alpedretinea sp. nov.

Figs. 2-11. Tables I-II.

MATERIAL EXAMINED:

Holotype: (Collection number: MNCN 20.02/19844) adult male, collected from a permanent pit pond (40.669193° -4.007720°, first pond), Alpedrete, Madrid on 18 June 2020.
Allotype: (Collection number: MNCN 20.02/19845), one adult female, collected from a permanent pit pond (40.674065° -4.007181°, third pond), Alpedrete, Madrid on 25 June 2020.
Paratype: (Collection number: MNCN 20.02/19846) adult male, collection data same as holotype.

DIAGNOSTIC CHARACTERS

Small dorsal plates wide; reduced number of genital acetabula in both the male and female; acetabula do not extend laterally beyond the exterior lateral corner of coxal plate IV in the male; first pair of posterior setae at the same level as the excretory pore.

DESCRIPTION. Male.

Idiosoma brown, oval, integument soft. Dorsum with two relatively wide platelets, sometimes difficult to see. Body setae thin and nearly identical in length. Antenniforme setae longer and thicker than the other body setae. Anterior coxal groups separated with short apodemes. Coxal plates III slightly separated. Coxal plates IV fused medially but with a suture line present. Acetabular plates fused to the posterior margins of coxal plates IV and do not extend laterally beyond the posterior margin projections of these coxal plates. Gonopore subhexagonal, with a fine median anterior incision; 6 (paratype: 4–6) subequal acetabula on each side; acetabula do not extend laterally beyond the posterior margin projections of coxal plates IV.

Ejaculatory complex with long proximal and distal arms, approximately equal in length, proximal arms slightly engrossed; proximal chamber large, with a curved proximal projection forming two and half coils.

Excretory pore surrounded by a narrow sclerotized ring. First pair of posterior setae at the level of the excretory pore; second pair of posterior setae posterior to the excretory pore. Pedipalp compact: P-1 with a single dorsodistal seta; P-2 with five setae; P-3 with two setae; P-4 with two peg-like setae; P-5 moderately elongated.

I/II-Leg-6 slightly thickened distally; III-Leg-5 long distally and slightly expanded;

III-Leg-6 relatively short and club-shaped. IV-Leg-4 thick, with a deep concavity bearing numerous unequal spine-like setae. Table I shows the number of swimming setae on the different legs and segments. Claws of I-II-Leg 6 with two long clawlets. Claws of leg III with thick and short clawlets. Claws of leg IV with two comparatively long clawlets.

Female. Idiosoma brown, oval, integument soft. Dorsal setae thin and nearly identical in length. Antenniforme setae longer and thicker than the other body setae. Anterior coxal groups separated with short apodemes. Coxal plates III and IV separated but in close proximity in this specimen, interspace between these plates sclerotized. Posterior margins of coxal plates IV form right angle, apodemes moderately developed. Genital field with two bowed plates bearing five acetabula each, arranged in a single row. Three anterior setae, two medial setae and two posterior setae on the acetabular plates. Excretory pore surrounded by a narrow sclerotized ring. First pair of posterior setae at the level of middle of the excretory pore; second pair of posterior setae posterior to the excretory pore.

Pedipalp compact: P-1 with a single dorsodistal seta; P-2 with three setae; P-3 with one seta; P-4 with two peg-like setae; P-5 moderately long. Legs thin and long, I/II-Leg-6 not thickened. Number of swimming setae on the legs and general body measurements are provide in Tables I and II, respectively.

For the structure of the claw clawlets, see Fig. 10.

ETYMOLOGY

The new species is named after the village in which the sampling locality is located. Small ponds are excellent reservoirs of biodiversity (Valdecasas *et al*., 1992), a fact that has only been recognized more recently. By naming the species after its geographic locality, we hope it will enhance the environmental protection policy that these types of ponds deserve.

Table I. Number of swimming setae on legs. T, Tuzovskij, 2017 (based on 32 males); H, holotype; P, paratype; A, allotype; (-) indicates that setae could not be seen clearly.

	T-♂	H-♂	(P-♂)	T-♀	A-♀
I-Leg-4	4-5	4	4	5-6	4
I-Leg-5	4-7	6	5	6-10	7
II-Leg-4	5-8	6	5	8-11	4
II-Leg-5	5-8	7	9	8-11	-
III-Leg-4	0	0	0	9-10	10
III-Leg-5	4-7	7	4	10-12	-
IV-Leg- 4	2-3	3	3	7 – 9	7
IV-Leg- 5	7-12	10	9	7 – 9	8

Table II. Body measurements (in µm). T, Tuzovskij, 2017 (based on 66 females); H, holotype; P, paratype; A, allotype (-) indicates that setae could not be seen clearly.

	T-♂	H-♂	(P-♂)	T-♀	A-♀
Idiosoma L	700-940	931	840	800-1350	908
Dorsal plates					
L/W	85-115/10-15	-	116/23	75-100/8-15	-
Seta Fch	85-100	84	-	100-115	75
Dorsal L					
P-1	37-50	44	38	37-50	41
P-2	110-140	136	114	125-150	119
P-3	65-75	64	55	62-90	64
P-4	110-140	130	104	110-137	128
P-5	50-62	67	58	50-75	65
Leg segments L					
I-Leg-1	75-115	-	-	85-100	-
I-Leg-2	110-125	110	104	125-150	-
I-Leg-3	150-190	154	133	175-215	160
I-Leg-4	18-2505	220	194	250-290	229
I-Leg-5	200-250	223	196	250-325	249
I-Leg-6	235-290	188	162	275-340	258
II-Leg-1	75-115	58	72	90-100	87
II-Leg-2	110-150	130	113	135-165	122
II-Leg-3	150-200	168	145	200-240	180
II-Leg-4	225-275	246	209	260-340	267
II-Leg-5	210-275	252	223	275-340	267
II-Leg-6	235-300	203	171	285-350	270
III-Leg-1	85-115	-	-	90-115	90
III-Leg-2	110-165	130	-	135-175	130
III-Leg-3	130-170	130	122	185-240	186
III-Leg-4	235-300	261	223	275-340	258
III-Leg-5	275-325	273	238	285-350	276
III-Leg-6	175-225	188	183	285-350	276
IV-Leg-1	125-150	116	-	150-190	139
IV-Leg-2	125-150	125	107	160-190	142
IV-Leg-3	110-150	122	110	210-250	197
IV-Leg-4	190-240	197	200	285-340	270
IV-Leg-5	225-290	258	223	285-375	281
IV-Leg-6	210-275	209	200	275-325	223

Discussion

Lundblad (1962) described the following variability within the so called *Piona nodata* group or complex: *Piona nodata* s. str., *Piona nodata f. ambigua* (Piersig, 1894), *Piona nodata f. laminata* (Thor, 1901) and *Piona nodata f. annulata* (Thor, 1901). These 'forma, varieties or subspecies' have recently been raised to species level. *Piona nodata* and *P. laminata* are distinguishable from one another only from characters derived from the female (Gerecke *et al*., 2016). According to Smit *et al*. (2015) *Piona laminata* and *P. ambigua* can be distinguished in males and females from the P-5 (Smit *et al*., 2015). These last authors found that specimens from three populations of *P. nodata* in the Netherlands (the specimen RMNH.ACA.755 was found in the same locality as RMNH.ACA.756—this is not indicated in the publication; H. Smit pers. comm., 22/10/2020) were genetically very closely related and differed by 15.57% from *P. laminata* specimens

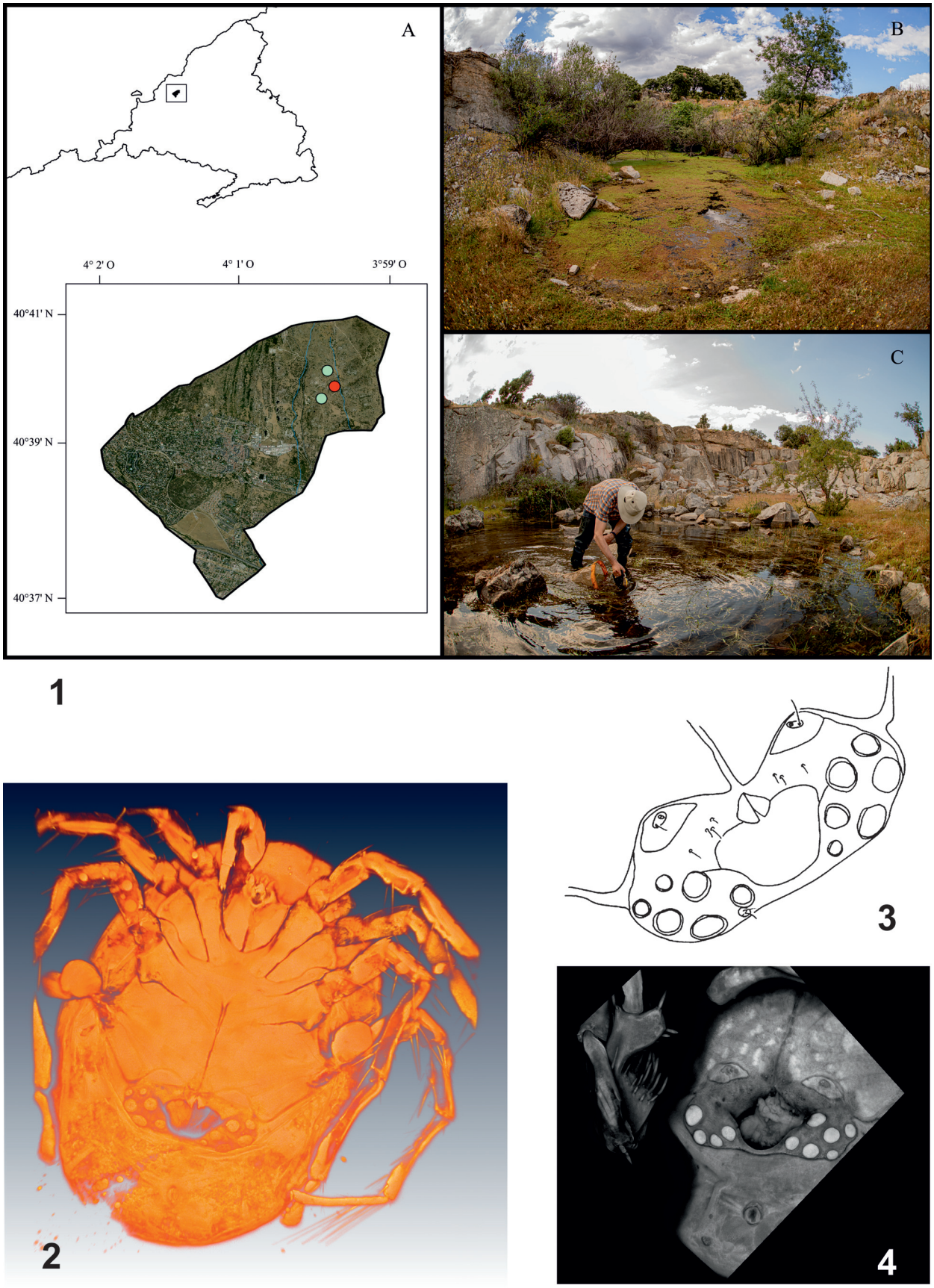
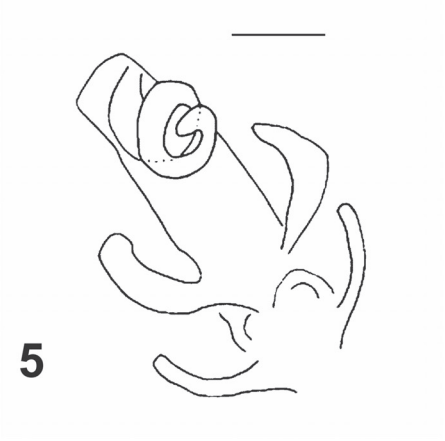
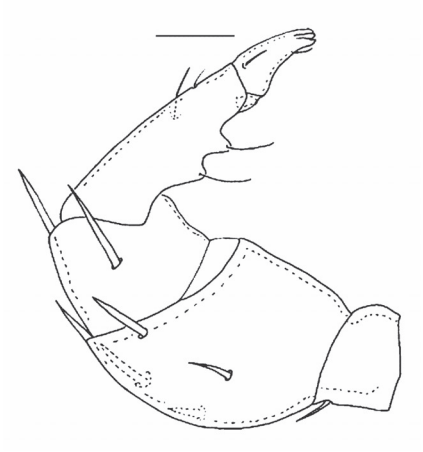


Fig. 1. Pit ponds surveyed in Alpedrete. **A**) Geographic location of the three ponds surveyed in the center of the Iberian Peninsula (Community of Madrid, Spain). Green and red dots indicate ponds with and without *Piona* specimens, respectively; **B**) pit pond one; **C**) pit pond three.

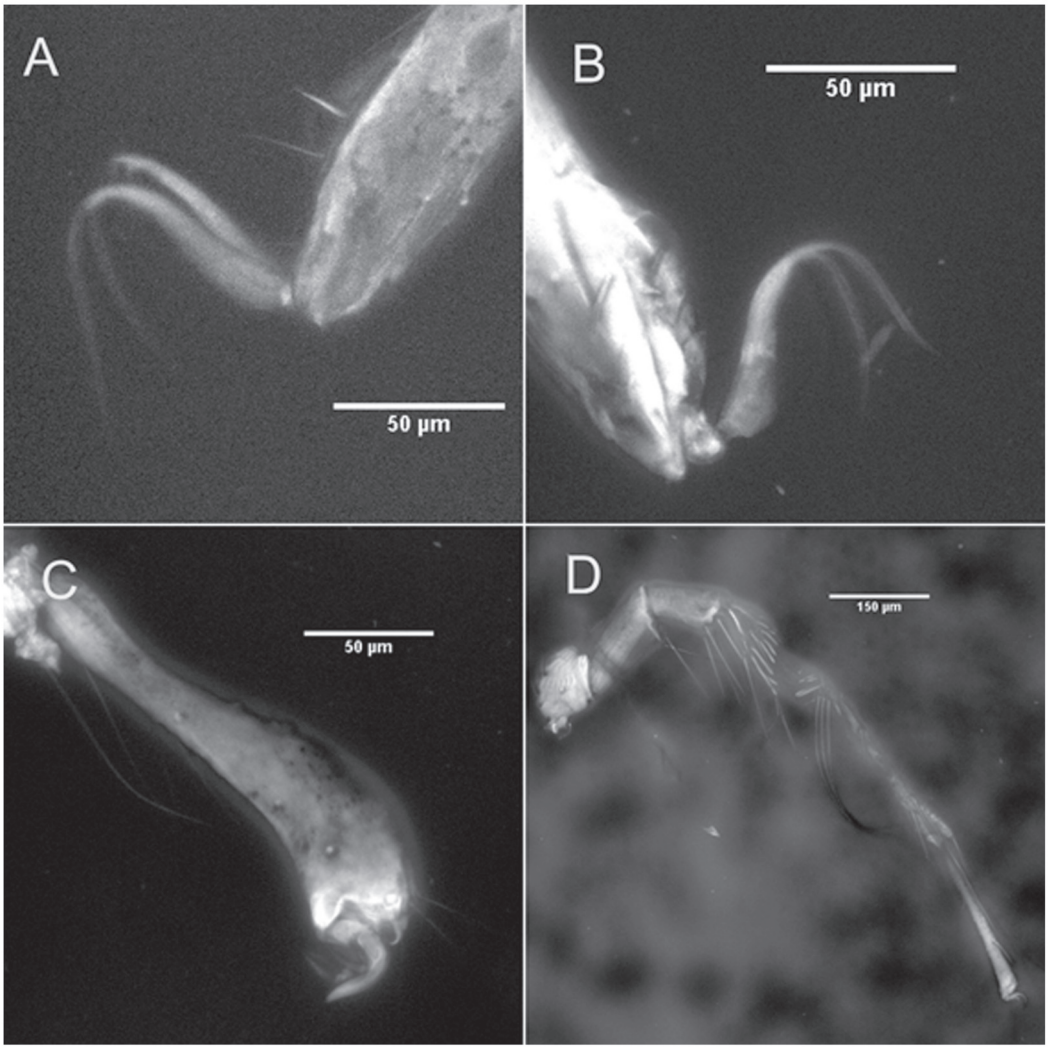
Fig. 2-4. *Piona alpedretinea* sp. nov. Male. **2.** Ventral view of holotype. **3.** Detail view of the genital (holotype). **4.** Detail view of the genital (paratype).



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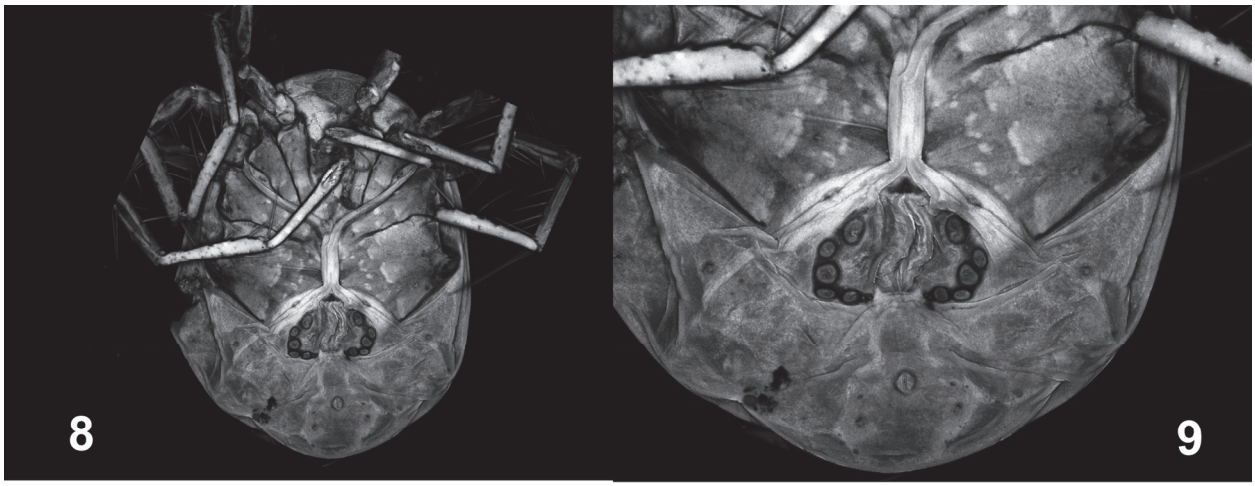


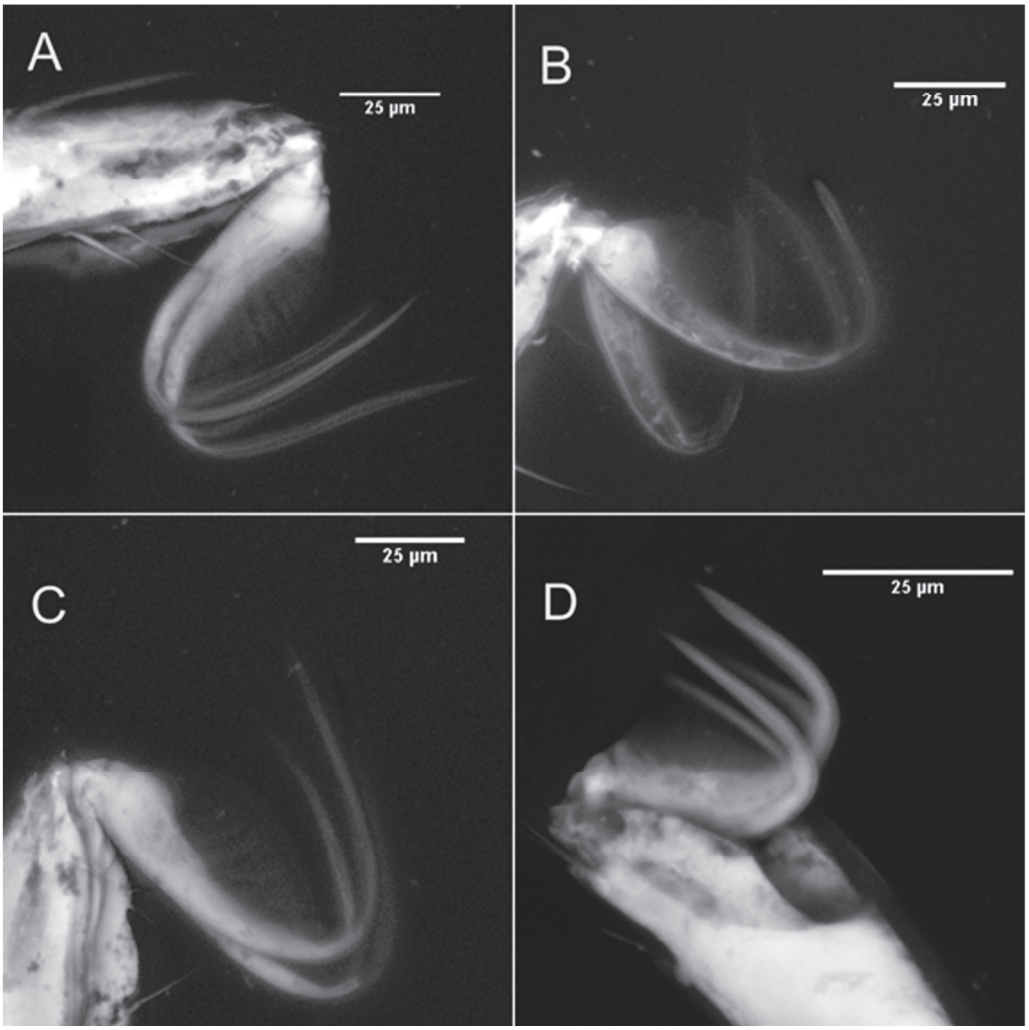
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Fig. 5-7. *Piona alpedretinea* sp. nov. Male. **5.** Ejaculatory complex. **6.** Pedipalp of a male (holotype). **7.** Sixth segment of **A**) I-Leg; **B**) II-Leg; **C**) III-Leg; **D**) IV-Leg.





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Fig. 8-10. *Piona alpedretinea* sp. nov. Female. **8.** Ventral view. **9.** Genital area. **10.** Claws: **A**) I-Leg- 6; **B**) II-Leg- 6 ; **C**) III-Leg- 6; **D**) IV-Leg- 6.

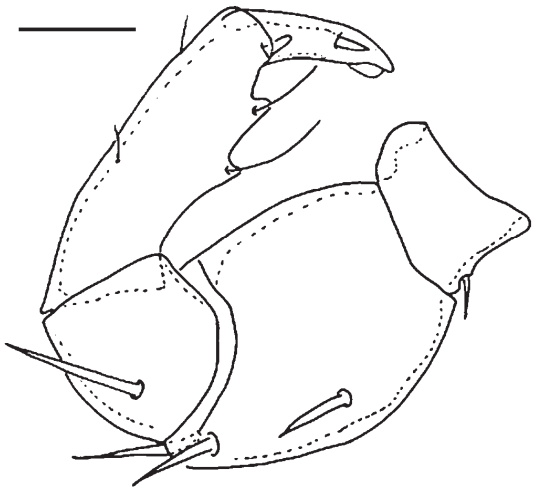


Fig. 11. *Piona alpedretinea* sp. nov. Female. Pedipalp.

from populations in the Netherlands. However, *P. laminata* populations from Norway and the Netherlands differed by more than 19%, suggesting the existence of two different cryptic species. The molecular sequences of the specimens analyzed by Smit *et al*. (2015) were not publicly available at the time of this writing; therefore, molecular analysis could not be performed.

To this panorama of variability, we add a new species and its morphology. The number of acetabula in both sexes is below the range given by other studies. Gerecke *et al*. (2016) reported the range of 8–12 in males and 7–13 in females; Tuzovskij (2017) noted it as 8–21 and 6–14 in males and females, respectively. Our specimens present 4–6 acetabula in the males and 5 in the female. In addition, in all of the specimens illustrated by Lundblad (1962), Tuzovskij (2017) and others (Viets, 2018), the acetabula (and acetabular plates?) extend laterally beyond the limit of the posterior side of coxal plates IV, whereas, in the male and female specimens described here, they do not, making the lateral extension of acetabula/acetabular plates a good diagnostic character. Additionally, the first pair of posterior setae, which are located posterior to the excretory pore in *P. nodata*, are situated adjacent (lateral) to the middle of the excretory pore in all of the specimens analyzed here. Overall, the morphological evidence supports the idea that the Alpedrete specimens are a new species, *Piona alpedretinea* sp. nov., that is closely related to other species of the *P. nodata* complex. Further work is needed to unravel the intricacies and relationships among these related species, which could surely be achieved through molecular analyses performed at a regional scale.

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