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WOODLICE (ISOPODA: ONISCIDEA) COLLECTED FROM NORTHWEST SPAIN AND NORTHERN PORTUGAL IN 2004 BY THE BRITISH MYRIAPOD AND ISOPOD GROUP

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ABSTRACT

In March 2004 members of the British Myriapod and Isopod Group collected woodlice (Isopoda: Oniscidea) from the southern Galician provinces of Pontevedra and Orense and the northern Portuguese distrito of Viana do Castelo. Samples were collected from a variety of locations from low-lying coastal areas to inland habitats up to 800m asl. Although 27 distinct oniscid taxa are recognised, the samples were dominated by five species; *Porcellionides cingendus*, *Porcellio scaber*, *Eluma caelata*, *Porcellio debueni* and *Oniscus lusitanus*. 36% of the species recorded are endemic to north-western Iberia, including *Trichoniscoides lusitanus*, *Miktoniscus bisetosus*, *Oniscus galicianus*, *Porcellio dispar* and *Porcellio herminiensis*. Other species collected were generally widespread European species. *Miktoniscus patiencei* and *P. dispar* are reported from Spain for the first time. Three species of *Trichoniscoides* remain undetermined and may be new to science. Outline descriptions of these are given, which should allow any future specimens to be recognised.

INTRODUCTION

In 2004 the British Myriapod and Isopod Group, under the auspices of the European Invertebrate Survey, undertook a short expedition to the north-western part of the Iberian Peninsula. This region was targeted because it was relatively under recorded for millipedes (Diplopoda) and potentially could hold an interesting and possibly endemic fauna. Subsequent descriptions of new species collected by this expedition, such as the glomeridan *Tectosphaera vincentae* and four species of *Cylindroiulus* millipede (Mauriès, 2005; Read, 2007) supported this view.

Although the sampling effort was directed at millipedes, other taxa, including woodlice (Isopoda: Oniscidea) were also collected. The woodlice of the region are much better known. In the 1930s and 1940s Albert Vandel examined much material from Portugal and he described many new oniscid species, including *Trichoniscoides lusitanus*, *Miktoniscus bisetosus* and *Porcellio herminiensis* (Vandel, 1946). More recently David Bilton has collected in the region, and described additional new species; *Oniscus acarenensis* and *O. galicianus* (Bilton, 1992; 1997). None-the-less, it is probable that much remains to be known about the onscid fauna of this region.

MATERIALS AND METHODS

The aim of the field meeting was to compile as many species records as possible including woodlice. Between 24th March and 29th March 2004 excursions were made into the southern Galician provinces of Pontevedra and Orense and into the northern Portuguese distrito of Viana do Castelo (Fig. 1). The list of the collecting localities is given in Table 1, which includes outline habitat characteristics and grid references.

Surveys were mainly undertaken in semi-natural habitats, including coastal sand-dunes and beaches, woodland (dominated by Oak *Quercus*, Alder *Alnus* or Pine *Pinus*) and upland moorland. A few synanthropic habitats, including gardens, were also sampled. Many of the localities were low-lying,

either coastal (beside the Atlantic Ocean) or within the valley of the Rio Miño (Mhino). Further inland the land rises, and the Puerto de Moncelos (upland moorland, locality 11) rises to 800m asl, while the Portuguese Oak woodlands at Vascões and Castanheira lie at about 500-550m asl.

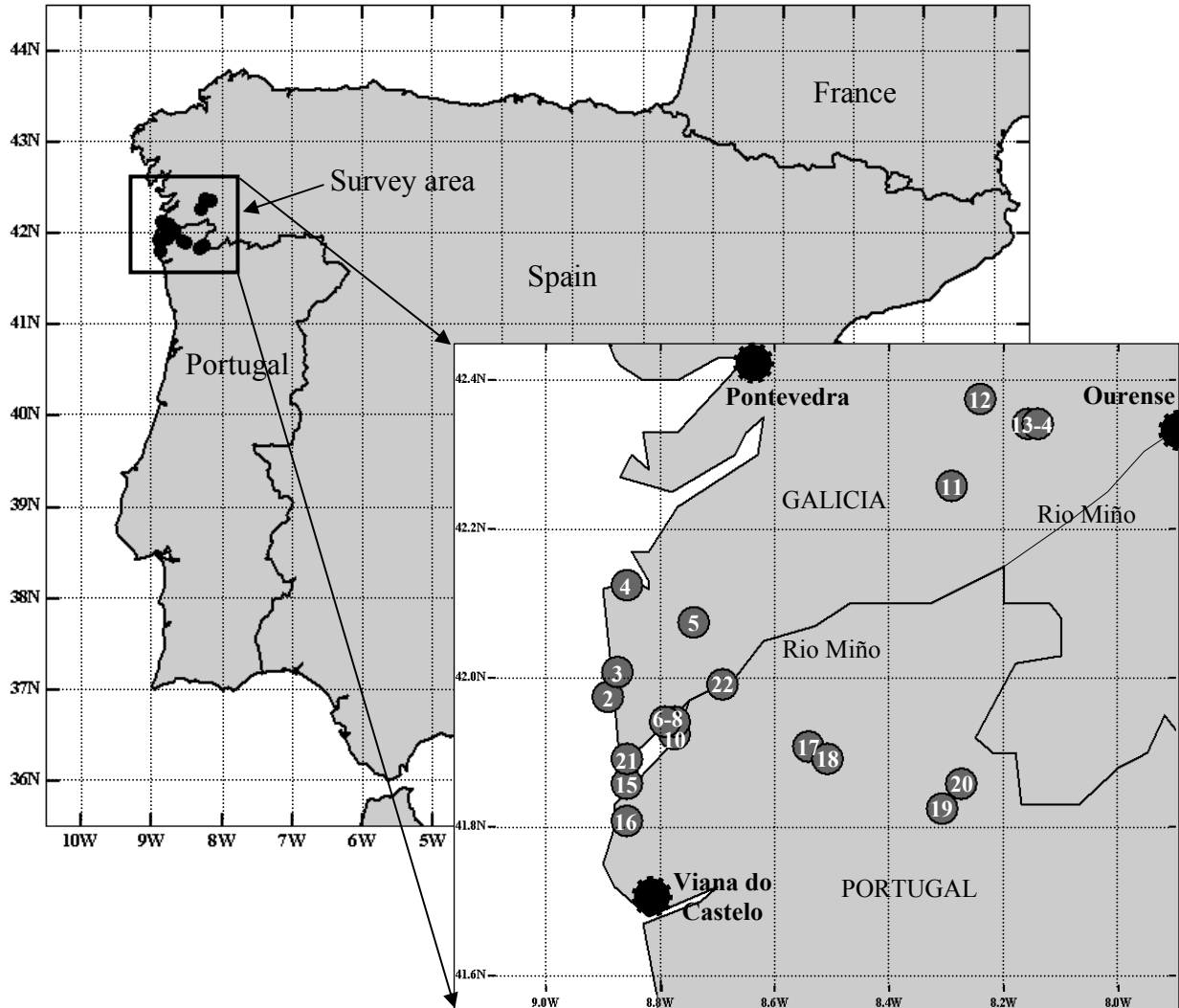


FIGURE 1: Map of Iberian Peninsula indicating survey area (left) and enlargement of survey area (inset right) to show sample sites within Galicia and northern Portugal.

NB: Site 1, Finca Rio Miño, lies within the cluster of sites 6-8.

At most sites specimens were collected by hand searching. As many micro-sites as possible were examined on each site. This mostly entailed searching the underside of large stones and fallen timber as well as the superficial soil layer beneath. Additional searches were made in leaf-litter and under the bark of fallen and standing dead wood. At a few sites leaf litter was sieved.

Specimens were collected by the authors, Steve Gregory (SJG), Paul Lee (PL), Helen Read (HJR) and Paul Richards (JPR). Species determinations were made by Steve Gregory. All specimens are stored in 75% ethanol, and currently retained in his personal collection in Oxfordshire, UK.

TABLE 1: List of localities, and outline habitats, from which samples were collected (Note: woodlice were not collected at site 6)

Site No.	Country	Province /Distrito	Locality and site details	Approx. Altitude	UTM (29T)	Latitude-Longitude	Date of collection
1	Spain	Pontevedra	Finca Rio Miño, near Goián; Domestic garden	< 50m	0519/4642	Not known	24/3/2004
2	Spain	Pontevedra	Oia, Km post 36 on road PO552; Scrubby cliff	Coastal	0509/4648	41°59'17"N, 8°53'01"W	24/3/2004
3	Spain	Pontevedra	Oia Harbour; Coastal site	Coastal	0510/4650	42°00'06"N, 8°52'37"W	24/3/2004
4	Spain	Pontevedra	Baiona; Coastal site	Coastal	0511/4663	42°07'05"N, 8°51'56"W	24/3/2004
5	Spain	Pontevedra	Gondomar; Woodland south of town	c. 100m	0520/4658	42°04'45"N, 8°44'59"W	24/3/2004
7	Spain	Pontevedra	As Eiras; Alder wood	< 50m	0519/4642	41°56'03"N, 8°46'06"W	25/3/2004
8	Spain	Pontevedra	Between As Eiras & Goián; Inshore island, R. Miño	< 50m	0519/4642	41°55'54"N, 8°46'04"W	25/3/2004
9	Spain	Pontevedra	Goián, North bank of Rio Miño; near beach	< 50m	0520/4643	Not known	25/3/2004
10	Spain	Pontevedra	As Eiras; Pine woodland	c. 50m	0517/4642	41°56'09"N, 8°47'08"W	25/3/2004
11	Spain	Pontevedra	Puerto de Moncelos; Moorland	800m	0558/4679	42°15'54"N, 8°17'48"W	26/3/2004
12	Spain	Orense	Avión, valley of Rio Valdeiras; Mixed woodland	c. 350m	0562/4691	42°22'02"N, 8°14'29"W	26/3/2004
13	Spain	Orense	Beiro; Pine woodland with oak and mimosa	c. 250m	0568/4688	42°20'52"N, 8°09'53"W	26/3/2004
14	Spain	Orense	Beado; Oakwood with chestnut & pine	c. 200m	0571/4688	42°20'27"N, 8°08'15"W	26/3/2004
15	Portugal	Viana do Castelo	Caminho, Minho; Coastal woodland & dunes	Coastal	0512/4635	41°51'02"N, 8°51'20"W	27/3/2004
16	Portugal	Viana do Castelo	Vila Praia de Âncora; Coastal dune area	Coastal	0511/4628	41°48'38"N, 8°51'35"W	27/3/2004
17	Portugal	Viana do Castelo	Castanheira; Oak woodland	c. 500m	0537/4639	41°54'09"N, 8°32'55"W	28/3/2004
18	Portugal	Viana do Castelo	Vascões; Oak woodland	c. 550m	0540/4638	41°53'29"N, 8°30'37"W	28/3/2004
19	Portugal	Viana do Castelo	Britelo; Roadside scrub & woodland	c. 150m	0557/4631	41°49'42"N, 8°18'31"W	28/3/2004
20	Portugal	Viana do Castelo	Near Central de Lindoso power station; Woodland	c. 400m	0560/4634	41°51'34"N, 8°16'26"W	28/3/2004
21	Spain	Pontevedra	Camposancos, near La Guardia; "mid-slopes"	Coastal	0511/4638	41°53'43"N, 8°51'55"W	29/3/2004
22	Spain	Pontevedra	Amorin, farmland; Ditches & woodland verges	< 50m	0525/4649	41°59'39"N, 8°41'31"W	29/3/2004

TABLE 2: List of woodlice recorded and sites from which they were collected (see Table 1 for locality details).

Family	Species	Localities: Spain															Localities: Portugal							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	21	22	15	16	17	18	19	20	
Tylosidae	<i>Tylos europaeus</i>																		#					
Ligiidae	<i>Ligia oceanica</i>			#																				
Trichoniscidae	<i>Trichoniscoides lusitanus</i>			#		#																		#
Trichoniscidae	<i>Trichoniscoides</i> species A											#											#	
Trichoniscidae	<i>Trichoniscoides</i> species B																							#
Trichoniscidae	? <i>Trichoniscoides</i> species C																							
Trichoniscidae	<i>Trichoniscus pusillus</i> s.l.			#																				#
Trichoniscidae	<i>Miktoniscus bisetosus</i>					#																		#
Trichoniscidae	<i>Miktoniscus patiencei</i>			#																				#
Trichoniscidae	<i>Haplophthalmus danicus</i>	#		#																				
Trichoniscidae	<i>Haplophthalmus</i> sp. [mengji-group]																							
Platyarthridae	<i>Platyarthrus hoffmannseggii</i>					#																		
Philosciidae	<i>Ctenoscia dorsalis</i>			#																				#
Philosciidae	<i>Halophiloscia couchii</i>			#																				
Oniscidae	<i>Oniscus asellus</i>																							
Oniscidae	<i>Oniscus galitanius</i>																							
Oniscidae	<i>Oniscus lusitanus</i>	#	#	#	#																			#
Porcellionidae	<i>Porcellionides cingendus</i>	#	#	#	#																			#
Porcellionidae	<i>Porcellionides pruinosus</i>			#																				
Porcellionidae	<i>Porcellionides sexfasciatus</i>																							
Porcellionidae	<i>Porcellio debueni</i>	#	#	#	#																			#
Porcellionidae	<i>Porcellio dilatatus dilatatus</i>			#																				
Porcellionidae	<i>Porcellio dispar</i>																							
Porcellionidae	<i>Porcellio hermiensis</i>																							
Porcellionidae	<i>Porcellio scaber</i>	#	#	#	#																			#
Armadillidiidae	<i>Armadillidium vulgare</i>	#	#	#	#																			#
Armadillidiidae	<i>Eluma caelata</i>	#	#	#	#																			#
	No. species per site:	7	5	15	10	3	0	3	4	3	8	5	10	4	8	12	7	7	9	8	8	4	10	

RESULTS

In total about 1,400 specimens were collected during the field meeting, comprising 27 species of Oniscidea. The species recorded, and the sites at which they were found, are indicated in Table 2.

The species records are summarised in Table 3, which lists the number of localities from which each species was recorded and gives details of the number of specimens collected.

Full details of species records are given in the taxonomic listing presented below.

TABLE 3: Summary of species records: number of localities where found and number of individuals (male, female, juvenile, total) collected

SPECIES	No. of localities recorded	Rank by no. localities	Number of specimens collected			
			males	females	juvenile	Total
<i>Ligia oceanica</i>	1	= 19	0	0	1	1
<i>Tylos europaeus</i>	1	= 19	0	1	0	1
<i>Trichoniscoides lusitanus</i>	11	= 6	25	95	0	120
<i>Trichoniscoides</i> species A	4	= 10	14	11	10	35
<i>Trichoniscoides</i> species B	2	= 14	6	13	1	20
? <i>Trichoniscoides</i> species C	2	= 14	7	7	0	14
<i>Trichoniscus pusillus</i> sensu lato	9	8	0	54	0	54
<i>Miktoniscus bisetosus</i>	3	13	10	31	2	43
<i>Miktoniscus patiencei</i>	2	= 14	14	13	0	27
<i>Haplophthalmus danicus</i>	4	= 10	46	113	4	163
<i>Haplophthalmus</i> sp. [mengii-group]	1	= 19	0	3	0	3
<i>Platyarthrus hoffmannseggii</i>	1	= 19	0	1	0	1
<i>Halophiloscia couchii</i>	1	= 19	0	5	0	5
<i>Ctenoscia dorsalis</i>	4	= 10	10	25	0	35
<i>Oniscus asellus</i>	1	= 19	0	3	0	3
<i>Oniscus galicianus</i>	1	= 19	1	4	0	5
<i>Oniscus lusitanus</i>	15	= 4	35	86	14	135
<i>Porcellionides cingendus</i>	18	1	44	82	4	130
<i>Porcellionides sexfasciatus</i>	2	= 14	6	10	1	17
<i>Porcellionides pruinosus</i>	1	= 19	0	1	0	1
<i>Porcellio debueni</i>	16	2	37	81	20	138
<i>Porcellio dilatatus</i>	2	= 14	6	4	0	10
<i>Porcellio dispar</i>	1	= 19	2	5	0	7
<i>Porcellio herminiensis</i>	6	9	16	28	4	48
<i>Porcellio scaber</i>	14	3	71	74	9	154
<i>Armadillidium vulgare</i>	11	= 6	19	40	12	71
<i>Eluma caelata</i>	15	= 4	54	64	34	152
27 species			Total number of specimens:			1393

TAXONOMIC LISTING OF WOODLICE (ISOPODA: ONISCIDEA) COLLECTED

The records consist of the locality number (locality details in Table 1), the number of collected specimens (differentiated into males, females and immatures) and comments about the collection of the specimens and the known occurrence in north-west Iberia and Europe. Species nomenclature follows Schotte, M., Boyko, C.B, Bruce, N.L., Poore, G.C.B., Taiti, S., Wilson, G.D.F. (Eds) (2012).

DIPLOCHETA: Family LIGIIDAE***Ligia oceanica* (Linnaeus, 1767)**

Spain: Locality 3 (1j; SJG leg.)

A single juvenile specimen of this halophilous species was collected from among stones above the strandline at the Harbour at Oia. This species is widely recorded along the Atlantic coasts of Europe and the western Baltic Sea (Schmalfuss, 2003).

TYLIDA: Family TYLIDAE***Tylos europaeus* Arcangeli, 1938**

Portugal: Locality 16 (1♀; PL leg.)

A single female specimen of this halophilous species was collected from coastal sand-dunes at Vila Praia de Âncora. This species favours fine sand and typically occurs a few metres above mean sea level.

The family Tylidae belongs to the section Tylida, which is not represented in Britain. The uropods are positioned ventrally below the body and are not visible when the animal is viewed dorsally. This is quite distinct from other oniscids. *T. europaeus* is a widespread European species, occurring along the coasts of the Black Sea and Mediterranean, and the Atlantic coast of Europe north to Brittany, north-west France (Schmalfuss, 2003).

SYNOCHETA: Family TRICHONISCIDAE***Trichoniscoides lusitanus* Vandel, 1946**

Spain: Localities 3 (6♂, 10♀; SJG, JPR leg.); 5 (2♀; SJG leg.); 10 (1♀; HJR leg.); 11 (6♀; SJG, HJR, JPR leg.); 12 (6♂, 17♀; SJG, HJR leg.); 13 (1♂, 2♀; HJR leg.); 14 (1♂, 3♀; HJR, JPR leg.); 22 (3♀; SJG leg.)

Portugal: Localities 17 (10♂, 32♀; SJG, PL, HJR leg.); 18 (1♂, 12♀; SJG, HJR leg.); 20 (7♀; SJG, HJR leg.)

Collected from eleven sites, this was one of the more frequently encountered species. It was mainly recorded from inland localities, such as deciduous woodland (up to 550m asl) and upland moorland (at 800m asl), but it was also collected from a few low-lying coastal or riverine habitats beside the Rio Miño. Specimens were found beneath stones and dead wood or among leaf litter, especially in damp places, such as ditches.

This is a large (to 4.5mm) darkly pigmented species with smooth pereonites and eyes comprising a single prominent ocellus. All pigment is rapidly lost in alcohol. Although superficially similar to an *Ortoniscus* species, the characteristic shape of the male pleopods readily assigns specimens to the genus *Trichoniscoides*. Vandel (1946) recorded this species from the mountainous regions of northern Portugal and considered it to be one of the more primitive species of the genus, allied to the north-

western European *T. albidus*. Its distribution is restricted to northern Portugal and north-west Spain (Schmalfuss, 2003).

Trichoniscoides species A

Spain: Localities 12 (1♂, ?♀; SJG leg.); 21 (5♂, 3♀, 10j; SJG, HJR, JPR leg.)

Portugal: Localities 17 (2♂; PL, JPR, leg.); 18 (6♂, 8♀, 1j; SJG leg).

This is probably a new species (S. Taiti, pers. comm.). Most of the specimens were collected from deciduous woodland beneath dead wood and stones or among deep accumulation of leaf-litter. Although close to the Atlantic coast, the Camposancos specimens (locality 21) were collected at an altitude of between 100-200m asl, while the two Portuguese Oak woodlands at Castanheira and Vascões (localities 17 & 18) were around 500-550m asl. Male specimens are 2-2.25mm in length, while females were 2.75-3mm. Specimens collected from Camposancos (locality 21) and Vascões (locality 18) were pinkish-red with the eye comprising a single dark red ocellus in life. All pigment was rapidly lost following preservation in alcohol. The coarse tubercles covering the body were apparent with a hand lens.

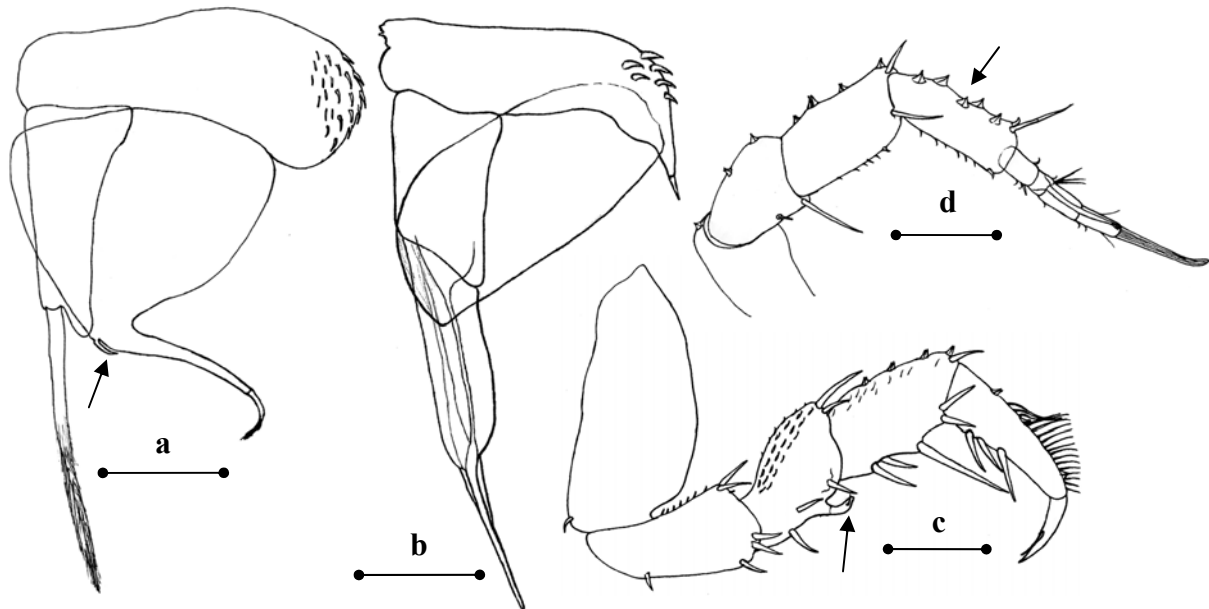


FIGURE 2: *Trichoniscoides* species A, male. Locality 17, Viana do Castelo, Portugal.

a) First pleopod; b) Second pleopod; c) Seventh pereopod; d) Antenna

Scale bars = 0.1 mm

The male sexual characters exhibit some distinctive features. The inner distal process of the exopod of the male first pleopod is considerably reduced to little more than an elongated tubercle (arrowed, Fig. 2a), whilst the outer process is well developed and terminated in a tuft of dark bristles. The second pleopod (Fig. 2b) has the basal part of the endopod broad and parallel sided, but it rapidly narrows in the distal half to form a narrow elongated tip. In some specimens this is straight (as Fig. 2b), while in others it is curved. The merus of the male seventh pereopod bears a distinctive hooked spur on the sternal face (arrowed, Fig 2c). The fourth and fifth articles of the antennae bear prominent tubercles, composed of groups of short scales (arrowed, Fig 2d).

The reduction of the inner spine of the first exopod and the presence of a hooked spur on the merus of the seventh pereopod suggest an affinity to Vandel's (1960) Groupe Aquitano-languedocien, which

includes *T. cadurcensis* Vandel, 1934 a species known in south-west France (Schmalfuss, 2003). (This group also includes the ‘expansive’ species *T. sarsi* that occurs in Britain). *Trichoniscoides* species A differs from *T. cadurcensis* in other male characters of the seventh pereopod and second endopod (see Vandel, 1960, pg. 266).

In Cruz’s (1993) key to *Trichoniscoides* Groupe Atlantique the presence of a hooked spur on the merus of the male seventh pereopod readily keys the specimens to *T. broteroi* Vandel, 1946, a species described from Coimbra, northern Portugal. However, there are two notable differences when Vandel’s description of *T. broteroi* is compared to *Trichoniscoides* species A. Firstly, Vandel gives 4 to 4.5mm body length for *T. broteroi*, while *Trichoniscoides* species A varies between 2.75 to 3mm. Secondly, and of key significance, both distal processes on the first exopod are normally developed, albeit sub-equal, in *T. broteroi* (as seen in *Trichoniscoides* species B, Fig. 3a, below). This is very different for the reduced state of the inner process apparent in *Trichoniscoides* species A.

Trichoniscoides species B

Spain: Locality 21 (2♂; JPR & HJR leg.)

Portugal: Locality 20 (4♂, 13♀, 1j; SJG leg.)

This is probably a new species (S. Taiti, pers. comm.). Specimens collected from near Central de Lindoso power station (locality 20) were from saturated peat beside a flushed area in wet deciduous woodland, in association with *Miktoniscus bisetosus* Vandel, 1946. Habitat details are not known for the two males collected from Camposancos (locality 21).

Male specimens were between 2-2.5mm in length, gravid females between 3-3.5mm. In life specimens were pale orange or pink, with an eye comprising a contrasting red ocellus. All pigment was rapidly lost in alcohol, leaving preserved specimens uniform off-white. The head bears tubercles, but these are reduced to rows of rounded bumps (each bearing a small spine) on the pereionites. There are no modifications to the male seventh pereopod (Fig. 3c), in contrast to *Trichoniscoides* species A and C, which both bear a hooked spur on the merus.

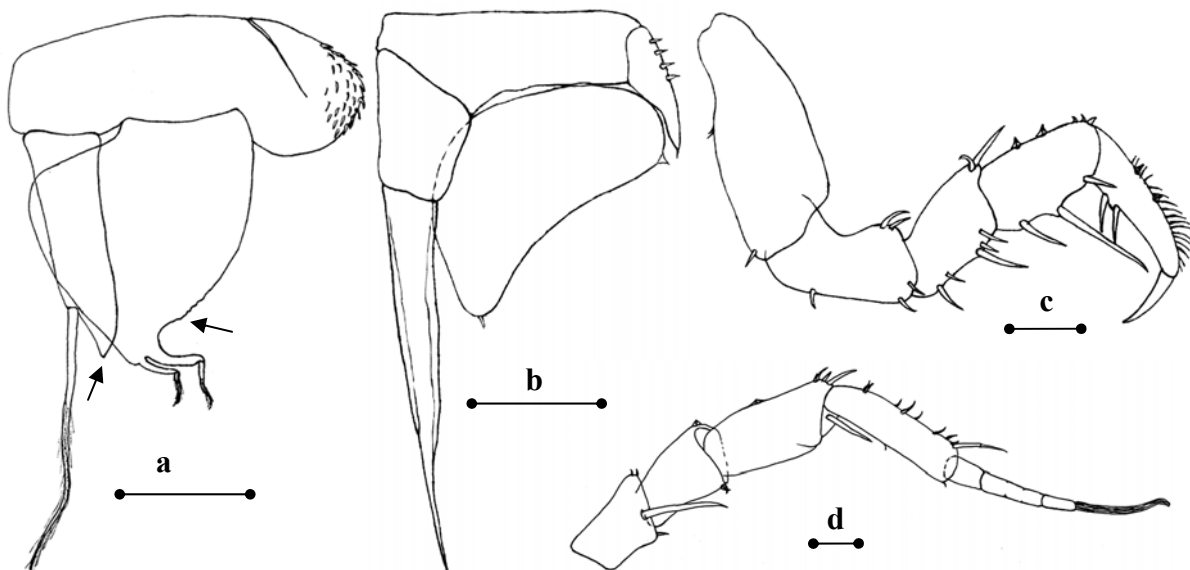


FIGURE 3: *Trichoniscoides* species B, male. Locality 20, Viana do Castelo, Portugal.

a) First pleopod; b) Second pleopod; c) Seventh pereopod; d) Antenna

Scale bars = 0.1 mm

In Cruz's (1993) key to *Trichoniscoides* Groupe Atlantique male specimens readily key to *T. modestus* Racovitza, 1908. However, specimens do not conform to figures of this species in Vandel (1960) and are clearly not that species. The male first and second pleopods (Figs. 3a & 3b) bear similarity to those of *T. machadoi* Vandel, 1946, a species described from Portugal. However, the material examined here differs from Vandel's description in three key features. Firstly, *T. machadoi* has a well-developed 'V' notch on the outer distal edge of the 1st exopod, which is absent in the material examined here (right arrow, Fig. 3a). Secondly, *Trichoniscoides* species B has a well-developed lateral lobe to the basal segment of the first endopod (left arrow, Fig. 3a), which is absent or weakly developed in *T. machadoi*. Thirdly, the pereionites of *T. machadoi* are described as smooth ('lisses'), whereas the specimens examined here bear rounded bumps.

?*Trichoniscoides* species C

Spain: Locality 12 (5♂, 7♀; SJG & HJR leg.)

Portugal: Localities 17 (2♂, 1♀; SJG & PL leg.)

This is probably a new species, probably referable to the genus *Trichoniscoides* (S. Taiti, pers. comm.). Specimens were collected from two localities, both in woodland well away from the coast, at relatively high altitudes of 350m (locality 12, Avión) and 500m (locality 17, Castanheira). Interestingly, *Trichoniscoides* species A was also recorded from both sites.

This is a small species, with males 1.75-2.25mm in length, while females were 2.5-3.25mm. The heads covered with distinct tubercles, but these become indistinct on the body. Specimens collected at Avión (locality 12) varied from white to pale pink in life, with an eye comprising a single reddish ocellus, but all specimens faded rapidly to off-white following preservation in alcohol.

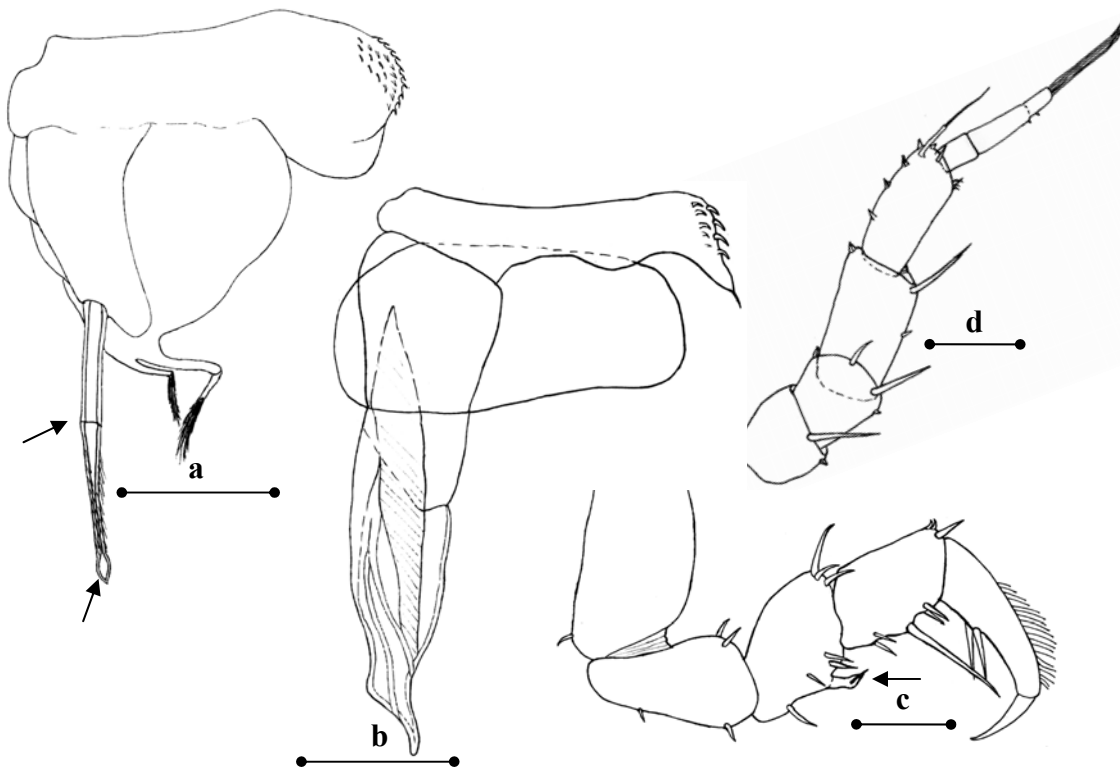


FIGURE 4: ?*Trichoniscoides* species C, male. Locality 12, Orense, Spain
a) First pleopod; b) Second pleopod; c) Seventh pereopod; d) Antenna
Scale bars 0.1 mm

The male sexual characters are highly distinctive. Although the structure of the male first pleopod suggests a close affinity to the genus *Trichoniscoides*, the distal article of the endopod is atypical in that it is jointed at its mid-point and terminates in a swollen rounded tip (arrowed, Fig. 4a). There are two sub-equal distal processes on the first exopod, but in one specimen there is a third even smaller innermost distal process. Due to the small number of specimens examined it is not clear whether this is an anomalous specimen or not. The endopod of the male second pleopod is broad and parallel sided for much of its length, then tapers suddenly to a curved point (Fig. 4b). The male seventh pereopod bears a prominent hooked spur, bearing a small spine, on the sternal face of the merus (arrowed, Fig. 4c). This is similar to that seen in *Trichoniscoides* species A, but there are considerable differences between the first and second pleopods of these two species.

Trichoniscus pusillus sensu lato

Spain: Localities 3 (7♀; SJG, JPR leg.); 8 (7♀; SJG leg.); 12 (6♀; SJG leg.); 14 (7♀; SJG, HJR leg.); 21 (18♀; SJG, HJR, JPR leg.); 22 (1♀ HJR leg.)

Portugal: Localities 15 (6♀; HJR leg.); 16 (1♀; SJG leg.); 20 (1♀; HJR leg.)

Recorded at nine sites, this was a frequently encountered species. All specimens collected were female. Unfortunately, species within the *Trichoniscus pusillus* aggregate can only be reliably separated by microscopic examination of male specimens. In north-west Iberia, this species aggregate is likely to include three species (as recognised by Schmalfuss, 2003): *T. provisorius* Racovitza, 1908; the parthenogenetic *T. pusillus* Brandt, 1833; and possibly *T. alticola* Legrand, Strouhal & Vandel, 1950.

Considering the absence of male specimens and the large size of gravid specimens (3.75 to 4.5 mm in length), it is probable that all specimens collected refer to the genuine *T. pusillus* Brandt, 1833 which is recorded by Vandel (1946) from Portugal (under the name *T. elisabethae* Herold, 1923). Gravid females of *T. alticola* and *T. provisorius* rarely exceed 3.5 mm in length (Vandel, 1960). Since males of *T. pusillus* Brandt occur at about 1% of the population in Europe (Gruner 1966), it is very difficult to confirm the occurrence of this species by collecting a male specimen.

T. pusillus sensu lato is widely dispersed across Europe, North Africa and western Asia. The segregate *T. pusillus* Brandt, 1833 is widespread in Europe, mainly north of the Alps, and has been introduced to Madeira, the Azores and North America (Schmalfuss, 2003).

Miktoniscus bisetosus Vandel, 1946

Spain: Locality 5 (1♂, 2♀; SJG leg.),

Portugal: Localities 18 (1♂, 1♀; HJR leg.); 20 (8♂, 18♀, 2j; SJG, HJR leg.)

This species was collected from three inland localities. Two of the sites are very wet: waterlogged dead wood beside a small stream in deciduous woodland (near Gondomar, locality 5) and among saturated peat beside a flushed area in wet deciduous woodland (near Central de Lindoso power station, locality 20). The third site is Oak woodland near Vascões (locality 18), but microsite details are not known. Males were c. 3mm in length, with characteristically well developed spinulation of the seventh pereopod (Fig. 5a), with gravid females to 4.5mm.

Vandel (1946) described this species from a single site in distrito Viana do Castelo, and its known distribution is restricted to northern Portugal and north-west Spain (Schmalfuss, 2003).

***Miktoniscus patiencei* Vandel, 1946**

Spain: Localities 3 (3♂, 4♀; SJG leg.); 4 (11♂, 9♀; SJG leg.).

This would appear to be the first formal record of this species in Spain; Schmalzfuss (2003) gives the known distribution of this species from northern France to Ireland and Scotland. However, David Bilton (1993, BISG Newsletter 35) informally reports this species from coastal sites in Galicia.

In contrast to *M. bisetosus*, this species was found exclusively on the coast. It was collected from among strandline debris at two sites at Oia Harbour and Baiona. In addition to habitat preferences, this species differs from *M. bisetosus* in male sexual characters, particularly in the less well-developed spinulation of the male seventh pereopod (Fig. 5b) and its smaller size (female to 3.5 mm).

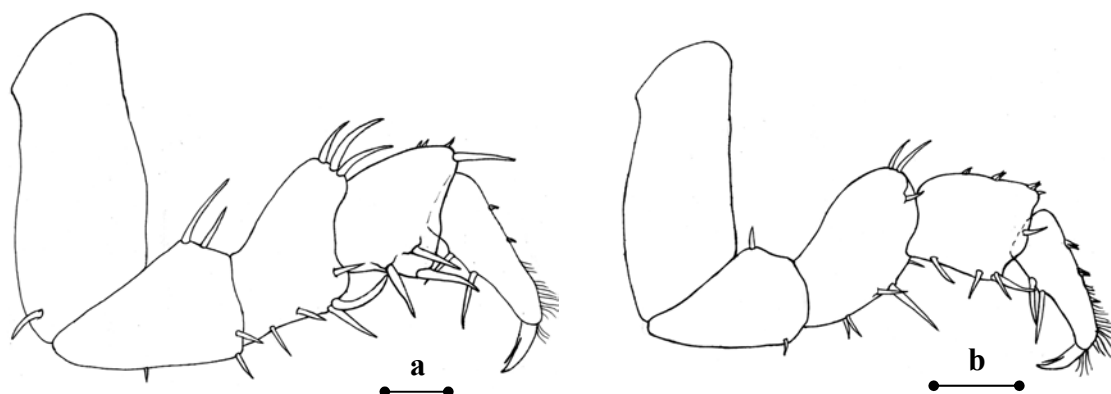


FIGURE 5: *Miktoniscus* species, male seventh pereopod
 a) *Miktoniscus bisetosus*. Locality 20, Viana do Castelo, Portugal
 b) *Miktoniscus patiencei*. Locality 4, Pontevedra, Spain
 Scale bar = 0.1 mm

***Haplophthalmus danicus* Budde-Lund, 1880**

Spain: Localities 1 (6♀; SJG, JPR leg.); 3 (1♂; SJG leg.); 14 (8♂, 24♀, 3j; SJG leg.); 21 (c.30♂, c.70♀; SJG, JPR leg.)

Specimens were collected from four sites varying from synanthropic (domestic garden at Finca Rio Miño) to coastal (Oia Harbour), to semi-natural woodland (Oak woodland near Beade). At Camposancos, near La Guardia (locality 21), it was abundant in rotting timber lying on the ground near a carpark. This is a widespread species across Europe, where it has been widely spread by human activity, and it has been widely introduced to other parts of the world (Schmalzfuss, 2003).

***Haplophthalmus* species (*mengii*-group)**

Spain: Locality 4 (3♀; SJG leg.)

Three female specimens were collected from beneath dead wood just above the storm high-water mark on the coast near Baiona. The well developed haplophthalmoid sculpturing of the pereionites and a pair of prominent projections on the third pleonite suggest that the specimens belong to the *H. mengii* species aggregate. Unfortunately, in the absence of a male, it is not possible to determine the actual species since other species allied to *H. mengii* (Zaddach, 1844), such as *H. asturicus* Vandel, 1952, are known to occur in north-west Spain.

CRINOCHEETA: Family PLATYARTHRIIDAE***Platyarthrus hoffmannseggii* Brandt, 1833**

Spain: Locality 4 (1♀; JPR leg.)

A single specimen was collected from an ants' nest from coastal habitat near Baiona. Due to its specialist niche, within ant's nests, it is possible that this common European species was over-looked at other sites surveyed. This widespread myrmecophilous species is known from much of Europe, North Africa and Asia Minor (Schmalfuss, 2003).

CRINOCHEETA: Family HALOPHILOSCIIDAE***Halophiloscia couchii* (Kinahan, 1858)**

Spain: Locality 3 (5♀; SJG leg.)

Female specimens of this halophilous species were collected from among stones above the strandline at the Harbour at Oia. Although several species of *Halophiloscia* have been described from the coastline of western Europe, Schmalfuss (2003) considers all to be junior synonyms of *H. couchii* (Kinahan, 1858). As defined by Schmalfuss (2003) this species has a very wide geographic distribution, along the Atlantic coasts from Dakar (Senegal) to the British Isles, and along the coasts of the Mediterranean Sea and the Black Sea.

CRINOCHEETA: Family PHILOSCIIDAE***Ctenoscia dorsalis* (Verhoeff, 1928)**

Spain: Localities 3 (5♂, 10♀; SJG, JPR leg.); 21 (2♂, 13♀; SJG leg.)

Portugal: Localities 16 (2♂, 2♀; SJG leg.); 17 (1♂; SJG leg.)

Specimens were collected from four sites. Three of these were coastal localities: among leaf-litter beneath scrub just above the sea-shore at Oia Harbour; among leaf-litter at Camposancos near La Guardia; and from coastal dunes at Vila Praia de Âncora. The fourth site, well away from the coast, was Oak woodland near Castanheira (locality 17). *C. dorsalis* is recorded mainly from coastal areas from Malta in the eastern Mediterranean to western Spain (Schmalfuss, 2003). Vandel (1946) reports its congener *Ct. minima* (Dollfuss, 1892), which differ in detail of the male first pleopod, from Portugal.

CRINOCHEETA: Family ONISCIDAE***Oniscus asellus* Linnaeus, 1758**

Portugal: Locality 20 (3♀; SJG, JPR leg.)

It is perhaps surprising that this common western European species was only recorded at a single site. However, in this part of the Iberian peninsular it is more-or-less replaced by its congener *O. lusitanus* (see below). Specimens were collected from under bark on a rotting log in road-side woodland near Central de Lindoso power station. With a broad Atlantic distribution, *O. asellus* is one of the most abundant (and familiar) species of western Europe (Schmalfuss, 2003).

***Oniscus galicianus* Bilton, 1997**

Spain: Locality 7 (1♂, 4♀; SJG leg.)

Specimens (confirmed by D.T.Bilton) were collected from among wet leaf litter in Alder woodland close to the Rio Miño near As Eiras. This is typical of the wet habitats reported for *O. galicianus* by Bilton (1997) who describes this species from material collected from ten localities in central Galicia, mainly in the province of Lugo. It is superficially similar to *O. asellus*, but differs in the form of the exopod and the tip of the endopod of the male first pleopod. This record considerably extends the range of this Galician endemic further south and west. Within its known range *O. galicianus* seems to favour colder regions than *O. lusitanus* and wetter microsites than *O. asellus* (Bilton, 1997).

***Oniscus lusitanus* Verhoeff, 1908**

Spain: Localities 1 (5♀; SJG leg.); 2 (2♀; SJG leg.); 3 (4♂, 8♀, 2j; SJG, JPR leg.); 4 (1♂, 4♀, 1j; SJG leg.); 5 (1♂; SJG leg.); 9 (2♂, 1♀; SJG leg.); 10 (5♂, 11♀; SJG leg.); 11 (3♂, 4♀, 1j; SJG, HJR, JPR leg.); 12 (1♂, 1♀; SJG leg.); 14 (1♀; SJG leg.); 21 (13♂, 15♀, 4j; SJG, HJR, JPR leg.); 22 (3♀, 1j; SJG, JPR leg.)

Portugal: Localities 15 (4♂, 29♀, 2j; SJG, JPR leg.); 18 (1♂, 3j; SJG, HJR leg.); 19 (1♀; SJG leg.)

Recorded from 15 sites, this was one of the most frequently encountered oniscid species. It was found in all principal habitats surveyed, from synanthropic sites, coastal sites, semi-natural Pine or Oak woodland to upland moorland, and typically numerous when found. Although known from central Portugal northwards to Asturias in north-west Spain (Schmalfuss, 2003), this species is most abundant in the warmer climes of northern Portugal and southern Galicia (Bilton, 1997).

CRINOCHEA: Family PORCELLIONIDAE***Porcellionides cingendus* (Kinahan, 1857)**

Spain: Localities 1 (6♂, 6♀; SJG leg.); 2 (1♂, 4♀; SJG, JPR leg.); 3 (3♂, 6♀; SJG, JPR leg.); 4 (8♂, 7♀; SJG, JPR leg.); 7 (1♂; SJG leg.); 10 (1♀; HJR leg.); 11 (5♂, 5♀; SJG, HJR leg.); 12 (3♂, 4♀; SJG leg.); 13 (1♂, 4♀; SJG, HJR leg.); 14 (2♂, 6♀; SJG, HJR leg.); 21 (1♂, 1♀; HJR, JPR leg.); 22 (2♂, 3♀; SJG, HJR leg.)

Portugal: Localities 15 (2♂, 10♀; SJG, HJR, JPR leg.); 16 (6♂, 18♀, 2j; SJG, HJR, JPR leg.); 17 (3♀; SJG, HJR leg.); 18 (2♂; SJG, HJR leg.); 19 (1♂, 2♀, 2j; SJG, HJR leg.); 20 (2♂, 3♀; SJG, HJR, JPR leg.)

This was the most frequently recorded species, collected from 18 sites, and typically numerous when found. It was found in all principal habitats surveyed, from synanthropic sites, coastal sites, semi-natural Pine or Oak woodland to upland moorland. This species has a strict Atlantic distribution, and is known from the Atlantic coastal areas of Portugal, Spain, France, southern Britain and Ireland (Schmalfuss, 2003).

***Porcellionides sexfasciatus* (Budde-Lund, 1885) ssp. *lusitanus* (Vandel, 1946)**

Spain: Locality 21 (3♂, 6♀; SJG leg.)

Portugal: Locality 16 (3♂, 4♀, 1j; SJG, JPR leg.)

Specimens of this distinctively coloured species were collected from two coastal locations; grassland at Camposancos, near La Guardia, and sand dunes at Vila Praia de Âncora. Male specimens were referable to sub-species *lusitanus* (Vandel, 1946), which was originally described from Portugal. This is a widely recorded species across the western Mediterranean region, and has been introduced to many other parts of the world (Schmalfuss, 2003).

***Porcellionides pruinosus* (Brandt, 1833)**

Spain: Locality 3 (1♀; JPR leg.)

A single specimen of this cosmopolitan synanthrope, that was associated with *Porcellio dilatatus*, was collected from a coastal location at Oia Harbour. Additional habitat information is not known. Although originating in the Mediterranean area, *P. pruinosus* has been widely introduced elsewhere (Schmalfuss 2003).

***Porcellio debueni* Dollfus, 1892**

Spain: Localities 1 (1♂, 7♀; SJG leg.); 3 (1♂, 2♀; SJG, JPR leg.); 4 (1♀; SJG leg.); 8 (1♀; SJG leg.); 9 (1♀; SJG leg.); 10 (2♂, 9♀, 4j; SJG, HJR leg.); 12 (1♂, 4♀, 1j; SJG, JPR leg.); 14 (1♀; SJG leg.); 21 (7♂, 11♀, 2j; SJG, HJR, JPR leg.); 22 (12♂, 14♀, 2j; SJG, HJR, JPR leg.)

Portugal: Localities 15 (2♂, 10♀, 3j SJG, HJR, JPR leg.); 16 (1♂, 3♀; SJG, HJR leg.); 17 (2♂, 1♀, 1j; SJG, HJR, JPR leg.); 18 (5♂, 6♀, 2j; SJG, HJR leg.); 19 (1♂, 6♀, 1j; SJG, HJR leg.); 20 (2♂, 4♀, 4j; SJG, HJR leg.)

This was the second most commonly recorded species, collected from 16 sites. *P. debueni* is a large species with a distinctive smooth dorsal surface and mottled colouration. It was found in a wide range of habitats from synanthropic sites (including a domestic garden at Finca Rio Miño), to coastal sites (e.g. Oia Harbour), to semi-natural Pine or Oak woodland. This is a species endemic to Portugal and north-west Spain (Schmalfuss 2003).

***Porcellio dilatatus* Brandt, 1833**

Spain: Localities 3 (1♂sub-adult; JPR leg.); 10 (5♂, 4♀; SJG leg.)

This species was recorded from two localities, a single sub-adult from a coastal site at Oia (associated with *Porcellionides pruinosus*) and several specimens from among dumped garden rubbish in Pine woodland near As Eiras. This is a widespread European species, which has been widely introduced to many other parts of the world (Schmalfuss, 2003).

***Porcellio dispar* Verhoeff, 1901**

Spain: Locality 2 (2♂, 5♀; SJG leg.).

This would appear to be the first record for Spain. Several specimens were collected from among rotting timber and rubbish below a small seepage issuing from a clay sea cliff. The site was not only coastal, but exhibited strong synanthropic influences. According to Schmalfuss (2003), previously this species has only been recorded from Portugal, but its occurrence in north-west Spain is not unexpected.

***Porcellio herminiensis* Vandel, 1946**

Spain: Localities 11 (1♂, 1♀; SJG leg.); 12 (8♂, 4♀, 1j; SJG, HJR leg.); 13 (2♂, 2♀; SJG, HJR leg.); 14 (1♂, 4♀; HJR, JPR leg.)

Portugal: Localities 17 (3♂, 15♀, 3j; SJG, HJR, JPR leg.); 18 (1♂, 2♀; SJG leg.)

This distinctive species was recorded from six upland localities, between 200m and 800m asl., in the Spanish province of Orense and the Portuguese distrito of Viana do Castelo (Fig. 6). Most of the records are from Oak woodland, but it was also collected from Pine woodland and moorland. Specimens were collected from beneath stones and dead wood. Vandel (1946) described this species from northern Portugal at altitudes of 950 to 1000m, but also reports its occurrence at low altitude. It is endemic to northern Portugal and north-west Spain (Schmalfuss, 2003).

***Porcellio scaber* Latreille, 1804**

Spain: Localities 1 (14♂, 5♀; SJG leg.); 2 (2♂, 2♀, 1j; SJG leg.); 3 (8♂, 11♀; SJG, JPR leg.); 4 (1♂; SJG leg.); 7 (2♂, 8♀, 6j; SJG, HJR leg.); 8 (9♂, 9♀; SJG, HJR leg.); 9 (1♂, 2j; SJG, HJR leg.); 10 (2♂, 7♀; SJG leg.); 21 (5♂, 7♀; SJG, HJR, JPR leg.); 22 (2♂, 2♀; SJG leg.)

Portugal: Localities 15 (9♂, 11♀; SJG leg.); 16 (12♂, 11♀; SJG, JPR leg.); 19 (1♂, SJG leg.); 20 (3♂, 1♀; SJG leg.)

Although a widely recorded species collected at 14 localities, *P. scaber* was most numerous in synanthropic sites and/or low-lying coastal areas (at altitudes from sea-level to 150m). In semi-natural forest it was encountered in small numbers. Although collected at up to 350m asl. (i.e. at locality 20, near Lindoso Power Station), it was generally absent in upland areas (where its congener *P. herminiensis* was found instead; Fig. 6).

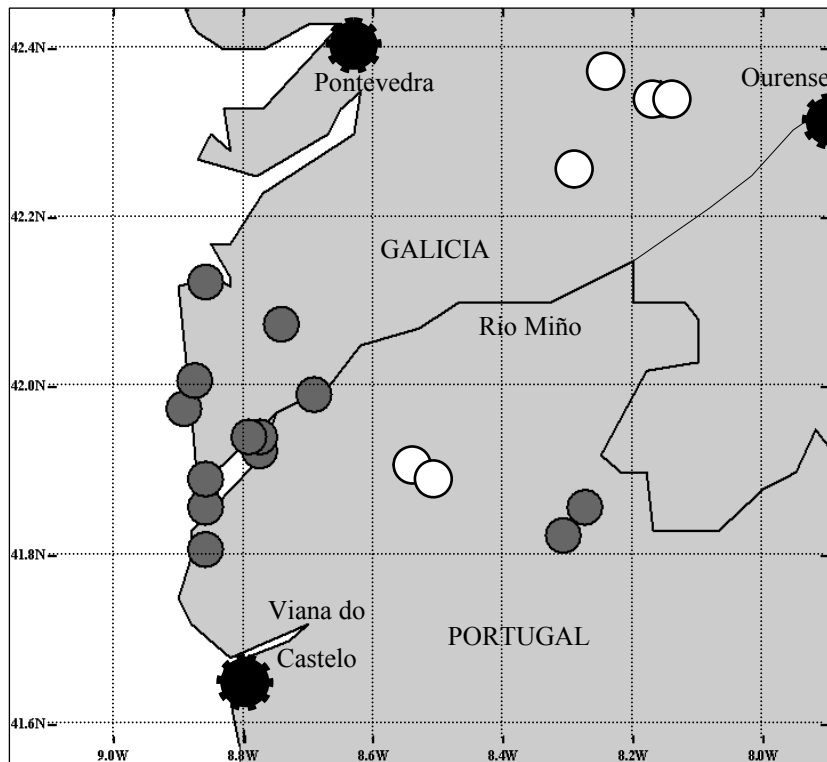


FIGURE 6: Distribution of *Porcellio* records: *Porcellio scaber* (dark grey circles), mostly 0-150m asl, and *Porcellio herminiensis* (white circles), between 200 and 800m asl.

P. scaber ssp. *scaber*, *P. scaber* ssp. *lusitanus* and intermediate forms were present in the samples and have not been differentiated. *P. s.* ssp. *lusitanus* was initially described as a distinct species *P. lusitanus* Verhoeff 1907, primarily distinguished from *P. scaber* by its larger size (to 18mm length), better developed tubercles on the head and body and strongly developed lateral lobes on head. However, the presence of intermediate forms suggested that these characters were allometric. They are now considered to be geographical sub-species (Vandel, 1966; Schmalfuss, 2003), with *P. scaber* ssp. *lusitanus* predominantly occurring in Portugal and north-west Spain.

With a broad Atlantic distribution, *P. scaber* is one of the most abundant species in western Europe (Schmalfuss, 2003).

CRINOCHEETA: Family ARMADILLIDIIDAE***Armadillidium vulgare* (Latreille, 1804)**

Spain: Localities 1 (6♂, 9♀; SJG leg.); 2 (2♂, 6♀; SJG, JPR leg.); 3 (1♀; JPR leg.); 4 (1♂, 7♀, 2j; SJG, JPR leg.); 8 (1♀; SJG leg.); 10 (2♂, 8♀, 9j; SJG leg.); 12 (5♂, 4♀, 1j; SJG leg.); 21 (1♂, 1♀; SJG leg.)

Portugal: Localities 15 (1♀; SJG leg.); 16 (1♂, 2♀; JPR leg.); 20 (1♂; JPR leg.)

Collected from 11 sites, typically coastal, low-lying or synanthropic. It may be significant that the two inland sites, near Avión (locality 12) and near Central de Lindoso power station (locality 20) were both from road-side verges. Although native to the Mediterranean region, it has been introduced to all parts of the world (Schmalfuss, 2003).

***Eluma caelata* (Miers, 1877)**

Spain: Localities 1 (15♂, 13♀; SJG, JPR leg.); 3 (2♂, 6♀; SJG, JPR leg.); 4 (8♂, 5♀, 3j; SJG, JPR leg.); 10 (4♂, 5♀, 4j; SJG, HJR leg.); 11 (2♀; SJG leg.); 12 (3♀, 6j; SJG, HJR leg.); 13 (1♂, 1j SJG, HJR leg.); 14 (3j HJR, JPR leg.); 21 (11♂, 10♀, 6j SJG, PL, HJR, JPR leg.); 22 (1♀, 2j SJG, HJR leg.)

Portugal: Localities 15 (6♂, 8♀, 4j SJG, HJR, JPR leg.); 16 (2♀; SJG, HJR leg.); 17 (2♂, 4♀, 1j SJG, PL, HJR, JPR leg.); 18 (4♂, 4♀, 1j SJG, PL, HJR leg.); 20 (1♂, 1♀, 3j SJG, HJR, JPR leg.)

Collected from 15 localities, this was one of the most frequently recorded species. It was found in most habitats sampled from coastal scrub, synanthropic sites, deciduous woodland to upland moorland at 800m asl. This species has a strict Atlantic distribution, occurring along the Atlantic coastal fringe, and off-shore islands, from north-west Africa, to western Iberia and western France, north to the British Isles (Schmalfuss, 2003).

DISCUSSION

In total, 27 species of oniscidea were collected during this survey. The five most frequently recorded species were *Porcellionides cingendus* (recorded from 18 localities), *Porcellio debueni* (16 localities), *Oniscus lusitanus*, *Eluma caelata* (both from 15 localities) and *Porcellio scaber* (14 localities) (Table 3). These five species account for 51% of the woodlouse records made during the field trip (Table 2), and were recorded from a wide variety of the habitats surveyed. Other frequently recorded species included *Trichoniscoides lusitanus* and *Porcellio herminiensis*, which are both endemic to north western parts of the Iberian peninsular, and *Armadillidium vulgare* and *Trichoniscus pusillus sensu lato*, which are both widespread throughout Europe (Schmalfuss, 2003).

It is apparent that the fauna is dominated by species that are either endemic to north-western Iberia, or exhibit strict Atlantic distributions along the oceanic fringe of western Europe. Seven species, *T. lusitanus*, *Miktoniscus bisetosus*, *O. lusitanus*, *Oniscus galicianus*, *Porcellio debueni*, *P. dispar* and *P. herminiensis*, are endemic to the region (Schmalfuss, 2003). It is probable that three additional species, *Trichoniscoides* sp. A, *Trichoniscoides* sp. B and ?*Trichoniscoides* sp. C, will also prove to be endemic to this area. This total of 10 endemic species represents 36% of the oniscid species collected. An additional four species have Atlantic distributions centred on western Europe, of which *P. cingendus* and *E. caelata*, are more or less restricted to the relatively moist coastal fringe of western Europe, whereas *Oniscus asellus* and *P. scaber* penetrate further east into central Europe.

Other woodlice species recorded are also widespread throughout Europe. Some, such as *Haplophthalmus danicus*, *Haplophthalmus* species (*mengii*-group), *Trichoniscus pusillus sensu lato* and *Platyarthrus hoffmannseggii* exhibit a Continental distribution based on central Europe. The remainder, including *Ctenoscia dorsalis*, *Porcellionides pruinosus*, *Porcellionides sexfasciatus*, *Porcellio dilatatus* and *A. vulgare*, exhibit a Mediterranean distribution based on southern Europe.

Four species are exclusively coastal. *Ligia oceanica* and *Miktoniscus patiencei* are confined to the Atlantic coasts of Europe. The records presented herein indicate that the distribution of the latter species extends as far south as the Portuguese border. *Tylos europaeus* and *Halophiloscia couchii* are both widespread along the Atlantic and Mediterranean coasts of Europe.

Overall, coastal sites proved to be the most species diverse, with between five and fifteen oniscid species recorded (mean per site 9.2 species). This included the four halophilous species mentioned above, but also species such as *P. hoffmannseggii*, *Ct. dorsalis*, *P. sexfasciatus* and *P. dispar*. In stark contrast, other lowland habitats, such as a garden, river-side scrub and woodland, which were not situated adjacent to the coast, proved to be the least species rich. Between three to eight species were recorded per site (mean 5.0 species). However, this did include the endemic *O. galicianus*, which was not recorded elsewhere. Semi-natural woodlands, which lay between 100 to 550m altitude, also held a good species diversity with between four and eleven species recorded per site (mean 7.4 species). This included the endemic species *M. bisetosus* and *P. herminiensis*.

Three species of Trichoniscid woodlice (sp. A, B & C) remain undetermined and may be new. Outline descriptions of these three species have been given herein, which should allow future specimens to be recognised pending clarification of their true identity or formal description. The oniscid fauna of the Iberian Peninsular is relatively poorly known compared to other parts of southern Europe. Glacial refuges, such as Italy and Greece, are known to support a large and diverse oniscid fauna (Schmalzfuss, 2003). It is highly probable that the Iberian Peninsular, another glacial refuge, holds an equally diverse fauna and that further species, such as these, await discovery.

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REFERENCES

- Bilton, D.T. (1997) The *Oniscus asellus* complex (Crustacea: Isopoda: Oniscidea) in the Iberian Peninsula with the description of a new species. *Revue suisse de Zoologie* **104**: 217-227.
- Bilton, D. (1993) Woodlice in northern Iberia. *Newsletter of the British Isopod Study Group* **35**: 5-6. Unpublished.
- Bilton, D.T. (1992) A new species of *Oniscus* Linnaeus, 1758 (Crustacea; Isopoda; Oniscidea) from northern Spain, with a revised key to members of the genus. *Zoological Journal of the Linnean Society*, **104**: 117-125.
- Cruz, A. (1993) Especies nuevas o poco conocidas de isópodos terrestres de la Península Ibérica. III. *Trichoniscoides pitarquensis* sp. n. y *T. serrai* sp. n. (Crustacea, Oniscidea, Trichoniscidae). *Bulletin de la Société d'Histoire naturelle de Toulouse* **127**: 15-21.
- Gruner, H.-E. (1966). Krebstiere oder Crustacea. V. Isopoda. 2. Lieferung. *Die Tierwelt Deutschlands*, **53**: 151-380. Jena.
- Mauriès, J.P. (2005) Attempt at a classification of Glomerida (Diplopoda), with descriptions of two new genera from the northwest of the Iberian Peninsula. *Arthropoda Selecta*, **14**: 241-249.
- Read, H.J. (2007) The millipede genus *Cylindroiulus* Verhoeff, 1894 in North-west Spain and northern Portugal: recent records and descriptions of four new species (Diplopoda, Julida, Julidae). *Graellsia*, **63**: 279-294

- Vandel, A. (1946) Crustacés isopodes terrestres (Oniscoïdea) épigés et cavernicoles du Portugal. *Anais da Faculdade de Ciências do Porto*, **30**: 135-427.
- Schmalfuss (2003) World catalog of terrestrial isopods (Isopoda: Oniscidea). *Stuttgarter Beitrage zur Naturkunde, Serie A*, **654**: 1-341.
- Schotte, M., Boyko, C.B, Bruce, N.L., Poore, G.C.B., Taiti, S., Wilson, G.D.F. (Eds) (2012). *World Marine, Freshwater and Terrestrial Isopod Crustaceans database*. Accessed through: World Register of Marine Species at <http://www.marinespecies.org/>