

GEOPHILOMORPH CENTIPEDES (CHILOPODA: GEOPHILOMORPHA) FROM NORTH-WEST SPAIN AND NORTHERN PORTUGAL COLLECTED BY THE BRITISH MYRIAPOD AND ISOPOD GROUP IN 2004

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ABSTRACT

The British Myriapod and Isopod Group 2004 field trip to southern Galicia and northern Portugal resulted in the collection of a number of geophilomorph centipedes (Chilopoda: Geophilomorpha). Samples were collected from a variety of locations from low-lying coastal areas to inland habitats up to 800m asl. Although 11 distinct geophilomorph taxa are recognised, the samples were dominated by four species, *Geophilus easoni*, *G. truncorum*, *Henia vesuviana* and *Strigamia crassipes*. Most of the species recorded occur widely across Western Europe and will be familiar to British workers. The discovery of *Arenophilus peregrinus* has implications on the conservation status of this rare species in Britain. One species of *Geophilus* remains undetermined and may be a new species. An outline description is given. The results have filled some gaps in the previous faunistic knowledge of north-west Iberia and have helped to put our own British and Irish fauna into a broader European perspective.

INTRODUCTION

In 2004 the British Myriapod and Isopod Group, under the auspices of the European Invertebrate Survey, undertook a short expedition to north-western Spain (Galicia) and northern Portugal. This region was targeted because it lies at the southern end of the Atlantic zone, is relatively under recorded for centipedes (Chilopoda), millipedes (Diplopoda) and woodlice (Isopoda: Oniscidea) and is likely to support a potentially interesting fauna. A better understanding of the fauna here will help put our own British fauna (at the northern end of the Atlantic zone) into a broader European context.

Some interesting results from this 2004 field meeting have been reported previously for millipedes (e.g. Mauriès, 2005; Read, 2007) and woodlice (Gregory, Lee, Read, & Richards, 2012). This article reports on the species of geophilomorph centipede (Chilopoda: Geophilomorpha) that were recorded during this field meeting.

MATERIALS AND METHODS

The group was based near La Guardia close to where the Rio Miño enters the Atlantic Ocean. 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. A map indicating the position of the localities is given in Fig. 1. The list localities sampled is given in Table 1, with habitat details and grid references.

The main taxa targeted by surveys were millipedes (Diplopoda), centipedes (Chilopoda) and woodlice (Isopoda: Oniscidea). Surveys were mainly undertaken in semi-natural habitats, including deciduous woodland, upland moorland and coastal sand-dunes and beaches. A few synanthropic habitats, including gardens, were also sampled. At most sites specimens were collected by hand searching as many micro-sites as practical at each site. This included searching the underside of large stones and fallen timber, the superficial soil layer beneath, among leaf-litter, under bark and within fallen and standing dead wood. At a few sites leaf litter was sieved.

Specimens were collected by Steve Gregory (SJG), John Lewis (JGEL), Desmond Kime (RDK), Paul Lee (PL), Helen Read (HJR) and Paul Richards (JPR). Species determinations were made by John Lewis (including material collected by RDK, PL and HJR) and Steve Gregory (including material collected by JPR). All specimens are stored in 75% ethanol and are currently retained within the personal collections of the authors.

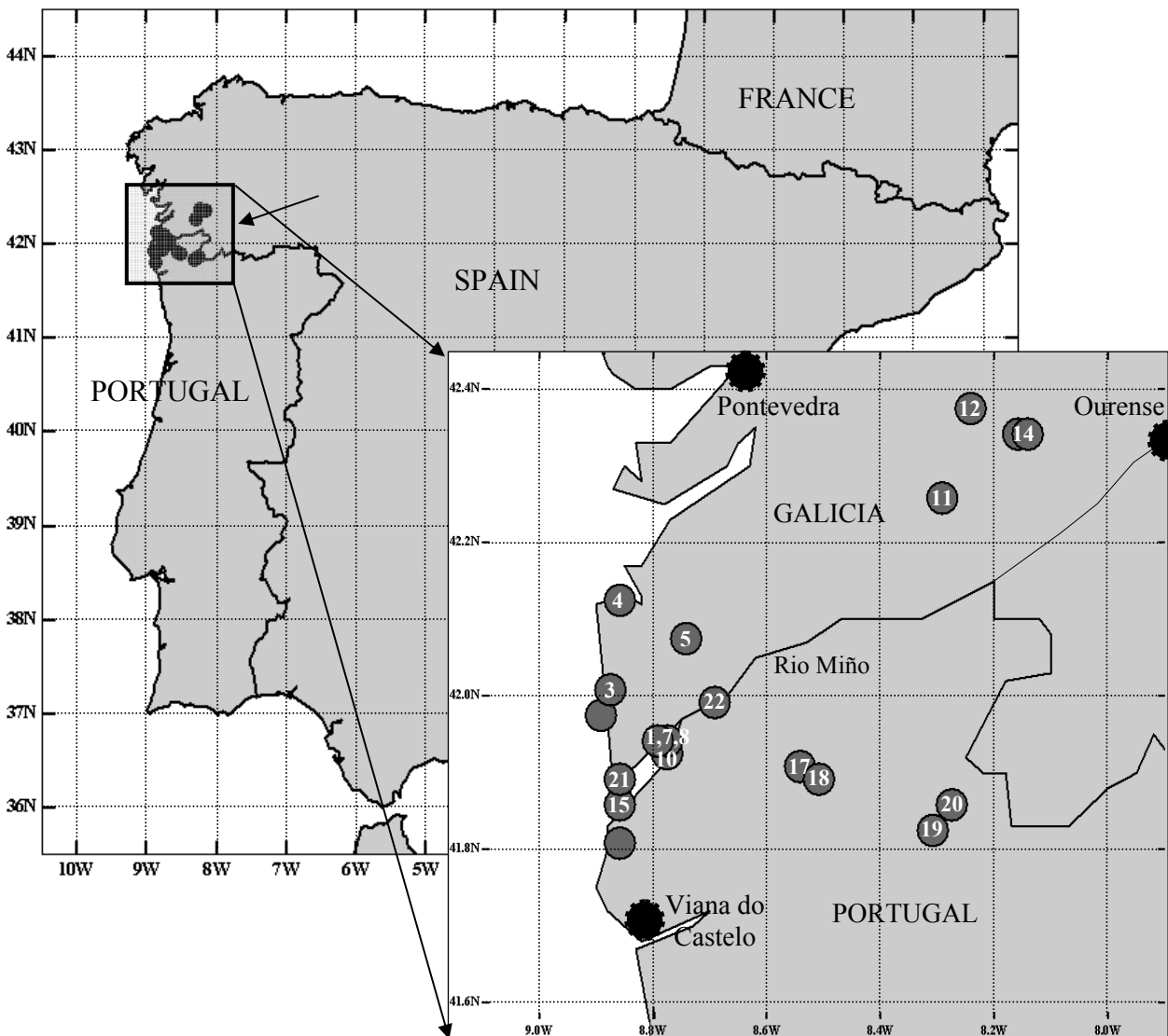


FIGURE 1: Map of Iberian Peninsula indicating survey area (top left) and enlargement of survey area (inset bottom right) to show location of sample sites in Galicia and northern Portugal.

TABLE 1: List of localities and habitats, from which geophilomorph specimens were collected

Site No.	Country	Province /Distrito	Locality and site details	UTM (29T)	Latitude-Longitude	Date of collection
1	Spain	Pontevedra	Finca Rio Miño, near Goián; Domestic garden	0519/4642	Not known	24.iii.2004
3	Spain	Pontevedra	Oia Harbour; Coastal site	0510/4650	42°00'06"N, 8°52'37"W	24.iii.2004
4	Spain	Pontevedra	Baiona; Coastal site	0511/4663	42°07'05"N, 8°51'56"W	24.iii.2004
5	Spain	Pontevedra	Gondomar; Deciduous woodland south of town	0520/4658	42°04'45"N, 8°44'59"W	24.iii.2004
7	Spain	Pontevedra	As Eiras; Alder <i>Alnus</i> wood	0519/4642	41°56'03"N, 8°46'06"W	25.iii.2004
8	Spain	Pontevedra	Between As Eiras & Goián; Inshore island, Rio Miño	0519/4642	41°55'54"N, 8°46'04"W	25.iii.2004
10	Spain	Pontevedra	As Eiras; Pine <i>Pinus</i> woodland	0517/4642	41°56'09"N, 8°47'08"W	25.iii.2004
11	Spain	Pontevedra	Puerto de Moncelos; Upland moorland	0558/4679	42°15'54"N, 8°17'48"W	26.iii.2004
12	Spain	Orense	Avión, valley of Rio Valdeiras; Mixed woodland	0562/4691	42°22'02"N, 8°14'29"W	26.iii.2004
14	Spain	Orense	Beade; Oak <i>Quercus</i> woodland, with chestnut & pine	0571/4688	42°20'27"N, 8°08'15"W	26.iii.2004
15	Portugal	Viana do Castelo	Caminho, Minho; Coastal woodland & dunes	0512/4635	41°51'02"N, 8°51'20"W	27.iii.2004
17	Portugal	Viana do Castelo	Castanheira; Oak <i>Quercus</i> woodland	0537/4639	41°54'09"N, 8°32'55"W	28.iii.2004
18	Portugal	Viana do Castelo	Vascões; Oak <i>Quercus</i> woodland	0540/4638	41°53'29"N, 8°30'37"W	28.iii.2004
19	Portugal	Viana do Castelo	Britelo; Roadside scrub & woodland	0557/4631	41°49'42"N, 8°18'31"W	28.iii.2004
20	Portugal	Viana do Castelo	Near Central de Lindoso power station; Wet woodland	0560/4634	41°51'34"N, 8°16'26"W	28.iii.2004
21	Spain	Pontevedra	Camposancos, near La Guardia; moorland "mid-slopes"	0511/4638	41°53'43"N, 8°51'55"W	29.iii.2004
22	Spain	Pontevedra	Amorin, Farmland; ditches & woodland verges	0525/4649	41°59'39"N, 8°41'31"W	29.iii.2004

TABLE 2: List of geophilomorph centipedes recorded, number of individuals collected at each site and summary of species data
(see Table 1 for details of each locality).

Family/Species	Spain												Portugal					No. of localities	No. of specimens	% abundance	
	1	3	4	5	7	8	10	11	12	14	21	22	15	17	18	19	20				
Himantariidae																					
<i>Haplophilus subterraneus</i>															1				1	1	1.4
Schendyliidae																					
<i>Schendyla nemorensis</i>							1												1	1	1.4
<i>Schendyla peyerimhoffi</i>			1																1	1	1.4
Dignathodontidae																					
<i>Henia vesuviana</i>	1									1	2					2	1	5	7	9.9	
Linotaeniidae																					
<i>Strigamia crassipes</i>								1					2	2	1			4	6	8.5	
Geophilidae																					
<i>Arenophilus peregrinus</i>																	1	1	1	1.4	
<i>Geophilus easoni</i>		1		2		1	5	3	1		14	1	4	2	1			11	35	49.3	
<i>Geophilus osquidatum</i>					1													1	1	1.4	
<i>Geophilus truncorum</i>		2	1	1		1	3				1	2			1		1	9	13	18.3	
<i>Geophilius</i> sp.					1													1	1	1.4	
<i>Gnathoribautia bonesis</i>	1										3							2	4	5.6	
Number of species per site:	2	2	2	2	2	2	3	2	1	1	4	2	2	3	4	1	3	-	71	100%	

RESULTS

In total 71 specimens of geophilomorph centipede were collected, comprising 11 species. Species diversity at a given locality was generally low, with just one to two species collected from most sites, but this could reflect the group's bias towards collecting millipedes and woodlice. The species recorded and the sites at which they were found are shown in Table 2, which also summarises the number of localities from which each species was recorded and their relative abundance.

Full details of species records are given in the taxonomic listing presented below. The records consist of the locality number (see Table 1), the number of collected specimens (differentiated into males and females) and comments about their collection and the known occurrence of that species in north-west Iberia and more widely across Europe. Species nomenclature follows Bonato & Minelli (2014).

GEOPHILOMORPH CENTIPEDES COLLECTED

Family Himantariidae

Haplophilus subterraneus (Shaw, 1789)

Portugal: Locality 18 (1 immature; SJG leg.)

A single immature specimen, 30mm in length, with 87 leg bearing segments (LBS), was collected from oak *Quercus* woodland at Vascões at about 500 metres asl. Although this specimen has more LBS than observed in Britain (Barber (2009) gives 77-83) this is in keeping with observations in lowland France where up to 89 LBS are reported (Brölemann, 1932). The specimen also lacks the virguliform fossae typical of British specimens, but Bonato & Minelli (2014) considered this to be not unusual in immature specimens (which were previously assigned to *H. s. var. complanta* Chalande & Ribaut, 1909).

Haplophilus subterraneus has a broad Atlantic distribution, being most frequent in western areas of Britain and France (Barber, 2009; Geoffroy & Iorio, 2009). However, it occurs widely across Western Europe from Spain northwards to Norway and eastwards to Poland (Minelli, et al., 2006 onwards), although interestingly Lindner (2007), in his review of this species' European distribution, did not mention any records occurring south of the Pyrenees.

Family Schendylidae

Schendyla nemorensis (C.L.Koch, 1837)

Spain: Locality 10 (1♀; JGEL leg.).

A single female specimen, with 37 LBS, was collected in pine *Pinus* woodland near As Eiras.

This species is very widespread across Europe and has been recorded from north-west Africa (Maghreb). It occurs widely throughout Britain (Barber, 2009) and is reported to be very common in France, especially on forest soils (Geoffroy & Iorio, 2009).

Schendyla peyerimhoffi Brölemann & Ribaut, 1911

Spain: Locality 4 (1♂; SJG leg.)

A single male specimen, with 37 LBS, was collected from beneath stones on coastal grassland near Baiona about 100m inland from the high tide level.

Considering its wide occurrence along the southern and western coasts of England and Wales (Barber, 2009), it seems surprising that there is just a single French record of *S. peyerimhoffi*, from the coast of Brittany (Geoffroy & Iorio, 2009). It has also been recorded from Portugal, where it occurs inland, and the Canary Isles and Morocco.

Family Dignathodontidae

***Henia vesuviana* (Newport, 1845)**

Spain: Localities: 1 (1♀; SJG leg.); 14 (1♀; JPR leg.); 21 (2♀; SJG, JGEL leg.)

Portugal: Localities: 19 (2♂; JGEL leg.); 20 (1♀; JPR leg.)

Found at five sites, this was the third most frequently recorded geophilomorph. The two males with 73 and 87 LBS, the largest reaching 47 mm in length. The females ranged between 83 to 87 LBS, reaching up to 53 mm.

Specimens were collected from beneath stones and dead wood at ground level, in a wide range of habitats including a domestic garden, mature deciduous woodland and open moorland.

Although this species distribution is centered on the western Mediterranean, including Portugal and Spain, it occurs widely throughout Europe (Lindner, 2007), and possibly also in northern Africa. It is widely distributed and fairly common in France (Geoffroy & Iorio, 2009), though it becomes decidedly local further north in southern Britain (Barber, 2009).

Family Linotaeniidae

***Strigamia crassipes* (C.L.Koch, 1835)**

Spain: Locality 11 (1♀; SJG leg.)

Portugal: Localities 15 (2♂; SJG, HJR leg.); 17 (2♂; JGEL, RDK leg.); 18 (1♀; JGEL leg.)

This species was recorded at four localities, including open moorland, oak *Quercus* woodland and coastal woodland.

Males with 45 or 47 LBS. The largest specimen, at 24 mm in length, with 18+16 coxal pores. Females with 47 or 49 LBS. The largest 26 mm long, with 14+12 coxal pores.

Although the range in LBS is slightly lower than seen in typical British specimens (Barber, 2009) specimens with 47 LBS are known in south Wales (Owen & Barber, 2014) and also in Italy (Bonato & Minelli, 2014). All specimens clearly showed a very slightly pigmented median cleft on the sternites characteristic of *S. crassipes*, and in those examined, the setae behind the anterior margin of the head occurred as a single continuous row, as noted by Iorio (2005).

This species has a holarctic distribution across Europe including mainland Portugal and Spain. It is common in France (Geoffroy & Iorio, 2009) and southern Britain (Barber, 2009).

Family Geophilidae***Arenophilus peregrinus* Jones, 1989**

Portugal: Locality 20 (1♀; JGEL leg.)

A single female specimen, 15 mm in length, with 47 LBS, was collected from under stones in open pine *Pinus* woodland near Central de Lindoso power station.

This species was first described from the Isles of Scilly (Jones, 1989), and is otherwise only known from two sites in Cornwall (Barber, 2009). Its discovery in northern Portugal suggests that it may have a widespread Atlantic distribution (and may have been overlooked in western France and Spain).

***Geophilus easoni* Arthur *et al*, 2001**

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

Portugal: Localities 15 (2♂, 2♀; SJG, JPR, JGEL leg.); 17 (1♂, 1♀; SJG, PL leg.); 18 (1♀; SJG leg.)

This was by far the most frequently recorded geophilomorph, with 35 specimens collected from eleven sites representing almost half of all the geophilomorph specimens collected. It was found in a wide array of habitats including, coastal grassland, oak *Quercus* woodland, pine *Pinus* woodland and upland moorland. All specimens were a uniform tan-orange in colour and were collected from beneath stones and dead wood at ground level.

Males typically had 51 or 53 LBS (one specimen with 47). The largest male was 36mm in length, with 7+8 coxal pores on the ultimate leg-bearing segment. Females mostly with 53 or 55 LBS (one specimen each with 49 and 51). The largest reaching 55mm, with up to 18+18 coxal pores.

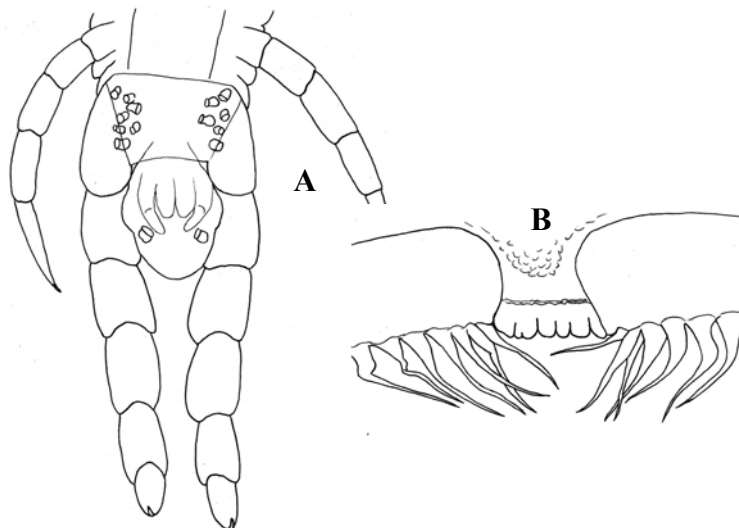


FIGURE 2: *Geophilus easoni* Arthur *et al* 2001, male, 34mm long, with 53 leg bearing segments. Locality 21; Camposancos ‘mid-slopes, moorland.

A) posterior extremity, ventral view, showing pores in coxopleuron; B) labrum, showing teeth of mid-piece, ventral view.

TABLE 3: Comparison of *Geophilus easoni* specimens collected from north-western Iberia with typical British *G. easoni* and *Geophilus carpophagus*

Character	<i>Geophilus easoni</i> North-western Iberia	<i>G. easoni</i> ~ UK (after Barber, 2009)	<i>G. carpophagus</i> ~ UK (after Barber, 2009)
Number of leg bearing segments	Male: (47) 51-53 Female: (49,51) 53-55	Male: 47-49 Female: 49-51	Male: 51-55 Female: 53-57
Adults: number of coxal pores	7-14 Typically easy to see	6-12 Typically easy to see	4-8 Often obscure
Labral mid-piece	Teeth stout, rounded, darker than side pieces	Teeth stout, rounded, darker than side pieces	Teeth elongate and pointed; same colour as sides
Max. length	to 55 mm	to 40 mm	to 60 mm
Body colour	Uniform tan/chestnut	Uniform tan/chestnut, any purple mottling feeble	Often strongly patterned with purple pigment
Typical habitat	Rural woodland, moorland	Rural woodland, moorland	Often synanthropic or coastal
Favoured microsites	Typically on ground surface, under stones, dead wood, etc.	Typically on ground surface, under stones, dead wood, etc.	Typically above ground level, on walls, tree trunks, rock faces, sea cliffs, etc.

Although most specimens have more LBS, and are larger, than described material (Arthur, *et al*, 2001) they otherwise conform to typical *G. easoni* in other aspects, such as the number of coxal pores and the darkly pigmented mid-piece of the labrum which bears blunt teeth (Fig. 2; Table 3). The number of leg bearing segments is known to be conspicuously variable within many geophilomorph species (Bonato & Minelli, 2014).

Beyond the British Isles typical specimens of *G. easoni* appears to be restricted to the Atlantic influenced extreme western parts of France (Geoffroy & Iorrio, 2009) as far south as the foothills of the Pyrenees (Gregory & Barber, 2010). However, it is probable that elsewhere in Europe the actual distribution is confused with that of *G. carpophagus s. str.* and possibly related species (Bonato and Minelli, 2011).

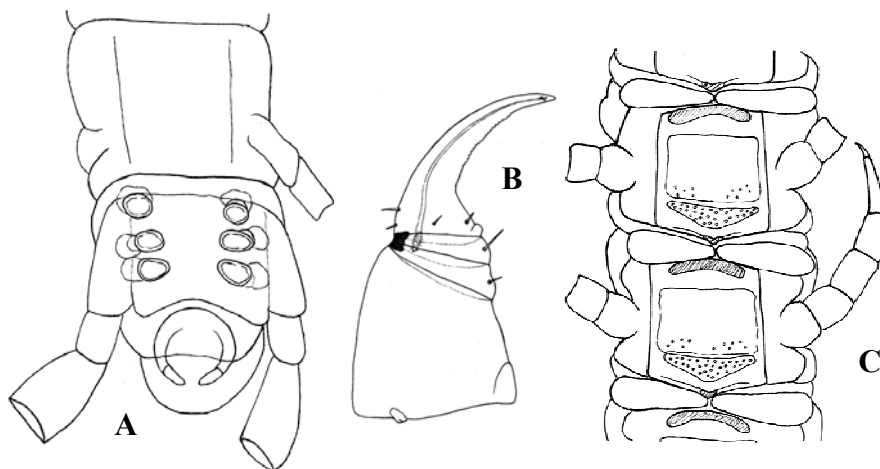


FIGURE 3: *Geophilus osquidatum* Brolemann, 1909, male, 32mm long, with 55 leg bearing segments. Locality 7; As Eiras, *Alnus* woodland.

A) terminal sternites, ventral view, showing 3+3 pores in coxopleuron; B) forcipule, ventral view; C) sternites 8-10, ventral view, showing fossae and sternal pore groups.

***Geophilus osquidatum* Brölemann, 1909**

Spain: Locality 7 (1♂; SJG leg.)

A single male specimen (Fig. 3), 30 mm in length, with 55 LBS was collected from beneath dead wood in alder *Alnus* woodland, near As Eiras.

Geophilus osquidatum has a broad Atlantic distribution and is most frequent in Western Europe, occurring from mainland Spain through western France (Geoffroy & Iorio, 2009) to Britain and Ireland (Barber, 2009). Scattered records occur in Italy, Czech Republic and Germany.

***Geophilus truncorum* Bergsøe & Meinert, 1866**

Spain: Localities 3 (2♀; SJG leg.); 4 (1♂; JGEL leg.); 5 (1♀; JGEL leg.); 8 (1♂; JPR leg.); 10 (1♂, 2♀; HJR leg.); 21 (1♂; JGEL leg.); 22 (1♂, 1♀; HJR leg.)

Portugal: Localities 18 (1♂; SJG leg.); 20 (1♀; SJG leg.)

This was the second most widely recorded geophilomorph (after *G. easoni*), with 13 specimens (18% of those collected) found at nine sites. Specimens were mainly found beneath bark and within dead wood in a variety of habitats, including coastal sites, pine *Pinus* woodland, oak *Quercus* woodland, and open moorland.

Geophilus truncorum has a broad Atlantic distribution. There are records from Morocco, Portugal and Spain (Minelli *et al.*, 2006 onwards) and it is widely distributed in western France (Geoffroy & Iorio, 2009) and occurs throughout Britain and Ireland (Barber, 2009). Although most frequent in Western Europe, it reaches Poland and Italy.

***Geophilus* sp.**

Spain: Locality 7 (1♂; SJG leg.)

A single male specimen was collected from beneath dead wood in damp alder *Alnus* woodland near As Eiras. This is a lowland, riverine habitat. Despite having a number of distinctive features (described below) it has not proved possible to make a definitive determination. In the mean time a brief description given here.

The specimen is 18 mm in length by 0.6 mm wide (at the widest point) and with 43 LBS. Given its relatively small size it may be immature. It has the typical appearance of a *Geophilus* species. The head is longer than broad; the forcipular tergite is trapezoidal; carpophagus fossae are present on sternites two to twelve (Fig. 4B); and the sternites bear traverse pore groups towards the posterior margin, with three shallow longitudinal 'gutters' running the full length of the body. The forcipules are relatively short and stout, with the tarsungulum bearing a small, but pronounced, denticle at its base (Fig. 4C). The first maxillary telopodite bears a prominent claw (Fig. 4D). Of significance is that the coxal pores of the ultimate leg pair (which number 11+12) cover the entire ventral surface of the coxopleura (Fig. 4A). The ultimate legs of are slightly swollen and terminate in a prominent claw.

The distribution of coxal pores over the entire ventral surface of the coxopleura suggests an affinity to the *Geophilus pyrenaicus* species complex. Examination of Table 4 indicates that it is most similar to *G. pyrenaicus* Chalande, 1909, but considering its small size it has too many coxal pores.

It has far too few LBS to be *G. chalandei* Brölemann, 1909, or *G. studeri* Rothenbühler, 1899, (minimum 59 or 53, respectively). In addition, all known nominal species within this complex are recorded from upland areas from the Pyrenees to the Alps. None are known from lowland regions, or from the Iberian Peninsula south of the Pyrenees.

Considering its small size, the relatively large number of coxal pores and its geographic location, this may be a new species.

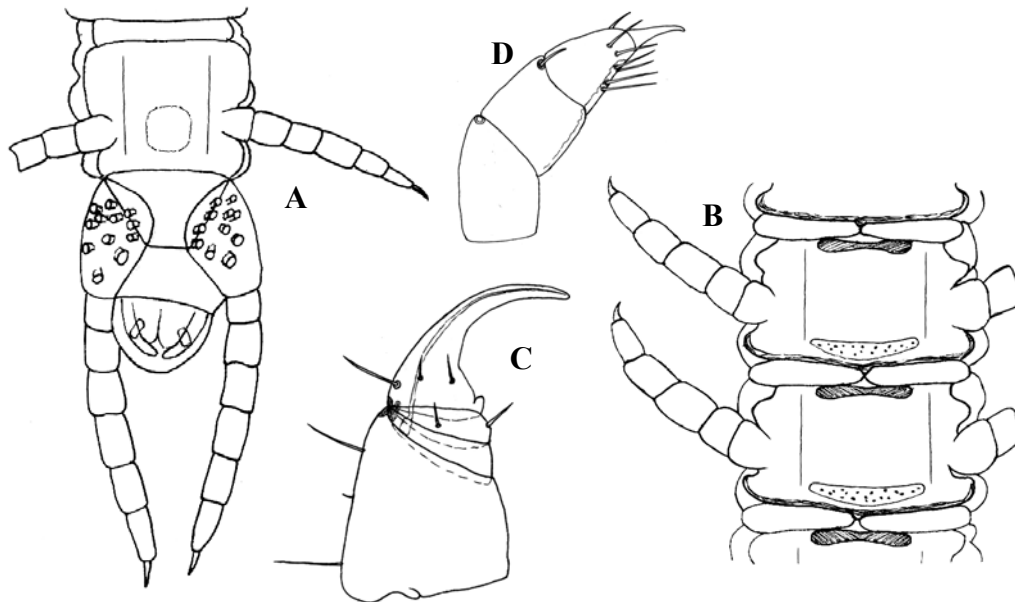


FIGURE 4: *Geophilus* sp., male, 18mm, with 43 leg bearing segments. Locality 7; As Eiras, *Alnus* woodland.

A) posterior extremity, ventral view; B) trunk segments 8-9, ventral view; C) forcipule, ventral view; D) first maxillary telopodite, ventral view.

TABLE 4: Comparison of *Geophilus* sp. collected from site 7 with other nominal species within the *Geophilus pyrenaicus* species complex and with *G. alzonis* Attems.

(Data initially compiled by Lucio Bonato, January 2011, synonymy follows Bonato & Minelli, 2014)

Nominal species	Current status	No. of LBS	Coxal pores	Max. length	Published records
<i>Geophilus</i> sp. ♂, Locality 7	unknown	43	11+12	18 mm	Galicia, lowland
<i>G. pyrenaicus</i> Chalande, 1909	valid species	43-51(-69)	4-10	30 mm	Pyrenees & Massif Central
<i>G. chalandei</i> Brolemann, 1909	valid species	59-71	11-15	44 mm	Pyrenees
<i>G. studeri</i> Rothenbühler, 1899	valid species	53-57	8-21	35 mm	Central-Western Alps
<i>G. padbergi</i> Verhoeff, 1939	= <i>studeri</i>	55	6-8	17 mm	Mountains, SW Germany
<i>G. silvaenigrae</i> Verhoeff, 1937	= <i>studeri</i>	55	8	23 mm	North-western Alps
<i>G. alzonis</i> Attems, 1952	unknown [#]	37-51	5-10 [#]	?	Spain

[#] In *G. alzonis* the ventral pores of the coxopleuron lie close to margin of metasternite. A nominal species of uncertain validity (Bonato & Minelli, 2014)

***Gnathoribautia bonesis* (Meinert, 1870)**

Spain: Localities 1 (1 specimen; SJG leg.); 21(1♂, 2 immatures; HJR, SJG leg.)

All specimens with 79 LBS. One specimen was found among debris in a domestic garden; the remainder beneath dead wood and stones on upland (but coastal) moorland.

Gnathoribautia bonesis inhabits the western Mediterranean region. In addition to Spain and Portugal, it also occurs in Algeria, Morocco and Tunisia in North Africa, and off shore islands such as the Canaries and the Azores. It has also been recorded from Sicily (Italy).

DISCUSSION

In total, 11 species of geophilomorph centipede were collected during the BMIG field meeting in Galicia in 2004. Two species, *Geophilus easoni* and *G. truncorum*, proved to be very widespread and numerous in the region. Recorded from eleven and nine localities, respectively, they account for 68% of the geophilomorph specimens collected (Table 2). Two additional species, *Henia vesuviana* and *Strigamia crassipes*, were also frequently encountered. These four species were collected from a wide range of habitats. The remaining species were encountered in small numbers at one or two sites.

One species of *Geophilus* remains undetermined and may be a new species. The brief description of this species provided should allow any future specimens to be recognised, pending clarification of their true identity. Although the distribution of pores on the coxopleura of the ultimate legs suggests an affinity to the *Geophilus pyrenaicus* species complex, the large number of coxal pores, relative to its small size, rules out the known described species, which all occur in upland areas from the Pyrenees to the Alps (Table 4). The specimen also bears some similarity to *G. alzonis* Attems, 1952, which has been recorded from north-west Spain (Pamplona), including the number of leg bearing segments and number of coxal pores. However, the coxal pores in *G. alzonis* are stated to lie close to margin of metasternite (as in most *Geophilus*) and not scattered over the entire ventral surface, as in the unidentified specimen. Bonato & Minelli (2014) consider *G. alzonis* to be a nominal species whose actual taxonomic value remains uncertain because its morphology is inadequately known. Thus, it is highly desirable to collect additional material of this unidentified species in order to confirm whether or not it is an anomalous specimen of a known species, or if it is new.

Recent studies indicate that *Geophilus carpophagus* comprises a group of closely related species (the *Geophilus carpophagus* species-complex) which have a broad distribution from northern Africa and across Europe (Bonato and Minelli, 2011). So far only three species have been clearly distinguished; *G. carpophagus* s. str. Leach, 1814, and *G. easoni* Arthur, et al, 2001, from Europe and *Geophilus arenarius* Meinert, 1870, from North Africa. The confirmed records for *G. easoni* suggest that it has a strict Atlantic distribution extending from Britain and Ireland and through western France to at least the foothills of the Pyrenees (Gregory & Barber, 2010). Thus, its occurrence in north-western Iberia is not unexpected. Although having a wider range of leg bearing segments (47-55) compared to the UK (47-51) it is not unusual for geophilomorph centipedes to show regional variation in this character (Bonato & Minelli, 2014).

The discovery of *Arenophilus peregrinus* in northern Portugal is of great significance. The few other known records for this species are from south-western Britain (Barber, 2009). On the basis that other known species of *Arenophilus* occur in North America, Jones (1989) suggested that *A. peregrinus* may have been imported to the Isles of Scilly (the type locality) with introduced exotic plants.

Unfortunately, its subsequent discovery on the Cornish mainland at a coastal site (Gregory & Jones, 1999) and inland woodland (Barber, 2008) has not helped clarify its status as an imported or native species in Britain. In light of the Portuguese record, it seems probable that *A. peregrinus* is a genuine native of Western Europe and therefore, considering the paucity of records, should be considered to be of high conservation status. Other taxa, such as the woodlouse genus *Miktoniscus* Kesselyak, 1930 (Isopoda: Oniscidea), are known to include native species from both side of the Atlantic Ocean. Unfortunately, *A. peregrinus* is inconspicuous and likely to be under-recorded. Additional data from targeted surveys of the Atlantic coasts of Europe and the USA will help elucidate its status in Europe.

It is apparent that the majority of the geophilomorph species recorded exhibit Atlantic distributions, favouring the mild and humid conditions found in Western Europe. Five species, *Haplophilus subterraneus*, *Schendyla nemorensis*, *Geophilus easoni*, *G. osquidatum* and *G. truncorum* have broad Atlantic distributions that penetrate, to a greater or lesser extent, eastwards into central Europe. Occurring along the western European coastline *Schendyla peyerimhoffi* has a strict Atlantic distribution. It is possible that *Arenophilus peregrinus*, previously only known from south-west England, and the unidentified *Geophilus* sp. may also have strict Atlantic distributions. In contrast the genera *Henia* and *Gnathoribautia* have their highest species richness centred on the Mediterranean region (Bonato & Minelli, 2009), with both *H. vesuviana* and *G. bonesis* having western (occidental) Mediterranean distributions. The exception to these distribution patterns is *Strigamia crassipes*, a centipede with a broad holartic distribution, which occurs widely throughout Europe.

This field trip has filled some gaps in previous faunistic knowledge of north-west Iberia and has helped to put our own British and Irish fauna into a broader European perspective. None-the-less, our knowledge of the geophilomorph fauna of north-west Iberia remains far from complete.

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REFERENCES

- Arthur W., Foddai D., Kettle C., Lewis J.G.E., Luczynski M., Minelli A. (2001) Analysis of segment number and enzyme variation in a centipede reveals a cryptic species, *Geophilus easoni* sp. nov., and raises questions about speciation. *Biological Journal of the Linnean Society* **74**: 489-499.
- Barber, A.D. (2008) Some recent Cornish myriapod records. *British Myriapod & Isopod Group Newsletter*. **17**: 3-4 (unpublished).
- Barber, A.D. (2009) *Centipedes*. Synopses of the British Fauna (New Series) **58**. Shrewsbury, Field Studies Council. pp. 96.
- Bonato, L. & Minelli, A. (2009) Geophilomorph centipedes in the Mediterranean region: revisiting taxonomy opens new evolutionary vistas. *Soil Organisms* **81**: 489–503.
- Bonato, L. & Minelli, A. (2011) *Geophilus arenarius*, a long-misunderstood species in the still unresolved *carpophagus* species-complex (Chilopoda: Geophilidae). *Zootaxa* **3114**: 40–49.

- Bonato, L. & Minelli, A. (2014) Chilopoda Geophilomorpha of Europe: a revised list of species, with taxonomic and nomenclatorial notes. *Zootaxa* **3770** (1): 001–136.
- Brolemann, H.W. (1932) Éléments d'une Faune des Myriapodes de France, Chilopodes. *Faune de France*, **25**. Imprimerie Toulousiane.
- Geoffroy, J-J & Iorio, E. (2009) The French centipede fauna (Chilopoda): updated checklist and distribution in mainland France, Corsica and Monaco. *Soil Organisms* **81**: 671-694.
- Gregory, S. & Barber, A.D. (2010) Observations of a population, including juveniles, of *Geophilus carpophagus* Leach, 1815, *sensu stricto* from Oxfordshire. *Bulletin of the British Myriapod & Isopod Group* **24**: 2-15.
- Gregory, S.J. & Jones, R.E. (1999) *Arenophilus peregrinus* Jones, 1989 in Cornwall: a centipede new to mainland Britain. *Bulletin of the British Myriapod Group* **15**: 28-29.
- Gregory, S.J., Lee, P., Read, H.J. & Richards, J.P. (2012) Woodlice (Isopoda: Oniscidea) collected from northwest Spain and northern Portugal in by the British Myriapod and Isopod Group. *Bulletin of the British Myriapod and Isopod Group* **26**: 6-23.
- Iorio, E. (2005): *Strigamia transsilvanica* (Verhoeff, 1928), espèce nouvelle pour la faune de France (Chilopoda, Geophilomorpha, Linotaeniidae). *Bulletin de la Société linnéenne de Bordeaux (NS)* **140**: 33(3), 195-198.
- Jones, R.E. (1989) On a new species of centipede (Chilopoda, Geophilomorph) from the Isles of Scilly. *Journal of Natural History* **23**: 627-633.
- Lindner, E.N. (2007) Einige Anmerkungen zum Vorkommen von *Stigmatogaster subterraneus* (Shaw, 1789) und *Henia vesuviana* (Newport, 1845) (Chilopoda: Geophilida) in Deutschland sowie Überblick über deren Verbreitung in Europa. *Schubartiana* **2**: 49-56.
- 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.
- Minelli A., Bonato L., Dioguardi R. *et al.* (2006 onwards) Chilobase: a web resource for Chilopoda taxonomy. Publicly searchable at <http://chilobase.bio.unipd.it>
- 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.
- Owen, C. & Barber, A.D. (2014) Abnormal coxal pores in a specimen of *Strigamia crassipes*. *Bulletin of the British Myriapod & Isopod Group* **27**: 36-37.