

CERATOSPHTYS AMOENA RIBAUT, 1920 AND HYLEBAINOSOMA NONTRONENSIS MAURIÈS & KIME, 1999 NEW TO BRITAIN (DIPLOPODA: CHORDEUMATIDA)

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ABSTRACT

Two species of millipede are recorded new to Britain: *Ceratosphys amoena* Ribaut, 1920 (Chordeumatida: Opisthocheiridae) and *Hylebainosoma nontronensis* Mauriès & Kime, 1999 (Chordeumatida: Haaseidae), having been discovered together at Bargoed, Glamorganshire, in September 2014. Both are described and illustrated in detail, enabling their identification. British records are reviewed. Summary information is provided on the foreign distribution and habitats of both species. It is noted that the British specimens of *C. amoena* match the description of *Ceratosphys confusa* Ribaut, 1955, currently treated as a synonym of *amoena*. For *H. nontronensis*, it is noted that Welsh specimens possess a prominent spine on the gonopod which is apparently absent from the holotype; presumably intra-specific variation but meriting further research. Uncertainties in the generic placement of *nontronensis* are briefly discussed. The question of whether both species are native to Britain or have been introduced is debated at some length, generating testable predictions and proposals for genetic analyses of these millipedes and of other invertebrates with similar geographical distributions.

INTRODUCTION

On 28th September 2014, MGT and David J. Gibbs, along with Jo Hodgkins and Bradley Telfer, arranged to meet up with CO at Bargoed, on the Glamorganshire (VC 41) side of the Rhymney Valley, South Wales. MGT and DJG were keen to see some of the more unusual invertebrate species which CO has found in this area, including the Ghost Slug *Selenochlamys ysbryda* Rowson & Symondson, 2008, the harvestman *Sabacon viscayanum* Dresco, 1952, the millipede *Propolydesmus testaceus* (C.L. Koch, 1847) and the centipede *Lithobius tricuspis* Meinert, 1872. While searching (successfully) for these species, some millipede specimens were collected for later identification.

Our samples were found to contain two species which had not previously been recorded from Britain: *Ceratosphys amoena* Ribaut, 1920 (Chordeumatida: Opisthocheiridae) and *Hylebainosoma nontronensis* Mauriès & Kime, 1999 (Chordeumatida: Haaseidae). For a more detailed, informal account of the field meeting and the subsequent discovery of these two millipedes, see Telfer (2014a, b).

CERATOSPHERYS AMOENA RIBAUT, 1920

Discovery

The first British specimen to be recognised was a male collected by MGT from the underside of a log in beech *Fagus* woodland at Groes-faen Wood (c. SO143007), along a footpath between the hairpin bend in the A469 road and Groes-faen Farm. It was provisionally identified as *Craspedosoma rawlinsii* Leach, 1814 in the field, with which it shares similar colouration and patterning, but an examination of the gonopods and paragonopods suggested it was a species new to Britain. This was confirmed by SJG and RDK and the specimen was first identified as *Ceratosphrys amoena* by JS on 9th October, from photographs and sketches.

Foreign distribution and habitats

Ceratosphrys amoena occurs in the contiguous Departments of Tarn, Aude, Ariège, Haute-Garonne and Hautes-Pyrénées in south-western France. Within this range, the form *confusa* Ribaut, 1955 is the most widespread form, occurring in the Departments of Tarn, Aude, Ariège and Haute-Garonne, the forms *amoena sensu stricto* Ribaut, 1920, *taurus* Ribaut, 1956 and *dentata* Ribaut, 1956 are only known from Ariège and the form *aurensis* Mauriès, 1966 only from Hautes-Pyrénées. In addition, RDK has found *C. amoena* (form *confusa*) on several occasions in the Meuse valley in Belgium, collected from deep litter in forested areas, often on Carboniferous limestone.

Identification

Using Blower (1985), *Ceratosphrys amoena* will key either to *Nanogona polydesmoides* (Leach, 1814) due to its well-developed paranota, or to *Craspedosoma rawlinsii* if emphasis is placed on its body length (11 - 12.5 mm). In the field it is easily confused with the latter. However, it differs from both in its smaller size, its relatively long macrosetae and its distinct body pigmentation. Mature male specimens may be readily identified from the distinctive profile of the gonopods in lateral view.

Description

This description is based on recently collected material, 3 males and 3 females, preserved in 70% isopropyl alcohol.

Adults with 30 body rings (pleurotergites) and therefore mature at stadium IX. Males are between 11.0 and 12.0 mm in length, body height some 0.9 mm (15th body ring). Females are slightly larger, up to 12.5 mm long, by 1.0 mm ring height.

Head with frons flattened in males, slightly convex in females. Antenna length about 1.75 mm in males and females. Eyes comprise 26 - 27 well pigmented ocelli arranged in a broad equilateral triangle (Fig. 1A), typically arranged in vertical rows of 1, 7, 6, 5, 4, 3 and 1.

Body colour highly characteristic. Much of the dorsal surface, including the dorsal surface of the paranota, is orange brown, with a contrasting dark brown longitudinal stripe, about ¼ the width of the body (including paranota), running the entire length of the animal. The lateral parts, below the paranota are also dark brown (Figs. 3 & 4). Dorsal parts of body smooth, but lateral areas between and beneath paranota with fine striae.

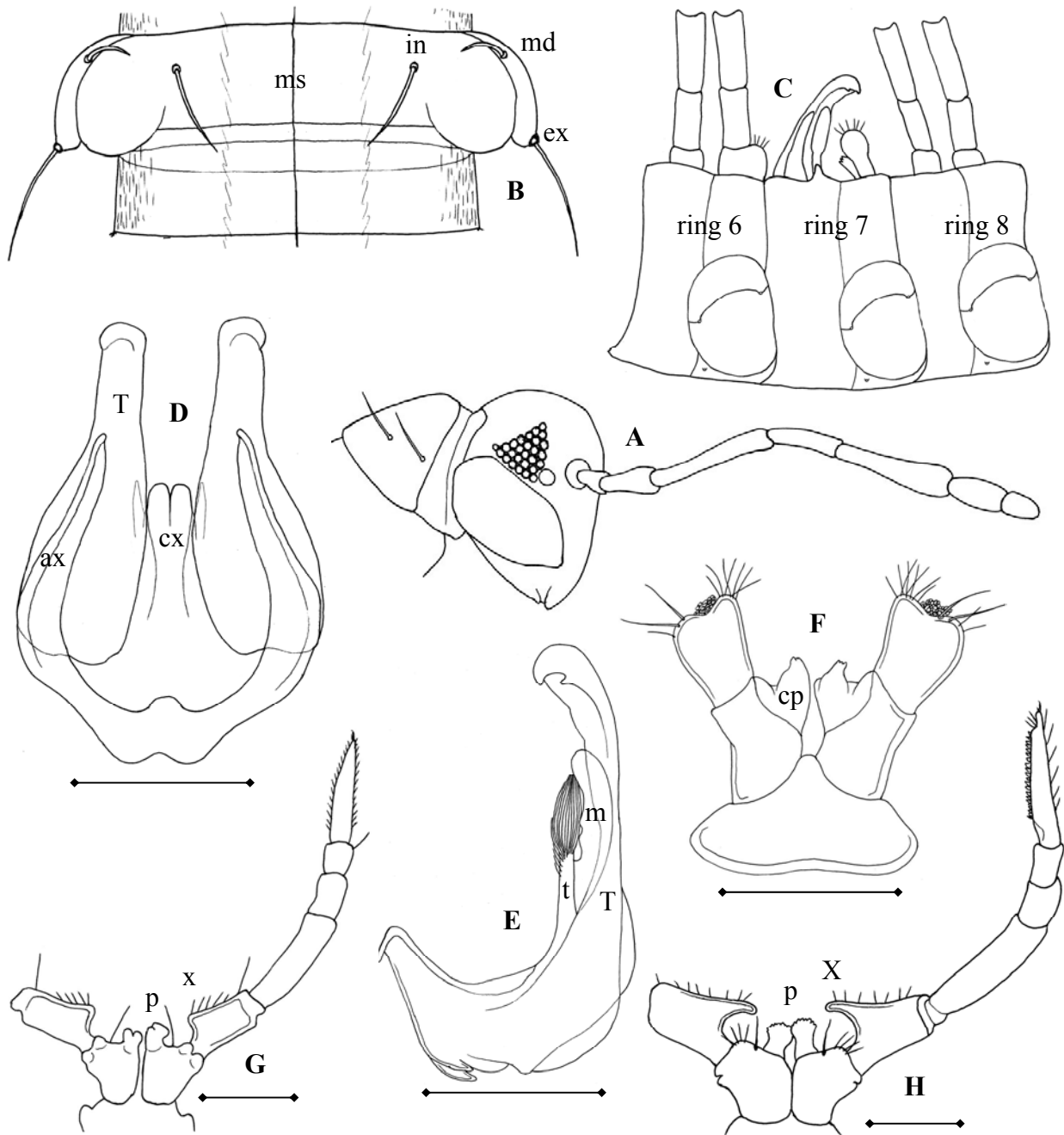


FIGURE 1: *Ceratosphys amoena* from Groes-faen Wood.

A) Female, head and antenna, right lateral view. B) Female, body ring 15, dorsal view. C) Male, body rings 6, 7 & 8, right lateral view. D) Male, gonopods (leg pair 8), anterior view. E) Male, telopodite (leg pair 8), left lateral external view. F) Male, paragonopods (leg pair 9), anterior view. G) Male, leg pair 10, anterior view. H) Male, leg pair 11, anterior view. All scale bars = 0.25 mm.

Paraterga (paranota) expanded laterally as a low keel, and very prominent in dorsal view (Figs. 1B & 3), though not as pronounced as seen in *Nanogona polydesmoides*.

Tergites each with three pairs of macrosetae; each macroseta elongated and gently curved to a fine point (Fig. 1B). The length of the longest exceeds the length of the associated metazonite. The external (ex) and median (md) macrosetae sit laterally on the paranotal keel. The internal macroseta (in) sits dorsally above the main bulge of the paranota.

On body ring 15, the angle formed by the bases of the three macrosetae is about 95-105°. The distance between bases of external and median macrosetae approximately equal to distance between bases of median and internal macrosetae (ring 15 examined). The distance between medial suture (ms) and base of internal macroseta slightly greater than distance between bases of median and internal macrosetae.

Male: leg pairs 1 to 7

In males, leg pairs 1 and 2 are much reduced in size, contrasting with leg pairs 3 - 7 which are more robust than other walking legs (or those of females). Coxa of leg 7 (6th body ring) expanded posteriorly into a small bulge (Fig. 1C).

Male: gonopods (leg pair 8)

The gonopods are not fully retracted into the body and in lateral view are of highly characteristic shape, visible even in the live animal (Figs. 1C & 1E). The telopodites are divided into two branches. In lateral view, the longer anterior branch (T) initially tapers from its base but beyond mid height it becomes slightly swollen and distally curves over to form a hooded tip. The shorter posterior branch (t) is about half this length, the distal part fringed by a brush of long dark hairs. Between the two telopodite branches lies a translucent membranous structure (m), with a convex anterior edge, and a sinuous posterior edge.

In anterior view (Fig. 1D) the main branch of the telopodite (T) tapers from its broad base to a wide rounded tip. The smaller posterior 'brush' is hidden from view. The elongated lateral horn of the horseshoe shaped angiocoxite (ax) sits anterior to, and rises beyond mid-height of, the telopodites. The colpocoxite (cx) is a wide blade lying centrally and posterior to the telopodites. It has four lobes apically. The larger rounded median pair is visible between the telopodites. The narrow exterior lobes are obscured from view.

Male: paragonopods (leg pair 9)

Paragonopods are reduced, consisting of two articles, rising from a subtriangular sternal plate (Fig. 1F). Basal article bears on its internal edge a prominent conical process (cp). Terminal article is split into two distal lobes. The external lobe is rounded and bears a few stout setae. The internal lobe is more triangular and bears a number of finer setae.

Male: leg pair 10

Coxae with medially directed swollen process (p) on their internal face (Fig. 1G). Base of prefemur with a small rounded lobe on its internal face (x).

Male: leg pair 11

Internal face of coxae with medially directed swollen process (p) covered in small dimples (Fig. 1H). Ventral edge of prefemur with strong extension (X) which tapers to a curved rounded tip directed towards its base. Metatarsus bears a row of scale-like setae on its internal face.

Female characters

In females all leg pairs are normally developed, with medial pairs longest, gradually decreasing in length towards the head and telson. Female vulvae were not examined.

Variation and the taxonomic status of *Ceratosphys confusa* Ribaut, 1955

Welsh specimens clearly match the description of *Ceratosphys confusa* Ribaut, 1955, which was described by comparison to *amoena*, with the principal differences being in the structure of the gonopods and paragonopods. Mauriès (1978) treated *confusa* as a subspecies of *amoena*. By omitting *confusa* altogether, it seems Demange (1981) and the authors of the Fauna Europaea (<http://www.faunaeur.org/experts.php?id=42>) myriapod pages may have opted to treat *confusa* as a mere synonym of *amoena*.

On first impression, Ribaut's illustrations of the gonopods and paragonopods of *amoena sensu stricto* and *confusa* seem strikingly different and it is difficult to understand how they could be regarded as synonymous. However, detailed studies of variation within and between millipede species, such as JS's studies of genus *Rhymogona* (Spelda, 1999), have revealed the potential for enormous intraspecific variation, analogous to the variation in antler structure of Red Deer *Cervus elaphus* Linnaeus. Similar detailed studies of genus *Ceratosphys* are much needed. In the meantime, we treat *confusa* as a form of *amoena*, while noting that if form *confusa* were to be elevated to subspecies or species status, it is *confusa* rather than *amoena sensu stricto* that we have found in Wales.

Ceratosphys amoena was described as 11 mm long (Ribaut, 1920) and *C. confusa* was described as being the same size as *amoena* (Ribaut, 1955). Our Welsh specimens thus appear to be somewhat larger at 11 - 12.5 mm. *C. amoena* was also described as having 25 ocelli in six rows of 1, 7, 6, 5, 4 and 2, fewer than the 26 - 27 ocelli found in Welsh specimens.

British records

CO has checked all the specimens standing as *Craspedosoma rawlinsii* in the National Museum of Wales, Cardiff. One sample proved to be of *Ceratosphys amoena*: 2 males and 1 ?female, Under bark of dead wood, Cefn Onn, South Glamorgan (ST177840), 11th November 1983, leg. and det. N. Nethercott, NMW.Z.1984.010.00029.

CO began recording millipedes in September 2011 after acquiring a copy of Blower (1985). A check of the specimens labelled as *Craspedosoma rawlinsii* in his collection has yielded two records made in October and November of that year (Table 1).

CO returned to the Groes-faen Wood on 5th October and collected further specimens of *C. amoena* by sieving leaf-litter. Subsequent fieldwork by CO has found *C. amoena* to be fairly common in the Welsh Valleys, occurring in a range of habitats including rough grassland, brownfield sites, an old overgrown landfill site, an unkempt cemetery, Rhôs pasture, Heather *Calluna vulgaris* and

Whinberry *Vaccinium myrtillus* heathland, Bracken *Pteridium aquilinum* heathland, hedgerows and woodland (including wet woodland). It has been found at the edge of a conifer plantation but the interior of the plantation has not yet been surveyed. It has been found by searching leaf-litter, turning over logs and stones, and by torchlight searching of rocks for active individuals. It has also been found in association with decaying wood: under bark of a standing dead tree, in a rot-hole 8ft up an apple tree, and in rotten wooden fence-posts.

From west to east, *C. amoena* has been recorded in the Taff Valley (ST08989264, Coed Pant-du Isaf, Cilfynydd), widely in the Rhymney Valley and also in the Sirhowy and Ebbw Valleys, and also southwards to Cardiff (Fig. 2).

TABLE 1: The first four British records of *Ceratosphys amoena* in chronological order.

Locality	Grid reference	Specimens	Date	Collector
Cefn Onn, South Glamorgan	ST177840	2 ♂♂ and 1 ♀♀?	11.xi.1983	N. Nethercott
Coed Groes-faen	SO132010	1 immature	27.x.2011	CO
Aberbargoed grasslands	ST16249923	1 immature	3.xi.2011	CO
Groes-faen Wood	c. SO143007	1 adult ♂	28.ix.2014	MGT

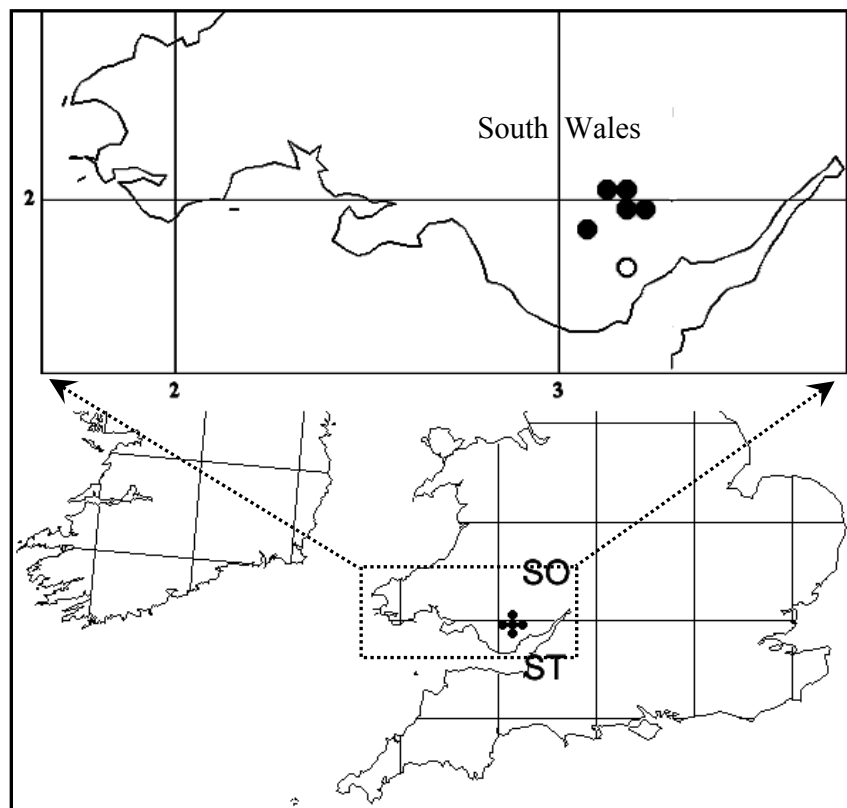


FIGURE 2: Known distribution of *Ceratosphys amoena* in Britain up to December 2014. Main map plotted at 10km resolution, inset at 5km resolution. Solid dot (●) = post 2011 records, open circle (○) = record from 1983



FIGURE 3: *Ceratosphys amoena*
Male specimen in dorsal view



FIGURE 4: *Ceratosphys amoena*
Male specimen in lateral view

HYLEBAINOSOMA NONTRONENSIS MAURIÈS & KIME, 1999**Discovery**

Small, whitish Chordeumatida millipedes were abundant in beech *Fagus* leaf-litter on 28th September 2014 in the same area of Groes-faen Wood, and indeed under the same log, where *C. amoena* was discovered. MGT sieved two or three handfuls of leaf-litter over a tray and collected 11 specimens of the 30 or more in the tray. They were tentatively identified as a *Melogona* species in the field but later examination revealed blunt paranota on the body rings, and also that all specimens were immature. All CO's and DJG's specimens were also immature.

CO returned to the wood on 5th October to collect further specimens of *C. amoena* (though still unidentified at that time). In the process, he easily found over 60 of the small, whitish Chordeumatida, and though still all immatures, he recognised that these were potentially another species new to Britain. He also recognised that they were conspecific with an adult female specimen in his collection from Bedwellty Church (c. SO166003, VC 35) collected on 23rd November 2011 and labelled as *Craspedosoma rawlinsii*.

By 9th October, CO had collected further adults from Bedwellty Church and from Groes-faen Wood and sent specimens to SJG who was able to confirm that these were of another species previously unrecorded from Britain. RDK first identified the species as *Hylebainosoma nontronensis* on 26th October from photographs and drawings by SJG. Subsequently, JS has confirmed that Welsh specimens match specimens of *H. nontronensis* from Brive-la-Gaillarde in the French Department of Corrèze.

Foreign distribution and habitats

Mauriès and Kime (1999) described *H. nontronensis* using specimens collected by RDK from three localities on the western edge of the Massif Central in the French Departments of Haute-Vienne and Dordogne. RDK has subsequently collected *H. nontronensis* from a further two localities in the same area, all from woods on neutral to acidic soils over metamorphic and igneous geology. In addition, JS has seen specimens collected by Axel Schönhofer from Brive-la-Gaillarde in the neighbouring French Department of Corrèze.

Identification

In Blower (1985), *H. nontronensis* will key to *Craspedosoma rawlinsii* due to its weakly developed paranota. However, it differs in its much smaller size (8 - 10 mm vs 15 - 16 mm), its longer body setae (shorter in *C. rawlinsii*), and its arrangement of ocelli (very acute triangle vs broad equilateral triangle). Mature male specimens can be readily identified due to the very distinctive profile of the gonopods in lateral view.

Description

This description is based on recently collected material, 3 males and 3 females, preserved in 70% isopropyl alcohol.

Adults with 30 body rings (pleurotergites), and therefore mature at stadium IX. Males have a body length of 8.5 - 9.0 mm and a body height of 0.85 - 0.90 mm (15th body ring). Females are slightly longer at 9.5 - 10.0 mm and with a body height of 0.90 - 0.95 mm.

Antennae 1.5 mm long in males, up to 1.6 mm in females. The eyes comprise between 13 and 14 ocelli forming a very acute triangle (Fig. 5A), typically arranged in horizontal rows of 1, 6, 4, and 2.

Body colour is a nondescript mottled pale brown, with paranota rather paler (Figs 8, 9). Body smooth, lacking obvious sculpture. Paranota weakly developed, little more than oval bumps, widest posteriorly (Fig. 5B).

Tergites each with three pairs of macrosetae, borne on the paranota (Fig. 5B). Angle formed by bases of the three macrosetae about 100° (15th body ring). Macrosetae are stout, elongated, and gently curved to a fine point. Their length exceeds the length of their associated metazonite.

Distance between bases of external (ex) and median (md) macrosetae slightly less than distance between bases of median and internal (in) macrosetae. The distance between medial suture (ms) and base of internal macroseta slightly more than double the distance between bases of median and internal macrosetae.

Male: leg pairs 1 to 7

In males, leg pairs 1 and 2 are reduced in size, while leg pairs 3 - 7 are more robust than other walking legs, or than those of female.

Male: body ring 7

Body ring 7 (which bears the gonopods and paragonopods) is noticeably swollen and clearly different from adjacent rings when viewed from above (Fig. 8).

Male: gonopods (leg pair 8)

Both gonopods (Figs. 5D, 5E) create a compact paired unit, with an unpaired median process (mp) lying in between.

In lateral view the gonopods are of highly characteristic shape (Fig. 5D). These are sometimes visible in un-dissected specimens but may be obscured by the bulbous paragonopods (leg pair 9). From a stout cylindrical base the gonopod divides towards the tip into three unequal branches (a, b, and c). The anterior branch (a) is much larger, and ends in a series of parallel slender processes. The two posterior branches (b and c) are slender and taper to curved points. On the interior side of the gonopod is a broad curved projection (d), bordered with fine spines, which is only visible from internal view.

There is a prominent spine (sp) located on the posterior, internal part of the gonopod. This feature is discussed further below under the heading "*A variable species?*".

The unpaired median process (mp) lies between the gonopods (Fig. 5D), rising to about half their height. Although laterally flattened, and slender in anterior or posterior view, in lateral view it is of a broad 'S' shape.

Gonopods also distinct in posterior (Fig. 5E) and anterior view, but the various gonopod branches (a, b and c) are less easy to discern.

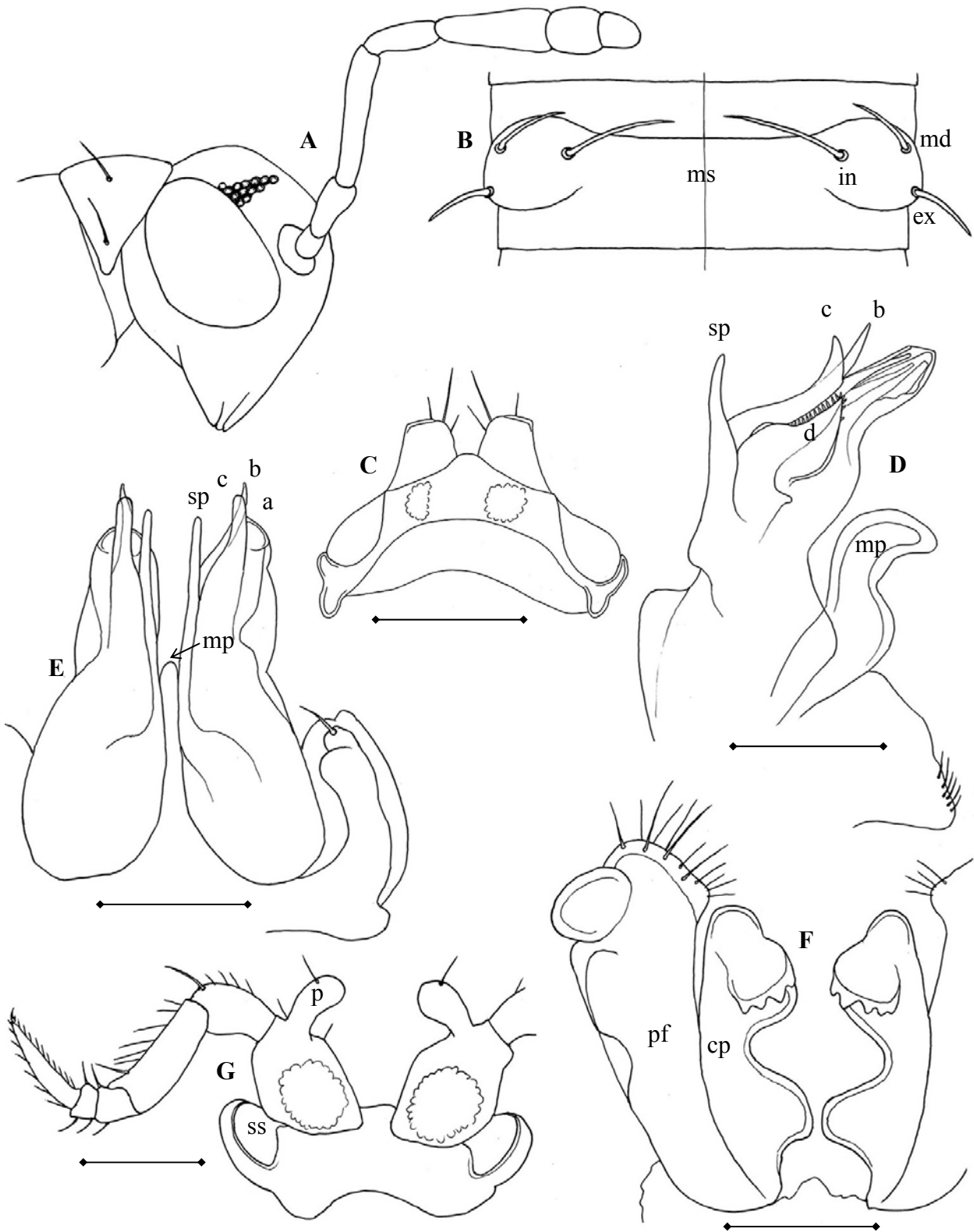


FIGURE 5: *Hylebainosoma nontronensis* from Groes-faen Wood.

A) Female, head and antenna, right lateral view. B) Female, body ring 15, dorsal view. C) Female, leg pair 3, posterior view. D) Male, right gonopod (leg 8) lateral internal view. E) Male, gonopods (leg pair 8), posterior view. F) Male, paragonopods (leg pair 9), posterior view. G) Male, leg pair 10, anterior view. All scale bars = 0.25 mm

Male: paragonopods (leg pair 9)

These are best seen in posterior view (Fig. 5F). Telopodite comprises mainly of prefemur (pf), which bears a fringe of stout setae along its apical margin. Other articles are greatly reduced to little more than a terminal tubercle. Coxa bears a conspicuous flattened medial coxal process (cp), which is almost as long as the telopodite. In posterior view these are of characteristic shape, with a sinuous inner margin, and towards their apex bear a ragged, coarsely toothed, basally oriented flange.

Male: leg pair 10

These are reduced relative to the following pairs of legs (Fig. 5G). Their enlarged coxae bear swollen sac-like processes (p), which are oriented medially to form a central channel between the legs. Each bears a large seta at its tip. The bases of the coxae are modified into ear-like structures, which link to sperm-sacs (ss).

Male: leg pair 11

Although reduced relative to the following leg pairs, they lack significant taxonomic features.

Female characters

In females the third pair of legs is considerably reduced (Fig. 5C), comprising essentially the basal article. This is rather square ended, and bears a few medial setae on the distal margin. All other leg pairs are normally developed. Female vulvae were not examined.

A variable species?

There is a prominent spine (sp) located on the posterior, internal, distal part of the gonopod of Welsh specimens (Figs 5D, 5E). This spine has also been observed on specimens from Brive-la-Gaillarde, France, examined by JS (Fig. 6 – arrowed). In this respect the Welsh and Brive-la-Gaillarde specimens differ significantly from the holotype illustrated by Mauriès and Kime (1999) in which the spine is apparently absent.

We recognise the need for further research on this subject. It is possible, though unlikely, that the spine was overlooked by Mauriès and Kime (1999). More likely in our view is that intra-specific variation exists for the presence or absence of this spine. Another possible explanation is that the specimens with the spine, recorded from Wales and Brive-la-Gaillarde, are an undescribed species closely allied to *H. nontronensis*.

The generic placement of *Hylebainosoma nontronensis* Mauriès & Kime, 1999

In their original description Mauriès & Kime (1999) tentatively placed *nontronensis*, from central France, within the Carpathian genus *Hylebainosoma* on the basis of the structure of the male genitalia. This generic placement was accepted as valid by Tajovsky *et al.* (2014) during their review of the genus. The question of the correct generic placement of *nontronensis* may not yet be finally resolved though; it may merit the erection of a new genus, though it also bears close similarities to genus *Xylophageuma*, occurring in parts of the Black Forest, Germany, the French and Swiss Jura and some other parts of eastern France.



FIGURE 6: *Hylebainosoma nontronensis* from Brive-la-Gaillarde, France. Gonopods in posterior view. Photograph by JS.

British records

The earliest British record thus far known is from Bedwellty Church, collected by CO on 23rd November 2011. Like the 1983 and 2011 records of *Ceratosphys amoena*, this too was originally misidentified as *Craspedosoma rawlinsii*. No other British records are currently known until the series of records starting on 28th September 2014 (Table 2).

TABLE 2: The first four British records of *Hylebainosoma nontronensis* in chronological order.

Locality	Grid reference	Specimens	Date	Collector(s)
Bedwellty Church	c. SO166003	1 adult ♀	23.xi.2011	CO
Groes-faen Wood	c. SO143007	numerous immatures	28.ix.2014	CO, DJG, MGT
Groes-faen Wood	c. SO143007	over 60 immatures	5.x.2014	CO
Bedwellty Church	c. SO166003	3 adult ♂♂ and 1 ♀	6.x.2014	CO

Subsequent fieldwork by CO has found *H. nontronensis* to be fairly common in the Welsh Valleys though slightly less frequent than *C. amoena*. It occurs in a range of habitats including an unkempt cemetery, Heather and Whinberry heathland (from thick moss at the base of Heather), Bracken heathland, hedgerows and woodland (including wet woodland). It has been found by searching leaf-litter, turning over logs and by torchlight searching for active individuals. *H. nontronensis* has been recorded quite widely in the Rhymney, Sirhowy and Ebbw Valleys, often in company with *C. amoena* but has not been found elsewhere and so is currently less widespread than *C. amoena* (Fig. 7).

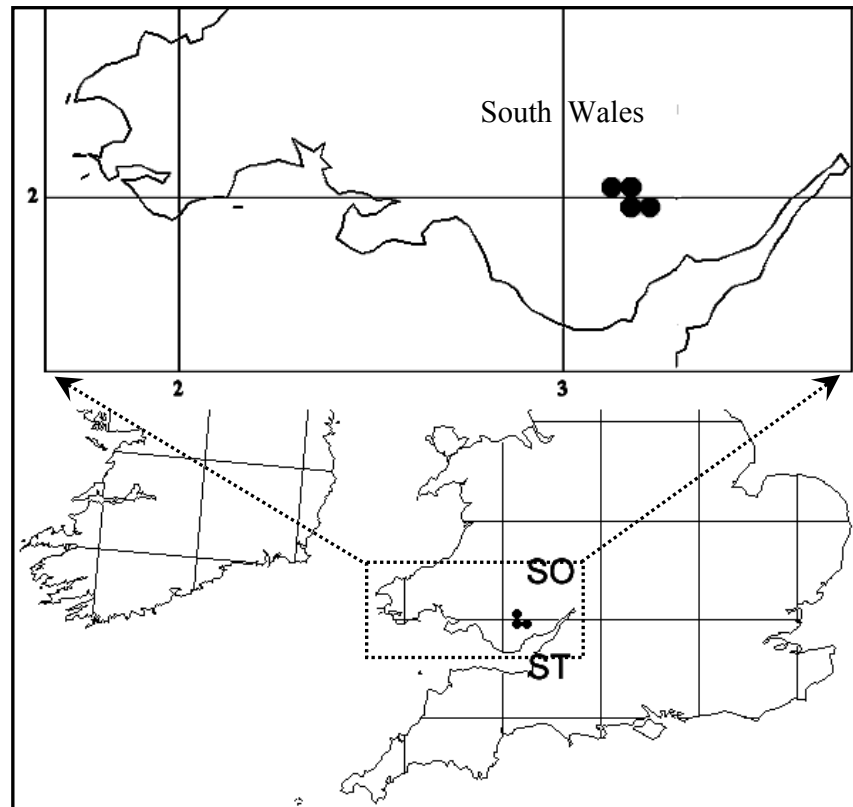


Figure 7: Known distribution of *Hylebainosoma nontronensis* in Britain up to December 2014. Main map plotted at 10km resolution, inset at 5km resolution. Solid dot (●) = post 2011 records.

Natives or aliens?

Two alternative hypotheses may be proposed: (i) these millipedes are native to Britain, in relict populations restricted to a small area of Wales where they were overlooked or misidentified until their discovery at Groes-faen Wood, or (ii) these millipedes have been introduced to Britain, beyond their natural range, probably in recent years, and have become established in a small area of Wales.

To confidently discriminate between these two hypotheses on current evidence is very difficult. However, we consider that the balance of evidence currently favours the hypothesis of overlooked natives. Firstly, both species are of western European distribution, unlike, for example, *Selenochlamys ysbryda* which is an alien of Crimean origin. Secondly, both species have been previously misidentified on at least one occasion in Britain as *C. rawlinsii*. Thirdly, *C. amoena* has been established in Glamorganshire since at least 1983, and *H. nontronensis* in Monmouthshire since at least 2011. Fourthly, the disjunct northern population of *C. amoena* in Belgium is regarded as native, occurring in a glacial refugium.

Alien species in Britain are usually discovered in the vicinity of ports and major population centres, and the earliest known record of *C. amoena* at Cefn Onn comes from just such a locality. However, Bedwellty Church, the earliest locality for *H. nontronensis*, is relatively remote from any obvious routes of importation, though the Bargoed area does support a number of undoubtedly alien species.

If our native hypothesis is correct, we predict that there is a chance that another member of the Chordeumatida with a similar distribution pattern, *Pyrgocyphosoma arvernum* Brolemann & Ribaut, 1932, may also be discovered in South Wales. This species currently shows a very disjunct distribution with records from the Massif Central as well as from the Pyrenees, although belonging to

a genus having its centre of diversity in Italy (Spelda, 2008). We further predict that examination of specimens of *C. rawlinsii* in museum and private collections will reveal further previously misidentified specimens of *C. amoena* and *H. nontronensis*, and from much earlier dates.

If our hypothesis is incorrect, we predict that any misidentified museum specimens that are found will all be quite recent, and that both species will expand to colonise a much wider area of southern and western Britain, as *Selenochlamys ysbryda* is currently doing. SJG has recently examined the *C. rawlinsii* specimens in the BMIG collections at Dinton Pastures and found all to be correctly identified.



FIGURE 8: *Hylebainosoma nontronensis*
Male specimen in dorsal view



FIGURE 9: *Hylebainosoma nontronensis*
Male specimen in lateral view

Rowson *et al.* (2014) added several slugs to the British list including two from South Wales which are otherwise known from the Pyrenees (*Arion (Mesarion) cf. iratii* Garrido, Castillejo & Iglesias, 1995 and *Arion (Kobeltia) cf. fagophilus* (de Winter, 1986)). Though regarded as probable introductions, they could be overlooked native species. The harvestman *Sabacon viscayanum* has a similar distribution, restricted in Britain to South Wales, the Wyre Forest and Devon and here represented by subspecies *ramblaianum* Martens, 1983 described from the French Department of Basses-Pyrénées. It has been assumed to be a native species in Britain. There has been trade and human migration amongst people on the Atlantic coast of Europe in ancient and modern times, including, for example, imports of iron ore from the Basque Country to the industrial Welsh Valleys (Ben Rowson, *in litt.*, March 2015), so there is at least a plausible pathway for introductions from the Pyrenees to South Wales. We are not aware of equivalent trade links between South Wales and the French range of *H. nontronensis*.

Genetic analysis of Welsh material of both species has been undertaken by sequencing the classical barcode fragment, the mitochondrial cytochrome c oxidase subunit 1 (CO1), following the methodology described by Spelda *et al.* (2011). Four specimens of each species were examined and barcodes of full length (658 base-pairs) were obtained from each. The sequences generated can be accessed in the Barcode of Life Data Systems (BOLD; Ratnasingham & Hebert 2007, <http://www.boldsystems.org>) under the BOLD Process IDs GBMYR290-15, GBMYR291-15, GBMYR292-15 and GBMYR434-15 for *H. nontronensis* and GBMYR435-15, GBMYR436-15, GBMYR437-15 and GBMYR438-15 for *C. amoena*. This will enable future comparison with continental populations of both species, once fresh material of each becomes available. We found very little variation in *H. nontronensis*, while the *C. amoena* specimen GBMYR435-15 showed a remarkable distance of about 1% from the other samples. So for at least this latter species we have a hint that it may be a native rather than an alien. This may provide evidence with which accurately to discriminate between the native and alien hypotheses. International genetic studies on other “Atlantic invertebrates” would help to answer the tantalizing question of whether such invertebrates survived in a glacial refugium in or near South Wales.

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