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Further observations of *Philoscia affinis* Verhoeff, 1908 (Isopoda, Oniscidea, Philosciidae) in Britain and Ireland: Distribution, Habitat and Identification

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Abstract

Philoscia affinis Verhoeff was first reported in Britain in 2017. Subsequently, records from 52 localities, within 40 hectads, have been submitted to the BMIG Non-marine Isopod Recording Scheme. These are mostly the result of targeted field work undertaken since 2018, but examination of reference collections of *Philoscia muscorum* (Scopoli) has revealed three additional sites recorded between 2004 and 2007. A provisional distribution map indicates that most records are from western Britain, suggesting an Atlantic distribution. *P. affinis* favours open woodland and coastal habitats and at some sites has been found to co-exist with *P. muscorum*. It is considered that previously *P. affinis* has been overlooked in Britain and Ireland due to its close resemblance its common congener *P. muscorum*. An illustrated guide to the identification of *P. affinis* and *P. muscorum* is given.

Key words: Isopoda, Oniscidea, *Philoscia affinis*, Britain, Ireland, distribution, habitat, identification.

Introduction

The Striped Woodlouse *Philoscia muscorum* (Scopoli) is ubiquitous in southern England (Gregory, 2009), where it rarely gets a second glance from most active woodlouse recorders. However, a second species, *Philoscia affinis* Verhoeff, 1908 is known to occur just across the Channel in northern France and Belgium (Séchet & Noël, 2015; Boeraeve, De Smedt, Arijs & Segers, 2017). In July 2017 *P. affinis* was confirmed as occurring in the UK (Segers, Boeraeve & De Smedt, 2018) with the collection of specimens from woodland in Arundel, West Sussex during a SPINICORNIS (www.spinicornis.be/) field excursion to south-east England. This is the first native or naturalised woodlouse (Isopoda: Oniscidea) to be recorded from Britain or Ireland since *Trichoniscoides helveticus* (Carl) was added by Steve Hopkin in 1990 (Gregory, 2009).

Following the recommendation of Segers, *et al.* (2018), the author examined his personal voucher collection of *P. muscorum*, which comprised fourteen tubes (mostly from Oxfordshire) and BMIG's basic and research collections (Harper, 2007) of nine tubes, mostly from south Wales and south-east England. In addition the author put out a plea in the BMIG Newsletter (Gregory, 2017) to encourage recorders to look out for this species. As a result a number additional UK records have come to light from various sources which are collated and discussed below.

Observations of *Philoscia affinis*

Since its discovery in 2017 *Philoscia affinis* has been recorded from 52 localities falling within 40 hectads in Britain and Ireland. Summary details of the records are listed in Appendix I.

In addition to the two sites given by Segers, *et al.* (2018), Hughes (2019) reports three sites in Caernarvonshire, north Wales and Anderson (2019) three sites in Co. Down and Co. Antrim, Northern Ireland. Examination of reference collections of *Philoscia muscorum* has revealed three additional sites for *P. affinis*. Two from south Wales (collected in 2004) were discovered following the examination of specimens held in the BMIG Collection and one from western Scotland (near Oban, in 2007) that is held in the author's reference collection. Records for an additional 41 localities have been submitted to the BMIG Non-marine Isopod Recording Scheme (www.bmig.org.uk/page/woodlice-waterlice-recording-

scheme) either submitted directly to the Recording Scheme organiser (the author); submitted via Biological Record Centre's iRecord website (www.brc.ac.uk/irecord/) and verified by the author; or data extracted by the author from BMIG's *Isopods and Myriapods of Britain and Ireland* group (<https://www.facebook.com/groups/407075766387553/>). A few additional, but poor, images of possible *P. affinis* have been posted online (e.g. from Essex, Yorkshire and southern Ireland), but in the absence of a specimen these have not been accepted by the Recording Scheme.

Distribution

A provisional distribution map for *Philoscia affinis*, based on the accepted records (Appendix I), is shown in Fig. 1. For comparison the map includes verified records (c. 700) for *Philoscia muscorum* submitted to the Recording Scheme from July 2017 to end December 2019. Although the first British records of *P. affinis* were from south-east England (South Essex and West Sussex) (Segers *et al.*, 2018), the majority of subsequent records have been made from western Britain, from south Devon, through Wales and Lancashire into western Scotland as far north as the North Ebuades. There is a scattering of records across Northern Ireland (Counties Antrim, Down and Tyrone) and an outlying population on the Burren (County Clare). A large proportion of the records are from coastal areas, but it is clearly able to penetrate far inland. Records range from sea level to 240m asl at Cwn Bychan, North Wales and up to 370m asl at McArt's Fort in Northern Ireland. It is of note that the UK supports, by far, the most northerly known populations of *P. affinis*. The record from Raasay, North Ebuades (northern-most red dot in Fig. 1) is some 700km further north than previously known observations in Belgium (Boeraeve, *et al.*, 2017).

Although the distribution map reflects areas where a few recorders have actively searched for this species, the general western trend appears to be genuine. Experienced recorders have not recorded *P. affinis* from eastern parts of Britain, including the Lothians of south-east Scotland where it has been specifically searched for (W. Maguire, pers. comm.) and parts of East Anglia (pers. obsv.; T. Hughes, pers. comm.), nor in central southern England (pers. obsv.; K. Lugg, pers. comm.). Thus, *P. affinis* seems to exhibit a typical western 'Atlantic' distribution in the British Isles and additional field work may prove it to be more widespread across Ireland. This contrasts with the more south-eastern 'Continental' bias noted for the distribution of *P. muscorum* (Gregory, 2009). Interestingly, one recent record is from the Weald in south-east England (Ashdown Forest), an area that is known to experience a relatively mild 'Atlantic' climate compared to other parts of the typically more 'Continental' south-eastern England (Chater, 1984). For example, this area is known to support inland populations of the strictly Atlantic woodlouse *Porcellionides cingendus* (Kinahan).

It is of note that during BMIG's spring 2019 field meeting to the Galloway coast, south west Scotland, *P. affinis* was collected from six rural sites (marked * in Appendix I) in both coastal habitats and inland woodland, but the only confirmed record for *P. muscorum* (i.e. male specimen examined) was from an ornamental garden (Cally Gardens); very much a synanthropic site. Subsequently, *P. affinis* has been recorded further north from the islands of Lismore and Raasay, with possible females from Arran (specimens examined by author) and Skye. These are important observations because during BMIG's previous field meetings in western Scotland (which predate the discovery of *P. affinis* in Britain), *P. muscorum* had been widely recorded from Kirkcudbrightshire (Gregory, 1997), Ayrshire (Collis, 2007), Argyllshire (Collis, 2008) and Kintyre (Gregory, 2016). One of these records (Oban 'wooded slopes', see Appendix I) has subsequently been shown by examination of voucher material to be *P. affinis*. Unfortunately, no additional voucher material of *Philoscia* collected during these meetings is available to check species identification.

Thus, it seems quite probable that some (possibly many) populations of *P. muscorum* reported from western Britain (and are mapped in Gregory, 2009) will be found to include, or to be entirely composed

of *P. affinis*. In Wales and western northern England both *P. affinis* and *P. muscorum* are known to coexist at the same site (see *Habitats, microsites and associated species* below). However, current evidence (albeit limited) suggests that *P. affinis* may partially (or even completely) replace *P. muscorum* in rural sites in western Scotland. This could be true also in Ireland, where, based on the few available records, *P. affinis* seems to be the predominant species found in rural habitats (Roy Anderson; Warren Maguire, pers. comms.). The conclusion is that many of the records for *P. muscorum* from the west coast of Scotland and across Ireland shown in Gregory (2009) could be erroneous and actually refer to *P. affinis*.

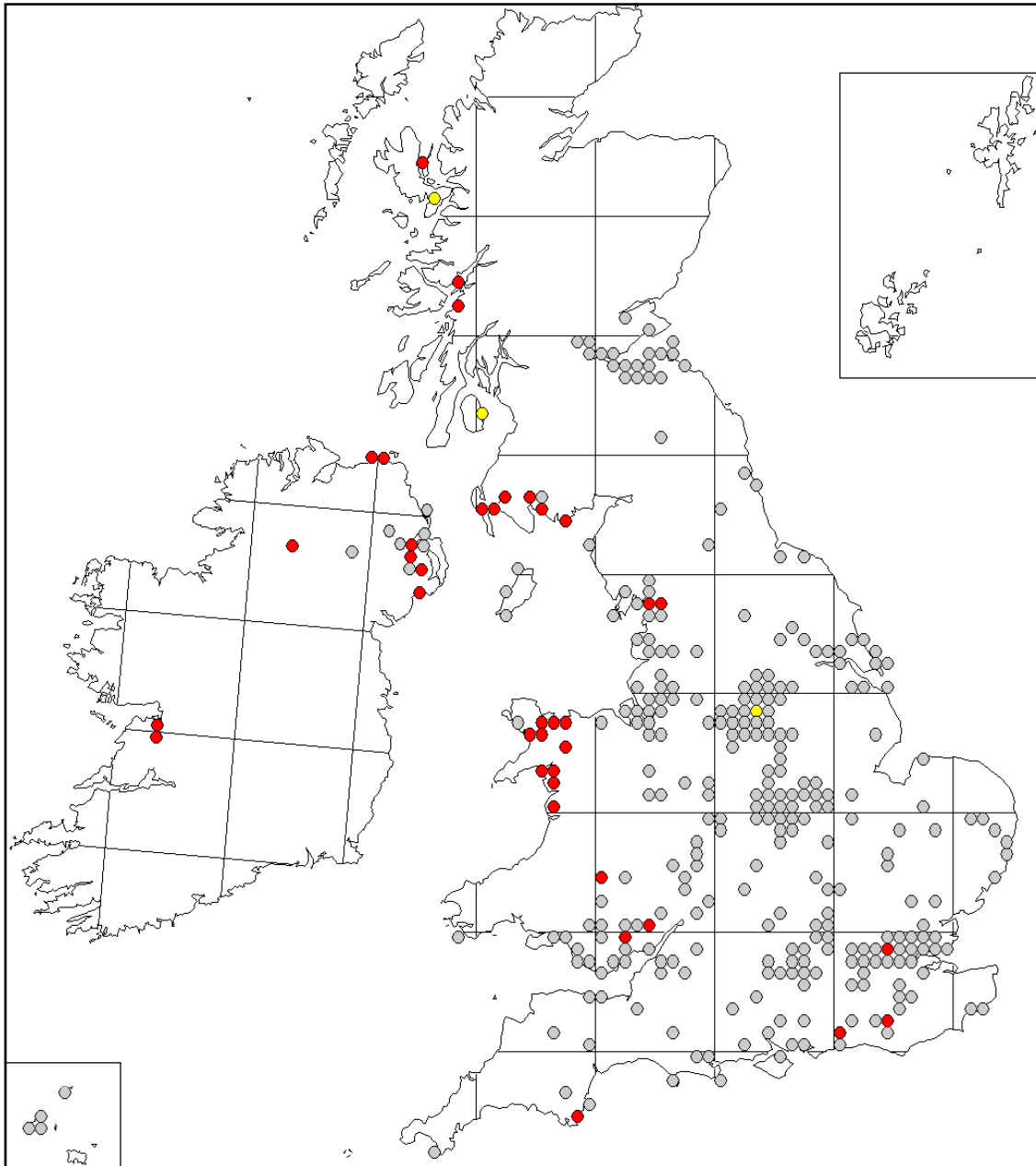


Figure 1: Provisional distribution of *Philoscia* species in Britain and Ireland.

Philoscia affinis: ● Confirmed male specimens; ● Possible female specimens (data from App. I).

Philoscia muscorum: ○ Verified records submitted to iRecord, July 2017 to end December 2019.

Where both species are present *P. affinis* takes precedence. Plotted at 10km (hectad) resolution.

Habitat, micro-sites and associated species

The majority of known British sites for *P. affinis* are open deciduous woodland, often oak *Quercus* sp., but also other deciduous trees, including alder *Alnus glutinosa* carr. The northern-most record from Raasay, North Ebeudes was made from Hazel *Corylus avanula* and Downy Birch *Betula pubescens* ‘Celtic Rainforest’. It appears to avoid deep shade, such as found beneath a closed canopy. It is typically found under stones and dead wood; from among accumulations of leaf litter, such as found at the base of trees and rocks; or among carpets of moss. On one occasion it was collected using a suction sampler (R. Gallon, pers. comm.). In woodlands it is typically associated with the ubiquitous *Oniscus asellus* Linnaeus, *Porcellio scaber* Latreille, *Trichoniscus pusillus* agg. and, on several occasions, *P. muscorum*.

However, *P. affinis* is by no means confined to woodland and also has been collected from coastal habitats. In south Devon it was collected from rank wet coastal grassland (K. Lugg, pers. comm.). In North Wales Hughes (2019) reports its occurrence (associated with *P. muscorum* and *Porcellionides cingendus*, T. Hughes, pers. comm.) from among shingle where leaf-litter derived from adjacent woodland had accumulated (Fig. 2B). In south-west Scotland it has been collected from among thick carpets of moss, beneath dead wood on rank fescue *Festuca* sp. grassland (at one site associated with *Armadillidium pulchellum* (Zencker)) or beneath drift wood along the strandline. In Northern Ireland, Anderson (2019) reports *P. affinis* from calcareous valley fen (among the roots of vegetation and moss) and from upland peaty heath (370m asl). On the Burren in Ireland it has been recorded from unimproved grassland (including pitfall traps) and on limestone pavement (R. Anderson, pers. comm.).

The distribution of *P. affinis* is not restricted by underlying geology and it occurs on both acidic substrates (Hughes, 2019; Fig. 2A) and on calcareous substrates (N. Garnham, pers. comm; Figs. 3A-B). The majority of records are from ground level, but above ground observations include on a dry stone wall (N. Garnham, pers. comm.), in a Malaise trap (R. Anderson, pers. comm.) and a female knocked from dead wood on a tree at 2m height (S. Gibson, pers. comm.). The key requirement seems to be for a stable habitat that provides relatively high levels of humidity. Such conditions are typically found in woodland, but also occur in open habitats in western coastal areas (as noted for terrestrial Molluscs by Kerney, 1999). In addition, minimum winter temperatures on the western coast are ameliorated by the relatively warm North Atlantic drift, such that ‘tender’ exotic plants such as *Fuchsia* sp. are able to survive outdoors even in western Scotland (pers. obsv.). Thus, it is perhaps not unexpected that the ‘southern European’ *P. affinis* is able to survive in these areas.

Many recorders have reported that both *P. affinis* and *P. muscorum* may be found at the same site (e.g. N. Garnham; T. Hughes, pers. comms.), occasionally beneath the same log or stone. Another example of the co-existence of these two species is illustrated by the BMIG reference collection sample from Aberedw Woods, south Wales (Appendix I), which was found to contain six male specimens of *P. affinis* and six of *P. muscorum* (with about 50 unidentified females). Interestingly, although *P. affinis* was readily found at six rural sites during BMIG’s spring 2019 field meeting in south western Scotland (Appendix I), *P. muscorum* was not found at the same sites, but was only recorded from a synanthropic ornamental garden in the same general area.

The fact that *P. affinis* is characteristically found in rural semi-natural habitats suggests that it is most likely an over-looked native species. However, there remain very few confirmed observations in Britain and Ireland and additional observations will help clarify the situation. Certainly, in northern France and Belgium, where woodlouse recorders have been more active in recent years, *P. affinis* is thought to have been long present, but under-recorded (Séchet & Noël, 2015; Boeraeve, *et al.*, 2017). This may also be true in Britain and Ireland. It is perhaps unfortunate that its congener *P. muscorum* has long been considered to be an ‘easy’ species that can be readily identified in the field (the author included). Few active recorders (again author included) have ever kept voucher specimens of *Philoscia* making it difficult to verify old records.



Figure 2: Habitat views of sites where *Philoscia affinis* has been recorded (Caernarvonshire).
A) Acidic woodland at Roman Camp, Bangor; B) Coastal shingle adjacent to woodland at Spinnies, Aberogwen (images © Thomas Hughes).



Figure 3: Habitat views of sites where *Philoscia affinis* has been recorded (West Lancashire).
Open woodland on limestone: A) Warton Crag LNR; B) Trowbarrow LNR (images © Nicola Garnham).

Pitfalls of Identification

Both *Philoscia affinis* and *P. muscorum* are similar in general appearance and body size (up to 11mm in length), hence the past confusion. Segers, *et al.* (2018) and Hughes (2019) provide basic information and figures for distinguishing *P. affinis* from its considerably more widespread congener *P. muscorum*. Male specimens, if viewed correctly, should not present problems with identification. However, several active recorders have noted areas of potential confusion in distinguishing the two species (as highlighted by Anderson, 2019). Firstly, both species may co-exist; secondly, both species exhibit numerous (and similar) colour varieties; and thirdly, males of both species bear a toothed spur (albeit of different orientation) on the merus of pereopod 7. These potential pitfalls in identification are discussed below.

Head and body pigmentation

A useful (but un-reliable) field assessment can be made from head pigmentation of adults and larger specimens. In *P. affinis* the head typically is brown speckled with paler yellowish mottling (never uniformly pigmented) and usually of a similar colour to, or slightly darker than, the body (Figs. 4B, 5A-B & 6A-D). Sometimes there is an indistinct yellow mark at the back of the head. In *P. muscorum* the head is typically uniformly pigmented, often black (but may be brown, red or other colours). However, typically it is noticeably darker than the body (Fig. 4A). Characteristically, there is a contrasting bright yellow spot at the rear of the head, but this may be feebly developed or sometimes entirely absent. In immature specimens of *P. muscorum* the head may be speckled with paler mottling as seen in typical *P. affinis*. Head pigmentation characters may not be apparent in pale colour forms of either species.

There are also consistent differences in body pigmentation. As a rule, *P. affinis* lacks the white and orange/brown stripe along the edge of the epimera (which is typical for *P. muscorum*). Instead it has a clear white oval spot towards the front of each epimeron (compare Figs. 4A & 4B; also see Segers, *et al.*, 2018, fig. 2). However, a large variety of colour forms occur in both species (Figs. 5 & 6) and exceptions to the typical pigmentation patterns are frequently encountered. Some examples of the wide range of colour variation seen in *P. muscorum* can be seen on the BMIG website (BMIG, 2019) and for *P. affinis* (in France) at Galerie du Monde des Insectes (2019).



Figure 4: Female *Philoscia* species showing typical habitus. A) *Philoscia muscorum*; B) *Philoscia* cf. *affinis* (images from BMIG website © Paul Richards). Also see Segers, *et al.* (2018, fig. 2).

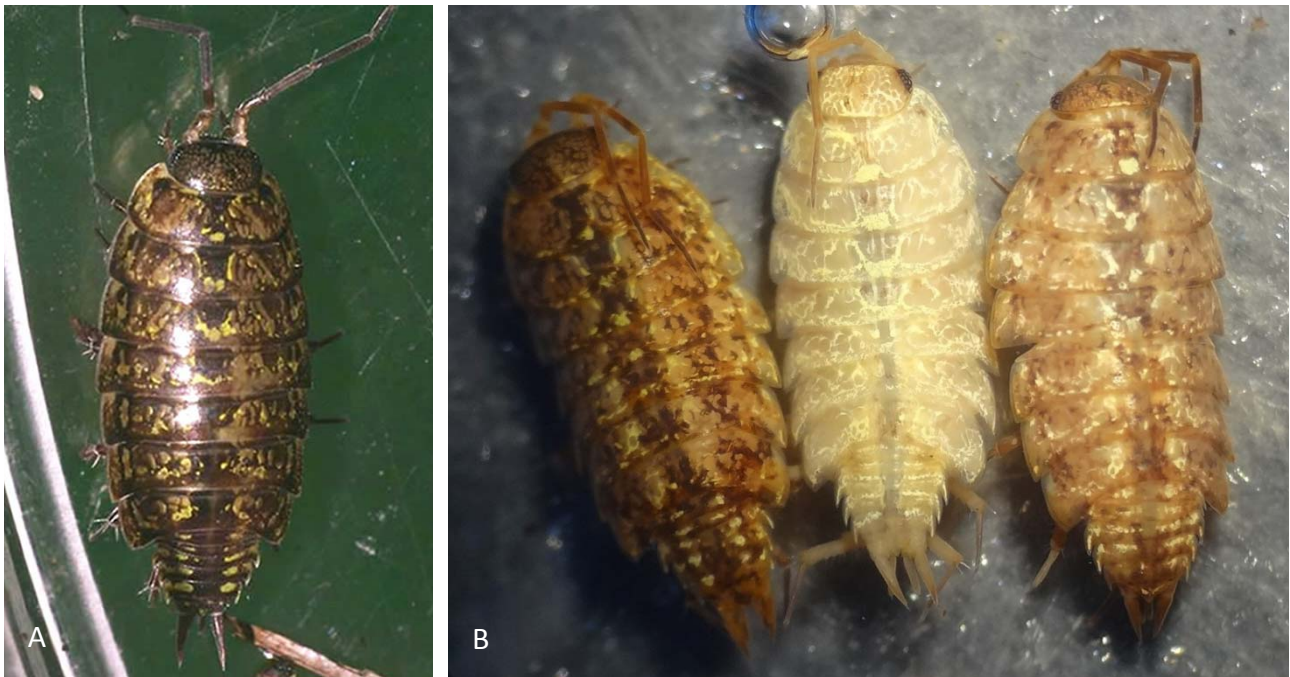


Figure 5: Some colour forms of female *Philoscia affinis*

A) Live specimen, Lancashire (image © Nicola Garnham); B) Specimens freshly preserved in 70% IDA, Ringdoo Point, Wigtownshire (image by author).



Figure 6: Some colour forms of male *Philoscia affinis*.

Live specimens from A) South Wales (image © Christian Owen); B) Northern Ireland (image © Roy Anderson); C) & D) South-west Scotland (images © Warren Maguire).

Male secondary sexual characters

Reliable identification can only be undertaken by examination of a male specimen. Examination of male pleopods 1 and 2 is not helpful in the separation of these two species (Vandel, 1962; Gruner, 1966). However, the two species can be readily separated by examination of male pereopod 7 which bears a triangular projection at the base of the merus in both species (Fig. 7A-D). The direction of viewing is critical and both Boeraeve, *et al.* (2017) and Anderson (2019) highlight the potential confusion caused by viewing male pereopod 7 from an inconsistent angle. Pereopod 7 must be observed in lateral view, most easily achieved by removing it from the specimen and allowing it to lie flat (as in Figs. 7C-D). In this position (lateral view) the projection is clearly visible in *P. affinis* as a ventrally projecting ‘tooth’ (Fig. 7D; also see Segers, *et al.* 2018, fig. 3A; Hughes, 2019, fig.4; Gruner, 1966, fig. 172).

In *P. muscorum*, with pereopod 7 in the same orientation, the projection curves around the merus towards the mid-line of the animal and, because it is partially obscured, appears as a low rounded bump the meral base (Figs. 7B-C; also see Segers, *et al.* 2018, fig. 3B; Gruner, 1966, fig. 170). Unfortunately, this ‘bump’ is barely discernible in Oliver & Meecham’s (1993) fig. 27B. However, if pereopod 7 is rotated through 90° (to give ventral view) this curved spur may become conspicuous (as in Fig. 7A), especially in smaller individuals where it seems to be more prominent, resulting in possible mis-identification as *P. affinis*. The figures in Vandel (1962; figs. 250, 253, 254) are misleading.

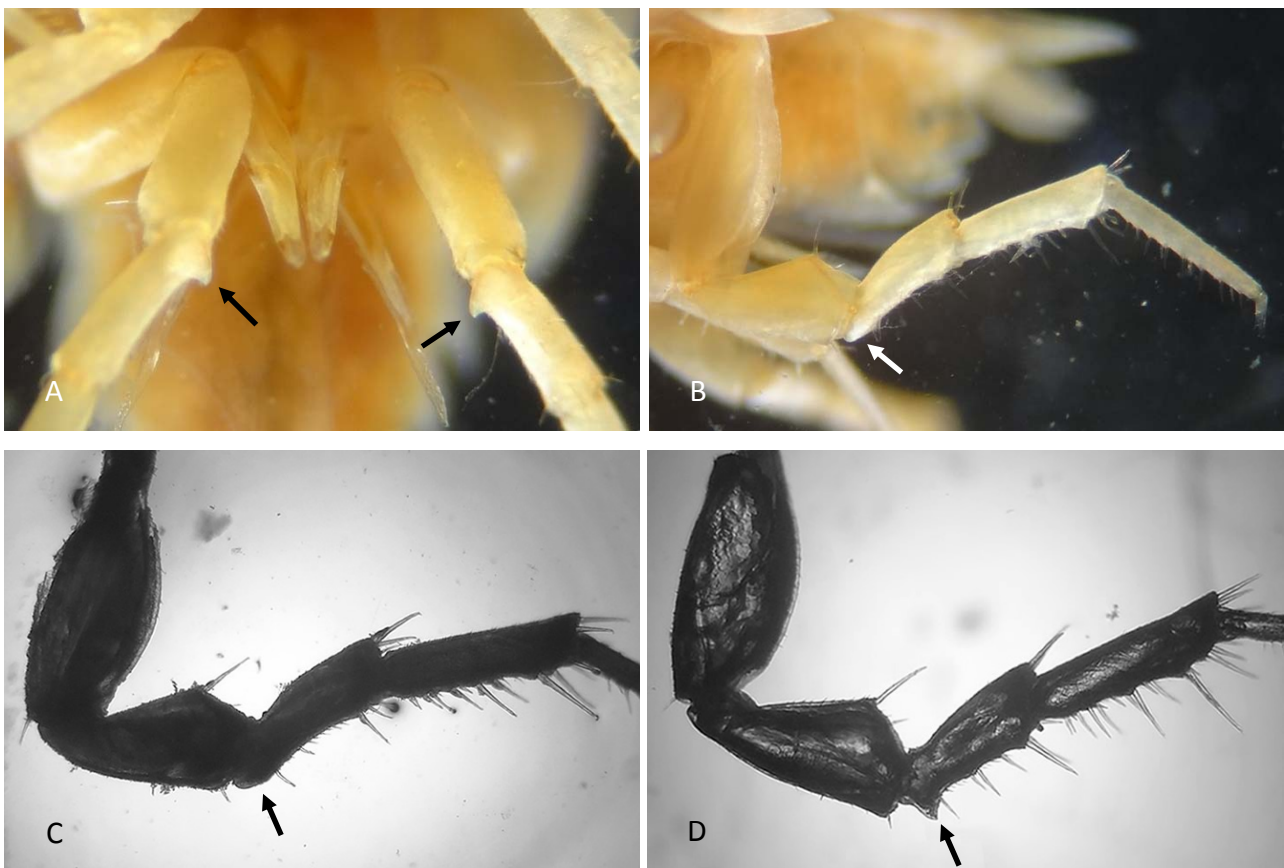


Figure 7: Male *Philoscia* species, pereopod 7.

***Philoscia muscorum*:** A) Pereopod 7, ventral view, showing triangular projections at base of merus (arrowed) (tips of male endopods 1 & 2 are visible at centre of image); B) & C) Same specimen as above, but pereopod 7 rotated through 90° to give lateral view and the triangular projection is now obscured from view (arrowed).

***Philoscia affinis*:** D) Pereopod 7, lateral view, indicating diagnostic ventrally directed triangular projection at base of merus (arrowed).

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Appendix I: Records of *Philoscia affinis* submitted to the British & Irish (BMIG) Woodlouse Recording Scheme to end December 2019.

Records based on male specimens, except where noted '♀ only'. * indicates records from BMIG's 2019 spring field meeting to south west Scotland.

Locality	Grid Ref	VC	VC Name	Broad Habitat	Date	Source/Recorder
Published records						
Wanstead	TQ423869	18	South Essex	Allotments	01.x.1985	Segers <i>et al.</i> (2018)
Houghton (Arundel)	TQ001110	13	West Sussex	Deciduous woodland	15.vii.2017	Segers <i>et al.</i> (2018)
McArt's Fort	J324795	H39	County Antrim	Peaty upland heath (at 70m asl)	23.xi.2018	Anderson (2019)
Corbally Ponds Fen	J451386	H38	County Down	Calcareous valley Fen	17.x.2018 11.xii.2018	Anderson (2019)
Turmennan Fen	J485500	H38	County Down	Deciduous woodland	12.ix.2018 29.x.2018	Anderson (2019)
Roman Camp, Bangor	SH580727	49	Caernarvonshire	Acidic deciduous woodland	24.xi.2018	Hughes (2019)
Bangor Mountain	SH583719	49	Caernarvonshire	Acidic deciduous woodland	07.ii.2019	Hughes (2019)
Spinnies, Aberogwen	SH617724	49	Caernarvonshire	Vegetated coastal shingle	09.ii.2019	Hughes (2019)
Records derived by examination of reference collections						
Aberedw Woods	SO083471	43	Radnorshire	Mixed woodland; 6m (and 6m <i>P.muscorum</i>) [c. 50ff]	08.viii.2004	BMIG Coll., tube AL
Croes-Robert Wood	SO478058	35	Monmouthshire	Mixed woodland; 4m 2f	21.viii.2004	BMIG Coll., tube GI
Oban, 'wooded slopes'	NM86-29-	98	Argyllshire	Habitat not recorded; 1m 5f	05.x.2007	Author's Collection
Recent additional field observations, in chronological order						
Dolgoch Falls	SH652043	48	Merionethshire	Deciduous woodland	26.xi.2017	S.J. Gregory
Slapton Ley	SX829444	3	South Devon	Rank grassland above shore	10.xii.2017	K. Lugg
Ecclesall wood (♀ only)	SK318823	63	S.W. Yorkshire	Ancient deciduous woodland	16.ii.2018	P. Richards
Newborough Warren	SH432627	52	Anglesey	Grassland above shore	05.iii.2018	J.H. Bratton
Warton Crag LNR	SD496725	60	West Lancashire	Calcareous deciduous woodland	05.iv.2018 25.xi.2018	N. Garnham
Slievecarran NR, Burren	M3--0-- various	H9	County Clare	Limestone pavement, grassland, scrub, etc	07.vii.2018 08.ix.2018	R. Anderson
Ballyogan Loughs	R377908	H9	County Clare	Limestone pavement	11.viii.2018	R. Anderson
Near Risca	ST266907	35	Monmouthshire	Alder <i>Alnus</i> carr woodland	15.ix.2018	C. Owen
Moelyci	SH597670	49	Caernarvonshire	Not recorded	01.xi.2018	J.H. Bratton
Trowbarrow LNR	SD480756 SD481755	60	West Lancashire	Calcareous deciduous woodland	07.xi.2018 15.x.2019	N. Garnham

Minnowburn Beeches	J323684	H38	County Down	Fen carr woodland	01.i.2019	R. Anderson
Coed Gorswen NNR	SH755710	49	Caernarvonshire	Acidic deciduous woodland	05.i.2019	R. Gallon
Sir Thomas & Lady Dixon Park	J303673	H39	County Antrim	Leaf litter in parks dump	08.i.2019	R. Anderson
Belfast Castle Estate	J325794	H39	County Antrim	Deciduous woodland	30.i.2019	R. Anderson
Lords Lot, Capernwray	SD543712	60	West Lancashire	Deciduous woodland	10.ii.2019 08.xi.2019	N. Garnham
Rathmullan Point, Tyrella	J484358	H38	County Down	Coastal grassland	10.iv.2019	R. Anderson
Port Moon, Benbane head	C978451	H39	County Antrim	Coastal grassland	21.vi.2019	R. Anderson
Ringdoo Point*	NX170551	74	Wigtownshire	Rank Fescue grassland above shore	26.iv.2019	S.J. Gregory, K. Lugg & W. Maguire
Mullock Bay*	NX708437	73	Kirkcudbrightshire	Rank Fescue grassland above shore	27.iv.2019	S.J. Gregory, K. Lugg & W. Maguire
Ravenshall Wood*	NX525522	73	Kirkcudbrightshire	Deciduous woodland	27.iv.2019	S.J. Gregory
Kirroughtree Forest*	NX456646	73	Kirkcudbrightshire	Deciduous woodland	28.iv.2019	S.J. Gregory
Black Loch, Gargre Moor*	NX27-65-	74	Wigtownshire	Under stones on heather moor	28.iv.2019	H.J. Read
Craigoch Park Moor*	NX00-53-	74	Wigtownshire	Rank Fescue grassland above shore	29.iv.2019	K.N.A. Alexander
Ashdown Forest, Chestnut Gill	TQ449275	13	West Sussex	Deciduous woodland	29.iv.2019	M. Funnel
Plas y Brenin	SH716578	49	Caernarvonshire	Oak & mixed woodland (200m asl)	May 2019	T. Hughes & R. Gallon
Coed Crafnant NR	SH617286	48	Merionethshire	Acidic deciduous woodland	31.v.2019	R. Gallon
White Park Bay	D018438	H39	County Antrim	Grey dunes on coast	08.vii.2019	R. Anderson
Weir's Snout, Giant's Causeway	C943441	H39	County Antrim	<i>Phragmites</i> swamp above shore	23.vii.2019	R. Anderson
Achueran House, Lismore	NM889452	98	Argyllshire	Not recorded	28.vii.2019	D. Whiteley
Camas Mhic Lairtidh, Lismore	NM872454	98	Argyllshire	Not recorded	29.vii.2019	D. Whiteley
Lamlash, Arran (♀ only)	NS042325	100	Clyde Islands	Deciduous woodland corridor	03.viii.2019	G. Maguire
Holy Island, Arran (♀ only)	NS05-30-	100	Clyde Islands	Heather moorland	07.viii.2019	G. Maguire
Rakeeranbeg, Dromore,	H389611	I 36	County Tyrone	Acidic deciduous woodland on peat	07.viii.2019	W. Maguire
Tokavaig, Skye (♀ only)	NG60-11-	104	North Ebudes	Deciduous woodland	22.viii.2019	S. Gibson
Cwm Bychan	SH648309	48	Merionethshire	Acidic decid. woodland (240m asl)	08.ix.2019	S.J. Gregory
North east of Harlech	SH589314	48	Merionethshire	Acidic deciduous woodland edge	12.ix.2019	S.J. Gregory
Wern Y Wylan Wood	SH555798	52	Anglesey	Deciduous woodland, Oak Litter	19.ix.2019	P. Richards
Leighton Moss NR	SD487758	60	West Lancashire	Deciduous Woodland	19.x.2019	N. Garnham
Eaves Wood	SD470761	60	West Lancashire	Deciduous Woodland	20.x.2019	N. Garnham
Loch Eadar dà Bhaile, Raasay	NG55-40-	104	North Ebudes	Celtic Rainforest (Hazel, Birch)	27.xi.2019	S. Gibson
Hying Scout	SD502737	60	West Lancashire	Deciduous Woodland	28.xi.2019	N. Garnham