

THE ESTABLISHMENT OF AN ITALIAN FLAT-BACK MILLIPEDE, *POLYDESMUS ASTHENESTATUS* POCOCK, 1894 (DIPLOPODA: POLYDESMIDAE) IN IRELAND

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ABSTRACT

Well established colonies of *Polydesmus asthenestatus* are reported from nine sites in north-east Ireland and one in Co Wicklow south of Dublin. This species is native to the provinces of Umbria, Toscana and Roma in Italy and to Corsica. It favours wet riverine woodland and is a winter species, being active from September through to May. It shows a small degree of synanthropic behaviour and can be bred in captivity. The colonisation of disturbed habitats and gardens is considered likely which may lead to further range expansion in Ireland.

INTRODUCTION

The Italian peninsula is well known as a centre of polydesmid diversity (Minelli *et al.*, 1995). A total of 49 species of flat-backed millipedes (Polydesmidae) are listed, many of which are endemic. In comparison, the polydesmid fauna of the British Isles is impoverished, with just seven species. Five are known from Ireland: *Polydesmus angustus* Latzel, *P. coriaceus* Porat, *P. denticulatus* C. L. Koch, *P. inconstans* Latzel and *Brachydesmus superus* Latzel (Lee, 2007). The polydesmid fauna of countries on the northern fringes of mainland Europe is similar and neither Holland nor Denmark list any additional species. Six non-British species recorded for Germany, are confined to the far south. The reasons why so few *Polydesmus* have been able to colonise northern latitudes in Europe from southern refugia following the last glaciation, are unclear. By comparison, anthropochorous spread of other millipede families across Europe has gone ahead relatively unimpeded. This suggests that there may be some climatic impediment, though this is not supported by the present discovery.

Two species of millipede native to Italy are currently known in Ireland. The paradoxosomatid *Stosatea italica* (Latzel), is known from southern counties and the chordeumatid *Anamastigona pulchella* (Silvestri), was discovered on National Trust properties in north-east Ireland in the nineteen-nineties (Anderson, 1996). *Stosatea* is well known in Britain, and possibly an ancient introduction, but until very recently (Gregory, *et al.* in this Bulletin 28:31-37) *Anamastigona* had not been recorded there.

It was as a result of a quiet afternoon's ramble at Minnowburn Beeches, a National Trust property in south Belfast, that I came across a new *Polydesmus*. Large numbers of millipedes of what at first appeared to be a species of *Brachydesmus*, because of their flat-backs, small size, relatively glossy upper surface and narrow profile (pronounced in juvenile instars), were found resting on the undersides of almost every branch picked up in a glade under beech. It was quickly apparent that these did not belong to any of the accepted British species of either *Brachydesmus* or *Polydesmus* (Blower, 1985). Demange (1981) was consulted and a provisional match found with *Polydesmus asthenestatus* Pocock, 1894. This was corroborated after consulting Attems (1926) and Verhoeff (1941). Material was then sent to Per Djursvoll, University of Bergen, who kindly confirmed the provisional diagnosis.

Polydesmus asthenestatus asthenestatus is a native of north central Italy, from Toscana to Neapoli (more or less the same area as that occupied by *Anamastigona pulchella* but excluding some areas south of Neapoli). *Polydesmus asthenestatus* and *Anamastigona pulchella* have therefore somehow found their way from Italy to Ireland, apparently missing out all of the countries in between. Transport together with horticultural goods from a distribution centre or centres in north Italy seems the most likely mechanism for this, but the exact source is unknown.

DESCRIPTION

A small species, length ranging in males from 7.9 to 10.3 mm (average 9.1 mm), in females from 8.1 to 11.8 mm (average 9.5 mm). Width measured across the median tergites for males averaged 1.0 mm, for females 1.3 mm. These measurements were from a sample of 54 specimens collected at the Belvoir Forest locality in January 2015. Within the sample the percentage of males present was 11.1 % i.e. one in nine.

Colour is variable, ranging from a relatively translucent greyish to a deeper grey-brown, becoming darker as development proceeds (Fig. 1A). Surface of the tergites is distinctly glossy. General habitus is strongly reminiscent of *Brachydesmus superus*, since tergite widths are relatively narrow compared to the length of the animal, and dorsal surfaces are glossy. Breadth in relation to length was 0.11 for males and 0.13 for females in the Belvoir sample (contracted, in alcohol) which is within the range for *Brachydesmus superus* quoted by Blower (1985).

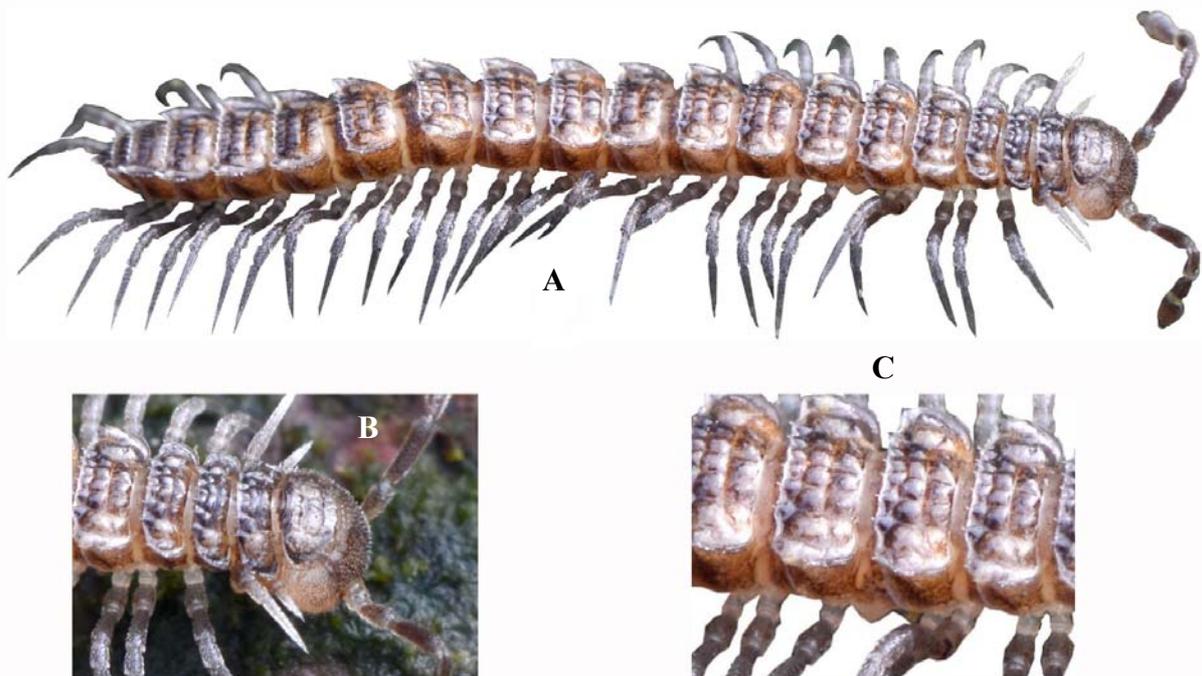


FIGURE 1: *Polydesmus asthenestatus*. Female specimen from Lagan Meadows, 23 January 2015
 A) habitus, length approx. 11 mm; B) close-up of head to show pubescence; C) close up of median tergites to show spines on basal tubercles.

The cephalon is evenly and densely pubescent (Fig. 1B). In other British polydesmids pubescence may be absent, somewhat scattered but certainly less even. Dorsal sculpture of the tergites is distinct and well incised with the boss divided transversely. Basal margins of the tergites are ornamented

with short spines, a distinctive feature, each spine issuing from one of the six basal tubercles, being obvious in all tergites (Fig. 1C). In other species these spines are either absent or developed only in the distal tergites and then much smaller and less distinct.

The gonopods are relatively small and inconspicuous. The right telopodite is illustrated in Fig. 2, from an external perspective. The exomerite (ex) of each telopodite is broadened apically with a downward pointing apical tooth and a single, small, sub-terminal tooth below the apex (the Corsican form of the species, ssp. *albanensis* Verhoeff appears to have several teeth, Demange, 1981). Between the apical tooth and subterminal tooth a pale internal sac (?flagellum) protrudes. It can be seen from an internal (mesal) view and comes to a point (see Attems, 1927: fig. 26), but this may just be visible from an external viewpoint. The exomerite (ex) is much smaller in relation to the seminal ramus (sr) which lies below it, than in other British *Polydesmus*. The ramus is broadly similar in shape to that of other species but the solenomere is usually somewhat broader and more conspicuous than in other species.



FIGURE 2: *Polydesmus asthenestatus*, male. External view of right telopodite ex - exomerite; sr - seminal ramus with solenomere.

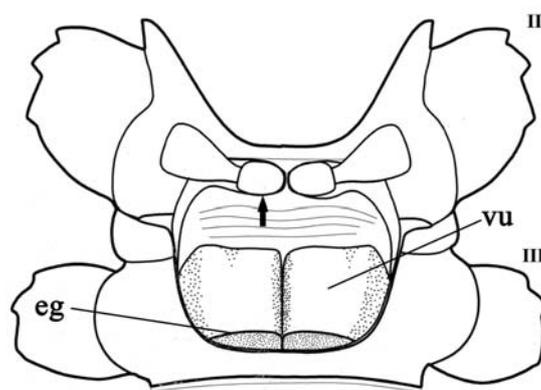


FIGURE 3: *Polydesmus asthenestatus*, female. Ventral view of the second pair of legs on segment III of a female: vu - vulva; eg - epigyne.

Overall, the main differences from other British *Polydesmus* consist in the small size of the exomerite and of the gonopods as a whole. Comparing it with *Brachydesmus superus*, which has a similar body size, the exomerite in *P. asthenestatus* is depressed against the seminal ramus, and points towards the rear of the animal, whereas in *Brachydesmus* it is lifted off the coxopodites and directed forwards towards the preceding pairs of legs.

The female genitalia (Fig. 3) are very inconspicuous and may only be seen by pulling the second pair of legs forward to reveal the vulva (vu) and epigynal ridge (eg) underneath.

GEOGRAPHICAL DISTRIBUTION

At present *Polydesmus asthenestatus* is known from 9 locations in south Co. Antrim and north Co. Down, all within a 14 mile radius of Belfast city centre as well as a recently discovered site south of Dublin. These are as follows:

- National Trust at Minnowburn Beeches (J327686), Co. Down, 6.ii.2008. Abundant on sticks and in litter under beech on dry south-facing slopes.
- Six Mile Water river valley at Muckamore (J157853, J158853), Co. Antrim, 8.iii.2008. Occasional, on branches and twigs of beech on the ground, sheltered riverine woods south of Antrim town.
- Lady Dixon Park, south Belfast (J308679), Co. Antrim, 19.i.2009. Abundant in wood chip in a Belfast Parks Department waste tip, under mature broadleaf trees.
- Hillmount Garden Centre, south Belfast (J392712), 20.v.2012. Several under large pots with shrubs and sapling trees.
- Lady Dixon Park (J306680), 25.ix.2012. Several stadium-I individuals in soil under planted green alder in formal beds.
- Orangefield Park, east Belfast (J372730), Co. Down, 3.ii.2013. Occasional in leaf litter under young oak/ash/beech saplings.
- Cultra Manor, Ulster Folk and Transport Museum (J425803), Co. Down, 20.iii.2013. Occasional under sacks of plant waste, derelict greenhouses.
- Belvoir Forest (J333685), Co. Down, 15.ix.2014. Common under dense ivy on the trunk of a mature sycamore in parkland.
- Lagan Meadows (J334703), Co. Antrim, 23.i.2015. Common in dead leaves, underside of large *Carex paniculata* tussocks, riverine wetland.
- Avoca Garden Centre (O24281524), Kilmacanoge, Co. Wicklow, 11.iv.2015. Two females and one male under plant pots on gravelly soil in a large garden and plant sales area.

It is clear from the spread of sites that introduction has occurred independently in a least three areas, one in the Lagan Valley just to the west of Belfast, one south of the town of Antrim town (Muckamore), Co. Antrim and at Kilmacanoge, Co. Wicklow. The Antrim (Muckamore) site is in the Six Mile Water valley close to an agricultural college with an organic farm unit. A large outbreak of the alien pest slug *Arion vulgaris* (Moquin-Tandon) occurred recently in the Six Mile Water valley close to the farm reaching as far south as Muckamore. The source of this was subsequently found in the organic unit where a very large population had become established (Anderson, 2010). Similar outbreaks have occurred at organic units elsewhere in Ireland (pers. obs.) and may be a source of other invasive fauna. The first Belfast locality at which *P. asthenestatus* was found is Minnowburn Beeches, a National Trust property in the valley of the River Lagan west of the city. National Trust properties in Northern Ireland have been notable in the past for their rapid colonisation by *Anamastigona pulchella* in the 1990s (Anderson, 1996). The suspicion is that this pattern reflects introduction via similar mechanisms to that of *P. asthenestatus*, from north Italy. The same would presumably apply to the discovery of the species in a garden centre in Co. Wicklow.

Polydesmus asthenestatus is now well established at a number of localities and is likely to spread not least because of its high fecundity.

ECOLOGY

There are only sparse references to habitat and ecology of this species in the literature. In Northern Ireland it has been found mostly in wet woodland such as alder carr along river valleys. Although not so far reported from domestic gardens there is some evidence for synanthropic tendencies with two records for garden centres and one for abandoned greenhouses in a publically owned site. Most

specimens have been taken in and on beds of leaf litter under trees, particularly beech. Drifts of beech litter can have in excess of 100 specimens per m². Animals are also common on the underside of fallen branches, particularly decorticate branches slightly raised off the ground. Up to 40 specimens have been found under a single branch. It has not so far been detected under bark on logs and fallen branches nor does it occur on trees except on bark surface close to the ground. It has rarely been found under stones. While slow to move when first uncovered, locomotion quickly becomes fluid and rapid.

BEHAVIOUR/SEASONALITY

Verhoeff (1941) studied the species in mainland Italy and states that it is very much a 'winter' species attaining maturity in mid-winter to early spring before mating and dying. This correlates well with observations in Ireland where eggs have been recorded (in captivity) from the beginning of February. Very young animals (stadium I) have been observed in September but there are no records for the summer period (June to August inclusive). Sub-adults are often abundant in December and mature specimens are very much in evidence by the beginning of February. It is not known when the eggs hatch but it seems likely that this occurs in late summer/early autumn.

Figure 4 shows a clutch of eggs laid in February in a specially constructed 'nest' made of a pabulum of leaf material and sandwiched between a solid piece of bark and underlying dead leaves. It contained 100-120 ova.



FIGURE 4. 'Nest' of leaf fragments on the underside of bark in litter.

CONCLUSIONS

This small, active *Polydesmus* is an addition to the fauna of northern Europe and is indigenous to north-western Italy and Corsica. It is a winter species and clearly resistant to low temperatures as observed by its presence and activity in surface leaf litter during the very cold winters of 2010/11 and 2012/13.

The species is well established and continues to spread in north-eastern Ireland. Since 2008 it has become well established in woodlands north, south and east of Belfast and there is now a single record for a garden centre in Co. Wicklow. It shows a small degree of synanthropic behaviour and will breed successfully in captivity. The eventual colonisation of disturbed habitats and gardens seems likely. Like *Anamastigona pulchella*, it could also turn up in Britain. Wet woodland, primarily riverine alder woods, appear to be favoured.

Although I have now had several years experience of this species, it still takes careful examination to discriminate it from dark specimens of *Brachydesmus superus*. I therefore recommend close examination of dark *Brachydesmus* in Britain where it could easily have been overlooked.

REFERENCE SPECIMENS

Specimens have been deposited in the British Myriapod and Isopod Group reference collection, the Natural History Museum, London and National Museum of Ireland, Dublin.

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