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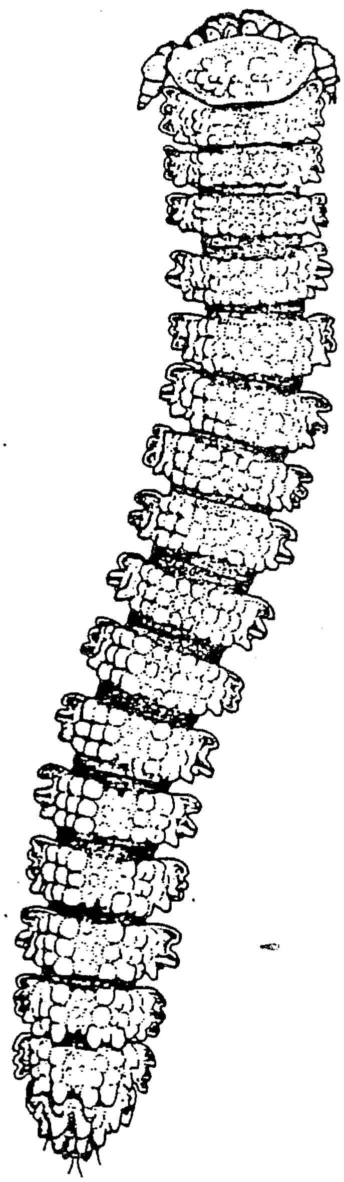
BULLETIN of the BRITISH MYRIAPOD GROUP

Edited for the Group by:

A. D. Barber
and
J. G. Blower



Volume 4

April 1987

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EDITORIAL

In the first volume of this Bulletin two species of millipede and one of centipede were formally added to the British fauna; in volume 3 a further two millipedes and one centipede were added; here we have just one new species; is our activity declining? Just four authors contributed to volume 1 and thirteen years passed before volume 2 appeared with six authors, three of the original and three new; four of these six plus two new authors appeared in volume 3; here we have articles from six old hands and five new authors; things are looking up. Perhaps our new section Miscellanea will attract more contributors for volume 5 and our Bulletin will more accurately reflect the abundant activity within BMG. Please start compiling your contribution for 1988 now and let the Editors have it in good time.

Your Editors are not complaining; they are just ambitious. There is ample Taxonomy, Distribution and Biology reported in this volume. Interest in island faunas has switched from the Shetlands to the Scillies. Interest in *Henia vesuviana* is maintained in a third and fourth contribution. We hope our French colleagues will forgive us invading Brittany again, and extending our front to Normandy. The elders amongst us grew up with Brolemann as our only guide and strove to reach his standard of precision and illustration, but recently we have been surprised to see from Demange's *Millepattes* that much of France remains unworked. It is not a piratical desire to get spots on their maps which attracts us English to France; it is their delightful countryside and people, not to mention their climate and wine.

This volume should appear on the eve of the eighth spring field meeting of BMG (fifth held jointly with BISG), at Lower Langford. Douglas Richardson has a variety of sites in Avon, Somerset and Wiltshire lined-up for us, very much in the Heart of the Country.

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ON SOME STRUCTURAL ABNORMALITIES IN LITHOBIUS AND CRYPTOPS (CHILOPODA) AND THEIR POSSIBLE SIGNIFICANCE

J.G.E. Lewis
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In a recent paper, Minelli and Pasqual (1986) described eight abnormal specimens of centipede and listed previously recorded cases. They distinguished three principal types of abnormality namely, spiral segmentation, homeotic mutations (the mutation of one structure into another, such as that of an insect wing into a haltere) and schistomely (the bifurcation of appendages).

It is not always possible to be sure whether malformed structures are due to some developmental problem or to regeneration after damage. Thus Kraus (1957) suggested that the abnormal spinulation of the last pair of legs in many individuals of a population of the scolopendrid centipede *Digitipes katangensis* Kraus from Zaire was due to mutation caused by radiation emitted by the rocks of the area but Lewis (1981) suggested that it could well have been caused by regeneration as are the abnormal numbers of antennal segments and spinulation of the last pair of legs in *Scolopendra amazonica* (Bücherl) (= *S. morsitans* Linn.) (Lewis, 1968). Developmental abnormalities may provide useful information about the homologies of certain structures, such as the female gonopod and walking leg in *Lithobius* (Demange, 1971) and may also have implications for taxonomists: Matic (1958) pointed out that they may be the kinds of differences that are used to separate species.

In a survey of the distribution of centipedes in Somerset currently being carried out by pupils at Taunton School, four abnormal specimens were collected. They are here described.

A Abnormal coxal pores in *Lithobius variegatus* Leach

A female *Lithobius variegatus* 21 mm long was collected on 11.iii.1986 from beneath the bark of a dead tree in deciduous woodland between Stockland, Bristol and Stogursey, Somerset (Grid ref. 223 436). The formula for the coxal pores of the last four pairs of legs is 6, 7, 6, 5 for

for the left side, and 6, 6, 6, 8 for the right side. The coxae of the fifteenth pair of legs are atypical being narrower than in normal specimens (Fig. 1). The right coxa has an abnormally high number of pores (eight). The left coxa has a more typical number of five pores but these are irregularly arranged. The telopodites of both legs are missing. I ascribe the condition of the coxae of the fifteenth pair of legs of this specimen to regeneration after damage.

B Abnormal prehensorial coxosternum in Lithobius borealis Meinert

A female Lithobius borealis 12.5 mm long was collected on 21.i.1986 from a beech wood at Lydeard Hill, 1 km east of West Bagborough, Somerst (Grid ref. 182 339). The anterior border of the left prehensorial coxosternum instead of being rather humped, with a pronouced shoulder, is straight (Fig. 2). The two coxosternal teeth on this side are very small. This condition approaches that seen in Lithobius pontifex Pocock from Mexico as figured by Eason (1973). There is no obvious sign that this specimen had been damaged; the abnormality may well be a developmental one.

C Abnormal prehensorial coxosternum in Cryptops parisi Brölemann

A Cryptops parisi 33 mm long was collected on 5.ii.1985 from humus on waste ground at Taunton School, Taunton, Somerset (Grid ref. 221 260). This specimen shows the normal four stout setae on the anterior border of the coxosternum on the left but has only one on the right, although a socket for a second is present. There is a proliferation of smaller setae behind the anteriour border on this side (Fig. 3). There is no indication of damage or regeneration in this specimen and I presume that this is a developmental abnormality.

D Abnormal female gonopods in Lithobius borealis

A Lithobius borealis 10.5 mm long was collected on 21.i.1986 from a beech wood at Lydeard Hill, 1 km east of West Bagborough, Somerset (Grid ref. 182 339). This specimen has only one conical spur on each gonopod; normally two are present. In this case the second is reduced to a spine (Fig. 4). This again would appear to be a developmental abnormality.

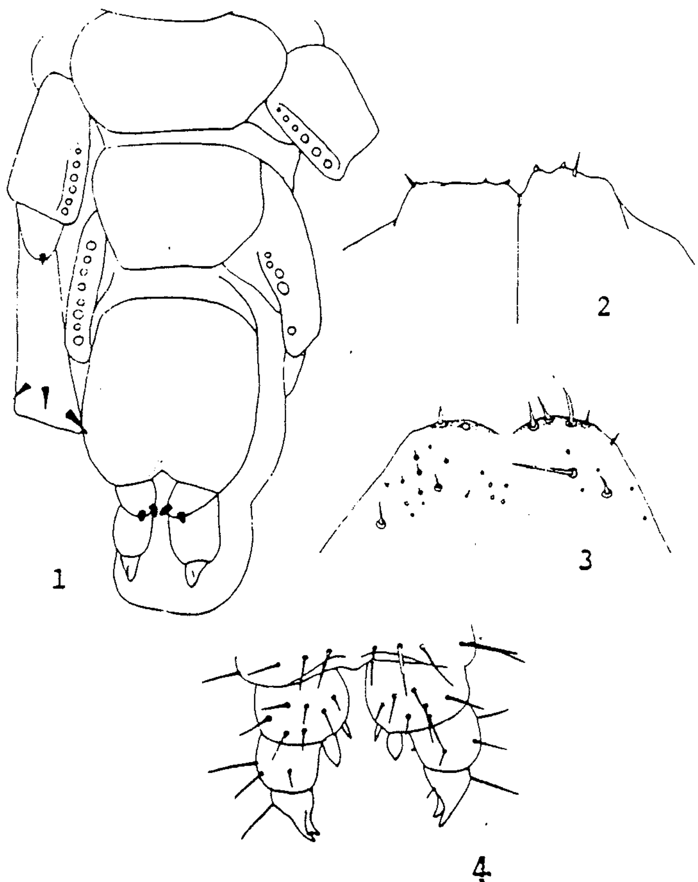
Legends to Figures

Figure 1. Ventral view of segments 14 and 15 and terminal segments of a female Lithobius variegatus from between Stockland Bristol, Somerset.

Figure 2. Prehensorial coxosternum of a female Lithobius borealis from Lydeard Hill, Somerset.

Figure 3. Prehensorial coxosternum of a Cryptops parisi from Taunton, Somerset.

Figure 4. Gonopods of a female Lithobius borealis from Lydeard Hill, Somerset.



Discussion

Cases B, C and D described above, appear to be developmental abnormalities which may well be due to mutation. Mutation during the course of development leading to changes on one side only. These cases indicate that radical changes in the number and size of setae and spines may take place and this should be borne in mind during taxonomic studies.

Acknowledgments

I am indebted to those pupils of Taunton School who have been involved in the survey of Somerset centipedes, in particular Paul Colthurst, Tom Gliddon and Alex Robins. My thanks are also due to the Royal Society Research in Schools Committee and to Dr. D.J. Stradling for support, encouragement and advice.

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MYRIAPODS OF THE ISLES OF SCILLY

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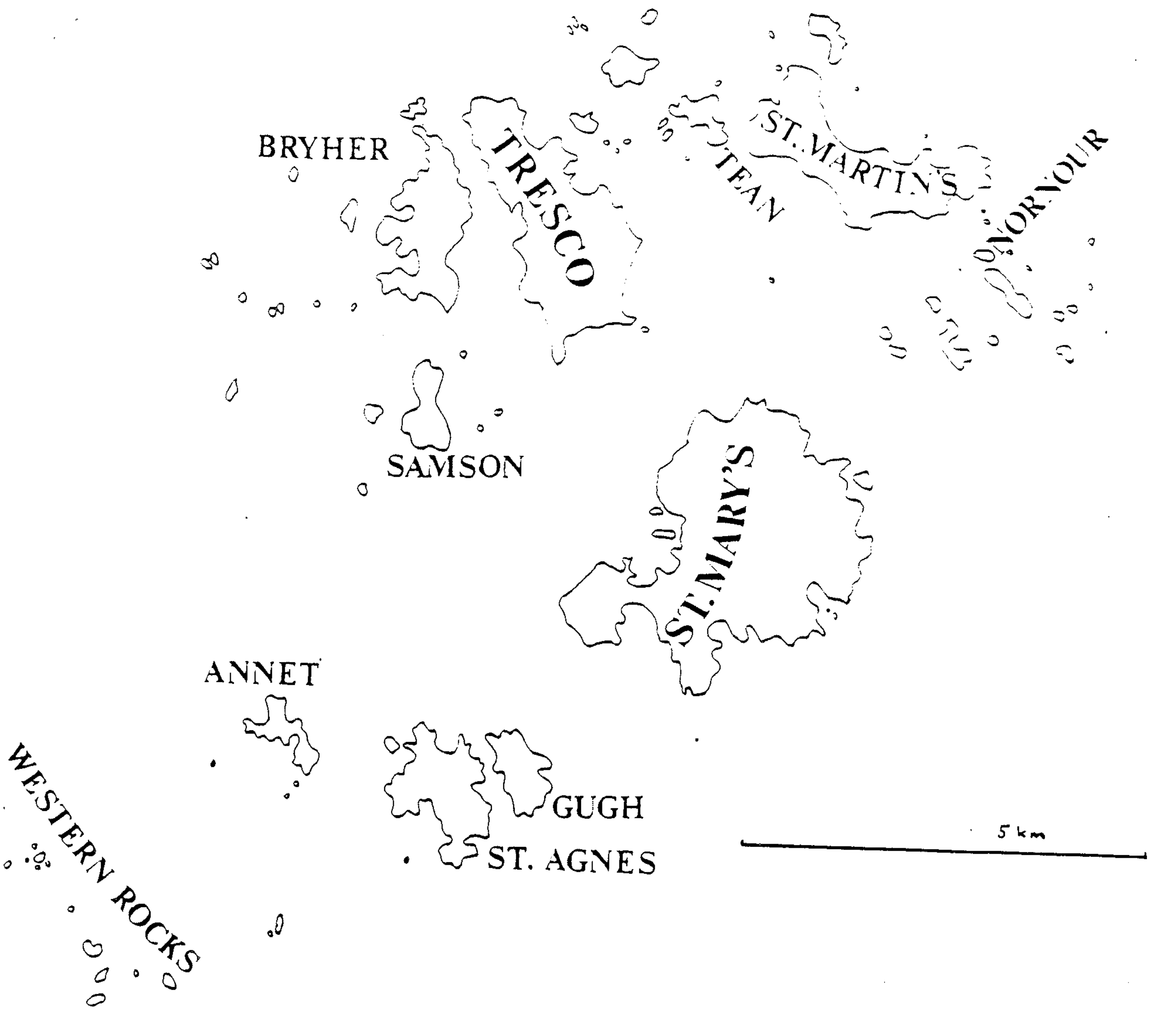
The Isles of Scilly are an archipelago lying 27 miles (43 km) W.S.W. of Land's End, Cornwall.

Today five major islands are inhabited, St. Marys, Tresco, St. Martins, Bryher and St. Agnes, with a population of just over 2,000, the majority inhabiting St. Marys. Some 40 other smaller islands are vegetated and uninhabited, although several were inhabited in the past. There are over 100 additional rocks and reefs. The total exposed land surface at H.W.N.T. is approximately 1,600 hectares (3,900 acres).

The islands are composed entirely of granite which is overlain by blown sand alluvium and head deposits.

The rise and fall of the sea level due to the advances and retreats of the ice during the Ice Age has meant that the islands have at times been all part of one large super-island and at other times been almost completely submerged. The islands were probably last connected to the mainland during the Mid-Pleistocene and the ice sheet reached Scilly on at least one occasion (Scourse 1986). During the ice advances the climate must have been extremely unsuitable for many of the species found on the islands at present.

The rise in sea level after the last advance probably split St. Agnes and Annet away from the rest of the super-island during the Bronze Age (c. 1700 BC) and the continuing rise fragmented the reamining super-island into the present islands. This was a gradual process and was probably not completed until the Middle Ages (Fowler & Thomas, 1979).



Map 1. The Scilly Isles

The climate today is very mild, far milder than the mainland. A high humidity is maintained by regular rainfall and sea fogs; snow is virtually unknown and frosts rarely exceed five days a year. For 350 days a year the air temperature is in excess of 5°C. Lousley (1971) gives a comprehensive summary of the climatic conditions.

The major habitats are limited. Obviously the coastal environment is well represented with bare granite cliffs, shingle and boulder beaches, sandy beaches and dunes. Many of the smaller rocks have little or no vegetation but are still capable of providing refuge for invertebrates such as the false scorpion Neobisium maritimum (Leach) and the centipede Hydroschendyla submarina (Grube).

There are large areas of Western Maritime Heath on all the larger islands and some areas are dominated by a combination of bracken (Pteridium aquilinum (L.)) Annet is unusual, being almost entirely covered with tall mounds of thrift (Armeria maritima (Mill.)). The extensive cultivated areas comprise small fields bounded by stone walls and often with shelter belts of the introduced shrub Pittosporum crassifolium Soland ex Putterl.

In 1835 Adam Smith commenced building his ornamental gardens at Tresco Abbey. This led to the importing of many exotic plants from all over the world, especially the Southern Hemisphere, although records of exotic plants acquired from passing ships being grown on the islands go back to 1650 (Lousley, 1971).

The invertebrate fauna of the islands is depauperate compared to that of the mainland, but also includes exotic species. At the maximum extent of the ice advance the fauna must have been small. Some species may have arrived naturally from warmer refugia to the south, but in the absence of proof of such refugia it seems likely that many species now present owe their introduction to human agency. This method of arrival has been proposed as the most likely explanation for the presence of the Scilly shrew (Crocidura suaveolens (Pallas)) on the islands (Corbet 1961) and invertebrates could have been similarly transported. For example the origin of several exotic species can be traced to Australasia, e.g. Geoplana sanguinea (Moseley), a terrestrial flatworm; Argonemertes dendyi (Dakin), a terrestrial nemertine; and Talitroides sylvaticus (Haswell), a terrestrial crustacean; whilst

Kontikia andersoni Jones, another flatworm, is probably from the Indo-Pacific region. These species can only have been transported by man, presumably with plants for the Tresco gardens. It is not inconceivable that undescribed species of centipedes collected on Scilly originate from as far afield.

In theory the arrival of some species could be roughly dated to the stages of break up of the super-island by examining the distribution of the species at present. For example, any species not found on all of the islands is likely to be a post-medieval arrival. Those found on all islands may well be native or imported as far back as the Bronze Age. However, this apparently simple picture would have been clouded by subsequent inter-island introductions and local extinctions. Much more collecting will be needed before the theory can be tested.

This paper is based on collections made in the autumn of 1982, 1983 and 1984 and the spring of 1985 and 1986. Most specimens were collected by the authors but additional material was collected by A.J. Stones and R. Image. We have included additional records extracted from B.R.C. which are of material collected by F.A. Turk in the 1940s and subsequently examined by A.D. Barber and E.H. Eason.

CENTIPEDES

Twenty species of centipede have been collected from the Isles of Scilly.

GEOPHILOMORPHA

Brachygeophilus truncorum (Bergsoë & Meinert) Collected from St. Marys, Tresco and St. Agnes and most commonly found in areas where there are trees.

Geophilus carpophagus Leach. Common, often abundant, e.g. under cow dung on Wingletang Down, St. Agnes in autumn 1984.

Geophilus fucorum seurati Brolemann. Not easily found but has been collected from coarse granite sand at the top of the beach (but below the high water mark) at Porth Hellick, St. Marys on several occasions and from a similar site on St. Agnes. In 1986 it was discovered under stones on the beach at Old Grimsby, Tresco, again below the high water mark, and under stones above the high water mark on Tean.

Geophilus osquidatum Brolemann. Collected from Gugh, Annet, Tean and Nornour, which are all uninhabited.

Geophilus pusillifrater Verhoeff. This species is difficult to collect but appears not to be uncommon. It is most easily found in cracks in the coastal rock or occasionally under large stones embedded in the soil and in exposed head deposits. All specimens have been from the splash zone, as was a specimen collected from Porthgwarra, Cornwall in 1982. Lewis (1961) found this species at a coastal site in Sussex. It has been collected from St. Marys, St. Martins and Nornour.

Haplophilus subterraneus (Shaw). Common on the inhabited islands and also found on Tean. Turk collected it from Samson.

Henia brevis (Silvestri). A single specimen was collected from Tresco in 1984. Turk collected it from St. Marys.

Hydroschendyla submarina (Grube). Common, often abundant. Easily collected from cracks in the coastal rock below the high tide mark. Probably occurs on all islands and large rocks and so far collected from seven.

Schendyla nemorensis (C.L. Koch). Very common especially under rocks and stones embedded in coastal grassland.

Schendyla peyerimhoffi Brolemann & Ribaut. Collected from St. Marys, Annet and Nornour from cracks in the coastal rock. A specimen collected by Turk from the rock Mincarlo in 1946 has been identified as this species by Eason.

Strigamia maritima (Leach). Commonly found around the tide line on most islands in similar situations to H. submarina and under stones. It is more often found above the high water mark than that species.

Two small species of geophilid have been collected which appear to be new to science and which we hope to describe fully soon. Species A is small with 37 pairs of legs. The head and forcipules are superficially very similar to Pachymerium ferrugineum (C.L. Koch) but the posterior end has only 3 to 5 coxal pores. Further specimens of the species have been collected from the Isle of Wight by A.N. Keay so it may well be found elsewhere in southern Britain. It is not uncommon on Scilly.

Species B is also small with 45 pairs of legs. It may well be an undescribed species of Arenophilus. It has been collected from Tresco by us and Turk found it on St. Marys.

SCOLOPENDROMORPHA

Cryptops hortensis Leach. Common on most of the inhabited islands and Annet.

LITHOBIOMORPHA

Lithobius borealis Meinert. Less widespread than L. melanops, it occurs on several islands.

Lithobius calcaratus C.L. Koch. A single male was collected from a sandy area on Gugh in 1985.

Lithobius forficatus (L.). So far collected only from St. Marys, Tresco and St. Agnes.

Lithobius melanops Newport. Common and widespread but so far not collected from Tresco.

Lithobius microps Meinert. Not uncommon on some islands.

Lithobius variegatus Leach. Very common. Found on all the islands visited except Bryher.

MILLIPEDES

Thirteen species of millipede have been collected from the islands.

PENICILLATA-POLYXENIDA

Polyxenus lagurus (L.). Surprisingly this species has not proved easy to find. It has been collected from under driftwood stacked on maritime heath on St. Marys and is abundant on Annet, again under driftwood.

HELMINTHOMORPHA-JULIDA

Thalassisobates littoralis (Silvestri). This halophile species has been collected on a number of occasions. It was first collected in 1984 from soil filled cracks in a low granite cliff on the Garrison, St. Marys and has been found there subsequently. The cracks also contained *Strigamia maritima* and *Schendyla nemorensis* and were situated above the black lichen zone, but within the splash zone. In 1986 it was also collected from under stones on Nornour, again above the black lichen zone but within the splash zone. Searching similar habitats elsewhere has so far failed to find it but it undoubtedly occurs on other islands.

Proteroiulus fuscus (Am Stein). Where conifers occur this is commonly found under bark, but it is also found on several islands which are completely lacking in trees. In these situations it is easily collected from under stones and driftwood. It has not yet been found on St. Agnes or Bryher.

Choneiulus palmatus (Nemec). This species has a patchy distribution amongst the islands. It has been collected from under stones and driftwood.

Blaniulus guttulatus (Fabricus). Common on the inhabited islands but absent from all the uninhabited ones visited except Tean. A thorough search was made for it on Annet where *P. fuscus* and *C. palmatus* are common but it could not be found.

Cylindroiulus vulnerarius (Berlese). This species was collected in 1986 from just above the high tide mark at Old Grimsby, Tresco.

Cylindroiulus punctatus (Leach). Found only on the inhabited islands of St. Marys, Tresco and St. Martins where there are trees.

Cylindroiulus latestraiatus (Curtis). Abundant, the commonest species on the islands.

Cylindroiulus britannicus (Verhoeff). A single male was collected from the rubbish tip on St. Marys in 1984.

Table 1. Diplopoda from the Scillies, by islands.

● Collected R.E.Jones and P. Pratley

T Collected F.A.Turk

	St. Mary's	Tresco	St. Martin's	Bryher	St. Agnes	Gugh	Annet	Tean	Little Ganilly	Nornour
Blaniulus guttulatus	●	●	●		●			●		
Brachydesmus superus	●	●								
Brachyiulus pusillus	●	●								
Choneiulus palmatus	●	●	●				●			
Cylindroiulus britannicus	●									
C. latestriatus	●	●	●	●	●	●	●	●		●
C. punctatus	●	●	●							
C. vulnerarius		●								
Thalassisobates littoralis	●									●
Polydesmus angustus	●									
P. denticulatus		●								
Polyxenus lagurus	●						●		T	
Proteroiulus fuscus	●	●	●			●	●	●	T	

Table 2.

Chilopoda from the Scillies, by islands.

	St. Mary's	Tresco	St. Martin's	Bryher	St. Agnes	Gugh	Annet	Tean	Samson	St. Helen's	Great Ganilly	Nornour	Mincarlo
Brachygeophilus truncorum	●	●			●								
Cryptops hortensis	●	●	●	T	●		●						
Geophilus carpophagus	●	●	●	T	●		●	●				●	T
G. fucorum serauti	●	●			●			●					
G. osquidatum						●	●	●				●	
G. pusillifrater	●		●									●	
Haplophilus subterraneus	●	●	●	●	●			●	T				
Henia brevis	T	●											
Hydroschendyla submarina	●	●		●	●		●	●				●	
Lithobius borealis	●	T	●			●	●				T		
L. calcaratus						●							
L. forficatus	●	●			●								
L. melanops	●		●	●	T	●	●	●	T	T		●	
L. microps	●	●		●	T				T	T			
L. variegatus	●	●	●		●	●	●	●	T	T		●	
Schendyla nemorensis	●	●	T	●	●	●	●	●	T	T		●	
S. peyerimhoffi	●						●					●	T
Strigamia maritima	●	●	●	●	●	●		●	T				
"Arenophilus" sp. nov. ?		●											
"Pachymerium" sp. nov. ?	●	●											

Brachyiulus pusillus (Leach). Collected from St. Marys and Tresco. Not common.

HELMINTHOMORPHA-POLYDESMIDA

Polydesmus angustus Latzel. Collected only from the Higher Moors area of St. Marys.

Polydesmus denticulatus C.L. Koch. A single specimen was collected from Tresco gardens in 1985.

Brachydesmus superus Latzel. Found only on St. Marys and Tresco.

Acknowledgements

Thanks are due to the N.C.C. warden R. Lawman for arranging for us to visit uninhabitated islands and the boatman W.C. Nicholas for getting us on and off them, often in rough weather. M. Nelham gave us permission for a most productive collecting session in the Tresco gardens.

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AN EXPERIMENTAL STUDY OF THE TOLERANCE OF HAPOLOPHILUS SUBTERRANEUS (SHAW) AND HENIA VESUVIANA (NEWPORT) TO LOW HUMIDITY LEVELS.

A.N. Keay & R.I. Forman

Field observations at a site in Newport, Isle of Wight (Grid ref. 40/498894) showed that the geophilomorph centipedes Haplophilus subterraneus (Shaw) and Henia vesuviana (Newport) were both present and abundant. The site is a south facing bank of clay, covered with scrub, nettles and various other vegetation. There is a high percentage of rubbish at the site, both on the ground surface and in the clay, providing a habitat similar to that of a rubbish dump.

Over a period of 27 months it was observed that although both of these large species were present, H. subterraneus was recorded at a higher frequency during the winter months whilst H. vesuviana was more abundant during the summer months. This indicated that there were factors acting on the two populations causing the seasonal variations. The seasonal variation in numbers of each species found in surface microsites is clearly seen in Fig. 1.

It was thought that this seasonal variation could be controlled by either soil humidity, ground temperature or both. Consequently, it was decided to experimentally test the two species' tolerance to low relative humidity at a constant temperature in order to determine whether this could be a controlling factor in the seasonal variation of the two species.

Method

Specimens were collected at different times of the year, from March 1986 to November 1986 from the Newport site.

37 specimens of H. subterraneus and 21 specimens of H. vesuviana were collected into mesh-topped petri dishes and were then kept for a period of 10-12 hours at a temperature of $19^{\circ}C \pm 1^{\circ}C$. The humidity level for this period was maintained at about 70% R.H.

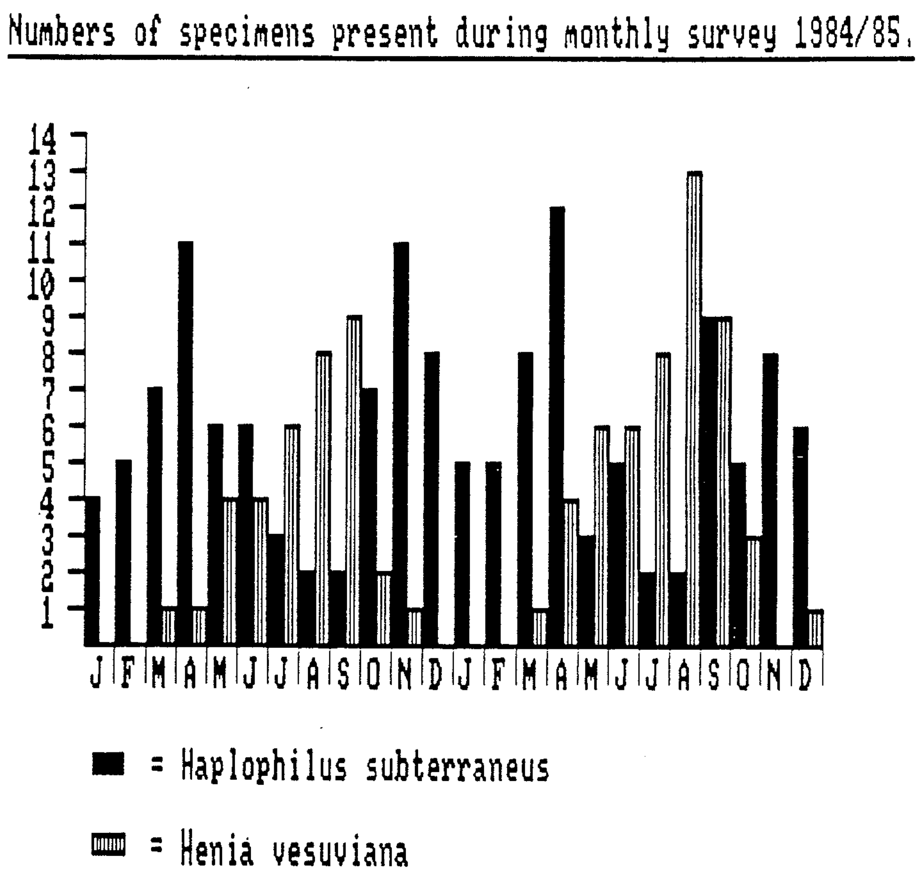

Fig. 1 Numbers of specimens of the two species present during monthly survey, 1984-5.

Each animal was then weighed on a Stanton 'Unimatic' balance in order to establish a 'start' weight and, once weighed, were placed in a humidity chamber with a R.H. of 40% at a temperature of 19°C ± 1°C.

For a period of eight hours, each was weighed hourly and the percentage of bodyweight lost calculated. The specimens were observed during the period in which they were retained in the humidity chamber and notes were made on their behaviour.

The humidity of the chamber was controlled using sulphuric acid at 48% concentratic giving a saturation deficit of 10.5 mm Hg at 19°C (40% R.H.).

Observations

Henia vesuviana

H. vesuviana, when placed into the controlled conditions, initially moved around the petri dishes for a short period (on average 23 minutes) before coiling itself into a 'ball'. This behaviour is described by Gaywood (1986) as a defensive mechanism and a resting stage but is also seen in females of this species when they form a coil around their eggs.

Generally H. vesuviana remains in the coiled position until after 4 hours when it spends increasing periods moving around the petri dish, alternating with periods of coiling. The effect of the increase in mobility is an increase in the loss of bodyweight.

Table 1. Henia vesuviana: Loss of Bodyweight at 40% and 70% relative humidity

Percentage loss of bodyweight at 40% R.H. at 19°C ± 1°C

Time	Min	Max	Mean
1 hr	1.5	2.9	2.3
2 hr	3.5	5.1	4.2
3 hr	4.2	5.7	5.2
4 hr	5.0	6.5	5.9
5 hr	5.5	10.9	8.2
6 hr	6.7	12.7	9.8
7 hr	8.7	13.6	11.5
8 hr	9.4	15.3	12.9

Percentage loss of bodyweight at 70% R.H. at 19°C ± 1°C

(Control specimens)

Time	Min	Max	Mean
1 hr	0.2	0.7	0.4
2 hr	0.5	0.9	0.65
3 hr	0.9	1.2	0.98
4 hr	1.0	1.7	1.31
5 hr	1.3	2.5	1.84
6 hr	1.7	3.3	2.41
7 hr	2.1	4.1	2.79
8 hr	2.4	5.0	3.32

Haplophilus subterraneus

H. subterraneus when placed in controlled conditions of 40% R.H. at 19°C ± 1°C initially remained quiescent for a short period (on average 38 minutes). During this period most specimens remained loosely coiled and never in the tight 'ball' of H. vesuviana. Generally the posterior end of the specimen was coiled and the anterior end was more or less extended.

Following the quiescent period, all specimens spent extended periods moving around the petri dishes and in all cases were very active. After five hours duration, one male specimen was walking backwards, dragging the anterior part of its body. At six and a half hours this specimen was dead. In the case of nine other specimens, after seven hours they were walking backwards dragging the anterior part of their bodies behind them. All nine of these specimens recovered at the termination of the experiment when they were laid on wet filter papers.

At all stages during the experiment H. subterraneus lost a higher percentage of bodyweight in the controlled conditions.

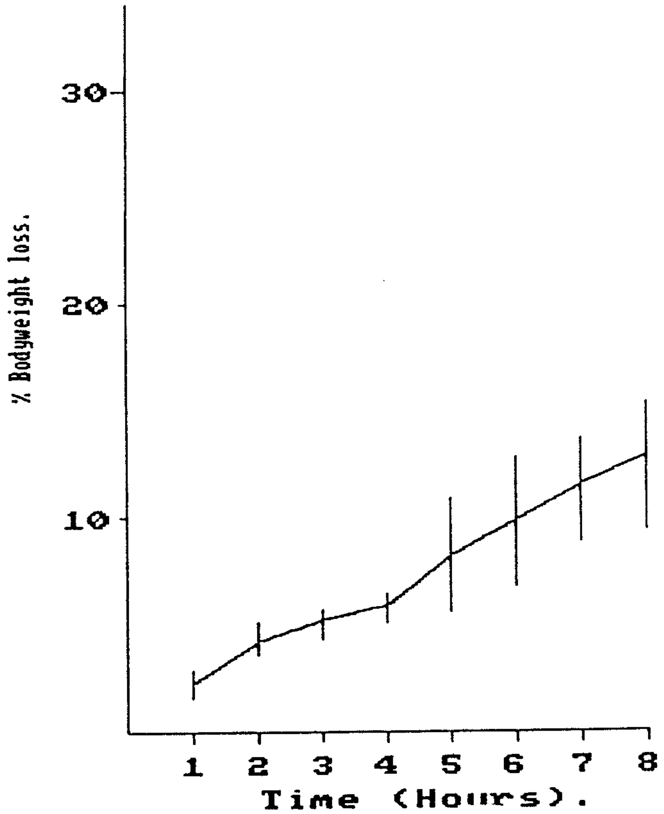

Fig. 2 Henia vesuviana: percentage loss of bodyweight at 40% R.H.

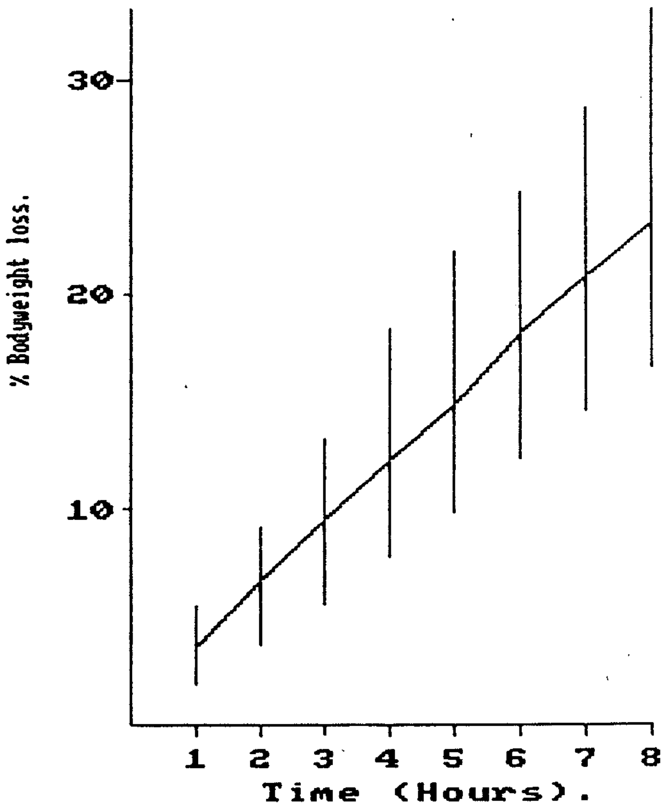

Fig. 3 Haplophilus subterraneus: percentage loss of bodyweight at 40% R.H.

Table 2. Haplophilus subterraneus: Loss of Bodyweight at 40% and 70% relative humidity

Percentage loss of bodyweight at 40% R.H. at 19°C ± 1°C

Time	Min	Max	Mean
1 hr	1.9	5.5	3.6
2 hr	3.6	9.1	6.7
3 hr	5.5	13.2	9.5
4 hr	7.7	18.4	12.3
5 hr	9.7	22.0	14.9
6 hr	12.3	24.7	18.2
7 hr	14.5	28.7	20.9
8 hr	16.5	33.9	23.4

Percentage loss of bodyweight at 70% R.H. at 19°C ± 1°C
(Control specimens)

Time	Min	Max	Mean
1 hr	0.35	0.81	0.51
2 hr	0.53	1.13	0.72
3 hr	0.8	1.37	1.07
4 hr	1.31	1.82	1.49
5 hr	1.85	2.31	2.08
6 hr	2.2	3.04	2.57
7 hr	2.98	3.87	3.49
8 hr	3.42	5.11	4.71

Discussion

In conditions of 70% R.H. at 19°C ± 1°C there is little difference between specimens of *H. subterraneus* and *H. vesuviana* in their loss of weight, although both species react differently. The control specimens of *H. vesuviana* tend to remain 'coiled' and inert, whilst the control specimens of *H. subterraneus* are generally more mobile and when inert do not display the fully 'coiled' stance of *H. vesuviana*.

However, when conditions of low humidity are imposed, the loss of weight by transpiration and respiration show a marked difference between the two species. At 40% R.H. 19°C ± 1°C, *H. subterraneus* loses water at a fairly constant rate, resulting in modified behaviour after about 5 hours. The behaviour shown (i.e. walking backwards, dragging the anterior part of the body) may indicate a serious loss of water from the anterior part of the body.

H. vesuviana exposed to the same conditions loses water at a slower rate possibly by remaining in its inert, coiled posture for long periods. After a period of about 4 hours there is increased activity in this species, probably triggered by the effect of water loss and the desire to find a site with a higher R.H. There is a lower rate of water loss in H. vesuviana and at no time during the experimental period did this species display the behaviour of H. subterraneus in walking backwards dragging the anterior end of the body.

Conclusion

H. vesuviana is better adapted to survive in a low relative humidity possibly due to its strategy of remaining in a quiescent, coiled state for long periods. Generally H. vesuviana is a less mobile species than is H. subterraneus.

Low relative humidity in the microsites at the Newport site would therefore suit H. vesuviana better than H. subterraneus. This would result in a higher population of H. vesuviana than H. subterraneus during the drier summer months, but does not explain the smaller winter population for this species. There are therefore other factors acting on the population of H. vesuviana resulting in the low winter population density.

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ENCOUNTERS BETWEEN THE GEOPHILID CENTIPEDE *HENIA* (*CHAETECHELYNE*) *VESUVIANA* NEWPORT AND THE DEVIL'S COACH HORSE BEETLE *STAPHYLINUS OLENS* (MUELLER)

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Introduction

Henia vesuviana Newport is a large soil-dwelling centipede found south of a line between Bristol and London. Notes on the ecology and feeding preferences of this species have appeared in previous issues of the *Bulletin* (Keay 1984, 1986) but in this article, we would like to describe perhaps the most remarkable aspect of its behaviour, the secretion of defensive glues.

During his studies on *Henia vesuviana*, Andy Keay noticed that forceps used to pick up the centipedes often became stuck together with copious amounts of a milky-white sticky substance which quickly hardened to form a very strong glue. This led us to examine this phenomenon in more detail, in particular whether the secretion of this substance could defend the centipede from attack by other predatory invertebrates. Specimens of *Henia vesuviana* collected from waste ground at Newport, Isle of Wight, were subjected to attacks from the Devil's Coach Horse beetle (*Staphylinus olens* (Mueller)), probably the fiercest invertebrate predator of its size in Britain. A detailed description of the ultrastructure of the secretory glands and the chemical properties of the glue will be presented at the 6th International Congress of Myriapodology in July 1987.

Experimental Results

The progress of encounters between *Henia vesuviana* and *Staphylinus olens* in a small cardboard arena (10 cm x 8 cm x 3.5 cm in height) were recorded with a close-up video camera attached to a recorder with a slow motion replay facility. A typical encounter is described in detail in Table 1.

Table 1: Encounter between a female *Henia vesuviana* (7.5 cm in length) and a *Staphylinus olens* (2.5 cm in length) on 11/2/86.

Time (mins. secs)	Actions	
	Beetle placed in box and crawls around for 5 minutes.	
.00	Centipede introduced into box.	
.32	ATTACK 1. Contact between animals. Beetle grasps middle of body of centipede with jaws.	7 second attack
.39	Contact lost. Centipede immediately flees. Mouthparts and antennae of beetle covered with glue. Beetle starts cleaning activities.	4.50 spent cleaning before next attack
4.12	Contact between animals. Centipede quickly withdraws.	
5.29	ATTACK 2. Contact between animals. Beetle grasps centipede.	20 sec. attack
5.49	Contact lost. Centipede flees. Beetle left with legs and antennae glued together and stuck to the floor of the box.	
17.12	Beetle pulls free of the box floor.	
23.32	All six legs of the beetle free.	54.08 spent cleaning
37.47	Beetle back on its feet.	
41.59	Contact between animals. Beetle turns head but does not attack.	
46.02	Contact between animals. Beetle moves towards centipede but no attack made.	
50.55	Contact between animals. Beetle turns head but does not attack.	
67.57	ATTACK 3. Contact between animals. Beetle bites centipede. Attack not vigorous.	2 sec. attack
67.59	Contact lost. Centipede flees. Beetle starts to clean mouthparts.	
74.22	Contact between animals. Uncertain whether beetle actually attacks but it quickly withdraws again.	
80.00	Experiment ended. Animals removed.	

In this encounter, there were three definite attacks. In the first and second attacks the beetle attempted to overpower the centipede by grasping it with its mandibles and violently rolling over, dragging the centipede with it. The first attack lasted 7 seconds and the mouthparts and antennae of the beetle were slightly affected. The second attack lasted 20 seconds which resulted in the beetle being severely disabled and unable to get back on its feet for 24 minutes. The third attack was not a determined effort and the beetle released the centipede after grasping it for 2 seconds.

The centipede, on being bitten by the beetle, reacted by curling its body and applying the ventral surface to the attacker, thus secreting directly onto it. Once released, the centipede always made a rapid escape away from the beetle. The centipede tried to avoid the risk of attack by rapidly recoiling its body whenever it made contact with the beetle. The body of the centipede was slightly swollen in the regions where it had been bitten but the mandibles of the beetle had not pierced the cuticle and appeared to have done no lasting damage (the centipede is still alive a year later!). During this incident, the centipede secreted 13 mg of glue representing about 8% of its body weight at the beginning of the experiment (Table 2). Encounters between Henia vesuviana and Staphylinus olens were repeated a further six times and in each case, the centipede escaped without fatal injury by virtue of its glue secreting ability.

Table 2: Loss of weight of Henia vesuviana after attacks by Staphylinus olens described in Table 1.

Weight of centipede before encounter	0.163 g
Weight of centipede after encounter	0.150 g
Weight of glue secreted	0.013 g
Percentage weight loss	8%

Discusssion

Staphylinus olens is probably one of the largest and most ferocious invertebrate predators that Henia vesuviana is likely to encounter in nature yet the centipede managed to deter several attacks from the beetle with relatively little damage to itself. Like other geophilid centipedes, Henia vesuviana is a relatively slow moving species (a measured speed of 0.4 cm sec^{-1} compared with 6.6 cm sec^{-1} for Lithobius forficatus), but the sticky secretion is sufficient to temporarily disable Staphylinus olens long enough for the centipede to make an escape. In the encounter described (Table 1), it took the beetle about 32 minutes to get back on its feet after the second attack. There are very few eye-witness reports of predation on centipedes in nature but Eason (1964) suggests that carabid beetles and hunting spiders may eat the smaller species, eggs and immature forms. Ridley (1936) observed a beetle, Harpalus ruficornis, successfully deterred by the defensive secretion of Geophilus electricus and Kirby & Spence (1867) observed the same species deterring a Carabus sp. Vertebrates such as shrews, toads and newts probably predate on centipedes as well.

Although the specimen of Staphylinus olens was severely disabled and repelled by the centipeded, it still attacked again once it had cleaned itself, apparently not having learned from its previous experience. A similar case was reported with carabid beetles which severed the body of julid millipedes with their first bites (Roth & Eisner 1962). The beetles were then repelled by the millipede's secretion, although this never happened until after the infliction of the fatal injury. The experiments were repeated day after day with identical results.

Chemical tests on the glue have shown it to be composed almost entirely of low (12,000) and high (>130,000) molecular weight proteins. When stretched, the glue forms strong fibres which polymerise and become very hard within about 20 seconds of exposure to the air. It sticks to a wide range of surfaces including glass, but does not stick to the cuticle of the centipede. Blower (1955) identified a superficial film of lipoid on the cuticle of geophilids which provides them with some degree of waterproofing and may possibly be the substance which prevents the glue from sticking to the centipede. Each segment of Henia vesuviana contains a large sac which surroungs about 200 small tubular glands which synthesize the glue. Each gland opens to the air via a small pore (diameter c. 5 um) which is sealed by a cuticular cap which is withdrawn to allow the glue to escape. The pores are situated centrally on the ventral surface and are visible to the naked eye as an orange patch. When at rest, the centipede always exposes its ventral surface towards the direction from which it is most likely to be attacked.

Jones et al (1976) reported that the geophilid Strigamia bothriopa, could successfully repel one or two ants with its secretion, but if milked exhaustively could become overrun by a swarm of ants and killed. It is, therefore, an adaptive advantage to be able to conserve these exocrine discharges and thus improve their effectiveness. When Henia vesuviana was prodded with a mounted needle under a binocular microscope, it was observed that glue was secreted only from sternal pore plates on the segments stimulated. Thus, the centipede is able to repel several attacks by only secreting glue at the specific site at which it is being bitten.

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DISPLACED OCELLI IN BLANIULID MILLIPEDES

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During the joint meeting of the British Isopod Study Group and the British Myriapod Group in Manchester, April 1986, one of us (S.P.H.) collected a number of small blanuilid millipedes from waste ground adjacent to the Williamson Building of the University of Manchester. Among the millipedes collected was a single specimen of an intercalary male provisionally identified by H. Enghoff as *Nopoiulus kochii*, possibly the first British record for this species. Eight specimens of another blaniulid, *Choneiulus palmatus*, were also collected along with about 30 individuals of *Blaniulus guttulatus*, the common spotted snake millipede which is, of course, blind.

In this recently published Synopsis on British Millipedes (Blower 1985), the arrangement of ocelli is a principal character used in the key to Blaniulidae (page 106). At level 2, *Proteroiulus fuscus* is separated from *Choneiulus palmatus* and *Nopoiulus kochii* by having "Ocelli in very acute triangular field consisting of an antero-posterior line augmented by two or three ocelli forming an additional line close to the base of the antenna" whereas the latter two species have "Ocelli in a single antero-posterior line". Close examination of the *Choneiulus palmatus* collected from the Manchester site, revealed that the eyes of five of the eight specimens did not conform to this description. Instead of being in a straight line, some of the ocelli were 'displaced' in a manner subtely different from those of *Proteroiulus fuscus* (Fig. 1). In *Proteroiulus fuscus*, the 'extra' ocelli are distal (close to the antennae) whereas in *Choneiulus palmatus* they occurred in the middle of the antero-posterior line (Fig. 1). The ocelli of *Nopoiulus kochii* also did not conform to a straight line (Fig. 2).

The unusual and inconsistent arrangement of ocelli observed in these blaniulids may result from the effects of vehicle exhausts on eye development in this heavily built up area. It is clear that care should be exercised when keying out *Proteroiulus fuscus*, *Choneiulus palmatus* and *Nopoiulus kochii* and that characters other than the eyes should be carefully examined before making a firm identification.

Reference

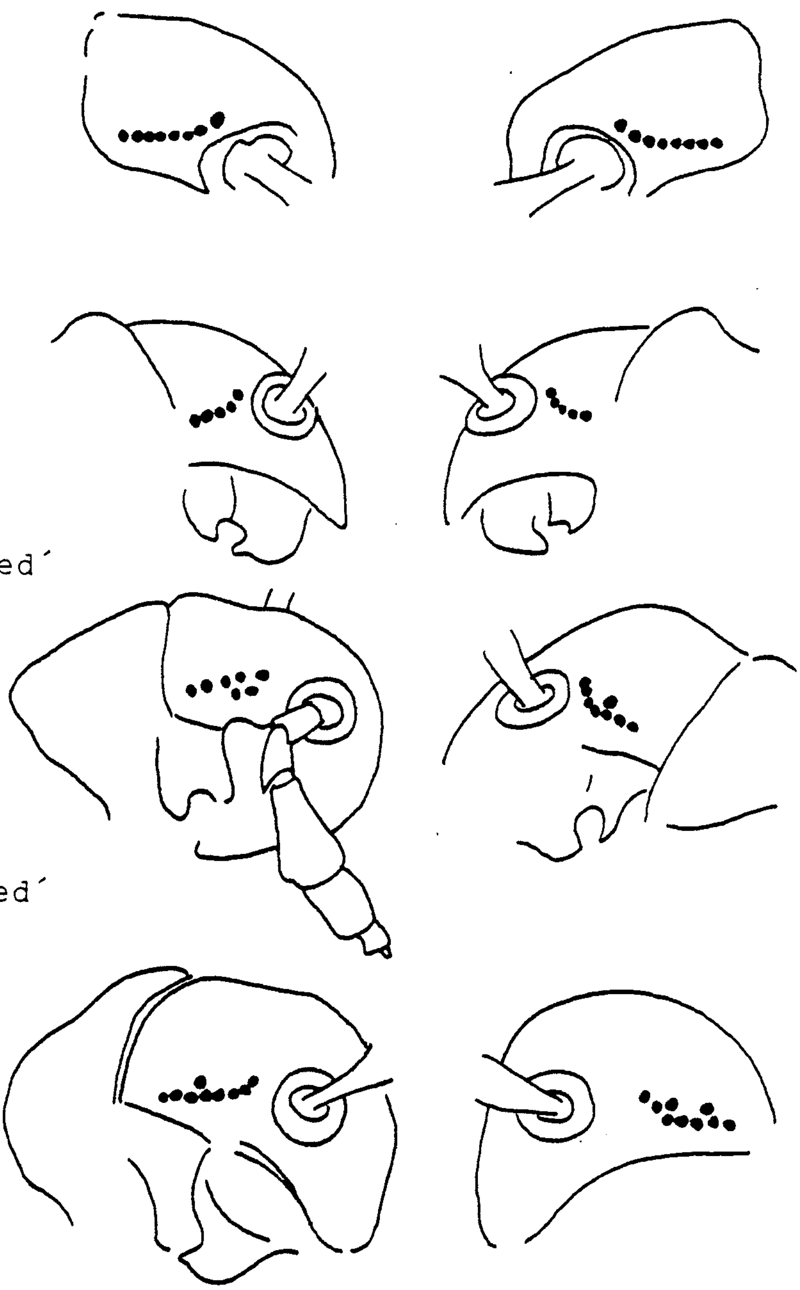
Blower, J.G. (1985). Millipedes. *Synop. Br. Fauna* (New Series), No. 35. E.J. Brill/Dr. W. Backhuys Publishers.

Specimen 1 : Ocelli ´normal´
Length : 9.9 mm
Diameter : 0.53 mm
No. rings : 36

Specimen 2 : Ocelli ´normal´
Length : 8.3 mm
Diameter : 0.50 mm
No. rings : 31

Specimen 3 : Ocelli ´displaced´
Length : 8.9 mm
Diameter : 0.48 mm
No. rings : 32

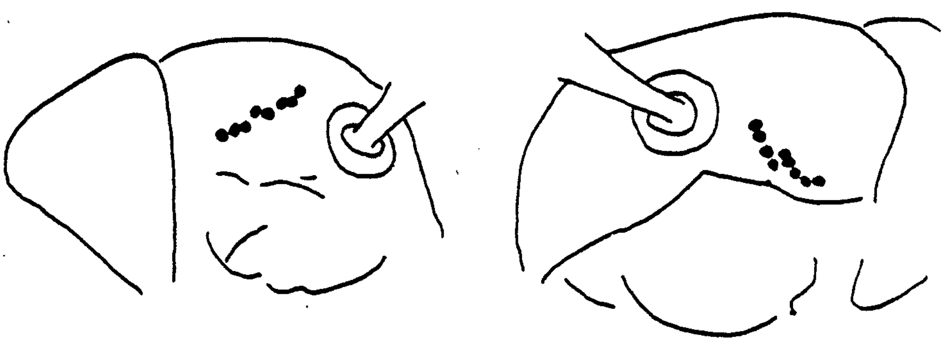
Specimen 4 : Ocelli ´displaced´
Length : 10.2 mm
Diameter : 0.53 mm
No. rings : 39



0.5 mm

Figure 1 : Arrangement of ocelli on right and left sides of the heads of four male specimens of Choneiulus palmatus collected from central Manchester, April 1986.

Length : 13.5 mm
Diameter : 0.64 mm
No. rings : 46



0.5 mm

Figure 2 : Arrangement of ocelli on right and left sides of the head of the specimen of Nopoiulus kochii collected from central Manchester, April 1986.

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CENTIPEDES AND MILLIPEDES COLLECTED IN NORMANDY, FRANCE

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Barber (1986) has pointed out that the myriapod fauna of Britanny is of particular interest to students of British myriapods: the same is true of the fauna of Normandy which may have links with the fauna of the south of England. Details are given here of two collections made in Normandy, the first by R.D.K. in 1979 and 1980 and the second by J.G.E.L. and S.J.L. in 1985. The millipedes have been identified by R.D.K., the centipedes by J.G.E.L.

The 1979/80 Collection

One km NE of Catheux on D106; Beechwood on chalk hill. Oise. DR30 (Edge of Picardy). 23.v.1979. Glomeris marginata (Villers), Cylindrioiulus nitidus (Verhoeff), Cylindrioiulus punctatus (Leach), Leptoiulus kervillei (Brolemann), Tachypodoiulus niger (Leach), Polydesmus angustus Latzel, Polydesmus testaceus C.L. Koch, Brachydesmus superus Latzel, stadium V chordeumoid.

One km W of Abancourt; Beechwood. Oise. DR10 km W of 24.v.1979. Cylindroiulus punctatus, Tachypodoiulus niger, Brachydesmus superus? immature, immature chordeumoid.

Forêt de Brotonne; Beechwood with some oak. Seine Maritime. CQ38. 3.xi.1980. Glomeris marginata, Glomeris hexasticha ssp. intermedia Latzel, Cylindroiulus londinensis (Leach), Leptoiulus kervillei, Polydesmus angustus, Chordeuma silvestri C.L. Koch, Chordeuma proximum Ribaut, (The only known site where the last two species co-exist), Lithobius forficatus (Linn.).

Montreuil-en-Auge, by D85a, W of Val Richer Abbey; mixed deciduous/coniferous woodland, mainly beech, oak, silver birch Calvados, BQ85. 4.xi.1980. Glomeris marginata, Cylindrioiulus nitidus, C. punctatus, Polydesmus sp. (immature), Polyzonium germanicum Brandt, Chordeuma proximum Ribaut, Melogona gallica (Latzel).

Immature Lithobius sp., Schendyla nemorensis (C.L. Koch), Strigamia crassipes (C.L. Koch), ♂, 18.5 mm, 49 pairs of legs, Brachygeophius truncorum (Bergsö and Meinert).

Forges de-Clermont en Auge; Beech/oak hanger facing south. Top of scarp E of village on D85. Calvados. YV15 4.xi.1980.
Cylindroiulus nitidus, C. punctatus, Leptoiulus kervillei, Polydesmus inconstans Latzel, Brachydesmus superus, Chordeuma proximum, Melogona sp. stadium VIII.
Lithobius forficatus, Strigamia crassipes ♂, 18.5 mm, 49 pairs of legs; ♀, 20 mm, 49 pairs of legs.

Forêt de Cerisey, N of D572 near Bas de Montfiquet; Beechwood with low holly, ivy, grass and mosses. Calvados. XV55. 4.xi.1980.
Polydesmus angustus, Brachydesmus superus, Chordeuma proximum, Melogona gallica, Anthogona variegatum Ribaut, Chamaesoma brolemanni Ribaut and Verhoeff.
Lithobius sp., Schendyla nemorensis, Brachygeophilus truncorum.

Guilberville; Oakwood with beech and silver birch, brambles, ivy and bracken. Manche. XV52. 5.xi.1980.
Polyzonium germanicum, Chordeuma proximum.

Forêt l'Evêque, St. Martin-de-Besaces oakwood with beech and silver birch, heather, whortleberry, bracken, woodsage, acid, Calvados XV52.
Tachypodoiulus niger, Polydesmus angustus, Polyzonium germanicum, Chordeuma proximum. 5.xi.1980.
The centipede material is very poorly preserved. Brachygeophilus truncorum, Schendyla nemorensis, Gnathomerium inopinatum Ribaut, Strigamia sp.
Lithobius melanops Newport, Cryptops hortensis Leach, Geophilus carpophagus Leach, stadium adolescens I, 11 mm, 49 pairs of legs.

Bois de Buron, Ondefontaine; Beechwood with oak and birch, some bracken and whortleberries, acid. Calvados. XV63. 5.xi.1980.
Tachypodoiulus niger, Polyzonium germanicum, Chordeuma proximum, Lithobius melanops, Strigamia acuminata (Leach) ♀, 13 mm, 41 pairs of legs.

St. Martin-de-Sallen; Beech and oak with holly, ivy, bramble, fern moss, grass and whortleberries. Calvados XV82. 5.xi.1980.
Glomeris marginata, Tachypodoiulus niger, Brachydesmus superus, Polyzonium germanicum, Chordeuma sp. ♀.
Lithobius microps Meinert.

Forêt de Cinglais; Beech, oak and others, brambles. Calvados. XV83. 5.xi.1980.
Cylindroiulus punctatus, Polydesmus angustus, Chordeuma proximum.
Lithobius piceus L. Koch, Geophilus carpophagus ♀, 26 mm, 51 pairs of legs.

Cossesseville; Beechwood on steep slope with brambles, rocky.
Calvados. XV82. 5.xi.1980.
Glomeris marginata, Glomeris hexasticha ssp, intermedia, Cylindroiulus punctatus, Tachypodoiulus niger, Leptoiulus kervillei, Polydesmus angustus, Chordeuma proximum, Anthogona variegatum, Chamaesoma brolemanni.

Forêt de la Ferté Macé; Beech, oak, pine, bracken, grass, whortleberries, peaty and acid. Orne. XU98. 6.xi.1980.
Polyzonium germanicum, Chordeuman proximum.
Lithobius microps, Schendyla nemorensis.

Bois de Magny; Mature beech and some oak, bracken, peaty soil.
Orne. XU97. 6.xi.1980.
Polyzonium germanicum, Chordeuma proximum, Polydesmus spp. immature.

Forêt d'Ecouve, N.E. of St. Didier s. Ecouves; Mature beech forest.
Orne. YU28. 6.xi.1980.
Leptoiulus kervillei, Polydesmus angustus, Brachydesmus superus.

Forêt d'Ecouve, W of D26, 4.5 km N of junction with D1; Beech forest.
Orne. BP87. 6.xi.1980.
Brachydesmus superus.

Forêt de Perseigne, Route de Ancinnes; Beechwood. Sarthe. BP96. 6.xi.1980.
Brachydesmus superus, Polydesmus sp., Chordeuma proximum.
Lithobius piceus, Lithobius crassipes L. Koch, Lithobius microps, Schendyla nemorensis, Gnathomerium inopinatum, ♂, 21 mm, 41 pairs of legs, ♀, 19.5 mm, 41 pairs of legs, two immature specimens, 7 mm and 75 mm each

with 41 pairs of legs and 1 - 1 coxal pores.

Forêt de Bellême; Beech, some oak, honeysuckle, madder, spurge, woodsage. Orne. 6.xi.1980.
Brachydesmus superus, Immature Leptoiulus, looks like kervillei but not certain. Lithobius microps, Schendyla nemorensis: the eight specimens of this species collected showed considerable variation in the ratio of the length of the tibia of the terminal leg to the tarsus, viz. between 1:0.66 and 1:0.45. (Figs 1-3). Gnathomerium inopinatum, 8 mm, 39 pairs of legs.

Forêt de Reno Valdieu; Mixed deciduous. Orne. 6.xi.1980.
Brachydesmus superus, Polydesmus sp. immature, chordeumoid immature.

The 1985 Collection

Six km east of Carteret on Sortosville road (D 902); Under birch logs and litter. Manche WV87. 2.iv.1985.
Glomeris marginata, Cylindroiulus punctatus, Tachypodoiulus niger, Julus scandinavius Latzel.
Lithobius piceus, Lithobius muticus C.L. Koch, Schendyla nemorensis.

Forêt de Cerisy, 4 km south of le Molay-Littry on D10; Beech/oak litter. Calvados XV55. 3.iv.1985.
Glomeris marginata, Cylindroiulus punctatus, Tachypodoiulus niger, Polydesmus angustus.
Lithobius piceus, Lithobius crassipes, Lithobius cacaratus C.L. Koch, Lithobius tricuspis Meinert ? ♂♂♂♀. Dr. E.H. Eason writes "Too immature to be certain (whether these are agilis or tricuspis) but the shape of the tergite T8 abruptly rounded, T10, 12 and 14 blunt (not rounded) and sharp projections on T9, 11 and 13 (not blunt as in agilis) all support tricuspis". Strigamia acuminata, 39 pairs of legs.

2.5 km west of Briquebec on D66 to Surtainville; Birch/Beech wood in litter and well rotted birch logs. Manche. WV98. 5.iv.1985.
(In litter) Glomeris marginata, Cylindroiulus punctatus.
(In logs) Lithobius variegatus Leach (five specimens): ♀, 19 mm, coxal pores 6.5.5.5. ♂, 19.5 mm, coxal pores 6.5.5.5. ♀, 16 mm, coxal pores 5.4.4.4. ♀, 13 mm, coxal pores 4.3.3.3. ♂, 12.5 mm, coxal pores 3.2.2.2. The

specimens were of typical colour pattern. No other centipedes were found in this habitat, neither in logs nor in litter.

Discussion

The most abundant millipedes species in Normandy in November 1980 were Chordeuma proximum and Polyzonium germanicum but they were characteristic of sandy and, or acid localities in particular. In basic areas there were other species such as Cylindroiulus nitidus, Leptoiulus kervillei, more Tachypodoiulus niger and Cylindroiulus londinensis (once). This seems to confirm the abundance of C. proximum in sandy areas referred to by Kime (1978). It is apparently an Atlantic species. Although it is found in S.E. England, albeit very much less than in the South-west, the most easterly record for France appears to be the one given here for the Forêt de Brotonne in Seine Maritime, however, Picardy and Artois have not yet been studied in detail. In eastern France, Chordeuma sivestre is the representative of this genus. It is odd then that C. silvestre occurs in Cornwall. R.D.K. has found Polyzonium germanicum a lot in France. It is very abundant in some of the woods of Normandy, especially in deep beech litter. In Great Britain it only occurs in Kent.

All the millipedes here recorded from Normandy occur in Britain, except Anthogona variegatum and Chamaesoma brolemanni, both small craspedosomids. Anthogona has not been found this far north before: the genus is centred in the Pyrenees. It was surprising that not a single Nanogona polydesmoides (Leach) was present in the collections as it is common in S.W. England.

The presence of Lithobius variegatus in Normandy is of interest. Until recently it was regarded as a species endemic to the British Isles but is now known to occur in Brittany (Barber, 1986) and the Iberian Peninsula and the western Mediterranean region (Eason and Serra, 1986). These latter authors have demonstrated that it is conspecific with Lithobius rubriceps Newport, which should be regarded as a subspecies, L. variegatus rubriceps. Eason and Serra discuss the distribution of Lithobius variegatus and conclude that climate is an important factor in the distribution of the species but not the sole one. Some other factor such as a competing species from the east whcih has failed to penetrate Brittany and the Iberian Peninsula may be important. Lithobius variegatus may exist in a number of scattered populations in northern and north-western France. If its distribution is due to competition with another lithobiomorph, then Lithobius piceus seems a likely possibility.

Gnathomerium inopinatum Ribaut, 1910 (= Arctogeophilus inopinatus) is found in western and central France but not in the British Isles it is a small species similar in size to Brachygeophilus truncorum and Schendyla nemorensis.

Acknowledgements

One of us, J.G.E.L., is indebted to the Royal Society Research in Schools Committee and to Dr. D.J. Stradling for their support, encouragement and advice.

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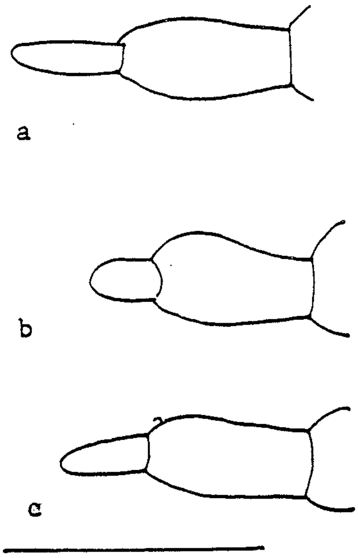
Fig. 1. Tibia and tarsus of the terminal leg of three specimens of <u>Schendyla nemorensis</u> from Forêt de Belleme, 6.xi.1980.

a) a female, length 16.5 mm with 39 pairs of legs.
b) a male, length 15.5 mm with 37 pairs of legs.
c) a female, length 17.0 mm with 39 pairs of legs.



JL.

Bulletin of the British Myriapod Group 4 (1987)

MORE MYRIAPODS FROM BRITTANY

J.G. Blower
Department of Environmental Biology, The University, Manchester.

Barber (1986) listed some myriapods recently collected in the French Departments of Finistère and Morbihan. He mentioned the significance of this area to students of British distribution, to which I may add that the three most western Departments are rarely mentioned by Demange (1981). The records presented here resulted from a holiday in the summer of 1986 in Finistère and Côtes du Nord.

Finistère

1. Pointe du Bénodet

Top of shore, west side in area of sea pink, 23.v.86

Geophilus carpophagus Leach male (49 pairs of legs)

Cylindroiulus latestriatus (Curtis) male VIII, 36+2; females XI 40+1, 40+1, 41+1; female XII 40+1

Top of shore, beneath cliff, under stones with rock hoppers, 24.v.86

Pachymerium ferrugineum (C.L. Koch) three large females, all with 55, 36-38 mm one immature (55); coll. D.B.B., J.G.B.

Schendyla peyerimhoffi Brolemann & Ribaut female (43) 19 mm

Under ivy on top of low garden wall, top of shore east side overlooking Mer Blanche, 23.v.86

Lithobius melanops Newport three females, one immature

Cryptops hortensis Leach one

(Also present were *Brachinus sclopeta*, *Philoscia muscorum* (Scopoli) and *Armadillidium* sp.)

2. Beg Meil

Top of shore on sand with pines, 27.v.86

Under ivy on fallen tree

Lithobius forficatus (L.) male, 17 mm

Geophilus carpophagus male (51), 37 mm, immature (49) 20 mm

Under stones

Lithobius melanops immature

Pachymerium ferrugineum immature (51)

Cryptops hortensis one adult, one immature

Cylindroiulus latestriatus male IX 35+2

3. Pointe du Raz; under stones, 26.v.86

Lithobius forficatus

Lithobius melanops male coll. J.B.B.

Geophilus carpophagus immature (49)

Cylindroiulus latestriatus female XII, 43:1

4. Quimper, north wooded side of Mont Frugy overlooking town, 28.v.86

Under bark

Cylindroiulus punctatus (Leach) ad. lib. incl. male X 47+2, 2 VI, 3 V

Cylindroiulus truncorum (Silvestri) two females, IX 38+1, 14.5 X 1.16 mm, XI 41+2, 17.5 X 1.33 mm; diagnosis on size, seven and eight anal valve setae and vulvae.

Côtes due Nord

5. Perros Guirec

Camp site, Le Ranolien

In tent, 30.v.86

Lithobius calcaratus C.L. Koch coll. J.N.B.

Ommatoiulus sabulosus (L.) coll. J.B.B. male 49+1

Under stones, open part of site, 31.v.86

Lithobius forficatus immature, 4+4 mxp. teeth

Lithobius calcaratus male

Shore path by Ploumanach, 30.v.86

Haplophilus subterraneus (Shaw) female (81) associated with Myrmica sp. and Platyarthrus

Schendyla nemorensis (C.L. Koch) immature (39)

6. Pointe du l'Arcouest, 2.vi.86
Shore just below car park for Ferry to Isle de Bréhat
Under lichen-covered stones at high water neap, with Orchestis sp., but only just above zone with Gammarus sp. and Carcinus moenas
Strigamia maritima (Leach) common, two adults and an immature coll. C.C.B., and J.G.B. (47) 24.3 mm, (49) 25.3 mm, (51) 17.5 mm.

Small island, 100 m further out from mainland, cut-off at mid tide; lower shore level than above; under stones with muddy silt substrate, (Sphaeroma sp. in pool nearby).
Hydroschendyla submarina (Grube) several seen only one tubed, female (49) 25.4 mm.

7. Trebeurden castle, 3.vi.86
On hillside, under bark.
Proteroiulus fuscus (A.M. Stein) females
In leaf litter
Gomeris marginata (Villers) male and imm. with perplexa markings
Cylindroiulus latestriatus female VIII 37+2

The most interesting chilopods were the littoral and semi-littoral Hydroschendyla submarina, Pachymerium ferrugineum and Schendyla peyerimhoffi, all with restricted distribution in Britain. H. submarina occurred in habitats very similar to those occupied by S. maritima; whilst both species can be exposed in rock crevices, they clearly live commonly under stones also. This was my first sighting of H. submarina; it has a reddish tinge like Strigamia maritima; I am warned to look very carefully at all the S. maritima I find in the future. P. ferrugineum is only known from one locality in Britain. In France, it has previously not been recorded from the Atlantic coast (Demange, 1981); I think southern Brittany qualifies as Atlantic coast. Schendyla peyerimhoffi is not included in Demange (1981). The most interesting diplopod was Cylindroiulus truncorum; although not listed in Demange (1981) it is said to occur in greenhouses there by Schubart (1934); previously, the species has not been recorded in an out-of-door site in northern Europe.

My thanks to Cathy, Jonathan and David Blower for much energetic stone turning.

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BRITISH SCHENDYLIDAE (CHILOPODA, GEOPHILOMORPHA)

A.D. Barber
Plymouth College of Further Education

Schendylid centipedes are generally described as small and pale species; Brolemann (1930) notes amongst the features of the tribe Schendylini to which all our forms belong "Formes petites où très petites, filiformes, de coloration pâle". If Hydroschendyla submarina is excluded (it is reddish brown and up to 40 mm long) this is probably a fair generalisation for at least the British species.

Six species have been recorded from Great Britain of which one, Schendyla zonalis is somewhat doubtful, another is known once from a greenhouse and two are maritime. There is, however, always a possibility of further forms occurring here especially in the south and west. One species, Brachyschendyla dentata has been found subsequent to the publication of Eason (1964) and more information is now available on both the ecology and distribution of our species.

Recognition of Schendylini

British schendylids are usually easily recognised by having a head rather longer than broad, forcipular tergite trapeziform, and, most distinctly, coxae of the last legs having only two, more or less conspicuous pores opening ventrally along the edge of the metasternite and the last legs not bearing claws, the latter often being represented by minute spines or tubercles.

The labrum consists of a conspicuous, toothed, arcuate mid piece connecting two side pieces and the second maxillae have well developed claws. The characteristics of these, together with the presence or absence of sternal pore groups and the appearance of the mandible are important diagnostic features.

Hydroschendyla submarina (Grube, 1869)
Quite unlike other British schendylids in appearance, being reddish brown in colour (similar to Strigamia maritima (Leach)) and up to 40 mm long, 45-53 pairs of legs. It is distinguished at once from S. maritima by the absence of the prominent tooth at the base of the poison claw of that species and by the appearance of the last legs, typically schendylid.

According to Lewis (1962) the species was recorded from Jersey, Cornwall, Yorkshire and Pembrokeshire; he reported it from the Plymouth area, on both sides of the Tamar. He is doubtful about the status of the Pembs specimens and has later (pers. comm.) expressed grave doubts about the record from Yorkshire. There is also a record from Ireland from the Clare Island Survey.

It is an elusive animal, being confined to rock crevices on the shore from which it has more recently been recorded from South Devon, the Scillies and Brittany, the latter two by R. Jones. In consequence it is difficult to be precise about its distribution; it may well have been confused with S. maritima in the past and is worth searching for. Elsewhere it occurs all along the Atlantic coast from Scandinavia to North Africa.

Schendyla nemorensis (C.L. Koch, 1837)
A colourless or pale yellow animal up to 30 mm long in some cases, distinguished from our other common small geophilomorph, Brachygeophilus truncorum (Bergsoë & Meinert) by its paler colour and distinctively different last legs, which, like other schendylids, lack claws. In addition B. truncorum is relatively rarely found in urban locations whilst S. nemorensis shows no marked preference for either rural or urban sites.

This is by far our commonest schendylid; the centipede recording scheme had 571 reports of it, mostly post-1970 which makes it our fifth commonest geophilomorph after Necrophloeophagus flavus, Brachygeophilus truncorum, Geophilus carpophagus and Haplophilus subterraneus. Records are from all parts of Britain and Ireland except the more northerly areas of Scotland but it is distinctly less common in Yorkshire and Cumbria northwards with few modern records from there. It has been found in a great variety of habitats, records from arable, scrubland, waste ground and seashore being amongst the highest numbers whilst it is also one of the commonest centipedes in bracket fungi.

Schendyla nemorensis var. fountaini Turk, 1944.
Turk reported this variety from Cornwall. The last segment (metatarsus) of the last legs was only one quarter the length of the penultimate (tarsus). There were also some differences in the shape of the claw of the second maxillae (3.5 times as long as broad instead of 2.25) and the labrum (17 teeth).

In the absence of the material it is difficult to be clear on the status of this variety. The last legs certainly tend to suggest S. peyerimhoffi but there is great variation in S. nemorensis in any case.

Schendyla peyerimhoffi Brolemann & Ribaut, 1911
Despite suggestions that this is not a "good" species by Misioch (1979) there is little doubt that we have a distinctive form characterised by 4-5 well spaced incisures giving the poison claws a distinctly crenulate appearance and a very short metatarsus compared to the tarsus on the last legs. These latter are usually quite distinctive and make the animal easily recognised once seen and easily separated from S. nemorensis which may occur in maritime sites to which S. peyerimhoffi seems to be confined in Britain.

It was originally described from Morocco and subsequently from Portugal and was first reported in Britain from the Sussex coast and Plymouth by J.G.E. Lewis (Lewis, 1961). It was later identified from material collected in the Scillies by F.A. Turk in 1946 and has more recently been rediscovered there by R.E. Jones (this Bulletin). In 1983 I first found it under flat, smallish stones on mud around high water in the Avon, near Aveton Gifford, South Devon. Subsequently it has been recorded from estuarine sites on the Erme, Dart, Teign and Exe in Devon and the Hayle area of Cornwall. Apart from sites under stones it has also been collected in rock crevices.

J.G. Blower has it from several sites around the Gower, South Wales and S.P. Hopkin has collected it on Anglesey. All the indications are that it will prove to be widespread in suitable locations around southern and western coasts. Mr. Blower has also collected it from the Brittany coast (Blower, 1987), a report which fits in with its known distribution along the Atlantic coast of S.W. Europe (Map 1).

Schendyla zonalis Brolemann & Ribaut, 1911
Similar in appearance to S. nemorensis although the metatarsus of the last legs is said to be usually more than half the length of the tarsus, this species is distinguished by the presence of 1-3 ventral and sometimes one dorsal spine on the claw of the second maxillae. This is not necessarily an easy character to see. In addition the labrum has 16-26 teeth (15 in S. nemorensis) and the mandibular dentate lamina is divided into three separate masses (only one in S. nemorensis). It occurs in southern France, the Mediterranean region and elsewhere in Europe.

R.S. Bagnall (Bagnall, 1935) reported it from the coasts of Devon and Dorset. Numerous specimens of S. nemorensis from southern Britain have been examined but so far we have failed to rediscover it. It could well occur here but its status must remain somewhat doubtful for the present.

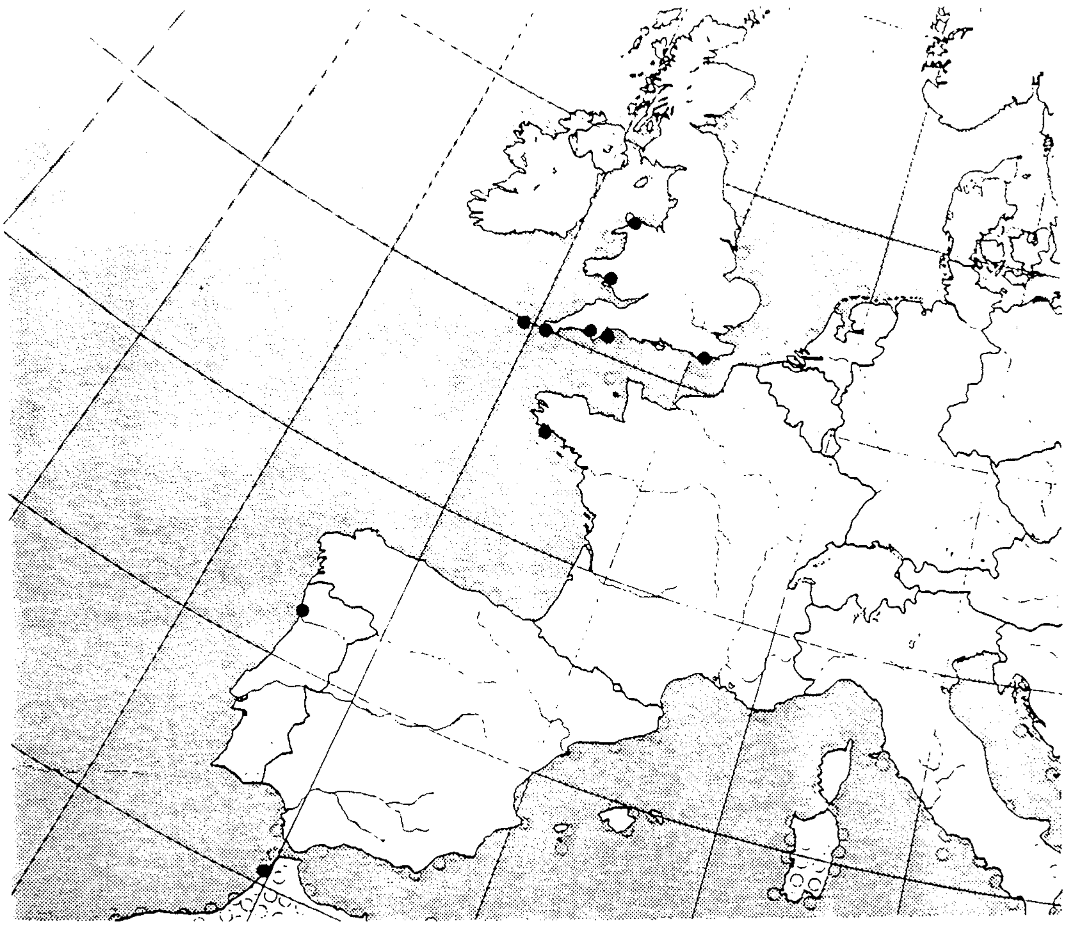
Brachyschendyla monoeci (Brolemann, 1904)
There has only been one record of this species, from a greenhouse at Tuckingmill, Cornwall in 1943 (Turk, 1944).

According to Brolemann (193) only females are known, it is up to 22 mm long and has 51-57 pairs of legs; the labrum has 9-13 tuberculous teeth and the second maxillae have one or two spines along its ventral edge. The last legs are slender and quite unlike those of any other of our British schendylids and the last segment (metatarsus) is longer than the preceding tarsus.

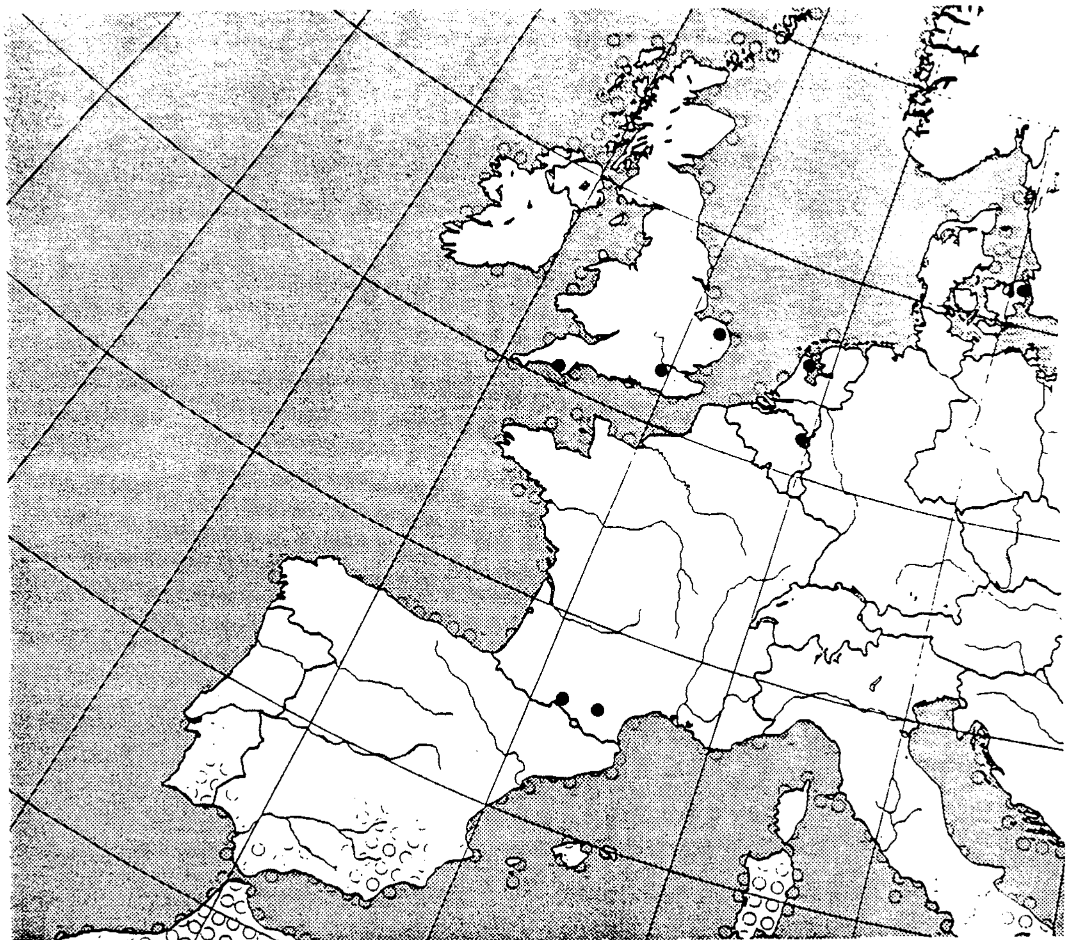
Turk noted certain differences from the French descriptions including the presence of a claw on one terminal leg but he had no doubt as to the identity of his animals.

Elsewhere the species is recorded from Alpes Maritimes, Czechoslovakia and Rumania.

Brachyschendyla dentata Brolemann & Ribaut, 1911
A small species, up to 12 mm or so long with 39 pairs of legs. As with the preceding, only females are known. It is a distinctive animal due to the presence of prominent projections on both the base of the poison claw itself and on the femoroid and by the appearance of the last legs. These latter



Map 1 Schendyla peyerimhoffi 50 km grid square distribution (UTM)



Map 2 Brachyschendyla dentata 50 km grid square distribution (UTM)

are somewhat swollen and the prefemur is extremely small.

The original records for this species were from two localities in France from the early years of this century (Brolemann & Ribaut, 1911). It was rediscovered in Surrey, at Haslemere and at Guildford in 1968 from Tullgren extractions of soil (Barber and Eason, 1970). It was later found by R.D. Kime on the Hogs Back near Guildford. Since then it has been found in a soil extract from a site in Devonport, twice under paving slabs in a garden in Norwich (R.E. Jones), last autumn under a log on a flower bed in Kensington Gardens, London and at the beginning of this year under a stone on a roadside bank next to a house near Ivybridge, Devon.

It has also now been found in the Netherlands and Denmark. Quite clearly the records do not represent the limits of its occurrence and it will be worth searching for elsewhere in southern Britain where it may prove to be widespread. Most, if not all, records are from the winter months of the year October to April; it is noticeable that on some occasions it is found at the soil surface on notably cold days.

Other Species

Demange (1981) notes a number of species of both *Schendyla* and *Brachyschendyla* from France and lists have been produced for other locations such as Liguria (Minelli & Zapparoli, 1982). A number of species have also been described from the Balkans. Our experience with *Brachyschendyla dentata* (Haute-Garonne, Tarn are the given locations) suggests that other small species such as other *Brachyschendyla* spp. might possibly occur here but because of their size and habits remain undiscovered. They are most likely to be introduced synanthropic or extreme south western species.

Acknowledgements

Thanks are due to all those who provided specimens and information which has been used in the above.

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Key to British Schendylidae

1. Robust reddish brown species with 45-53 pairs of legs. Sea shore only: Hydroschendyla submarina
   Whitish or pale yellow species with 37-57 pairs of legs. Inland or seashore 2

2. Last legs relatively slender, meatarsus exceeds tarsus in length, 51-57 pairs of legs, females only; Brachyschendyla monoeci
   Last legs more or less swollen, metatarsus markedly shorter than tarsus, 49 or fewer pairs of legs, males or females 3

3. Forcipules having a prominent projection on the femoroid and on the base or the claw itself; 12 mm or less, females only; Brachyschendyla dentata
   Forcipules having a more or less prominent projection only on the base of the claw, males or females 4

4. Metatarsus of last legs 1/3 to 1/5 length of tarsus. Poison claw with 4 or 5 well marked incisures giving it a crenulate appearance, littoral: Schendyla peyerimhoffi
   Metatarsus $\frac{1}{2}$ to $\frac{1}{3}$ length of tarsus or longer, no regular incisures in poison claw; 5

5. Metatarsus of last legs $\frac{2}{3}$ to $\frac{1}{2}$ length of tarsus, labrum with 16-26 teeth, dentate lamina of mandible in 3 separate masses, apical claw of second maxillae with 1-3 spines on its ventral ridge, possibly 1 on dorsal. Schendyla zonalis

6. Metatarsus of last legs $\frac{1}{3}$ to $\frac{1}{2}$ length of tarsus, labrum with about 15 teeth, dentate lamina in single mass, apical claw of second maxillae entirely without spines.
   Schendyla nemorensis

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MISCELLANEA

A collection of miscellaneous short notes on myriapods.

This is intended to provide a vehicle for miscellaneous short notes on distribution ecology, biology, systematics, etc not long enough to provide a full paper. Contributions of up to half a page or so are welcome. Hopefully this will give an opportunity to put in that interesting odd note that would not otherwise appear for a long time if at all or pass only as "pers. comm.".
Eds.

Myriapods in the Lothians

I work as a part-time Countryside Ranger at Hopetoun House in West Lothian, V.C. 84, sharing a post with another two Rangers. In 1982, in an attempt to extend our knowledge of the fauna of our 100 acres, we undertook to collect Centipedes and Millipedes, using the facilities offered by the Biological Recording Scheme. A combination of the enthusiasm of the two Organisers/ Determiners, and a growing interest in the beasties, led, on my part, to a spread of interest from our narrow confines to a desire to learn as much as possible of the distribution of the Myriapoda in the three Lothians as they were, i.e. VC's 82, 83 and 84.

The scheme got going in 1986 with a planned effort to collect in every 10 km. or part-10 km. square, covering in each one as wide a range of microsites as possible. Initially three years has been set for this task. Results are plotted on maps to four figures of Nat. Grid Reference. It is too early to talk about results but on the way there have been some goodies; Centipedes 3 Vice County firsts and Millipedes 20.

A remark by Tony Barber prompted me to seek permission to search in the Royal Botanic Garden and this gave a first for Britain, *Lithobius lapidicola* Meinert, 1872 (det. E.H. Eason) from the Tropical Rock House (20.v.86). (Not to be confused with the species now known as *L. borealis*.)

Whilst it would be idle to belittle the joy of such a find, one must accept that the real value of an undertaking is in the hard slog of collecting, card completing, packaging and recording. I hope to be spared the time and given the energy to complete it.
C.P. RAWCLIFFE

Recent Records of Enantiulus armatus (Ribaut)

According to Gordon Blower's "MIllipedes" (Blower, 1985) this species, originally known as Leptophyllum armatum was first found in Britain in 1958 by E.H. Eason at two sites in the Sidmouth area. Subsequently he found it himself at Great Haldon in 1967. In August 1981 I found a number of smallish iuliforms at Chudleigh Rocks, a site, like the others, in Devon (Vice County 3); these were identified for me by Mr. Blower as E. armatus.

Subsequently I found it in a former garden at Ivybridge (April, 1983) amongst litter and under old wood, a location from which it was collected on several later occasions. It was also found in a mixed woodland at Bowringsleigh near Kingsbridge (October 1983) by myself and S.P. Hopkin at Wonwell Beach at the mouth of the Erme (July 1984), again in woodland and most recently (June 1986) at Slapton, in Quercus ilex litter at the top of the cliffs by myself and A.N. Keay whilst looking for Lithobius tricuspis.

From these records it would clearly seem to be well established in South Devon, often in substantially man influenced habitats. We do not, as yet appear to have records from elsewhere. Demange (1981) gives "Tarn et dans le plateau central, Puy-de-Dôme, Aveyron" as localities in France.

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A.D. BARBER

Map 1. Enantiulus armatus 10 km distribution map.

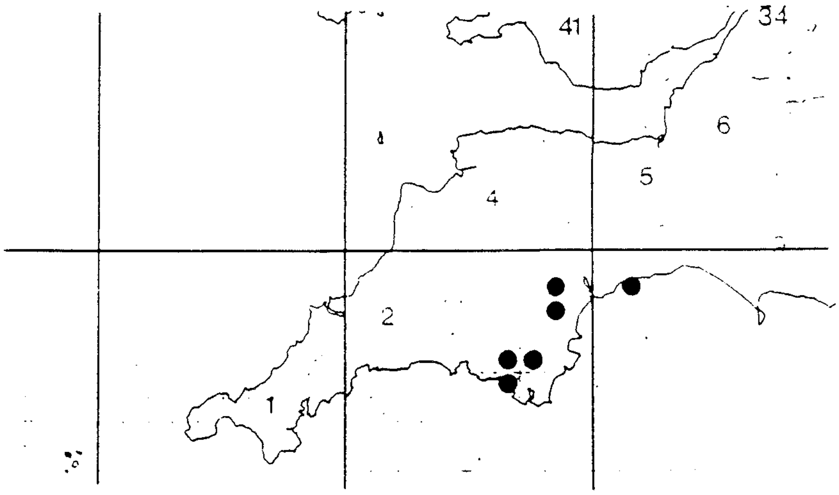
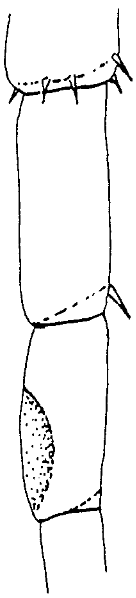


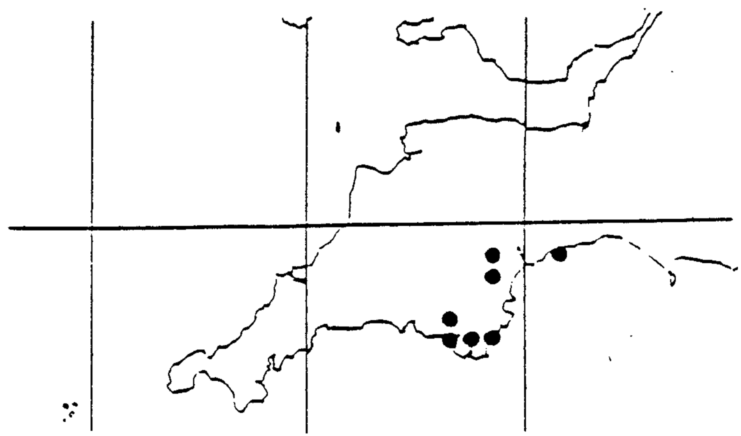
Fig. 1 Lithobius crassipes, male: Left 15th femur and tibia, dorsomedial



CORRECTION : *Enantiulus armatus* (Ribaut)

As indicated in the Newsletter of the British Myriapod group there were errors in the map in our last issue (Bull. Brit. Myriapod Group 4 : 50 : Miscellanea)

Map 1. *Enantiulus armatus* 10 km distribution map.



A secondary sexual character in *Lithobius crassipes* L. Koch

Serra (1980: Fig. 39C) has figured *Lithobius crassipes* L. Koch with a shallow dorsal excavation or sulcus on the distal two-thirds of the male fifteenth tibia. As far as I know this character has been overlooked by all other authors, although I quoted Serra in this respect in a paper on Macaronesian centipedes and confirmed its presence in examples of *L. crassipes* from the Canary Is. and Madeira (Eason 1985). I have also re-examined some of my British specimens of this species and have found this sulcus to be present.

L. crassipes is one of the commonest British species and it would be of interest to know whether this character is, in fact, always to be found. It is certainly rather obscure, has to be carefully sought by direct oblique illumination, and is only likely to be present in fully mature males.

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E.H. EASON

Lithobius pilicornis Newport in Yorkshire

During a visit to Wakefield in November and December of 1985 I collected three male specimens of *L. pilicornis* from the south side of the railway embankment at Westgate Railway station.

The specimens were all discovered under stones at the base of the embankment.

A further collection was made at this site during February 1987 but failed to discover any specimens of *L. pilicornis*.

Other species from this site include *L. forficatus*, *L. crassipes*, *L. melanops* and *G. carpophagus*.

A.N. KEAY

CORRECTION : *Enantiulus armatus* (Ribaut)

As indicated in the Newsletter of the British Myriapod group there were errors in the map in our last issue (Bull. Brit. Myriapod Group 4 : 50 : Miscellanea)

Map 1. *Enantiulus armatus* 10 km distribution map.