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SYMPHYLA - THE LEAST STUDIED OF THE MOST INTERESTING SOIL ANIMALS

S.P. Hopkin & A.W. Roberts

Department of Pure & Applied Zoology, University of Reading,
P.O. Box 228, Reading RG6 2AJ.

Introduction - Why Study Symphyla?

There are three principal reasons why Symphyla are of interest to zoologists. First, they can be serious agricultural pests of root crops such as sugar beet (see ADAS leaflet no. 484). Second, no-one has made a serious attempt at studying the distribution and taxonomy of the British representatives of the group since Edwards' (1959) Synopsis, despite the fact that they are one of the most common animals in the soil (Eisenbeis & Wickard, 1987). Third, they have a most bizarre sex life. This involves the female storing the male spermatophores in cheek pouches until she lays her eggs, fertilising them by 'licking' sperm onto the outer surface (Juberthie-Jupeau 1959).

What is known about British Symphyla?

For students of British Symphyla, the only comprehensive key available was published almost 30 years ago by Edwards (1959). His synopsis provided comprehensive illustrated descriptions of 14 species and was remarkable for its attention to detail. Of these 14 species (Table 1), two had been found only in hothouses (Hanseniella caldaria, Hanseniella unguiculata), one had been described by Bagnall from a single damaged specimen collected from Axwell Park, Durham in 1911 (Neoscutigerella hanseni) and two species (Scutigerella lineatus, Symphylella hintoni) were described by Edwards as being new to science.

It is inevitable that the status of some of these species described in pre-scanning electron microscope days should now be open to question, especially as synonymy and taxonomic 'splitting' are rife in the Symphyla. For example, Remy described Scutigerella nodicerca as being new to Britain in the late fifties but recent studies by Scheller (1986) have shown that this 'species' is in fact identical with Scutigerella palmoni which was described in Edwards' synopsis.

In the summer of 1987, the British Ecological Society sponsored a short pilot study (as part of their Small Ecological Projects Grant scheme) to assess the status of Edwards' (1959) key and to examine Symphyla specimens in S.P.H.'s collection, and those sent by members of the British Myriapod Group (BMG) following an appeal in the BMG Newsletter. Andy Roberts (a Reading zoology

Table 1. Checklist of species and status in Britain of Symphyla according to Edwards (1959).

Class Myriapoda	
Order Symphyla (Ryder 1880)	
Family Scutigerellidae (Bagnall 1913)	
Genus *Scutigerella* (Ryder 1882)	
Scutigerella causeyae (Michelbacher 1942)	COMMON
Scutigerella immaculata (Newport 1845)	COMMON
Scutigerella lineatus (Edwards 1959)	COMMON
Scutigerella linsleyi (Michelbacher 1942)	RARE
Scutigerella palmoni (Michelbacher 1942)	COMMON
Genus *Hanseniella* (Bagnall 1913)	
Hanseniella caldaria (Hansen 1904)	HOTHOUSES
Hanseniella unguiculata (Hansen 1904)	HOTHOUSES
Genus *Neoscutigerella* (Bagnall 1911)	
Neoscutigerella hanseni (Bagnall 1911)	RARE
Family Scolopendrellidae (Bagnall 1913)	
Genus *Symphylellopsis* (Ribaut 1931)	
Symphylellopsis arvernorum (Ribaut 1931)	QUITE COMMON
Symphylellopsis subnuda (Hansen 1903)	QUITE COMMON
Genus *Scolopendrella* (Gervais 1840)	
Scolopendrella notocantha (Gervais 1840)	RARE
Genus *Symphylella* (Silvestri 1902)	
Symphylella hintoni (Edwards 1959)	COMMON
Symphylella isabellae (Grassi 1886)	COMMON
Symphylella vulgaris (Hansen 1884)	COMMON

graduate) was employed for six weeks on the grant and was able to mount and examine the specimens by light and scanning microscopy.

Provisional Results and Conclusions

Of the nine species described by Edwards (1959) as being 'common' or 'quite common', we found five, namely Scutigerella lineatus, Scutigerella causeyae, Symphylellopsis subnuda, Symphylella vulgaris and Symphylella isabellae. Scanning electron micrographs of Scutigerella causeyae are presented in Figs. 1 to 5.

Insufficient specimens have been examined so far for other than tentative conclusions to be drawn. However, the following facts have emerged during the study.

1. Scutigerella causeyae is the largest, most common and widespread species and would be the symphylid most people would encounter during casual searches of non-agricultural sites.
2. The only features on which Edwards (1959) separated Scutigerella causeyae from Scutigerella lineatus were:
   (a) males of S. lineatus have a small peg on the inner surface of the trochanter of the first pair of legs whereas males of S. causeyae do not possess this feature.
   (b) S. lineatus reach a maximum length of 4.8 mm whereas the minimum length of S. causeyae is 5.1 mm.

Our studies on Scutigerella causeyae and Scutigerella lineatus have raised several questions. First, it is implicit that under Edwards' scheme, females of the two species cannot be separated except on the basis of their length. We consider length to be an unacceptable diagnostic character as we found several individuals which fitted the descriptions of both 'species' which were between 4.3 and 5.5 mm in length. Second, we could find no unambiguous references as to how one goes about sexing a symphylid (if you know, please write and tell us). The possibility therefore exists that Scutigerella 'lineatus' are males, and Scutigerella 'causeyae' are females of the same species. Further work on specimens from a wider range of sites is needed before this suggestion can be confirmed or disproved.

Extreme caution should be observed before new species are erected based on subtle differences in morphology. Setae may break off and the relative dimensions of structures can alter during preparation and mounting. It is likely that many 'species' of symphylid are not valid and that further studies will reveal synonyms. However, on a brighter note, it is highly likely that several species remain to be discovered in the U.K., one or more of which may be as yet undescribed.

Micrographs at higher magnification are shown of the head (Figs 2,3) and posterior region (Figs 4,5)

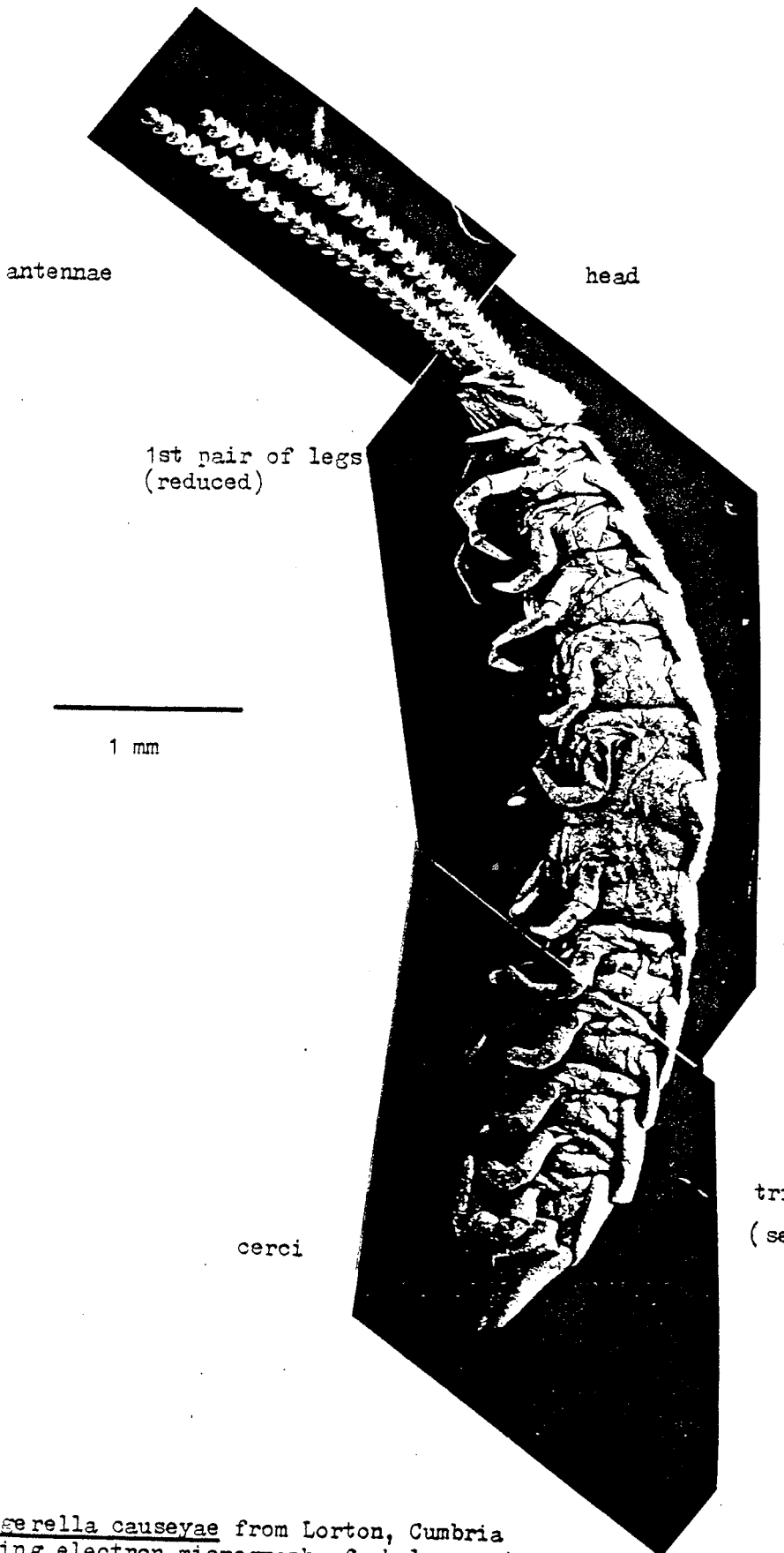

Fig 1. Scutigerella causeyae from Lorton, Cumbria
scanning electron micrograph of whole specimen

The Next Step

There are more than 60 schemes for recording the distribution of animals and plants in Britain and Ireland co-ordinated by the Biological Records Centre (BRC) at the Institute of Terrestrial Ecology's Monks Wood Experimental Station. Most contributors to these schemes are amateurs who possess a specialised knowledge of one or more animal or plant groups. The presence of particular species is recorded in Ordnance Survey 10 km grid squares and are presented as, the by now familiar, 'dot-distribution' maps which have appeared in many publications in recent years. Such information is indispensible for formulating conservation strategies for threatened species. Two of these schemes, for millipedes and centipedes, are run under the auspices of the British Myriapod Group (BMG), a loose assemblage of amateur and professional zoologists with a special interest in many-legged anthropods. A provisional atlas of centipede distribution containing maps produced by BRC is now in press, and several thousand records for millipedes have been collected and will eventually be mapped by BRC in a similar manner. A valuable feature of these schemes is the inclusion of habitat data on recording cards which has enabled the site and habitat preferences of many species to be accurately defined.

The next logical step for the BMG to take is to map the distribution and ecology of one of the other two orders within the Myriapoda, namely the Symphyla (the Pauropoda will have to wait a while!)on the same 10 km square basis (Edwards recorded their distribution by counties based on his records which were the only ones available at the time). However, the identification of Symphyla is difficult (impossible without mounting specimens and examining them with a compound microscope) and the questionable status of some species make it essential that a complete revision of the group be conducted before a recording scheme is instituted.

It is obvious that a study of a few months can only dent the problem of our lack of knowledge of the distribution and ecology of British Symphyla. The BES grant has 'pump-primed' a comprehensive revision of the order in the U.K. which will take several years. It is a tribute to the work of Edwards (1959) that it should take this long before we can consider replacing his scholarly work. Watch this space (in 1998)!

If you are interested in contributing to a survey of British Symphyla, please write in the first instance to Dr. Steve Hopkin at the address given at the head of this article.

Figs 2-5
Details of regions indicated on fig 1

100 µm

Fig 2
Head (postantennal organ arrowed)

10 µm

Fig 3 Postantennal organ
(probably a humidity receptor)

cerci

12th pair of legs

100 µm

Fig 4 Posterior end
(trichobothrial pit arrowed)

10 µm

Fig 5
Trichobothrial pit from which the sensory hair emerges (arrow)

The pit is covered with branching setae, an important taxonomic character

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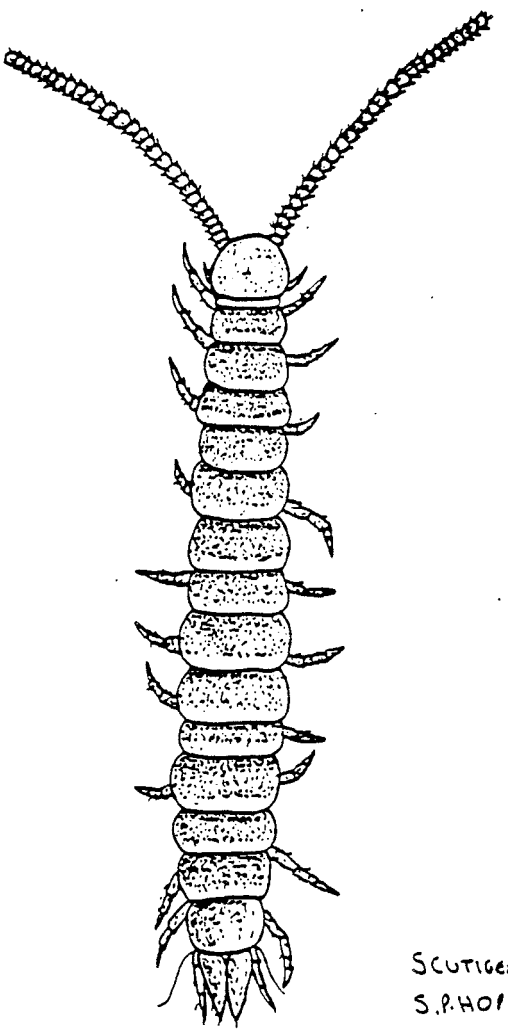

SCUTIGERELLA CAUSEYAE
S.P.HOPKIN 3/3/88
LOATON, CUMBRIA (JULY 1987)