

# The Pauropoda

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There is a considerable degree of similarity between the animal life which inhabits the soil and that in leaf litter and rotting wood. The most familiar are perhaps the earthworms, woodlice, millepedes, centipedes and ground beetles, but there are many other groups which are much less well known. Examples of one of these, the Pauropoda, we collected recently (I.XI.1981) from under the bark of a fallen tree in the Whitchurch Canal Woodland Reserve, on the outskirts of Cardiff.

The pauropods are placed in the Myriapoda, the most familiar of which are the centipedes and millepedes. Pauropods have fewer legs than other members of the Myriapoda and hence their name (Gk. *pauros* = few; *pous, podos* = foot). Pauropods are very small, white or brownish in colour and rarely exceed 1 mm in length. Turning over the bark of a fallen tree they might just be seen as minute specks of white running for cover in a crevice. British Pauropoda are generally white and fast moving but on the Continent short legged, slow moving ones, are found as well. This ability of most pauropods to run rapidly makes observation difficult, but with a 20x hand lens the characteristic branched antennae and the 3-10 pairs of legs can be seen.

Sir John Lubbock described the first pauropods in 1866 from specimens he collected in leaf litter in his garden. Lubbock was obviously captivated by his discovery as he went on to describe the animal as "a bustling, active, neat and cleanly little creature. It has, too, a look of cheerful intelligence, which forms a great contrast to the dull stupidity of Diplopods [Millepedes], or the melancholy ferocity of most Chilopods" [Centipedes]. Lubbock's observations were meticulous and his figures reproduced here (Fig. 14.) illustrate the fine detail which can be achieved using standard light microscopy. Today this method is still appropriate for routine identification as most of the key characters can be recognised at magnifications of 250-400x.

We collected 30 specimens of *Allopaupopus gracilis* (Hansen), from underneath a piece of bark ten inches by five inches. This identification was later confirmed by Dr. Ulf Scheller (Sweden) and appears

to be the first time that this species has been recorded for Wales although it is common in other parts of the British Isles.

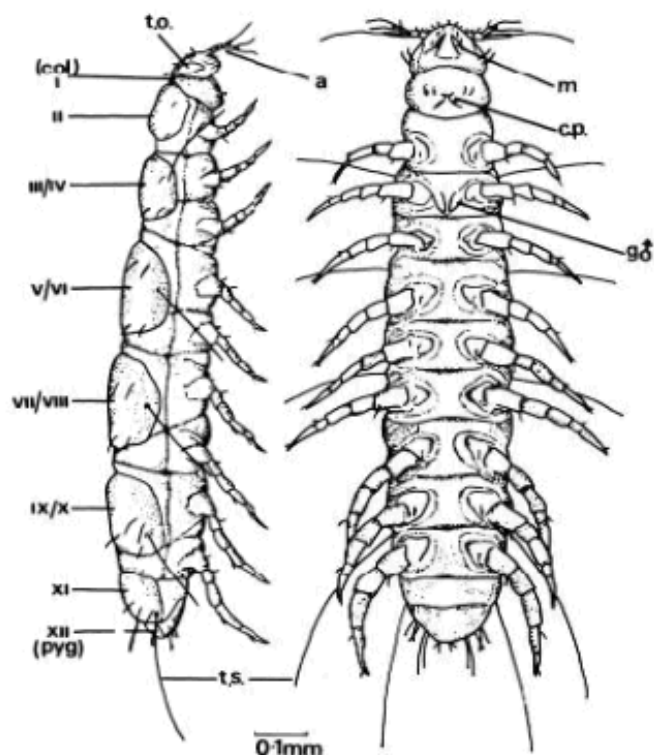
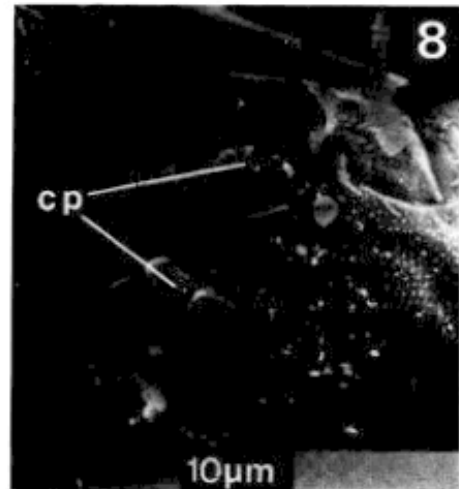
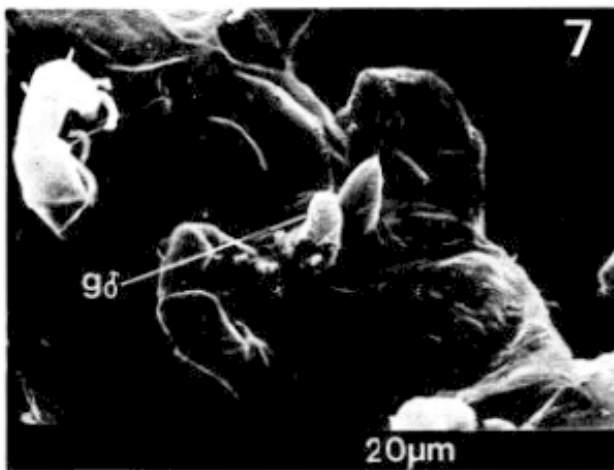
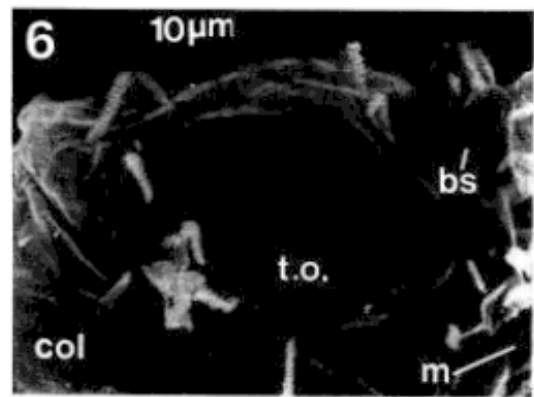
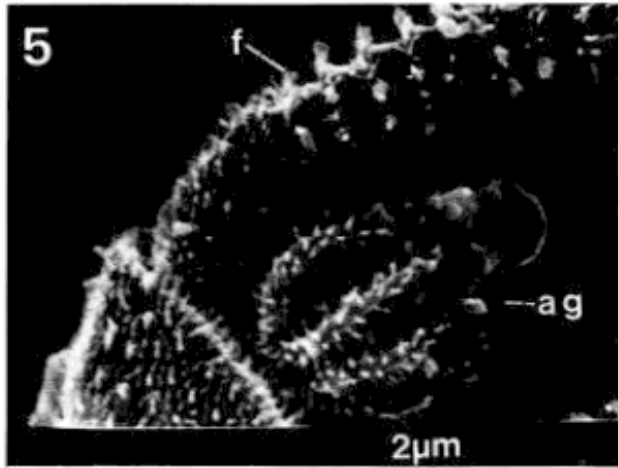
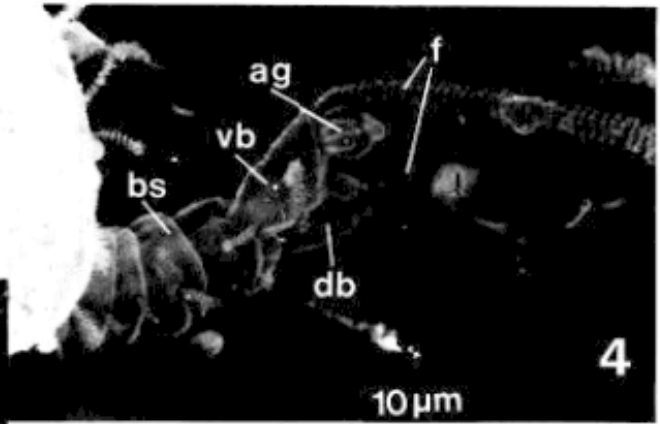
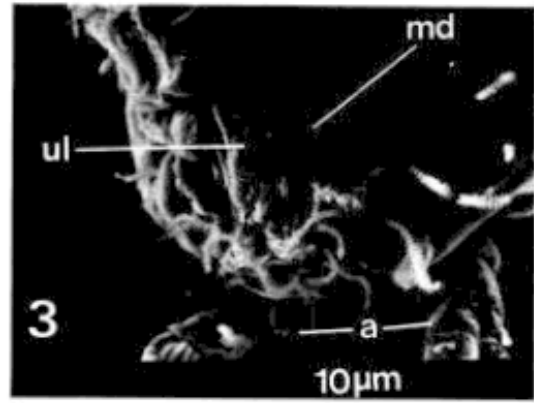
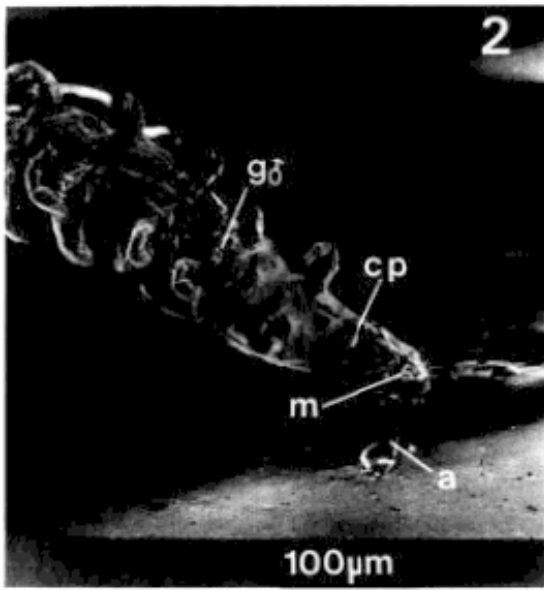
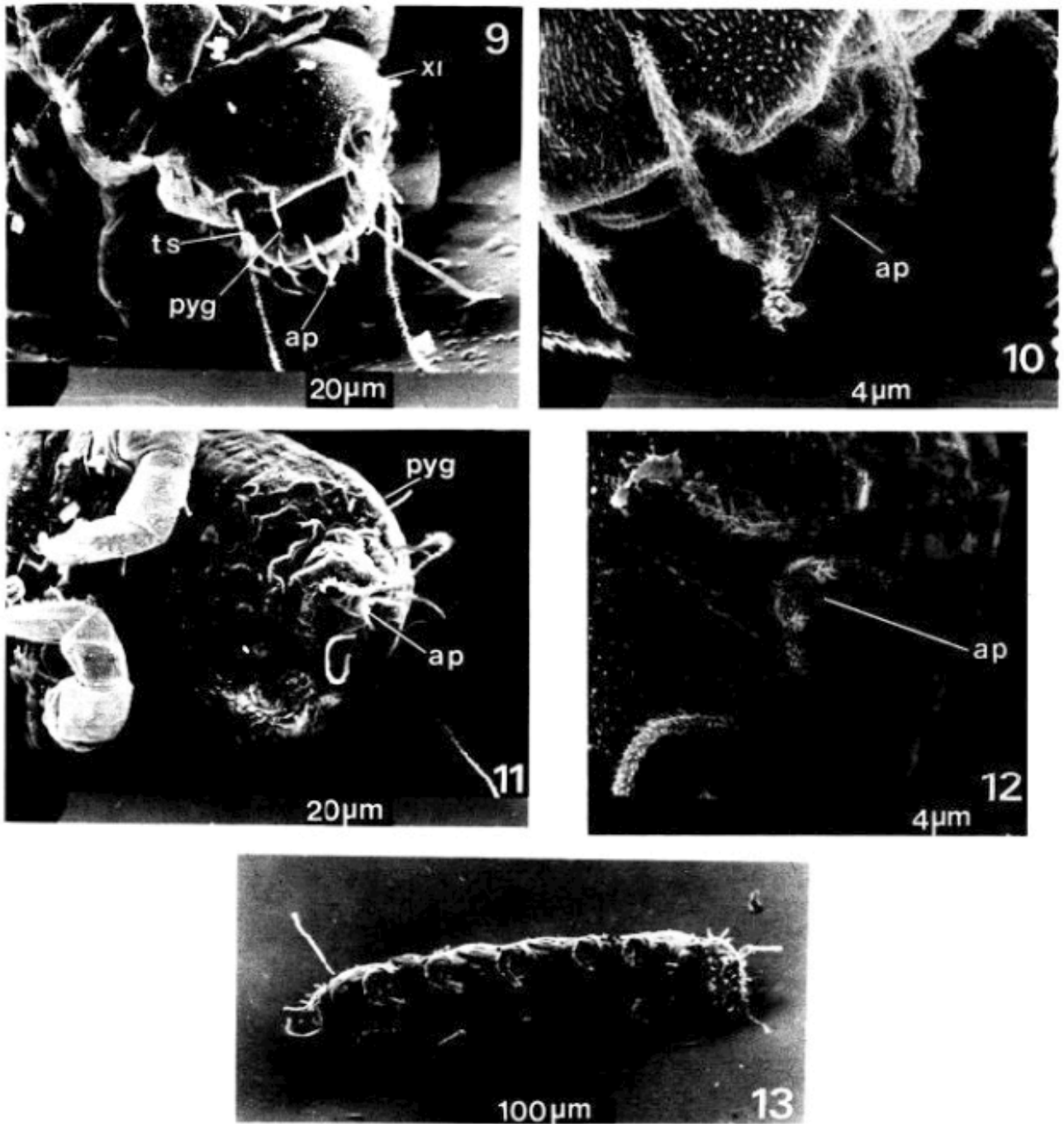


Figure 1  
Lateral and ventral views of a pauropod (after Tiegs, O.W. The development and affinities of the Pauropoda . . . *Quart. J. micr. Sci.* 88, 2, p.278.). i-xii - Body segments; a - antenna; c - collum = 1st segment; cp - collum papillae; g - male gonopods; m - mouth-parts; pyg - pygidium = 12th segment; t.s. - tergal setae; t.o. - temporal organ.

Here we give a generalised description of a mature pauropod, based on *A. gracilis* as seen under the scanning electron microscope. The animal (Fig. 1.) consists of a head and body of twelve segments, which gradually taper towards the front. There are 9 (or 10) pairs of legs, one pair on each of segments 2 to 10 (or 11). Segments 3 to 10 (or 11-12) are superficially fused and each dorsal plate carries a pair of long stout setae.

The head is relatively small and bluntly pointed anteriorly. The typical branched antennae (Fig. 4.) arise from the anterior dorsal surface, the upper





Figures 2-13

Scanning Electron Micrographs of *Allopauropus gracilis*

2. anterior ventral view of whole animal; 3. mouthparts;  
4. antenna; 5. antennal globulus; 6. temporal organ; 7. male  
gonopods; 8. collum papillae; 9. dorsal view of eleventh and  
twelfth segments; 10. anal plate dorsal view; 11. ventral view of  
twelfth segment (pygidium); 12. anal plate ventral view;  
13. ventral view of larval stage with 5 pairs of legs.

a. antenna; ag. antennal globulus; ap. anal plate; bs. basal stalk  
of antenna; col. collum = 1st segment; cp. collum papillae;  
db. dorsal branch of antenna; f. flagellum of antenna;  
g. male gonopods; m. mouthparts; md. mandible;  
t.o. temporal organ; pyg. pygidium = 12th segment; ts. tergal  
setae; ul. underlip structure; vb. ventral branch of antenna;  
! artifacts — extraneous particles.

branch being single whilst the lower branch divides again into two. Between the bifurcation of the lower branch there is a small spherical structure known as the antennal globulus (Fig. 5.). The antennal flagella are composed of a series of disc-like segments, each fringed with stiff hairs. The globulus is constructed of a number of filaments fused together, its function however remains obscure. This sequential disc-like construction of the antennal flagella can also be seen in the bristles which adorn other parts of the body. The mouthparts consist of a pair of mandibles and an underlip structure (Fig. 3.). Behind each antenna is an area of thinner integument, the temporal organ (Fig. 6.).

Apart from the legs and tergal setae referred to above the body carries a number of other structures. On the ventral surface of the first segment (collum) there is a pair of small papillae (Fig. 8.) which are probably vestigial legs. The reproductive organs (Fig. 7.) open ventrally on the third segment between the second pair of legs. This feature is shared with the millepedes but is in contrast with centipedes which have the genital openings situated posteriorly. The pygidium or tail segment is rounded with numerous bristles and a central appendage termed the anal plate (Figs. 9-12.), the structure of which is characteristic for each species.

The young larvae of pauropods hatch from the eggs having only three pairs of legs. Body segments and legs are added in each of the four successive larval stages (Fig. 13.) before achieving the nine or ten-legged state — a process called anamorphosis. This process is also found in millepedes, centipedes and the Protura (a group of wingless insects) but is in contrast to other insect groups which hatch with the full number of body segments.

Pauropods are found in a variety of habitats where the humidity is high including soil, leaf litter and rotting wood. These conditions, essential for pauropods since they are very susceptible to dehydration, are also ideal for decay and for the growth of fungal hyphae. This provides the decaying vegetation and moulds on which pauropods feed (Hüther, 1959). Some species may prey on other microscopic animals, but not European species. Pauropods themselves are probably preyed upon by carnivorous mites and false scorpions but we know very little of such aspects of their ecology.

Since Lubbock's discovery about 500 species of pauropods have been found in Europe, Asia, the Americas and Australia. In the British Isles relatively few species are known and their distribution is not at all clear, largely because so few people have collected them. Papers by Bagnall (1901, 1911, 1935), Remy (1956, 1961) and Scheller (1974) are the only ones which mention pauropods specifically. The major works are concerned only with those species that occur in arable soils, so examination of other habitats should be productive. Only one paper known to us mentions the occurrence of pauropods in Wales. The French zoologist, Remy (1956) records three species from Wales, all collected by his assistant Jean Pagés in 1950. These were:

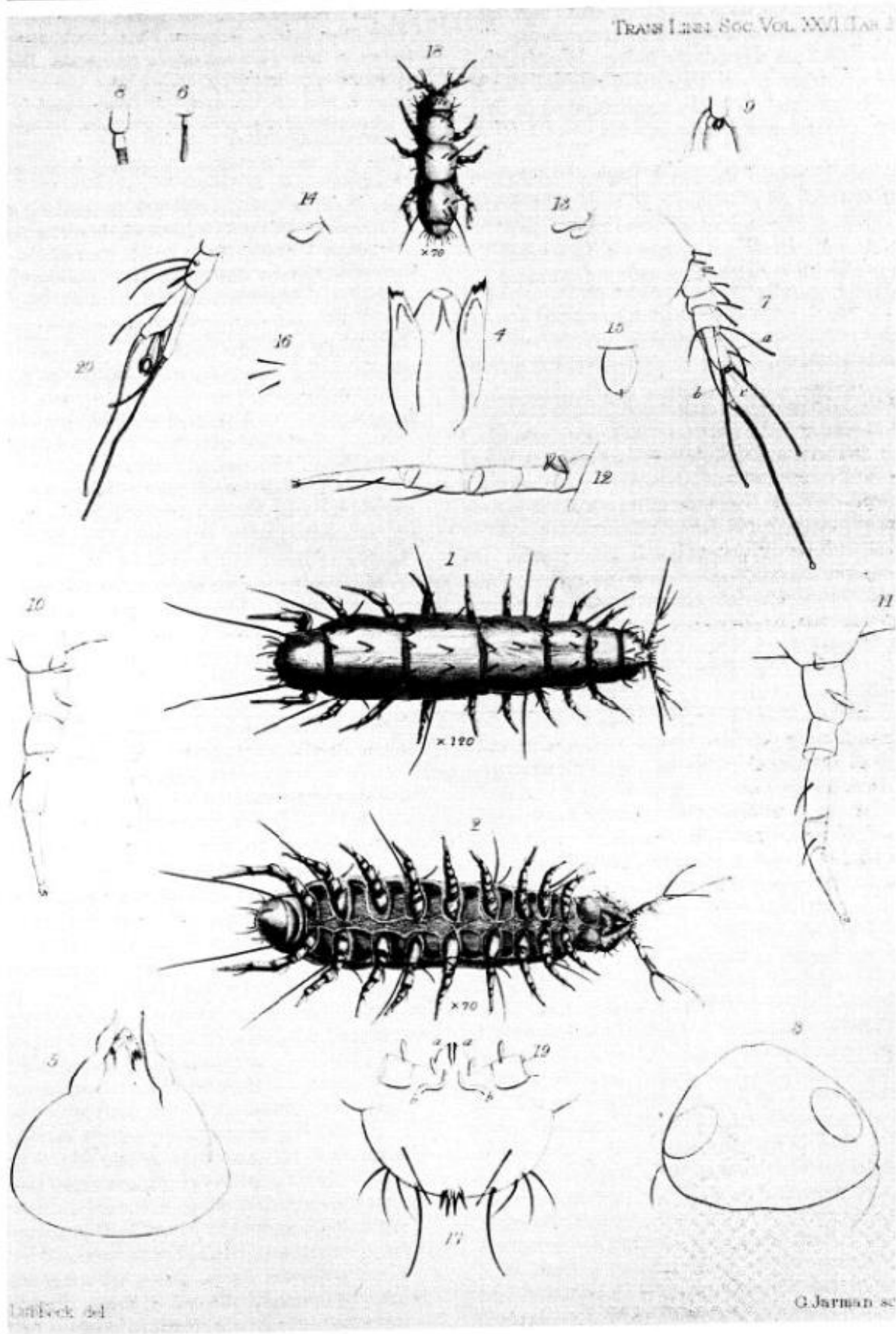
*Allopaupopus multiplex* Remy from Pont Nedd Fechan (Brecon) under stones in a quarry.

*Allopaupopus distinctus* Bagnall and *Allopaupopus vulgaris* (Hansen) from Cwm, near Aberdare from under stones embedded in soil.

As can be appreciated pauropods are intricate and interesting animals which to not deserve to be

Figure 14  
Reproduction of Lubbock's 1866 Figures of Pauropoda.

1.	<i>Pauropus Huxleyi</i> .	Seen from above, x 70.	11.	<i>Pauropus Huxleyi</i> .	Second leg, x 250.
2.	" "	Seen from below, x 70.	12.	" "	Posterior leg, x 125.
3.	" "	Outline of head, x 125.	13.	" "	Appendage on underside of posterior leg.
4.	}	Mouth-parts, x 250.	14.	" "	Appendage on underside of antepultimate leg.
5.			" "	Appendage at the base of second pair of legs, x 250.	
6.	" "	Hair on head, x 250.	16.	" "	Spermatozoa.
7.	" "	Antenna, x 250.	17.	" "	Posterior segment seen from above, x 250.
8.	" "	Base of appendage.	18.	" "	Young.
9.	" "	Portions of appendage.	19.	" "	Base of second pair of legs, x 125.
10.	" "	Anterior leg, x 250.	20.	<i>P. pedunculatus</i> .	Termination of antenna, x 250.



overlooked merely because of their small size, as also happens with so many other invertebrate groups which are still poorly known. However it is a field which can prove very rewarding and can add valuable information to our understanding of the biology of these and similar animals.

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