THE BRITISH ISOPODA STUDY GROUP

Newsletter of the Isopoda Survey Scheme

No. 19 July 1985

EDITORIAL

The recording scheme still flourishes and the current tally of species since 'Woodlice in Britain and Ireland ...'* (W.B.I.) went into preparation is listed below. Inevitably some of W.B.I.'s distribution maps could now be updated but, this notwithstanding, it represents a marvellous achievement for all concerned (namely recorders, contributors and editors) but especially for Paul Harding and Stephen Sutton to whom our thanks are largely due.

Isopodology must be seen as a thriving concern judging by the recent Symposium volume*. Elsewhere in this newsletter Trevor Williams and Dr Nigel Franks describe their work at Bath University on Platyarthrus and ants, while on the distribution front, Steven Jones has produced a splendid guide to Cornish woodlice. On a lighter note, from the West Country I have had some interesting correspondence with Dr Terry Glanvill of Honiton, who is raising money for charity by racing woodlice on a patented 10-lane race track! A fourth example of progress with woodlice (per isopoda ad astra to coin a Suttonism!) is the production of a field key to isopods by Arthur Chater and Adrian Rundle which should go on trial soon. Obviously, what with W.B.I. and the Symposium, the next major event in the woodlouse world ought to be the production of a new key to replace Edney (1953) and Sutton, Harding and Burn (1972). Paul Harding tells me that such a thing might be in the offing under the aegis of the Linnean Society.

One of the reasons for our active group has been the stimulation of the April weekend meetings which have been a regular feature since 1981. This year Steve Hopkin organised a memorable timetable of talks and fieldwork which revitalised us all, as well as producing some rather interesting records. Thanks are due to S.P.H. for all his efforts. Next year's meeting will be at Manchester**, and will again be held jointly with the myriapod group (who are not a bad lot really!). One idea to come out of Bangor was the possible formation of a joint society with the myriapod group: this would necessitate a subscription and (perhaps) an improved newsletter, as well as formalising a committee, and becoming potentially independent of B.R.C. There are obviously pros and cons for such a move, and I would value your opinions. At the moment it seems unlikely that anything along these lines will be done before the Manchester meeting in 1986.

Finally, would recorders please note that as from September, 1985 my address will be:

G.D. Fussey
Biology Department
Eton College
Windsor, Berks.

George Fussey

*Order forms for both Woodlice in Britain and Ireland and The Biology of Terrestrial Isopods are enclosed. Please note the pre-publication offer on Woodlice in Britain and Ireland.

**A notice about the 1986 B.I.S.G./B.M.G. meeting at Manchester is enclosed.

POST-ATLAS RECORDS

Species	Number of "post-atlas" records
Androniscus dentiger	114
Armadillidium album	6
depressum	26
nasatum	31
pictum	3
pulchellum	14
vulgare	329
Asellus aquaticus	40
meridianus	4
Cylisticus convexus	35
Eluma purpurascens	2
Halophiloscia couchi	11
Haplophthalmus danicus	50
mengei	65
Ligia oceanica	54
Ligidium hypnorum	32
Porcellionides cingendus	55
pruinosus	30
Miktoniscus patiencei	4
Oniscus asellus	811
Oritoniscus flavus	5
Philoscia muscorum	540
Platyarthrus hoffmannseggi	126
Porcellio dilatatus	6
laevis	2
scaber	622
spinicornis	46
Trachelipus rathkei	8
Trichoniscoides albidus	9
saeroeensis	25
sarsi	2
Trichoniscus pusillus	551
pygmaeus	111

TOTAL CARDS RECEIVED = 1204

TOTAL RECORDS = 3769

G.D.F.

10 June 1985

B.I.S.G./B.M.G. MEETING - ST. MARY'S COLLEGE, BANGOR 19-21 APRIL, 1985

About 30 people attended what has now become a permanent fixture in our diaries, the annual Spring joint meeting of B.I.S.G. and B.M.G. More than a dozen sites were visited over the three days, and a grand total of 18 species of woodlice was collected. High points were important new sites for Halophiloscia couchi, Porcellionides (Metoponorthus) cingendus and Miktoniscus patiencei and the news that the woodlouse "atlas" was finally in press. Low points included searching for Armadillidium album on Newborough Beach while being pelted with A. album-sized hailstones! Unfortunately, there was little time in the evenings for discussion, and it is hoped that at next year's meeting in Manchester, at least one evening will be left free for examination of specimens. Organising the meeting was made much easier by the prompt response to circulars and the return of species lists before the closing date. I would like to thank all the participants for their cooperation, which helped to make this a successful weekend.

Steve Hopkin

WOODLICE SPECIES collected 19-21 April 1985 ORDNANCE SURVEY SH(23) GRID REFERENCE SITE		Androniscus dentiger	Armadillidium album	Armadillidium vulgare	Cylisticus convexus	Halophiloscia couchi	Haplophthalmus danicus	Haplophthalmus mengei	Ligia oceanica	Miktoniscus patiencei	Oniscus asellus	Philoscia muscorum	Platyarthrus hoffmannseggi	Porcellio scaber	Porcellio spinicornis	Porcellionides cingendus	Reductoniscus costulatus	Trichoniscus pusillus	Trichoniscus pygmaeus
Carreg y Defaid	343 326			✓					✓		✓	✓	✓	✓				✓	
Mynydd Cilan	295 247										✓	✓		✓					
Porth Ceiriad	315 248			✓					✓		✓	✓		✓				✓	
Morfa Abererch	424 355	✓		✓							✓			✓					
Coedydd Maentwrog N.N.R.	670 415										✓	✓		✓				✓	
Nant Porth N.W.N.T. Reserve	570 723	✓					✓	✓	✓	✓	✓	✓		✓		v.c. record ✓		✓	✓
Penmon Quarry and Beach	635 805	✓		✓	✓	v.c. record ✓			✓		✓	✓		✓	✓			✓	✓
Rhydlanfair	826 523										✓	✓		✓				✓	
Treborth Gardens	552 711	✓					✓				✓	✓		✓			hot house ✓	✓	
Llangoed	605 819			✓							✓	✓		✓		v.c. record ✓		✓	
Cors Erddreiniog N.N.R.	472 813							✓			✓	✓		✓				✓	✓
Redwharfe Bay	573 815			✓							✓	✓							✓
Newborough Sands N.N.R.	390 636		✓																

Compiled from lists supplied by Dick Jones, Keith Alexander, Helen Read, Steve Hopkin, Adrian Rundle, Douglas Richardson, Arthur Chater, Tony Barber, Paul Harding, David Holdich, Steve Sutton, George Fussey

H.W. HOWARD, Ph.D., D.Sc.

Harold Howard died earlier this year after a short illness. Over a period of nearly 50 years he made important contributions to our knowledge of the genetics of Armadillidium vulgare. In particular, he surveyed the Mendelian genetics of the colour morphs as well as investigating the mechanism by which the sex ratio of broods is determined.

In fact, woodlice were very much a diversion to him, because his main interest as a biologist was plant breeding. Educated at Manchester G.S. and then a scholar of Emmanuel, he took a double first and then research degrees in the Plant Breeding Institute at Cambridge. While in charge of potato and Brassica breeding the P.B.I. produced the Maris Piper potato and a new variety of Kale which both won Queen's Awards for the Institute. Harold himself was given an O.B.E. in 1976. Since his retirement in 1978 he had been able to devote more time to Armadillidium, and made regular contributions to B.I.S.G. April meetings where he will be sorely missed.

Unlike Vandel before him, his work on brood sex ratios had the great advantage of numerically large broods (100 or more in A. vulgare) when compared to Trichoniscus pusillus (ave. 7). He found that few broods were amphogenic (i.e. with 50:50 sex ratios), while many consisted entirely of males (arrhenogenic) or females (thelygenic). In later work this tendency to produce broods of a particular make-up was shown to be heritable, but the mechanism by which it is controlled proved to be complex and likely to involve cytoplasmic and genetic control. Monogeny, he suggested, was a means of restricting inbreeding, surely a problem for aggregated litter animals like woodlice.

The extent of colour polymorphism in A. vulgare was studied with great thoroughness, with both the dominance relationships of the various alleles and the frequency of the morphs in natural populations well documented. The study of red and black morph frequencies at the Four Went Ways site near Abington was remarkable in that it showed the existence of a more or less stable polymorphism for 35 years or so. Remarkable also is the fact that the sex ratio at this site remained stable at 35 males:65 females over the same period.

His finding that A. vulgare can show a distributional separation of the sexes when the females are ovigerous (viz. that the proportion of pregnant females tended to increase in samples with a high proportion of females) is a puzzling phenomenon, but must be borne in mind when field data are used to model population dynamics. It would indeed be interesting to know how widespread this is in other species.

I can do little better than quote the great geneticist J.B.S. Haldane (1962), who stated that 'such investigations as those of Howard are of great importance for population genetics, and it is to be hoped that others will do similar work ....'.

His sustained contribution to isopod research cannot be overestimated, and he will be sadly missed by us all. To Dorothy, his wife, we extend our sympathy.

G.D.F.

ISOPOD PUBLICATIONS BY H.W. HOWARD

1938 Genetics of Armadillidium vulgare Latr. Nature, 142: 1038-9.

1939 Monogenic broods in Armadillidium vulgare Latr. Nature, 144: 979.

1940 The Genetics of Armadillidium vulgare Latr. I. A General Survey of the Problems. Journal of Genetics, 40: 83-108.

1942 The Genetics of Armadillidium vulgare Latr. II. Studies on Monogeny and Amphogeny. Journal of Genetics, 44: 143-159.

1943 Length of Life of Sperms in the Woodlouse Armadillidium vulgare Latr. Nature, 152: 331.

1947 Genetics of Red Body Colour in Armadillidium vulgare Latr. Nature, 159: 683.

1953 The Genetics of Armadillidium vulgare Latr. III. Dominant and Recessive Alleles for Red Body Colour. Journal of Genetics, 51: 259-269.

1958 The Genetics of Armadillidium vulgare Latr. IV. Lines Breeding True for Amphogeny and Thelygeny. Journal of Genetics, 56: 1-10.

1962 The Genetics of Armadillidium vulgare Latr. V. Factors for Body Colour. Journal of Genetics, 58: 29-38.

1980 The Distribution at Breeding Time of the Sexes of the Woodlouse Armadillidium vulgare (Latreille, 1802) (Isopoda). Crustaceana, 39: 52-58.

1981 Constancy of Polymorphism in Three Populations of the Terrestrial Isopod Armadillidium vulgare Latr. Heredity, 47: 135-137.

1981 Maintenance of a Sex Ratio of 35 Males:65 Females in an Armadillidium vulgare Latr. Population. B.I.S.G. Newsletter, 14: 11.

1982 Genetical Studies of an Armadillidium vulgare Latr. Population. B.I.S.G. Newsletter, 15: 7.

1982 Coloration and Sex in Woodlice. B.I.S.G. Newsletter, 15: 8.

WOODLICE IN CORNWALL

On taking up the recording of terrestrial isopods at the beginning of 1983, I quickly discovered that woodlice in Cornwall were very much under-recorded (1976 Atlas); even the common species such as Porcellio scaber, Oniscus asellus and Trichoniscus pusillus had little coverage. The fact that, to my knowledge, there were no Cornish-based recorders working the group fired my enthusiasm and I set about trying to rectify the situation.

During a very interesting first year, when my activities were confined mostly to West Cornwall (v.c. 1), I found Trichoniscus pusillus, Philoscia muscorum, Oniscus asellus and Porcellio scaber to be common almost everywhere. Platyarthrus hoffmannseggi popped up in 12 10 km squares and Trichoniscus pygmaeus, absent from Cornwall in the 1976 Atlas, proved just as common. The "Lusitanian" species,

Porcellionides cingendus, proved to be plentiful up to 3 km from the coast in 14 10 km squares. Some excellent advice from Arthur Chater in June of 1983 led me to search the splash zone of the seashore, and 'first time out' this led to the discovery of Trichoniscoides saeroeensis, a new species to Cornwall.

A fuller account of my findings in that first year can be found in a 25-page illustrated report ("A Report on the Non-Marine Isopods of Cornwall 1983"), which includes tetrad maps for the 14 species I found.

Anyone who might like a copy of this report can obtain one from me at the following address -

Steven Jones, Dunromin, Chapel Hill, Brea, Camborne, Cornwall, TR14 9AZ.

A small contribution towards photocopying and postage of 50p would be appreciated.

I am sure that any isopodologists holidaying in Cornwall will find it an interesting area for study, and the more experienced recorder might perhaps make some notable discoveries that relative inexperience precludes the writer from.

Steven Jones

RESEARCH ON PLATYARTHRUS HOFFMANNSEGGI AT BATH UNIVERSITY

Platyarthrus hoffmannseggi (Brandt, 1833) is a small, blind, white woodlouse which lives almost solely in ant nests. Until now, all that was known about the behaviour and ecology of this little creature was that it is unusually long-lived, produces small numbers of young, appears to be completely at home with many species of ants and shows female-biased sex ratios (Donisthorpe, 1927; Vandel, 1962; Sutton, 1972; Sutton et al., 1984). A more detailed study of P. hoffmannseggi has recently been carried out at the University of Bath. The isopods with their host, the yellow meadow ant Lasius flavus (Fabricius, 1781) were collected in Cheddar Gorge between October 1984 and March 1985. We present here only a summary of some of the more important and interesting findings including feeding, behaviour, choice chamber studies and sex ratio; a more complete account is now being prepared for publication.

1. Feeding

Exactly what P. hoffmannseggi eats has long been a subject of conjecture. Suggested foods include: spores of lower plants (Lord Avebury in Donisthorpe, 1927), "boulettes de nettoyage" from the ants' infrabuccal cavity (Donisthorpe, 1927), general nest detritus, aphid secretions (Bernard, 1968) and ant faeces (Sutton, 1972). This study confirms the nutritional link between the ants and the isopods. Isopods have been observed eating infrabuccal pellets, fragments of wood, soil, their own faeces and general detritus found in the artificial nests. We have never seen L. flavus produce solid faecal pellets, but cannot discount faeces as a possible constituent of the isopod diet.

2. Behaviour

Observations on P. hoffmannseggi in artificial soil-free nests with their own ants (established isopods) or with new ants (introduced isopods) indicates that the frequency of certain behaviours may be very different in each situation. A total of 32 behaviours were seen in the isopods, some of which had been previously reported (e.g. clamping down and presentation of the uropods upon attack by

an ant, as described by Gorvett and Taylor (1963), or sharp turning, described by Brooks (1942) as an adaptation to life in ant tunnels). Many other behaviours have not previously been described, however (e.g. climbing on the ants, rushing away on meeting ants, mating, aggression between isopods which was mentioned briefly by Crawley (1910) as "butting one another"). Established isopods survived twice as long as introduced isopods, although neither survived as long as isopods just kept in soil.

. Soil selection

Choice chamber experiments suggest that the ability of P. hoffmannseggi to discriminate between its own and other nest soils is limited; factors such as humus content and soil texture seem to be more important factors in isopod choice. Soils containing 0.1-0.01% formic acid were highly adversive. This contrasts with work by Brooks (1942) and O'Rourke (1950) who found P. hoffmannseggi attracted to the vapour of 10% formic acid.

4. Sex ratio

A total of 2155 isopods from 20 separate populations in L. flavus nests were measured and had their sex determined. The overall proportion of females was 0.57 (ranging between 0.45 and 0.76). Measurement of the width of the head capsule showed distinct size/age classes in both males and females. This allowed us to estimate the change in sex ratio from generation to generation. Multilinear regression equations indicate that populations of 20 or more produce female-biased broods, whereas below 20, an increasing proportion of males are produced in the next generation. We also found that females were 14% larger than males as determined by the size of the head capsule. Male head widths ranged between 0.4-0.8 mm and females between 0.4-0.98 mm.

Relatively few species have female-biased sex ratios, and such populations have recently attracted the attention of evolutionary theorists. There are several possible explanations for female-biased sex ratios, including local competition for mates (Hamilton, 1967) and differential productivity of spatially structured populations (Colwell, 1981; Colwell et al, 1981; Wilson and Colwell, 1981). The fact that P. hoffmannseggi lives in distinct groups makes it an excellent candidate for trait-group selection. However, these models assume periodic mixing of the population, and little, if anything, is known of the isopods' ability to migrate to other nests. Our study suggests that such migrations may be restricted for reasons of survival or persecution by their new hosts.

These studies have enhanced our understanding of the association of Platyarthrus hoffmannseggi with its Lasius hosts, yet the true benefits of the relationship to ant and isopod still remain unclear. We feel that the main advantage of the association goes to the isopods which receive a constant food supply and, as long as they are tolerated by their hosts, suffer little predation.

References

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Trevor Williams and Nigel Franks
University of Bath

KEEPING WOODLOUSE CULTURES

Every year my isopod cultures go on holiday - to the B.I.S.G. weekend meeting - and every year George asks me to write a few lines about how I keep them. As the oldest has now passed its eighth birthday, perhaps the method is worth dissemination.

Container - rigid, clear sandwich box type with tight-fitting lid (e.g. from Griffin and George, Ealing Road, Alperton, Wembley, Middx HAO 1HJ, ref. BUH-530-031G, approx. £13.00 for 6).

Medium - soil/humus from where the animals were collected, to about half fill the container and moistened as appropriate.

Label - the origin of the stock, date, place, etc.

Stock - depends on availability, but ten should be ample and just one gravid female would do.

Food, etc. - A cherry-sized pinch of grated carrot and white cabbage about once a fortnight. Cover with a paper hankie, which serves as back-up food and also offers shelter and a choice of humidity. Occasionally, i.e. about annually, perhaps a few dead leaves or some moss may be added for a treat. Add more water if drying out, or wipe condensation from lid if it seems very wet, but many species thrive in amazingly soupy conditions. Do not churn up the soil, allow them to structure it.

Stable-mates - I find swarms of apterygous insects sometimes develop (little white jumpy things), and most cultures seem to have one or two resident slugs. Neither seems harmful, and I suspect they are actually beneficial in clearing up food before it goes mouldy.

Position - mine live stacked two by two in a bookcase away from the window in a centrally-heated office.

Species in culture - A. depressum (since 1977), A. vulgare (1979), T. rathkei (1979)- L. hypnorum cohabited with it for about 2 years before dying out; C. convexus (1982), P. scaber, O. asellus and T. pusillus. In the past I have had successful cultures of A. dentiger and P. pruinosus. Species tried without success are A. nasatum, P. spinicornis, P. muscorum and H. danicus.

Swaps - phone or write with offers!

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ENVIRONMENTAL FACTORS AFFECTING WOODLOUSE RECORDING

Most of the larger species of woodlice frequently occupy very different microsites at night when they are active from those that they occupy during the day when they are at rest, and as very few records (only 2% in the records for the forthcoming "atlas", for example) are made at night it is clear that in such cases there is a recorder-bias towards daytime microsites and against night-time ones. The physiological and behavioural factors involved in the diurnal activity, micro-ecology and distribution of woodlice are summarised by J.L. Cloudsley-Thompson, The Water and Temperature Relations of Woodlice (1977), but to what extent the distribution of the larger species is affected by a need for two different (or a gradation of) microhabitats is unknown. To the casual recorder the needs of, say, Porcellio spinicornis, moving more or less diurnally between contrasting micro-sites, appear very different from those of Haplophthalmus mengei which may be assumed to spend its whole existence in a more or less uniform environment of soil. The small soil- and litter-dwelling species consistently seem to occupy only one microhabitat and are more or less permanently cryptozoic, being rarely seen in the open even at night. The chief exceptions are Trichoniscus pusillus, occasionally seen on damp surfaces, and Androniscus dentiger which has been recorded in quantity on open coastal cliff sites in the dark. The larger, predominantly litter-dwelling species such as Philoscia muscorum, Metoponorthus cingendus and Ligidium hypnorum, and the litter-dwelling populations of such species as Oniscus asellus, although more prominent on the surface at night, may well spend most of their time in one microhabitat. The larger species, such as Oniscus, Cylisticus and most Porcellio and Armadillidium, that to a considerable extent occupy dual microhabitats, are normally much easier to find at night, and

this is especially true of such species as Porcellio spinicornis and Armadillidium depressum which occupy inaccessible crevices in masonry by day. Ligia often travels into completely different coastal zones at night. Armadillidium vulgare is the only species seen at all frequently in the open during the day. It is largely unknown to what extent particular species do occupy dual microhabitats, and it may be that over the British Isles as a whole the majority of populations of even such species as Porcellio scaber and Oniscus asellus occupy only single microhabitats. From the point of view of the general observer and recorder, however, dual microhabitats appear to be the rule for most of the larger species, and the bias towards daytime recording should always be recognised (and indeed, if possible, corrected).

Weather conditions and particularly the humidity of the soil strongly affect the small-scale distribution of woodlice. These factors often take effect over quite long periods of time, and are therefore extremely difficult to evaluate. The complexity of behavioural response makes it difficult to generalise, but woodlice that occur on open sites at night are likely to be visible in greater numbers in calm weather, and to some extent in damp and warm weather, than in windy, dry and very cold conditions. Litter-dwelling species such as Philoscia muscorum and Metoponorthus cingendus are commonly much more in evidence in the upper, looser layers of litter in wet weather, and in prolonged drought both these species can be virtually unfindable even in areas where they are normally abundant; they presumably retreat beyond even the deeper layers of litter into crevices in the soil, or possibly even into quite different sites. To what extent their disappearance is due to mortality is uncertain, but they often reappear quite quickly when conditions are again favourable. Soil-dwelling species certainly retreat to greater depths as the soil dries out, and, in both inland and supralittoral sites, the finding of these species is largely dependent on the dampness of the soil. These factors add a further element of bias to distribution maps, perhaps almost as important as collector-bias, for even the experienced finder of a particular species may be quite unable to locate it if he visits a site only in dry conditions.

Seasonal changes in distribution also occur, but it is difficult for the casual recorder to distinguish them from changes caused by shorter-term climatic variation. A detailed account of seasonal changes in the daytime distribution of Trichoniscus pusillus, Philoscia muscorum, Porcellio scaber, Oniscus asellus and Armadillidium vulgare, and in the night-time distribution of Porcellio scaber, in a wood near Oxford is given by J. Le G. Brereton, The distribution of woodland isopods, Oikos, 8: 85-106 (1957), but there are no comparable accounts for other species and other habitats. Nor are there any comparably detailed accounts of diurnal changes in distribution, or of changes caused by climatic variation.

A.O. Chater