MYRIAPODOLOGICAL RESOURCES IN THE MANCHESTER MUSEUM

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ABSTRACT

The Manchester Museum houses eleven significant myriapodological resources: 1. Holotype, Paratype and Syntype material of extant and fossil species. 2. The whole spirit collection of J. Gordon Blower and his students, including a reference collection of British Diplopoda. 3. Part of the collection of K. W. Verhoeff. 4. Probably the whole spirit collection of H. K. and S. G. Brade-Birks. 5. The myriapodological library derived mainly from the personal collections of Blower and Brade-Birks' but with some modern additions. 6. A collection of ten theses on myriapodological topics in the John Rylands University Library of Manchester. 7. Fossil material in the Department of Geology of the Museum. 8. A dried collection probably attributable to H. K. and S. G. Brade-Birks. 9. The Harry Britten slide collection of myriapoda. 10. A miscellaneous dried and spirit collection. 11. An archive of unpublished material, mainly from the offices of J. Gordon Blower. The Blower spirit collection has been fully examined, re-curated and catalogued, while the Verhoeff and Brade-Birks' collections remain to be dealt with in detail. The Blower collection contains 4560 tubes in 181 boxes. A reference collection of British species has been extracted from the main collection. It contains 51 of the 61 British native and introduced species. The library contains 40 books and about 2000 reprints.

INTRODUCTION

The Manchester Museum, a constituent part of the University of Manchester, has the third largest entomological collection in the UK (Logunov, 2011a, b). It covers a wide spectrum of arthropod classes and is particularly important in Coleoptera, Lepidoptera and Dermaptera. Two groups that are also well represented, but which to date are relatively unstudied and unknown, are the Diplopoda (millipedes) and, to a smaller extent, the Chilopoda (centipedes). There are also small collections of Symphyla and Pauropoda. Work over the past three years has revealed that the Museum collection of Myriapoda, and various other related materials, constitute important resources which deserve to be better known.

A significant part of these resources owe their presence in the Museum to the influence of J. Gordon Blower (1923-2001, Read 2002, Bulletin BMIG 2003), the most important British diplopodologist of the second half of the 20th century [the chilopodoligical equivalent being E. H. Eason]. His contribution to myriapodology has been adequately covered by a number of authors and is not repeated here in detail here (see Read, 2002 for fuller information). He became interested in myriapods, and in particular the Diplopoda, around 1948, but it is not known exactly how this interest originated. One possibility is that he was urged to study the group by Professor Ralph Dennell in the Zoology Department at Manchester University, and subsequently took a deep and abiding interest in it (Lawrence Cook, Helen Read and John Lewis pers. comm.). Blower and his students made major contributions in the fields of taxonomy, distribution and ecology of Diplopoda over a 40 year period.

The myriapodological resources in the Museum, in approximate order of importance, are:

1. Type material of extant Myriapoda held in the Entomology collection and type material of fossils held in the Geology collection.
2. The J. Gordon Blower spirit collection, including those of his research students, and the reference collection of British Diplopoda.
3. A part of the K. W. Verhoeff spirit collection (260 species).
4. The H.K Brade-Birks and S.G Brade-Birks spirit collection (possibly including the A. Randell Jackson and other collections).
5. The amalgamated H. K. and S. G. Brade-Birks and J. Gordon Blower literature collections (books and reprints), with tens of additional reprints added in recent years.

6. A collection of M.Sc. and Ph.D. theses on myriapodological topics in the John Rylands University Library of Manchester (written by or supervised by J. Gordon Blower).
7. Collections of fossil myriapods from the Devonian and Carboniferous periods.
8. A dried collection probably attributable to H. K. and/or S. G. Brade-Birks.
9. The Harry Britten slide collection of Myriapoda.
10. A miscellaneous dried and spirit collection.
11. The J. Gordon Blower archive of unpublished materials.

This article briefly describes what we currently know of these resources. Taken together they probably constitute one of the most important collections of myriapodological resources in Great Britain and Ireland, with the exception of the type material held in the Natural History Museum London. The accession numbers (e.g., G3214, L.9941, etc.) mentioned in the following text refer to the corresponding numbered records in the Register Book retained in the Manchester Museum's Entomology (G series) or Geology (L series) departments. If this figure consists of two parts (e.g., G7484.633), its first half (G7484) is the registration number of the corresponding Myriapoda collection and the second one (633) a unique number of the sample within the collection G7484.

Abbreviations used in the text: BM(NH) = British Museum (Natural History) now NHML = Natural History Museum London; MNHN = Museum national d'Histoire naturelle, Paris; VMNH = Virginia Museum of Natural History.

1. Type Material of Myriapoda held in the Entomology and Palaeontology Collections

The collection contains the following type material:

Extant species

***Iacksoneuma bradeae* (H.K Brade-Birks and S.G. Brade-Birks, 1917).**
One syntype of three, G3214. Found among the unrelated Harry Britten slide collection in November 2010.

The label on the slide envelope reads:
Brachychaeteuma (= *Iacksoneuma*) *bradeae* Brole & Brade-Birks. Male Gonopods. G3214
Whitehall Park, Darwen, Lancashire, 27-1-1916, S.G. Brade-Birks, TYPE.

The label on the slide (Fig. 1) reads:
"TYPE. *Iacksoneuma braedae* (sic) Brole & Brade B. / G3214. Type specimen of *Iacksoneuma bradeae* Brölemann et Brade-Birks / Male mounted to show anterior gonopods in lateral profile. (Brade-Birks no 984) / Coll Whitehall Park, Darwen 27.1.1916 S.G.B. Prep by Brölemann & Brade-Birks".

The museum Register Book record (G3214) for this slide is:
"20/IX/1917 (Coll 27/I/16) *Iacksoneuma bradeae* Male. (Type of genus). [Mounted to show anterior gonopods in lateral profile]. Darwen. Brade-Birks donors. Brölemann and Brade-Birks prep."

This specimen is a possible future lectotype should this be required. [Species now in *Brachychaeteuma*]. Further details of this specimen, and of other type material for this species, are given by Proudlove (2011).

It is possible that the Brade-Birks' collection contains further types of this species and of the other three Brade-Birks' species, *Brachychaeteuma melanops*, *B. quartum* and *Proteroiulus pallidus* (see Proudlove, 2011, for further details on these names).

Figure 1: Slide G3214

There is no type material for these four species in the Natural History Museum London (Janet Beccaloni pers. comm.).

***Prosopodesmus panporus* Blower and Rundle, 1980.**
Two paratypes, G7484.633 and G7484.634. The type series for this species is divided among several locations according to Blower and Rundle (1980): Holotype NHML; Paratypes at Portici and the Hoffman Collection at VMNH. However the NHML does not appear to have these specimens, or at least their database contains no information on them (Jan Beccaloni pers. comm.).

A note on *Metaiulus pratensis* Blower and Rolfe, 1956
Type material for the only other species described by Blower, *Metaiulus pratensis* Blower and Rolfe, 1956, is in the NHML (Holotype BM1957.1.3.1: Paratypes BM1957.1.3.3; BM1957.1.3.4-10; BM1957.1.3.11-17; BM1957.1.3.2). The original description had more material than the type series but a full re-curation of the Blower collection in the Manchester Museum turned up no type material for this species, indeed no material at all from the original collection of this species in the 1930s, 40s and 50s. Only one specimen, from Petersham, Surrey in 1978 (an extension to the known range), is present in the Museum collection (G7484.1117). The absence of any original material in Blower's personal collection is very perplexing.

Fossil species

***Palaeosoma giganteum* (Baldwin, 1911)**
L.9941. Holotype. For further information see Baldwin (1911), Jackson et al. (1919) and Jackson (1952). (= A*cantherpestes giganteus* Baldwin, 1911).

2. THE J. GORDON BLOWER SPIRIT COLLECTION

John Gordon Blower (1923–2001) (Read, 2002) was employed in the Department of Zoology at Manchester University from c. 1948 to c. 1984, and upon retirement was appointed Honorary Research Associate in the Zoology Department of the Manchester Museum until his death and beyond! His collection of millipedes forms part of the Manchester Museum collections. A commemorative volume, based on a meeting in Manchester in April 2003, was provided in volume 19 of the Bulletin of the British Myriapod and Isopod Group (2003). A full list of Blower's publications was given in the same volume as the obituary. In addition a short obituary of Blower was also published in Museum Annual Report for 2001-2002 (p. 21).

The history of the collection in Manchester Museum

Upon his retirement from the University of Manchester in 1984, or possibly later, Blower donated much material to the Museum. An uncertainty in date is because the acquisition of Blower's myriapod collection was not properly recorded. No records of this acquisition exist in Museum Annual Reports (1984-86) and no Annual Reports were produced during the period 1986-95, when the achievements of the Manchester Museum were included in the University's annual reports (Report 1996-97: p. 2). There is also no record of this collection in the Register Book. Actually, the latter does not contain any records for the period 1982-84, only two records for 1985, three records for 1987, 1989 and 1993 (the latter a giant captive-bred millipede, G7166). Regular records in this Register Book continue only from mid-1998. Therefore, the exact quantity and nature of the material was not known in full detail until 2010. We have what is probably the full spirit collection which was housed in the soil laboratory in the Williamson Building (though there are some perplexing omissions). The collection had been untouched until October 2007 when the first author took on the task of re-curation and cataloguing.

Details of collection in the Manchester Museum

The main body of the Blower Collection is housed in 5cm screw-top "Bijou bottles" (small versions of the popular McCartney bottle). These in turn are kept in 17cm x 112cm plastic boxes with up to 38 bottles per box (known to Blower and all Manchester students as sandwich boxes: Figs. 2 and 3). These are catalogued under Manchester Museum Accession numbers G7484.1–G7484.4560 in Boxes 1–181. The usage of Bijou

bottles, which have a very good seal, has ensured that the great majority of this collection has remained in good condition, despite some of it being nearly 60 years old. In addition to this main body there is a further body which has not yet been re-curated and catalogued, a medium sized collection of Bijou bottles which appear to house the field collections of research students. This latter collection will be dealt with at a later date. The earliest discovered date for specimens in the collection is May 1952 for *Ommatoiulus sabulosus* from Padockwood and the latest date is 5th April 1997 for specimens of *Thalassisobates littoralis* (a major find!) from Mullock Bay, Galloway. This represents a life works of 44 years.

FIGURE 2: The J. Gordon Blower spirit collection. Most of the collection is kept in boxes.

FIGURE 3: The J. Gordon Blower collection.

Many tubes contain cryptic labels (e.g. II E 2 S in tube G7484.3618) for which no-one now seems to be able to provide an explanation. Despite the not-obviously-useful nature of such tubes they have been re-curated and catalogued in case these labels can be understood in future if any further information/material becomes available. The great majority of the tubes contain Diplopoda and Chilopoda but there are many with other groups of other soil animals. In particular there are many Isopoda, Diptera larvae and large numbers of beetles and spiders. All specimens of non-myriapod groups have been extracted and kept separately for further re-curation and in order to be merged with the collections of corresponding groups.

Significant sub-collections within the Blower collection

Throughout his working life Blower, and his students, made several in-depth ecological studies of numerous sites around the UK and the collection is composed mainly of samples taken during these activities. The following list briefly highlights the main sub-collections, and more details of each will be available once a full database of the whole collection is available.

Scott's collection of *Tachypodoiulus niger* (Leach, 1814)

Dr Hugh Scott lived in house in Henley-on-Thames which was often invaded by the large cylindroiuline *Tachypodoiulus niger*. Fairhurst (1968, 1970, 1974), Blower and Fairhurst (1968) made very good use of this most valuable material.

***Geoglomeris subterranea* Verhoeff, 1908**

Previously known as *Stygioglomeris crinata* and *Geoglomeris jurassica* this species was studied in detail by Bocock, Heath and Blower (1973). A specimen in the reference collection from 1962 (G7484.326) seems to be one of the earliest collections of this species though it is not mentioned in Blower (1985b).

Milldale, Derbyshire (SK 135545)

An important site for millipede ecology worked by numerous students.

Gower and Llethrid, South Wales (SS 535915)

The Zoology Department of the University of Manchester ran a two-week faunistics field course at the University of Swansea, with the Gower Peninsula as the main area of faunistic interest. Blower attended these courses from their inception. Students were allocated a taxonomic group to become familiar with, one of which was the Myriapoda and many samples remain in the collection.
[In 1976 I was assigned to, or chose, I cannot remember which, Blower's myriapod group – the inception of my, extremely latent, interest].

Ernocroft Wood, Cheshire (SJ 982910)

The woodland near Compstall in Cheshire, Ernocroft Wood, is one of the most important of Blower's field sites.

Kerridge, Cheshire (SJ 936769)

Another important ecological site.

Harpford Wood, Devon (SY 091907)

Harpford Wood, Sidmouth, Devon is the "Devon oak wood" of the seminal Blower and Gabbutt paper of 1964. The millipedes were collected, from samples extracted by Tullgren funnel, by Gabbutt during a separate study for his Ph. D. Blower took the opportunity of this excellent sample to undertake the ground-breaking work on the ecology and development of six common millipede species.

Trelill, Cornwall (SX 045785)

Near Camelford in north Cornwall, this site has revealed the following species: *Brachyiulus pusillus*, *Ophiodesmus albonanus*, *Polydesmus angustus*, *Polydesmus denticulatus* and the very local *Chordeuma sylvestre* (2 10km squares only, both in Cornwall, Lee (2006:62-63)). Trelill was the first recorded British site for *C. sylvestre*, found by Blower in August 1961, though adults were not obtained until April 1962. Specimens from April 1962 are present in the reference collection.

Bernac, France

The second year field course was moved from Gower to the French town of Bernac after Blower's retirement but he attended a number of these courses and there is a small number of samples.

The islands of Madeira

In 1981 Blower and a number of colleagues visited Madeira and there is a significant collection of diplopod material from this visit.

Woodchester Park, Gloucestershire (SO 815015)

Manchester Zoology Department ran a two-week terrestrial ecology field course, for students at the end of their second year, at Woodchester Park, Nailsworth, Gloucestershire from 1967 to 1994. Very many samples of myriapods were taken over these years.

Waterbarrow (Levens area, Cumbria, exact location unknown)

Samples from Waterbarrow are among the last to appear in the Blower collection and were probably obtained after he retired.

The Reference Collection of British Diplopoda (Appendix 1)

During re-curation and cataloguing an opportunity was taken to extract four or five examples (where possible) of each British species (native and introduced, see Appendix 1). These now form the core of the *J. Gordon Blower reference collection of British Diplopoda* and includes most of the species given in Lee (2006). The Museum would very much welcome donations of further Diplopoda to add to this collection, including not only those species we do not currently have but also further material of species already in the collection. The reference collection is housed in various sizes of glass tubes, stoppered with cotton wool, and kept immersed in 70% ethanol in rubber sealed preserving jars. Information about the reference collection and a full species list will soon be databased and available online via the Manchester Museum home page.

3. A PART OF THE VERHOEFF COLLECTION

Karl Wilhelm Verhoeff (1867 – 1945) was a prolific worker in several arthropod groups but is mainly known for his works on Diplopoda, Chilopoda and Isopoda (see Mayermayer (1962) for details of his biography and publications). The history of his collection is not known in any detail because of the somewhat chaotic nature of its development. It is certain that the collection labelled as the Verhoeff collection in the Manchester Museum is but a small part of the whole. It may be one of the lots he sold to pay for his lifestyle. This collection was purchased from Verhoeff for £17.10.0 in 1908 (£1300-£7000 today depending on the comparison used). The collection was mounted in separate tubes, labelled and registered by Mr Robert Standen, Assistant Keeper (later Senior Assistant Keeper) of the Museum (Report, 1907-08: p. 9-11). It is evident that any material which was worked by Verhoeff is, potentially, of very great value. The Manchester collection is thus a logical part of the whole Verhoeff Collection which is physically kept in several museums including Zoologische Staatssammlung München, Museum für Naturkunde, Berlin and the Natural History Museum London. The whole collection is to be databased as part of the G*loMyrIS* project run from Munich (gbif.de/evertebrata2/GloMyrIS). The Manchester Museum's Register Book contains 258 records of myriapod species purchased from Verhoeff (G1045-G1301), yet the number of specimens in this collection remains unknown. It will take a considerable time to re-curate the whole spirit collection and compare its contents against these records. Full details will appear at a later date. However, in broad terms the spirit collection consists of about 50 jars and many hundreds of specimens (Fig. 4). As this collection is recurated individual lots are being provided with new accession numbers in the range G7506.1 – G7506.259.

4. THE BRADE-BIRKS' SPIRIT COLLECTION

Hilda Kathleen Brade (1890–1982) and Stanley Graham Birks (1887–1982) (Blower, 1985a; Lusted, 1991) were the most prominent and influential myriapod workers of the first third of the 20th century and worked together as a married couple with the joined surname of Brade-Birks (referred to in the plural below as Brade-Birks'). Their 36 papers on British Myriapoda formed the backbone of myriapodological work in the first half of the 20th century. Between 1916 and 1939 they laid the very firm foundations of taxonomy and literature that stabilised the knowledge of diplopods in Great Britain, as well as enlarging that knowledge with their own, most significant, contributions. They described two genera, four species and two subspecies from British collected material (see Proudlove, 2011, for a full discussion of these taxa). This enormously valuable synthetic work played a significant part in enabling Gordon Blower to make his own major contribution a generation later.

It is likely, though not now provable, that the whole Brade-Birks' collection was gifted to Gordon Blower sometime in the 1950s. It probably resided in his laboratories in the Beyer Building of the University of Manchester from arrival until it was moved to the Williamson Building upon relocation of the Department of

Zoology in 1974. It probably moved to the Museum in the 1980s with the Blower Collection. It is conceivable that it came to the Museum directly but there is no evidence (e.g. accession numbers or a record in Annual Reports) for this.

At this time it is not possible to say much about this collection as it has not been examined in detail. It is currently housed in large metal cabinet and in broad terms it consists of 100 or more bottles, some quite large and with much material (Fig. 5).

FIGURE 4: The Manchester Museum portion of the Verhoeff Collection.

FIGURE 5: The Brade-Birks' spirit collection.

5. MYRIAPOD LITERATURE IN THE MANCHESTER MUSEUM

During his 40+ years of studying Myriapoda, especially Diplopoda, but also soil biology, population biology, and other aspects of ecology and zoology, Blower accumulated a substantial and significant collection of books, reprints and other literature. In addition, his friendship with the Brade-Birks' meant that they passed their own literature resources to Blower. When this happened is not known. This library was also added by several tens of myriapodological reprints donated by the Field Museum of Natural History (Chicago, USA) in 2003, courtesy Petra Sierwald. Consequently the present Manchester Museum literature collection on Myriapoda is probably among the best in the UK, along with that at the Natural History Museum London and the collection of the British Myriapod and Isopod Group. The building of an Endnote library is in progress and its completion will facilitate an internet searchable index to this irreplaceable collection of literature.

Books

Although Blower would have had a substantial number of books on many aspects of zoology most were not passed to the Museum with his spirit and reprint collections and the location of these books is not known. There is a small collection of about 40 books plus a larger number of books from the original Brade-Birks' library. Although the book component of the myriapod library is small it contains some very important works by, among others, Schubart, Verhoeff and Brolemann. Another perplexing absence is that of any of the nine theses he supervised (see below).

Reprints

In contrast the reprint collection is internationally significant and is housed in 41 box folders and, though not counted, must have in excess of 2000 individual reprints. It is planned to provide a web-based index to this collection and, if the legal position is agreed, full digitisation and download ability. Until this is achieved requests for copies of papers can be made to the first author.

Other materials

The collection contains a full set of Bulletins of the British Myriapod Group (BMG), 1-16 (1972-2000) and, its successor, the British Myriapod and Isopod Group (BMIG), 17-26 (2001-2011) and a full set of newsletters of the BMIG. There are no copies of Isopoda, the preceding journal of the British Isopoda Study Group (BISG) nor of the newsletters of BMG, of which there were 31, or the BISG.

6. THESES ON MYRIAPODOLOGICAL TOPICS IN THE JOHN RYLANDS UNIVERSITY LIBRARY OF MANCHESTER

During his time at Manchester University Gordon Blower produced his own M.Sc. thesis and supervised 7 Ph.D. and 2 M.Sc. theses. These provided significant additions to knowledge of both diplopods and chilopods as wells as to general ecology. Copies of all are kept in the John Rylands University Library of Manchester (JRULM). A copy of each would have remained with Blower but it is not known what has become of these. They are not among his book collection currently in the Museum. There is now an internet tool (ethos.bl.uk) provided to access many of the theses published in British Universities in the past 50 years. None of the Blower-supervised theses are yet available through this tool though they may become so in the future. Currently the JRULM policy on theses is that they are for use in the library only, but that they can be loaned to other libraries, also for use in the library only. The theses, and published papers resulting directly from the thesis work, are listed in the reference list. [N.B. The thesis by Healey is on Isopoda, not Myriapoda, but is highly relevant to the ecological studies carried out on millipedes in the other theses, and to the ecology of Ernocroft Wood. Because of this relevance, and because it will be of interest to members of the British Myriapod and Isopod Group, it is included for completeness.] Future studies will aim to match the collection of voucher specimens resulting from the ecological studies and retained in the Manchester Museum, to the locality and ecological data given in the theses.

7. FOSSIL MYRIAPOD MATERIAL IN THE MANCHESTER MUSEUM

In addition to the Holotype of *Palaeosoma giganteum* (see above) the Museum has a representative sample of fossil myriapods from the Devonian and Carboniferous Periods (415 – 300 mya).

The type, figured and referred fossil material in the Manchester Museum is catalogued by Jackson (1952) and Nudds (1992, 2005) and the details from these are given below. Other sources are given with each description. Wilson (1999) studied the biology of the fossil diplopod family the Arthropleuridae and her thesis is included in the reference list.

L.6970.a-b. *Euphoberia brownii* Woodward, 1871. Carboniferous, Westphalian A, Soapstone Bed Carr Heys, Colne, Lancs (Fig. 6). See Woodward (1871).

L.8193. *Archiulus* sp. Carboniferous, Middle Coal Measures UK, Lancashire, Rochdale, Sparth Bottoms

L.8541. *Kampecaris forfarensis* Peach, 1882. Devonian, Lower, Lower Old Red Sandstone UK, Forfarshire, Leysmill Quarry. See Almond (1985).

L.9942. *Palaeosoma giganteum* (Baldwin, 1911) (syn. *Acantherpestes giganteus*). See Baldwin (1911) and Jackson, Brade-Birks and Brade-Birks (1919).

L.9943. *Palaeosoma robustum* (Baldwin, 1911). (syn. *Euphoberia robusta*). See Baldwin (1911) and Jackson, Brade-Birks and Brade-Birks (1919).

L.9944. *Palaeosoma robustum* (Baldwin, 1911). (syn. *Euphoberia armigera*). See Baldwin (1911) and Jackson, Brade-Birks and Brade-Birks (1919).

L.10281. *Kampecaris forfarensis* Peach, 1882. Devonian, Lower, Lower Old Red Sandstone UK, Forfarshire, Balgavies Quarry. See Almond (1985).

LL.131. *Euphoberia ferox* (Salter, 1863). Middle Coal Measures, Crawcrook, Ryton on Tyne, plaster cast. See S.G. Brade-Birks (1928).

LL.11165. *Arthropleura* sp. Westphalian A, Upper Carboniferous. Bickershaw Colliery, Leigh, Lancashire, UK. Figured in Anderson et al. (1997: 203; figs 3d,e,f).

LL.11166.a-b. *Arthropleura* sp. Upper Carboniferous, Westphalian A, Coal Measures, Bickershaw Colliery, Leigh, Lancashire, UK. Referred to in Anderson et al. (1997: 203).

LL.11167.a-b. *Arthropleura* sp. Upper Carboniferous, Westphalian A, Coal Measures, Bickershaw Colliery, Leigh, Lancashire, UK. Referred to in Anderson et al. (1997: 203).

LL.11176. *Arthropleura* sp. Upper Carboniferous, Westphalian A, Coal Measures, Bickershaw Colliery, Leigh, Lancashire, UK. Figured Anderson et al. (1997: 203; figs 3d,e,f).

LL.11219. *Arthropleura* sp. Westphalian A, Upper Carboniferous. Bickershaw Colliery, Leigh, Lancashire, UK. Figured in Anderson et al. (1997: 203; figs 3d,e,f).

LL.11294. *Xyliolius* sp. Wigan Four Foot coal seam roof shales, Upper Westphalian A, Upper Carboniferous. Westhoughton, 3 miles east of Wigan, Lancashire [SD 669004]. Figured in Anderson et al. (1999: fig 5a).

LL.15944.1. Unnamed specimen. St Helens, Lancashire, UK.

LL.15944.3. *Xylobius* sp. Carboniferous, Middle Coal Measures Europe, England, South Lancashire, Ashton Moss.

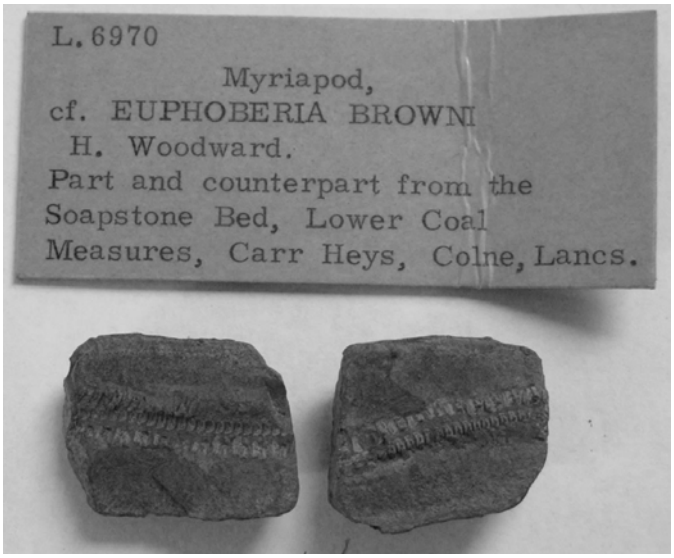

FIGURE 6: A fossil myriapod in the collection of the Manchester Museum.

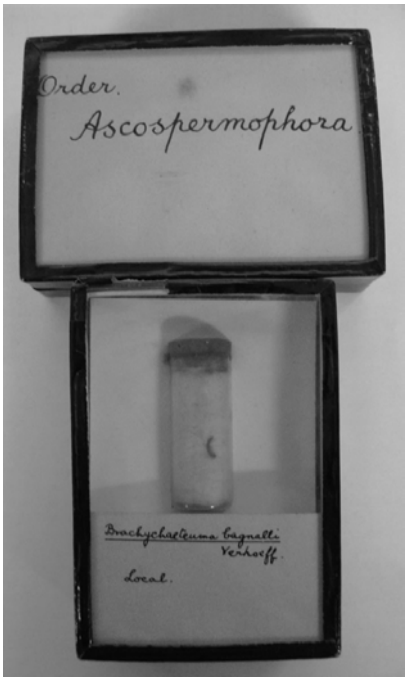

FIGURE 7: The dried collection probably by one or both of H.K. and S.G. Brade-Birks.

8. A DRIED MYRIAPODA COLLECTION

This collection seems to be historically important, as it is probably attributable to H.K and/or S.G. Brade-Birks and includes specimens from other collections. It contains purposely dried (not accidentally dried) specimens housed in cork stoppered glass tubes within cardboard boxes with clear glass lids (Fig. 7). Each tube lies on pads and is surrounded by white card to highlight the specimen. All specimens are accompanied by a card with various handwritten comments. Each card is cut very precisely to fit the width of the box. Some of the tubes contain an internal label, some readable, some not. However at the current time it is deemed too damaging to remove these labels. Only in exceptional circumstances should these internal labels be removed. Where readable the data are included below (Appendix 2). It is a very nicely presented collection and is probably unique.

There are 50 boxes in all, 30 boxes of Diplopoda and 20 boxes of Chilopoda, each with one tube. Each box is provided with a Manchester Museum accession number in the series G7505.1-50 and details are provided in Appendix 2. Verbatim text of the labels is given in inverted commas, comments, including the current name, in square brackets. The collection must date from 1921 or later as this is the year that *Proteroiulus pallidus*, one of the species included in the collection, was moved to the genus *Archiboreoiulus* (Proudlove 2011).

Several lines of evidence point to a Brade-Birks' origin for this collection.

1. There is one mention of the Lancashire town of Darwen (G7505.6), and several mentions of Kent (G7505.4, G7505.38, G7505.47). It is known that the Brade-Birks' were resident in Darwen between 1916 and 1919, and continued to visit after moving to Kent, and one of their species, *Iacksoneuma bradeae*, was described from material collected in the town in 1916. Darwen is a very ordinary Lancashire town and it is exceedingly unlikely that any other myriapodologist would light on it as a place to look for millipedes. It is also known that they moved to Wye in Kent in 1919 which helps explain the Kent entries.
2. G7505.25, *Polydesmus gallicus*, contains an internal label with evidence that it was collected by S. Graham Brade.
3. It seems highly unlikely that there was anyone in the country, after 1920 and before 1950, except for one or both Brade-Birks', that had the knowledge and determination to put together such a collection. Certainly it is not Blowers work as the handwriting is not his.
4. It is remotely possible that the collection was made by A. Randell Jackson. Tube G7505.28 contains an internal label indicating that the specimen was in Jackson's collection. However, it is more likely that, some or all of, the Jackson material found its way to the Brade-Birks' as they were very close to, and friendly with, Jackson. And the Darwen references are much more likely Brade-Birks' than Jackson.

9. THE HARRY BRITTEN SLIDE COLLECTION OF MYRIAPODA

Harry Britten (1870-1954) was the Manchester Museum's Assistant Keeper in Entomology (1919-1938), and was primarily responsible for building up the bulk of the extensive collection of British insects (Hincks 1954, Johnson 1996, Logunov 2011a,b). However he also made a small but useful collection of diplopods and chilopods which are slide mounted in various media (Canada Balsam, Euparal, PVA, Gum Chroral). The collection is of modest and mainly historical value and consists of 17 slides of Diplopoda (G7501.1 – G7501.17), 38 slides of Chilopoda (G7501.18 – G7501.55) and 7 slides of Symphyla (G7501.56 – G7501.62). All are of common species and no further details are provided here. During the documenting of this collection in November 2010 the long-lost syntype of *Iacksoneuma bradeae* (see above) was found among these slides.

10. A MISCELLANEOUS DRIED AND SPIRIT COLLECTION

The miscellaneous part of the Manchester Museum's Myriapoda collection is an assemblage of occasional donations and of material collected in the field by various people, including the museum staff. For instance, in April-May 1894, Mr G. Pearcey, an Assistant Keeper in the Museum at that time, collected 44 specimens belonging to 11 British species of Myriapoda and presented them to the collection (G669-680, G682-689, G701-702). More British material on the Myriapoda was received as gifts and exchanges from Mr G.F. Sinclair in 1902 (G988-993; Report, 1902-03) and from several museum-based collectors, including Dr W. M. Tattersall (the Keeper of the Manchester Museum in 1909-1922 and famous carcinologist), in 1911, 1912 and 1914 (G1775-1792, G1808, G3130-3176). Some exotic taxa (e.g. a set of nine tropical species of *Scolopendra*, *Rhysida longipes*, *Rhinocricus* sp., etc.; G690-699) are of uncertain origin, as neither the Register Book, nor the Annual Reports provide the names of their collectors or donors. There are also some undetermined specimens originating from the (sub)tropics, e.g. collected from the Cape Verde Islands or India (G1348, 1351), or imported from Trinidad (G1810-1811). Large and showy tropical species from the miscellaneous collection (e.g., *Scolopendra* spp.) are regularly used as educational material.

11. THE BLOWER UNPUBLISHED ARCHIVE

In his working life in the Department of Zoology at the University of Manchester Blower would have amassed a great deal of paperwork, notes, laboratory note books, experimental analyses, drafts of papers and books he wrote or co-authored, teaching materials (his teaching materials were first class), minutes of departmental meetings and probably a huge file of correspondence both received and sent. It is greatly unfortunate that very little of this material was gifted to the Museum with his other materials. If is particularly sad that he did not provide his correspondence as this must contain a huge amount of important information. We currently have a small archive which is being actively built as material is discovered.

DISCUSSION

The first major collection of Myriapoda arrived in the Manchester Museum in 1908 and this was followed by further major collections in the 1980's. Investigations in various Museum record books, minutes etc seem to show that very little work was done on these collections until very recently (though there are indications that some work was done in the 1950s but we do not know by whom). The total resources in the Museum are highly significant. Comparing the information presented here with information on other British millipede collections (in Sierwald and Reft, 2004) it would seem that the Manchester Museum diplopod collection is second only to that in the Natural History Museum London. The British Myriapod and Isopod Group also has a considerable collection but its size and composition has not been published. The present paper is only an outline of these resources. Full re-curation of the Verhoeff and Brade-Birks' collections are in progress, as is a full database of all specimens in the collections. Full analyses of these collections will be published as data become available.

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REFERENCES

Almond, J.E. (1985) The Silurian – Devonian fossil record of the Myriapoda. *Philosophical Transactions of the Royal Society of London* B **309**: 227-237.

Anderson, L.I., Dunlop, J.A., Horrocks, C.A., Winkelmann, H,M. and Eagar, R.M.C. (1997) Exceptionally preserved fossils from Bickershaw, Lancashire, UK (Upper Carboniferous, Westphalian A (Lansettian)). *Geological Journal* **32**: 197-210.

Anderson, L.I., Dunlop, J.A., Eagar, R.M.C., Horrocks, C.A. and Wilson, H.M. (1999) Soft bodied fossils from the roof shales of the Wigan Four Foot coal seam, Westhoughton, Lancashire, UK. *Geological Magazine* **136**: 321-329.

Baldwin, W. (1911) Fossil Myriapods from the Middle Coal-measures of Sparth Bottoms, Rochdale, Lancashire. *Geological Magazine* **2**: 74-80.

Barber, A.D. (2009) *Centipedes*. Synopses of the British Fauna 58. Linnean Society of London, London.

Blower, J.G. (1949) Histological and histochemical studies on the integument of Chilopoda and Diplopoda. M. Sc. Dissertation. Th1847. Joule Library. 98 pages.

Blower, J. G. (1950) Aromatic tanning in the myriapod cuticle. *Nature* **165**: 569-570.

Blower, J. G. (1951). A comparative study of the chilopod and diplopod cuticle. *Quarterly Journal of the Microscopical Society* **92**: 141-161.

Blower, J.G. (1952) Epidermal glands in centipedes. *Nature* **170**: 166-167.

Blower, J.G. (1985a) Obituary. The Rev. Cannon Stanley Graham Brade-Birks. *Bull.Brit. Myriapod Group* **2**: 3-4.

Blower, J.G. (1985b) *Millipedes*. Synopses of the British Fauna 35. Linnean Society of London, London.

Blower, J.G. and Fairhurst, CP. (1968) Notes on the life-history and ecology of *Tachypodoiulus niger* (Diplopoda, Iulidae) in Britain. *Journal of Zoology* **156**: 257-271.

Blower, J.G. and Gabbutt, P.D. (1964) Studies on the millipedes of a Devon Oak Wood. *Proceedings of the Zoological Society of London* **143**: 143-176.

Blower, J.G. and Rolfe, S.W. (1956) *Metaiulus pratensis*, gen. et sp. nov., and *Leptoiulus kervillei* (Brolemann) from Britain. *Annals and Magazine of Natural History* (**12**) **9** :513-520.

Blower, J.G. and Rundle, A.J. (1980) *Prosopodesmus panporus*, an interesting new species of polydesmoid millipede from the Royal Botanic Gardens, Kew, England. *Myriapodologica* **1**: 27-34.

Bocock, K.L., Heath, J. and Blower, J.G. (1973) Some observations on the biology of the millipede *Geoglomeris jurassica* Verhoeff, 1915. *Journal of Natural History* **7**: 691-697.

Brade-Birks, H.K. and Brade-Birks, S.G. (1917) A new member of the Ascospermophora (*Iacksoneuma bradeae* gen. et sp. nov.). *Journal of Zoological Research* **2**: 135-149.

Brade-Birks, S.G. (1928). Notes on myriapoda XXXII. An important specimen of *Euphoberia ferox* from the Middle Coal Measures of Crawcrook. *Geological Magazine* **65**: 400-406.

Brooks, C. H. (1963) Some aspects of the life-histories and ecology of *Proteroiulus fuscus* (Am Stein) and *Isobates varicornis* (Koch) with information on other blaniulid millipedes. Ph. D. thesis. Th2068. Joule Library. 301 pages.

Brooks, C. H. (1974) The life-cycle of *Proteroiulus fuscus* (Am Stein) and *Isobates varicornis* (Koch) with notes on the anamorphosis of Blaniulidae. *Symposium of the Zoological Society of London* **32**: 485-501.

Brooks, C. H. and Willoughby, J. (1978). An investigation of the ecology and life-history of the millipede *Blaniulus guttulatus* (Bosc) in a British woodland. *Abhandlungen und Verhandlungen des Naturwissenschaftlichen Vereins zu Hamburg* (NF) **21/22**: 105-114.

Fairhurst, C. P. (1968) Life cycles and activity patterns in schizophilline millipedes. Ph. D. thesis. Th3841. Joule Library.

Fairhurst, C. P. (1970) Activity and wandering in *Tachypodoiulus niger* (Leach) and *Schizophyllum sabulosum* (Linne). *Bulletin du Museum National D'Histoire Naturelle Paris* (2) **41**, Supplement 2: 61-66.

Fairhurst, C. P. (1974) The adaptive significance of variations in the life cycles of schizophylline millipedes. *Symposium of the Zoological Society of London* **32**: 575-587.

Gregory, S.J., Jones, R.E. and Mauries, J.P. (1993) A new species of millipede (Myriapoda: Diplopoda: Chordeumatidae) from the British Isles. *Journal of Natural History* **28**: 47-52.

Healey, V. (1963) Studies on the ecology of the woodlouse *Trichoniscus pusillus pusillus* Brandt 1833. Ph. Thesis. Th5299. Joule Library. 187 pages.

Hincks, W.D. (1954) Obituary. Harry Britten, M.Sc., A.L.S., F.R.E.S. *Journal of the Society for British Entomology* **4**: 225-228.

Jackson, J.W. (1952) Catalogue of types and figured specimens in the Geological Department of the Manchester Museum. *Manchester Museum Publication* No. **6**.

Jackson, J.W., Brade-Birks, H.K. and Brade-Birks, S.G. (1919) Notes on myriapoda XIX. A revision of some fossil material from Sparth Bottoms, Lancs. *Geological Magazine* **6**: 406-411.

Johnson, C. (1996). The Manchester Museum, Department of Entomology. In: Underwood, R. (ed.), *The Raven Entomological and Natural History Society, Fifty Years, 1946 to 1996.* The Raven Entomological and Natural History Society. p. 202-207.

Kayed, A. N. T. (1974) Food consumption, assimilation and growth in *Ophyiulus pilosus* (Newport). M. Sc. thesis. Th6327. Joule Library. 115 pages.

Kayed, A. N. T. (1977) Bioenergetics of *Ophyiulus pilosus* (Newport) with notes on other millipedes. Ph. D. thesis. Th6328. Joule Library. 377 pages.

Kayed, A. N. (1978) Consumption and assimilation of food by *Ophyiulus pilosus* (Newport). *Abhandlungen und Verhandlungen des Naturwissenschaftlichen Vereins zu Hamburg* (NF) **21/22**: 121-128.

Kheirallah, A. M. (1966) Studies on the feeding behaviour of the millipede *Iulus scandinavius* (Latzel, 1884). Ph. Thesis. Th6539. Joule Library. 271 pages.

Kheirallah, A. M. (1979) Behavioural preference of *Iulus scandinavius* to different species of leaf litter. *Oikos* **33**: 466-471.

Lee, P. (2006) *Atlas of the millipedes (Diplopoda) of Britain and Ireland*. Pensoft, Sofia and Moscow.

Littlewood, P. M. H. (1983) Studies in the structure and function of the coxal glands of *Lithobius forficatus* (L.) (Chilopoda: Lithobiidae). Ph. D. thesis. Th7026. Joule Library. 304 pages.

Littlewood, P. M. H. (1983) Fine structure and function of the coxal glands of lithobiomorph centipedes: *Lithobius forficatus and L. crassipes* (Chilopoda, Lithobiidae). *Journal of Morphology* **177**: 157-179.

Littlewood, P.M.H. (1988) The chemosensory behaviour of *Lithobius forficatus* (Myriapoda: Chilopoda). 2. Bioassay and chemistry of the coxal pheromone. *Journal of Zoology* **215**: 523-535.

Littlewood, P.M.H. (1991) The water relations of *Lithobius forficatus* and the role of the coxal organs. *Journal of Zoology* **223**: 653-665.

Littlewood, P. M. H. and Blower, J. G. (1987) The chemosensory behaviour of *Lithobius forficatus*. 1. Evidence for a pheromone released by the coxal organs (Myriapoda: Chilopoda). *Journal of Zoology* **211**:65-82.

Logunov, D.V. (2011a) The Manchester Museum's entomology collection. *Antenna* **34**: 163-167.

Logunov, D.V. (2011b) British entomology collections of the Manchester Museum. *Journal of the Lancashire and Cheshire Entomological Society* (in press).

Lusted, F.P. (1991) Cannon Stanley Brade-Birks: An appreciation. *Bull.Brit. Myriapod Group* **8**:39-45.

Mayermayer, G. (1962) Karl Wilhelm Verhoeff 1867–1945. Selbsdarstellung eines deutschen Zoologen mit einem Verzeichnis seiner Veröffentlichungen. *Lebensdarstellungen deutscher Naturforscher* **9**: 9–50.

Miller, P.F. (1973) The consumption and utilisation of food by millipede populations. Ph. D. thesis. Th8043. Joule Library.

Miller, P. F. (1974) Competition between *Ophyiulus pilosus* (Newport) and *Julus scandinavius* Latzel. *Symposium of the Zoological Society of London* **32**: 553-574.

Nudds, J.R. (1992) Catalogue of type, figured and referred fossils in the Geological Department of the Manchester Museum: Supplement. *Proceedings of the Yorkshire Geological Society* **49**: 81-94.

Nudds, J.R. (2005). Catalogue of type, figured and referred fossils in the Geological Department of the Manchester Museum: Supplement. *Proceedings of the Yorkshire Geological Society* **55**: 173-182.

Proudlove, G.S. (2011) Notes on authorship, type material, and current systematic position of the Diplopod taxa described by H.K. and S.G. Brade-Birks. *Bull.Brit. Myriapod & Isopod Group* **25**:2-13.

Read, H. J. (1984) Study of endemic Madeiran millipedes. M.Sc. thesis. Th9425. Joule Library. 109 pages.

Read, H.J. (1988) The life histories of millipedes: a review of those found in British species of the order Julida and comments on endemic Madeiran *Cylindroiulus* species. *Revue d'Ecologie et Biologie du Sol* **25**: 451-467.

Read, H. (2002) Obituary. John Gordon Blower 1923 – 2001. *Bull.Brit. Myriapod and Isopod Group* **18**: 5-6.

Report (1902-03) Report of the Museum Committee. The Manchester Museum, Owens College, Manchester. 39 pp.

Report (1956-57) Report of the Museum Committee. The University, Manchester: 20 pp.

Report (1957-58) Report of the Museum Committee. The University, Manchester: 20 pp.

Report (1996-97) The Manchester Museum Annual Report: 22 pp.

Report (2001-02) The Manchester Museum Annual Report: 32 pp.

Sierwald, P. and Reft, A.J. (2004) The millipede collections of the world. *Fieldiana Zoology* N.S. **103**: 1-100

Wilson, H.M. (1999) Palaeobiology of the Arthropleuridea. Ph. D. Thesis. Th21261. Joule Library.

Woodward, H. (1871) II.—On *Euphoberia Brownii*, H. Woodw., a New Species of Myriapod from the Coal-measures of the West of Scotland. *Geological Magazine* **8**: 102-104.

APPENDIX 1: THE J. GORDON BLOWER REFERENCE COLLECTION OF BRITISH DIPLOPODA IN THE MANCHESTER MUSEUM

Species in the collection with geographic data (where known). Species list from Lee (2006).
(I) =Introduced species, all others are native. See discussion below for the missing species.

Species	Acc. No. G7484	Location	Date	Collector	Stadium, abundance & sex	Notes
POLYXENIDA						
Polyxenus lagurus	331	Toleworth, Rutland	26/9/1977	C. Johnson	2F	
	332	Lee over Sands, Essex	31/7/1963			
	335	Wytham Wood	10/8/1963			
	336	Godmerstham	10/7/1954			
GLOMERIDA						
Glomeris marginata	1306	Llethrid	22/7/1964			
Geoglomeris subterranea	321	Kerridge	5/1970			
	322	Milldale	20/10/1975			
	323	Kerridge	20/11/1971	P.F. Miller	F	
	326	Wytham	21/11/1962			
	3395	Slade, Gower probably	25/9/1987			First Welsh record
Adenomeris gibbosa	1107	Ballygall, Dublin	18/11/1978	D. Doogue		First "British" record
	1109	None, probably Dublin		D. Doogue		
	1112	Dublin	24/2/1981	D. Doogue		
Trachysphaera lobata	NONE					
POLYZONIIDA						
Polyzonium germanicum	NONE					
Rhinotus purpureus	1144	Cambridge University Botanic Garden	3/6/1978	A.J.Rundle		First British record
CHORDEUMATIDA						
Craspedosoma rawlinsii	553	Ernocroft Wood	03/1966			
	559	Delamere	27/5/1975			

Nanogona polydesmoides	1353	Llethrid	22/6/1968		2	
	1355	Llethrid	24/10/1968		1	
	2690	Sulby Glen	No date		3	M28 rings, F28 rings
Anthogona britannica	NONE					
Chordeuma proximum	457	Llethrid	23/9/1986		VIII	28 rings
	457	Llethrid	23/9/1986		VIII	
	530	Bishops Wood	18/9/1968		VIII, 19	For comparison
	3399	Slade, Gower probably	22/9/1987			
Chordeuma sylvestre	274	Trelill	12/4/1962		M	
	292	Trelill	12/4/1962	J.G. Blower	3M, 3F	First British record
	1078	Trelill	12/4/1962			
	1081	Trelill				
	1084	Camelford	04/1975	R.Daniels		
	4374	Trelill SX053778	19/6/1995	J.G. Blower		
Melogona gallica	1281	Old Radnor Wood	07/04/1971?		2M	
	1282	Delamere	27/5/1975			
	1284	Old Radnor Wood	7/4/1971		3F	
	1286	Barr??? Wood	17/4/1970		3F	
	1286	BMIG meeting 1970	1970			
Melogona scutellaris	530	Bishops Wood	18/9/1968		VII 3	For comparison
	617	Llethrid	26/9/1969			
	617	Llethrid				
	628	Compstall	2/1969			
	1292	Woodchester Park	17/5/1967			
Melogona voigti	NONE					
Anamastigona pulchella	NONE					
Brachychaetuma bagnalli	NONE					
Brachychaetuma bradeae	1096	No location.	16/4/1983			
Brachychaetuma melanops	558	Rucky Valley, Cornwall	4/1963			

POLYDESMIDA						
Oxidus gracilis	516	Kew Gardens	23/5/1976	A.J.Rundle		
	1105	No location given	3/8/1984			
Stosatea italica	1106	No location given	No date			
Brachydesmus superus	511	Ailsa Craig	3/6/1976	R.A.Crowson	1M, 3F	
	1055	Woodchester Park	17/5/1967		1M, 2F	
	1066	Silwood Park	14/11/1968			
	1301	Llethrid	21/9/1970			
Polydesmus angustus	479	Ecology Study Area Manchester University	23/3/1983		1	
	1060	Delamere	14/5/1975			
	1063	Trelill	12/4/1962			
	1068	Great Haldon	1/4/1967		2M, 1F	
Polydesmus barberii	NONE					
Polydesmus coriaceus	964	Port Erin	18/3/1961			
	966	Old Park Wood	1/9/1954			
	3482	Brendon Pastures	17/4/1970	J.G. Blower		BMG 1970
Polydesmus denticulatus	1057	Delamere	14/5/1975			
	1072	West Suffolk	8/1968			
	1073	Trelill	12/4/1962			
	1212	Brigg and Manby Woods	16/5/1959			
Polydesmus inconstans	4021	Bernac, France	9/7/1991	J.G. Blower	1F	
Propolydesmus testaceus	NONE					
Cylindrodesmus hirsutus	1142	Kew Gardens	12/7/1986	A.J.Rundle		First British record
Prosopodesmus panporus	633	Kew Gardens	16/5/1976	A.J.Rundle	28M	Paratypes
	634	Kew Gardens	16/5/1976	A.J.Rundle	15F	Paratypes
	1099	No location given	No date			
	1108	Kew Gardens	No date		M	
Prosopodesmus juvenile	1119	Leicester Museum Botanic Gardens	14/9/1985	A.J.Rundle	juvenile	

Poratia digitata	637	Kew Gardens	9/5/1976	A.J.Rundle	VII 27M	
	638	Kew Gardens	9/5/1976	A.J.Rundle	VIII 22F	
	645	Kew Gardens	9/5/1976	A.J.Rundle	VII 18F	
	1115	Kew Gardens	12/7/1986	A.J.Rundle		
	1140	Wisley, Surrey	14/6/1986	A.J.Rundle	1M	
Macrosternodesmus palicola	554	Brooms Barn	13/5/1966			
	956	Lincoln	1930	W.J.Letts		
	3397	Dunkeld Grounds	6/4/1971	Lewis		
	4093	Burnbarrow Scar	8/4/1990	J.G. Blower		
	4129	Raxsons Wood SD463860	24/4/1990	J.G. Blower	5F	
Ophiodesmus albonanus	256	Trelill	12/4/1962			
	265	St Nectans	4/1963			
	269	Parcle Breas Quarry	20/9/1969			
	955	No location given	1930	Letts,W.J.		
	1098	Gaitbarrow	16/4/1983			
	1114	Dublin	24/2/1981	D. Kime		
	3397	Dunkeld Grounds	6/4/1971	Lewis		
SPIROBOLIDA						
Paraspirobolus lucifugus	NONE					
JULIDA						
Choneiulus palmatus	352	Manchester			M	
	355	Merlewood	3/9/1964		M	
	400	Kew Gardens	16/3/1976	A.J.Rundle		
	1164	Lundy ???				
	4359	Sand Point ST329659	25/4/1987	J.G. Blower	1M, 5F	
Nopoiulus kochii	1143	Kew Gardens	12/7/1986	A.J.Rundle		
Proteroiulus fuscus	507	Ailsa Craig	3/6/1976	R.A.Crowson		
	1154	Castletown, Caithness	30/3/1969	Blumfield		
	1156	Birkrigg	20/7/1960			
	1159	Silwood Park	14/11/1964			

Blaniulus guttulatus	339	Buckingham Palace	20/5/1960			
	340	Buckingham Palace	20/5/1960			
	1149	Brooms Barn	13/5/1966			
	1300	Llethrid			5M, 3F	
Archeboreoiulis pallidus	338	Milldale	20/5/1976			
	961	No location given	1930	Letts,W.J.		
	1157	No location given				
	1158	Helmsley, Rievaulx				
Boreoiulus tenuis	957	No location given	1930	Letts,W.J.		
	1113	Dublin	24/2/1981	D. Kime		
	1150	Sutton Bridge, Lincolnshire	5/1964	Marie Wolfe	20F	
	1152	Sutton Bridge, Lincolnshire	4/1964	Marie Wolfe	3M	
Nemasoma varicorne	351	Llethrid	22/9/1982		VII 3F	
	1151	Suffolk	8/1968		4M	
Thalassisobates littoralis	341	No location given				
	344	No location given				
	349	No location given				
	4092	Mullock Bay	5/4/1997	J.G. Blower		
Julus scandinavius	362	Wonwell	7/4/1967		X M	
	367	No location given				
Haplopodoiulus spathifer	NONE					
Ophyiulus pilosus	359	Llethrid	9/1979		IX F	
	480	Ecology Study Area Manchester University	23/3/1983		1	
	1093	Kerridge	11/1975	Nabil Kayed	XIII F	12RO,55 or 56 +1
	1116	Kew Gardens	30/3/1976	A.J.Rundle		
Leptoiulus belgicus	374	Cornwall			2M	
	1102	Falmouth	No date		IX 2M, 4F IX	
	1102	Falmouth			IX 2M, IX 4F, VIII F	
	1104	No location given				

Leptoiulus kervillei	295	Southampton	2/6/1989			
	369	Widlake Wood	4/1982		IX M	
	369	Widlake Wood	4/1982		IX M	
	369	Widlake Wood	4/1982		IX F	
	369	Widlake Wood	4/1982		IX F	
	4373	Trethin SX101820	21/6/1995	J.G. Blower		
Metaiulus pratensis	1117	Petersham, Surrey	15/10/1978	A.J.Rundle		New record
Allajulus nitidus	280	Milldale	29/7/1968		1M, 10F, 1 intersex	
	287	Sawrey, Windermere	16/8/1964		1M, 1F	
	364	No location given			1M, 1F	
Cylindroiulus caeruleocinctus	358	Woodchester Park	2/4/1979		2M	
	370	Woodchester Park			M	
	409	Woodchester Park	2/4/1979		F	
Cylindroiulus britannicus	401	Kew Gardens	14/12/1975	A.J.Rundle		
	417	Oxwich Wood	22/9/1970		VII	
	419	Oxwich Wood	22/9/1970		IV	
	423	Woodchester Park	7/1974			
	481	Ecology Study Area Manchester University	23/3/1983		1	
Cylindroiulus latestriatus	509	Ailsa Craig	3/6/1976	R.A.Crowson	1	
Cylindroiulus londinensis	363	Ryhope Dean		D. Kime	2M	
	365	Ryhope Dean	20/8/1982	D. Kime	2M	
	405	Dune Park	30/6/1961			
	561	Kent	9/1983	A.J.Rundle	VII M, IX F	
Cylindroiulus parisiorum	395	Kew Gardens	14/12/1975	A.J.Rundle		
	396	Kew Gardens	16/3/1975	A.J.Rundle		
	397	Kew Gardens	14/12/1975	A.J.Rundle		
	398	Kew Gardens	30/3/1976	A.J.Rundle		
	399	Kew Gardens	8/2/1976	A.J.Rundle		
	402	Kew Gardens	14/12/1975	A.J.Rundle		

Cylindroiulus punctatus	357	Truro				
	508	Ailsa Craig	3/6/1976	R.A.Crowson		
Cylindroiulus salicivorus	NONE					
Cylindroiulus truncorum	392	Kew Gardens	30/5/1976	A.J.Rundle	VIII M,V IIM	
Cylindroiulus vulnerarius	267	Avon Gorge	20/5/1905			
	390	Fletcher Moss	28/4/1978	M. Jones	1M	
	391	Fletcher Moss	18/5/1978	M. Jones	2F	
	394	Mortlake	4/1976	A.J.Rundle	1M	
	1125	Gower	24/9/1979		2M, 2F	
Enantoiulus armatus	375	Great Haldon	1/4/1967		1M, 1F	
	406	Salcombe Hill	10/5/1958	E.H.Eason	5M, 3F	
	1094	No location given	3/8/1984			
Unciger foetidus	NONE					
Brachyiulus pusillus	360	No location given			VII 2M	
	366	No location given				
	548	Little Hampden	4/4/1980			
	1101	Trelill	No date		2	
Ommatoiulus sabulosus	298	Abbotts Moss	12/10/1986	R.R.Askew		
	361	Llethrid	22/7/1964			
	368	No location given				
	512	Ailsa Craig	3/6/1976	R.A.Crowson		
Tachypodoiulus niger	372	Bowker's wall	3/3/1965		VII M	
	372	Bowker's wall	3/3/1965		IX M	
	372	No location given	18/8/1977	C. Johnson	VIII M	
	1319	Llethrid	2/9/1970		1M	
	3945	Castle Eden Dene, Durham	2/6/1986	Noel Jackson		Albino

The missing species

Anamastigona pulchella (I)
Not discovered in Britain (Northern Ireland) till 1994, after the end of Blower's main interest.

Anthogona britannica
Described as new in 1993 (Gregory, Jones and Mauriés 1993), after the end of Blower's main interest.

Brachychaeteuma bagnalli
This is a curious omission as Blower clearly had the animal: collected "by myself in a garden in Easingwold, North Riding, a male in April 1956 and a female with two immature stadia ... in August 1961." (Blower 1985:82). It is also likely that Declan Doogue (specimens from Ballygal, Dublin) and Adrian Rundle (specimens from several locations) would have sent material to Blower as they did with other species (Doogue sent *Adenomeris gibbosa* from the same site and this is in the collection).

Cylindroiulus salicivorus (I)
Not recorded in Britain (Scotland) until 1987.

Haplopodoiulus spathifer (I)
Not known from Britain (Kew Gardens, London) until 1986.

Melogona voigti
Not known from Britain (Lothian, Scotland) until 1995.

Paraspirobolus lucifugus (I)
Not discovered in Britain (The Eden Project, Cornwall) until 2005.

Polydesmus barberii (i)
Discovered in Devon in 1995.

Polydesmus inconstans
As the 14th most common millipede at the time of Blower's synopsis (1985) this is a remarkable omission.

Polyzonium germanicum
Though it is very restricted in distribution, being known only from extreme east Kent, it is surprising that Blower did not collect even a few animals for his collection. What little evidence there is suggests that he did not. Despite nearly all drawings in the synopsis being drawn from material in his collection, two of the drawings of this species are "drawn from photographs by Dr S. M. Manton." A third drawing, of the head, looks much more like other drawings in the synopsis and may have been from a real animal.

Propolydesmus testaceus
Long known as *Polydesmus testaceus* and found in Britain in 1903. This is a major, and unexplained, omission from the Blower collection.

Trachysphaera lobata
Not known from Britain (The Isle of Wight) until 1986.

Unciger foetidus (I)
Not found in this country until 27th April 1983. However, the synopsis contains a full account, with a drawing of the whole animal in lateral view and four details of the gonopods. All appear to in Blower's unique style.

APPENDIX 2: THE DRIED MYRIAPODA COLLECTION ATTRIBUTABLE TO H.K. AND S.G. BRADE-BIRKS.

Each box is given a unique accession number in the series G7505 e.g. G7505.1. Contents of the labels provided with the boxes are given in "inverted commas" *verbatim*, comments on the samples, including the presently accepted name, are given in [square brackets].

Diplopoda

G7505.1. "*Cylindroiulus luscus* (Meinert)"

G7505.2. "*Polydesmus coriaceus* Porat. Widespread. A small species. Gonopods of male are diagnostic."

G7505.3. "The so-called "*Polydesmus complanatus* (L)" of British authors. Male (larger) and female. This is our commonest species of Polydesmus." [*Polydesmus angustus* ?]

G7505.4. "*Polyzonium germanicum* Brandt. The only British member of the order Colobgnatha is known only from the neighbourhood of the North Downs of Kent."

G7505.5. *"Archiboreoiulus pallidus* (Brade-Birks), probably widespread." [Widespread but not common]

G7505.6. "*Chordeumella scutellare brolemanni* Brade-Birks. Local. Common under leaves on surface of soil Darwen, Lancashire. Gonopods are diagnostic." [*Melogona scutellaris*]

G7505.7. "*Microbrachyiulus pusillus* (Leach). Widespread. Size and colour (note dorsal markings) are guides to diagnosis." Internal label: "*Julus pusillus*." [*Brachyiulus pusillus*]

G7505.8. "*Brachydesmus superus mosellanus* Verhoeff. This is the only British representative of the genus. Common in gardens. Attacks delicate roots of seedlings."

G7505.9. "*Brachychaeteuma bradeae* (Brölemann and Brade-Birks). Four British species of this genus have been described. The gonopods of the male are diagnostic." [Only three species now recognised in the genus]

G7505.10. "*Iulus (Micropodoiulus) scandinavius* Latzel. Quite common in some localities, absent in others. There is a diagnostic process on the second walking leg of the male." [Note spelling of generic name with an I rather than a J. This usage discussed by Jeekel 1971]

G7505.11. "*Cylindroiulus londinensis caeruleocinctus* (Wood). Widespread. Occurs as a subspecies in some parts of England and on the continent but also occurs as a variety with the true *C. Londinensis*." [Now considered to be *C. caeruleocinctus*, see discussion in Blower (1985:140-141, 144)]

G7505.12. "*Macrosternodesmus palicola* Brolemann. Local. Chester etc." [Chester was the base of A. Randell Jackson]

G7505.13. "*Proteroiulus fuscus* (Am Stein). Commonly found between the bark and trunk of rotting timber. Males are remarkably rare. The arrangement of the eyes and the habitat are clues in diagnosis."

G7505.14. "*Polymicrodon polydesmoides* (Leach). As this is the only known British representative of the genus the form of the body serves to distinguish the animal." [*Nanogona polydesmoides*]

G7505.15. "*Tachypodoiulus niger* (Leach). Common in most places in the British Isles. The anterior part of each body segment has striations at right angles to the length of the body and these are diagnostic." Internal label: "*T. Niger* 587: Co Down, Ireland."

G7505.16. "*Blaniulus guttulatus* (Bosc). Very common. Injurious to beans strawberries and other crops."

G7505.17. "*Isobates varicornis* (C. L. Koch). Local. Habitat and eye-structure are aids to diagnosis." Internal label: "*I. varicornis* 920." [*Nemasoma varicorrne*]

G7505.18. "*Brachychaeteuma bagnalli* Verhoeff. Local." See Figure 7.

G7505.19. "*Craspedosoma rawlinsi* Leach. Widespread. Sparsely distributed."

G7505.20. "*Cylindroiulus londinensis* (Leach). The largest British millipede." [Specimen measures 42mm x 5mm]

G7505.21. "*Glomeris marginata* Villers. The common black "pill-millipede"."

G7505.22. "*Boreoiulus tenuis* (Biglen). Local." Internal label: "*M. Tenuis* 1140."

G7505.23. "*Ophyiulus pilosus* (Newport). Widespread. The form of the limbs of the first body segment in the male is diagnostic."

G7505.24. "*Cylindroiulus nitidus* (Verhoeff)." [*Allajulus nitidus*]

G7505.25. "*Polydesmus gallicus* Latzel. A swamp lover. Local. In this genus the modified legs (gonopods) of the 7th body-segment of the male are diagnostic." Internal label: "Fever swamp, Chester, 7/X/15, Coll. S.G.B". [S.G.B is S. Graham Brade] [*Polydesmus coriaceus*]

G7505.26. "*Nopoiulus kochi* (Gervais). Widespread. This is the "*Iulus venustus* Meinert" of various authors." [*Nopoiulus kochii*]

G7505.27. "*Schizophyllum sabulosum* (L.). Widespread. Note dorsal marking indicated by the inclusion of a small part of a second animal." [*Ommatoiulus sabulosus*]

G7505.28. "*Polydesmus denticulatus* C.L. Koch. Widespread, but local. Gonopods of male are diagnostic." Internal label: "P. dentic ARJs coll [unreadable location]". [ARJ is A. Randell Jackson]

G7505.29. "*Choneiulus palmatus* (Nemec). One of our rarer species. Sometimes occurs in greenhouses." [Widespread but still uncommon]

G7505.30. "*Paradesmus gracilis* (C. L. Koch). Not uncommon in greenhouses." [*Oxidus gracilis*].

Chilopoda

G7505.31. "*Brachygeophilus truncorum* (Bergsoe and Meinert, 1886). Widespread. The form of the ventral body plates is diagnostic." [*Geophilus truncorum*]

G7505.32. "*Hydroschendyla submarina* (Grube). Below high-water mark."

G7505.33. "*Lithobius calcaratus* C. L. Koch. Local. The specific name has reference to a characteristic projection on the last leg of the male."

G7505.34. "*Lithobius lapidicola* Meinert. Local." [May be *L. borealis* (Barber 2008:75)]

G7505.35. "*Lamyctes fulvicornis* Meinert. Local. Often abundant. The legs are spineless and only a single pair of ocelli is present." [*Lamyctes emarginatus* (Newport, 1844)]

G7505.36. "*Scolioplanes acuminatus* (Leach). Uncommon. There are several records for North of England localities." [*Strigamia acuminata*]

G7505.37. "*Cryptops hortensis* Leach. The only British member of the order Scolopendromorpha. Widespread. Common in some gardens and greenhouses." [Now three native, and one introduced, species in the genus in Great Britain]

G7505.38. "? *Lithobius muticus* C. L. Koch. North Downs, Wye, Kent. No other British specimen of this species is known."

G7505.39. "*Geophilus insculptus* Attems. A common species in parts of the north of England. The ventral body plates are diagnostic."

G7505.40. "*Geophilus longicornis* (Leach). Widespread. The long segments of the antennae are diagnostic." [*Geophilus flavus*]

G7505.41. "*Geophilus carpophagus* Leach. Widespread and often common. Typical ventral plates." [*G. carpophagus* now split into two species, the other is *G. easoni* Arthur et al., 2001]

G7505.42. "*Stigmatogaster subterraneus* (Shaw). Widespread, but somewhat local; often common. Structure of ventral plates diagnostic." [*Stigmatogaster subterranea*]

G7505.43. "*Lithobius variegatus* Leach. Often common on moorlands and in the open country. Distinguished from all other British Lithobiidae by its colour. Known only from the British Isles." [Now known from France and Spain, Barber (2009)]

G7505.44. "*Lithobius forficatus* (Linne). The common brown centipede."

G7505.45. "*Scolioplanes crassipes* (C. L. Koch). Widespread but local." [*Strigamia crassipes*]

G7505.46. "*Schendyla nemorensis* (Leach)."

G7505.47. "*Monotarsobius duboscqui* (Brolemann). Widespread. Common in Kent." [*Lithobius microps*]

G7505.48. "*Lithobius melanops* Newport. Widespread."

G7505.49. "*Scolioplanes maritimus* (Leach). A shore form." [*Strigamia maritima*]

G7505.50. "*Monotarsobius crassipes* (L. Koch). Common in Lancashire and in some other districts." [*Lithobius crassipes*]