

OXFORDSHIRE MILLIPEDES

S.J.Gregory

Northmoor Trust, Little Wittenham Nature Reserve, Manor House, Little Wittenham, Abingdon, Oxfordshire, OX14 4RA

INTRODUCTION

Oxfordshire is fortunate to have had a long history of entomological research, mainly due to the presence of specialists associated with Oxford University (most notably at the Hope Department). Thus much is known about the insect fauna since the early 19th century. Unfortunately, as is the case with most other counties, little work was done on non-insect orders.

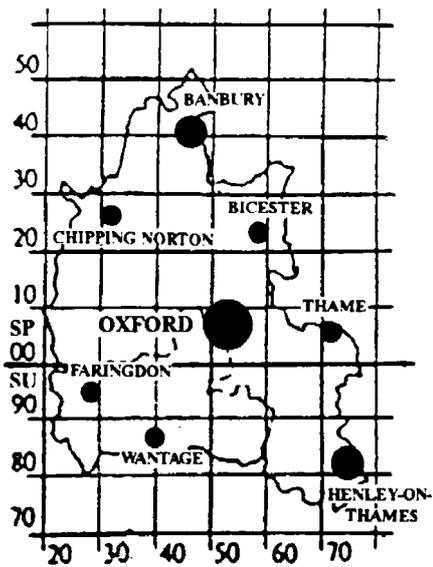
The situation was improved by Charles Elton and his workers at the Bureau of Animal Population Studies, who pioneered ecological research in the 1920's. This research, known locally as the 'Wytham Survey', continued until the 1970's. Species records were obtained for many under-recorded taxa including millipedes.

The current survey was started following the collection by the author of several species of Myriapoda considered to be rare in Britain, but which had been previously collected locally by the Wytham Survey. Were these species really rare or was it just that no-one had looked elsewhere before? Clearly some fieldwork was needed to put these, and other species, into their true county context. It is hoped that some objective statement can now be made about the distribution of millipedes in Oxfordshire and that species important in semi-natural habitats can be identified.

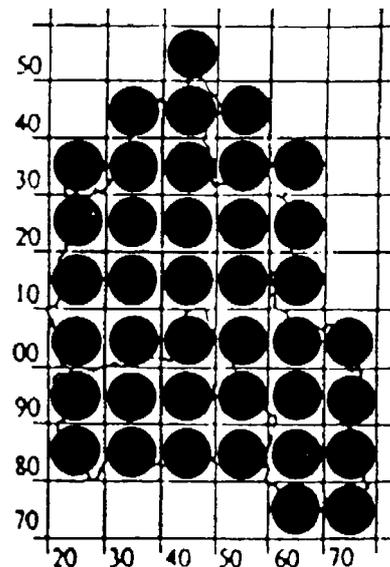
AREA OF SURVEY

The records presented in these maps cover the current administrative county of Oxfordshire (Map 1). This was created in 1974 by the amalgamation of Watsonian vice-county 23 (Oxfordshire) and the north west part of vice-county 22 (Berkshire). The old county boundary followed the course of the River Thames and is shown on the maps as a dashed line. This gives an area of 260,944 hectares which falls within the following 39 10km squares:

SU(41)28, SU29, SU38, SU39, SU48, SU49, SU58, SU59, SU67, SU68, SU69, SU77, SU78, SU79, SP(42)20, SP21, SP22, SP23, SP30, SP31, SP32, SP33, SP34, SP40, SP41, SP42, SP43, SP44, SP45, SP50, SP51, SP52, SP53, SP54, SP60, SP61, SP62, SP63 and SP70.



Map 1. Modern county of Oxfordshire



Map 2. Coverage map

PHYSICAL FEATURES OF THE COUNTY

Like most counties in the lowland south much of the countryside supports extensive agriculture. Considering the close proximity to London the county is surprisingly free of conurbations. Habitats considered to be of high conservation value occupy only 8% of the county. The underlying geology is a series of exposures from the Jurassic in the north west to the Cretaceous in the south east, forming three main north west facing calcareous escarpments, separated by two low lying clay vales. The county is dominated by the River Thames, which winds its way from the west to the south-east of the county against the slope of the prevailing escarpments. Extremes in elevation are seen in the south east of the county. The Thames valley lies at 35m above sea level and the highest point of the Chiltern escarpment at 255m.

The northern third of the county is a rolling plateau of Jurassic limestones (the North Oxfordshire Uplands). The extreme north is ironstone, once worked for iron ore, and dominated by agriculture. It is dissected by deep stream valleys which still contain a few remnants of semi-natural habitat. Further south on the oolitic limestones some large tracts of deciduous woodland occur, most notably Wychwood Forest NNR. Locally some glacial acidic clay drift occurs.

The Oxford Clay Vale lies between this and a well defined ridge of Corallian limestone and calcareous sands (the Oxford Heights) which crosses the centre of the county. In addition to woodlands this supports remnants of contrasting calcareous grassland and heath reminiscent of those of the East Anglian brecklands. At the base of the ridge, where these porous rocks meet the underlying impermeable clays a series of calcareous seepage fens has developed, typified by Cothill Fen NNR.

The Vale of White Horse, of Gault and Kimmeridge clays, lies across much of the south of the county. Along the southern edge Cretaceous chalk outcrops, forming the Chiltern escarpment, with much beech woodland and chalk grassland. In the extreme south east of the county this is overlain by acidic clay drift. This area covered by extensive woodlands

shows contrasting habitats where dry valleys have cut through this acid drift into the underlying chalk.

The Thames and its many tributaries, such as the Evenlode, Windrush, Cherwell, Ray and Thame, still have many associated unimproved damp meadows and marshes, including Otmoor.

HISTORICAL RECORDS

In general records have not been extracted from the literature or from the national database held at the BRC at Monks Wood. There is no reference to Myriapoda in the Victorian County History (Salzman, 1938). It is not clear whether this is due to the absence of recording or because no one was available to write the relevant text. It does record a visit by R.S.Bagnall to collect woodlice and it is possible that he may have collected Myriapoda as well. The following account is based on the computerised database held at the Oxfordshire BRC.

The earliest records that I am aware of are a result of the 'Wytham Survey'. This was started by Charles Elton, in the 1920's, with the formation of the Bureau of Animal Population Studies. Initially fieldwork was confined to Bagley Wood (SP50) near Oxford and covered a variety of taxa. Following the gift of the Wytham Estate to the University, research was concentrated there. In time the survey spread further afield to include other sites. The earliest millipede record is for *Glomeris marginata* from Bagley Wood in 1933. The remainder of the Wytham Survey millipede records date from 1950 to 1963.

The survey pioneered many new sampling techniques to enable ecological studies to be undertaken, such as Tullgren Funnel extraction of invertebrates from soil core samples. Specialists were often brought in to identify collected material. As a result many important species records were made. This is best illustrated by the collection of *Stygioglomeris crinata* from soil core samples taken at Wytham Woods in 1950, the first British record. In the following two decades the species was repeatedly extracted from soil cores at Wytham (Bocock et al.1973) and Howe Wood (SU69 & SU79) (Oxfordshire BRC database).

12 species of millipede were recorded during this period as follows: *Polyxenus lagurus*, *Glomeris marginata*, *Stygioglomeris crinata*, *Nemasoma varicorne*, *Proteroiulus fuscus*, *Tachypodoiulus niger*, *Cylindroiulus caeruleocinctus*, *C. punctatus*, *Julus scandinavicus*, *Polydesmus gallicus*, *P. denticulatus* and *Brachydesmus superus*.

RECENT RECORDING

In the late 1980's collections were made in the county by S.P.Hopkin and D.T.Bilton. S.P.Hopkin made several excursions into the county to collect various invertebrate taxa from nature reserves. Millipedes he recorded include *Ommatoiulus sabulosus*, *Cylindroiulus britannicus* and *Ophiodesmus albonanus*. D.T.Bilton was based at Oxford University for a number of years and did much collecting from Oxford city centre where he found *Choneiulus palmatus*, *Nopoiulus kochii*, *Cylindroiulus vulnerarius*, *C. parisorum*, *C. truncorum*, *Macrosternodesmus palicola* and *Oxidus gracilis* to add to the county list. Visits to Wychwood Forest NNR also added *Brachychaeteuma bradeae*,

Melogona scutellare, *Boreoiulus tenuis* and another record for *S. crinata*. Some collections were also undertaken from National Trust properties by K.N.Alexander. Other species recorded in this period were *Nanogona polydesmoides*, *Blaniulus guttulatus*, *Ophiulus pilosus* and *Polydesmus angustus* adding 17 species to the county list.

THE PRESENT SURVEY

Since 1990 the author has put much effort into filling in the gaps for the common species and defining the ranges of the more local ones. Records are site based, within 10km national grid squares, and are made in accordance with guidelines given by the British Myriapod Group recording scheme. These are compatible with the tetrad (2km x 2km) recording unit used by the Oxfordshire BRC.

All 39 10km grid squares have been visited (Map 2). Within each 10km square several sites with contrasting habitats were sampled. These included not only natural sites such as ancient woodland, semi-natural grassland, old meadow and fen, such as those identified by the County Nature Conservation Forum, but also synanthropic sites such as old churchyards. Effort has been made to visit inaccessible and under recorded areas especially in the north. Most of the fieldwork was undertaken from October to May. Many species seemed much easier to find in the winter months, even in very cold conditions. Indeed the Chordeumatidans were conspicuously absent during the summer. Since this is primarily a tetrad survey many sites were visited only once. A few sites have been more extensively surveyed and should provide base-line species lists for other similar sites in the county.

As many microsites as possible were examined on each site. This mostly entailed searching the underside of large stones and fallen timber as well as the superficial soil layer beneath. Searches were also made in leaf-litter and under the bark of fallen and standing dead wood. Time permitting, soil or rubble in 'promising spots' was also hand sorted in the field. There has been a deliberate bias in looking for the more elusive species on the assumption that the common species will be found anyway. With practice it became possible to find many species simply by searching the appropriate microsite within suitable habitat. Much additional material has been collected by John Campbell at the Oxfordshire BRC and passed on for determination, including some pitfall trap specimens.

Seven further species have been added to the Oxfordshire list as follows: *Brachychaeteuma melanops*, *Chordeuma proximum*, *Archiboreoiulus pallidus*, *Allajulus nitidus*, *Brachyiulus pusillus*, *Polydesmus testaceus* and *P. inconstans*. *Cylindroiulus latestriatus* was also collected but, although no records were held at the Oxfordshire BRC, the Preliminary Atlas (BMG 1988) lists records for this species in Oxfordshire. The number of millipedes now recorded from Oxfordshire stands at 37.

RECORDS AND VOUCHER SPECIMENS

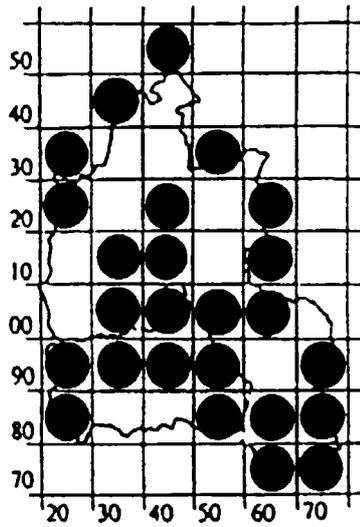
Biological recording for the county is co-ordinated by the Oxfordshire Biological Records Centre, part of the County Museum Service. Full details of all records are held there on a computerised database (using Recorder programme). To the end of October 1994 this amounts to 3109 millipede records. The majority of these records (96%) are post 1990 and mostly attributable to the author (2366 records) and J.M.Campbell (606 records).

The total number of records for each species is shown in Table 1. Species are ranked by the number of 10km squares within which they have been found in the county. The overall rank in Britain as given in the Preliminary Atlas (BMG 1988) is noted. The number of species recorded from each 10km square is shown in Map 40.

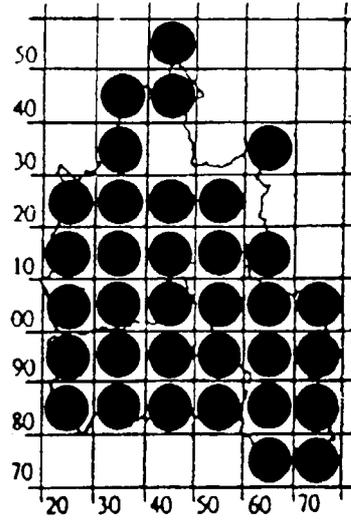
Of the post 1990 records at least one species record per 10km square has been submitted to the national recording scheme. A selection of Oxfordshire material has been lodged in the collections of the County Museum Service. A small working collection is held by the author.

Table 1: Species list for Oxfordshire showing relative abundance, rank in the county and rank in Britain (BMG 1988)

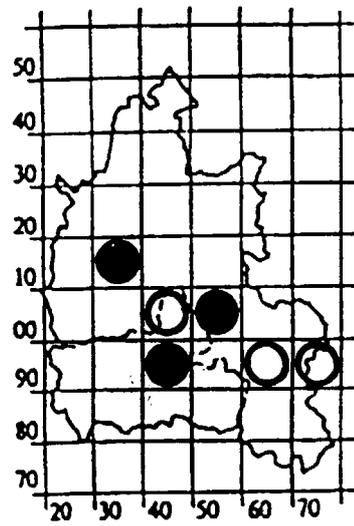
Species	Number of 10km sqs.	Total no. Records	Rank in county	Rank in Britain
<i>Polyxenus lagurus</i>	25	49	16	20
<i>Glomeris marginata</i>	34	176	11	4
<i>Stygioglomeris crinata</i>	6	9	27	31
<i>Nanogona polydesmoides</i>	39	127	7	5
<i>Brachychaeteuma melanops</i>	7	13	25	32
<i>Brachychaeteuma bradeae</i>	6	7	28	34
<i>Chordeuma proximum</i>	4	6	30	22
<i>Melogona scutellare</i>	13	25	20	23
<i>Nemasoma varicorne</i>	38	116	8	14
<i>Proteroiulus fuscus</i>	37	141	10	6
<i>Choneiulus palmatus</i>	7	8	26	29
<i>Nopoiulus kochii</i>	3	5	32	40
<i>Blaniulus guttulatus</i>	39	168	6	11
<i>Archiboreoiulus pallidus</i>	11	18	21	24
<i>Boreoiulus tenuis</i>	23	44	18	21
<i>Ommatoiulus sabulosus</i>	4	4	31	9
<i>Tachypodoiulus niger</i>	39	408	2	2
<i>Allajulus nitidus</i>	1	1	35	28
<i>Cylindroiulus caeruleocinctus</i>	39	114	8	19
<i>Cylindroiulus vulnerarius</i>	1	4	33	41
<i>Cylindroiulus punctatus</i>	39	424	1	1
<i>Cylindroiulus latestriatus</i>	5	11	29	12
<i>Cylindroiulus britannicus</i>	30	98	14	15
<i>Cylindroiulus parisiorum</i>	10	23	22	31
<i>Cylindroiulus truncorum</i>	1	1	36	-
<i>Julus scandinavus</i>	9	14	23	8
<i>Ophiulus pilosus</i>	39	186	5	7
<i>Brachyiulus pusillus</i>	23	53	17	16
<i>Polydesmus angustus</i>	33	136	12	3
<i>Polydesmus testaceus</i>	1	1	37	37
<i>Polydesmus inconstans</i>	8	14	24	17
<i>Polydesmus gallicus</i>	39	310	3	13
<i>Polydesmus denticulatus</i>	13	29	19	18
<i>Brachydesmus superus</i>	39	222	4	10
<i>Macrosternodesmus palicola</i>	32	94	13	23
<i>Ophiodesmus albonanus</i>	26	49	15	25
<i>Oxidus gracilis</i>	1	4	34	-



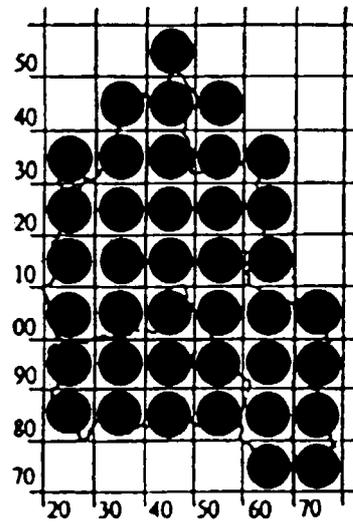
Map 3. *Polyxenus lagurus*



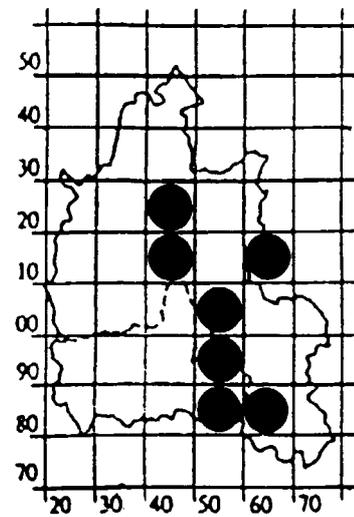
Map 4. *Glomeris marginata*



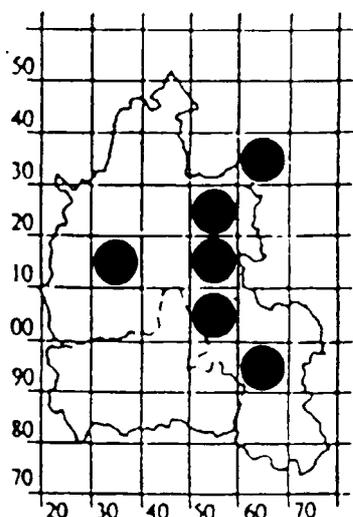
Map 5. *Stygioglomeris crinata*



Map 6. *Nanogona polydesmoides*



Map 7. *Brachychaeteuma melanops*



Map 8. *Brachychaeteuma bradeae*

INTRODUCTION TO THE MAPS

Records are shown in two time categories:

Post 1980 records (mostly post 1990) are shown as solid dots.

Pre-1980 records (mostly 1950 to 1963, Wytham Survey) are shown by an open circle.

Additional 10km records shown in the Preliminary Atlas (BMG 1988) but where details are not held on the O.B.R.C database are indicated by an 'A'. Only the most recent record for each square is shown on the maps.

NOTES ON SPECIES RECORDED

All of the 25 most common millipedes found in Britain (BMG 1988) have been collected from Oxfordshire. Despite many rare species having been recorded during this survey only one, *P. testaceus* was unexpected (Blower, 1985 & BMG, 1988). There are noticeable differences between the abundance of species found in the county and the abundance noted in the Preliminary Atlas (BMG 1988) (see Table 1). These are highlighted in the text below.

Polyxenus lagurus (Linne, 1758)

Map 3. The bristly millipede is fairly common in the county and found in a variety of dry microsites. It is often numerous under loose bark on riverside willow pollards above winter flood levels. Also found under the bark of dead trees in ancient woodland and under moss or loose stones on walls.

Glomeris marginata (Villers, 1789)

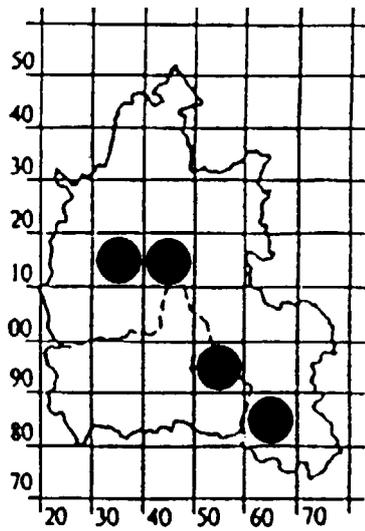
Map 4. Can be locally abundant, usually in shady habitats, where friable soils on both calcareous and acidic substrates occur. In the clay vales it is uncommon and confined to ancient woodlands. This patchy distribution is apparent from the tetrad maps held at the Oxfordshire BRC and reflected by it being ranked the 11th most common millipede in the county compared to 4th in Britain.

Stygioglomeris crinata Brolemann, 1913

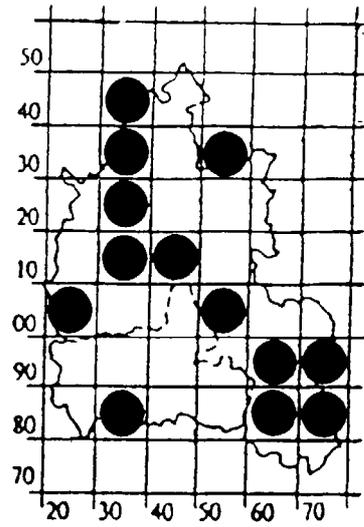
Map 5. This small soil-dwelling pill millipede has proved very elusive in the county. It was recorded as new to Britain from Wytham Woods in 1950 and subsequently extracted from soil core samples on several occasions by the 'Wytham Survey'. There are three recent records where hand searching techniques have been used. All records are from primary woodlands (all SSSI) on friable calcareous soils. Probably very under-recorded in the county and, so far, no records from synanthropic sites.

Nanogona polydesmoides (Leach, 1815)

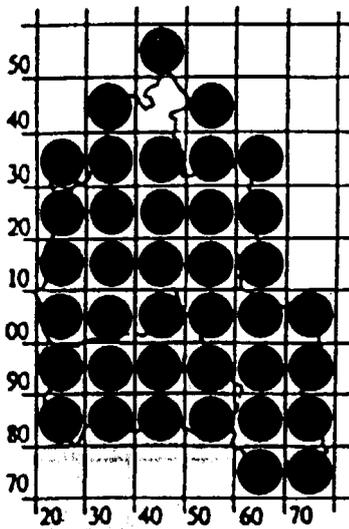
Map 6. The only common Chordeumatidan in the county. It is found under stones and dead wood in a wide range of habitats from churchyards to ancient woodlands, usually on calcareous soils. In the summer months the distinctive 'hairy' immatures can be readily found.



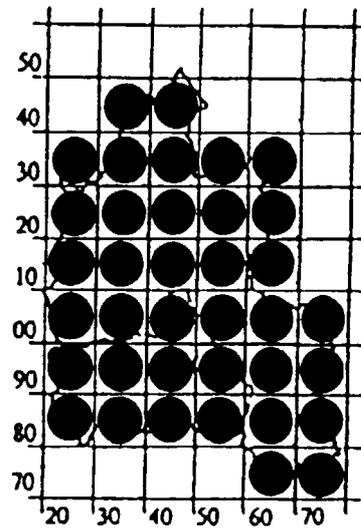
Map 9. *Chordeuma proximum*



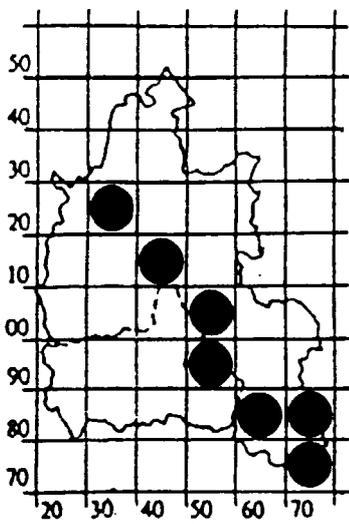
Map 10. *Melogona scutellare*



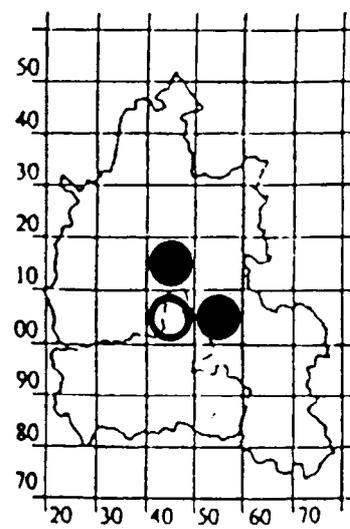
Map 11. *Nemasoma varicorne*



Map 12. *Proteroiulus fuscus*



Map 13. *Choneiulus palmatus*



Map 14. *Nopoiulus kochii*

Brachychaeteuma melanops Brade-Birks, 1918

Map 7. A scarce species in the county. Records are typically from rather disturbed sites such as riverside meadows prone to flooding or churchyards, usually on clay. Adults have been collected in the winter months, mostly November to April, under large stones or dead wood. This southern species is at the edge of its British range in Oxfordshire.

Brachychaeteuma bradeae (Brolemann & Brade-Birks, 1917)

Map 8. Another scarce winter active species. All records are from ancient woodland on clay, where small numbers can be found under dead wood, large stones, etc. Though synanthropic further north in England (where *B. melanops* does not occur) this is not the case in Oxfordshire (Gregory, 1993).

Chordeuma proximum Ribaut, 1913

Map 9. One of the more recent additions to the county list. A single specimen was collected from ancient woodland on acidic sands south of Oxford in October 1992. The following February it was collected from acidic woodland and *Salix* carr further north in the county. Recently another site has been found in deciduous woodland on acidic drift in the Chiltern Hills. Since acidic woodland is a scarce habitat in Oxfordshire it is probable that these records represent relic populations of this mainly western species, rather than a recent expansion in range as observed by Morgan (1986) in South Wales.

Melogona scutellare (Ribaut, 1913)

Map 10. A widespread but local species in Oxfordshire. All records are from the winter months (October to April), typically amongst litter or under dead wood in damp woodland. A few records are from churchyards where it is usually found near compost heaps.

Nemasoma varicorne C.L.Koch, 1847

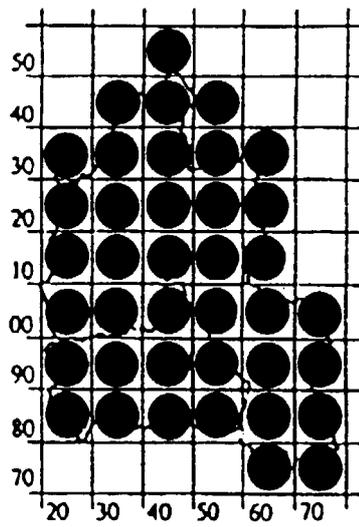
Map 11. A common millipede in the county found under the bark of fallen and standing dead wood, especially beech, or on live trees such as old willow pollards. Possibly more common in Oxfordshire (ranked 9th) than in Britain as a whole (14th in BMG 1988). Sometimes found with *P. fuscus* but typically found under closer fitting (less rotten) bark than that species. No males have been collected.

Proteroiulus fuscus (Am Stein, 1857)

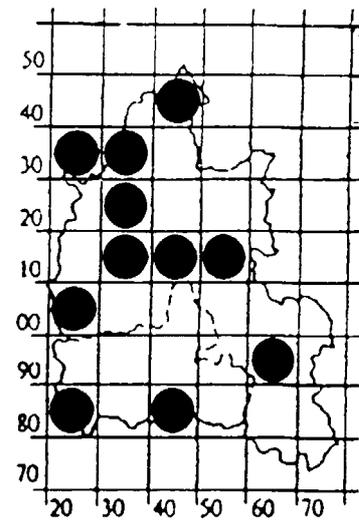
Map 12. Another common species found under the bark of both living and dead trees (often with *N. varicorne*) in a wide range of natural and synanthropic habitats. Occasionally collected from deep leaf-litter in woodland or in compost heaps. In contrast to *N. varicorne* it appears to be less common in Oxfordshire (ranked 10th) than in Britain overall (ranked 6th). Males have been collected once; from a synanthropic site where *P. fuscus* was found in a pile of rotting wood chippings in association with *C. palmatus* and *B. guttulatus*.

Choneiulus palmatus (Nemec, 1895)

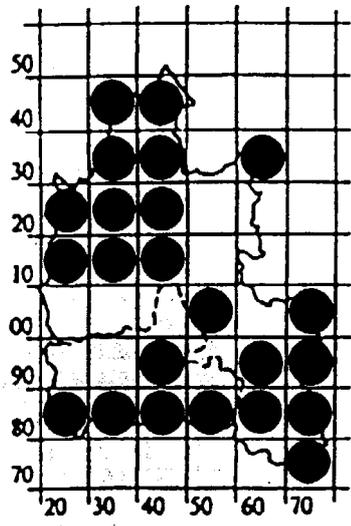
Map 13. Uncommon in the county. The few records are mainly from compost heaps or amongst dead wood in disturbed sites such as churchyards or quarries. Many sites are adjacent to, or near, the River Thames. It is easily overlooked as the common *P. fuscus*. It is conspicuously hairy when viewed with a handlens and the presence of males is diagnostic.



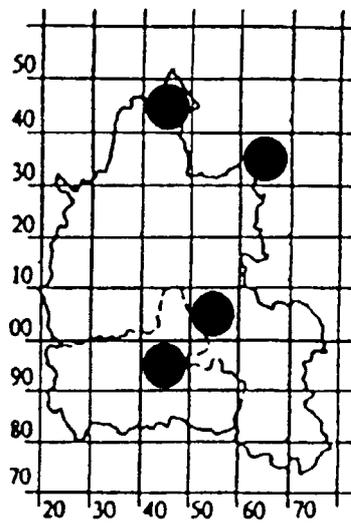
Map 15. *Blaniulus guttulatus*



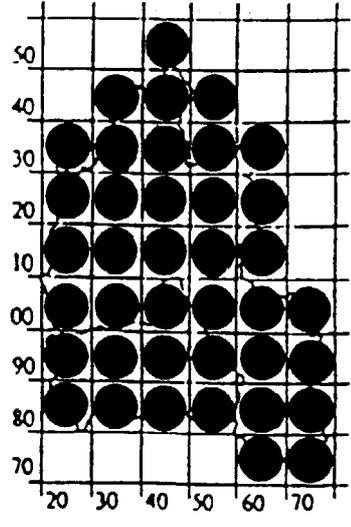
Map 16. *Archiboreoiulus pallidus*



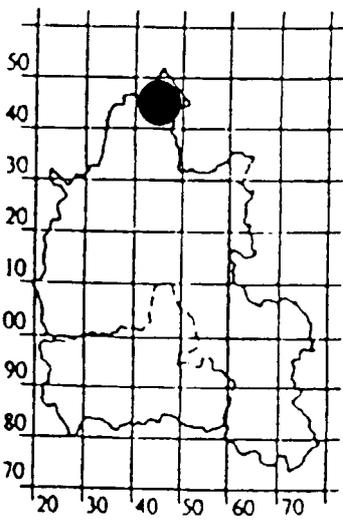
Map 17. *Boreoiulus tenuis*



Map 18. *Ommatoiulus subulosus*



Map 19. *Tachypodoiulus niger*



Map 20. *Allajulus nitidus*

Nopoiulus kochii (Gervais, 1847)

Map 14. A rare species in the county with two recent records, both from synanthropic sites. First recorded from under a rotting mattress on the site of a disused landfill near Oxford (Bilton 1990). Subsequently found amongst dead wood and debris dumped in a small disused quarry near Woodstock. Over winter it was numerous and associated with *N. varicorne*, the Blaniulids *P. fuscus*, *B. guttulatus*, *C. palmatus* and an abundance of the Julids *Cylindroiulus britannicus* and *C. parisiorum*. A 1954 record (under the name *N. minutus*) from bark traps at the University Field Station at Wytham needs confirming.

Blaniulus guttulatus (Fabricius, 1798)

Map 15. This soil dwelling species may prove ubiquitous in the county (presently ranked 6th) and appears more abundant than in Britain as a whole (ranked 11th). Records are from a variety of habitats such as arable fields, gardens, meadows and ancient woodland. It is typically found under stones or dead wood and often numerous, especially during the winter.

Archiboreoiulus pallidus (Brade-Birks, 1920)

Map 16. A local species in the county recorded from friable calcareous soils, in churchyards and natural sites including river banks. Perhaps more common on the Jurassic limestones in the north west of the county. It is similar in appearance to the common *Blaniulus guttulatus* with which it often occurs.

Boreoiulus tenuis (Bigler, 1913)

Map 17. This small Blaniulid is frequent on the Chiltern chalk in the south and on the Jurassic limestone and ironstone in the north of the county. It has been found in a wide range of habitats from churchyards to ancient woodland, but always on friable calcareous soils. During winter it seems to be much easier to find and can occasionally be numerous under large stones or dead wood.

Ommatoiulus sabulosus (Linne, 1758)

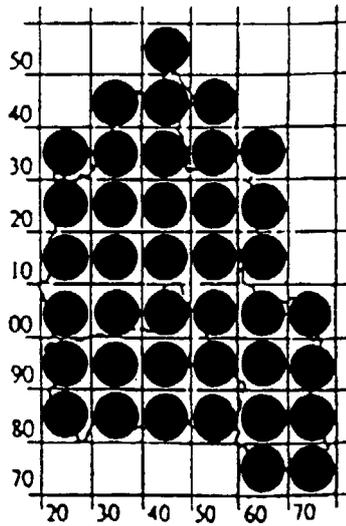
Map 18. This large, unmistakable species is rare in the county (ranked 31th). Two records are from ironstone railway cuttings in the north where it was found under stones and beaten from scrub. Another two are from relic heathland and a disused sandpit on the Corallian sands near Oxford. The scarcity of this nationally common species (ranked 9th in BMG 1988) is perplexing. It is also rather scarce in adjacent Warwickshire (Copson 1991) and the Preliminary Atlas (BMG 1988) shows few records for central southern England.

Tachypodoiulus niger (Leach, 1815)

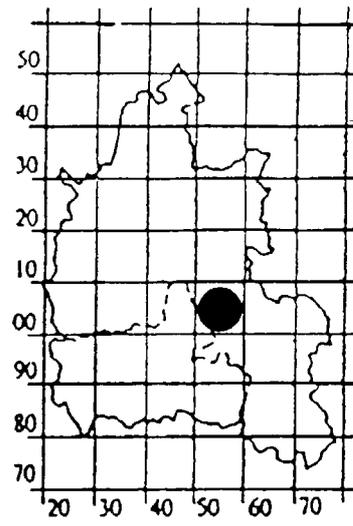
Map 19. A common and ubiquitous species in the county found under stones and dead wood, on walls and under loose bark on trees. It is ranked 2nd in the county and is the most frequently encountered species in gardens and houses.

Allajulus nitidus (Verhoeff, 1891)

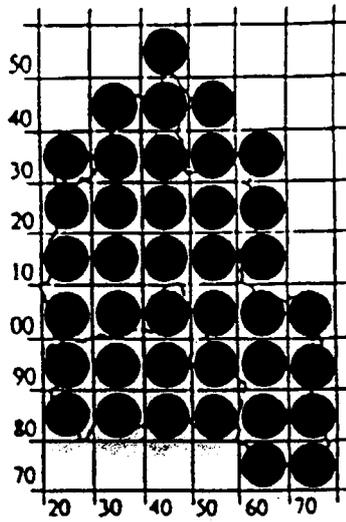
Map 20. A recent addition to the county list collected from the north of the county in August 1993. Several specimens were found under ironstone slabs at the bottom of a steep north facing slope within ancient deciduous woodland. Considering its large size it is probably genuinely scarce in the county despite its subterranean habits.



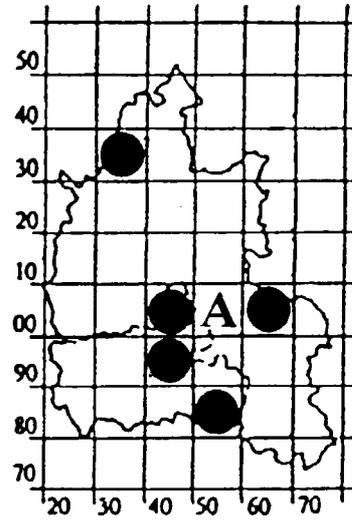
Map 21. *Cylindroiulus caeruleocinctus*



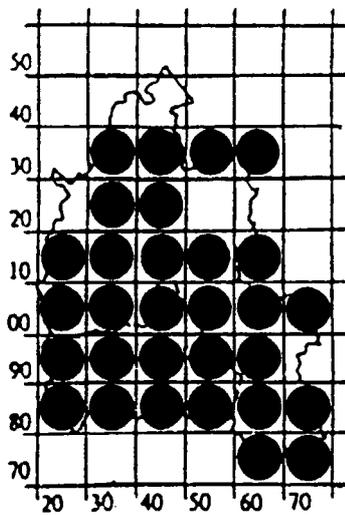
Map 22. *Cylindroiulus vulnerarius*



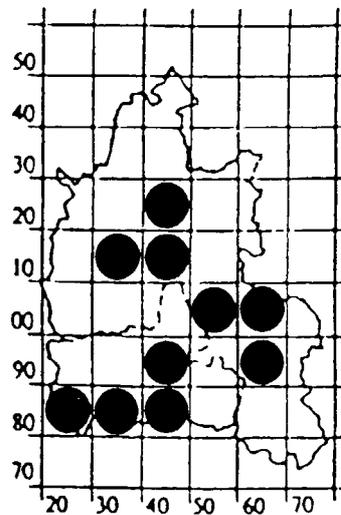
Map 23. *Cylindroiulus punctatus*



Map 24. *Cylindroiulus latestriatus*



Map 25. *Cylindroiulus britannicus*



Map 26. *Cylindroiulus parisiorum*

Cylindroiulus caeruleocinctus (Wood, 1864)

Map 21. This large and distinctive millipede is widespread and frequently encountered. Records are typically from churchyards or gardens but it can be numerous in natural calcareous grasslands. It is ranked 8th in the county (as opposed 19th nationally) which reflects its marked south eastern distribution in Britain. A 1959 record for *C. londinensis* from Wytham Woods (SP40) (of which *C. caeruleocinctus* was once considered a variety) has not been mapped.

Cylindroiulus vulnerarius (Berlese, 1888)

Map 22. A blind, pallid soil dwelling species widely recorded from the city of Oxford (Bilton 1990). Mainly collected from gardens it has been found under paving slabs and in compost heaps. At a garden centre it was numerous amongst 'chipped bark' covering soil in a shrub display. It will probably be found in other old towns in the county.

Cylindroiulus punctatus (Leach, 1815)

Map 23. The most commonly recorded millipede in the county readily found wherever rotting dead wood (including old planks) occurs. Also found under the bark of live trees, in compost heaps and amongst leaf-litter in woodlands.

Cylindroiulus latestriatus (Curtis, 1845)

Map 24. This soil dwelling species is scarce in the county (ranked 29th). Most records are from amongst plant roots on relic grassy heaths on the Corallian sands, but also from sandy soils in churchyards. In the north of the county it was collected among stones in a disused railway cutting. This mainly coastal species is ranked 12th in BMG (1988) which also gives an additional record for SP50 (A).

Cylindroiulus britannicus (Verhoeff, 1891)

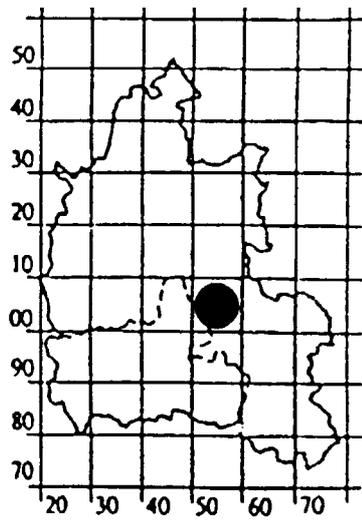
Map 25. A fairly common dead wood species in the county. Typically found under the bark of old waterside willow pollards, or within and beneath fallen rotting timber in woodlands. It has also been found in compost heaps in gardens and churchyards.

Cylindroiulus parisiorum (Brolemann & Verhoeff, 1896)

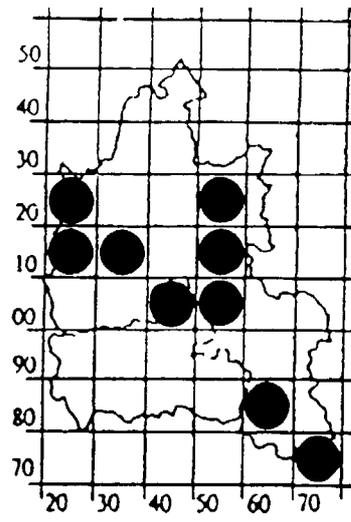
Map 26. Uncommon in the county and usually found in well rotted dead wood in both semi-natural woodlands and synanthropic sites such as churchyards. It has also been found under the bark of large 'parkland' beech and oak trees. Single males have been taken in pitfall-traps: once in an old orchard and once in a willow carr. At the latter site *C. parisiorum* had not been recorded before despite regular searches for Myriapods during the preceding year! It seems to be more common in the county (ranked 22nd) than in Britain as a whole (ranked 31st) but this could be recorder bias.

Cylindroiulus truncorum (Silvestri, 1896)

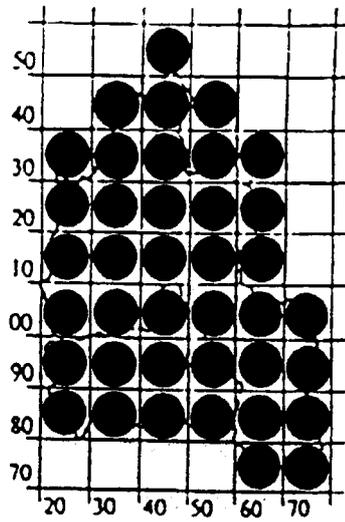
Map 27. D.T.Bilton collected this species from the Oxford Botanic Gardens in 1987. Further details are not known.



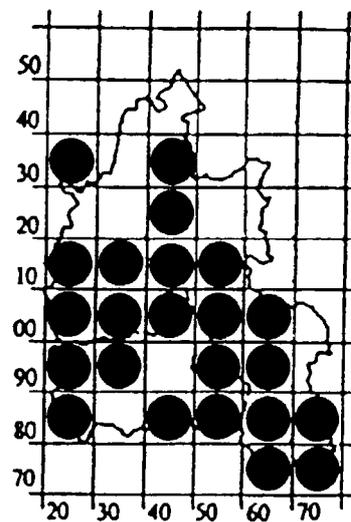
Map 27. *Cylindroiulus truncorum*



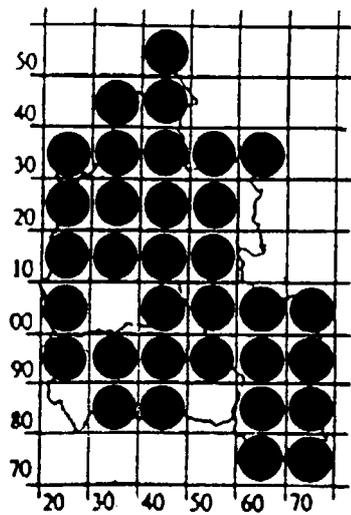
Map 28. *Julus scandinavicus*



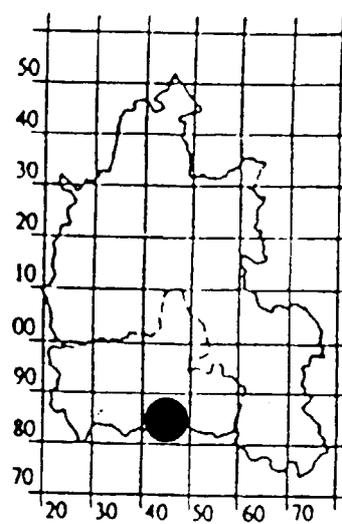
Map 29. *Ophiulus pilosus*



Map 30. *Brachyiulus pusillus*



Map 31. *Polydesmus angustus*



Map 32. *Polydesmus testaceus*

Julus scandinavicus Latzel, 1884

Map 28. An uncommon species in the county (ranked 23rd) recorded from damp areas in sandy or acidic deciduous woodland, usually under dead wood or amongst moss. Hand searching typically reveals few specimens, often mixed in with the superficially similar *O. pilosus* which does not aid detection! At one site it was abundant in pitfall traps. This is another nationally common species (ranked 8th in BMG 1988) which, like *O. sabulosus*, becomes inexplicably scarce in central southern England.

Ophiulus pilosus (Newport, 1842)

Map 29. A common and ubiquitous species over much of the county often found under dead wood, amongst leaf-litter or in compost heaps in a variety of damp habitats.

Brachyiulus pusillus (Leach, 1815)

Map 30. This small but distinctive species is typically associated with riverside meadows in the county, where it occurs in litter or under dead wood. It has also been found in drier sites such as gardens, railway sidings and arable fields often within soil.

Polydesmus angustus Latzel, 1884

Map 31. A frequent species typically found in the more acidic or drier parts of the county (most notably the Chiltern Hills) and is rare in the clay vales. This is more apparent from the tetrad distribution maps held at the Oxfordshire BRC. Most records are from semi-natural sites such as ancient woodland, relic heathland or non-calcareous marsh. There are few records from synanthropic sites and it is ranked only 12th in the county compared to 3rd in Britain. It is usually found with the locally ubiquitous *P.gallicus*, but can be separated in the field with a hand lens.

Polydesmus testaceus C.L.Koch, 1847

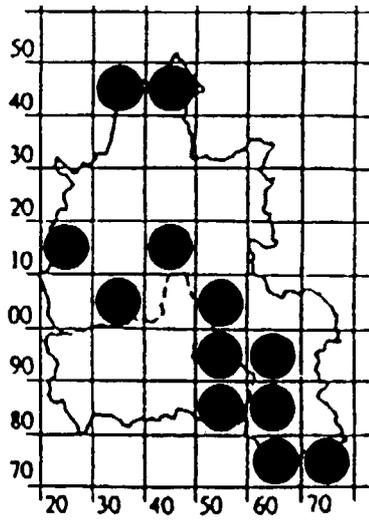
Map 32. The latest addition to the county list. Many specimens were collected in October 1994 from a remote area of herb rich short turf chalk grassland in the Lambourn Downs. These were on the underside of rotten logs towards the top of a south facing slope, which must become very hot and dry in summer. The only other recent records for this species are from Kent (pers comm R.E.Jones). The calcareous substrate and dry exposed habitat is in keeping with localities listed in Blower (1985). There is no reason to believe this species has been introduced to this site and it may represent a relic population.

Polydesmus inconstans Latzel, 1884

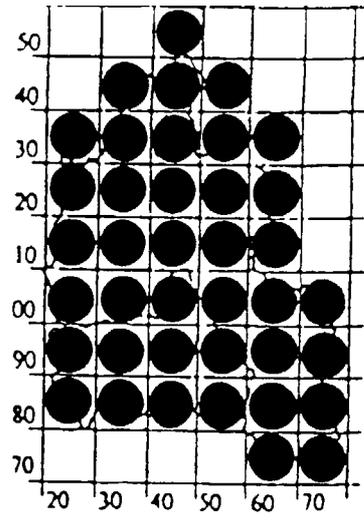
Map 33. A local species collected from damp grassland, under dead wood or in litter, mainly beside the River Thames. It appears to be highly seasonal with adults recorded from 25th May to 5th July. Possible (but not reliably identifiable) sub-adult stadia have been taken as early as February. The species may be under-recorded in the county.

Polydesmus gallicus Latzel, 1884

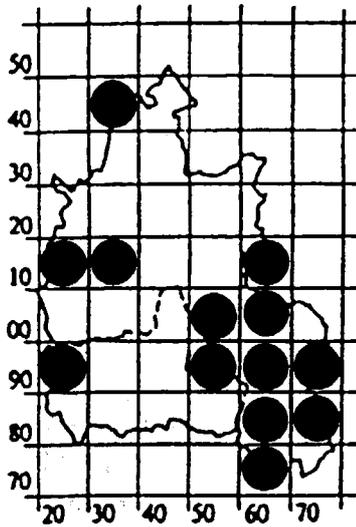
Map 34. By far the commonest of the flatback millipedes in the county (ranked 3rd after the Julids *C. punctatus* and *T. niger*). Often abundant in a wide range of natural and synanthropic sites. On the Chiltern Hills in the south-east (where *P.angustus* abounds) it is much more local and mainly confined to the course of the River Thames. The Preliminary Atlas (BMG 1988) ranks this species 13th in Britain overall.



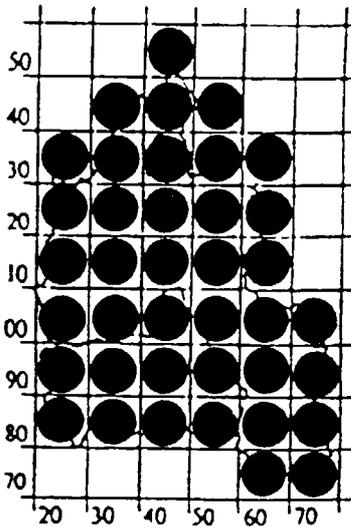
Map 33. *Polydesmus inconstans*



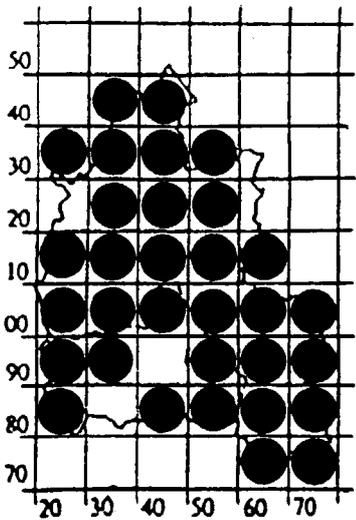
Map 34. *Polydesmus gallicus*



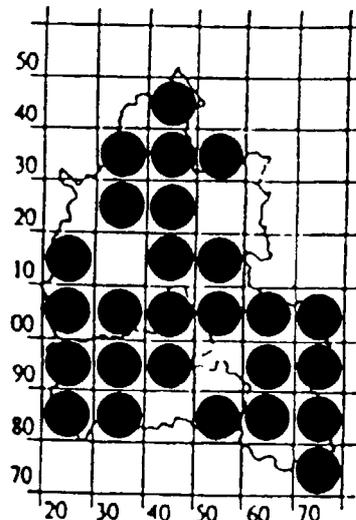
Map 35. *Polydesmus denticulatus*



Map 36. *Brachydesmus superus*



Map 37. *Macrosternodesmus palicola*



Map 38. *Ophiodesmus albonanus*

Polydesmus denticulatus C.L.Koch, 1847

Map 35. Apparently local in the county and usually collected from deciduous woodland. Perhaps more common in the well wooded south east. Hand-searching under dead wood or in leaf-litter rarely reveals more than single specimens. However it is readily taken in pitfall traps, including an arable field margin, suggesting it is elusive and possibly under recorded.

Brachydesmus superus Latzel, 1884

Map 36. Another common flatback ranked 4th in the county. Found amongst litter, under dead wood, etc in damp woodlands and meadows and within compost heaps, sometimes in abundance. Though common nationally it is only ranked 10th in BMG (1988).

Macrosternodesmus palicola Brolemann, 1908

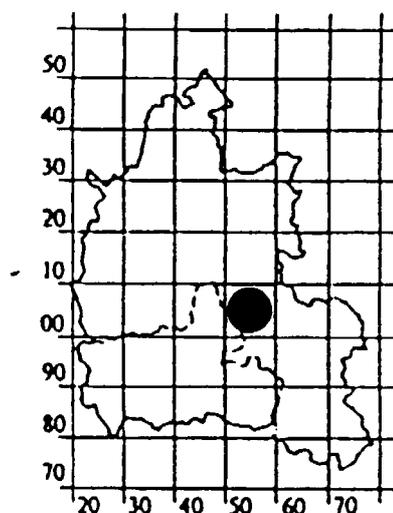
Map 37. This small white flatback is probably common throughout the county (currently ranked 13th). It inhabits friable calcareous soils and is usually found in small numbers under large stones, mainly in the winter months. Records are mostly from churchyards or gardens but it is also characteristic of ancient deciduous woodlands on the Chiltern chalk. Apparently much scarcer in the rest of Britain (ranked 23rd in BMG 1988).

Ophiodesmus albonanus (Latzel, 1895)

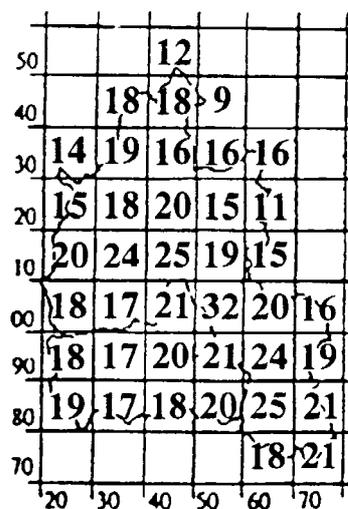
Map 38. Another small white species inhabiting friable calcareous soils. It is often found with *M. palicola* in churchyards and Chiltern woodlands. It appears less widespread than that species and easier to find rather later in spring. Ranked 15th in the county but only 25th in Britain overall.

Oxidus gracilis (C.L.Koch, 1847)

Map 39. This greenhouse species cannot be considered a true component of the county fauna. It is present at the Oxford Botanic Gardens and will almost certainly occur in other old heated greenhouses where pesticide usage is minimal. Single vagrant specimens have been taken amongst house plant displays at an Oxford garden centre (assumed to be introduced via a nursery) but there is little chance of a population becoming established.



Map 39. *Oxidus gracilis*



Map 40. Number of species recorded per 10km square

DISCUSSIONS

It is believed that a reasonable amount of fieldwork has been done for useful (albeit still subjective) conclusions to be made. Millipedes which are conspicuously uncommon in the county, considering their national abundance, are *O. sabulosus*, *J. scandinavicus*, and *P. angustus*. The first two are scarce over much of central southern England (Kime, 1978 & BMG, 1988). The latter seems to be replaced in the county, especially in synanthropic sites, by *P. gallicus* (and perhaps *B. superus*).

Other species appear to be unexpectedly more common in Oxfordshire than elsewhere in Britain. *P. gallicus* is conspicuously abundant, perhaps due to the predominant 'wetness' of the county. The small white Polydesmidans, *M. palicola* and *O. albonanus* are perhaps favoured by the friable calcareous soils which have developed over much of the county.

It is clear from this survey that synanthropic sites are important for many species. Some synanthropic species are probably recent introductions into Britain. The most likely candidates are *N. kochii*, *C. vulnerarius*, *C. truncorum* and the greenhouse species *Oxidus gracilis*. All are only known from synanthropic locations in the city of Oxford or the equally historic town of Woodstock (Blenheim Park).

Other species thrive in apparently contrasting synanthropic and semi-natural habitats, which share common microsites. *B. tenuis*, *M. palicola* and *O. albonanus* thrive in friable calcareous soils whether these are in primary deciduous woodland on the shallow rendzinas of the Chiltern escarpment or in ancient churchyards with infrequently dug deep brown earths. A similar situation is seen with *P. lagurus* (under bark in woodland or under stones on walls), *M. scutellare*, (deep leaf litter in woodland or churchyard compost heaps) and *C. latestriatus* (grassy heath or churchyards on sand).

Some species show strong preferences for rural sites or semi-natural habitats in the county, although many are synanthropic elsewhere in Britain. These are *G. marginata*, *S. crinata*, *B. bradeae*, *C. proximum*, *O. sabulosus*, *J. scandinavicus*, *P. angustus*, *P. denticulatus* and *P. inconstans*. Ubiquitous species such as *N. polydesmoides*, *B. guttulatus*, *T. niger*, *C. punctatus*, *O. pilosus*, *P. gallicus* and *B. superus* will obviously occur anywhere.

Reference to Map 40 shows the number of species recorded per 10km square to be rather uniform. The richest millipede fauna seems to be in the south east where there is a good diversity of habitats associated with the Chiltern Hills and the Thames valley. The southern edge of the Jurassic oolite is also apparently rich but this is possibly recorder bias. For example squares SP21 (20 species), SP31 (24 spp.) and SP41 (25 spp.) are well worked.

The species total for SP50 (32 spp.) is not just recorder bias. This square contains the most diverse assemblage of habitats in the county. The ancient city of Oxford is sited beside the rivers Thames and Cherwell, with associated grazing and hay meadows. A complex geology of limestones, sands and clays supports a mosaic of primary calcareous and acidic woodlands, seepage fens, carr, calcareous grassland, relic heathland and some non-calcareous marsh. It shows what can be achieved from even a small area!

The least diverse areas are the calcareous clays and chalky drift in the south-west and the ironstones and clay drift in the north. It is not clear why this should be so but perhaps the predominance of clayey soils in these areas is the reason.

THE FUTURE

Though initially undertaken as a 10km survey, a tetrad (2km X 2km) atlas is in preparation through the County Museum Service using records held on the Oxfordshire BRC database. Fieldwork continues to add further species records. Additional species may still be found in Oxfordshire. *Craspedosoma rawlinsii*, *Melogona gallica*, *Cylindroiulus londinensis* and perhaps *Stosatea italica* are the most likely candidates.

Continued fieldwork will also enable changes in species abundance and distribution to be observed. *C. vulnerarius* and *N. kochii* may be found in other old towns. Further sites may be found for *P. testaceus*. The use of specialist techniques may improve our knowledge of elusive species such as *S. crinata*. A number of questions may also be answered. For example: Are *B. bradeae* and *B. melanops* really mutually exclusive?; Will *C. proximum* show an expansion of range as seen in Wales?; Is *P. angustus* decreasing its range at the expense of *P. gallicus*?

For the sake of completeness it is worth collating old records for the county, both from the literature and from the national database held at the Biological Records Centre (Monks Wood).

ACKNOWLEDGEMENTS

I am indebted to John Campbell of the Oxfordshire Biological Records Centre for his encouragement, contribution of specimens, access to otherwise inaccessible sites and transport to the far corners of the county without which this survey would have been substantially less comprehensive.

I would also like to thank Fiona Woolmer and Yvonne Simms for their patience with my computer illiteracy, Robin Buxton for the use of his microscope and Wendy Millatt for checking the text.

Dick Jones unwittingly snared my interest in millipedes by his prompt checking of specimens in the early days.

REFERENCES

- Bilton, D.T., (1990) Recent records of *Cylindroiulus vulnerarius* in the British Isles. *Bull. Brit. Myriapod Group* 7:50-51.
- Bilton, D.T., (1990) *Nopoiulus kochii* in two suburban localities. *Bull. Brit. Myriapod Group* 7:51.
- Blower, J.G., (1985) *Millipedes*. Synopses of the British Fauna (New Series) no.35, Linnean Society, London.
- Bocock, K.L., Heath, J. & Blower, J.G., (1973) Some observations on the biology of the millipede *Geoglomeris jurassica* Verheoff, 1915. *J. Nat. Hist* 7:691-697.
- British Myriapod Group, (1988) *Preliminary Atlas of the Millipedes of the British Isles*. BRC, Huntingdon. Unpublished.
- Copson, P.J., (1991) *Provisional Atlas of the Millipedes of Warwickshire*. Warwickshire Museum Service.
- Gregory, S.J., (1993) More on *Brachychaeteuma*. *British Myriapod Group Newsletter No.19*. Unpublished.
- Kime, R.D., (1978) The distribution of millipedes in the south of England. *Abh. Verh. naturwiss. Ver. Hamburg (NF)* 21/22:135-147.
- Morgan, I.K., (1986) *Chordeuma proximum* in Dyfed, S.Wales. *British Myriapod Group Newsletter No.6*. Unpublished.
- Salzman, L.F.(Ed), (1938) *Victorian County History of Oxfordshire*. Oxford University Press.