

OXFORDSHIRE WOODLICE: CURRENT STATUS AND DISTRIBUTION

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INTRODUCTION

This paper summarises the current knowledge of the Oxfordshire woodlouse fauna. The distributional data are primarily based on the county tetrad atlas (Gregory and Campbell 1995), but updated to December 2000 and plotted using national 10km grid squares.

The records presented here cover the current administrative county of Oxfordshire (Figure 1). This differs considerably from the Watsonian vice-county of Oxfordshire (vc 23), which is traditionally used in recording schemes, and includes a large chunk of Berkshire (vc 22) in the south-west. The boundary between the two vice-counties approximately follows the course of the River Thames which is shown on the maps.

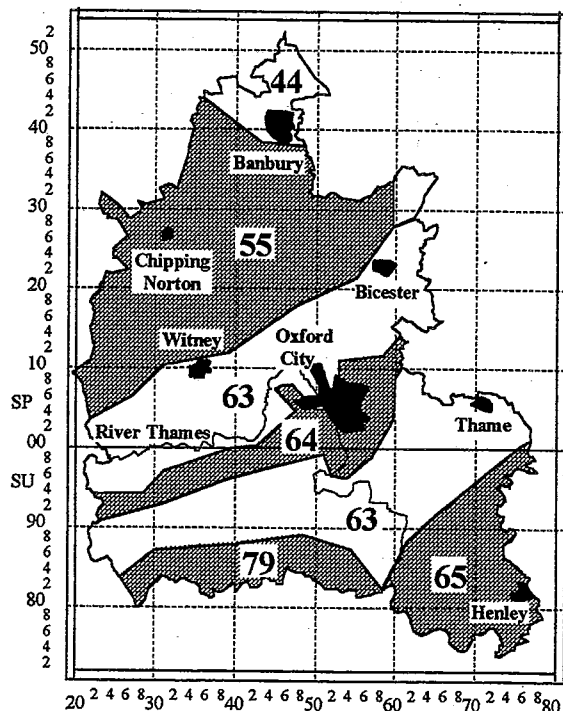


Figure 1. The modern county of Oxfordshire showing key towns and Natural Areas

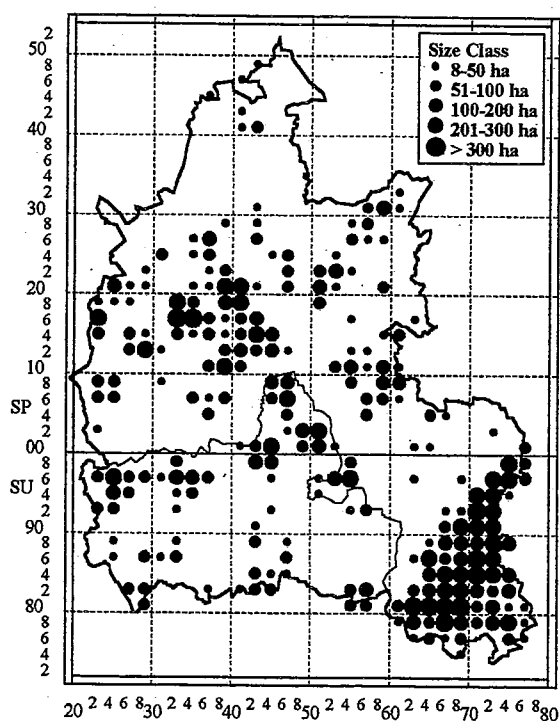


Figure 2. Extent of woodland cover: all tetrads with woodlands over 8ha in area (including plantation) are shown.

This gives an area of 260,944 hectares which falls within the following 39 10km squares: SU28, SU29, SU38, SU39, SU48, SU49, SU58, SU59, SU67, SU68, SU69, SU77, SU78, SU79, SP20, 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.

PHYSICAL FEATURES OF THE COUNTY

Like most counties in the lowland south Oxfordshire supports much extensive agriculture, but considering the close proximity to London, is surprisingly free of conurbations. Extremes in elevation are seen in the south-east where the Thames lies at 35m and the Chilterns rise to 255m. 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. Six Natural Areas*, which strongly correspond to the underlying geology, occur in Oxfordshire (Figure 1).

* Natural Areas: The idea of Natural Areas was developed by English Nature in the 1990's. They are biogeographic zones characterised by physical factors such as geology and topography. Each has a unique landscape, rural land use and associated fauna and flora. They are intended to provide a framework for conservation initiatives across England. Historically such work had been restricted by artificial constraints such as administrative county boundaries.

In the extreme north there is a small area of the Midland Clay Pastures (44), but much of the northern third of the county consists of a rolling limestone plateau forming the north-eastern end of the Cotswold Natural Area (55). Although dominated by pasture and agriculture it is dissected by deep stream valleys which still contain small remnants of semi-natural habitat. Along the southern edge, where oolitic limestones outcrop, many large tracts of deciduous woodland survive (Figure 2).

The Thames and Avon Vales (63) are low lying areas composed of heavy Oxford and Gault clays. The Thames and its many tributaries, such as the Cherwell and the Ray, still have many unimproved damp meadows and marshes. Within the Thames and Avon Vales lies the well-defined Midvale Ridge (64), composed of limestone and calcareous sands. This is another well-wooded area (Figure 2), but also supports remnants of contrasting calcareous grassland and heath reminiscent of those of the East Anglian brecklands. At the base of the ridge a well-developed series of calcareous seepage fens occurs.

In the south Cretaceous chalk outcrops. West of the Thames this forms the rolling hills of the Berkshire Downs. Intensive agriculture predominates, but some areas of chalk grassland survive. Over much of the Chilterns, which lie east of the Thames, the chalk is locally masked by acidic clay drift and is dominated by woodland (Figure 2). Chalk grassland mainly occurs on the north-west facing escarpment.

PAST AND PRESENT RECORDS

A more detailed account of past recording in the county is given in Gregory & Campbell (1995). The first woodlice records, for *Platyarthrus hoffmannseggii* and *Porcellionides pruinosus*, were made in 1868 near Oxford (Taylor 1939). In the early decades of the

twentieth century the Rev T.R.R. Stebbing and Dr R.S. Bagnell were both active in the county. The early records are collated in the Victoria County History (Taylor 1939), which lists 16 species (Table 1). The few records made from the 1930's to the 1970's were mainly generated by the Bureau of Animal Population Studies at Oxford University.

TABLE 1. WOODLICE SPECIES RECORDED FROM OXFORDSHIRE SHOWING FREQUENCY OF OCCURRENCE IN OXFORDSHIRE AND THROUGHOUT ENGLAND (BASED ON HARDING & SUTTON 1985, EXCEPT *)

Species	First Oxon Record	Number Oxon 10km sq.	Number Oxon Records	Oxon Rank	Number English Records	English Rank
<i>Ligidium hypnorum</i>	1963	7	47	14	131	12
<i>Androniscus dentiger</i>	pre 1939	37	132	9	463	6
<i>Buddelundiella cataractae</i>	1989	1	3	= 23	2	23
<i>Haplophthalmus danicus</i>	pre 1939	36	175	8	162	11
# <i>Haplophthalmus mengei</i>	pre 1939	22	58	13	91	15
<i>Haplophthalmus montivagus</i>	1987	4	7	21	new	22*
<i>Trichoniscoides albidus</i>	1989	12	32	15	47	18
<i>Trichoniscoides helveticus</i>	1987	5	9	19	new	21*
<i>Trichoniscus pusillus</i>	pre 1939	39	704	4	1988	4
<i>Trichoniscus pygmaeus</i>	1963	39	207	6	243	8
<i>Metatrachoniscoides leydigi</i>	1989	1	3	= 23	new	24*
<i>Oniscus asellus</i>	pre 1939	39	727	3	3389	1
<i>Philoscia muscorum</i>	pre 1939	39	808	1	2249	3
<i>Platyarthrus hoffmannseggii</i>	pre 1939	39	205	7	412	7
<i>Armadillidium depressum</i>	1980	9	21	16	99	14
<i>Armadillidium nasatum</i>	pre 1939	5	12	17	117	13
<i>Cylisticus convexus</i>	pre 1939	4	6	22	87	16
<i>Armadillidium vulgare</i>	pre 1939	39	537	5	1488	5
<i>Porcellio dilatatus</i>	pre 1939	7	12	18	41	19
<i>Porcellio laevis</i>	pre 1939	9	8	20	28	20
<i>Porcellio scaber</i>	pre 1939	39	754	2	2788	2
<i>Porcellio spinicornis</i>	pre 1939	35	82	10	196	9
<i>Porcellionides pruinosus</i>	pre 1939	30	64	12	177	10
<i>Trachelipus rathkei</i>	pre 1939	22	77	11	84	17

includes a few undifferentiated records for *H. mengei* aggregate.

From the mid 1980's to the mid 1990's saw a decade of intense recording activity across the county. Steve Hopkin and David Bilton were both active in the county and provided records for many elusive species. Building on this promising start J.M.Campbell, of the Oxfordshire Biological Record Centre (OBRC), and the author made a concerted effort during the 1990's to achieve a balanced coverage across the county.

Surveys were not confined to semi-natural habitats, such as woodland, grassland and fen. In order to address the usual bias towards such 'prime sites', man-made habitats such as churchyards, gardens and waste ground were also included. It was considered that we could not comment on the true status of the woodlice occurring within the county unless all potential habitat types had been examined. Species records have been made in accordance

with guidelines given by the British Isopod Study Group. The 24 species that have been recorded from the county and details of their frequency of occurrence are listed in Table 1. Full details of all 4689 site based records (to December 2000) are held by the OBRC database (using Recorder). These are mainly post 1990. The collection of data is on-going and any records for Oxfordshire woodlice will be gratefully received by the author.

The coincidence map (Figure 3) is plotted at tetrad level (2km x 2km) and indicates the extent of recording activity across the county. The number of species of woodlice recorded from each 10 km grid square is indicated in Figure 4.

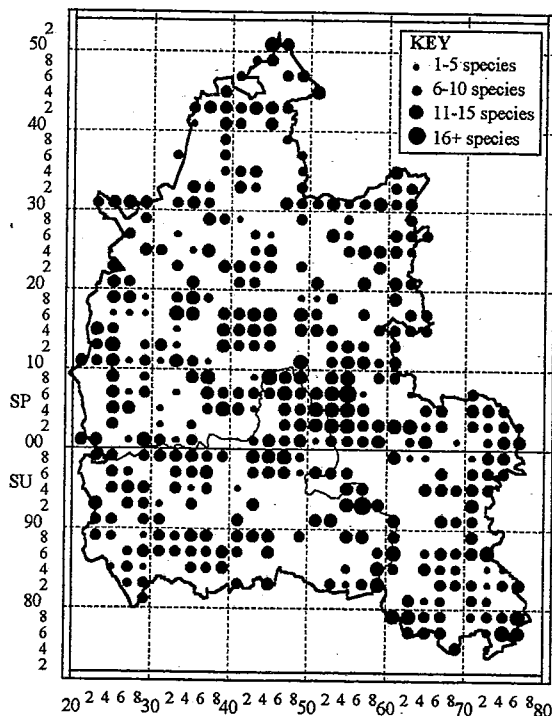


Figure 3. Coincidence map of all species records indicating extent of recording

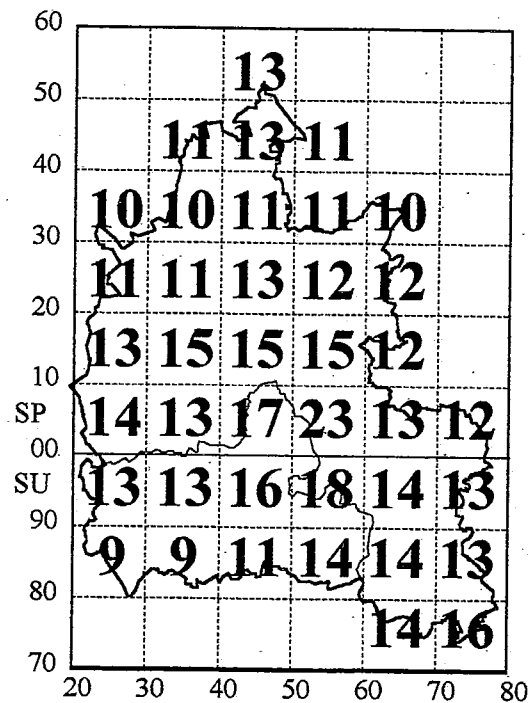


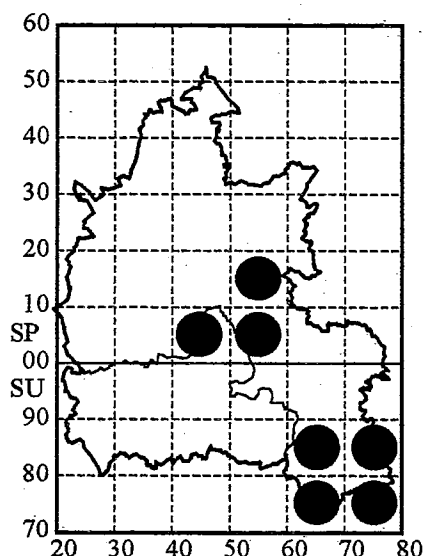
Figure 4. Number of species recorded per 10km grid square

INTRODUCTION TO THE SPECIES ACCOUNTS AND MAPS

The maps illustrate the occurrence of all native and naturalised woodlice capable of surviving outdoors within national 10 km grid squares. Species names follow those used in Hopkin (1991). Nationally Notable species (i.e. those occurring in less than 100 10km grid squares throughout the British Isles) are noted. Records are shown for two time categories as listed below. Only the most recent record for a given 10 km grid square is shown

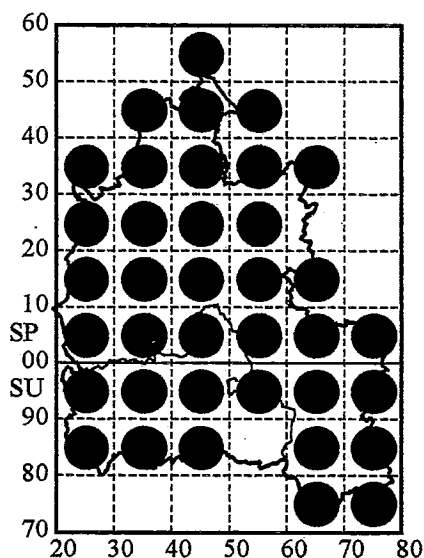
- indicates post 1985 records
- indicates records made before 1985

DISTRIBUTION MAPS AND SPECIES ACCOUNTS



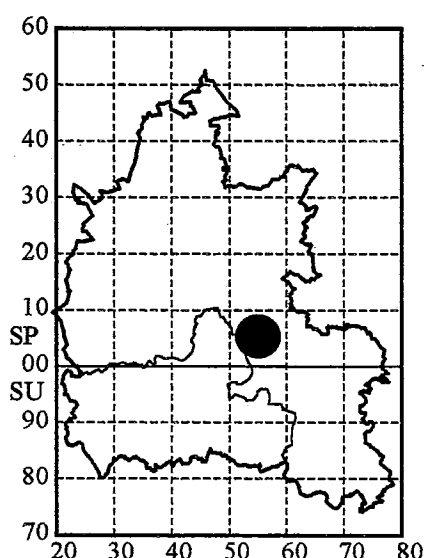
Ligidium hypnorum (Cuvier, 1792)

First recorded at Wytham Wood (SP40) in 1963, this species occupies two distinct habitat types. On the Midvale Ridge around Oxford it can be locally common amongst litter and moss within ancient wet woodland and carr. In the Chilterns it is typically found in small numbers amongst moss in deciduous woodlands on north facing slopes. One site is a willow thicket beside the River Thames.



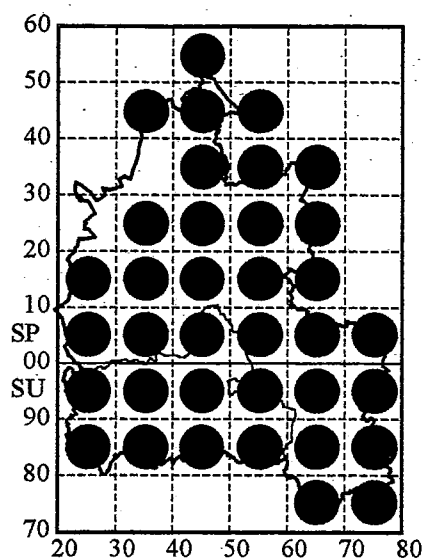
Androniscus dentiger Verhoeff, 1908

This distinctive species is fairly common in the county. Records are mainly from amongst rubble and under stones in man-made habitats such as churchyards or quarries. It is occasionally found in semi-natural sites typically near water. Taylor (1939) records it from Oxford city.



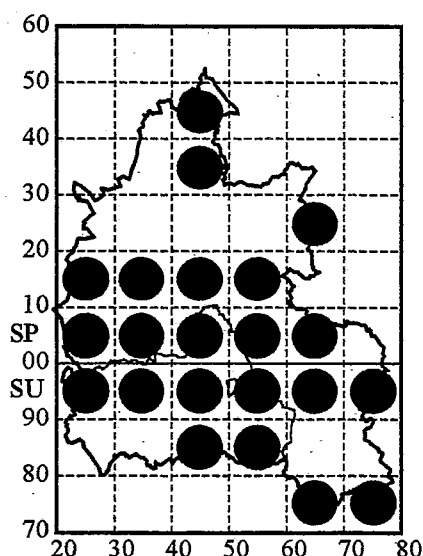
Buddelundiella cataractae Verhoef, 1930

This predominantly coastal species was discovered at an Oxford garden centre in 1989. Specimens were found beneath a piece of wood lying on gravel and amongst peaty debris beneath paving stones in association with *H. menzei* and *T. pygmaeus*. It was still present the following year, but has not been seen since. One of the locations has been lost following rebuilding work.



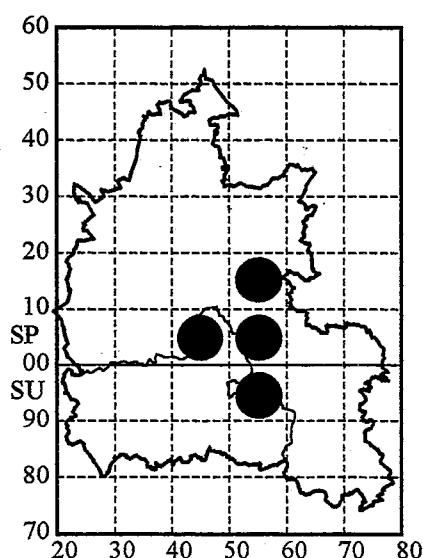
Haplophthalmus danicus Budde-lund, 1880

This is the only common member of the genus in Oxfordshire. In the Thames valley it is apparently common, but is easily overlooked due to its small size and sluggish movements. Typical locations are beneath or within damp rotten wood, within compost heaps or amongst wet litter in fens, occasionally in damp soil. First recorded from 'Oxford' by R.S.Bagnall in 1913.



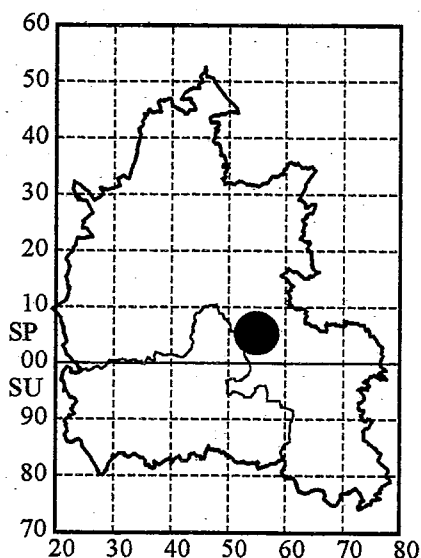
Haplophthalmus mengei (Zaddach, 1844)

A local species found amongst rubble, in friable soil or on the underside of dead wood and large stones. Although characteristic of riverside meadows and wet woodland, where it often occurs with *H. danicus*, it occupies a wide range of other habitats. For example, it has been collected from dry short-turf chalk grassland during heavy frosts and synanthropic sites such as farmyards and churchyards (often within compost heaps). R.S.Bagnall found it at 'Oxford' in 1913 but this could be either this species or *H. montivagus*.



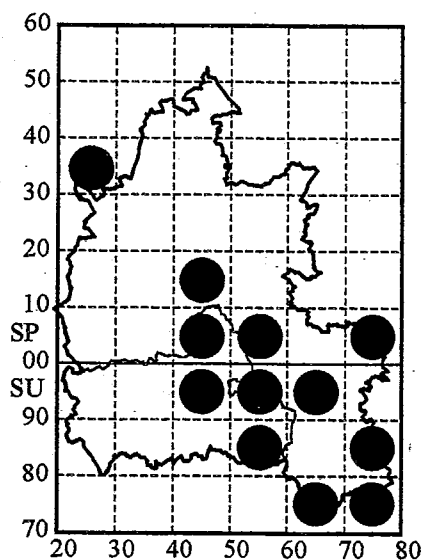
Haplophthalmus montivagus Verhoeff, 1941

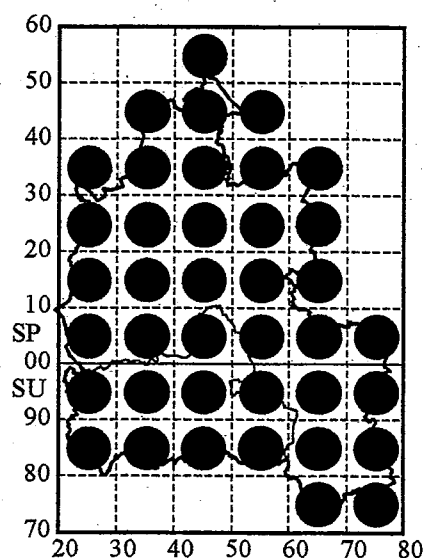
First recognised in 1987 from Wytham Wood (SP40) this species appears to be restricted to a few old calcareous woodlands around Oxford. It is most easily found in winter, typically on the underside of deeply embedded stones and dead wood, but also hand-sorted from soil and rotten deadwood. Three of the four known sites are exceptionally well recorded, so it may have been over-looked elsewhere. However, at other apparently suitable sites (e.g. Wychwood Forest, SP31) *H. mengei* has been found instead.



***Metatrichoniscoides leydigi* (Weber, 1880)**

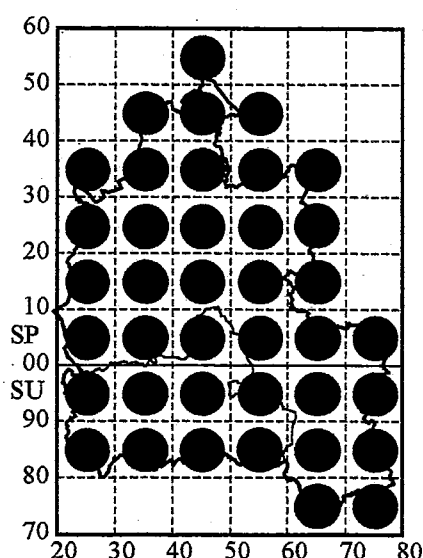
In October 1989 specimens were found beneath pallets, plant pots and amongst peaty gravel at an Oxford garden centre. The underlying ground consists of about 1/2 metre depth of ballast mixed with gravel and sand. Throughout winter *M. leydigi* was regularly seen in association with *H. mengei* and *T. pygmaeus*. The following summer it became very elusive and had retreated down to a depth of around 30cm. This remains the only known British locality for this species, otherwise recorded from the coasts of France and Holland and a few synanthropic sites inland.





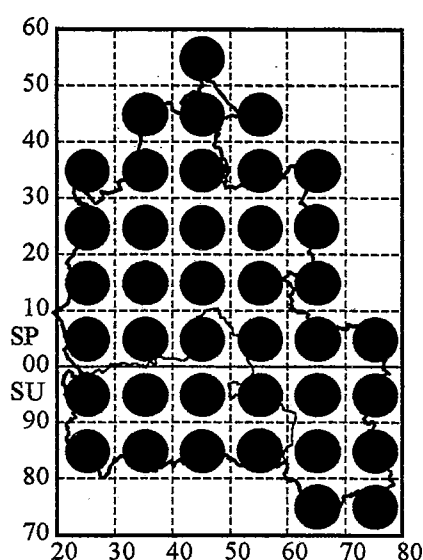
***Trichoniscus pusillus* Brandt, 1833**

This is the only abundant and ubiquitous Trichoniscid woodlouse in the county. It was first collected in 1908 from Witney and widely recorded in Taylor (1939). It is readily found on the underside of stones and deadwood in all but the driest places, but specimens quickly disappear upon disturbance.



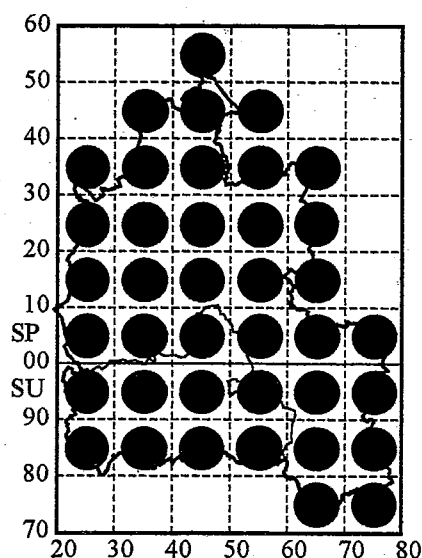
***Trichoniscus pygmaeus* Sars, 1899**

First recorded at Wytham Wood (SP40) in 1963, this soil dwelling species has proved much less frequent than *T. pusillus*. This is partly a reflection of its much more elusive behavior. During cold or wet weather it is much easier to locate, but rarely in more than ones or twos. Although found in most habitats it has a strong preference for disturbed sites such as churchyards, where it is often found on the underside of stones or amongst rubble in damp spots.



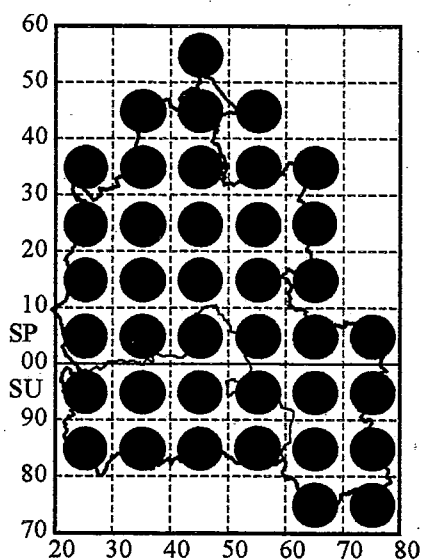
***Oniscus asellus* Linnaeus, 1758**

Readily found under dead wood and stones throughout the county and widely recorded in Taylor (1939). It can be extremely abundant in many urban areas. The subspecies *O. asellus asellus* occurs in Oxfordshire but some specimens collected from Wychwood Forest (SP31) were found to be intermediate between this and the newly described *O. asellus occidentalis* (Bilton 1994).



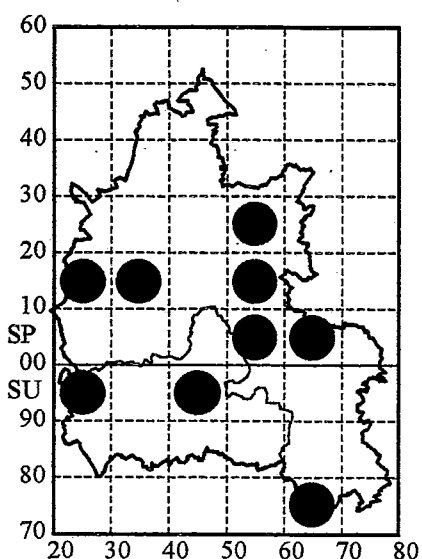
***Philoscia muscorum* (Scopoli, 1763)**

This is the most widely recorded woodlouse in Oxfordshire and it has proved difficult to find sites where *P. muscorum* cannot be found. It was equally well known to early recorders (Taylor 1939). Although best described as abundant and ubiquitous it does have a strong preference for grassy sites and is never as numerous within dense woodland.



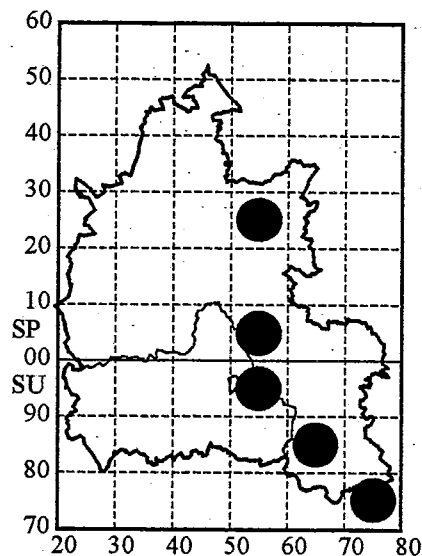
***Platyarthrus hoffmannseggii* Brandt, 1833**

First recorded in 1868 at Stow Wood, near Oxford (SP51), this distinctive woodlouse is one of the earliest species to be recorded from the county (Taylor 1939). It is always found in association with ants (typically *Lasius* or *Myrmica* spp.) and has proved to be common wherever the host species occur, such as gardens, churchyards, road verges and semi-natural grasslands. Unlike most woodlice it is very elusive throughout the winter months until ants become active in the spring.



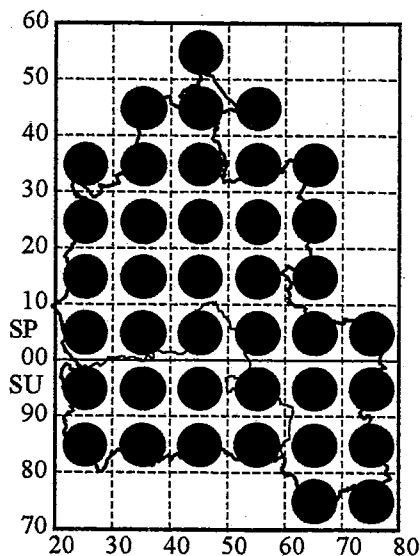
***Armadillidium depressum* Brandt, 1833**

This pill-woodlouse, first recorded at Shipton-under-Wychwood (SP21) in 1980, has proved uncommon and mainly restricted to the limestones of the Cotswolds and the Midvale Ridge. Old limestone walls are a favorite location, but it has been collected from limestone railway cuttings. It is often abundant when a population has been found. The Oxfordshire records are probably recent introductions beyond its natural south-western range. To add support to this view it is apparent that many records are within a kilometre of active or disused railway lines.



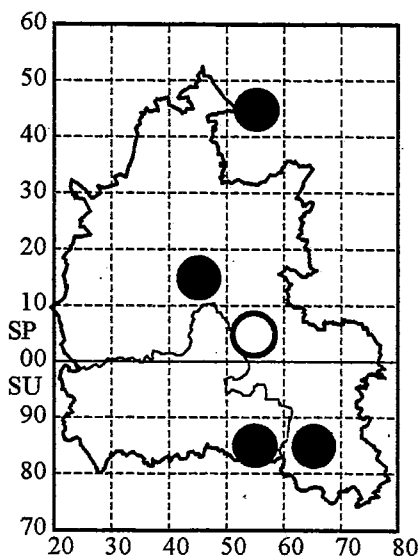
Armadillidium nasatum Budde-lund, 1885

Another uncommon pill-woodlouse in the county first recorded in Taylor (1939) from the Oxford Botanic Gardens. It still occurs there amongst rockery stones in the garden, but is also common inside all hothouses. Elsewhere in the county it has been recorded from a few dry sparsely vegetated sites such as railway sidings, garden centres and disused quarries. It has probably been spread into the county by human activities.



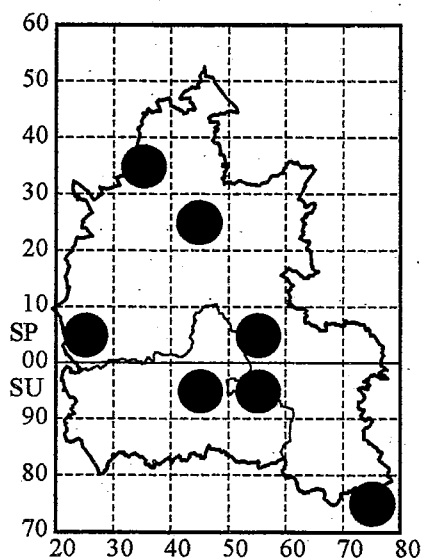
Armadillidium vulgare Latreille, 1804

This pill-bug is common in gardens, churchyards and grasslands throughout the county and was widely recorded in Taylor (1939). It is scarce in damp or wooded sites, especially in the north-west of the county.



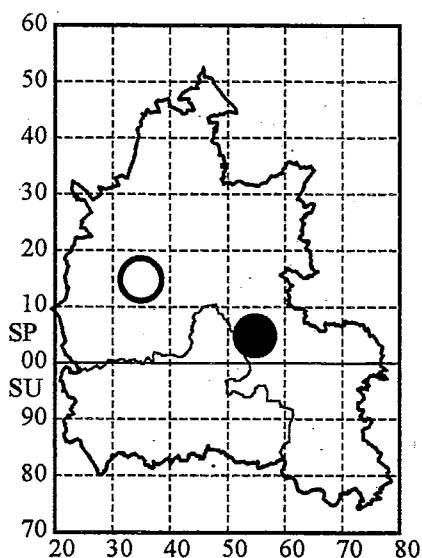
Cylisticus convexus (De Geer, 1778)

An apparently rare pill-bug in the county. The few recent records are from sparsely vegetated synanthropic sites, including a railway siding and a few disused quarries. It is probably under-recorded but is clearly not common. It has not been found in churchyards, a habitat in which it occurs in Leicestershire (Daws 1994), but sites such as farm-yards, which have been poorly covered in this survey, may be productive. Taylor (1939) gives two records from Oxford city-centre where the species may still persist.



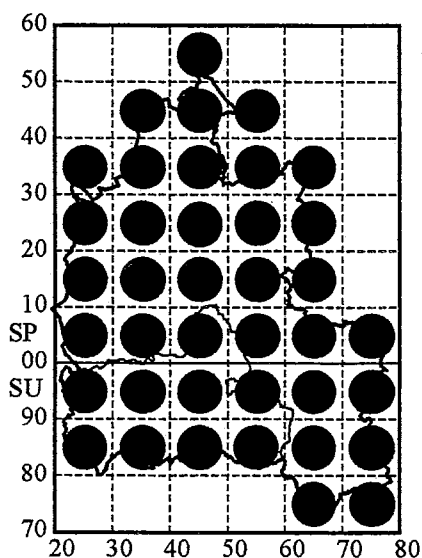
***Porcellio dilatatus* Brandt, 1833**

The few records for this large species are mainly from stables and manure or compost heaps. Typically single specimens are found with difficulty so it may have been missed at some sites. Several Oxford localities are given in Taylor (1939) when stables (and perhaps the species) were much more common. Recent surveys in Leicestershire (Daws, 1994) have shown the species to be common on dairy farms. This habitat has not been sampled in Oxfordshire and, consequently, the species is probably considerably under-recorded.



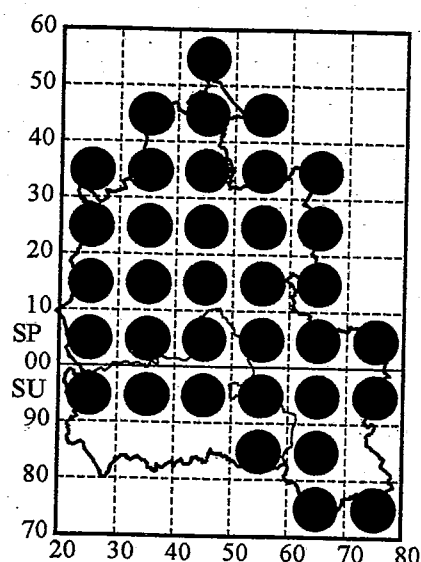
***Porcellio laevis* Latreille, 1804**

Another species possibly more common in the past. Taylor (1939) lists records from Witney (1908) and Oxford. There are just two recent records, both from Oxford city centre. It has long been known from Oxford Botanical Gardens, but in 1990 a large population was discovered within a compost heap in nearby garden, suggesting it may be more widespread within the city. As for *P. dilatatus*, further surveys may show it associated with dairy farms and stables.



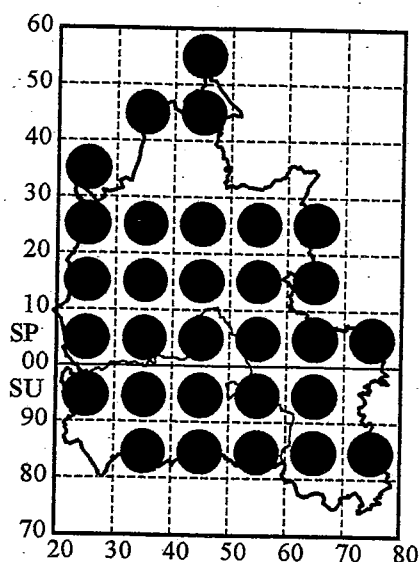
***Porcellio scaber* Latreille, 1804**

A ubiquitous and abundant woodlouse readily found under stones and dead-wood, on walls and even under the bark of trees high above the ground. It is the woodlouse most likely to be found inside houses. It was equally well known to early recorders (Taylor 1939).



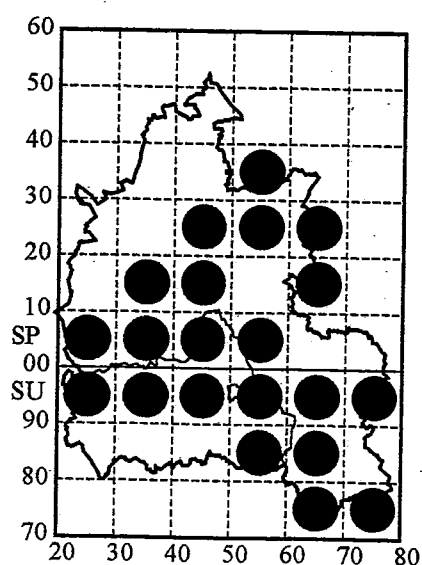
***Porcellio spinicornis* Say, 1818**

This attractively marked species is common over much of the county. It is usually collected from limestone walls, but two records are from disused limestone quarries. Usually it is found in small numbers, but when conditions are right it can appear in abundance. Across the Berkshire Downs and the Chilterns, where walls tend to be made of flint or sarcen stone, the species seems to be much scarcer. Taylor (1939) lists several records.



***Porcellionides pruinosus* (Brandt, 1833)**

A common species which can be abundant within compost and manure heaps. It can persist away from such sites and has been found under stones in churchyards and on road verges. Many specimens were seen under the bark of over-mature oaks at a nature reserve near Oxford but these were probably introduced via an adjacent rubbish tip. First recorded in 1868 as 'Plentiful in the vicinity of Oxford' Taylor (1939) gives several additional records.



***Trachelipus rathkei* (Barndt, 1833)**

Taylor (1939) lists several records for this attractively marked species near Oxford. It has subsequently proved to be widespread in the county within two distinct areas. In the Thames Valley it is locally common in damp meadows, gravel-pits, disused quarries, farmyards, railway sidings and even arable fields. A second cluster of records, from similar habitats in the north-east of the county, are associated with the upper catchment of the Great Ouse. This is clearly shown in the tetrad maps for the county (Gregory & Campbell 1995).

DISCUSSION

Considering the absence of coastline, the county list of 24 species is very respectable. The coincidence map (Figure 3) indicates that there are many unrecorded areas across the county. The number of species recorded from each 10km square is rather uniform (Figure 4) with little correlation between geology or habitat availability. Many of the higher totals (i.e. 15+) tend to reflect well-worked squares rather than species hot spots. There seems to be a general decline in species richness towards the north of the county probably reflecting the limited range of habitats available in this part of the county. It is believed that there has been sufficient fieldwork to enable comments on the status and distribution of the Oxfordshire woodlouse fauna to be made.

In general species abundance, distribution and habitat preference mirrors the national picture given in Harding and Sutton (1985). The five most frequently encountered species in Oxfordshire are *Philoscia muscorum*, *Porcellio scaber*, *Oniscus asellus*, *Trichoniscus pusillus* and *Armadillidium vulgare*. These 'famous five' dominate the county's woodlouse fauna and account for 75% of the woodlouse records (Table 1).

Reference to Table 1 indicates that there are differences in the apparent abundance of several species across Oxfordshire (Oxfordshire rank) when compared to England as a whole (English rank). Three species, *Androniscus dentiger* (Oxon 9th, but English 6th) and the two pill-bugs *Armadillidium nasatum* (Oxon 17th, English 13th) and *Cylisticus convexus* (Oxon 22nd, English 16th) do seem to be genuinely less common in Oxfordshire than across the rest of England. The maps in Harding & Sutton (1985) indicate that all are widespread across Britain and there is no apparent explanation why they should be relatively scarce in Oxfordshire.

Species such as *Haplophthalmus danicus* (ie Oxon rank 8th, English rank 12th) and *Trachelipus rathkei* (Oxon 11th, English 17th) seem to be more common in the county than in England overall. These are south-eastern species so they are expected to be well represented in a south-eastern county such as Oxfordshire. The same trend is also demonstrated by *H. mengei* (Oxon 13th, English 15th) and *Trichoniscoides albidus* (Oxon 15th, English 18th). Due to the extra recording effort put into locating such elusive species within the county it is difficult to make judgement. Even so, it is believed that most of the soil dwelling Trichoniscids, especially within the genera *Trichoniscoides* and *Haplophthalmus*, remain very under recorded in the county.

Due to the paucity of historical records (less than 2% are pre 1970) we cannot make any reliable claims about distributional changes over the past century. Certainly, several of the county's present day 'rarities', ie *Armadillidium nasatum*, *Cylisticus convexus*, *Porcellio dilatatus* and *P. laevis*, were well known to recorders of the early twentieth century (Table 1). Even the few old records for these species represent a substantial proportion of the total made at that time and it is possible they may once have been more widespread.

Other woodlice were not discovered in the county until recent decades. Four species, *Haplophthalmus montivagus* (unknown to science until 1941), *Trichoniscoides*

albidus and *T. helveticus* (both very elusive) and *Ligidium hypnorum* (overlooked), tend to occupy semi-natural habitats within the county. Their relatively recent discovery in the county is a result of increased recording effort in recent decades. *Armadillidium depressum* is a possible candidate for a relatively new colonist of the county. It is apparent that many sites are within a kilometre of active or disused railway lines and it is possible that it has been spread from its south-western strongholds via the rail network. To back this view, the most north-easterly record published in Harding & Sutton (1985) is from a railway bridge in Buckinghamshire.

The discovery of *Buddelundiella cataractae* and *Metatrachoniscoides leydigi* surviving out-doors in Oxford city was unexpected. The site had been a plant nursery for around 200 years and pre-dates modern practices of routinely sterilising composts, gravel, etc. Both may have been present, unnoticed for many decades. Considering the unique nature of the habitat, which consists of about 1/2 metre of ballast mixed with sand, gravel and peat, it is unlikely that either has been spread into local gardens. Although both are clearly very rare in Britain they are accidental introductions into Oxfordshire. Given the limited resources available for species conservation they should not be considered as part of Britain's threatened wildlife. However, it does illustrate the point that synanthropic sites can be extremely rewarding to sample.

In Oxfordshire 20 species (83% of the county fauna) have been collected from churchyards and gardens, making this the most diverse habitat type in the county. Old churchyards are particularly important as they have been under consistent management for centuries and offer a wide range of micro-sites, including friable soils, piles of stone or rubble, stone walls, compost heaps, areas of shrubs or grassland and ancient trees. Waste ground such as railway sidings, abandoned quarries and derelict urban areas support fewer species, but the characteristically dry, exposed and sparsely vegetated habitats support several county rarities, such as *Armadillidium nasatum* and *Cylisticus convexus*.

Of the semi-natural habitats, the generally damp conditions found in deciduous woodland support 16 species within Oxfordshire. Woodland is a key habitat for three locally scarce species, *Ligidium hypnorum*, *Haplophthalmus montivagus* and *Trichoniscoides helveticus*. 14 species have been recorded from meadows and wetlands. Three local species, *Haplophthalmus mengei*, *Trichoniscoides albidus* and *Trachelipus rathkei*, are strongly associated with damp river-side meadows. Only 10 species have been collected from dry calcareous grassland, but this is another important habitat the *T. helveticus*.

Hopkin (1991) notes that *Haplophthalmus mengei* and *H. montivagus* seem to be mutually exclusive in Britain. The two species occur in close vicinity at two sites in Oxfordshire: at Little Wittenham Nature Reserve (SU59) and Wytham Estate (SP40). Both border the river Thames and *H. mengei* inhabits grassland, scrub and at Little Wittenham NR a narrow strip of woodland prone to flooding. In contrast *H. montivagus* occurs on higher ground within deciduous woodland. This is in keeping with habitat preferences observed elsewhere. At Little Wittenham NR both have been found in the same micro-site. Two males of each species (det S.P.Hopkin) were hand

sorted from lime-rich clay at a depth of about 10cm (in association with *Trichoniscoides albidus*) at the edge of deciduous woodland just beyond the flood plain.

It has been well documented by many authors (eg Hopkin 1991) that normally elusive soil dwelling Trichoniscids are much easier to find in frosty weather. This has proved to be the case in Oxfordshire. For example, the only Oxfordshire record for *Haplophthalmus menzei* from dry chalk grassland (a species normally associated with damp sites) was made in heavy frost when it was found under a stone with the notoriously elusive *Trichoniscoides helveticus*. Even widespread species such as *Androniscus dentiger* and *Trichoniscus pygmaeus* are much easier to find in cold or inclement weather conditions. There seems little point in laboriously hand-sorting for these species in the dry summer months. The only species which cannot be easily found in winter is *Platyarthrus hoffmannseggii*, which (presumably) follows the host ants deep underground until spring brings them back to the surface.

Being a land locked county there would appear to be few species left to add to the county list. The most likely candidates are *Trichoniscoides sarsi* (which inhabits churchyards and gardens in Leicestershire (Daws 1994)) and *Armadillidium pulchellum* (acidic woodland in Gloucestershire and Hampshire). It is apparent that farmyards and animal out-buildings such as stables would repay further study. Surveys in Leicestershire have shown apparently rare species, such as *Porcellio dilatatus* and *P. laevis*, to be quite widespread in these habitats.

Many of the species distribution patterns seen across the county are too subtle to be adequately seen with the relatively coarse 10km recording unit used by the national recording scheme. These patterns are much more apparent from the tetrad (2km X 2km) maps in the county atlas (Gregory & Campbell 1995). A baseline for the county has been set and the collection of data is on-going. We are now in a position to observe long-term changes in species abundance and across the county.

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