Terrestrial Mollusca in Oxfordshire: Current Status and Distributional Changes since the Nineteenth Century of some Species

S. J. Gregory

Originally published December 2000
Published online November 2023

Summary

Terrestrial mollusca (slugs and snails) are among the most well worked invertebrate taxa in Oxfordshire with records dating back to the early nineteenth century. Since the mid 1980's surveys have determined the current status and distribution of species occurring in this county. Ninety species have been recorded and over 20,000 site-based records are held on the Oxfordshire Biological Records Centre (OBRC) database. Many molluscs have precise habitat requirements and the current status and distribution of selected species characteristic of ancient woodland, wetland, calcicolous grassland and man-made habitats is compared to that given in older texts. There has been little change in the known range of characteristic woodland and wetland species across the county, although the lack of sensitivity of the methodology may mask localised changes. Oxfordshire has proved to be an important refuge for a number of key species including four UK BAP species. Several species of calcicolous grassland have shown clear twentieth century declines, particularly *Helicella itala* and *Helicigona lapicida*, and factors other than habitat loss seem to be at play. Many species associated with man were unknown to early recorders, but are now well established and continue to expand across the county. These trends follow those reported nationally.

Introduction

Terrestrial mollsuca are the land dwelling snails and slugs. There is no real difference between a snail and a slug. In the latter the shell, so characteristic of snails, is much reduced in size and usually internal. The national atlas (Kerney 1999) lists 126 species of native or naturalised terrestrial mollusc occurring within the British Isles. Ninety species are known from Oxfordshire (Gregory & Campbell in prep.). About a quarter are less than 3 mm in size. The majority live unnoticed in the countryside and feed on lichens, algae, fungi or dead plant matter. Many will also scavenge corpses, but few, notably the Shelled Slugs, *Testacella* spp., are active predators. A few, such as the Grey Field Slug, *Deroceras reticulatum*, and the Garden Snail, *Helix aspersa*, are well known as pests of crops and garden plants.

In the last few decades distributional changes in popular taxa, such as birds and butterflies, have been well documented through the use of long term quantitative monitoring programmes. Examples are the Common Bird Census (British Trust for Ornithology 1983), the Butterfly Transect (Butterfly Monitoring Scheme 1981) and locally, surveys undertaken by the Banbury Ornithological Society. For most other groups, especially invertebrates, data are typically in the form of a presence/absence site species list. Such data can be used, albeit crudely, to demonstrate long-term changes in species distribution by comparing, over time, the frequency of species within defined recording units, usually hectads (10 km x 10 km national grid squares). This approach has been used to highlight changes in vascular plant floras (Rich & Woodruff 1996) and regional declines in Bumblebees (Williams 1982) and molluscs (Kerney 1999).

Recording of Terrestrial Mollusca in Oxfordshire

The wide range of forms and colour varieties exhibited by many species made them popular with Victorian collectors. The numerous species lists published during the 19th century (eg Whiteaves 1857) were collated by Collinge (1891), who listed 64 species, complete with outline distributional information. In the 1920's, A.E.Ellis, author of the standard book 'British Snails', and the Rev. L.W.Grensted were active in the county. The publication of the Victoria County History of Oxfordshire (Grensted 1938) saw the county list rise to 73 species, mainly through taxonomic splitting of species aggregates. Virtually all of the county's present day 'rarities' were well known to recorders of the nineteenth century. From the 1930's to the mid 1980's recording was rather patchy, but widely spread across the county. The Bureau of Animal Population Studies at Oxford University, Dr H.J.M.Bowen, T.E.Crowley and M.R.Hughes contributed many records.

Since the late 1980's there has been a concerted effort by Dr A.I.Spriggs, J.M.Campbell (OBRC) and the author to achieve a balanced recording effort across the county. The current survey area is taken as the 'modern' county of Oxfordshire (Figure 1), which since 1974, has included the north-west part of what was then Berkshire (essentially the Vale of the White Horse). 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 terrestrial molluscs within the county unless all potential habitat types had been examined. Further taxonomic splits and the discovery of several species of man-made habitats, previously unknown in the county, have seen the county list rise steadily to 90 species. The majority of the records are post 1990 and we can be sure that trends in species distribution are real and not just a reflection of recorder activity.

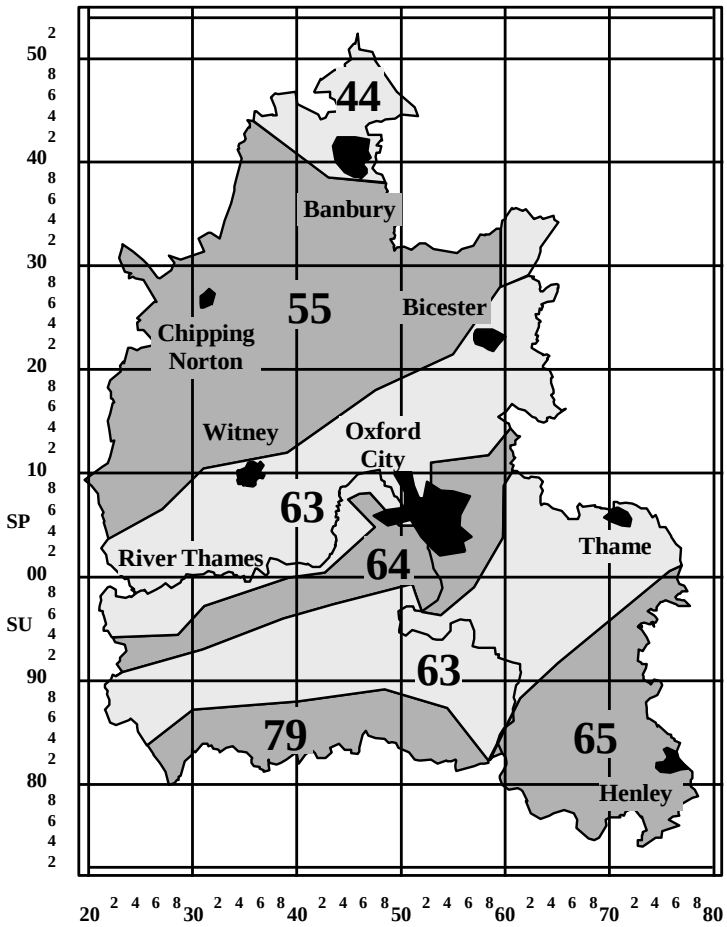

Figure 1: The modern county of Oxfordshire showing major towns and natural areas occurring within the county (the river Thames, which roughly corresponds to the old county boundary, is also shown)

Key

44 – Midland Clay Pastures
55 – Cotswolds
63 – Thames and Avon Vales
64 – Midvale Ridge
65 – Chiltern Hills
79 – Berkshire Downs

Changes over the Past 150 Years

Changes in the distribution in Oxfordshire's terrestrial mollusca were assessed in three ways.

- **Visiting old sites:** This is the simplest method. Historical sites given by old recorders, such as those listed in Collinge (1891) and Grensted (1938) were visited and key species sought.
- **Distribution maps:** Species distribution maps were plotted to compare current and historical ranges.
- **Species accounts:** Finally, and possibly least reliably, species accounts in the old texts, such as Collinge (1891) and Grensted (1938), were compared with the present day records.

There are a number of factors which limit the usefulness of the species data in determining changes in Oxfordshire's terrestrial mollusc fauna.

- **Differing objectives:** The older (nineteenth century) collectors were more interested in rare species and unusual colour/growth forms and tended not to record common species or forms.
- **Limited access:** Before the motor car, visits to distant sites were difficult and time-consuming. Many historically well-recorded sites (eg Hartslock NR, SU 6179) are close to railway stations.
- **Differing recording effort:** There has been more than 100 years of patchy, ad-hoc recording, compared to the more systematic approach used over the last two decades.
- **Different recording areas:** Earlier records refer to 'old' Oxfordshire (approximately Watsonian vice-county 23 (Dandy 1969)). The current survey area is taken as the 'modern' county of Oxfordshire (Fig. 1).
- **Site vagueness:** For many historical records site details tend to be vague, typically a place name without any grid reference.
- **Distribution vagueness:** In most of the old species accounts, the sites (albeit vague) are only listed for the rarest species. The distribution of the more widespread species tends to be summed up in a few words (eg. '*not uncommon*' or '*widely met with*').
- **Taxonomy:** Old workers classed as one, some species which are now recognised as aggregates of closely related species.

Past and Current status of some of Oxfordshire's Terrestrial Mollusca

A crude breakdown of the apparent distributional changes occurring within major habitat types during the last century is shown in Table 1. The majority of Oxfordshire's terrestrial mollusc fauna appears to have maintained a stable range. This paper concentrates on the current status and distributional changes of 31 species. It includes all species indicative of semi-natural habitats or indicative of human disturbance (Kerney & Stubbs 1980) and all other species where trends are apparent (Gregory & Campbell in prep.). These species, and their apparent trends found in this study, are summarised in Table 2. Example species, which have good past and present records, are discussed in more detail in the text below.

Table 1. Number of species of terrestrial mollusca associated with particular habitat types within Oxfordshire and the number of species showing an increase (expansion) or decrease (contraction) of range.

Habitat Preferences	Number of species	Range has remained stable	Increase in Range	Decrease in Range
Woodland/scrub	13	12	1	0
Woodland/wetland	7	7	0	0
Wetland	8	8	0	0
Calcicolous grassland	7	4	0	3
Stone walls	5	3	0	2
Man-made habitats	12	2	7	3
Generalists	38	37	1	0
All species	**90**	**73**	**9**	**8**

Table 2. Summary of apparent distributional trends in terrestrial mollusca within Oxfordshire during the 20th century

The table includes all habitat indicator species (Kerney & Stubbs 1980) and all other species where trends in the county are apparent (Gregory & Campbell in prep.).

No. Recs indicates number of species records held on OBRC database (Sept. 2000). British Status after Ball (1997), Anon (1995) & Kerney (1999). Key to British Status: Nb - Nationally Notable; RDB - Red Data Book; BAP(P) - UK BAP priority species; BAP(C) - UK BAP species of conservation concern; intro - introduction (i.e. non-native alien)

Species	No. recs	Habitat Preference in Oxfordshire Species	Indicator	British Status	Oxfordshire Trends
Deciduous Woodland					
Acicula fusca	30	ancient deciduous woodland	woodland	Nb	stable ?
Cochlodina laminata	304	deciduous woodland	-		increase
Ena montana	42	ancient deciduous woodland	woodland	RDB. BAP(C)	stable ?
Limax cineroniger	22	ancient deciduous woodland	woodland		stable ?
Malacolimax tenella	17	ancient deciduous woodland	woodland	Nb, BAP(C)	stable ?
Vertigo substriata	8	ancient sallow carr	woodland		stable ?
Fen and Marsh					
Ashfordia granulata	46	undisturbed wetland	-	BAP	stable ?
Perforatella rubiginosa	4	undisturbed wetland	-	RDB	stable ?
Vertigo antivertigo	21	undisturbed wetland	wetland		stable ?
Vertigo moulinsiana	14	undisturbed wetland	wetland	RDB, BAP(P)	decline ?
Calcicolous Grassland					
Abida secale	28	old calcicolous grassland	grassland	Nb	decline
Helicella itala	113	old calcicolous grassland	grassland		large decline
Helicigona lapicida	2	stone walls, old quarries, Chiltern beechwoods	grassland		large decline

Pupilla muscorum	105	old calcicolous grassland. walls	grassland		stable ?
Vertigo pusilla	12	mossy, shady limestone walls	grassland	Nb	stable ?

Man-made Habitats

Arion hortensis agg.	565	ubiquitous	disturbance	native	stable
Arion flagellus	3	churchyards	-	native ?	new colonist
Arion lusitanicus	1	churchyards	-	20C intro ?	new colonist
Boettgerilla pallens	57	churchyards, gardens	disturbance	1970's intro	increase
Deroceraspanormitanum	112	churchyards, waste-ground	disturbance	20C intro	increase
Deroceras reticulatum	704	ubiquitous	disturbance	native	stable
Helix aspersa	642	ubiquitous	disturbance	ancient intro	stable
Hygromia cinctella	1	waste-ground	-	1950's intro	new colonist
Lehmannia valentiana	3	garden centres	-	20C intro	new colonist
Limax flavus	27	churchyards	disturbance	ancient intro	decline
Monacha cantiana	651	ubiquitous	-	ancient intro	increase
Oxychilus draparnaudi	121	churchyards, waste-ground	disturbance	ancient intro	increase
Tandonia budapestensis	185	churchyards, waste-ground	disturbance	20C intro	increase
Tadonia sowerbyi	55	churchyards, waste-ground	disturbance	old intro ?	stable ?
Testacella hallotidea	12	churchyards, matured gardens	-	ancient intro ?	decline
Trichia striolata	1102	ubiquitous	disturbance	Native	stable

Deciduous woodland

The 'primary woodland indicators' listed by Kerney & Stubbs (1980) are all species that were once common in the primeval deciduous forests that covered much of England and Wales up to 5,000 years ago (Kerney 1999). Five such species occur within Oxfordshire (Table 2). All are scarce and have localised distributions within the county. However, it is apparent that all five species have maintained their historical ranges across the county during the last century with no evidence of local extinction. Some outlying populations have been overlooked by early recorders and the discovery of new sites is attributable to increased recorder effort in recent decades, rather than species expansion.

A good example is the nationally rare Mountain Bulin, *Ena montana*, a large and distinctive snail reaching 1.6 cm (Figure 2). It is normally very elusive, hiding amongst moss and leaf litter on stony slopes, but in wet weather it readily climbs smooth barked trees, such as beech or ash, where it grazes algae. It was widely recorded from the Chiltern Hills by early workers (Grensted 1938), where it remains widespread today. Subsequently a previously-overlooked cluster of sites has been discovered in the Evenlode catchment of the Cotswolds, including Wychwood Forest. This distribution is illustrated in Figure 3.

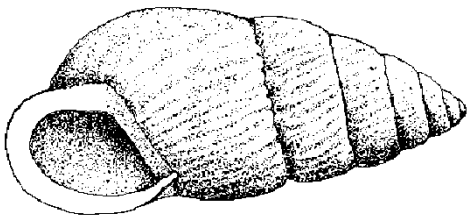

Figure 2. Mountain Bulin, *Ena montana* (14-17 mm)

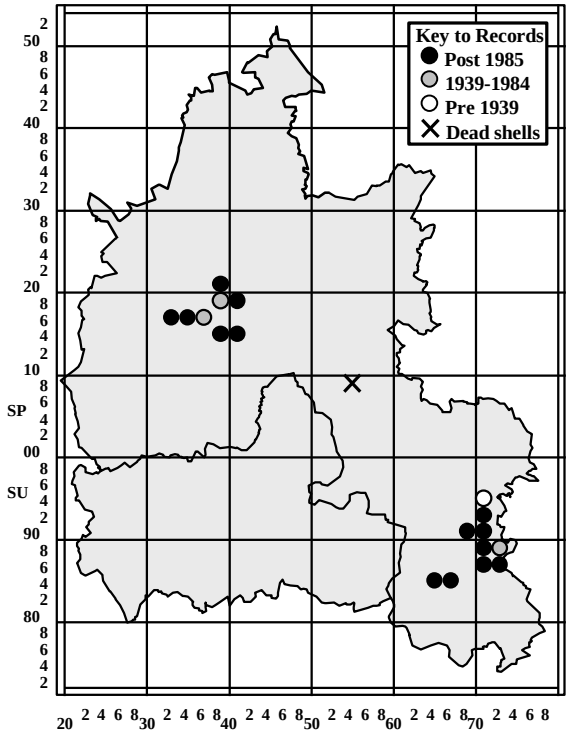

Figure 3. (right) Distribution of Mountain Bulin, *Ena montana*: a primary woodland snail with localised populations in the Cotswolds and Chilterns

Note: the distribution maps show the presence of species within tetrads (2km x 2km squares). Only the most recent record for a tetrad is shown.

The Ash-black Slug, *Limax cinereoniger*, is another example. This handsome beast (Figure 4), typically jet-black in colour with a contrasting orange dorsal keel to the body, is Britain's largest slug. Despite reaching over 20 cm in length it is surprisingly adept at concealing itself within small crevices in dead wood. It is easiest to find in the autumn when toadstools, its favourite food, abound. Since the early twentieth century it has been considered characteristic of the Chiltern Hills (Grensted 1938; OBRC records). There it is often associated with another fungus feeder, the locally rare Tender Slug, *Malacolimax (Limax) tenellus*, a small bright yellow species which rarely reaches 5 cm. An outlying population for the Ash-black Slug at Bagley Wood, Oxford (SP5002), first noted in the 1850's (Collinge 1891), is still extant and a new site in the west of the county (Foxholes Wood, SP2520) has recently been discovered (Figure 5).

Figure 4. Ash-black Slug, *Limax cinereoniger* (100-200 mm)

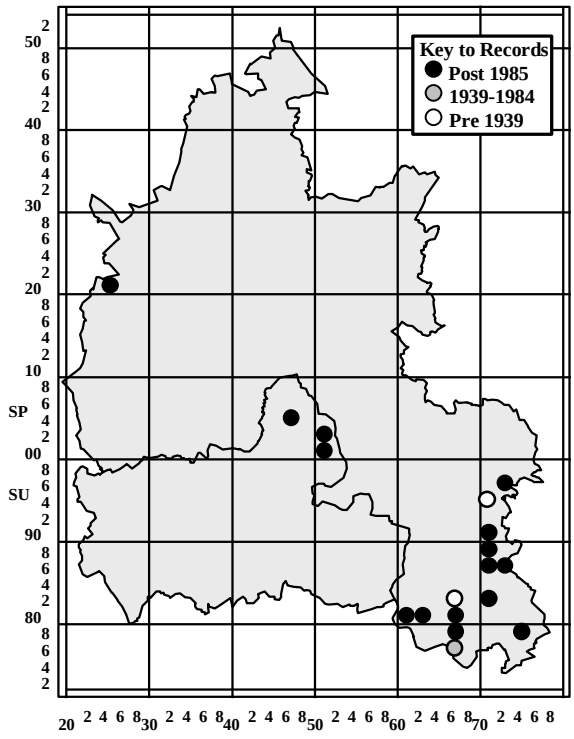

Figure 5: Distribution of Ash-black Slug, *Limax cinereoniger*: a primary woodland slug characteristic of the Chilterns with outlying populations extant

Unlike the species described above the Plaited Door Snail, *Cochlodina laminata*, will also inhabit secondary woodland and young plantation. It was considered very scarce by early recorders. Collinge (1891) considered it '*not a common or plentiful species*'. Grensted (1926), noted it to be '*perhaps now extinct*' at Stow Wood, near Oxford (SP5510) (a site listed in Whiteaves 1857) and later (Grensted 1938) summarised the county distribution as '*not common except* (Chiltern) *Beech Woods*'. Today it is locally common across the county, wherever deciduous woodlands occur on calcareous soils. In wet weather the glossy cigar-shaped chestnut-coloured shells (Figure 6) can often be seen in abundance on tree trunks. It is apparent that *C. laminata* has undergone a genuine expansion of range in the last hundred years.

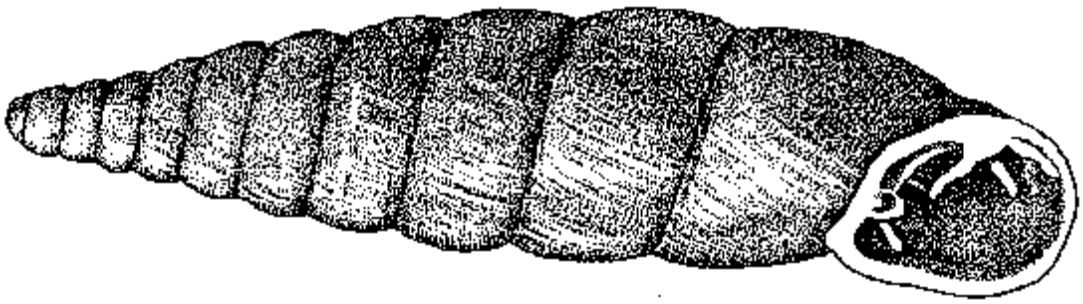

Figure 6. Plaited Door Snail, *Cochlodina laminata* (15-17 mm)

Fen and marsh

Two locally scarce Whorl Snails (*Vertigo* spp.) indicative of undisturbed wetland (Kerney & Stubbs 1980) occur in the county (Table 2). As with ancient woodland species there is evidence of under-recording of the county's characteristic wetland species by earlier workers. Whorl Snails are notoriously elusive and, for example, Collinge (1891) confesses '*I have paid but very little attention to this genus*'. This is

hardly surprising for they are tiny animals less than 2.5 mm in size. Each species has a distinctive arrangement of folds in the opening of the shell, reminiscent of teeth, which simplifies species identification (Figure 7).

The Marsh Whorl Snail, *Vertigo antivertigo*, which occurs amongst wet ground litter or moss, in fens and riverside marshes, is the most frequently encountered. There are 20 records from recent decades, but only one old record, Weston Fen (SP5219) in 1857 (Grensted 1938). Des Moulins' Whorl Snail, *V. moulinsiana*, (Figure 7) is legally protected under European law and achieved national fame when several colonies were discovered on the proposed route of the (now completed) Newbury bypass. Since 1906 it has been recorded from a number of fens in the Sandford Brook catchment, including Cothill Fen (SU4699). Although apparently lost at one site beside the river Thames at Radley (SU5297 - now a gravel pit) this secretive snail has recently been found inhabiting two Thames-side marshes downstream from Wallingford.

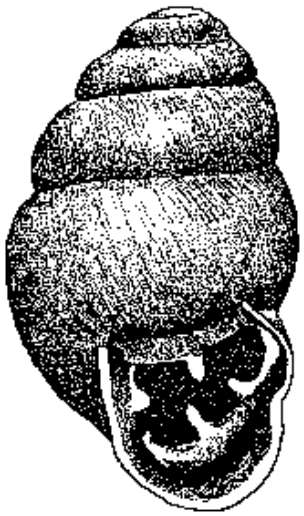

Figure 7. Des Moulins' Whorl Snail, *Vertigo moulinsiana* (2.5 mm)

Calcicolous grassland and stone walls

Within Oxfordshire calcicolous grassland is a secondary habitat created by clearance of primeval forest from Neolithic times onwards (Killick *et al* 1998). Five species indicative of unimproved calcicolous grassland occur in Oxfordshire (Table 2), including some, such as the Wall Whorl-snail, *Vertigo pusilla*, which favour limestone walls. (Snails regard walls as poorly vegetated grassland.) Although this rarity has not been seen in the '*neighbourhood of Banbury*' since 1855 (Collinge 1891), this may reflect the elusiveness of this tiny (2 mm) species rather than a decline. Certainly Whiteaves' (1857) Woodeaton site near Oxford remains extant despite the collapse of the stone wall which supports the colony and several previously unknown sites have recently come to light. Similarly there is no evidence of a decline for the Moss Chrysalis Snail, *Pupilla muscorum*, a widely recorded species of short-turf grassland and old limestone walls.

The three remaining calcicolous grassland species were once much more widely recorded across the county and have suffered local contractions of range since the nineteenth century. For example, the Large Chrysalis Snail, *Abida secale*, (8 mm) was described by Collinge (1891) as '*occurs plentifully* (in) *calcareous districts*'. Today this distinctive species, rather reminiscent of an over-size Whorl Snail (Figure

8), has disappeared from all outlying localities on the Midvale Ridge and Cotswold limestones. It is still widespread in short turf chalk grassland in the Chilterns, but even within this stronghold only dead shells have been found at some sites where it was previously recorded (eg Hartslock NR; Warburg Reserve, SU7187) (OBRC records).

Figure 8: Large Chrysalis Snail, *Abida secale* (6-8 mm)

The Heath Snail, *Helicella itala* (Figure 8), is a distinctive species with a broadly flattened, banded shell up to 20 mm across. It was once '*local but occasionally abundant*' (Grensted 1938) in species rich calcareous grassland across the county. In the last fifty years this distinctive animal has been lost from, or has greatly declined at most known sites in the county, although the Berkshire Downs and the Chiltern Hills remain a stronghold. This is apparent from the distribution map (Figure 10). This decline is has been documented at two well-worked sites. Described by Ellis (1927) as '*an abundance*' at Wick (Sydlings) Copse (SP5509), very few live specimens have been seen in recent years (Gregory 1990). At Little Wittenham NR (SU5692), specimens were collected in 1945 (OBRC records), but today only bleached empty shells sieved from soil can be found (Gregory 1991).

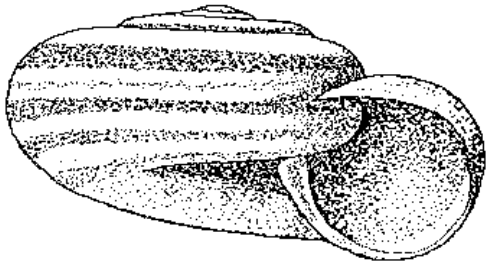

Figure 9. Heath Snail, *Helicella itala* (12-20 mm)

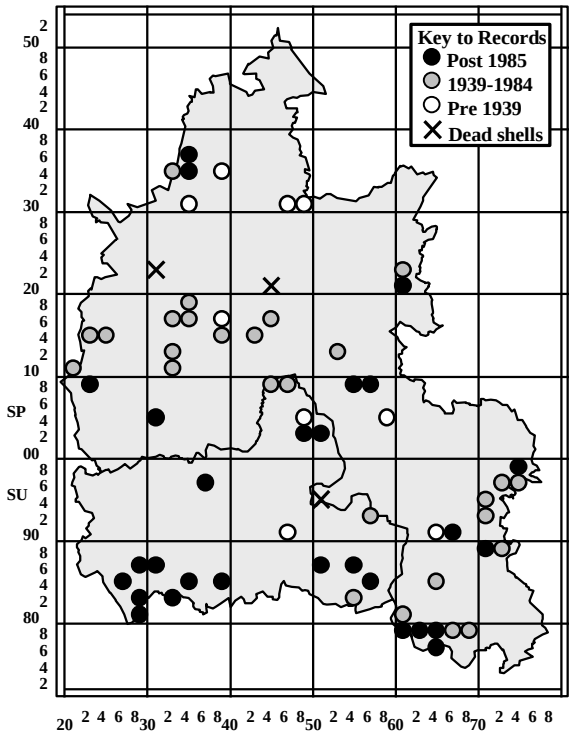

Figure 10. (right) Distribution of Heath Snail, *Helicella itala*: a calcicolous grassland snail, once frequent and widespread, but showing considerable contraction of range in the last 50 years

The Lapidary Snail, *Helicigona lapicida* (Figure 11), has fared even worse. This attractively marked species has a flattened, sharply keeled shell up to 20 mm in width,

adapted for hiding in crevices. On the limestones of the Cotswolds and the Midvale Ridge it occurred on grassy banks, in old quarries and on limestone walls. In the Chilterns, where it was once a familiar sight, it was equally at home in beech woods on chalky soils, which must have provided suitably deep crevices in which to hide. Collinge (1891) found it '*abundantly in the chalk near Goring*' and Grensted (1938) considered it '*common on the Chilterns*'. There are records around Goring (including Hartslock NR) up to the mid 1980's (OBRC records), but recent site visits have revealed just two bleached dead shells. This trend has been repeated across its former Chiltern and Cotswold strongholds and today, with two just extant sites, it is all but lost from the county. This decline is apparent from the predominance of old records in the distribution map (Figure 12).

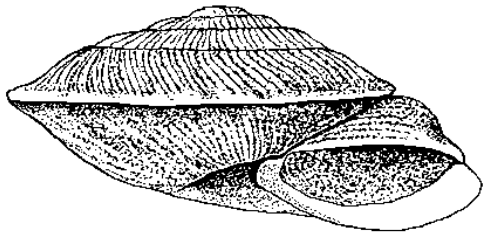

Figure 11. Lapidary Snail, *Helicigona lapicida* (15-20 mm)

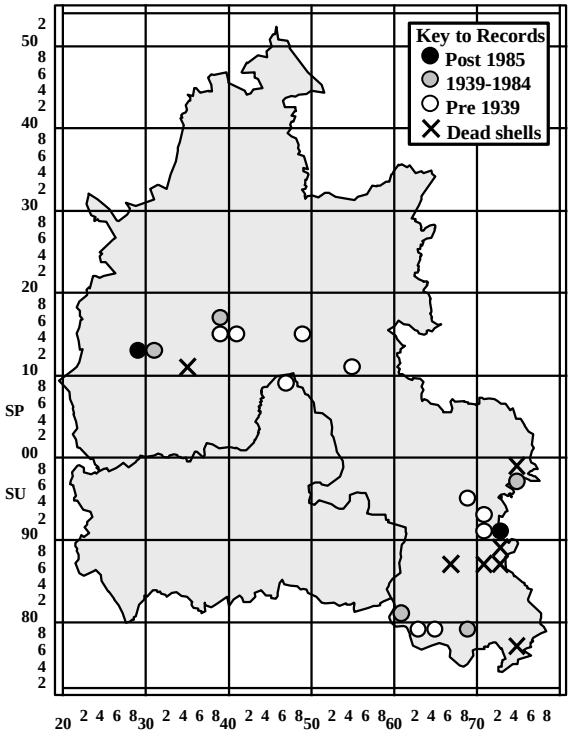

Figure 12. (right) Distribution of Lapidary Snail, *Helicigona lapicida*: a snail of grassy banks, old quarries, stone walls and beech woodland on chalk, once widespread, but today known alive at two sites

Man-made Habitats

Man-made habitats, including waste ground, railway sidings, gardens and churchyards, can prove be as diverse as some semi-natural sites. All ten species considered by Kerney & Stubbs (1980) to be indicative of human disturbance occur in Oxfordshire (Table 2). Four, the Garden Slug, *Arion hortensis* agg., the Grey Field Slug, *Deroceras reticulatum*, the Garden Snail, *Helix aspersa*, and the Strawberry Snail, *Trichia striolata*, were commonly recorded in the nineteenth century and remain ubiquitous today.

The Yellow Slug, *Limax flavus*, is an ancient introduction well known to early recorders. It is a large species (to 13 cm), typically a mottled greenish-yellow, and was once so widespread that individual records were not listed. It was simply described as '*an exceedingly common and abundant form*' by Collinge (1891) and '*common and general*' by Grensted (1938). It was a frequent inhabitant of cellars and sculleries as aptly illustrated by Boycott (1934); '*fond of the grease in the kitchen sink and at night may crawl all about the scullery*'. Although still widespread in the county there are just 25 post 1985 records. Today it is rarely seen indoors and is

typically found under large stones or within crevices on stone walls in churchyards and gardens. The high proportion of old records for this species suggests that it was previously more plentiful and has declined during the last century. Another long-established introduction, the Shelled Slug, *Testacella haliotidea* (7-10 cm) (Figure 13), was also well known to early recorders. So named because of the fingernail-like vestigial shell covering the end of the body, this is an exclusively carnivorous species favouring well-manured gardens where it pursues earthworms. Its subterranean habits make it elusive, but Collinge (1891) considered it to be '*not at all uncommon*' and nine locations are listed in Grensted (1938). Today, despite careful searches, there are just six post 1985 records.

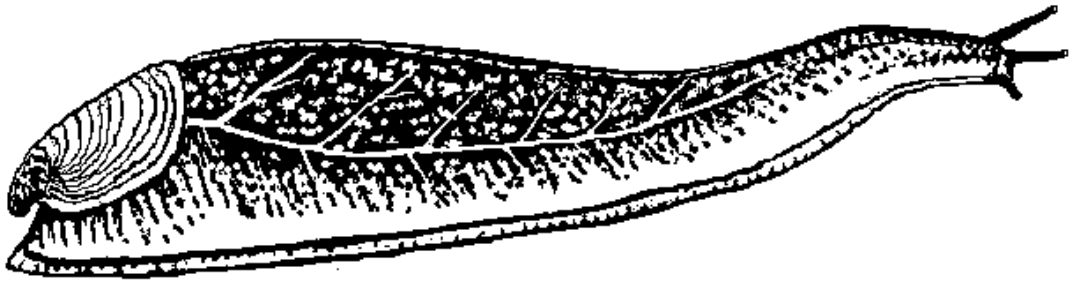

Figure 13. Shelled Slug, *Testacella haliotidea* (70-100 mm)

Some of today's most familiar species have only reached Oxfordshire comparatively recently, so were completely unknown to early recorders. For example, the Kentish Snail, *Monacha cantiana*, was introduced into south-eastern England probably in late Roman times (Kerney 1999). It slowly spread north-west to reach Oxfordshire in the mid-nineteenth century. It was initially only known from Headington, Oxford (Whiteaves 1857), but subsequently it has steadily spread across the county. Collinge (1891) comments that it '*seems now to have a general distribution*' whilst half a century later, Grensted (1938) reported it to be '*general and abundant*'. Today this rather drab and ordinary looking snail (up to 20 mm) is ubiquitous and, with over 650 records, is one of the most commonly encountered snails in the county. Another species, the Budapest Slug, *Tandonia budapestensis*, may have arrived unnoticed in Oxfordshire early in the twentieth century. Grensted (1938) suggests that some of the records for the Keeled Slug, *Tandonia sowerbyi* (described as '*apparently increasing* (and) *now abundant in Oxford gardens*'), may refer to the Budapest Slug, then a recent discovery in Britain. This is distinctive species (up to 7 cm) with a characteristic central dark strip to the underside and typically curling into a 'C' shape when resting, so it is surprising that its occurrence in Oxfordshire was not proven until 1988. Today it is well established and commonly found under stones and general debris in built up areas across the county (185 records).

Recent introductions

During the 1990's several species strongly associated with man-made habitats, such as churchyards, were discovered in the county. Most are recent colonists in Britain and all are increasing in range (Kerney 1999). One example, the Worm Slug, *Boettgerilla pallens*, was unknown in Britain until 1972 (Colville *et al.* 1974), and has subsequently spread rapidly. This small pallid burrowing species (to 5cm) has been shown to be widely established in churchyards and gardens across Oxfordshire (57 records). The Durham and Lusitanian Slugs, *Arion flagellus* and *A. lusitanicus* are quite common and possibly native in south-western Britain. Recently a few isolated populations have been discovered in Oxfordshire churchyards. Both species are large

(10cm) and look rather like the common round-back slug *A. ater* (Figure 14), a familiar sight in most gardens, so they are probably easily overlooked. The Greenhouse Slug, *Lehmannia (Limax) valentiana*, was first noted outdoors in England during the 1980's and in Oxfordshire has recently been found under pots at three garden centres. The most recent colonist of Oxfordshire is the Girdled Snail, *Hygromia cinctella* (12 mm) (Figure 15). It has a conspicuous keel to the shell highlighted by a thin pale line. This Mediterranean species was first noted in Devon in 1950 (Kerney 1999) and has slowly spread north-east across southern England. In spring 2000 it was collected in Oxford City. We shall have to wait and see if these new colonists become as well established in the county as some of their earlier counterparts.

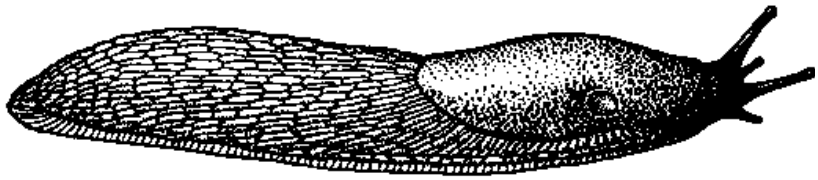

Figure 14. Large-black Slug, *Arion ater* (60-130 mm)

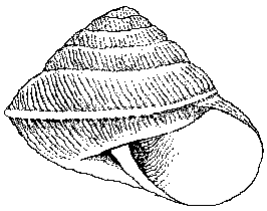

Figure 15. Girdled Snail, *Hygromia cinctella* (10-12 mm)

Discussion

It has proved difficult to trace changes in the terrestrial mollusc fauna of Oxfordshire. We can safely say that common species (not considered here) are still common, but this really just highlights one of the main problems with presence/absence data: the lack of numerical abundance information. There is no way of determining whether certain species have suffered local or site based population declines as documented in other taxa, such as birds (eg Marchant *et al*. 1999). To give an extreme example, if all populations of a species, once abundant at all known sites, were to catastrophically crash to just a few individuals then this decline would be completely overlooked. It is still present at all sites. It is this lack of sensitivity which results in the illusion that many species may be stable when they may actually be undergoing retreat at a local level. This problem has been partly addressed by comparing species accounts in the old texts, such as Collinge (1891) and Grensted (1938) with modern observations. Certainly this has confirmed some of our suspicions, for example the increase in the woodland snail *Cochlodina laminata* and the decline of the grassland snail *Abida secale*.

Another problem has been the patchy nature of the historical recording. It is clear that outlying sites for many species of semi-natural habitat, most notably the Cotswold woodland populations of the Mountain Bulin, *Ena montana*, have been overlooked until recent decades. This suggests the possibility that outlying populations of some species could have died out during the last century before their presence was even noted. It is also apparent that some well-established twentieth century introductions, such as the Budapest Slug, *Tandonia budapestensis*, have been completely overlooked within the county for decades.

It can be said with some confidence that the majority of 'county rarities' associated with semi-natural woodland and wetland habitats have maintained their known range

across the county. There has been no evidence of local contraction during the last century. The discovery of new sites is attributable to increased recorder effort, revealing previously overlooked colonies, rather than species expansion. Good examples are the Mountain Bulin (mentioned above) and the Whorl Snails, *Vertigo* spp., which are notoriously elusive. However, it should be borne in mind that the specialist woodland and wetland species occurring in southern England are, as a rule, retreating locally (Kerney 1999). They have quite precise habitat requirements (Kerney and Stubbs 1980, Willing 1993) and are particularly vulnerable to habitat change and degradation brought about by human activities, such as intensification of farming and forestry, river improvements, air pollution and urban development (Bratton 1991). Many are listed in the British Red Data Book (Bratton 1991) and/or the UK Biodiversity Action Plan (Anon 1995; Anon 1998) (see Table 2 for details). We should, therefore, be aware of the limitations of records which lack numerical abundance data, as highlighted above. It is perhaps fortunate that, as relicts of unmanaged primeval forest, none is dependent on artificial management such as coppicing or hay cutting. In common with the majority of Britain's endangered woodland and wetland invertebrates they thrive in the absence of such traditional practices (Bratton 1991; Kirby 1992).

In general, species characteristic of short turf calcicolous grassland and of old limestone walls have not fared so well. Of particular concern is the dramatic decline of *Helicella itala* and *Helicigona lapicida* across Oxfordshire in the last few decades. Both are known to be receding in other parts of Britain (Kerney 1999), partly through direct habitat destruction. Although many species rich grasslands have been ploughed in Oxfordshire during the last 50 years few known colonies have been lost in this way (although we will never know how many unrecorded ones). In the last decade both species have been lost from extant grassland sites within the county, including several SSSI's (sites of special scientific interest) designated and managed for their calcicolous grassland interest. This suggests that other unknown factors, possibly linked to changes in climate or grassland management, are also at play. Many of the remaining colonies of *H. itala* are small and maintained by rabbit grazing and must be considered vulnerable, whilst *H. lapicida* is in danger of becoming the first recorded extinction of a terrestrial mollusc from the county.

Man-made habitats are not generally considered to be of great conservation importance and many twentieth century recorders have continued with the tried and tested 'natural' habitats, often revisiting known hot-spots. Within Oxfordshire old churchyards have proved important for snails and slugs and many other under-recorded invertebrates, such as centipedes (Gregory 1996). Some species are genuinely rare, but due to the limited resources available for species conservation, these accidental introductions are not considered to be part of Britain's threatened wildlife (Bratton 1991). Many have been spread far beyond their natural ranges and are typically spread passively, for example within potted plants or mossy wreaths. As a rule, most introduced species, such as the Worm Slug, *Boettgerilla pallens*, and the Budapest Slug, *Tandonia budapestensis*, were found to be more widespread than previously thought and have clearly increased greatly during the last century. These trends reflect the national trends noted by Kerney (1999) and are similar to those reported for vascular plants by Rich & Woodruff (1996). A few, including the slugs *Arion flagellus*, *A. lusitanicus* and *Lehmannia valentiana* are new arrivals to the county and may become more widespread in subsequent years. The importance of churchyards is not confined to species of man-made habitats. One of the two

remaining sites for the declining Lapidary Snail (discussed above) is from a churchyard wall enclosing a botanically rich graveyard.

Exceptions to this general upward trend of species of man-made habitats are two long-established slugs, *Limax flavus* and *Testacella haliotidea*, which seem to have declined since the turn of the last century. Kerney (1999) notes a high proportion old records for both species across Britain, but believes it reflects modern under-recording, rather than a decline. This is not the case in Oxfordshire where both species have been specifically searched for. It is quite likely that improved standards of hygiene within the home may have contributed to the decline of the one and the decreasing popularity of manured vegetable plots to that of the other. Similar twentieth century declines have been reported for other invertebrates typical of man-made habitats, such as woodlice associated with stables and farm outbuildings (another decreased habitat) (Harding & Sutton 1986).

Semi-natural habitats within Oxfordshire, especially those which are not too heavily managed and support a good diversity of vegetation structure, have proved important refuges for a number of key British species. These include UK BAP species, including *Vertigo moulinsiana, Ena montana, Malacolimax (Limax) tenellus* and *Ashfordia garnulata*, and also a number of species which are more frequent elsewhere in the British Isles, such as the grassland snail *Abida secale* and the woodland slug *Limax cinereoniger*. New species, typically of man-made habitats, continue to be accidentally introduced. A detailed baseline has been set and we are now in a position to monitor future distributional changes, possibly concentrating on key species or key habitats. For many species we need to know if they are still there, but with careful choice of methodology it should be possible to apply appropriate statistical analysis to future results.

Acknowledgements

I wish to thank Dr Arthur Spriggs, John Campbell (Oxfordshire Biological Records Centre) and also Miss Stella Davies and Dr Michael Kerney of the Conchological Society of Great Britain and Ireland for their advice and support. The maps have been produced using DMAP software developed by Dr Alan Morton.

I thank Peter Abbott, Peter Pool and Catherine Ross for supplying data from CBC sites. Comments from Richard Bradbury, John Brucker, Rob Fuller, Andrew Gosler, Mark Whittingham, Mike Wilson and Jeremy Wilson improved an earlier draft of this paper.

S. Gregory, Northmoor Trust, Little Wittenham, near Abingdon, Oxfordshire, OX14 4RA
northmoorecol@aol.com

References

Anon. 1995. Biodiversity: *The UK Steering Group Report*. HMSO.

Anon. 1998. *UK Biodiversity Group Tranche 2 Action Plans*. English Nature.

Ball, S. 1997. RECORDER 3.3: *Biological Recording Package*. JNCC.

Boycott, A. E. 1934. The Habitats of Land Mollusca in Britain. *Journal of Ecology*, 22: 1-38.

Bratton, J. H. 1991. *British Red Data Books: 3.Invertebrates other than Insects*. JNCC, Peterborough.

British Trust for Ornithology (BTO). 1983. *Common Bird Census Instructions*. BTO, Hertfordshire.

Butterfly Monitoring Scheme (BMS). 1981. *Instructions to Independent Recorders*. ITE, Huntingdon.

Collinge, W. E. 1891. *The Land and Freshwater Mollusca of Oxfordshire. The Conchologis*t 1: 11-53.

Colville, B., Lloyd-Evans, L., Norris, A. 1974. *Boettgerilla pallens* Simroth, a new British species. *Journal of Conchology* 28: 203-207.

Dandy, J. E. 1969. *Watsonian vice-counties of Great Britain*. Ray Society publication 146, London.

Ellis, A. E. 1927. Additional notes on the Mollusca of the Oxford District. *Journal of Conchology* 18: 137-138.

Gregory, S. J. 1990. *Terrestrial Mollusca of College Pond and Sydlings Copse*. Unpublished report for Berkshire, Buckinghamshire and Oxfordshire Naturalists' Trust.

Gregory, S. J. 1991. *A Preliminary Survey of the Terrestrial Mollusca of Little Wittenham NR.* Unpublished report for the Northmoor Trust.

Gregory, S. 1996. Oxfordshire Centipedes. *Bulletin of the British Myriapod Group* **12:** 27-44.

Gregory, S. J., Campbell, J. M. (*in prep*.) *An Atlas of Oxfordshire Terrestrial Mollusca*. Oxfordshire Museums Service.

Grensted, L. W. 1926. *Mollusca*. In: Walker JJ (Ed) *The Natural History of the Oxford District*. Oxford University Press.

Grensted, L.W. 1938. *Mollusca.* In: Salzman LP (Ed) *Victoria County History of Oxfordshire*. Oxford University Press.

Harding, P. T., Sutton, S. L. 1986. *Woodlice in Britain and Ireland: Distribution and Habitat.* NERC, Huntingdon.

Kerney, M. 1999. *Atlas of the Land and Freshwater Molluscs of Britain and Ireland*. Harley Books.

Kerney, M., Stubbs, A. 1980. *The Conservation of Snails, Slugs and Freshwater Mussels.* NCC.

Killick, H. J., Perry, A. R., Woodell, S. R. J. 1998. *The Flora of Oxfordshire.* Pisces Publications, Newbury.

Kirby, P. 1992. *Habitat Management for Invertebrates: a Practical Handbook.* RSPB.

Marchant, J., Sanderson, F., Glue, D. 1999. Changes in breeding bird populations. *BTO News* 222. BTO

Rich, T. C. G., Woodruff, E. R. 1996. Changes in the Vascular Plant Floras of England and Scotland between 1930-1960 and 1987-1988: The BSBI Monitoring Scheme. *Biological Conservation* 75: 217-229.

Whiteaves, J. F. 1857. *On the Land and Freshwater Mollusca inhabiting the Neighbourhood of Oxford.* Ashmolean Society, Oxford.

Williams, P. H. 1982. The Distribution and Decline of the British Bumble Bees (*Bombus* Latr.). *Journal of Apicultural Research* 21 (4), 236-45.

Willing, M. 1993. Land Molluscs and their Conservation - an Introduction. *British Wildlife* 4: 145-153.