The Terrestrial Mollusca of the Valley-head Fens of Oxfordshire

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Introduction

Many aspects of the natural history of Oxfordshire have been well studied in the past and sites within the county of national or even international importance have been recognised. The rich botanical interest of Oxfordshire's valley-head fens has long been appreciated. In recent decades work by English Nature has shown that the entomological interest, first hinted at by historical records collated in the Victoria County History of Oxfordshire (Salzman 1938), is considerable and of international importance (English Nature 1997). In general non-Insect groups are less well known, but in the last two decades the distribution of terrestrial *Mollusca*, snails and slugs, across Oxfordshire has been widely researched. This paper highlights some of the findings about the terrestrial *Mollusca* fauna that inhabit Oxfordshire's valley-head fens.

The valley-head fens of Oxfordshire

Most of the fens of Oxfordshire are associated with the Midvale Ridge Natural Area (also known locally as the Oxford Heights or the Corallian Ridge) that runs from east to west across the county (figure 1). The ridge itself is composed of porous limestones and sands derived from a fossilised coral reef. The impervious clays of the Avon and Thames Vales Natural Area, that outcrop to the north and south, underlie the ridge. Where these underlying clays are exposed, such as along the edges of a small valley, calcareous springs arise and it is here that calcicolous fen communities can develop. These are known as soligenous or valley-head fens.

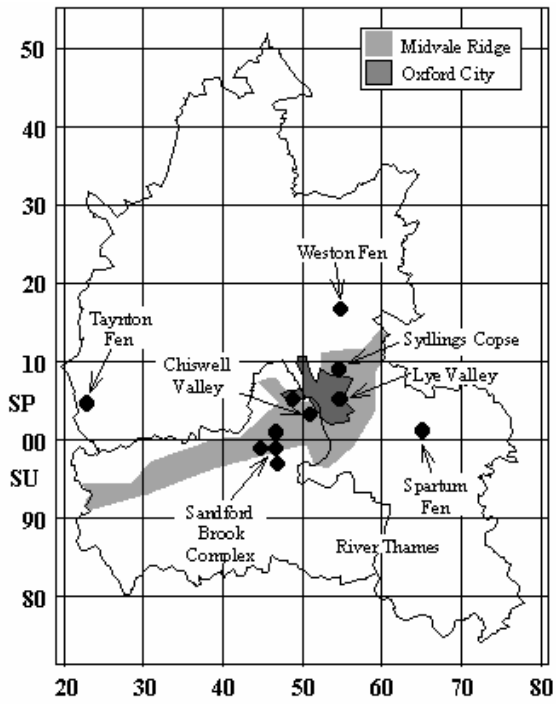

Figure 1. Some Key Valley-head Fens of Oxfordshire and the Mid-vale Ridge Natural Area

The Midvale Ridge is considered to hold the greatest concentration of calcareous springs in southern England (English Nature 1997). Perhaps best known are those of the Sandford brook catchment (SU49), near Cothill, and Sydlings Copse (SP50) just north of Oxford. Outlying sites occur elsewhere in the county where other limestones occur, including Taynton in the west (SP21) and Weston Fen (SP51) and Spartum Fen (SP60) in the east.

The Snails and Slugs of Oxfordshire

Conchology, the study or collection of shells, was very poplar with the Victorians who were fascinated by the wide range of colour varieties exhibited by many species. Consequently, there has been a long history of study of the county's mollusc fauna by both amateur naturalists and specialists associated with Oxford University. For many sites around Oxford, such as the Lye Valley (also known as Bullingdon or Hogley Bog), the records date back to the mid-19th century. In recent decades the county has been exceptionally well recorded, culminating in the publication of the county tetrad atlas (Gregory and Campbell 2000). The biology and distribution of most species is well known not just locally, but also nationally (Kerney 1999). Unless otherwise stated, throughout this paper information on the occurrence of species within Oxfordshire is based on Gregory and Campbell (2000) and national occurrence on Kerney (1999).

Areas of high diversity for terrestrial molluscs in the county can be revealed by coincidence plotting the distribution of the 'less common' species. Figure 2 shows such a coincidence plot using records held by the Oxfordshire Biological Records Centre (Oxon BRC). All species indicative of semi-natural habitats (Kerney and Stubbs 1980) and other nationally Local*, Notable* or Rare* species native to the

* Rare species are those with an expected British distribution falling within less than 15 10km grid squares and are listed in the British Red Data Book (Bratton 1991). Nationally Notable species are

British Isles (ie excluding introduced species of man-made habitats) are plotted. The number of species recorded within each tetrad (2km x 2km grid squares) is indicated. Three main 'hotspots' for terrestrial *Mollusca* are revealed: the oolitic limestones of the Evenlode catchment in the Cotswolds, the chalk of the Chiltern escarpment and, of significance to this paper, the Oxford Heights of the Midvale Ridge. For example, the high totals around SU4698 correspond to the Cothill catchment and SP5408 is Sydlings Copse and College Pond.

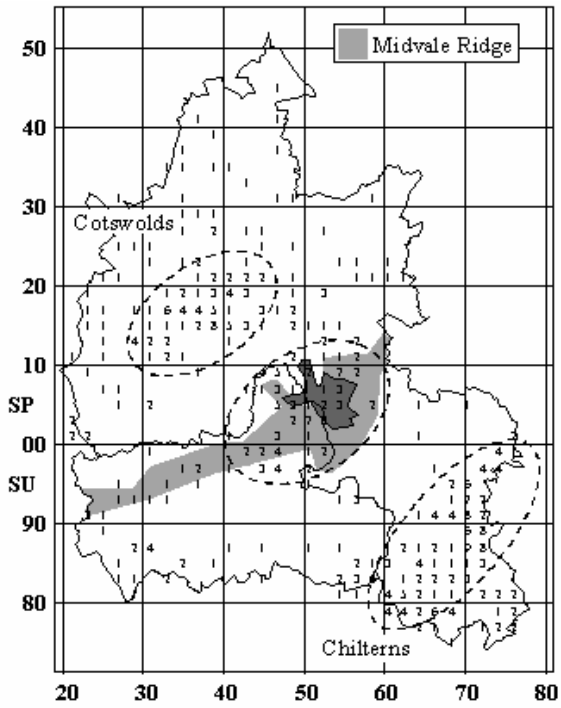

Figure 2. Coincidence plot of the species indicative of semi-natural habitat and other Local, Notable or Rare native terrestrial *Mollusca* recorded from Oxfordshire

Snails and Slugs recorded from Oxfordshire's Valley-head Fens

We have shown that valley-head fen sites are one of the three key areas supporting a good diversity of terrestrial molluscs. Let us look in more detail at the species recorded. Table 1 lists all species of snail and slug that have been recorded from some of the better known of the county's valley-head fens. Only species collected from within actual wetland habitat, such as open fen, reedbed or carr woodland are included in the table. Many of Oxfordshire's valley-head fen sites also include fragments of other habitats, such as dry grassland or woodland. These support their own unique mollusc fauna and species that have only been recorded in these areas have not been included in the site lists.

The total comes to 44 snails and 13 slugs, a total of 57 species or 63 % of the county fauna. The list includes one Red Data Book species, Desmoulins' whorl snail (*Vertigo moulinsiana*), two Nationally Notables, point snail (*Acicula fusca)* and Rolph's door snail (*Macrogastra rolphii*) and six Local species including the wetland species marsh

those with an expected British occurrence of between 16 to 100 10km grid squares. Local species are expected to occur in between 101 to 500. There are about 3,800 10km grid squares in Britain.

whorl snail (*Vertigo antivertigo*), striated whorl snail (*V. substriata)*, silky snail (*Ashfordia granulata)* and tawny glass snail (*Euconulus alderi*). These and some of the other more interesting species are examined in more detail below.

Table 1. Snails recorded from the principal valley-head fens of Oxfordshire (source: Oxfordshire Biological Records Centre, Standlake).

				Sandford Brook						Boars Hill							
		Sites:	**Fr**	**Ba**	**Go**	**Dr**	**Pa**	**Sa**	**La**	**Li**	**Ch**	**Ha**	**Ly**	**Co**	**Si**	**Sp**	**We**
Species	**Common Name**	**GB Status**															
Acanthinula aculeata	Prickly Snail		+	+			+		+	+	+	+		+	+	+	+
Acicula fusca	Point Snail	Notable/Nb									+			+	+		
Aegopinella nitidula	Smooth Glass Snail		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Aegopinella pura	Clear Glass Snail		+	+	+	+	+	+	+	+		+	+	+	+	+	+
Arianta arbustorum	Copse Snail				+		+			+	+	+					
Arion ater	Great Black Slug		+			+		+	+	+			+	+	+		+
Arion subfuscus	Dusky Slug				+	+	+	+	+	+		+	+	+	+		
Arion circumscriptus agg.	Bourguignat's Slug			+	+	+		+	+	+				+	+		
Arion hortensis agg.	Garden Slug			+	+	+		+	+	+			+	+	+		+
Arion intermedius	Hedgehog Slug		+				+	+		+			+	+	+		
** Ashfordia granulata*	Silky Snail	Local, BAP(c)			+	+											+
Azeca goodalli	Three-toothed Moss Snail	Local								+				+	+		
Boettgerilla pallens	Worm Slug	Introduction								+							
Carychium minimum	Herald Snail		+	+	+	+	+	+		+	+	+	+	+	+	+	+
Carychium tridentatum	Slender Herald Snail		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Cepaea hortensis	White Lipped Snail		+	+	+		+	+	+	+		+		+	+		
Cepaea nemoralis	Brown Lipped Snail			+	+		+	+	+	+	+	+		+	+	+	+
Clausilia bidentata	Common Door Snail		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Cochlicopa lubrica	Slippery Moss Snail		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Cochlicopa lubricella	Least Slippery Moss Snail		+		+	+				+					+		

Cochlodina laminata	Plaited Door Snail									+				+	+		
Columella edentula	Toothless Chrysalis Snail			+	+	+	+	+	+	+	+			+	+	+	+
* *Deroceras laeve*	Marsh Slug			+	+	+	+	+	+			+	+	+	+		+
Deroceras reticulatum	Grey Field Slug				+	+	+	+	+	+			+	+	+	+	+
Deroceras panormitanum	Caruana's Slug												+				
Discus rotundatus	Rounded Snail		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Ena obscura	Lesser Bulin		+		+	+	+		+	+				+	+		
* *Euconulus alderi*	Tawny Glass Snail	Local	+	+	+	+	+	+	+		+	+	+	+	+	+	+
Euconulus fulvus	Tawny Glass Snail		+	+	+	+	+	+	+	+	+			+	+	+	+
Helix aspersa	Garden Snail			+	+		+	+	+								

		Sites:	**Fr**	**Ba**	**Go**	**Dr**	**Pa**	**Sa**	**La**	**Li**	**Ch**	**Ha**	**Ly**	**Co**	**Si**	**Sp**	**We**
Species	**Common Name**	**GB Status**															
Lauria cylindracea	Common Chrysalis Snail		+	+	+	+		+					+			+	
Limax maximus	Leopard Slug					+	+		+	+				+	+	+	
Lehmannia marginatus	Tree Slug				+	+				+				+	+		+
Macrogastra rolphii	Rolph's Door Snail	Notable/Nb								+							
Monacha cantiana	Kentish Snail			+	+			+	+	+	+	+	+	+	+		+
Nesovitrea hammonis	Rayed Glass Snail		+	+	+		+	+	+	+	+	+		+	+	+	+
Oxychilus alliarius	Garlic Snail		+	+	+		+		+	+		+	+	+	+		+
Oxychilus cellarius	Cellar Snail			+	+		+		+	+	+	+		+	+		+
Oxychilus draparnaudi	Draparnaud's Glass Snail	Introduction								+			+				
Oxychilus helveticus	Swiss Glass Snail				+	+		+	+	+			+	+	+		+

* *Oxyloma pfeifferi*	Pfeiffer's Amber Snail				+	+	+	+	+					+	+		
Punctum pygmaeum	Dwarf Snail			+	+	+	+	+	+			+	+	+	+	+	+
* *Succinea putris*	Large Amber Snail		+	+	+	+	+		+			+	+			+	+
Tandonia budapestensis	Budapest Slug												+				
Tandonia sowerbyi	Keeled Slug	Introduction											+				
Trichia hispida	Hairy Snail		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Trichia striolata	Strawberry Snail			+	+	+	+	+	+	+	+	+	+	+	+		+
Vallonia costata	Ribbed Grass Snail		+	+	+	+		+	+				+			+	+
* *Vallonia pulchella*	Beautiful Grass Snail				+		+										
** *Vertigo antivertigo*	Marsh Whorl Snail	Local		+	+		+					+	+				
** *Vertigo moulinsiana*	Des Moulins' Whorl Snail	RDB	+		+	+		+									
Vertigo pygmaea	Common Whorl Snail	Local			+		+		+		+				+		
** *Vertigo substriata*	Striated Whorl Snail	Local		+				+						+			
Vitrea contracta	Milky Crystal Snail		+	+	+				+	+		+	+		+	+	+
Vitrea crystallina	Crystal Snail		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Vitrina pellucida	Pellucid Glass Snail		+	+	+	+	+	+	+	+	+	+	+	+	+		+
* *Zonitoides nitidus*	Shiny Glass Snail				+							+				+	+

** species indicative of undisturbed wetland or carr woodland, Kerney & Stubbs (1980)

* other species characteristic wetland habitat within Oxfordshire (Gregory & Campbell 2000)

KEY TO SITES:

Fr - Frilford Heath (SU4498), Ba - Barrow Farm Bog (SU4697), Go - Gozzards Ford Fen (SU4698), Dr - Dry Sandford Pit (4699), Pa - Parsonage Moor (SU4699), Sa - Sandford Brook (SP4600), La - Lashford Lane Fen (SP4601), Li - Limekiln Copse (SP5003), Ch - Chilswell Valley (SP5003), Ha - Harcourt Valley (SP4904), Ly - Lye Valley (SP5405), Co - College Pond (SP5409), Sy - Sydlings Copse (SP5509), Sp - Spartum Fen (SP6501), We - Weston Fen (SP5219).

Common and widespread species

The majority of species in table 1 are common species that occur in a wide variety of habitats, including woodland, grassland and even gardens. The 30 most frequent species in the county (Oxon BRC records) have all been recorded. Some such as the slippery moss snail (*Cochlicopa lubrica*), the rounded snail (*Discus rotundatus*) and the two-toothed door snail (*Clausilia bidentata*) are ubiquitous in the county. Other common species, such as the rayed glass snail (*Nesovitrea hammonis*), show a general preference for damper sites. There are also a number of common species more characteristic of woodland, rather than fens. Some, including the prickly snail (*Acanthinula aculeata*) and the toothless chrysalis snail (*Columella edentula*), are actually more frequently recorded within fen sites along the Midvale Ridge, than across the county as whole. Conversely other woodland species seem to be much less frequently encountered than expected. Good examples are the lesser bulin (*Ena obscura*) and the plaited door snail (*Cochlodina laminata*) which are both relatively scarce along the Midvale Ridge.

Species occurring in wetland habitats

There are eleven species that are characteristically associated with wetland habitats within Oxfordshire (Gregory & Campbell 2000). Ten have been recorded in Oxfordshire's valley-head fens and are annotated in table 1 (the 11th species, *Perforatella rubiginosa*, is known from a single Thames-side marsh). Five of these, the amber snails (*Oxyloma pfeifferi* and *Succinea putris*), the beautiful grass snail (*Vallonia pulchella*), the shiny glass snail (*Zonitoides nitidus*) and the marsh slug (*Deroceras laeve*), are common in Oxfordshire. A coincidence plot of these species (figure 3) shows a wide scatter of records across the county without any obvious association to fen sites. It is apparent that many are associated with river valleys. Indeed, the beautiful grass snail and the shiny glass snail are predominantly associated with riverside meadows in the county and are rarely recorded in Oxfordshire's fens. The two amber snails are found wherever there are dense stands of lush vegetation near water. These requirements are as readily met in fens as in other wetland habitats, including the margins of ponds, rivers or even farmland drains. The marsh slug is even more widespread and frequently turns up in wet glades within woodland.

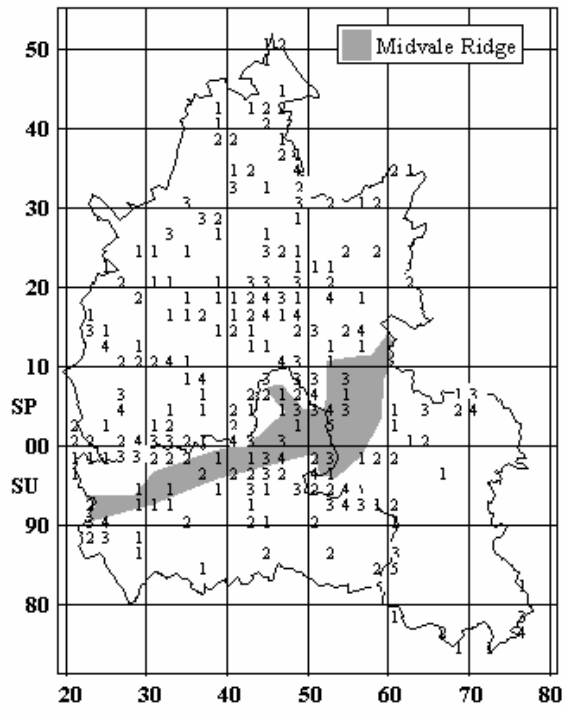

Figure 3. Coincidence plot of the Oxfordshire distribution of common wetland species recorded from the county's valley-head fens. Species plotted: *Oxyloma pfeifferi, Succinea putris, Vallonia pulchella, Zonitoides nitidus and Deroceras laeve* (records from Oxon BRC)

The remaining five species have a local distribution across Britain. Coincidence plotting the distribution of these species across Oxfordshire (figure 4) indicates, as expected, that they are much more locally distributed. They tend to be associated with the less disturbed of the county's wetlands and there is a much stronger association with the county's valley-head fens, especially those of Sandford Brook catchment (centred on SU4698). It also highlights the Thames-side marshes in the south of the county (around SU5882). The occurrence of these five species within Oxfordshire's valley-head fens is looked at in more detail below.

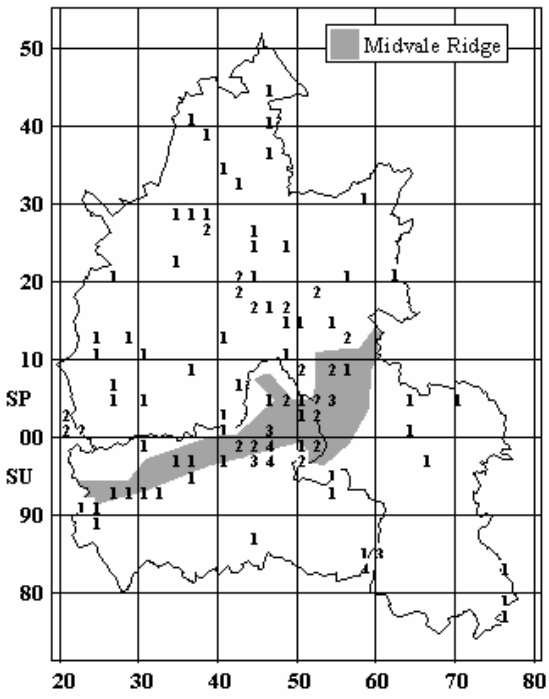

Figure 4. Coincidence plot of the Oxfordshire distribution of local or rare wetland species recorded from the county's valley-head fens. Species plotted: *Vertigo antivertigo, V. substriata, V. moulinsiana, Euconulus alderi* and *Ashfordia granulata* (records from Oxon BRC)

The silky snail (*Ashfordia granulata*) (figure 5) was first recorded at Lye Valley, Oxford, in 1857. It has proved to be patchily distributed along the Midvale Ridge and elsewhere in the county, usually at wet sites with rough vegetation or shade, including carr woodland. At up to 9 mm in width this is a medium sized species. The pale shell has a characteristic silky appearance (hence vernacular name) caused by numerous fine hairs. Although quite frequent in parts of Britain it is very rare in Europe and consequently listed as a species of 'conservation concern' on the UK Biodiversity Action Plan (Anon 1998).

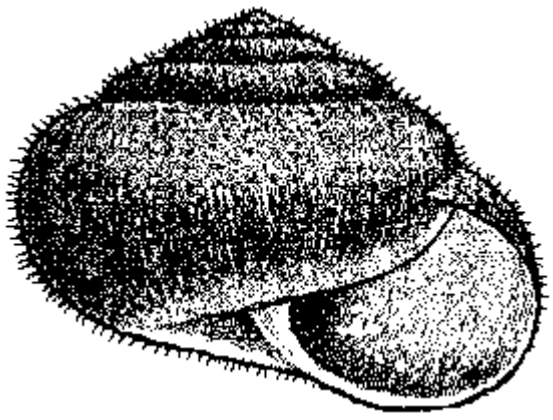

Figure 5. Silky Snail, *Ashfordia granulata*

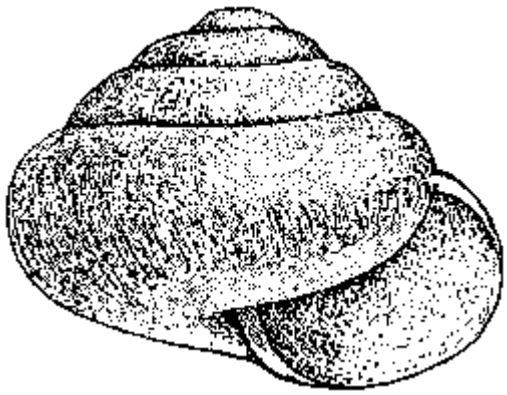

Figure 6. Tawny Glass Snail, *Euconulus alderi*

The largest proportion of the county's records for the tawny glass snail (*Euconulus alderi*) (figure 6) is from the fens of the Midvale Ridge. However, is also widely scattered in a variety of wet sites across the county, including flood meadows and wet woodlands. It is a small species with the top shaped shell reaching about 2.5 mm in diameter. It is only in recent decades that this species has been recognised as distinct from the common *E. fulvus* so older records do not differentiate between the two.

The remaining three are very scarce in the county. They are the marsh whorl snail (*Vertigo antivertigo*), the striated whorl snail (*V. substriata*) and Desmoulins' whorl snail (*V. moulinsiana*). Although minute and rarely exceeding 2.5 x 1.5 mm in size, the whorl snails are readily recognised by the small 'teeth' within the opening to the shell. They are all rather elusive, but there are specialised methods to locate them. Perhaps the simplest method is to collect bags of moss or sedge-litter from promising sites. This is then dried and shaken through a sieve to allow any snails to drop through. Considering that about one quarter of Oxfordshire's snails are less than 3mm in size, this can be a very productive collecting method for other species too.

Desmoulins' whorl snail (*V. moulinsiana*) (figure 7) is listed in the British Red Data Book (Bratton 1991), that documents rare or threatened species. It is rare and declining throughout Europe. For this reason its habitat is legally protected from destruction under European law and it has been made a priority species on the UK Biodiversity Action Plan (Anon 1998). Within Oxfordshire Desmoulins' whorl snail is a characteristic inhabitant of the fens and seepages of the Sandford Brook catchment. Recently it has been discovered at two Thames-side marshes in the south of the county. Unlike most other whorl snails it does not normally occur amongst ground litter and is often found on vegetation including reeds and sedge tussocks.

Although widespread in the northern and western Britain, the striated whorl snail (*Vertigo substriata*) (figure 8) is very rare in south-eastern England (Kerney 1999) and declining in many lowland areas. There are just five Oxfordshire sites, all discovered since the late 1980's, centred on the valley-head fens of the Midvale Ridge. The discovery of these sites is attributed to increased recorder activity rather than species expansion (Gregory 2000). Unlike the other two whorl snails it favours shady sites and occurs amongst moss and litter within scrubby fen or carr woodland.

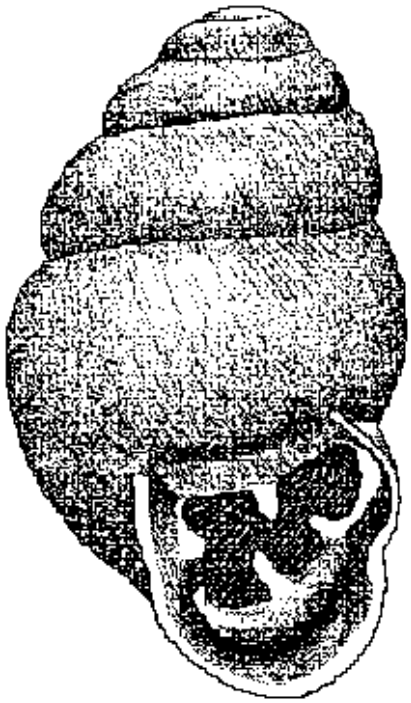

Figure 7. Desmoulins' Whorl Snail, *Vertigo moulinsiana*

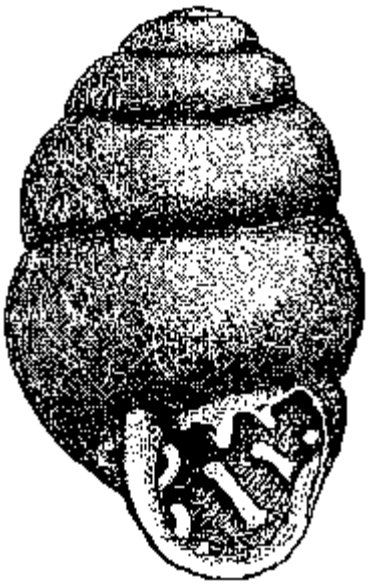

Figure 8. Marsh Whorl Snail, *Vertigo antivertigo*

First recorded from near 'Weston-on-the-Green' in 1857, the marsh whorl snail (*Vertigo antivertigo*) (figure 9) is the most widely distributed of the three across the county. It seems to have been more widely recorded in the past, but most of the modern (post 1985) records are from the Midvale Ridge. Here it characteristically occurs amongst wet ground-litter or moss in open fens, but also inhabits a few riverside marshes.

Another minute (about 2.3 x 0.8 mm) and elusive county rarity, the point snail (*Acicula fusca*) (figure 10) has also been recorded from a few valley-head fen sites. Normally this is a characteristic snail of ancient deciduous woodland with the majority of Oxfordshire records originating from the ancient beech woods of the Chiltern Hills (Gregory and Campbell 2000). The first county record was made in 1857 from Stow Wood just north of Oxford (Grensted, in Salzman 1938). Surveys in the 1990's have shown the species to be present at other sites around Oxford, where it typically inhabits wet moss around small springs at the wooded edges of fens.

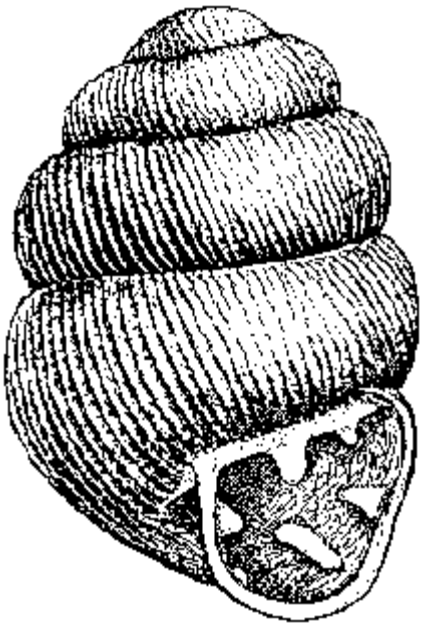

Figure 9. Striated Whorl Snail, *Vertigo substriata*

Figure 10. Point Snail, *Acicula fusca*

Their fussy habitat requirements, intolerance to human disturbance and very poor dispersal rates to new sites means that these whorl snails and the point snail make very reliable indicators of undisturbed semi-natural habitats (Kerney & Stubbs 1980). Unfortunately, all are declining over much of lowland England, primarily due to habitat destruction (Kerney 1999). It is a testament to the undisturbed nature of Oxfordshire's valley-head fens that these vulnerable species have survived. In fact most of the modern (post 1985) records for the three whorl snails are from the valley-head fens of the Midvale Ridge.

Species of man-made habitats

One apparent, but unwelcome, change in snail fauna of Oxfordshire's valley-head fens is the colonization of some sites by recent accidental introductions that are usually associated with sites of high human disturbance. This is most apparent, and perhaps not unexpected, at the Lye Valley, a site that lies within Oxford City. Here three introduced species, Draparnaud's glass snail (*Oxychilus draparnaudi*), the Budapest slug (*Tandonia budapestensis*) and Sowerby's slug (*Tandonia sowerbyi*) are now present in large numbers. The first two were unknown in the county until early in the 20th century (Kerney 1999). The worm slug (*Boettgerilla pallens*), a species unknown in Britain until the 1970s has been collected from Limekiln Copse, west of Oxford. All four species are considered indicative of human disturbance and are widespread in gardens and churchyards across the county, particularly in Oxford City. A more detailed account of the expansion of such species in the county is given in Gregory (2000).

Discussion

Of the 91 species of snail and slug listed in the county atlas (Gregory and Campbell 2000), most live unobtrusively in the countryside. For the majority their distribution is determined by humidity and, in the case of snails, the availability of lime for shell building. In addition many require sites where there has been a long history of stable

land use. Unlike many of the rare soldier flies (*Diptera: Stratiomyidae*) (Porter this volume) known from Oxfordshire's valley-head fens, there are no snail or slug species dependent on the occurrence of lime-rich tufa or marl deposits. Molluscs simply require undisturbed moist and lime-rich conditions. The valley-head fens of Oxfordshire fulfil these requirements and it no surprise that they have proved to be an important habitat in terms of both diversity and rarity of their associated terrestrial mollusc fauna.

It is apparent that there have been major changes in land use during the last century. Intensification of farming and forestry and loss of land through housing and road-building have considerably altered the countryside. Several factors have affected Oxfordshire's fens. For example, peat ('turf') cutting was practised at some sites (e.g. Barrow Farm Fen) and most sites would have been used for rough grazing. Today drier land surrounding the remaining fens tends to be put down to arable production and the traditional management has ceased. Most sites have been subjected to partial drainage and the effects of fertiliser run-off. The effect on the vegetation has been a general shift from botanically rich short turf vegetation, with blunt-flowered rush (*Juncus subnodulosus*), towards tall herb fen communities in which reeds (*Phragmites australis*) become more prominent.

Considering the fussy habitat requirements of many wetland snails (Kerney and Stubbs 1980) it would be expected to observe similar changes in the associated mollusc fauna. Few snails tolerate dense reedbeds, but equally we should be aware that many species are intolerant of heavy grazing or mowing, methods that could be used to maintain botanical interest. It is apparent that many wetland snails have declined considerably in south-eastern England and many known sites have been lost (Kerney 1999). There is no evidence that snails of Oxfordshire's valley-head fens have declined in the last century (Gregory 2000). In fact increased recorder effort in recent decades has brought to light previously overlooked colonies of elusive species such as the Whorl Snails.

One reason that this characteristic valley-head fen fauna has survived is that for many invertebrates a viable population can be maintained by a much smaller area of suitable habitat than is possible for the majority of plants and vertebrates (Kirby 1992). At some valley-head fens where reedbeds are prominent it is apparent that small pockets of more diverse vegetation survive on wetter ground around springs and flushes. A good example of this is at College Pond (SP5408). Here the striated whorl snail mainly occurs in small patches where blunt-flowered rush, kept wet by small springs, survives within the dense reedbeds. Provided such pockets are maintained by springs, colonies of this and other vulnerable species should survive. Unfortunately individual colonies at many sites tend to be rather isolated and potentially vulnerable to localised extinction. The poor dispersal rates of such specialised snails means that once extinct on a site the species is unlikely to recolonise. It is important that site management takes in to account these, and other scarce and vulnerable invertebrates.

Although the snails and slugs of Oxfordshire's valley-head fens all have different habitat preferences there are nonetheless general guidelines that we need to be aware of if we are to conserve them. The most important factor is to maintain current water levels. Any changes, whether drying out or increased flooding, could be damaging. If deemed necessary, grazing is best kept extensive and at a low intensity. Likewise mowing should not be undertaken regularly or over an entire site. Encroachment by dense scrub should be minimised (but be aware that mature carr woodland is an

extremely important habitat in its own right). Finally dense stands of reeds should not be encouraged.

It is clear that the wetland mollusc fauna of Oxfordshire's valley-head fens is of considerable importance. The nationally rare Desmoulins' whorl snail is listed on the UK BAP that documents species of global significance. This, and another county rarity, the striated whorl snail are virtually confined to the fens of the Midvale Ridge. The fauna is not restricted to wetland species, but also includes woodland species, such as the nationally notable point snail, and several local species including the tawny glass snail and the silky snail. The latter is also a UK BAP species. Most of these species are known to have declined in many parts of lowland England (Kerney 1999). It is a testament to the undisturbed nature of Oxfordshire's valley-head fens that these highly habitat-specific and declining species have survived. However, the fauna is not static. The apparent colonisation of two sites near Oxford by several species characteristic of human disturbance is of concern and may be an indication of future long-terms trends.

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