

Land Snails in the British Isles

By Robert Cameron
Illustrated by Gordon Riley



Keys for the identification of Land Snails in the British Isles

By Robert Cameron

Illustrated by Gordon Riley



First Edition 2003, Second Edition 2008

© FSC 2003, 2008

ISBN 978-1-85153-890-4

Occasional Publication 79

ACKNOWLEDGEMENTS

A test version of these keys was circulated by AIDGAP/FSC in 1994. I am grateful to Steve Tilling, who supervised its production and distribution, and who analysed the feedback from users. The long delay in producing a revised version is partly due to the intrusion of other duties on me, but also to struggling to find ways of accommodating valid criticisms made by users. Rebecca Farley encouraged me to persist, and was invaluable in the production of the revised version.

Most of the illustrations are by Gordon Riley. Some are taken from the *Field Guide to the Land Snails of Britain and North-West Europe* (Kerney and Cameron, 1979), by kind permission of the publishers, HarperCollins. Others were made especially for these keys, and I thank the Linnean Society of London for an NERC grant to commission them. No one could ask for a more skilled, patient and amiable partner than Gordon. A small number of illustrations are by Beata Pokryszko, made originally for her monograph on the Vertiginidae of Poland (Pokryszko, 1990), and I am very grateful for permission to use them.

I should also like to thank Dr. Mary Seddon, and the National Museum of Wales for the loan of specimens. Finally, I owe heartfelt thanks to my wife, Dr. Margaret Redfern, both as the co-author of the original 1976 key, and for encouragement and support thereafter.

This revised edition, apart from correcting a few mistakes, and adding newly determined species, differs from the original chiefly in the changed nomenclature. Shortly after the first edition, a revised official checklist of the non-marine molluscs of Britain and Ireland was provided by Anderson (2005). This in turn has been revised, and I am grateful to Roy Anderson and the Conchological Society of Great Britain and Ireland for permission to use the most recent version still in press.

CONTENTS

Acknowledgements	ii
Introduction	1
Notes on biology, habitats and distribution	2
Collection and preservation	4
Systematic list of land snails in the British Isles	6
Identification using the Keys	11
Glossary of terms and measurements	14
Key 1: Pictorial Key to Families	20
Key 2. General Key to Families	24
Key 3. Annotated Key to species by Groups	31
A. Pomatiidae	31
B. Aciculidae	31
C. Ellobiidae and Carychiidae	31
D. Succineidae	33
E. Cochlicopidae	34
F. Pyramidulidae	35
G. Vertiginidae	36
H. Chondrinidae	45
I. Pupillidae and Lauriidae	45
J. Valloniidae	46
K. Enidae	48
L. Discidae, Helicodiscidae and Punctidae	49
M. Vitrinidae	50
N. Gastrodontidae, Oxychilidae and Pristilomatidae	51
O. Euconulidae	56
P. Ferussaciidae	56
Q. Clausiliidae	57
R. Helicoidea	60
Key 4. Keys to internal characters	72
The reproductive system	72
Simple guide to dissection	73
A. Carychiidae: <i>Carychium</i>	75
B. Succineidae	76
C. Vitrinidae: <i>Vitrina pellucida</i> and <i>Phenacolimax major</i> ,	77
D. Helicoidea: <i>Trochulus</i> spp. and <i>Pseudotrachia rubiginosa</i>	78
E. Helicoidea: <i>Cepaea nemoralis</i> and <i>C. hortensis</i>	79
References	81
Index to species and Families/Superfamilies	83

INTRODUCTION

Land molluscs in the British Isles belong to two subclasses of the Class Gastropoda, which includes a far larger array of marine and freshwater species. Primitively, gastropods have a single coiled shell into which the animal can withdraw, and this character is retained by most, but not all terrestrial species.

Only two terrestrial species in the British Isles belong to the subclass Prosobranchia, which is mainly aquatic. They have an operculum, or horny lid, carried on the foot, which seals the mouth of the shell when the animal is withdrawn. The sexes are separate.

All the remaining species belong to the subclass Pulmonata, characterised by the presence of a lung in the mantle cavity. The Pulmonates are hermaphrodite. Most are outcrossers, exchanging spermatophores containing spermatozoa at mating. Others self-fertilise, at least some of the time; in some, parts of the male reproductive system may be lost.

Amongst the Pulmonates, a practical distinction is made between **snails**, which retain coiled shells into which they can withdraw, and **slugs**, in which the shell is completely internal, and reduced to a small plate or a few granules, or in which, although external and visible, it is far too small to contain the animal.

Slugs are not included in these keys. Most can be identified using Cameron, Eversham and Jackson (1983), or Kerney and Cameron (1979), but there is no single up-to-date guide to species in the British Isles. Accurate determination of many species now depends on dissection.

The keys do include snails in the family Vitrinidae, which are sometimes referred to as "semislugs", because when active, the shell is partly covered by the body (see Plate 2, p. 40). The slug or semislug form has evolved many times, and the distinction made here is less easy in some other parts of the world.

The keys also exclude introduced species confined to such places as greenhouses and botanic gardens. Kerney and Cameron (1979) illustrate some of these exotics. I have also excluded introduced species recorded in the wild that are believed to have died out in Britain, and all species that are known only in subfossil condition. Kerney (1999) provides illustrations and distribution of finds for the latter.

As the keys do not include freshwater species, care is necessary when identifying specimens taken from wetland or riverbanks. Macan (1969) provides keys to freshwater snails.

These keys are designed to replace the single dichotomous key to all species provided in *British Land Snails* (Cameron and Redfern, 1976). That key was long, and entirely artificial. Here, I have provided two keys (pictorial and dichotomous) to families or groups of similar families, and then separate keys to the species within each group. The keys rely **mainly** on shell characters, which allows the identification of empty shells; external features of the body are used where they are useful. In a few cases, identification requires dissection, and this is dealt with separately in a final set of keys.

Over recent years, there have been many taxonomic revisions, and new species have been discovered living in the wild. For the sake of consistency, I have generally adopted the nomenclature in the latest approved checklist of British and Irish land molluscs (Anderson, 2005), incorporating later revisions to that list. The Systematic List section gives more details. I do not give a comprehensive account of each species. Kerney (1999) is an indispensable guide to distribution, while Kerney and Cameron (1979) provide more detailed descriptions and more coloured illustrations.

NOTES ON BIOLOGY, HABITATS AND DISTRIBUTION

These notes give only the bare essentials to assist collection and identification. A fuller account is given in Kerney and Cameron (1979).

Land snails in the British Isles either lay eggs, or are ovoviviparous, where the eggs hatch inside the mother. Eggs are usually laid in clutches; the larger helicoid species may lay 50-200 eggs in one clutch. Smaller species lay fewer eggs; some may deposit single eggs rather than a clutch. Most species have extended breeding seasons, and adult and juvenile shells can be found at any time of year. Most breed in spring, summer or autumn. Activity is low in winter, and some species hibernate, secreting a thick and calcified mucus epiphragm over the mouth of the shell. Dry spells at other times of year may halt growth and breeding.

Land snails develop directly, without any metamorphosis. Small juveniles emerge from the eggs and grow by adding whorls to the shell. There is usually a determinate adult size: growth ceases, and the mouth of the shell may be strengthened with a lip, and with teeth or lamellae (see p. 17). Most species live for a year or less, often dying after breeding. Some, especially the larger species, may take two or more years to reach adulthood, and may breed for several years thereafter.

The shells of most species contain a lot of calcium carbonate, and calcium is an important component of their diet. Calcium-rich soils tend to have a different structure from those that are calcium-deficient, and this also favours snails. The most diverse and abundant faunas tend to occur on calcium-rich soils with high pH. Some species appear to be more-or-less restricted to such soils, and are called calcicoles, but most tolerate a wider range; they become less abundant and harder to find as soil acidity increases. Very acid habitats, such as heather moorland or blanket bog, may have no snails at all, and there are very few species that tolerate the conditions in conifer plantations.

The skin of snails is wet, and a lot of water is used in the production of the mucus (slime-trails) made when the snail is crawling. Moisture is a critical factor. Snails are generally nocturnal, but will emerge in daytime in, or just after, wet weather particularly if it has been dry for some time previously. When conditions are dry, they "aestivate", remaining inactive, and usually hidden. They may secrete a thin "summer epiphragm" of dried mucus over the mouth of the shell. Some species, though, rest in the open, on the stems and leaves of plants, or on rocks.

The snail fauna of the British Isles is profoundly affected by Pleistocene and Holocene climatic changes. At the last glacial maximum, ca 18,000 - 14,000 BP, only a very few species survived in the extreme south. As the climate got warmer, and forest advanced across the islands, species associated with forest and lowland wetland advanced, while species with Arctic-Alpine affinities retreated north or uphill. Many of the latter have disappeared from the British Isles. Immigration was of course curtailed by the eventual opening of the English Channel.

The pre-Neolithic landscape of Britain, at the "climatic optimum", was dominated by forest, with extensive wetlands. Hence, the great majority of our native fauna consists of species with forest or wetland affinities. From the Neolithic onwards (Evans, 1972), humans cleared forests and drained wetlands, creating new, more open and drier environments. The open country fauna, previously mostly confined to sand dunes, could expand, and trade, migrations and conquests across the English Channel and Irish Sea resulted in the introduction and spread of non-indigenous species from the south, adapted to drier and more open environments.

The modern fauna can be categorised, broadly, as follows:

1. **A forest fauna**, which has survived, more-or-less intact, in ancient woodlands on limestone. Many species in this group are tolerant of moderate disturbance, and are still widespread and common, even in habitats like hedges and gardens. This is the largest group.
2. **Wetland faunas**, more demanding in their requirements, which have suffered rather more from human disturbance. They contain most of our rare and endangered species. There are big differences between the faunas included here, as for example between lowland lake shores and reedbeds, and high, open calcareous flushes in the mountains.
3. A rather specific **rock-dwelling fauna**, particularly associated with limestone. Some species tolerate shade, and there is an overlap with the forest fauna above. Others require exposure, and some have colonised walls and ruins. This fauna may be especially vulnerable to airborne pollution.
4. **A fauna of dry, calcareous grassland and sand dunes**. This fauna contains many species thought to have been introduced by humans.
5. **A fauna of gardens, parks, and other highly disturbed places**. Many members of the forest fauna have adapted to this set of habitats, and there are also many introduced species; the best known is the archetypal garden snail *Cornu aspersum* (p. 63).

Snails can be remarkably tenacious. Despite massive human disturbance, we know of no extinction of a native species in the British Isles over the last 5,000 years (earlier extinctions are a result of natural, climate-induced habitat change). Small fragments of suitable habitat can retain very rich faunas, and around half of the whole fauna can be regarded as common and widespread. Only a quarter are really rare; the remainder show varying degrees of geographical restriction. Because it is an immigrant fauna, there are no endemics, with the possible exception of the British and Irish form of *Pyramidula pusilla* (p. 35), which may be distinct from continental congeners.

A significant proportion (ca 20%) of the fauna found in the wild is thought to be introduced, accidentally or deliberately. Most of these introduced species are Helicoids, the largest and most conspicuous of our snails. Some long-standing introductions, like *Cornu aspersum* (p. 63), are now widespread, even in old woodland. Some more recent ones have remained very restricted, like *Trochoidea elegans* (p. 61), while others, like *Hygromia cinctella* (p. 61), have recently spread rapidly across England and Wales.

Some native species, perhaps especially Clausiliidae, have been badly affected by atmospheric pollution and acid rain. With deindustrialisation and legislation, many northern English cities are being recolonised by a number of species. The protection of many woodlands, and the broad tolerance of many forest species means that this fauna is less at risk than those of the various wetlands, which often survive as tiny patches, vulnerable to very localised disturbance.

COLLECTION AND PRESERVATION

Snails may be collected by hand in any habitat. In damp weather, the larger species can be found active, but in dry conditions it is necessary to turn over logs or stones, or to search at close quarters in leaf-litter or at the base of grasses and sedges. Some species climb trees, or go up lower vegetation; beating the vegetation over a tray may yield some specimens.

There is a huge size range amongst the shells of different species. The adult shell of the smallest, *Punctum pygmaeum*, (p. 50) is only 1.5mm wide, while that of the largest, *Helix pomatia* (p. 63) is more than 40mm. Many species have a maximum shell dimension of less than 4mm, and may be dull brown in colour. They are easily missed when searching by eye in the field, especially in bad light (the inside of a wood on a rainy day, for example). Collecting litter and surface soil, and examining it under good lighting indoors will often add several species not found in the field search. This examination is made easier by letting the litter dry, and passing it through a set of graded sieves, examining each fraction separately. The smallest mesh should be about 0.5mm, small enough to retain all adult shells and nearly all juveniles. Fine particles passing through this sieve can be discarded. For quantitative studies, it may be necessary to remove all the litter from quadrats of a particular size.

With a little experience, many of the larger species can be recognised on sight, and there is no need to collect a lot of live individuals if a record is kept in the field. Especially in calcareous sites, it is easy to find fresh, but empty, shells, which can be identified, and can form part of a reference collection.

Snails are fairly tough. They can be collected into tubes or plastic bags in the field. If they are not to be worked on immediately, however, they should be placed in dry, non-airtight containers, usually cardboard boxes. Larger species will survive, inactive, in such containers for several days, or even longer. If slugs are collected at the same time, they should either be held separately from the start, or transferred as soon as possible to glass or plastic containers, not airtight, with damp paper and food. They die very quickly in dry conditions. They also leave slime all over other specimens.

For most species, the shell carries the features needed for identification. Empty shells, when thoroughly dry, can be stored in any container, but it is a good idea not to make it airtight. Glass or plastic tubes should be stoppered with cotton wool or something similar. Living specimens required whole for a collection should be killed (see below), then preserved in 70% alcohol. For those without laboratories, keeping such material is not recommended; if you have important specimens, it is better to find a home for them in a professionally maintained collection.

When only the shell is required, but the animal is alive, it can be killed by immersion in boiling water. Many small species die anyway if kept in dried litter for any length of time. For large shells (10mm+ diameter), it is usually possible to remove the body with a bent pin, or with fine forceps, applying an unscrewing movement as the body is pulled. Some parts may remain behind, but as with smaller shells, where removing the body is too difficult, the remains can be left inside, and the shell stored, once the whole is thoroughly dry.

If a dissection is required, it is better to drown the animal in deoxygenated (boiled) water in a sealed container. This may take 24 hours; it can be speeded up by gently warming the container, or by adding a few drops of alcohol at half hourly intervals.

When this is done, the animal dies fully extended, and is much easier to dissect. The body can be removed in the same way as above. Further instructions on dissection are given on page 73.

Any collection should be properly labelled. The minimum requirements are the species name, a locality name and grid reference, the date of collection, the habitat, and who collected and determined the specimens.

SYSTEMATIC LIST OF LAND SNAILS IN THE BRITISH ISLES

In recent years, the higher level classification (families, subfamilies, even genera) of land snails has been very unstable. Revisions, in principle cladistic, based on shell and body morphology, have been supplemented by an increasing number of molecular studies. A significant number of snail species are self-fertilizing, making some definitions of species inapplicable.

At the level of identifying species in the British Isles, this instability results, for the most part, in purely nomenclatural changes. Even these can be confusing when trying to find more information about a particular species. There are a few cases where the status of a species is in doubt: these are mentioned at appropriate points in the keys. Where there is doubt about the identity or integrity of a species, cf. is inserted between the generic and trivial names.

The first edition of this key (Cameron, 2003) used the nomenclature given in Kerney (1999), *Atlas of the Land and Freshwater Mollusca of Britain and Ireland*, as this was, and is, the most useful companion to this key. Subsequently a new standard checklist (Anderson, 2005) introduced major changes, and has subsequently been further revised. Since these changes are now incorporated into the Conchological Society of Great Britain and Ireland's recording scheme, the most recent version (soon available online at the Conchological Society's website: www.conchsoc.org) has been used here, except that I have omitted any reference to subspecies. In my view these are irrelevant in the context of recording. I have also retained a traditional sequence of families, rather than the alphabetical order adopted by Anderson. An alternative checklist (differing only in small details) is given by Bank, Falkner and von Proschwitz (2007). Synonyms are given mainly where there is a change from the name used in Kerney (1999). I would emphasise that these nomenclatural problems do not prevent the accurate and useful identification of the species dealt with here.

Species extinct in the British Isles (native or introduced) and those confined to glasshouses *etc.* are excluded.

Asterisked species are additional to those listed in Cameron (2003).

CLASS GASTROPODA

SUBCLASS PROSOBRANCHIA

Order Mesogastropoda

Family Pomatiidae

Pomatias elegans (O.F. Müller, 1774)

Family Aciculidae

Acicula fusca (Montagu, 1803)

SUBCLASS PULMONATA

Order Basommatophora

Family Carychiidae

Carychium minimum O.F. Müller, 1774

Carychium tridentatum (Risso, 1826)

Family Ellobiidae

Myosotella myosotis (Draparnaud, 1801)

Syn: *Ovatella myosotis*

**Myosotella denticulata* (Montagu, 1803)

Leucophytia bidentata (Montagu, 1808)

Order Stylommatophora

Family Succineidae

Quickella arenaria (Potiez & Michaud, 1835)

Syn: *Catinella arenaria*

Succinella oblonga Draparnaud, 1801

Syn: *Succinea oblonga*

Succinea putris (Linnaeus, 1758)

Oxyloma elegans (Risso, 1826)

Syn: *Oxyloma pfeifferi*

Oxyloma sarsii (Esmark, 1886)

Family Cochlicopidae

Azeca goodalli (A. Férussac, 1821)

Cochlicopa cf. *lubrica* (O.F. Müller, 1774)

Cochlicopa cf. *lubricella* (Rossmässler, 1834)

NOTE: further details on *Cochlicopa* on page 35.

Family Pyramidulidae

Pyramidula pusilla (Vallot, 1801)

Syn: *Pyramidula rupestris*

Family Vertiginidae

Columella edentula (Draparnaud, 1805)

Columella aspera Waldén, 1966

Truncatellina cylindrica (Férussac, 1807)

Truncatellina callicratis (Scacchi, 1833)

Vertigo pusilla O.F. Müller, 1774

Vertigo antivertigo (Draparnaud, 1801)

Vertigo substriata (Jeffreys, 1833)

Vertigo pygmaea (Draparnaud, 1801)

Vertigo moulinsiana (Dupuy, 1849)

Vertigo modesta (Say, 1824)

Vertigo lilljeborgi (Westerlund, 1871)

Vertigo genesii (Gredler, 1856)

Vertigo geyeri Lindholm, 1925

Vertigo alpestris Alder, 1838

Vertigo angustior Jeffreys, 1830

Family Chondrinidae

Abida secale (Draparnaud, 1801)

Family Pupillidae

Pupilla muscorum (Linnaeus, 1758)

Family Lauriidae

Leiostyla anglica (A. Férussac, 1821)

Lauria cylindracea (da Costa, 1776)

Lauria sempronii (Charpentier, 1837)

Family Valloniidae

Vallonia costata (O.F. Müller, 1774)

Vallonia pulchella (O.F. Müller, 1774)

Vallonia cf. *excentrica* Sterki, 1892

Acanthinula aculeata (O.F. Müller, 1774)

Spermodea lamellata (Jeffreys, 1830)

Family Enidae

Ena montana (Draparnaud, 1801)

Merdigera obscura (O.F. Müller, 1774)

Syn: *Ena obscura*

Family Punctidae

Punctum pygmaeum (Draparnaud, 1801)

Paralaoma servilis (Shuttleworth, 1852)

Syns: *Toltecia pusilla*, *Paralaoma caputspinulae*

Family Helicodiscidae

Lucilla singleyana (Pilsbry, 1889)

Syn: *Helicodiscus singleyanus*

Family Discidae

Discus rotundatus (O.F. Müller, 1774)

Family Vitrinidae

Vitrina pellucida (O.F. Müller, 1774)

Semilimax pyrenaicus (A. Férussac, 1821)

Syn: *Vitrina pyrenaica*

Phenacolimax major (A. Férussac, 1807)

Syn: *Vitrina major*

Family Pristilomatidae

Vitrea subrimata (Reinhardt, 1871)

Vitrea crystallina (O.F. Müller, 1774)

Vitrea contracta (Westerlund, 1871)

Family Oxychilidae

Nesovitrea hammonis (Ström, 1765)

Aegopinella pura (Alder, 1830)

Aegopinella nitidula (Draparnaud, 1805)

Oxychilus draparnaudi (H.Beck, 1837)

Oxychilus cellarius (O.F. Müller, 1774)

Oxychilus alliarius (J.S. Miller, 1822)

Oxychilus navarricus (Bourguignat, 1870)

Syn: *Oxychilus helveticus*. See Anderson (2005) for details.

Family Gastrodontidae

Zonitoides nitidus (O.F.Müller, 1774)

Zonitoides excavatus (Alder, 1830)

Family Euconulidae

Euconulus cf. *fulvus* (O.F. Müller, 1774)

Euconulus cf. *alderi* (J.E. Gray, 1840)

NOTE: Bank *et al.* (2007) recognise three species of *Euconulus* in Britain, splitting the currently recognised *E. alderi* between two earlier described species *Euconulus trochiformis* and *Euconulus praticola*.

See Key 3, page 56

Family Ferussaciidae

Cecilioides acicula (O.F. Müller, 1774)

Family Clausiliidae

Cochlodina laminata (Montagu, 1803)

Macrogastera rolphii (Turton, 1826)

Clausilia bidentata (Ström, 1765)

Clausilia dubia Draparnaud, 1805

Alinda biplicata (Montagu, 1803)

Syns: *Laciniaria biplicata*, *Balea biplicata*

Balea perversa (Linnaeus, 1758)

**Balea heydeni* Von Maltzan, 1881

**Papillifera bidens* (Linnaeus, 1758)

Syn: *Papillifera papillaris*

Superfamily Helicoidea

NOTE: equivalent to Helicidae as used in Kerney (1999). Various conflicting arrangements of families/subfamilies have been proposed.

Candidula intersecta (Poiret, 1801)

Candidula gigaxii (L. Pfeiffer, 1850)

**Cernuella aginnica* (Locard, 1894)

Cernuella virgata (da Costa, 1778)

Helicella itala (Linnaeus, 1758)

Trochoidea elegans (Gmelin, 1791)

Cochlicella acuta (O.F. Müller, 1774)

Cochlicella barbara (Linnaeus, 1758)

Monacha cartusiana (O.F. Müller, 1774)

Monacha cantiana (Montagu, 1803)

Ashfordia granulata (Alder, 1830)

Syn: *Monacha granulata*

Zenobiella subrufescens (Miller, 1822)

Syn: *Perforatella subrufescens*

Pseudotrichia rubiginosa (Schmidt, 1853)

Syn: *Perforatella rubiginosa*

Hygromia cinctella (Draparnaud, 1801)

Hygromia limbata (Draparnaud, 1805)

Trochulus striolatus (C. Pfeiffer, 1826)

Syn: *Trichia striolata*

Trochulus hispidus (Linnaeus, 1758)

Syn: *Trichia hispida*

Trochulus sericeus (Draparnaud, 1801)

Syn: *Trichia plebeia*

NOTE: recent work (Prockow, 2000) suggests that this entity, at least in Britain, may be a form of *T. hispida*. See Key 3, page 60

Ponentina subvoirescens (Bellamy, 1839)

Helicodonta obvoluta (O.F. Müller, 1774)

Arianta arbustorum (Linnaeus, 1758)

Helicigona lapicida (Linnaeus, 1758)

Theba pisana (O.F. Müller, 1774)

Cepaea nemoralis (Linnaeus, 1758)

Cepaea hortensis (O.F. Müller, 1774)

Cornu aspersum (O.F. Müller, 1774)

Syn: *Helix aspersa*

Helix pomatia Linnaeus, 1758.

IDENTIFICATION USING THE KEYS

Before you start

Experience has shown me that there are two extremes in reactions to keys. One is the expectation that a good key should lead simply to the right answer, even in the hands of a beginner. The other, sometimes expressed by experts, is that keys never work well, and that only face-to-face tuition by an expert works properly. The first view leads to frustration, or even despair. The second can have the effect of making identification an arcane professional preserve.

These extremes express aspects of the truth about identification. If species differ, it ought to be possible to describe those differences, or to illustrate them. In some cases, however, the differences may lie in combinations of characters, and their interpretation depends on knowledge of variation within species. Experienced people tend to identify in a holistic way, integrating many characters in coming to a decision. Unravelling these judgements into a step-by-step process can be very hard!

The most efficient way to learn how to identify a given group of animals is to use a key, even a rather inadequate one, but to have an expert at hand to tell you when you have gone wrong, and why. Using a key makes you familiar with the terminology and the "characters" used in identification, and the repeated checking enables you to build up your own holistic picture of each species.

In the absence of a tame expert, there are several things to do which speed up the process of achieving accurate identifications:

- 1. Use more than one source of information.** Different books describe snails in slightly different ways, and illustrations may differ in emphasis. Do you get the same, unambiguous answer with each? Nowadays, it is worth inserting a Latin species name into an internet search engine: you may find a number of good photographic images.
- 2. Keep labelled specimens.** This is easy with snails, because fresh, but empty shells are easily found. The keys generally work well with these. After a while, it will be obvious if you are giving different names to the same species on different occasions, or *vice versa*.
- 3. Get an experienced person to check your specimens.** This will depend on opportunity (and remember that even experts can make mistakes!). Note which of your specimens have been confirmed, and use them for reference.
- 4. Compare your specimens with "authenticated" specimens.** Again, this depends on opportunity. Local museums often have collections, but if they have not been worked on for some time, you may find that the names on the labels are very out of date.
- 5. Do not expect to identify every shell you find.** Especially when you start from scratch, old, broken or juvenile specimens will be difficult. There is a troubleshooting section (p. 13) to help you.

Arrangement of the keys

There are four sets of keys:

KEY 1 (p. 20). A pictorial key to families/superfamilies, based on the general appearance of shells, leading to keys in 3 below.

KEY 2 (p. 24). A dichotomous key to families/superfamilies, with marginal figures illustrating characters used in the couplets. This leads to appropriate keys in 3 below.

Keys 1 and 2 are alternatives. The pictorial key gives quick access to the individual keys in section 3, which may be helpful when the Family is known. It is more strictly based on adult specimens, and does not have the qualifying notes and comments.

KEY 3 (p. 31). Dichotomous and tabular keys to species within each family/superfamily, based on shell characters and external features of the body. Where these are unreliable, the user is directed to the appropriate part of section 4. The principal habitats and status of each species are described very briefly.

KEY 4 (p. 72). Keys to difficult species groups based on internal anatomical characters, for which dissection is required. The section includes a brief guide to dissection, and a general account of the organ systems involved.

Five Families are represented in the British Isles by only one species each. The family keys name the Family and species, but there is a fuller account of each in the appropriate part of Key 3.

Using the Keys

Some species can be identified with the naked eye, but a hand-lens (at least x8) and a ruler are essential equipment. Vernier callipers and a binocular microscope with magnifications up to at least x30 make some determinations much easier.

The keys are mostly of the dichotomous type, presenting alternatives in the form of descriptive couplets. It is important to read **both** alternatives and any additional **notes** before making a decision. Pay attention to emphasised qualifiers like **or**, **and** and **usually**; in many cases it is combinations of characters which determine a pathway through the key. Similarly, all possibilities in pictorial or tabular keys should be considered before moving on.

Difficult determinations. Where  appears before both items in a couplet, experience has shown that the distinction can be hard to make. Special care should be taken in these cases, particularly if the species involved are rare, or the user inexperienced. Comparison with authenticated specimens or confirmation by an experienced person is **strongly recommended**. It is a good idea to build up a small collection of authenticated shells of "difficult" species to make this easier.

Where a species is described as **very rare**, expert confirmation should be sought. The national recording scheme, run by the Conchological Society of Great Britain and Ireland, requires voucher specimens for new vice-county records.

Troubleshooting. The commonest causes of difficulty in identifying snails by their shells are given on the next page. Use the list if your specimen does not fit the description or illustration of the species to which you have assigned it, or if you have difficulty relating your specimen to either part of a couplet.

Common causes of difficulty in identification

(a) **The specimen may be a juvenile.** Land snails develop directly, and juveniles may be found along with adults at any time of year. They will be smaller than adults, have fewer whorls, and will lack the shell lip and teeth that are characteristic of adults in some, but not all species:

- If the shell has a lip and/or teeth, then it is adult. **But:** Adults of many species have neither.
- Adult shells of all species except Vitrinidae (p. 50) have at least three whorls. The great majority of species have more than four whorls when adult. The major exceptions are *Aegopinella pura* and *Nesovitrea hammonis* (Oxychilidae, p. 51), the Succineidae (p. 33), and the Punctidae (p. 49).
- The range of variation in number of whorls amongst adults of a species is usually small. If the specimen is the right size for its putative species but has fewer whorls, consider the possibility that it may be a juvenile of a larger species.

(b) **Empty shells change in colour and texture with time.** Transparent and translucent shells become opaque, colours fade, and glossy surfaces can become matt as the periostracum wears off the surface. This can happen in living animals, especially amongst the larger, long-lived species.

In lime-rich soils, empty shells may persist for thousands of years in a subfossil condition. Very bleached and empty shells cannot be taken as evidence that the species still lives where the shells are found.

(c) **Shell colour is variable.** Many Helicoidea are polymorphic: a variety of colour and pattern forms may be found within a single population. Many species with coloured or patterned shells occur also as albinos, which can be quite common.

(d) **Very rarely, the coiling of a shell is reversed.** Such cases usually occur in less than 1 in 100,000 specimens. Only the Clausiliidae (p. 57) and two species of *Vertigo* (Vertiginidae, p. 36) are normally sinistral. All others are dextral.

(e) **Distortions and monstrosities** can occur as a result of damage, disease or mite infestation. It is usually obvious that the shell is abnormal.

Any collection made by sieving litter, or by collecting all specimens found at a site will contain juveniles and old and broken shells. It is useful to sort the catch into provisional "species", and then to start the identification process by taking the largest and freshest specimens of each, and work downwards. Smaller specimens can then be compared with larger. **It is to be expected** that some material will be unidentifiable.

GLOSSARY OF TERMS AND MEASUREMENTS

Snail shells have a basic uniformity of structure that means that there are rather few presence/absence characters available. Measurements, ratios and descriptions of shape are particularly important. The figures show the major characters used, and they are explained in this alphabetical glossary. Internal features mentioned in Section 4 are explained in that section, not here.

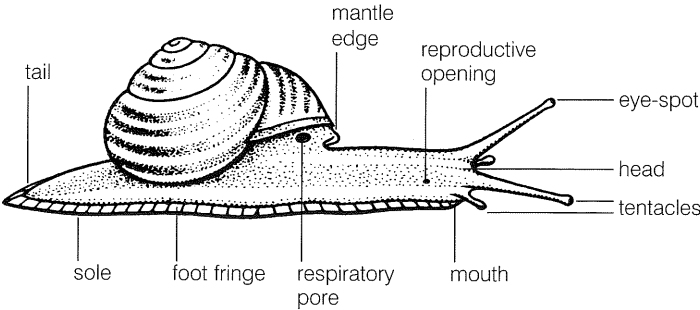


Fig. 1. External morphology of a snail.

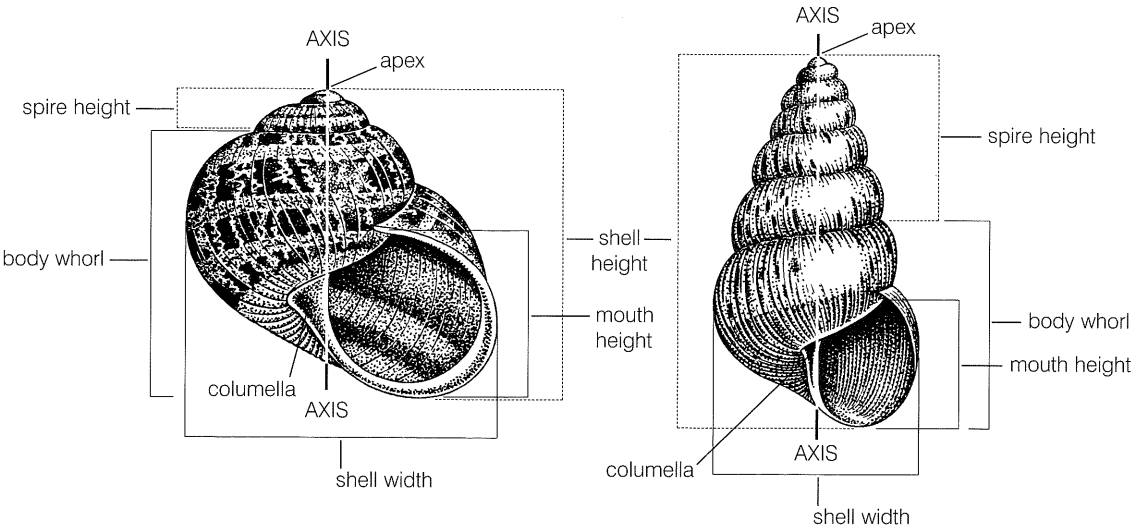


Fig. 2. Shell measurements used in the keys.

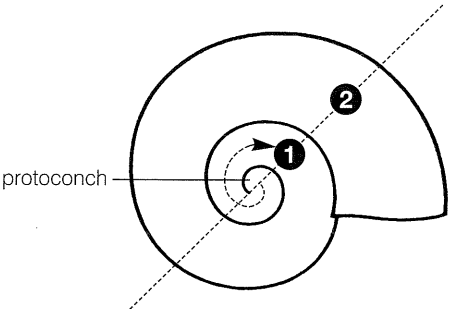


Fig. 3. Counting whorls.

The number of whorls is often an important clue to identification. The figure shows the standard method of counting whorls. The first half turn of the protoconch is ignored, and whorls thereafter estimated to the nearest quarter turn. It is often difficult to decide just where to place the starting point, and this should be allowed for in using the counts.

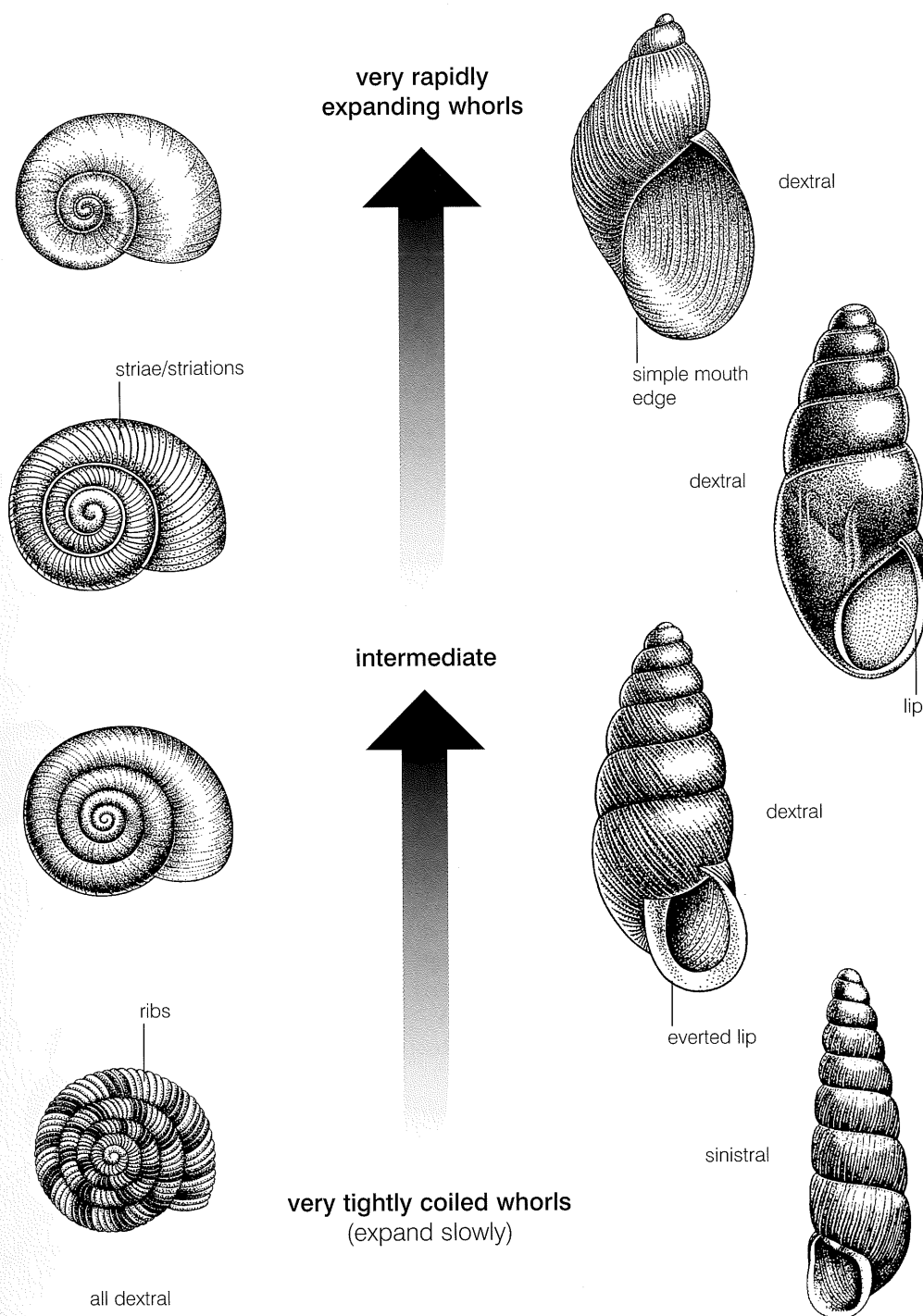


Fig. 4. Terms used to describe shell shape.

- i. Rate of whorl expansion.
- ii. Shell sculpture (ribs and striae).
- iii. Mouth edge and lips.
- iv. Direction of growth (sinistral and dextral).

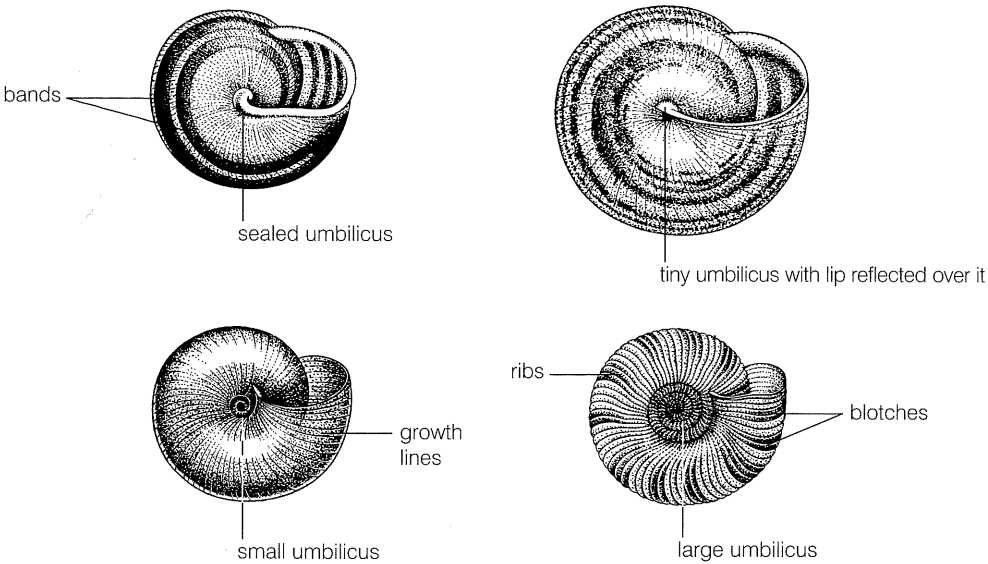


Fig. 5. Various forms of the umbilicus.
Shell sculpture (ribs and growth lines) and shell patterning (bands and blotches).

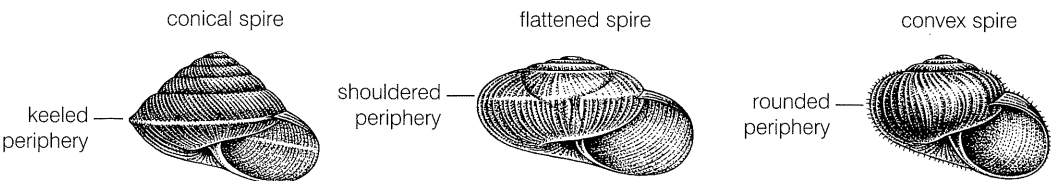


Fig. 6. Terms used to describe the shell periphery and shell spire.

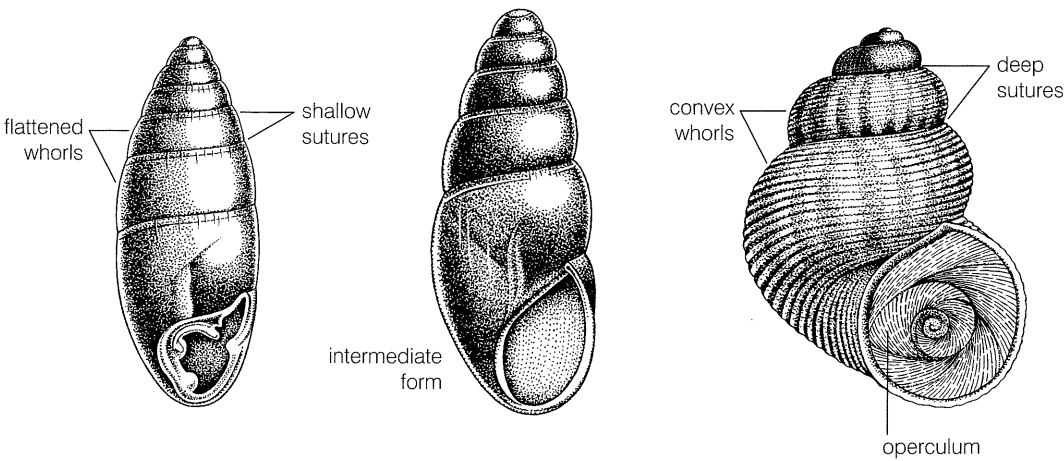


Fig. 7. Describing the whorl shape and sutures.
(In some species the mouth may be sealed by the operculum.)

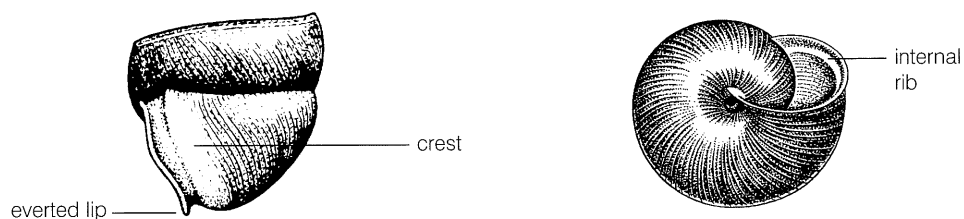


Fig. 8. The mouth edge may: i. thicken into a lip with crest; ii. have an internal rib inside the mouth.

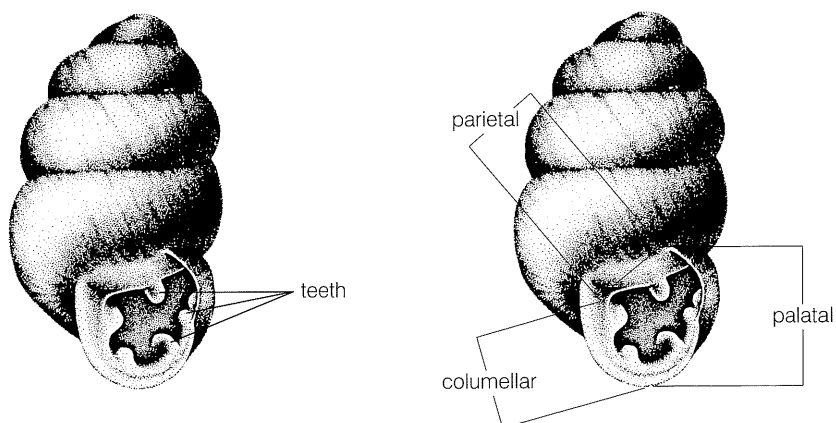


Fig. 9. Terms used to describe regions of the mouth (palatal, columellar and parietal). Teeth may be described by the area they are in (e.g. parietal teeth). Shell shape is ovoid.

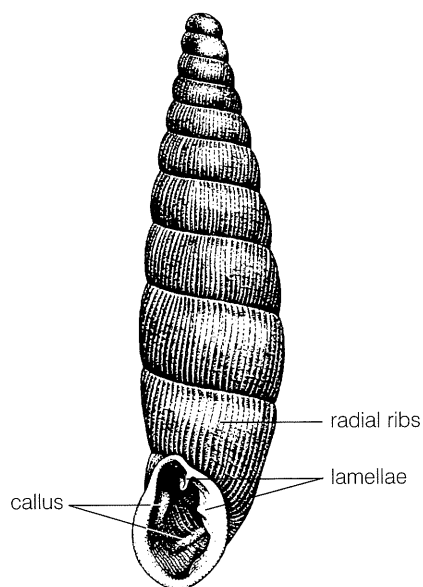


Fig. 10. Inside of mouth showing lamellae (spiral ridges) and callus (callosity – thickening of shell). Shell has external radial ribs.

Apex. The summit, or centre, of the shell, crowned by the **protoconch** (Fig. 2).

Axis. The imaginary line round which the shell coils, and along which the measurement of **shell height** is made (Fig. 2).

Bands. Spiral bands of pigmentation in the shell (Fig. 5).

Blotches. Patches of pigment on the shell (Fig. 5).

Body whorl (or last whorl). The complete **whorl** ending at the **mouth** (Fig. 2).

Callus, callosity. Thickenings of the shell in or near the **mouth** (Fig. 10).

Columella. The solid or hollow pillar of the shell surrounding the **axis**, formed by the inner walls of the **whorls** (Fig. 2).

Columellar. That part of the **mouth** lying on the **columella** (Fig. 9) (see **parietal, palatal**).

Conical. (of the **spire**, or the shell as a whole) Outline with straight sides converging on the **apex**, not bowed outwards (Fig. 6) (see **convex**).

Convex. (of the **spire**, or of **whorls** individually) Rounded and therefore bowed outwards (Fig. 6) (see **conical, flattened**).

Crest. A substantial thickening and swelling of the outside of the shell behind the **mouth** (Fig. 8).

Dextral. Shell coiling clockwise when viewed from above. **Mouth** on observer's right when seen in front view (Fig. 4) (see **sinistral**).

Everted. The **lip** of the shell turns outwards, breaking the smooth curve of the shell outline (Fig. 8) (see **reflected**).

Flattened. (of the **spire**, or of **whorls** individually) **Spire** very low; **whorls** rather flat sided, rather than markedly rounded (Fig. 6) (see **convex**).

Globular. Shell shape rounded (**convex**) both above and below, and not much flattened (Fig. 82).

Growth lines. Rather small and irregular **radial** thickenings on the shell, marking pauses in growth. There is no absolute demarcation with **radial ribs**, which are regular, and more conspicuous (Fig. 5).

Hairs. Hair-like projections of the **periostracum**, present in some Helicoid species. These "hairs" are made as the shell grows, and do not grow themselves. They frequently get worn off.

Keel. A sharp angle (often with shell thickening) made by the **periphery** of the shell (Fig. 6) (see **shouldered**).

Lamella, lamellae. Spiral ridges on the inside of the shell, especially near the **mouth**. Some may terminate in a **tooth** (Fig. 10).

Last whorl. see **body whorl**.

Lip. The thickened edge of the **mouth** in the adult shells of some species (Fig. 4) (see **everted, reflected**).

Mantle. The tissue surrounding the mantle cavity, which forms the lung in Pumonates. The mantle lies just inside the **mouth** in active animals, and is the part exposed inside the **mouth** in resting ones (Fig. 1).

Mouth. This always refers to the mouth of the shell, not of the animal.

Mouth edge. (Sometimes referred to as the peristome in other books). The edge of the shell at the **mouth**. In juveniles and some adults, it is simple. In other adults it may be strengthened by a **lip** (Fig. 4).

Operculum. A horny or calcareous plate, carried on the foot, which seals the shell mouth when the snail withdraws. Found only in Prosobranchs (Fig. 7).

Ovoid. (of the shell shape) +/- egg shaped. Used of shells higher than wide, and convex both above and below the **periphery** (Fig. 9).

Palatal. The outer region of the shell mouth, between the **suture** and the **columella** (Fig. 9) (see **columellar** and **parietal**).

Parietal. the region of the shell mouth made up by the outside of the previous **whorl**, between the **columella** and the **suture** (Fig. 9) (see **columellar** and **palatal**).

Periostracum. The horny outer covering of the shell. It can erode, showing the duller surface underneath.

Periphery. The outer edge of the shell, furthest from the **axis**. It may be rounded, **keeled**, or **shouldered** (Fig. 6).

Protoconch. The shell formed when the embryo is still in the egg, becoming the very tip of the **apex** (Fig. 3).

Radial. (of **ribs**, or **striae**) Aligned so as to radiate from the **axis**, effectively from **suture** to **columella**. In tall shells, radial **ribs** appear vertical (Fig. 10).

Reflected. (of the shell **lip**) **Lip** turned back or outwards, especially over the **umbilicus**, which may be partly or completely obscured (Fig. 5).

Ribs, ribbing. Externally, usually regular, radial thickenings, giving the shell a corrugated appearance (Figs 5, 10). Internally, there may be a rib just behind the **mouth edge** in the **palatal** region in adult shells (Fig. 8).

SHELL MEASUREMENTS. Figs 2 and 3 show all the measurements used in the keys. For larger species, Vernier callipers or a ruler can be used. For very small species, a micrometer eyepiece, or a small piece of ruler or other scale bar that will fit in a dish under a binocular microscope are needed. In the counting of whorls, it is quite hard to establish the starting point (Fig. 3); counts should be treated with a margin of error!

Shouldered. (of the shell **periphery**) The **periphery** is bluntly angular, rather than having a **keel**, or being smoothly rounded (Fig. 6).

Sinistral. Shell coiling anticlockwise when viewed from above. The **mouth** is on the observer's left when the shell is viewed from the front (Fig. 4).

Spiral. (of **bands**, etc) Following the spiral of the **whorls**, parallel to the **sutures** (Fig. 7).

Spire. All of the shell above or inside the last, or **body whorl** (Fig. 2).

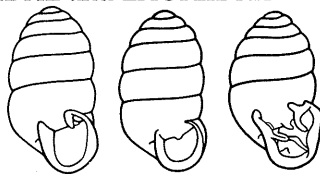
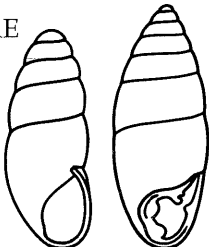
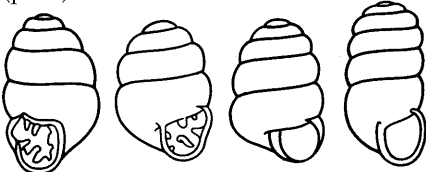
Striae. Fine incised grooves in the shell surface (Fig. 43).

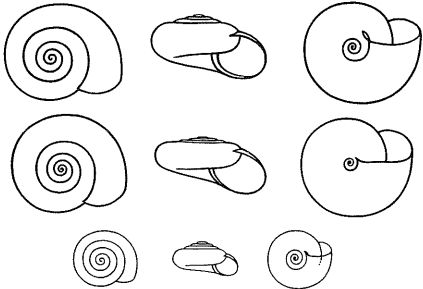
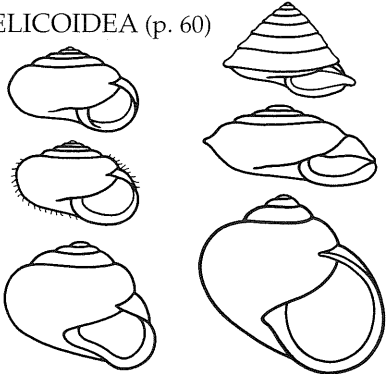
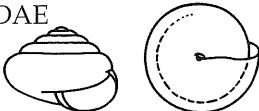
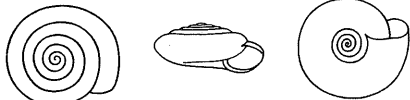
Sutures. The junctions between successive **whorls**. They may be described as deep or shallow (Fig. 7), but remember that these terms are relative; use the illustrations in the key.

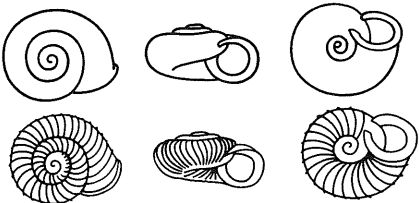
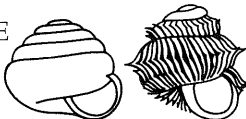
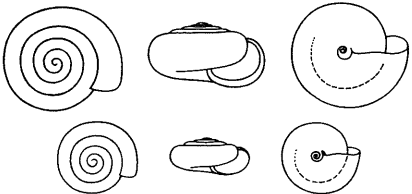
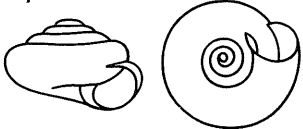
Tooth, teeth. Shelly prominences in or near the **mouth** of the shell. A tooth may represent the end point of a **lamella**, but this is not always the case (Figs 9, 10) The position of teeth (**columellar**, **parietal**, **palatal**) is often important.

Umbilicus. The cavity surrounding the hollow **axis** in some species, visible from below (Fig. 5).

Whorl. Any complete 360° coil of the shell (see **shell measurements**, and Figs 2, 3). Whorls may expand rapidly, or slowly (Fig. 4).

A2 Medium (3-7mm high)	i. Squat, cylindrical or obtusely conical. $\leq 4.5\text{mm}$ high	PUPILLIDAE and LAURIIDAE (p. 45) 
	ii. Very narrow, conical. White	FERUSSACIIDAE <i>Cecilioides acicula</i> (p. 56) 
	iii. Glossy, smooth	COCHLICOPIDAE (p. 34) 
A3 Small (less than 3mm high)	i. Some cylindrical or obtusely conical, squat, <i>may</i> be sinistral. Brownish	VERTIGINIDAE (p. 36) 
	ii. Sharply conical, white, large mouth, rounded whorls	CARYCHIIDAE <i>Carychium</i> (p. 31) 
	iii. Narrowly cylindrical, smooth very flattened whorls, small mouth. Pinkish	ACICULIDAE <i>Acicula fusca</i> (p. 31) 

Shells at least as wide as high (B1, B2, B3)		
B1 Large (7mm+ wide)	i. Flattened, glossy or waxy. No lip. Never patterns or bands	OXYCHILIDAE and GASTRODONTIDAE (p. 51) 
	ii. Less flattened, and/or opaque, or keeled. Often with lip. May have bands or blotches	HELICOIDEA (p. 60) 
B2 Medium (3-7mm wide)	i. Whorls expand very rapidly. No umbilicus. Colourless – greenish. 3 whorls or less	VITRINIDAE (p. 50) 
	ii. Flattened, glossy or waxy. No lip	OXYCHILIDAE (p. 51) 
	iii. Tightly coiled, conical above. No umbilicus	EUCONULIDAE (p. 56) 
	iv. Very flattened, heavily ribbed above	DISCIDAE <i>Discus rotundatus</i> (p. 49) 

B3 Small (less than 3mm wide) At least 3.5 whorls	i. Flattened. Obvious lip. Large umbilicus. White	VALLONIIDAE (p. 46) 
	ii. Conical above. Smooth, ± globular or conical	EUCONULIDAE (p. 56) 
	iii. Globular, with ribs or spines	VALLONIIDAE (p. 46) 
	iv. Flat. Glossy, transparent or whitish	PRISTILOMATIDAE (p. 51) 
	v. Flattened. Matt, brownish, <2.5mm wide	HELICODISCIDAE and PUNCTIDAE (p. 49) 
	vi. Taller spire. Matt. Limestone soils only	PYRAMIDULIDAE <i>Pyramidula pusilla</i> (p. 35) 

KEY 2
GENERAL KEY TO FAMILIES

This key has a conventional dichotomous form. Always read both parts of a couplet before deciding which path to follow. Remember that juveniles are smaller than adults!

1. No external shell (Fig. 11) **SLUGS**
Not taken further in these keys.



Fig. 11

- External shell present 2

2. (1) External shell small and ear-shaped, not capable of containing body (Fig. 12)
..... **SLUGS: Testacellidae:**
Not taken further in these keys.

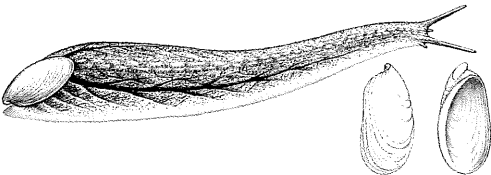


Fig. 12

- External shell more-or-less capable of containing body, and with obvious coiling 3

Note: See Kerney and Cameron (1979) or Cameron, Eversham and Jackson (1983) for slug identification.

3. (2) Height of shell clearly greater than width (Fig. 13) 4

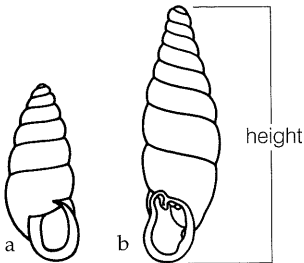


Fig. 13

- Height of shell less than or roughly equal to width (Fig. 14) 17

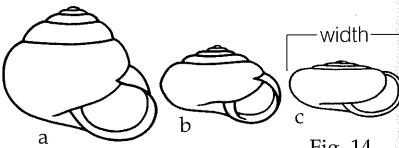


Fig. 14

4. (3) Shell sinistral (Fig. 15) 5

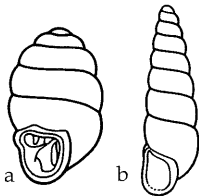


Fig. 15

- Shell dextral (Fig. 16) 6

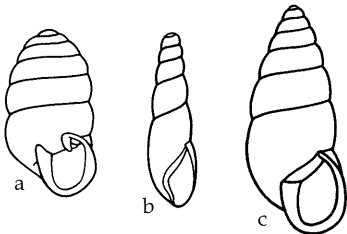


Fig. 16

5. (4) Adult shell always more than 6mm high. If less than 6mm, then a simple narrow cone with no teeth (Fig. 17) **Clausiliidae** (p. 57)

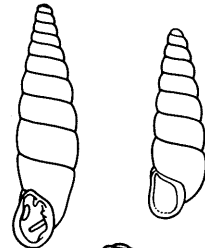


Fig. 17

- Adult shell always less than 3mm high, with many teeth in mouth (Fig. 18) **Vertiginidae** (p. 36)

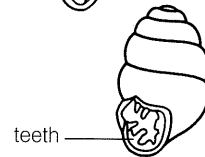


Fig. 18

6. (4) Adult shell less than 3mm high 7

- Adult shell more than 3mm high 9

Note: If specimen does not match the details in couplets 7 and 8, it is probably a juvenile. Follow couplet 9.

7. (6) Shell tapering gently with rather flattened whorls and shallow sutures (Fig. 19). Height ca 2.5x width. No teeth **Aciculidae** (*Acicula fusca*) (p. 31)

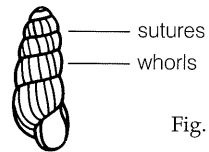


Fig. 19

Notes:

1. Shell shiny, translucent pale brown when fresh, with clear, widely spaced radial striae.
2. Juvenile *Cecilioides acicula* (p. 56) are colourless (white when old), and lack the radial grooves.

- Shell cylindrical or conical with deep sutures and rounded whorls. Height less than ca 2.2x width, usually less than 2.0x. With or without teeth 8

8. (7) Shell colourless/transparent or white. Steeply conical, with large, flaring lips. Three teeth in adult shells (Fig. 20) **Carychiidae** (p. 31)

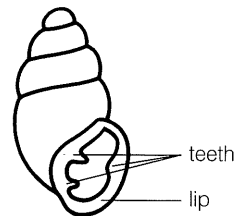


Fig. 20

- Shell dark to yellowish brown. Cylindrical or ovoid. May or may not have teeth (Fig. 21) **Vertiginidae** (p. 36)

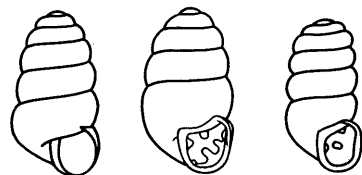


Fig. 21

- 9. (6) Height of mouth nearly or more than half height of shell. Body-whorl 0.67x shell height 10
- Height of mouth 0.4x shell height or less. Body-whorl about 0.5x or less shell height 12

- 10. Adult height more than 12mm, shell height ca 1.5x width (Fig. 22). An operculum in the mouth when alive (empty shells without the operculum are found frequently) **Pomatiidae (*Pomatias elegans*)** (p. 31)

Note: Shell massive and thick, with large, very convex whorls and deep sutures and heavy spiral ribbing.

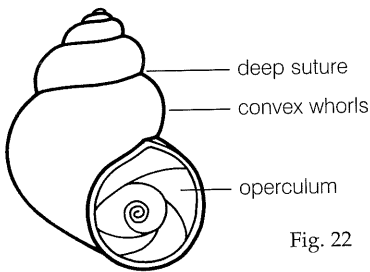


Fig. 22

- Shell height ca 2.0x width or more. Shell never with obvious spiral ribs. No operculum 11

- 11. (10) Shell a smooth opaque cone above, with flattened whorls and shallow sutures. Adults with more than five whorls, and with teeth in the mouth (Fig. 23). Near high tide line only **Ellobiidae** (p. 31)

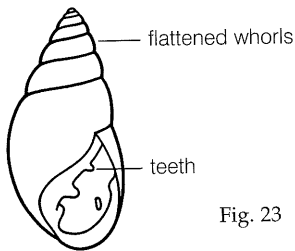


Fig. 23

- Shell with rounded and rapidly expanding whorls, translucent. Always less than five whorls, and with a simple, unthickened mouth without teeth (Fig. 24) **Succineidae** (p. 33)

Note: Succineids live in wet places where freshwater snails are sometimes found, and especially *Lymnaea truncatula*. This species is illustrated at the beginning of the Succineidae key (Fig. 48).

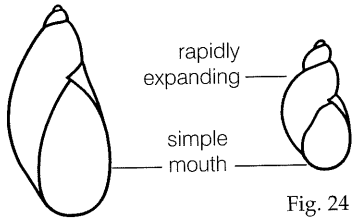


Fig. 24

- 12. (9) Shell a nearly perfect cone, with a small, simple and unthickened mouth (Fig. 25). Shell opaque and whitish, often with dark bands and/or blotches **Helicoidea (*Cochlicella*)** (p. 60)

Note: Adults 7mm high or more.

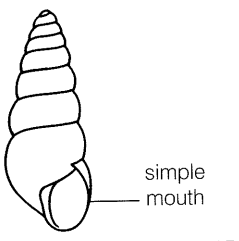


Fig. 25

- Shell various sizes; if conical then brown or lacking bands or blotches, or transparent when fresh 13

13. (12) Shell transparent and colourless when fresh, turning white when old. Very narrow relative to height (Fig. 26), never wider than 1.5mm or higher than 5.5mm **Ferussaciidae** (*Cecilioides acicula*) (p. 56)



Fig. 26

- Shell opaque, or yellow to brown. If transparent and glossy then always more than 1.5mm wide 14

14. (13) Shell 5 to 7.5mm high, very smooth and shiny. Transparent when fresh. Lip small and not everted (Fig. 27) **Cochlicopidae** (p. 34)

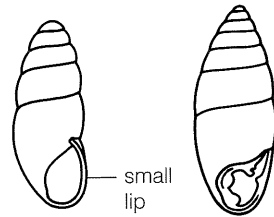


Fig. 27

- Shell various sizes. If smooth, then with a white everted lip 15

15. (14) Adult shell at least 6mm high, with at least 7 whorls and at least 7 teeth in mouth (Fig. 28) **Chondrinidae** (*Abida secale*) (p. 45)



Fig. 28

Notes:

1. Opaque, with fine dense radial ribbing. Dark brown when young (can go grey-purple when old, but alive).
2. Juvenile *A. secale* widen rapidly, being nearly as wide as high when ca 3mm high, hence much wider than Pupillidae (Couplet 16) at the same height.

- Shell size variable. If more than 5mm high, then smooth and without teeth 16

16. (15) Adult shell 7mm or more high, conical. Brown opaque with a white everted lip but no teeth (Fig. 29) **Enidae** (p. 48)

Note: Juveniles less than 4mm high nearly as wide as high.

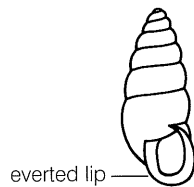


Fig. 29

- Shell never more than 4.5mm high, cylindrical or ovoid (Fig. 30). Opaque, various colours. Adults have a lip, with or without teeth **Pupillidae and Lauriidae** (p. 45)

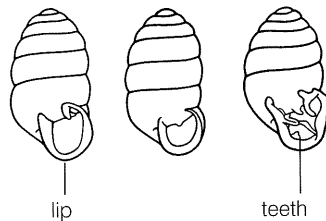


Fig. 30

17. (3) Whorls expanding **very** rapidly, and never more than 3 of them. Shell smooth, very glossy, transparent, colourless or greenish when fresh. Mouth edge always simple, **umbilicus** tiny or absent (Fig. 31) **Vitrinidae** (p. 50)



Fig. 31

- Adults always with more than 3 whorls. If transparent, then brownish **and/or** tightly coiled **and/or** with large umbilicus **18**

Note: Small juveniles of large Helicoidea can resemble Vitrinidae. They often have patterns or bands on the shell and appear slightly **keeled** or **shouldered**. Check also with *Zenobiella subrufescens*, which has a thin, glossy shell, and a very small umbilicus (p. 71).

18. (17) Adult less than 4mm wide. (Adults have at least 3.5 whorls – see note) **19**

- Adult more than 4mm wide **25**

Note: From here on, a major difficulty for the inexperienced is dealing with juveniles. Unless the shell is **clearly** adult (see p. 13), consider the possibility that the specimen might have keyed out in the smaller of two size categories when the adult would have keyed out in the larger. **ANY SHELL WITH LESS THAN 3.5 WHORLS IS JUVENILE**, but not all shells with four or more whorls are adult!

19. (18) Globular or conical (height 0.7-1.0x width) **20**

- Flattened (height usually less than 0.7x width) **21**

Note: *Pyramidula pusilla* often falls on the boundary here. Check with Fig. 54, p. 35.

20. (19) Up to 4mm wide, conical above. Pale-to-dark brown when alive, smooth and shiny above. Umbilicus tiny (Fig. 32) **Euconulidae** (p. 56)

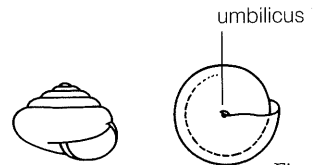


Fig. 32

- Up to 2.5mm wide, convex above. Brown with conspicuous radial ribbing or spines (lens or microscope!). Umbilicus various (Fig. 33) **Valloniidae** (p. 46)

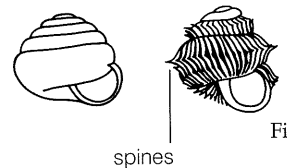


Fig. 33

21. (19) Umbilicus small (often nearly closed), shell tightly coiled (Fig. 34) and white or colourless/transparent **Pristilomatidae (*Vitrea*)** (p. 51)

Note: Not more than 3.5mm wide.

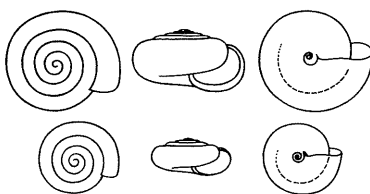


Fig. 34

- Umbilicus large, shells various 22

22. (21) Shell white/colourless with prominent thickened lip round mouth **adult Valloniidae** (p. 46)

Note: 2.0-2.5mm wide.

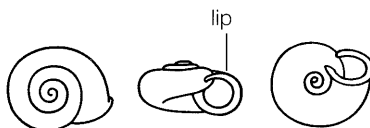


Fig. 35

- Shell colours various, but no thickened lip 23

Note: Juvenile *Vallonia* species will key out in the second choice; they will be less than 2.2mm wide.

23. (22) Whorls tightly coiled. Shell less than 3mm wide, with at least 3.5 whorls at this width 24

Note: May be ribbed or rough-looking.

- Whorls expand rapidly (Fig. 36). If less than 3mm wide, then fewer than 3.5 whorls **Oxychilidae** (p. 51)

Note: When fresh, shells are glossy or waxy, not ribbed or rough.

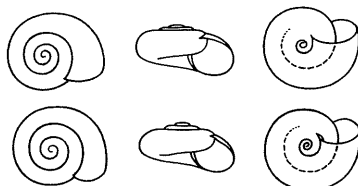


Fig. 36

24. (23) Shell dark brown when fresh, bleaching to purplish or white when worn. Up to 3mm (Fig. 37) **Pyramidulidae (*Pyramidula pusilla*)** (p. 35)

Note: Shell with fine, regular striations.

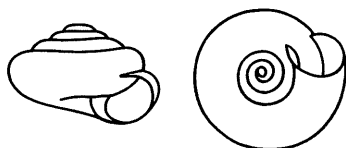


Fig. 37

- Shell pale brown to colourless. Never more than 2.5mm wide (Fig. 38) **Punctidae and Helicodiscidae** (p. 49)

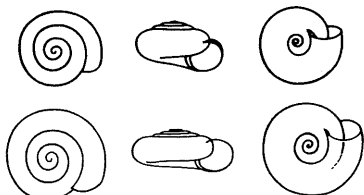


Fig. 38

25. (18) Shell very flattened, very tightly coiled, with heavy regular radial ribbing. Very large umbilicus (Fig. 39). Not more than 7mm wide **Discidae** (*Discus rotundatus*) (p. 49)



Fig. 39

- Shell not as above 26

26. (25) Remaining species belong either to the **Gastrodontidae** and **Oxychilidae** (Fig. 40; p. 51) or to the **Helicoidea** (Fig. 41; p. 60). These are the groups with the most species present in the British Isles.

Gastrodontid and Oxychilid shells (Fig. 40):

- are glossy or waxy, more-or-less translucent or transparent when fresh.
- always have a visible umbilicus.
- never have a lip round the shell-mouth.
- are always flattened (height approximately 0.5x width).
- never have a keel.
- never have hairs, bands or patterns on the shell.
- are never more than 16mm wide, and usually less than 12mm wide.

If your specimen does not match **all** these criteria, it should be a **Helicoidean** shell (Fig. 41). Of the Helicoidea only *Zenobiella subrufescens* and *Pseudotrachia rubiginosa* look glossy and transparent. Both have height more than 0.5x width. Shells of the Helicoidea are very varied in shape, size and texture (see the outlines in Fig. 41). None of them has the complete suite of characters given above for Gastrodontidae and Oxychilidae.

Fig. 40. GASTRODONTIDAE
and OXYCHILIDAE

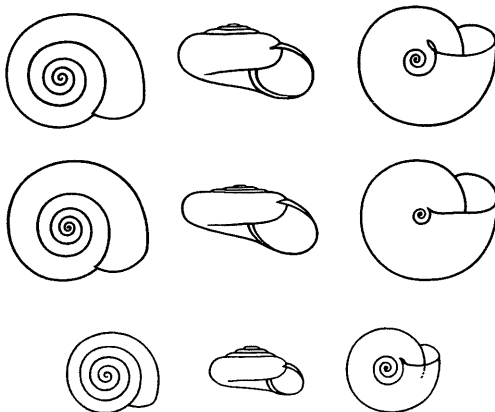
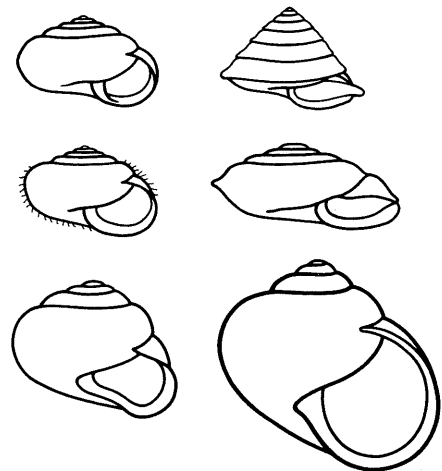


Fig. 41. HELICOIDEA



KEY 3

ANNOTATED KEY TO SPECIES BY GROUPS

Very brief notes on habitat and distribution are given for each species. Where species have been added since the first edition, they are generally keyed out alongside their closest relative to avoid a complete renumbering of key couplets.

A. Pomatiidae.

From Picture Key A1(ii), or Family Key couplet 10.
There is only one species in this family in the British Isles:

Pomatias elegans

Unmistakeable species with a thick shell with obvious spiral striations (Fig. 42). Empty shells usually lose the operculum.

Note: Adult height more than 12mm. Mainly southern, living in loose, friable soils on chalk or limestone, both in woods and in the open.

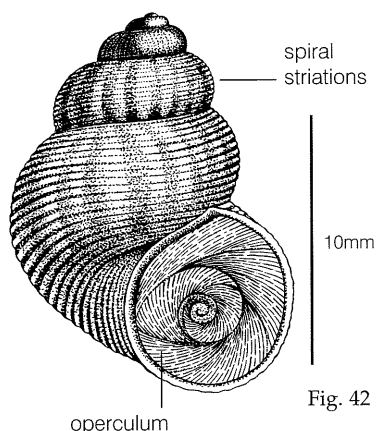


Fig. 42

B. Aciculidae.

From Picture Key A3(iii) or Family Key couplet 7.
There is only one species in this family in the British Isles:

Acicula fusca

Although an operculate, the operculum is rarely seen. The shell, rich pinkish brown when fresh, is up to 2.8mm high, with a blunt apex, and widely-spaced radial striae (Fig. 43).

Notes:

1. In forest leaf-litter, especially in old, damp woodland.
2. Juvenile *Cecilioides acicula* (p. 56) are white/colourless, and lack the radial striae.

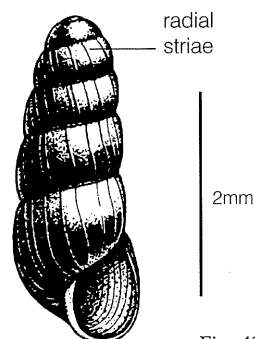


Fig. 43

C. Ellobiidae and Carychiidae.

From Picture Key A1(vii) or A3(ii); from Family Key couplet 8 or couplet 11.

1. Adult shell 5mm or more high 2 (Ellobiidae)
- Adult shell ca 2mm high 3 (Carychiidae)

2. (1) Adult shell with 3 or more columellar/parietal teeth and a palatal callosity (Fig. 44). Shell semitransparent and brown when fresh, and up to 12mm high. Tentacles of living animal thick and streaked with purple *Myosotella species*

Note:

1. Two species key out here. *M. myosotis* (Fig 44) is commoner than *M. denticulata* (Figure 44a), which **usually** has more teeth in the shell mouth. This distinction is hard to make reliably (see Anderson, online revision).

2. Widely distributed near tidal strandline and on edge of saltmarshes.

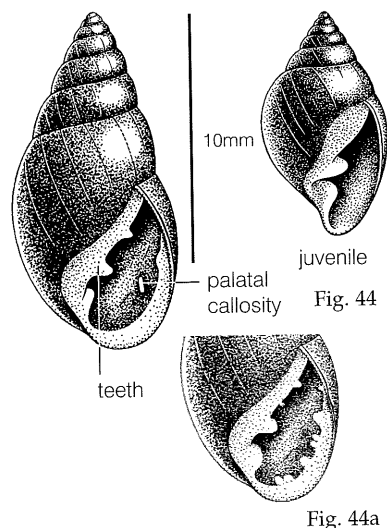


Fig. 44a

- Adult shell with 2 columellar teeth and no palatal callosity (Fig. 45). Shell white and opaque, and up to 8mm high. Tentacles short and flattened *Leucophytia bidentata*

Note: Less frequent than *M. myosotis*, but also near strandline, and on the fringe of saltmarshes.

Additional note: Juveniles are shown alongside the adults in the figures; *L. bidentata* has shallower sutures than *M. myosotis*, but they can be hard to separate.

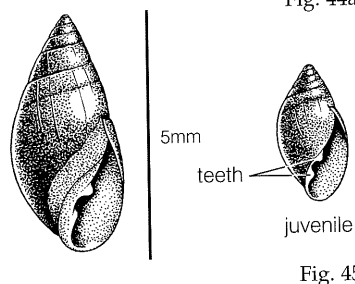


Fig. 45

- ❗ 3. (1) Adult shell **usually** with 5 whorls visible in frontal view (Fig. 46). **Relatively** narrower than *C. minimum* (see Fig. 47) *Carychium tridentatum*

Note: Rather strong, regular radial ribs visible at x10 magnification or greater. Widespread in leaf litter etc. in woods and hedges. Especially abundant on calcareous soils.

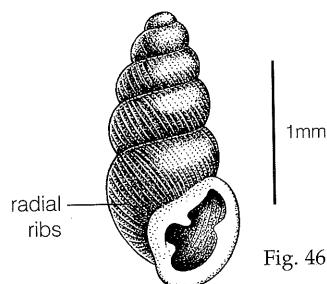


Fig. 46

- ❗ – Adult shell often with only 4 whorls visible in frontal view. Ribs less well developed (Fig. 47). **Relatively** wider than *C. tridentatum* (see Fig. 46) *Carychium minimum*

Note: Widespread. Usually in wetlands or damp woodland.

Additional notes:

1. See Key 4A (p. 75) for diagnostic internal characters.
2. Comparison with confirmed specimens makes this separation relatively easy!
3. The two species can occur together, especially in woodland.

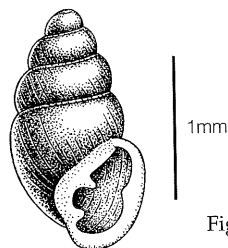


Fig. 47

❗ **Take special care here as the distinction between species can be hard to make.**

D. Succineidae.

From Picture Key A1(v), or Family Key couplet 11.

Succineids are mainly wetland species, and may be found alongside freshwater snails, in particular with *Lymnaea truncatula* (Müller, 1774). *L. truncatula* is up to 12mm in shell height. When adult, it has more whorls than any Succineid, and its mouth is smaller relative to the shell (see Fig. 48).

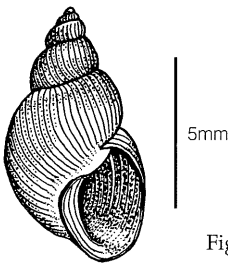


Fig. 48

For other freshwater snails, use the keys in Macan (1969).

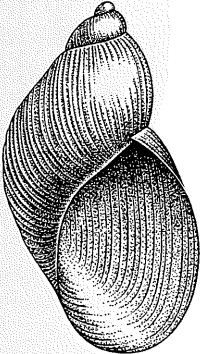
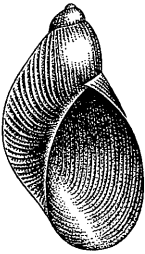
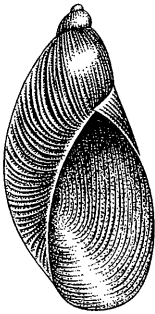
- 1. Shell with few, very rapidly expanding whorls, and shallow sutures. Height of mouth ca 0.6 or more x height of shell. Shell height up to ca 20mm, but usually less2
- Shell with more, less rapidly expanding whorls, and deep sutures. Height of mouth little more than half height of shell. Shell never more than 10mm high3

2. (1) Three species key out here. They cannot be determined reliably from shells alone, though there may be **local** differences that can be used after confirmation by dissections. See Key 4B (p. 76) for internal characters.

Succinea putris (Fig. 49a; Plate 3, p. 41) usually has a pale body, and the shell is typically very smooth. Shell height approx. 10-17mm. It is common in fens, marshes and reed-beds. Most frequent in the south.

Oxyloma elegans (Fig. 49b; Plate 3, p. 41) usually has a dark body. The shell is often amber coloured, and irregular radial growth lines may give the shell a rougher appearance than in *S. putris*. The shell does not usually exceed 12mm in height. It is widespread in wetlands, and is commoner in the north. It can occupy more oligotrophic sites than *S. putris*.

Oxyloma sarsii (Fig. 49c) is usually large (shell 20mm+ when adult). The shell is usually dark amber, and may show irregular but prominent growth lines. It is a rare species, restricted to wetland in East Anglia.

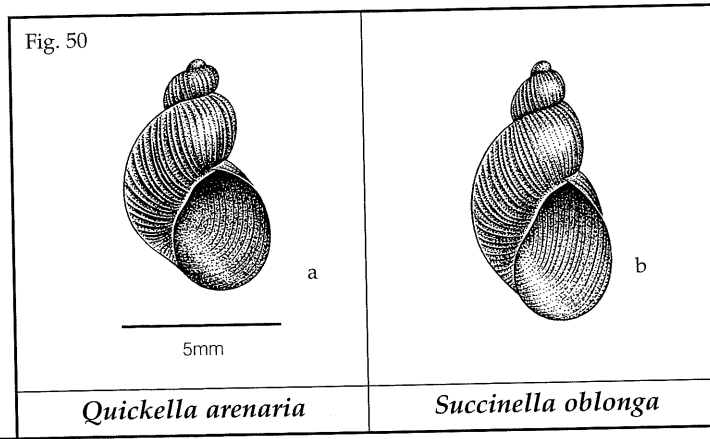
Fig. 49  a	 b 10mm	 c
<i>Succinea putris</i>	<i>Oxyloma elegans</i>	<i>Oxyloma sarsii</i>

⚠ Take special care here as the distinction between species can be hard to make.

- ❗ 3. (1) Two species key out here. Reliable determination depends on dissection: see Key 4B (p. 76):

Quickella arenaria (Fig. 50a) has a shell up to 9mm high. The shell is often reddish brown, and the body is black or dark grey. **A very rare species**, with priority listing in the European Union Habitats and Species Directive (EUHSD). Found in wet dune slacks, or on bare mud in calcareous marshes.

Succinella oblonga (Fig. 50b) has a shell up to 8mm high. The shell is usually pale amber or greenish white (but often covered in mud). The body is dark grey. **Very rare** in Britain, less so in Ireland; found in wet places with some bare soil.



E. Cochlicopidae.

From Picture Key A2(iii), or from Family Key couplet 14.

1. Shell with very flattened whorls and very shallow sutures. Many teeth in mouth (Fig. 51)
 *Azeca goodalli*

Notes:

1. Very smooth and glossy, usually reddish-brown, but albino shells are common.
2. Widespread but uncommon in England and Wales, usually in woods, or amongst rocks, especially in moss or leaf litter.

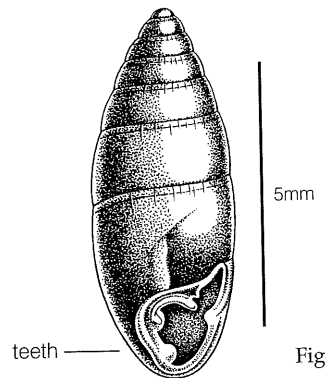


Fig. 51

- Shell with slightly convex whorls and deeper sutures. Mouth has a simple thickened lip and no teeth 2

❗ Take special care here as the distinction between species can be hard to make.

2. (1) Shell up to 7.5mm high, and 2.9mm wide. **Relatively** convex whorls and deep sutures (see Fig. 52). The shell **may** be dark *Cochlicopa* cf. *lubrica*

Note: Nearly universal, in woods, hedges, damp grassland and wetlands.

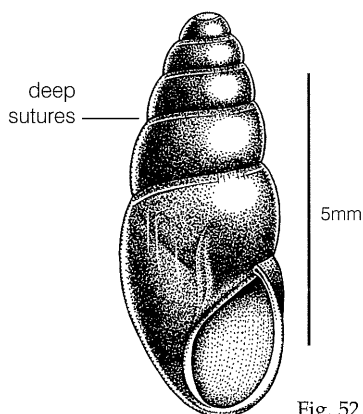


Fig. 52

- Shell up to 6.8mm high, and 2.5mm wide. **Relatively** flattened whorls and shallow sutures (see Fig. 53). The shell is usually pale *Cochlicopa* cf. *lubricella*

Notes:

1. There are no reliable internal characters to distinguish these species. Although "intermediate" shells do occur, it is usually possible to separate the two when they occur together. It is a very good idea to keep "typical" reference specimens for comparison.

2. The names and status of *Cochlicopa* species in Europe are a subject of debate (Armbruster, 1994 and 1995). Falkner, Bank and von Proschwitz (2001) recognise a third species in Britain, *Cochlicopa repentina* Hudec 1960, the shell characters of which are intermediate between those of *C. lubrica* and *C. lubricella*. Molecular studies do not support this (Armbruster, 1997; Armbruster and Bernhard, 2000), but the name *C. lubricella* may refer to more than one species when the whole European range is considered. The species in this genus are largely self-fertilizing.

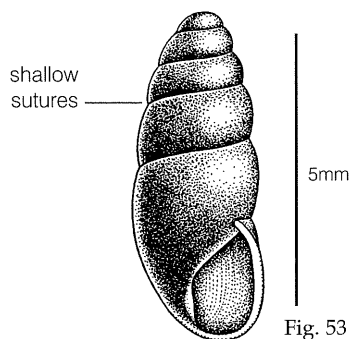


Fig. 53

F. Pyramidulidae.

From Picture Key B3(vi), or Family Key couplet 24.

There is only one species in this family in the British Isles:

Pyramidula pusilla

Shell dark reddish-brown, bleaching to pale purple or grey in old but living specimens. Shell up to 3mm wide, with slightly irregular but well-marked growth-lines (lens). The umbilicus is very large (Fig. 54).

Notes:

1. Restricted to dry, exposed, or partly shaded limestone rocks; occasionally on walls and buildings. Rare in E. England and Scotland.

2. Until recently, there was thought to be only a single species, *Pyramidula rupestris* (Draparnaud, 1801), widespread in Europe. Gittenberger and Bank (1996) revised the genus on the basis of shell morphology, and split it into several species, only one of which occurs in Britain and Ireland. For more details, see Anderson (2005).

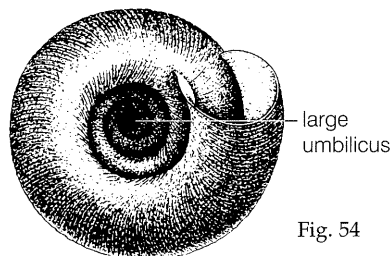
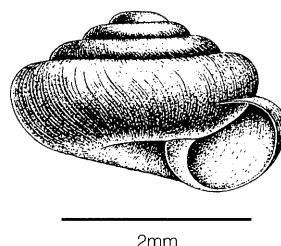


Fig. 54

Take special care here as the distinction between species can be hard to make.

G. Vertiginidae.

From Picture Key A3(i), or Family Key couplets 5 and 8.

Notes:

- 1. A binocular microscope is usually needed for members of this family. Juveniles of these very small species are very hard to identify. They often require comparison with adult shells under high magnification.
- 2. Some species in this family are very rare. Because they are small, dissection is a very professional task. For the enthusiast, Pokryszko (1990) gives very thorough shell descriptions of the species in this family.

- 1. Shell sinistral 2
- Shell dextral 3

- 2. (1) Shell pale brown with fine regular growth lines visible on upper whorls. Penultimate whorl (Fig. 55) wider than body whorl. Palatal lip with deep central indentation, carried back round the shell. 5-6 teeth *Vertigo angustior*

Note: Very rare (priority listing under EUHSD). Open, permanently moist fringes of wetland, often near the coast. Empty shells can be found in flood debris.

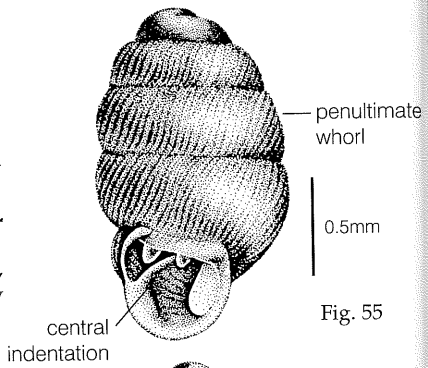


Fig. 55

- Shell pale and glossy with only weak, irregular growth lines. Maximum width is at the body whorl (Fig. 56). Mouth with at least 6 teeth, but without the marked palatal indentation *Vertigo pusilla*

Note: Rare, but widespread; in dry woods, on rocks, and especially in partly shaded drystone walls.

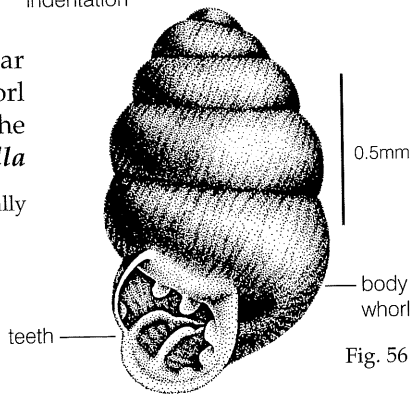


Fig. 56

- 3. (1) Shell cylindrical, usually at least twice as high as wide. Without teeth, or with 1-3 teeth set very far back in the mouth (Fig. 57) 4

Note: Only the very rare *Truncatellina callicratis* (p. 37) amongst species keying out here has teeth.

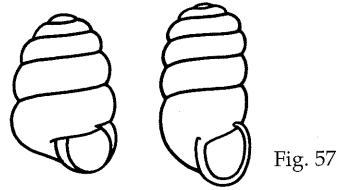


Fig. 57

- Shell more tapering or convex, less than twice as high as wide. Nearly always with several teeth (Fig. 58) (*Vertigo*) ... 7

Note: Only the very rare *Vertigo genesii* (p. 38) lacks teeth. It has the characteristic shell shape of a *Vertigo*.

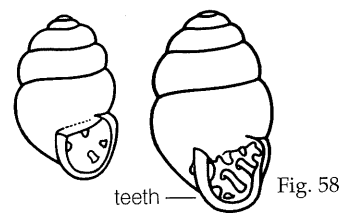
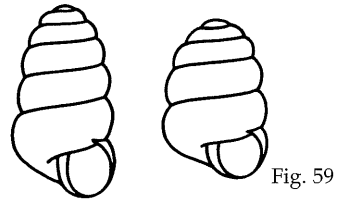
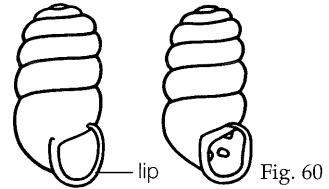


Fig. 58

4. (3) Shell at least 1.2mm wide, gently tapering. Mouth without evident thickened lip, and rounded (Fig. 59)
..... (*Columella*) ... 5



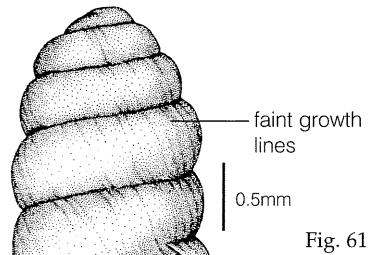
- Shell about 0.9mm wide, and very cylindrical. Mouth slightly elongated, with a slightly thickened lip (Fig. 60) (*Truncatellina*) ... 6



Note: Fine, regular radial ribs.

5. (4) Adult shell 2.5-3.0mm high, nearly cylindrical. Yellowish brown, with faint, irregular growth lines (Fig. 61) *Columella edentula*

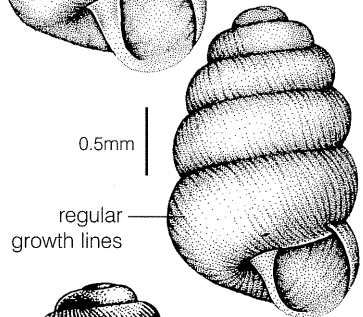
Note: Widespread in many habitats, usually on eutrophic soils. Frequently climbs up low vegetation (eg. ferns); often found by entomologists using sweep nets!



- Adult shell up to 2.5mm high, more tapering. Dark brown, with regular, close-set growth lines (Fig. 62) *Columella aspera*

Notes:

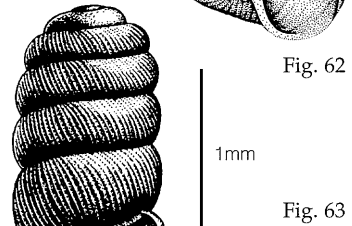
1. Widespread, but with a preference for oligotrophic sites, including dry acid woodland.
2. This separation can be difficult at first, but is easy with authenticated specimens to hand.



6. (4) Shell without teeth. Whorls slightly flattened (Fig. 63) *Truncatellina cylindrica*

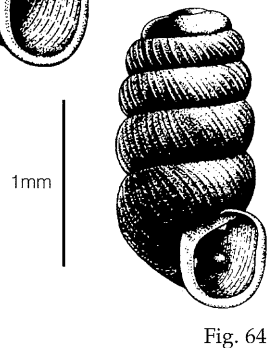
Notes:

1. **Very rare.** dry, exposed calcareous grassland. Northern and eastern only.
2. Old shells of *T. cylindrica* are found in various sites in E. England and E. Scotland. Fresh, preferably living specimens are needed to confirm occurrence.



- Shell with (usually) 3 teeth: one palatal; one parietal; one columellar; these are set back behind the mouth, but the palatal is visible in front view. Whorls more convex, and sutures deeper (Fig. 64) *Truncatellina callicratis*

Note: **Very rare.** Dry calcareous grassland on part of the south coast of England.



7. (3) Shell mouth with one or more parietal teeth 8

- Shell lacking teeth altogether
..... *Vertigo genesii* (see below, Fig. 65)

Vertigo genesii.

Despite the lack of teeth, the shell is recognisable as that of a *Vertigo* (compare Fig. 65 here with those for *Columella*, above, Figs 61, 62). The shell is usually less than 2.0mm high.

Notes:

1. **Very rare.** (priority in EUHSD). Calcareous flushes in the open, usually at high altitudes.
2. Very rarely, individual *V. genesii* may have a vestigial parietal tooth. Also, very rarely, *V. modesta* (see item 12, p. 44) may lack teeth. *V. modesta* is almost always more than 2.2mm high.

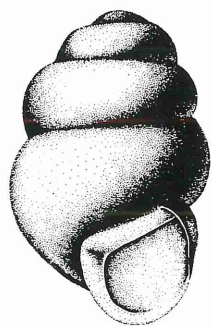


Fig. 65

8. (7) Shell mouth with at least two parietal teeth (Fig. 66) 9

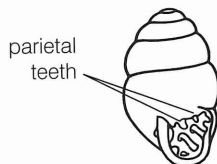


Fig. 66

- Shell mouth with a single parietal tooth (Fig. 67) 10

Note: Very rarely, *Vertigo pygmaea* and *V. moulinsiana* may have a very small, second parietal tooth. If your specimen keying out under 8 for 9 does not appear to match either alternative in 9, look at the pictures in couplet 11.

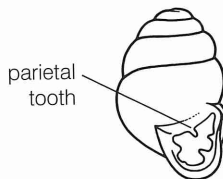


Fig. 67

9. (8) Shell dark brown, smooth with only faint, irregular growth lines. Relatively shallow sutures. 6-10 teeth (Fig. 68). Up to 2.2mm high *Vertigo antivertigo*

Note: Common, but declining, in many wetlands.

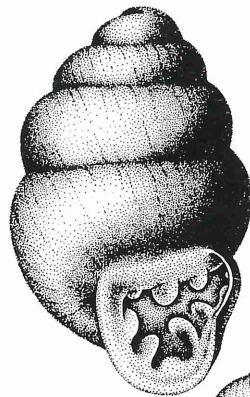


Fig. 68

- Shell pale brown, with fine regular ribbing, especially on middle whorls. Relatively deep sutures. 5-6 teeth (Fig. 69). Up to 1.9mm high *Vertigo substriata*

Note: Widespread in wetlands and wet, especially alder, woodlands. Commoner in north.

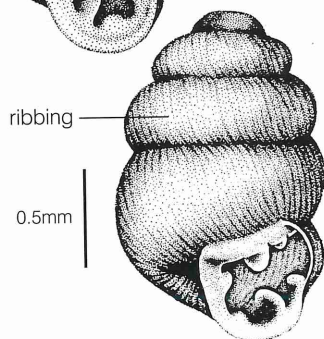


Fig. 69

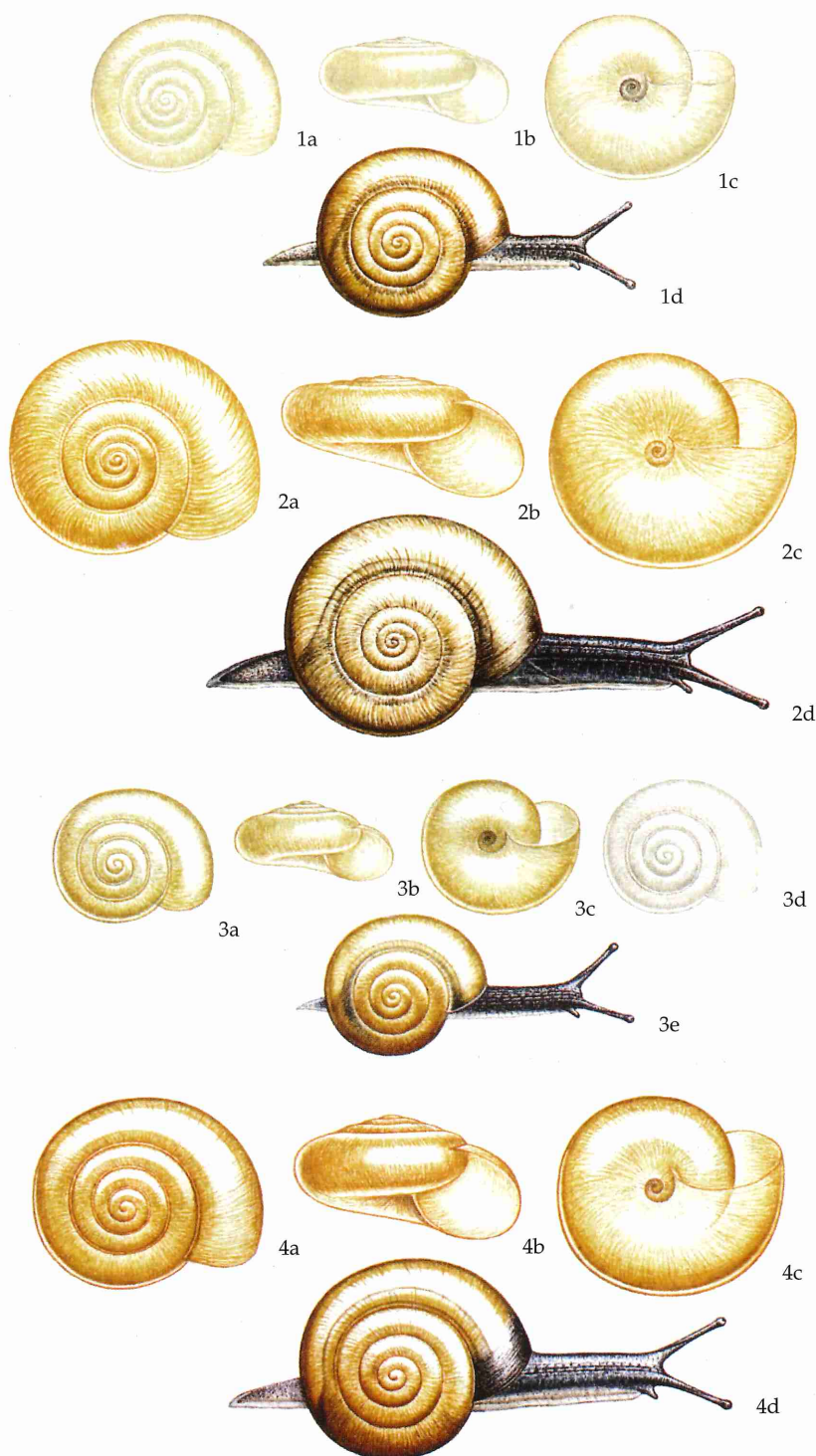


Plate 1. *Oxychilus* spp.

1. *O. cellarius*. 2. *O. draparnaudi*. 3. *O. alliarius*. 4. *O. navarricus*.

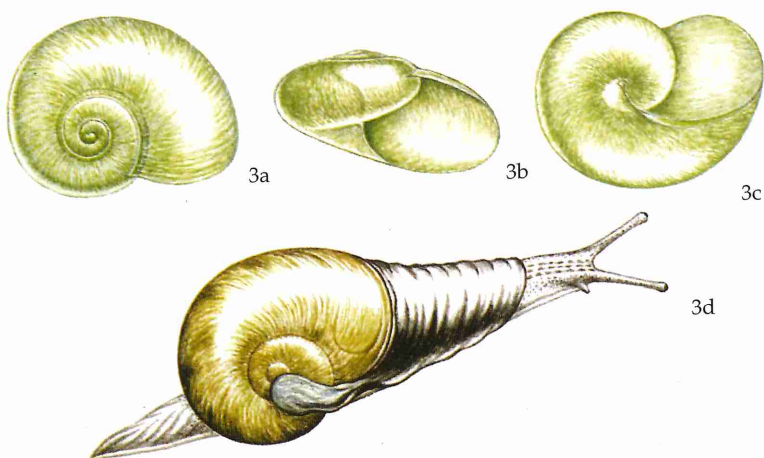
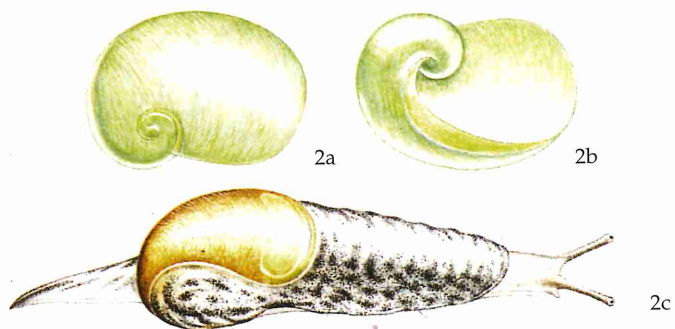
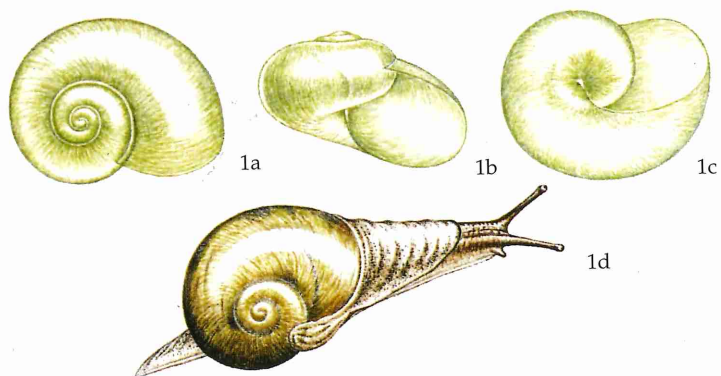


Plate 2. The Vitrinids.

1. *Vitrina pellucida*. 2. *Semilimax pyrenaicus*. 3. *Phenacolimax major*.

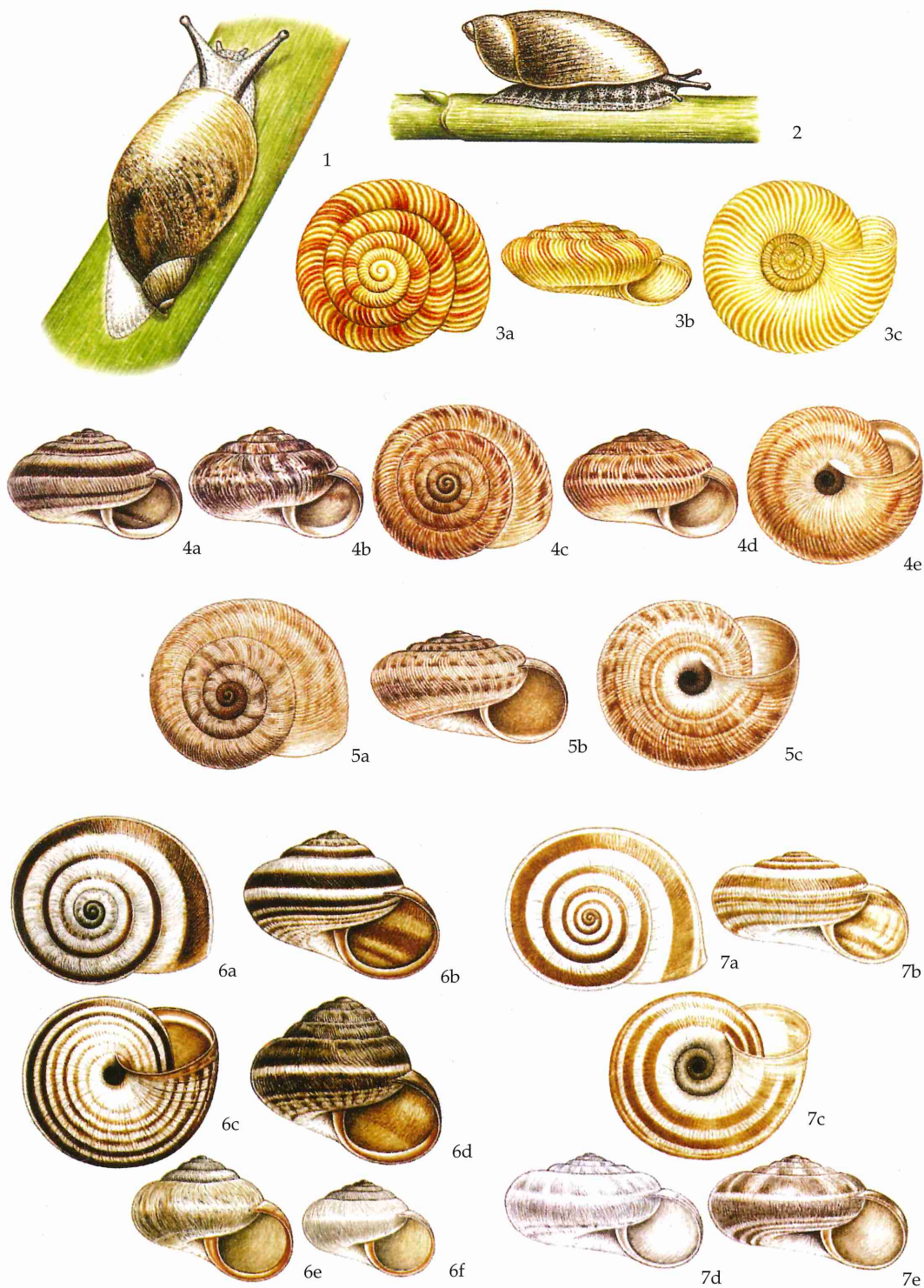


Plate 3.

1. *Succinea putris* (live). 2. *Oxyloma elegans* (live). 3. *Discus rotundatus*. 4. *Candidula intersepta*. 5. *Candidula gigaxii*.
6. *Cernulla virgata*. 7. *Helicella itala*.

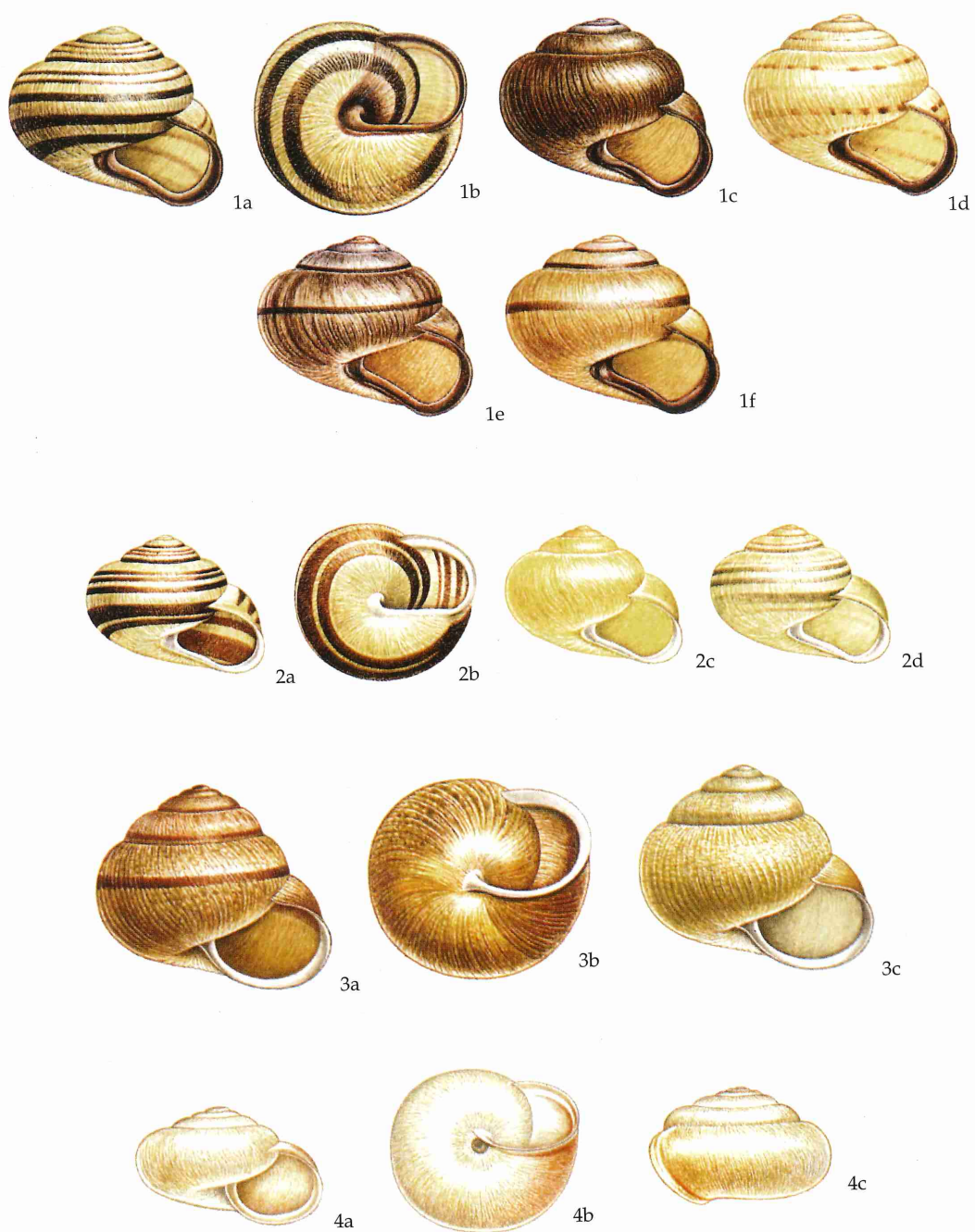


Plate 4.

1. *Cepaea nemoralis*. 2. *Cepaea hortensis*. 3. *Arianta arbustorum*. 4. *Monacha cantiana*.

- ! 10. (8) Shell mouth with a substantial, paler lip (Fig. 70).
Teeth connected to this by pale, opaque callosities 11



Fig. 70



Fig. 71

- Shell mouth with a relatively feeble lip. Teeth arising from shell wall with no, or only slight, connection to the lip by callosities (Fig. 71) 12

Note: *Vertigo pygmaea*, which should key out through couplet 11, is sometimes found with a rather thin lip, and feeble callosities, especially in wetland. All the species keying out under 12 are rare, so this possibility should always be considered. *Vertigo alpestris* might key out under 11: see 12 for its distinguishing features.

- ! 11. (10) Shell large (up to 2.7mm high). Very large body whorl making up nearly two thirds of the shell height. Mouth with a very substantial lip which flares outwards (Fig. 72) *Vertigo moulinsiana*

Note: Rare (priority in EUHSD), mainly southern and Ireland. Lowland calcareous fens and lake margins, especially reedbeds.

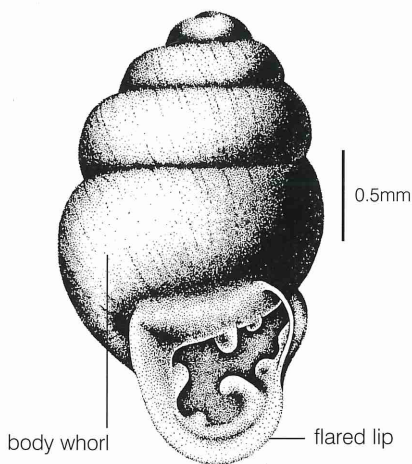


Fig. 72

- Shell rarely more than 2.3mm high, tapering gently. Body whorl makes up slightly more than half shell height. Lip not flared (Fig. 73) *Vertigo pygmaea*

Notes:

1. There is usually a strong, whitened crest behind the lip visible externally (see Fig. 73c). This is occasionally absent (see Fig. 73b).
2. Easily the most widespread *Vertigo* species, occurring in calcareous grassland and also in wetlands.
3. See the notes under couplets 9 and 12.

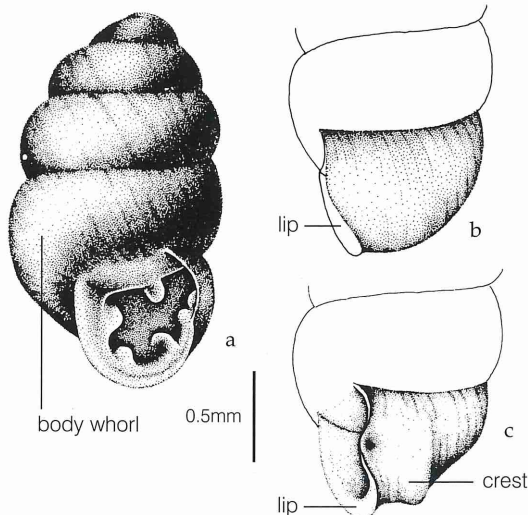


Fig. 73

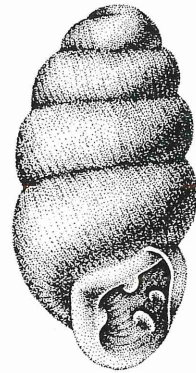
! Take special care here as the distinction between species can be hard to make.

12. (10) Shell rather cylindrical (Fig. 74), with rather flattened whorls and shallow sutures. Light brown, with fine, regular, radial striations *Vertigo alpestris*

Notes:

1. No crest behind lip (cf. *V. pygmaea*, above).
2. Mainly on old walls covered in ivy. Rare except in English Lake District.

- Shell more globose, whorls more convex, with deeper sutures. Reddish or yellow-brown and without the regular striations 13



0.5mm

Fig. 74

- ! 13. (12) Three species key out here. All of them are **very rare**: expert confirmation is required. Read the descriptions below:

Vertigo lilljeborgi (Fig. 75a). Shell pale yellowish-brown. Always very globular, shell width at least two thirds height. Mouth almost always with 4 teeth. Resembles a miniature *V. moulinsiana* without the flared lip. Up to 2.1mm high.

Note: Scattered localities in the NW and Ireland. Marshes and lake shores liable to flooding. Tolerates rather oligotrophic conditions where few other snails live.

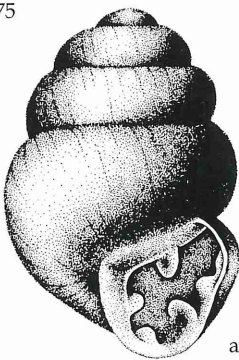
Vertigo geyeri (Fig. 75b). Shell glossy, reddish-brown, with very fine striae. Usually 4 teeth in mouth; the palatal teeth are set back from the lip with no connecting callus. Height usually less than 2.0mm.

Note: **Very rare** (priority in EUHSD). Scattered localities in the north, and in Ireland. Open, sparsely vegetated calcareous wetland with flowing water, often with tufa formation. Beware confusion with poorly developed *V. pygmaea*!

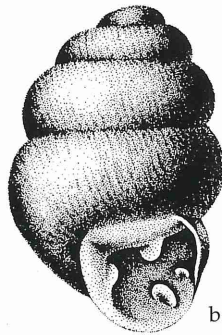
Vertigo modesta (Fig. 75c). Shell reddish-brown, with very fine striae. Teeth very variable, 0-4 (palatals often absent, as in Fig. 75c). Usually more than 2.0mm high (up to 2.6mm). A very variable species.

Note: **Very rare.** Known in Britain only from two Scottish mountains in alpine vegetation on base-rich rocks.

Fig. 75

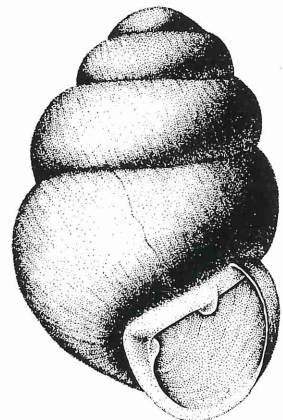


a



b

0.5mm



c

*Vertigo lilljeborgi**Vertigo geyeri**Vertigo modesta*

! Take special care here as the distinction between species can be hard to make.

H. Chondrinidae.

From Picture Key A1(iv), or Family Key couplet 15.
There is only one species in this family in the British Isles.

Abida secale

Shell at least 6mm high, opaque, with fine, dense ribbing. Dark brown, but may weather to grey or pale purple. At least 7 teeth in mouth (Fig. 76).

Note: Restricted to rocky limestone in the open or partial shade. Absent from many limestone areas.

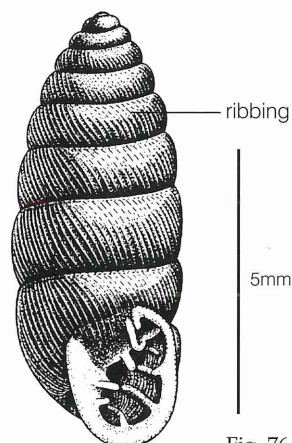


Fig. 76

I. Pupillidae and Lauriidae.

From Picture Key A2(i), or Family Key couplet 16.

1. Mouth with 4-6 teeth. Shell ovoid (Fig. 77)
..... *Leiostyla anglica*

Notes:

1. Flattened whorls and shallow sutures, dark brown.
2. Damp woodland and marshes, mainly northern and western, most frequent in Ireland.

- Mouth with one parietal tooth or none. Shell more cylindrical (Figs 78, 79, 80) 2

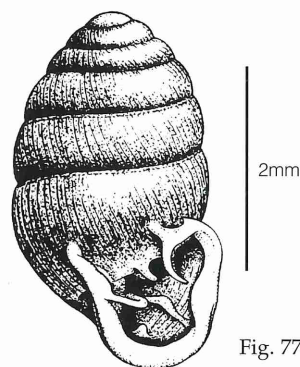


Fig. 77

2. (1) Mouth with everted white lip. Usually with a small, sharp parietal tooth close to the junction with the palatal region. No thickening behind lip 3

- Lip not everted. Parietal tooth, if present, blunt, set back in mouth, and central in parietal region. Marked thickening (crest) of shell behind lip (Fig. 78)
..... *Pupilla muscorum*

Note: Dry calcareous grasslands, including dunes. Widespread, but declining, mainly coastal in N and W.

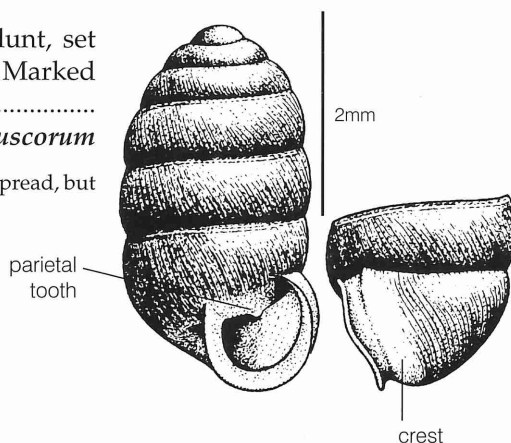


Fig. 78

- ❗ 3. (2) Shell up to 4.4mm high, relatively ovoid. Tooth often connected to lip by callus. Shell pale brown (albinos not uncommon) (Fig. 79) *Lauria cylindracea*

Notes:
1. Widespread, in woods, damp grassland, walls and hedges, especially where there are exposed rocks.
2. The tooth in this genus is the end of a spiral lamella which can be seen in juveniles (Fig. 79).

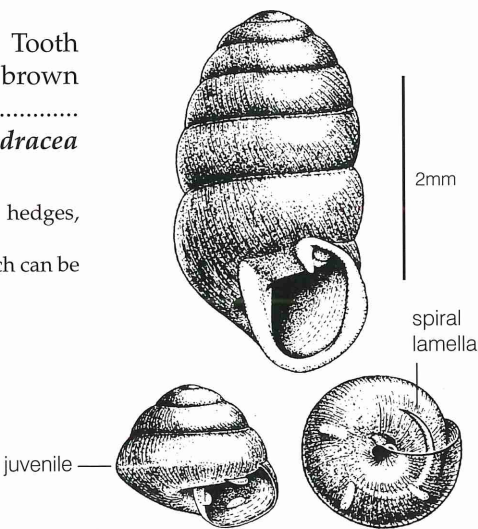


Fig. 79

- ❗ – Shell up to 3.2mm high, narrow and relatively cylindrical (Fig. 80). Tooth, when visible, not connected to lip. Shell reddish and glossy *Lauria sempronii*

Notes:
1. **Very rare.** Known from a few walls in the Cotswolds only.
2. This is a difficult separation, because *L. cylindracea* is very variable in size, and in the development of the tooth. Small *L. cylindracea* tend to be more ovoid than large ones, hence more distinct in shape from *L. sempronii*. In general, it is safe to regard a shell keying out to couplet 3 as *L. cylindracea*.

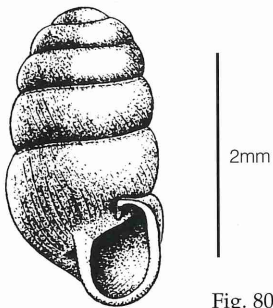


Fig. 80

J. Valloniidae.

From Picture Key B3(i) and B3(iii), or Family Key couplets 20 and 22.

1. Shell flattened (width ca 2x height). White or pale cream, with a large umbilicus (Fig. 81) (*Vallonia*) ... 2

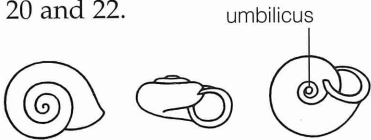


Fig. 81

- Shell more globular. Brown, with a small umbilicus (Fig. 82) 4

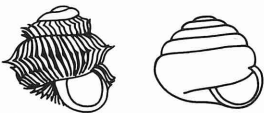


Fig. 82

Note: Adult *Vallonia* shells have a very prominent lip (see Figs 83-87). Juveniles lack this, and can be confused with other species. See all the notes at the end of couplet 3.

❗ Take special care here as the distinction between species can be hard to make.

2. (1) Shell with regular, widely spaced ribs (Fig. 83). These may be worn down, but traces usually remain in or near the umbilicus *Vallonia costata*

Note: Widespread in calcareous grassland; occasionally in dry, open woodland or scrub.

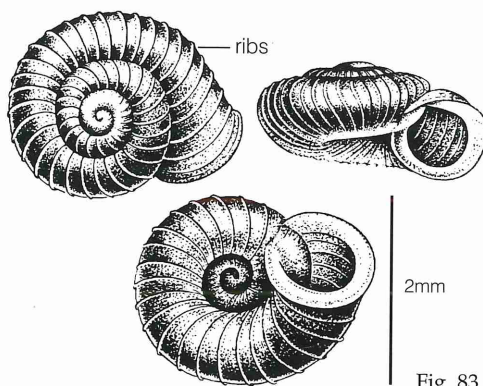


Fig. 83

- Shell without regular ribbing 3

3. (2) Lip making a sharp angle with the profile of the last whorl viewed from above. The whorls, and the umbilicus expand rather regularly, giving the latter a rather circular appearance (Fig. 84) *Vallonia pulchella*

Note: Usually in damp, open habitats, including wetlands and near ditches.

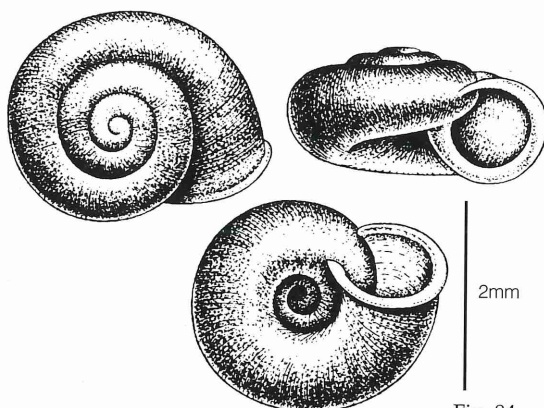


Fig. 84

- Lip thickened, but less flared, so that the profile of the last whorl changes only slightly at the mouth. Last whorl expands rather rapidly, giving shell and umbilicus an eccentric appearance (Fig. 85) *Vallonia* cf. *excentrica*

Note: Dry, calcareous grasslands, including dunes.

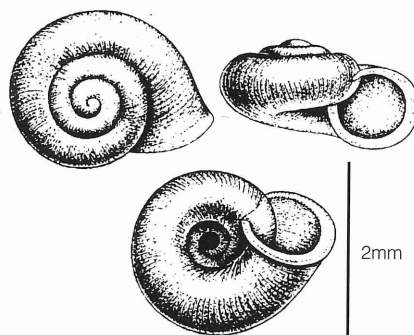


Fig. 85

Additional notes:

1. Juveniles of *V. cf. excentrica* and *V. pulchella* cannot be separated reliably.
2. Very badly worn *V. costata* and *V. pulchella* may be indistinguishable.
3. Juvenile *V. costata* can resemble *Paralaoma servilis* (p. 49). The latter are brownish and more high-spined.
4. Specimens intermediate between *V. cf. excentrica* and *V. pulchella* can be found. The status of these (almost certainly self-fertilizing) species needs further study.

! Take special care here as the distinction between species can be hard to make.

4. (1) Shell with up to 4 rapidly expanding whorls, with a nearly circular mouth. When fresh, the shell is covered with regular, well-spaced spines (Fig. 86). These may wear off old shells, but widely spaced ribs remain *Acanthinula aculeata*

Note: Widespread. Typically in woodland leaf-litter.

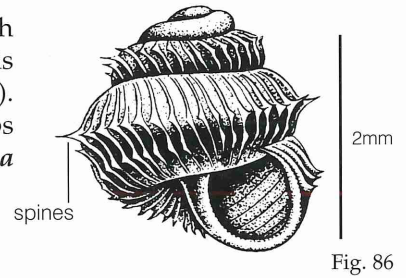


Fig. 86

- Shell with up to 6 slowly expanding whorls, mouth somewhat crescentic. Fresh shell pale brown, with fine, sharp, regular and closely-spaced ribs (Fig. 87) *Spermodea lamellata*

Note: Uncommon. Mainly leaf-litter in northern woodland.

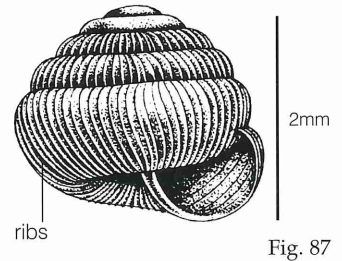


Fig. 87

K. Enidae.

From Picture Key A1(iii), or Family Key couplet 16.

1. Shell up to 9mm high and 3.7mm wide. With fine and irregular radial growth lines (Fig. 88) *Merdigera obscura*

Note: Common in woods and hedges on richer, especially calcareous, soils.

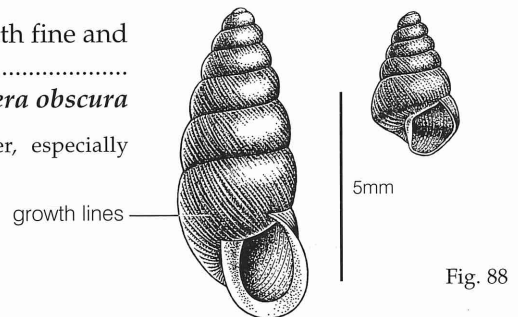


Fig. 88

- Shell up to 17mm high and 7mm wide. Has coarser growth lines, interrupted with faint spiral lines, which gives a granular appearance (Fig. 89) *Ena montana*

Note: Uncommon: Ancient woodland and hedges in the south of England.

Additional note: At any given height, *M. obscura* juveniles are narrower, and have more whorls than juvenile *E. montana*. Juveniles are illustrated above. At 6mm height, *M. obscura* is about 3.4mm wide and has about 5.5-6.0 whorls. At the same height, a juvenile *E. montana* is about 4.5mm wide, and has about 4.5 whorls.

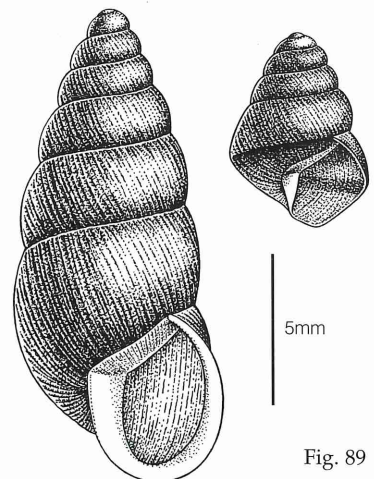


Fig. 89

L. Discidae, Helicodiscidae and Punctidae.

These families are keyed together because some members of each are rather similar. From Picture Key B2(iv) and B3(v), or from Family Key couplets 24 and 25.

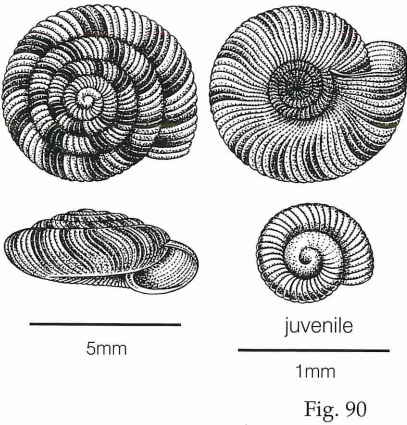
- 1. Shell up to 7mm wide, with up to 6 whorls. Occasionally white, but usually pale brown with darker reddish radial stripes or blotches. Upper surface with very substantial, regular radial ribs. (Fig. 90; Plate 3, p. 41) *Discus rotundatus*

Notes:

- 1. Very flattened, and shouldered at the periphery (looking keeled when juvenile).
- 2. Very common, especially in woods and hedges.

- Shell never more than 2.5mm wide, with 3.5 to 4 whorls. Never with coarse ribs or blotches 2

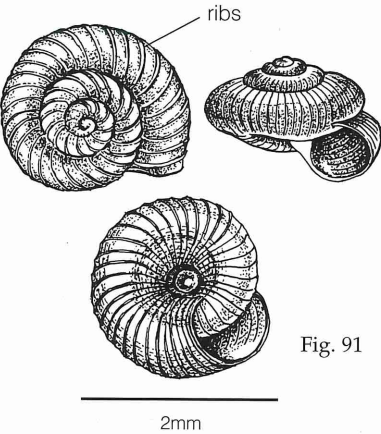
Note: Small juvenile *D. rotundatus* are shouldered/keeled, and show the start of the coarse ribbing beyond the protoconch (Fig. 90).



- 2. (1) Shell with regular, widely spaced radial ribs, and very fine spiral striae (visible at x20 magnification or more on the underside) (Fig. 91) ... *Paralaoma servilis*

Notes:

- 1. Usually less than 2mm wide.
- 2. A relatively recent introduction, scarce, but spreading and naturalised.
- 3. See comments about juvenile *Vallonia costata* on page 47.



- Shell with fine radial growth lines only; if regular, then close together. Spiral striae not visible 3

3. (2) Shell up to 1.5mm wide, with a low spire (height approx 0.6x width). Many fine, regular and closely-packed growth lines, clearly visible at x20 magnification, giving a characteristic matt sheen at lower magnifications (Fig. 92) *Punctum pygmaeum*

Note: Common and widespread, usually in leaf-litter. Often overlooked because of its small size!

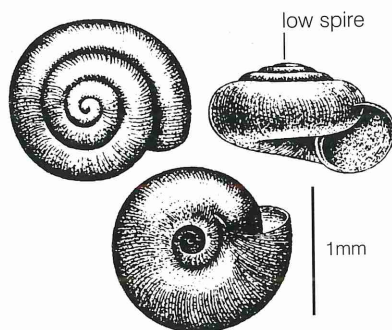


Fig. 92

- Shell up to 2.5mm wide, very flattened (width more than 2x height) (Fig. 93). Growth lines faint and irregular *Lucilla singleyana*

Note: Umbilicus huge (Fig. 93). A relatively recent introduction. Mainly subterranean. Few records.

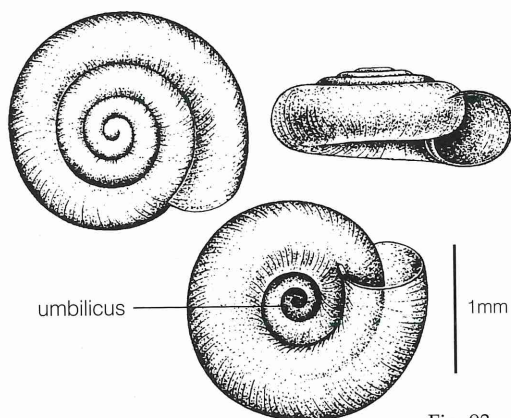


Fig. 93

M. Vitrinidae.

From Picture Key B2(i), or Family Key couplet 17.

Shells of species in this family are always very thin and transparent, colourless or with a greenish tinge.

1. Shell with fewer than two whorls, with a huge, ear-like last whorl. In living animals the mantle is pale grey spotted with black. (Fig. 94; Plate 2, p. 40) *Semilimax pyrenaicus*

Notes:

1. Mouth more than 0.75x shell width (Fig. 94).
2. Very rare: a few sites in Ireland only.

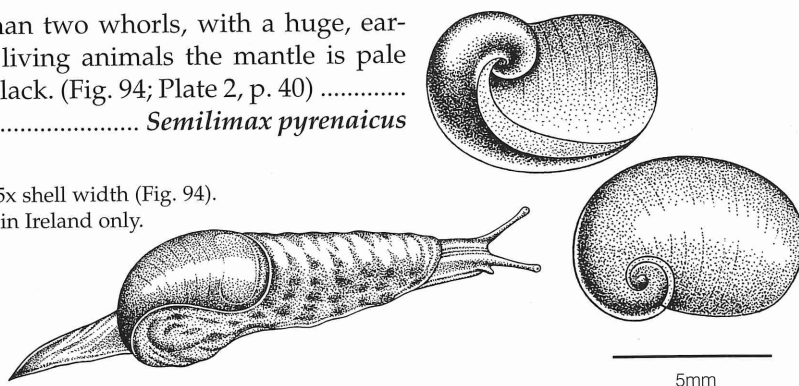
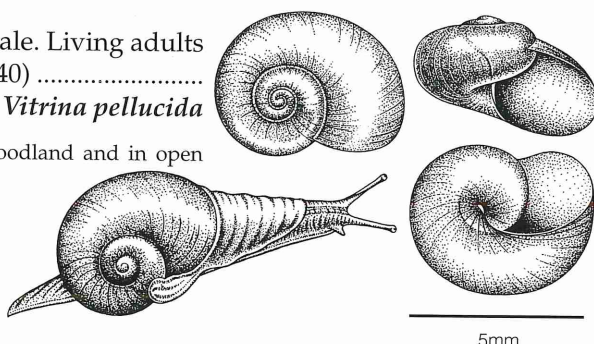


Fig. 94

- Shell with more than two whorls, rapidly expanding, but the shell retaining a normal globular appearance (Figs 95, 96). In living animals the mantle is not spotted 2

2. (1) Mantle of living animal usually pale. Living adults mainly in winter. (Fig. 95; Plate 2, p. 40)
..... *Vitrina pellucida*

Note: Common and widespread, both in woodland and in open habitats.



5mm

Fig. 95

- Mantle of living animal usually dark. Living adults mainly in summer. (Fig. 96; Plate 2, p. 40) *Phenacolimax major*

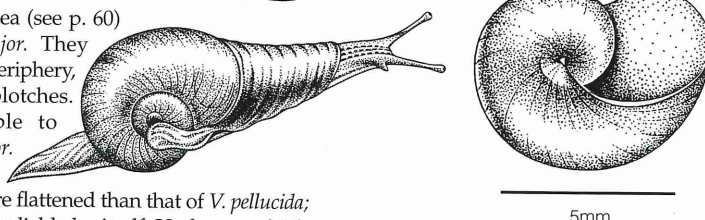
Note: Rare: generally ancient woodland in the south.

Additional notes:

1. Small juveniles of some Helicoidea (see p. 60) can resemble *V. pellucida*/ *P. major*. They generally appear shouldered at the periphery, and often have traces of bands or blotches.

2. Dissection is highly desirable to confirm the occurrence of *P. major*.
SEE KEY 4C (p. 77).

3. The shell of *P. major* is slightly more flattened than that of *V. pellucida*; the mouth is more oval. This is not reliable by itself. Under very high magnification ($\times 40+$), with good lighting, the upper whorls of *P. major* can be seen to be covered with minute pits, which give a slight dullness to the whorls at lower magnifications. Such pits do occur in *V. pellucida*, but they are smaller, seen clearly only in scanning electron micrographs.



5mm

Fig. 96

N. Pristilomatidae, Oxychilidae and Gastrodontidae.

From Picture Key B1(i), B2(ii), B3(iv), or Family Key couplets 21, 23 and 26.

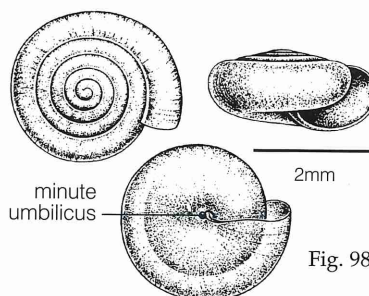
1. Shell always less than 4mm wide, with at least 4 tightly coiled whorls if the shell is 3mm or more (Fig. 97). Glossy, transparent and colourless if fresh (*Vitrea*) ... 2
- Adult shells more than 4mm wide. Shells smaller than this with fewer than 4 whorls. Whorls expand more rapidly. Colour and texture varies 4



Fig. 97

2. (1) Umbilicus minute, nearly sealed off (Fig. 98)
..... *Vitrea subrimata*

Note: Restricted to calcareous habitats in a limited area of northern England.



2mm

Fig. 98

- Umbilicus plainly visible and open (Figs 99, 100) 3

Take special care here as the distinction between species can be hard to make.

- 3. (2) Shell up to 4mm wide (usually not more than 3.5mm), with a slightly raised spire (Fig. 99). The shell, and the edge of the mouth are rounded in outline. Umbilicus looks slightly eccentric (Fig. 99). Seen from above, the width of the last whorl just behind the mouth is at least 1.5x the visible width of the next whorl in *Vitrea crystallina*

Note: Common and widespread, in many habitats. Often missing from the driest and most open. Frequently found together with *V. contracta*.

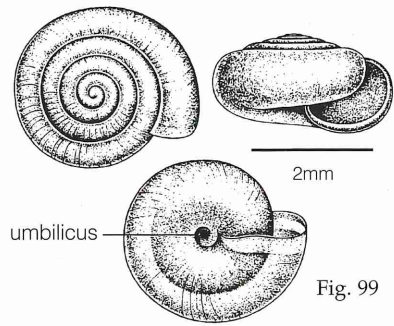


Fig. 99

- ! - Shell up to 2.8mm wide (usually 2.5mm or less), with a very flat spire (Fig. 100). The shell and the edge of the mouth are flattened below in outline. Umbilicus appears deep and symmetrical (Fig. 100). Seen from above, the width of the last whorl just behind the mouth is less than 1.5x the apparent width of the next whorl in *Vitrea contracta*

Notes:

- 1. Common and widespread. Often found with *V. crystallina*, but prefers drier and more calcareous places.
- 2. It is difficult to distinguish juveniles. In addition to the characters given above, mature *V. crystallina* may have a very slight thickening of the lip. This does not occur in *V. contracta*. Authenticated specimens are very helpful!

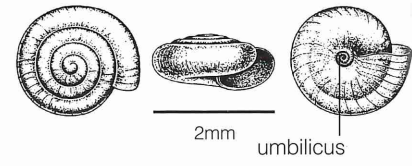


Fig. 100

- 4. (1) Shell no more than 4.5mm wide, usually less than 4mm, glossy brown and transparent when fresh, with distinct, regular, widely-spaced radial striae (Fig. 101). These remain visible even in long dead shells *Nesovitrea hammonis*

Note: Very widespread, including very acid woodland, but rarely occurs at high densities. Often missing or rare in the richest calcareous woodlands.

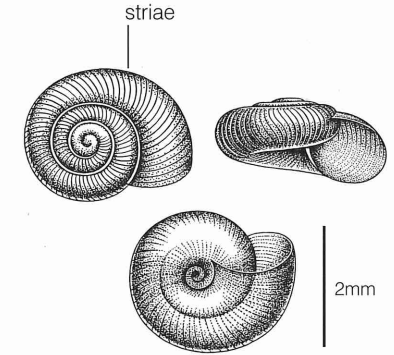


Fig. 101

- Shells **may** be considerably larger than 4mm and vary in colour and texture. **None** have the regular widely-spaced striations of *N. hammonis* 5

Note: From this point on, identifying specimens, especially juveniles or old, empty shells, is quite difficult for the beginner. It is a good idea to build up experience with living or very fresh material. In a mixed collection, always start with the largest shell of those you believe to be the same species.

- 5. (4) Shell with rapidly expanding whorls (see Fig. 102) *Aegopinella* species ... 6

Note: Relatively large umbilicus. Shells never glossy, but may have a waxy sheen.

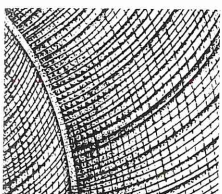


Fig. 102

- Shell with slowly expanding whorls (see Fig. 106) 7

! **Take special care here as the distinction between species can be hard to make.**

6. (5) Shell not more than 4.0-4.5mm wide, when it has 3.5 whorls. Shell translucent but not glossy, usually white, but with a brown form not uncommon. Weak, irregular radial growth lines crossed by much finer spiral striae visible at x20 magnification (Figs 103, 104) *Aegopinella pura*



Note: Common in woodland leaf-litter, also sometimes in hedges etc.

Fig. 103. Microsculpture of shell of *Aegopinella pura*

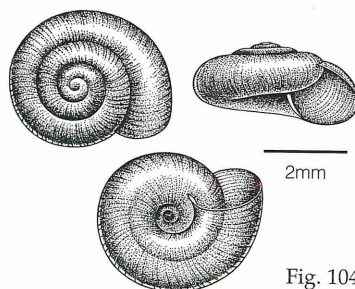


Fig. 104

- Shell up to 10mm wide (usually 7-9mm). At 4mm or less in width, juveniles have fewer whorls than *A. pura*. Flattened, brown and waxy. Often with an opaque milky flush round the umbilicus. Has irregular radial growth lines, but much weaker spiral striae (Fig. 105) *Aegopinella nitidula*

Note: Very common, in woods, hedges, gardens, rough grassland and waste ground.

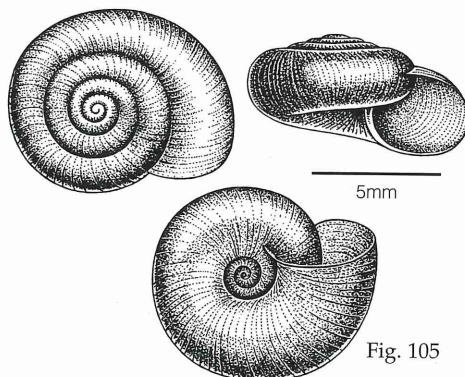


Fig. 105

7. (5) Large umbilicus. May be glossy or dull, but the spire is slightly raised (Fig. 106) *Zonitoides* species ... 8

Note: Adult shells around 6-7mm wide.



Fig. 106

- Small umbilicus. Shell always glossy when fresh. Always flattened relative to *Zonitoides* (Fig. 107) *Oxychilus* species ... 9

Note: Shells more than 10mm wide **almost always** belong here.



Fig. 107

8. (7) Shell with a massive and deep umbilicus. Irregular and rather coarse growth lines (Fig. 108). Shell pale brown or whitish, but the body of the living animal is dark. Mantle is grey with paler spotting *Zonitoides excavatus*

Note: Uncommon, usually in old, damp, oligotrophic woodland, and not in calcareous places.

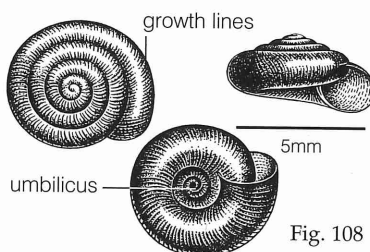


Fig. 108

- Shell with a large, but rather shallow and eccentric umbilicus (Fig. 109). Shell brown, transparent and very glossy when fresh, but living body dark. Mantle grey with darker spots. A dull orange spot is visible from above in living animals, just behind the mantle *Zonitoides nitidus*

Note: Common in wetlands and on river banks. Also in small marshes in woods.

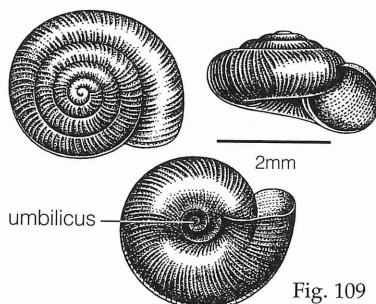


Fig. 109

9. (7) *Oxychilus* species (Figs 110, 111, 112, 113).

Dead, broken or juvenile specimens are difficult. Comparison with authenticated adult shells is very helpful. Use the table of shell and body characters opposite to get the best match. Use the colour plate (p. 39) as a point of reference.

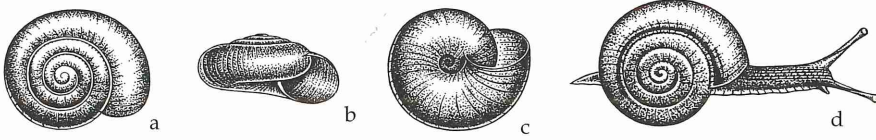


Fig. 110. *Oxychilus alliarius*

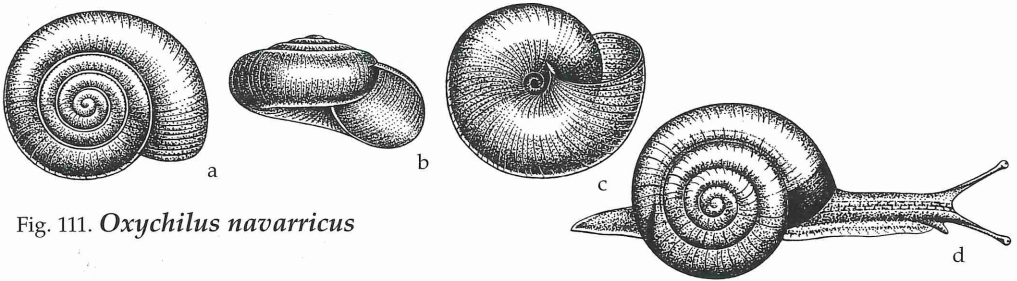


Fig. 111. *Oxychilus navarricus*

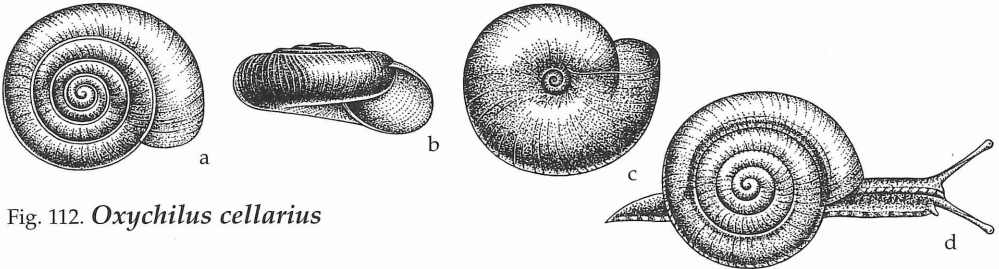


Fig. 112. *Oxychilus cellarius*

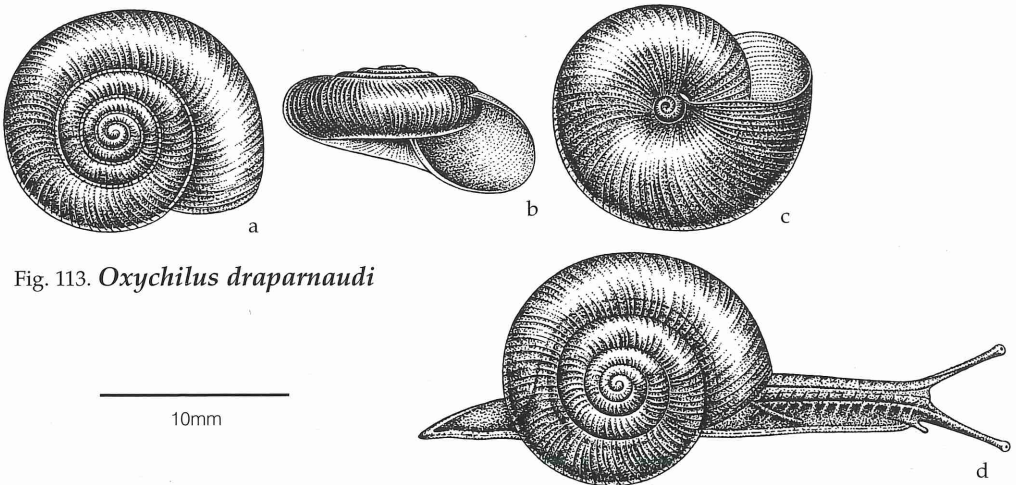


Fig. 113. *Oxychilus draparnaudi*

9. (continued)	<i>Oxychilus alliarius</i>	<i>Oxychilus navarricus</i>	<i>Oxychilus cellarius</i>	<i>Oxychilus draparnaudi</i>
	Fig. 110	Fig. 111	Fig. 112	Fig. 113
Adult shell width	6-8mm	8-10mm	9-12mm	11-16mm
Spire shape	Slightly raised (b)	Slightly raised (b)	Very flattened (b)	Very flattened (b)
Shell colour and texture	Variable. Pale brown to greenish, often with whitish streaks. Glossy	Rich brown. Very glossy	Very pale, transparent. Glossy	Yellow-brown. Slightly opaque. Growth lines easily visible
Other features	About 4.0-4.5 whorls in first 6-7mm. Less than 3.5 whorls in the others (a, d)	At the same size of shell, the umbilicus of <i>O. cellarius</i> is larger than that of <i>O. navarricus</i>		Last whorl enlarges rapidly (a). Umbilicus relatively large (c)
Body colour	Dark bluish-grey	Bluish-grey	Usually pale bluish-grey	Blue-black
Mantle colour	Like body	Black and conspicuous	Like body	Grey
Odour when irritated	Garlic smell usually and stronger	Garlic smell sometimes	None	None
Additional notes	Very widespread, and can be found even in very oligotrophic woodland	Less widespread than <i>O. cellarius</i> , but has been spreading in the last century	Widespread in woodland, hedges, gardens and waste ground, also in caves and deep in screes. It avoids the most acid and oligotrophic environments	Introduced species, now widespread, especially in gardens, parks and other anthropogenic places

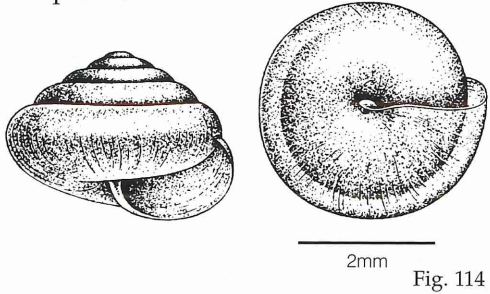
Notes:

1. The maximum sizes given are, very rarely, exceeded. Empty, worn, shells of *O. navarricus* less than 8mm wide are hard to distinguish from those of *O. alliarius*.
2. Body colour can vary within species.
3. To detect the odour, prod the animal gently with a grass-stem or similar object, so that it withdraws into the shell. If it is already withdrawn, a few gentle prods of the mantle suffice. *O. alliarius* frequently gives off an odour when picked off the natural surface.
4. None of the *Oxychilus* species occur regularly in dry open habitats without rocky shelter or scree.

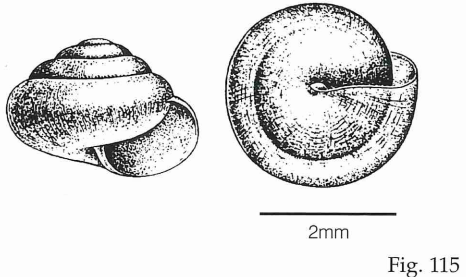
O. Euconulidae

From Picture Key B2(iii) or B3(ii), or Family Key couplet 20.

- 1. Shell up to 3.5mm wide. Pale brown and translucent. The underside shows only very faint traces of spiral striae under high magnification (Fig. 114). Body pale *Euconulus fulvus*



- Shell up to 2.8mm wide. Darker brown and translucent. The underside shows clear, minute spiral striae under high magnification (Fig. 115). Body dark *Euconulus alderi*



Notes:

- 1. Normally restricted to wetlands. Widespread.
- 2. *E. alderi* is split by Falkner, Ripken and Falkner (2002) into two previously recognised species, *E. trochiformis* (Montagu, 1803) and *E. praticola* (Reinhardt, 1883). A full diagnosis is in preparation (Falkner, von Proschwitz and Ripken). If possible, retain specimens of *E. alderi* for later determination. Dark-bodied forms found in wetland are probably *E. praticola*. Those found elsewhere, including some identified as *E. fulvus*, may turn out to be *E. trochiformis*.

P. Ferussaciidae

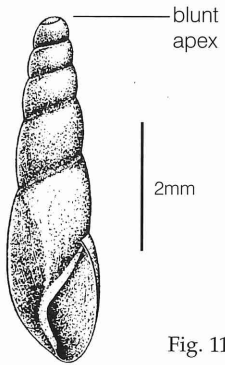
From Picture Key A2(ii), or Family Key couplet 13.
There is only one species in this family in the British Isles.

Ceciloides acicula

Shell transparent and colourless when fresh, white and opaque when old. Very long and narrow, with a blunt apex. Max. dimensions 5.5mm high, 1.3mm wide (Fig. 115).

Notes:

- 1. A subterranean species, living in calcareous soils. Old shells often seen in molehills or by rabbit burrows.
- 2. Juveniles are rather similar in shape to *Acicula fusca* (p. 31), but they have no radial striae, and the whorls expand much faster (in the vertical plane), producing a much more elliptical mouth.



Q. Clausiliidae

From Picture Key A1(i), or Family Key couplet 5.

GENERAL NOTE: Members of this family are sinistral, and have a very characteristic shape. Adults have a lip, and in all **except** *Balea* species (Fig. 118), there are lamellae and/or calluses inside the mouth (Fig. 117). **Juveniles** appear as narrow cones with simple mouths. With practice, and good magnification, they can often be identified by the texture of the shell. Comparison with known adults is obviously helpful! Clausiliids tend to be long lived, and adults are generally encountered much more often than juveniles. **The key below is to adults.**

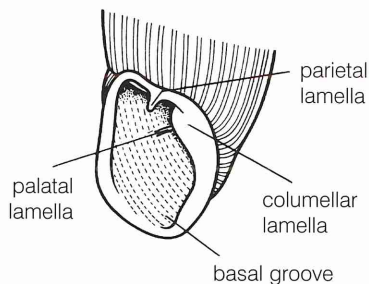


Fig. 117

1. Shell widest above mouth, which is encircled by a thickened lip. There is an evident parietal lamella, and there are other thickenings and lamellae visible inside the mouth (Fig. 117) 2

– Shell widest at, or just below the top of the mouth, which is rather rounded, with a feebly developed lip, which may not be continuous across the parietal region. Either no lamellae or thickenings in the mouth, or a very small, peg-like parietal lamella

..... ***Balea* species**

D Two species key out here, *Balea perversa* (Fig. 118), and the newly recognised *Balea heydeni* (Fig. 118a) (Gittenberger, Preece and Ripken, 2006). *B. heydeni* is usually shorter than *B. perversa*, and wider relative to its height. It never has a parietal denticle. The apex of *B. heydeni* widens more rapidly, and it is never regularly ribbed. Its shell is usually yellowish rather than brown. Earlier records of *B. perversa* will include *B. heydeni*, which appears to be the commoner of the two species in Britain and Ireland.

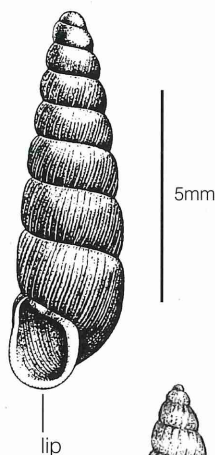


Fig. 118

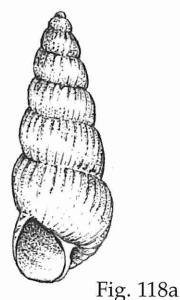


Fig. 118a

2. (1) Shell pale or greyish, with a conspicuous dark spiral band, spotted regularly with white, just below the suture of each whorl (Fig. 118b) ***Papillifera bidens***

Shell lacking such a band, usually unicolourous or with whitish streaks on a generally darker background 3

Note. *P. bidens*, an introduced Mediterranean species, is currently known only from the grounds of Cliveden House, but there are earlier, unconfirmed records from elsewhere (Ridout Sharp, 2007; Dance, 2008).



Fig. 118b

3. (2) Shell with a matt surface, with many regular, radial ribs (x10 magnification) 4

- Shell glossy and smooth, rather translucent when fresh (Fig. 119) *Cochlodina laminata*

Notes:

1. Usually reddish-brown, but albinos are not uncommon.
2. Shell height 14-17mm, width ca 4mm.
3. Widespread in England, but rare elsewhere. Typically in deciduous woodland, in litter and on logs. Climbs up tree trunks in wet weather. Most abundant on calcareous soils, but not restricted to them.
4. Juveniles of this species can usually be identified by their glossy, unribbed shells.

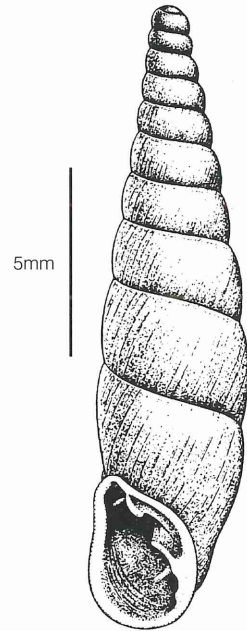


Fig. 119

4. (3) Shell large (ca 16mm high, 4mm wide) with strong prominent ribs (ca 5-6 per mm of shell width; Fig. 120) *Alinda biplicata*

Notes:

1. Shell pale brown when fresh.
2. A spiral palatal lamella is clearly visible inside the mouth.
3. Now **very rare** in Britain (absent in Ireland). Known from a few rather disturbed riverside sites in or near London.

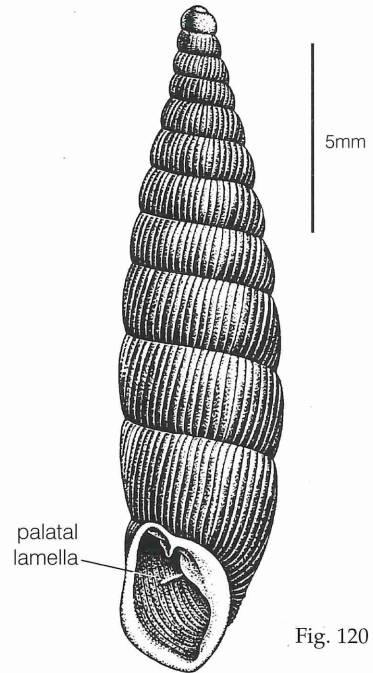


Fig. 120

- Shell smaller, or with much finer ribbing or both. No palatal lamella visible (there may be a palatal callus, oriented vertically) 5

Note: *Macrogastera rolpheii* (opposite, 5.) resembles *A. biplicata* in colour, and it has relatively coarse ribbing. It is smaller, has no visible palatal lamella, and the shell widens rapidly near the mouth. *A. biplicata* widens steadily along its length.

5. (4) Shell pale brown, wide (3.4-3.6mm) relative to height (12-14mm). Ribs rather widely spaced (ca 7 per mm on penultimate whorl). Mouth wide relative to its height. Basal groove present, but no basal callus alongside it (Fig. 121) *Macrogaster rolpheii*

Note: Leaf litter in deciduous woodland in the south of England, especially the extreme SE.

- Shell darker (may be greyish when old). Narrower relative to height. Finer ribbing (usually 9-11 per mm on penultimate whorl). Mouth relatively narrow, and an evident, whitened callus alongside the basal groove (see Figs 122, 123) 6

6. (5) Shell 9-12mm high, 2.2-2.7mm wide. Approx 11 ribs per mm on penultimate whorl. Spiral striations on shell **not** evident. Columellar lamella simple and inconspicuous, sometimes forking at the mouth (Fig. 122) *Clausilia bidentata*

Note: Common and widespread; missing from some areas previously subject to heavy pollution.

- Shell 13-16mm high, and 2.7-3.6mm wide. Ribs slightly more widely spaced (8-10 per mm). Spiral striations clearly visible (x10 magnification) on unworn shells. Columellar lamella with “notch” when viewed from front (Fig. 123) *Clausilia dubia*

Note: Limestone rocks and walls in N. England. An isolated population at Dover is probably introduced, and is ascribed to another subspecies (Anderson, 2005).

Additional note: In Britain, *C. dubia* and *C. bidentata* are easily separated on size: nearly all adult *C. dubia* are 14mm or more high. *C. dubia* shows much more variation over its European range. The two species are quite often found together in the northern Pennines. *C. dubia* often has a palatal callosity (see Fig. 123).

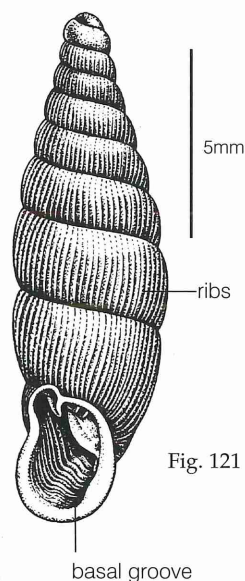


Fig. 121

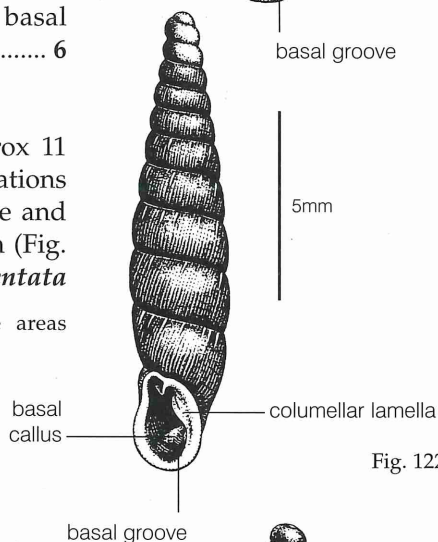


Fig. 122

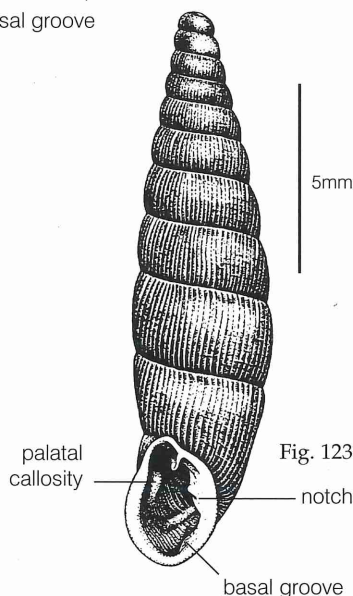


Fig. 123

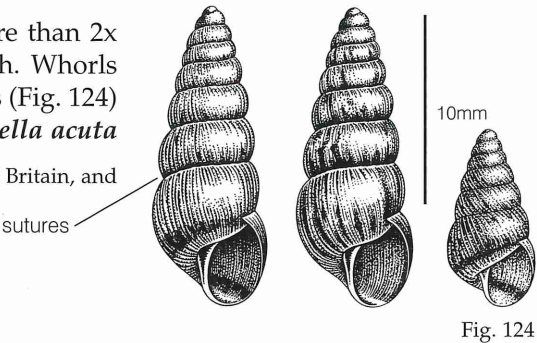
R. Helicoidea

From Picture Key A1(vi) or B1(ii), or from Family Key couplets 12 and 26.

- 1. Shell clearly higher than wide, as a simple cone (see Figs 124, 125) (*Cochlicella*) ... 2
- Shell wider than high, or with height and width approximately equal (Figs 126, 127) 3

- 2. (1) Shell very elongate, with height more than 2x width, when shell is 7mm or more high. Whorls relatively convex, with moderate sutures (Fig. 124) *Cochlicella acuta*

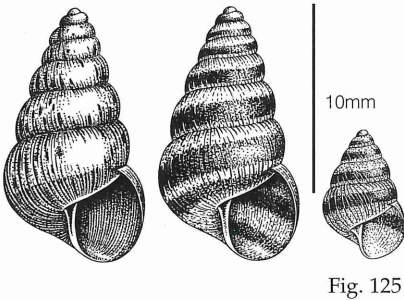
Note: Mainly on sand dunes on western coasts of Britain, and around Ireland. Often abundant.



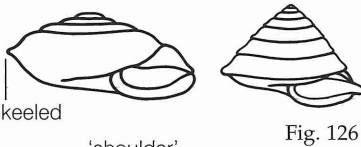
- Shell height less than 2x width. Whorls more flattened, and sutures shallow (Fig. 125) *Cochlicella barbara*

Note: A few coastal sites in the SW of Britain. A recent introduction.

Additional note: Both species of *Cochlicella* vary greatly in shell pattern and banding.



- 3. (1) Shell sharply keeled at the periphery (Fig. 126) 4



- Shell not sharply keeled (may have a blunt keel or 'shoulder' (Fig. 127) 7

Note: *Trochulus striolatus* (p. 67) or *Hygromia limbata* (p. 70), especially when juvenile, are rather shouldered. See later notes.



4. (3) Shell very flattened (width ca 2x height). Umbilicus very large (Fig. 128)
..... *Helicigona lapicida*

Notes:

1. Usually with a pattern of darker radial blotches and streaks. The shell has a granular microsculpture visible at modest magnification (x7 or x8).
2. Widespread in England only, but uncommon and declining in the east. On calcareous soils, especially on limestone rocks, but in woodland also.

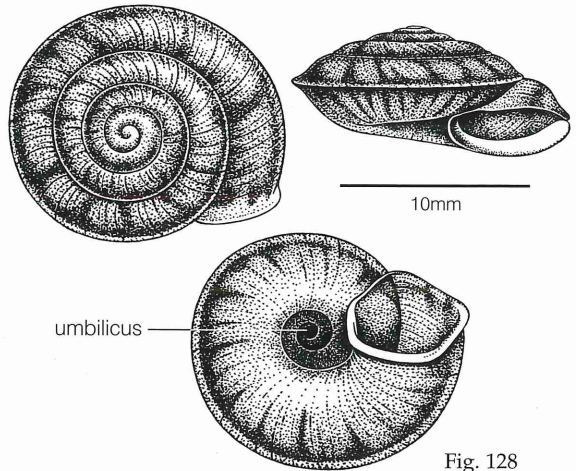


Fig. 128

- Shell not very flattened. Umbilicus small or tiny 5

5. (4) Shell a sharp cone above, very flattened below. Mouth very flattened, with a visible notch at the periphery. Fine regular ribbing visible at x7 magnification or higher (Fig. 129) *Trochoidea elegans*

Notes:

1. Whorls very flattened, with overlaps hiding the sutures.
2. **Very rare.** An introduced species present at a few localities in Kent.

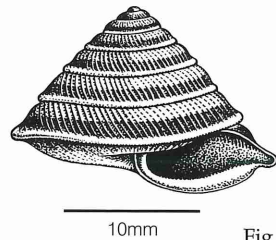


Fig. 129

- Shell slightly convex above, not so flattened below. Mouth oval or rounded. Irregular growth lines only (Figs 130, 131) 6

6. (5) Shell slightly translucent, brown to yellow, with a whiter spiral band at the periphery. Spire relatively high and conical. Umbilicus virtually sealed, underside slightly flattened (Fig. 130)
..... *Hygromia cinctella*

Notes:

1. An introduced species, found in hedges and gardens. Spreading fast, and now widely distributed in the southern half of England.
2. Juvenile *Trochulus striolatus*, which can appear keeled, are much flatter than *H. cinctella*, and have a much larger umbilicus.
3. *Hygromia limbata* (p. 70) is slightly keeled. It has an obvious thickened lip when adult, unlike *H. cinctella*.

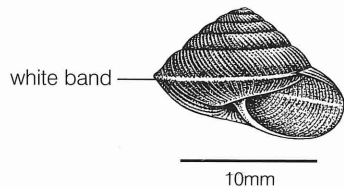


Fig. 130

- Shell basically white and opaque, but usually with darker spiral bands and blotches. Rather flattened spire, but underside large and rounded. Umbilicus small but visible (Fig. 131)
..... **JUVENILE** *Theba pisana*

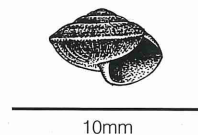


Fig. 131

Note: The keel disappears in the adults, which have a rounded periphery. See account of *T. pisana* on page 69.

7. (3) Shell very flattened (width ca 2x height).
Umbilicus very large 8
- Shell globular or only slightly flattened (width 1.6x
height or less). Umbilicus medium, small or absent
..... 9

Notes:

1. Exceptionally, some specimens of *Trochulus hispidus* (p. 68) may key out under 7a. They will look obviously different from either species keying out in 8 below.
2. Juvenile *Helicodonta obvoluta* have a relatively small umbilicus, but have a **sunken spire**. They are unmistakable.

8. (7) Shell with a very low spire. White, but usually with darker spiral bands or blotches. Mouth without lip or calluses, but may have a weak internal rib just behind the mouth edge (Fig. 132; Plate 3, p. 41) *Helicella itala*

Note: Short, dry, exposed calcareous grassland and dunes. Widespread, but has retreated from many inland sites.

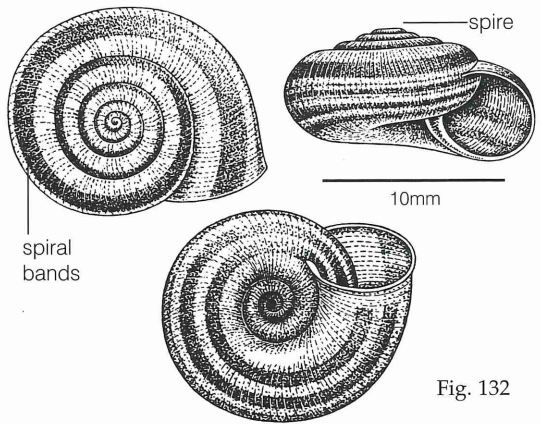


Fig. 132

- Shell with a sunken spire. Brown and tightly coiled. Adults with angular, lipped mouth with basal and palatal calluses (Fig. 133)
..... *Helicodonta obvoluta*

Notes:

1. Hairy when young (even as adult), but hairs wear off old specimens.
2. Very flattened below, giving the shell the appearance of a thick wheel with a rounded rim.
3. Rare. In deciduous woodlands in a small part of W. Sussex and Hampshire. Strongly associated with large rotting logs.

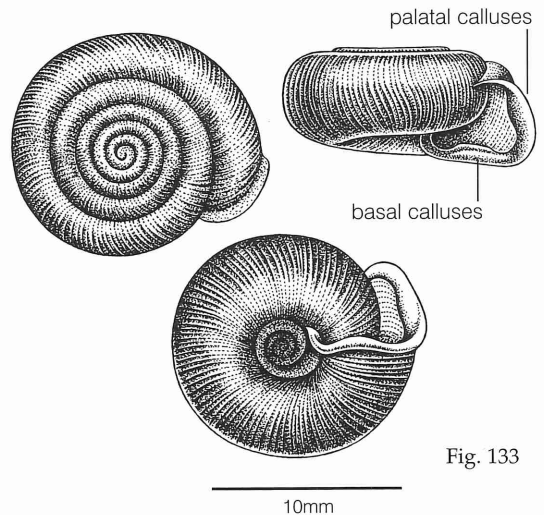


Fig. 133

9. (7) Adult shell very large (25mm or more wide). Globular (height roughly equal to width), with very rapidly expanding whorls (Fig. 134) 10

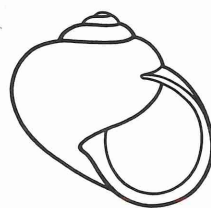


Fig. 134

- Adult shell less than 25mm wide. Shapes various, including globular (Fig. 135) 11



Fig. 135

Note: *Cepaea nemoralis* (p. 70) **very** occasionally exceeds 25mm in width. It is less globular, and completely different from *Helix* in colour and pattern.

10. (9) Shell pale brown or yellow, usually with extensive darker banding and blotching (Fig. 136). Characteristic wrinkled surface (x10 magnification). Adult usually less than 40mm wide. Umbilicus completely sealed by lip *Cornu aspersum*

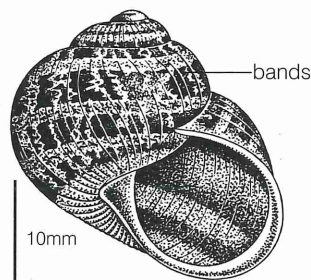


Fig. 136

Notes:

1. Common in the south, and near the coast. Spreading rapidly inland in the north. A very successful introduced species, occurring in woods, hedges and dunes as well as in gardens.
2. *Arianta arbustorum* (p. 69) is sometimes confused with *C. aspersum*, because of similar colouring. It is smaller, more tightly coiled, less globular, and lacks the wrinkles of *C. aspersum*.

- Shell creamy-white, very opaque, usually with a few faint, broad, pale brown spiral bands (Fig. 137). Shell with coarse growth lines, but no wrinkles. Adult shells usually more than 35mm wide. Umbilicus remains visible as a tiny chink *Helix pomatia*

Note: An introduced species, now rare and protected because collected for food. Confined to a few calcareous districts in S. England.

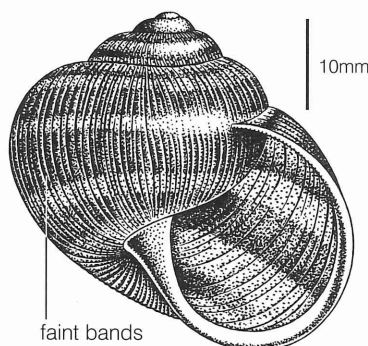
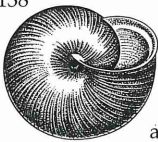
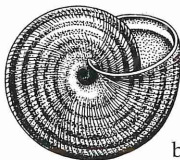
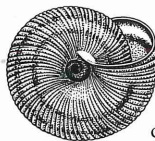
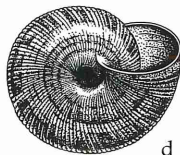
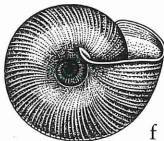
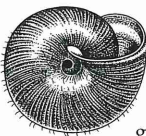
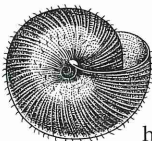
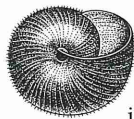
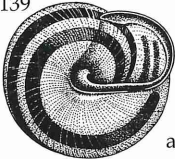
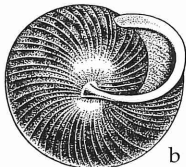
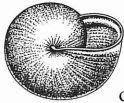
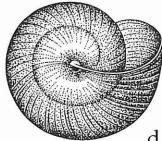
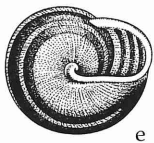
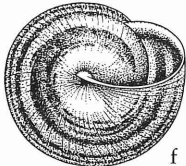
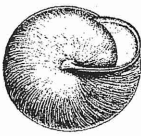
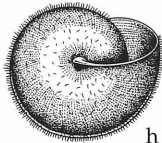


Fig. 137

11. (9) Shell with an evident and substantial umbilicus, not much obscured by mouth edge or lip. The undersides of all species falling into this category are shown in outline below (Fig. 138). GO TO 12.

Fig. 138				
				
<i>Monacha cantiana</i>	<i>Cernuella virgata</i>	<i>Candidula intersecta</i>	<i>Candidula gigaxii</i>	
				
<i>Trochulus striolatus</i>	<i>Trochulus hispidus</i>	<i>Trochulus sericeus</i>	<i>Zenobiella rubiginosa</i>	<i>Ponentina subvirescens</i>

– Adult shell with umbilicus completely sealed by lip, or remaining as a small chink, partly obscured by mouth edge or lip. The undersides of all species falling into this group are shown below (Fig. 139). GO TO 19.

Fig. 139			
			
<i>Cepaea nemoralis</i>	<i>Arianta arbustorum</i>	<i>Monacha cartusiana</i>	<i>Pseudotrachia rubiginosa</i>
			
<i>Cepaea hortensis</i>	<i>Theba pisana</i>	<i>Hygromia limbata</i>	<i>Ashfordia granulata</i>

Notes:

1. Juveniles of species keying out under 11b may have an umbilicus more apparent than in the adult. The umbilicus is always small relative to that in species keying out in 11a.

2. Adults of *Cepaea* and *Arianta* sometimes fail to close the umbilicus to the normal extent. These large species soon become familiar through other characters.

3. In the test version of this key, many users found this "umbilicus" character hard to determine. I have persisted with it (with illustrations), because it is hard to find any other single character that breaks the remaining helicoids into equal-sized groups. There is a partial check which you can use, based on size: **if the shell is more than 9mm wide**, you can **eliminate** *Ashfordia granulata*, *Pseudotrachia rubiginosa*, *Trochulus sericeus* and *Ponentina subvirescens*. **If it is more than 11mm wide**, you can also eliminate *Trochulus hispidus*. **If it is more than 13mm wide**, you can eliminate *Candidula intersecta* and *Candidula gigaxii*. **If it is more than 16mm wide**, you can eliminate *Monacha cartusiana*, *Hygromia limbata* and *Trochulus striolatus*. Because juveniles are, of course, smaller than adults, you cannot operate this size criterion in reverse!

12. (11) Shell background colour white and opaque, sometimes very pale brown, often with spiral bands and/or blotches of darker brown/black, which may obscure the ground colour, giving the shell a speckled appearance. **Never hairy**, but may be heavily ribbed (*Cernuella* and *Candidula*) ... 13

– Shell background colour brown, yellow, greenish or creamy, generally slightly translucent when fresh. **No darker bands or blotches**, except near the mouth. Hairs **may** be present, especially in juveniles 15

13. (12) Shell nearly globular (height approx 0.75x width). Whorls very rounded *Cernuella virgata*

Notes:

1. Fine, rather irregular radial growth lines, often wrinkled near the suture. Umbilicus small relative to shell size (Fig. 140). In adults the inside of the mouth may be flushed with brown.

2. A common species of dunes, coastal grassland and open calcareous habitats inland, including some roadside verges.

3. This species varies immensely in size from place to place; adults 7-18mm wide.

4. This species is very variable in appearance, being polymorphic for banding and blotching on the shell. Strikingly different forms can be found together (Plate 3, p. 41).

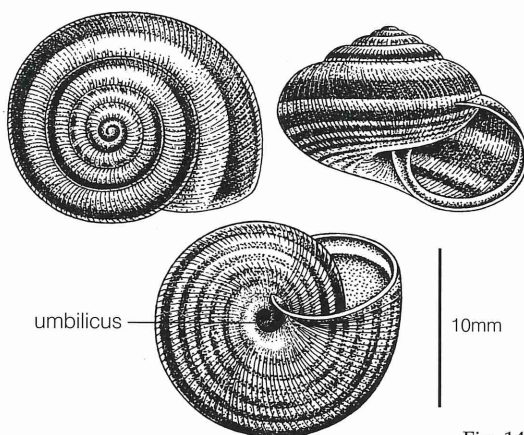


Fig. 140

– Shell height less than 0.7x width. Whorls at least slightly flattened above 14

! **Additional species!** Carr (2002) gives details of a confirmed finding of the introduced *Cernuella aginnica* in Kent. This species (Fig. 140a) closely resembles *C. virgata*, but is usually flatter, and with a larger umbilicus. There is, however, a lot of variation in these characters, and the diagnostic feature is internal: both parts of the paired dart-sac are more or less equal in *C. aginnica*, while in *C. virgata* the portion holding the dart is much larger than the other. The position of the dart-sac is shown (for other species) in Figs 165 and 166 (pages 78, 79). It is almost certainly a very rare species in this country.

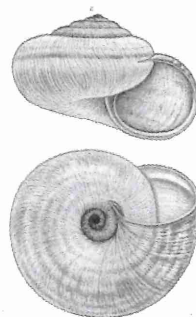


Fig. 140a

14. (13) Shell height usually 0.6-0.7x width, whorls somewhat flattened, upper surface covered with rather coarse and irregular ribbing. The whorls expand evenly, and the umbilicus, large relative to that of *C. virgata*, is round and symmetrical (Fig. 141; Plate 3, p. 41)
..... *Candidula intersecta*

Note: Common in dunes and other dry, calcareous habitats, often more exposed than those occupied by *Cernuella virgata*.

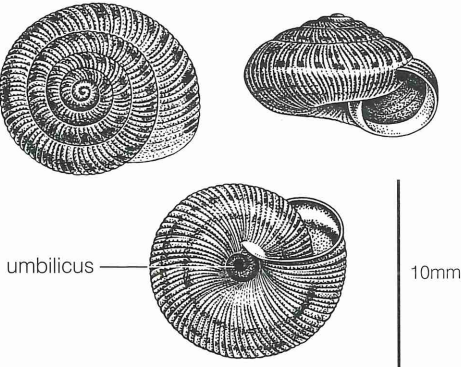


Fig. 141

- Shell clearly rather flattened, with height usually less than 0.6x width. Whorls rather flattened above, and with fine, regular radial ribbing. Last whorl expands rather rapidly towards the mouth, and the umbilicus appears eccentric (Fig. 142; Plate 3, p. 41)
..... *Candidula gigaxii*

Notes:

1. Open, grassy and calcareous habitats, mainly inland, and in the south and east of England.

Additional notes:

1. Both species keying out here are very variable in appearance, being polymorphic for banding and blotching on the shell. Strikingly different forms can be found together.

2. Neither species of *Candidula* has the brownish flush inside the mouth, which is often present in *Cernuella virgata*.

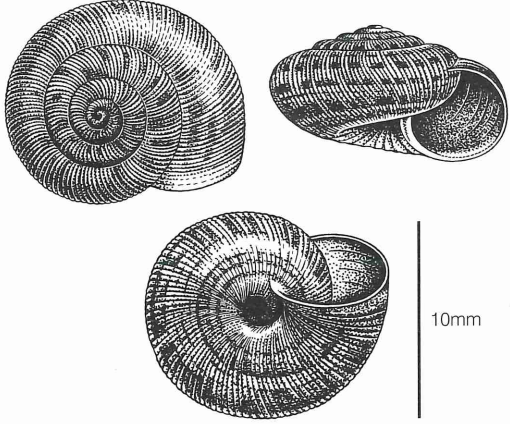


Fig. 142

15. (12) Never more than 8mm wide. Shell very globular, height 0.75x width, or more. Shell greenish, translucent and hairy when fresh, with rapidly expanding whorls (Fig. 143) *Ponentina subvirescens*

Notes:

1. Almost exclusively in cliff-top grassland in SW England and Pembroke.

2. Check *Ashfordia granulata* (p. 71). It is also small, hairy and globular, but is much more tightly coiled, has a **tiny** umbilicus and is typical of rather wet places inland.

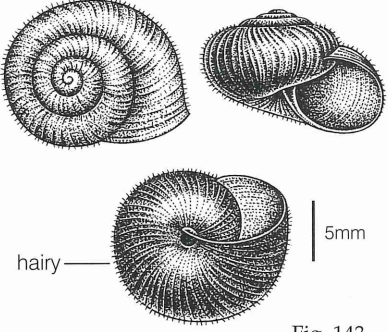


Fig. 143

- Shell **often** more than 8mm wide, and **often** rather flattened. Colour may be brown, creamy, or yellow / horn when fresh, but not greenish 16

16. (15) Adult shell about 15mm wide or more. Umbilicus small. Shell creamy white, often with reddish flush behind the mouth, which may extend some way back (Fig. 144; Plate 4, p. 42) *Monacha cantiana*

Notes:

1. Flattened above, with large last whorl.
2. A successful introduced species, found on roadsides, railway embankments and open waste ground. Mainly S. and E. England.
3. Adult *M. cantiana* are hairless, but small juveniles are densely hairy. *Monacha cartusiana* (which is rare, see page 70) is very similar in appearance but smaller, and with a **minute** umbilicus.

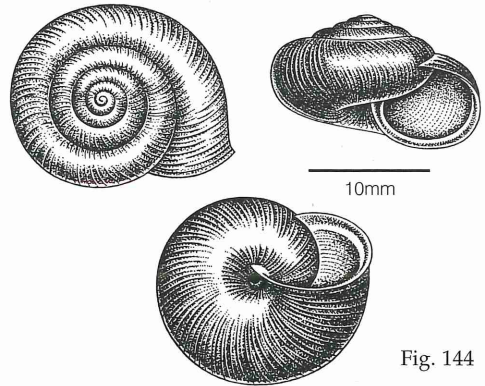


Fig. 144

- Shell nearly always less than 14mm wide. Umbilicus relatively large (Fig. 145). Brown or yellowish. Sometimes pale at the periphery, but no reddish flush behind mouth 17

Note: All are hairy as juveniles; hair persists in some, but not all adults.

17. (16) Adult shell usually more than 12mm wide. Periphery is distinctly shouldered (even bluntly keeled in juveniles). Never hairy when adult (Fig. 145) ... *Trochulus striolatus*

Notes:

1. Rather flattened, with a low, convex spire.
2. Common and widespread, especially in gardens, but also woodland, hedges and waste ground generally.
3. This species is very variable in both the height of the shell relative to width, and in the size of the umbilicus.

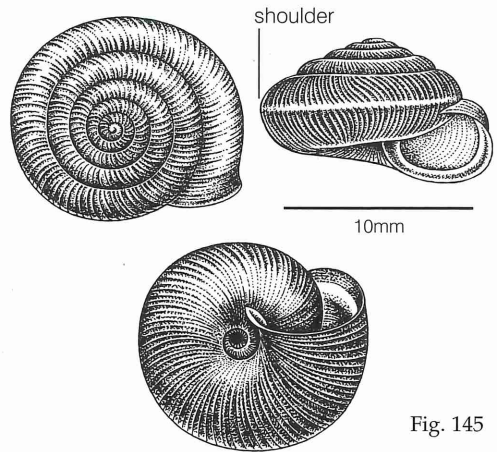


Fig. 145

- Adult shell usually less than 10mm wide (occasionally up to 12mm). Periphery rounded rather than shouldered. Adults often, but not always hairy (traces of hairs may remain in the umbilicus) 18



18. (17) There are three “forms” which key out here.

Fig. 146

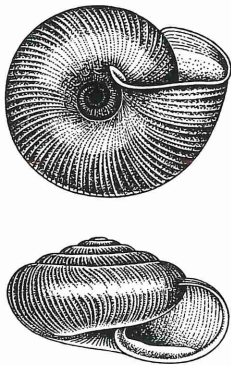


Fig. 147

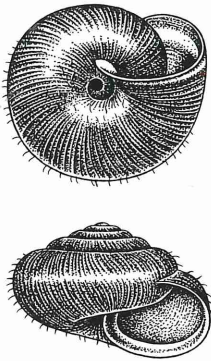
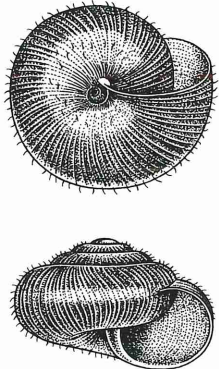


Fig. 148



Trochulus hispidus

Trochulus sericeus

Pseudotrichia rubiginosa

Flattened spire. Relatively large umbilicus. Lip/rib in mouth of adult. Hairs often missing in adults, especially in open habitats.

Taller spire. Relatively small umbilicus. Lip/rib in mouth of adult. Hairs usually persist in living adults.

Taller spire. Small umbilicus. Closely resembling *T. sericeus*, but never with a lip or rib at mouth edge.

Although difficult to distinguish on external features, there is no doubt about the distinctness of *Pseudotrichia rubiginosa*. It has very different reproductive organs from those of *Trichia* species. Key 4 D (p. 78) tells you what to look for.

Pseudotrichia rubiginosa (Fig. 148) is a rare and restricted species in Great Britain, being confined to muddy riversides in the Thames and Medway valleys. It may, however, be under-recorded! On the continent, it is associated with floodplains. If you find populations in this kind of habitat, where not even the largest shells have lips or ribs, it is worth attempting a dissection, or giving specimens to an expert.

Trochulus hispidus (Fig. 146) is a common and widespread species, found in woods, wetlands and in hedges, rough ground and quite dry, calcareous grassland. It varies considerably in shape, in the size of the umbilicus, and in the extent to which hairs persist on the adult shell. Typically, populations in drier and more exposed habitats have flatter shells, with larger umbilicuses, than those in wetter and more shady places. They also lose the hairs more often as adults.

Trochulus sericeus (Fig. 147) is a form the status of which are not clear. In Britain, the distinction between *T. sericeus* and *T. hispidus* has been made mainly on shell characters, but detailed analyses of shell characters do not show clear-cut differences (Naggs, 1985). Recently, a thorough systematic review (Prockow, 2000), making comparisons across Europe, could find no consistent diagnostic characters to distinguish the two. Recently, however, Naggs, reported in Anderson (2005), has shown that the bursa of *T. sericeus* is always spherical, while that of *T. hispidus* is always longer than broad. See Key 4D. Hence, there is a case for regarding *T. sericeus* as merely a form of *T. hispidus*. It is likely to be encountered in wetter, shadier places than typical *T. hispidus*. On the other hand, as shown in Kerney (1999), forms recognised as *T. sericeus* have a rather distinctive distribution in Britain, being centred in the East Midlands of England. It is worth noting if specimens appear to be of the *sericeus* type.



Take special care here as the distinction between species can be hard to make.

19. (11) Adult shell more than 15mm wide, and opaque. If juvenile, then fewer than 3.5 whorls in first 12mm. Colour and pattern very variable, often with bands or blotches. Rarely uniform pale brown 20

– Adult shell less than 14mm wide, sometimes transparent or translucent. More than 4 whorls at 12mm width. No bands or blotches; at most a **pale** band at the periphery, or a reddish flush behind the mouth 23

20. (19) Shell white, usually with multiple spiral bands and patterns. The lip is not strong being reflected only over the columella, partly covering a tiny umbilicus (Fig. 149) *Theba pisana*

Notes:

1. The mouth of the adult may have a pinkish tinge inside.
2. Introduced. On sand dunes in the S.W of England and of Wales, and a few places on the Irish coast. Can be locally very abundant.
3. Small juveniles are keeled, see page 61 and Fig. 131.

– Shell colour varies, but not white when fresh. There may be up to 5 darker bands. The lip is everted; the umbilicus is either completely sealed, or is a tiny chink (*Cepaea* and *Arianta*) ... 21

Note: Juveniles are not markedly keeled.

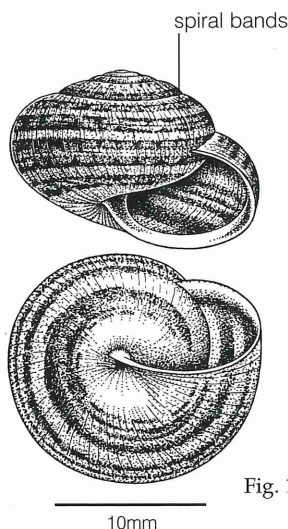


Fig. 149

21. (20) Shell colour variable, but not mottled. Unbanded, or with up to 5 spiral bands, which may vary in width and pigmentation, or be broken up into spiral rows of darker spots. In adults, the umbilicus is sealed completely by the lip. The mouth is rather flattened below (*Cepaea*) ... 22

– Shell usually brown and mottled/flecked, with either a single, central, spiral band or none. In the adult, the umbilicus survives as a tiny chink, nearly sealed by the everted lip. The mouth is rounded below, and the lip is always white (Fig. 150; Plate 4, p. 42) *Arianta arbustorum*

Note: Widespread, usually in damp places, and more confined to these in the south and east.

Additional notes:

1. Both *Cepaea* (p. 70) species, and *A. arbustorum* are very variable in the colour and pattern of the shell, and strikingly different forms may be present in the same population. The shape of the mouth, and the form of the lip are absolutely characteristic.
2. There is a rare form of *A. arbustorum* which lacks the mottling. A minority of *A. arbustorum* shells are yellowish, rather than dark brown.
3. Small juveniles of these species can resemble Vitrinids (p. 50). Vitrinids never have any trace of bands, nor of bright colour. These juveniles are also shouldered at the periphery.

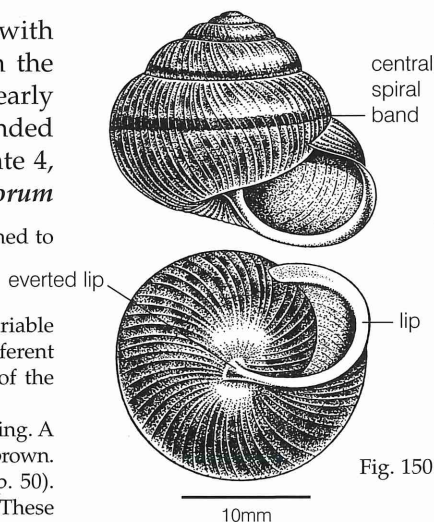


Fig. 150

22. (21) Adult shell usually 20-24mm wide. Lip dark brown, and large juveniles may have dark flush inside the mouth near the columella (Fig. 151; Plate 4, p. 42) *Cepaea nemoralis*

Note: Common and widespread, in woods, hedges and some calcareous grasslands, including dunes. The largest **native** species.

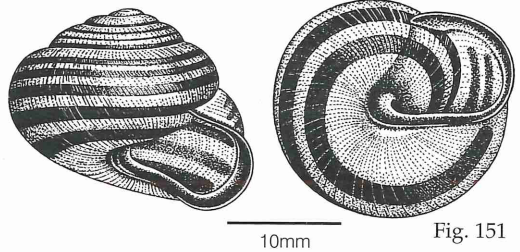


Fig. 151

- Adult shell usually 16-20mm wide. Lip white, or slightly flushed with darker pigment if shell is pink or brown (Fig. 152; Plate 4, p. 42) *Cepaea hortensis*

Note: Common and widespread. Many habitats, but on dunes only in N. Scotland. On average prefers marginally wetter and colder places than *Cepaea nemoralis*.

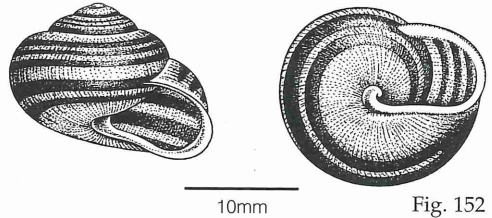


Fig. 152

Additional notes:

1. The **lip colour distinction**, given above, is reliable in the great majority of cases. There are, however, populations of *C. nemoralis* in which white-lipped shells occur, and of *C. hortensis* in which dark-lipped forms occur. They are usually in a minority amongst the population, and it is usually obvious that they are the same size as those with the "right" lip colour. Occasionally, a dissection may be necessary: see **Key 4E**, page 79.
2. Small juveniles cannot be reliably distinguished in the absence of adults; the species share many colour and banding varieties.

23. (19) Adult shell flattened above, whitish and more-or-less matt and opaque. There is a thickened rib behind the lip, which is slightly reflected, and often dark. A pale reddish flush is often found behind the mouth (Fig. 153) *Monacha cartusiana*

Notes:

1. Introduced, rare and declining, known now only from a few open-habitat sites in the extreme SE of England.
2. Similar to *M. cantiana*, (p. 67) which is much commoner. *M. cantiana* is larger, and has a larger umbilicus.

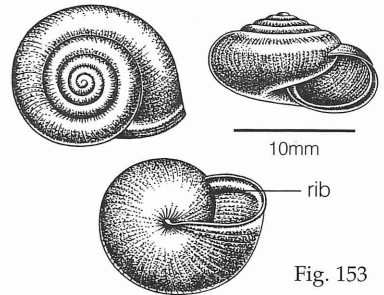


Fig. 153

- Shell brown or yellowish, if very pale then thin and translucent. Lip, if present, not darker than rest of shell 24
24. (23) Shell up to 11mm wide, thin and translucent. No reflected lip, and internal rib feeble if present 25
- Shell up to 14mm wide, opaque. Fully adult shell has a slightly reflected lip, and an internal rib behind (Fig. 154) *Hygromia limbata*

Notes:

1. Rather coarse growth lines; shouldered at the periphery, where there may be a pale spiral band.
2. Introduced; basically restricted to the SW of England, but spreading slowly. Hedges, roadsides, gardens, etc.

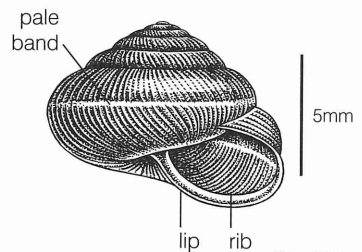


Fig. 154

25. (24) Shell somewhat flattened above (height 0.6-0.7x width) up to 10mm wide. Never hairy (Fig. 155)
 *Zenobiella subrufescens*

Notes:

1. Thin, translucent and very fragile, usually pale brown and rather glossy. Whorls expand rapidly. Slightly shouldered at the periphery, rounder below than above.
2. Widespread but uncommon in the north and west, absent from most of the southeast. Mainly in old woodland, and may climb and rest in foliage.
3. There is an uncommon variety of *Z. subrufescens* in which the shell is greenish. This resembles Vitrinids (p. 50), but is shouldered, and has more whorls.

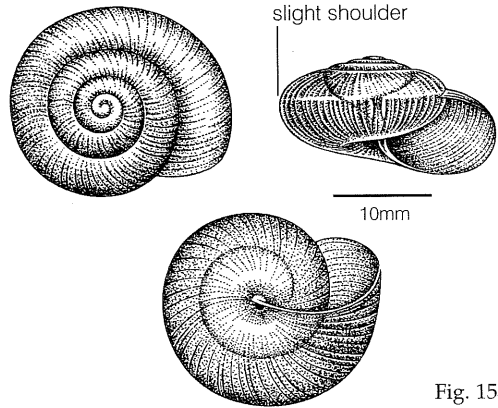


Fig. 155

- Shell rather globular, up to 9mm wide, with tightly-coiled whorls. Densely hairy when fresh (Fig. 156)
 *Ashfordia granulata*

Notes:

1. Widespread, though absent from many areas in the English and Welsh midlands. Usually in open damp habitats with lush vegetation. Habitat range much wider in north and west.
2. *Pseudotrachia rubiginosa*, *Trochulus hispidus* and *T. sericaceus* (p. 68) are also hairy, and may be found in similar habitats. They are not so tightly coiled, and their umbilicuses are proportionately larger.

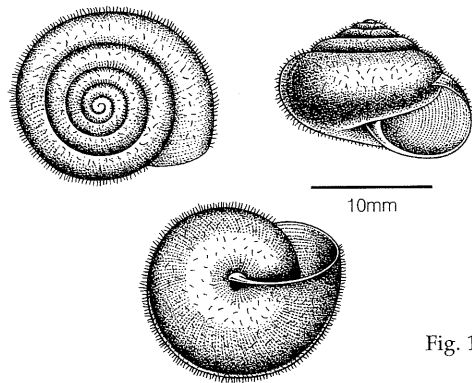


Fig. 156

KEY 4

KEYS TO INTERNAL CHARACTERS

The reproductive system.

It is details of the reproductive organs that provide most of the diagnostic characters for species that are difficult to separate on shell characters. What follows is a very simple guide to the reproductive system; further details of internal anatomy and the mode of reproduction can be found in Kerney and Cameron (1979).

Pulmonate snails are hermaphrodite. During mating, each usually transfers spermatozoa to the other in a long, thin package, a spermatophore. As far as is known, no snails reproduce asexually, but a number are capable of self-fertilisation; some may reproduce only in this way.

Figure 157 shows the reproductive organs of *Cornu aspersum*, spread out after dissection. *Helix* species have the most elaborate systems; some or all of the accessory components, labelled in *italics*, may be missing in other genera and families.

At the proximal end (where the system starts) is the **ovotestis**, which produces both eggs and sperm. These travel down a **common duct** to the **albumen gland**, which supplies albumen to the eggs. Thereafter, eggs and sperm travel different paths, the eggs down the wide and lobed **oviduct**, the sperm down the narrow **vas deferens**, which lies on the oviduct for much of its length.

The organs which lie "downstream" of the point at which the vas deferens separates from the oviduct are known as the **distal genitalia**. Diagnostic features concern these, rather than the parts so far described.

In the male part, the vas deferens lies free for a part of its length, then joins the **epiphallus**, which in turn joins the muscular and evertible **penis**, which opens into the **atrium**. The junction between the epiphallus and the penis is marked by the attachment of the powerful **penial retractor muscle**. The *flagellum* is missing in many species of snail.

In the female part, the oviduct leads to the **vagina**, which opens into the atrium. Joining the vagina are the *dart-sac*, paired *mucus glands*, and the **duct** of the **bursa copulatrix**. Inside the dart-sac there is the *love-dart*, which is discharged at the partner during courtship. The *diverticulum* of the bursa duct, the dart-sac and the mucus glands are missing in many species.

Figure 158 also shows some other organs, partly to help in orientation. Notice the **buccal mass**, housing the jaw and radula. The jaw can be examined to identify two Succineid species (p. 76).

Simple guide to dissection.

This is a guide to quick dissection for identification, mainly to expose the distal reproductive system where diagnostic characters are found. A slightly fuller account can be found in Kerney and Cameron (1979).

1. The animal to be dissected should be adult, or nearly so.
2. Kill the animal by drowning/narcotising (see p. 4).
3. Remove the body from the shell. This can be done as set out on page 4. If this proves difficult, the shell can be broken off in pieces with strong forceps.
4. Pin the body, foot down, to wax or plasticene stuck in the base of a small dissecting dish (a high-sided glass petri dish will do), stretching it **gently**: one pin centrally through the head, another through the rear of the foot (see Fig. 158). Fill the dish with water, so that it covers the body.
5. Cut away the upper wall of the mantle, working round from the respiratory pore. Then make a cut through the body wall in the mid line, extending forward to the upper tentacles, and backwards to the rear of the mantle. Keep sharp edges (scalpel or scissors) pointing upwards.
6. Make lateral cuts down to the edge of the foot on both sides just behind the tentacles, and at the rear of your mid line cut. Be especially careful on the right side behind the tentacle: the opening of the reproductive system is just behind the tentacle.
7. Carefully pin down the flaps of skin on either side. The internal organs in the anterior of the body are now exposed. Remove any thin connective tissue that obscures your view. Identify as many organs as you can, then tease them out gently, using needles and forceps. You may need to cut through small muscles and tissue; make sure you are not removing a part of the reproductive system.
8. Spread out the reproductive system (see Fig. 158), so that you can see all the elements of the distal system. You can now use the figures in the keys that follow to identify your specimen.
9. The dissected body can be preserved in 70% alcohol. If the diagnosis is clear, though, a drawing of the organs, or notes, are adequate.

NOTE: A common problem in dissecting is accidentally cutting parts of the digestive tract, which releases a cloud of gut contents. This debris can be washed away gently; a bulb pipette is useful to clear the water around the organs you are looking at.

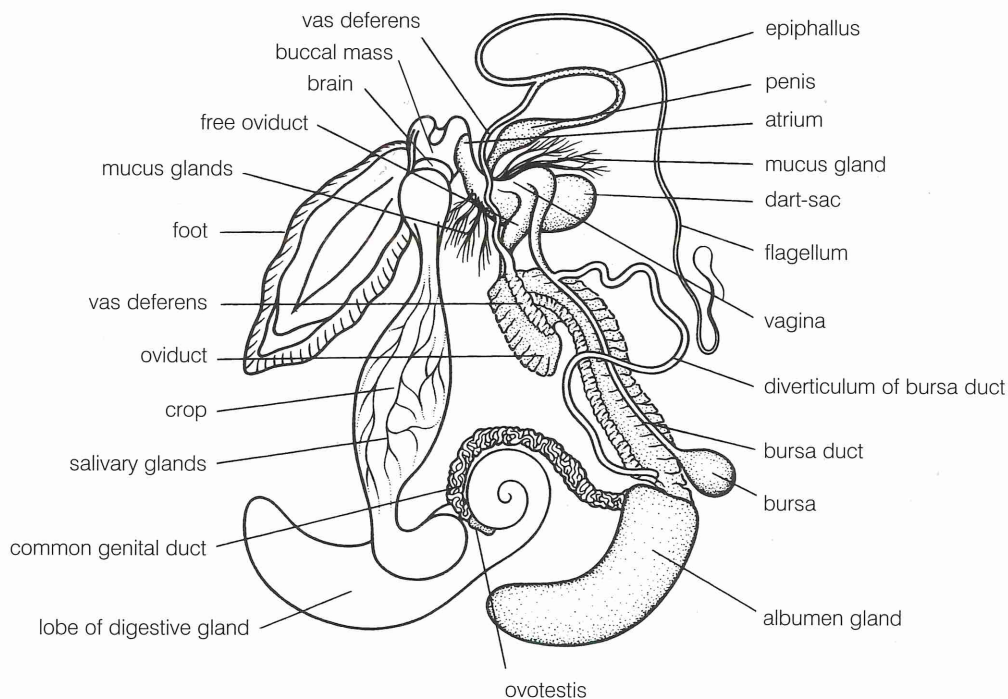


Fig. 157. Anatomy of snail (*Cornu aspersum*)

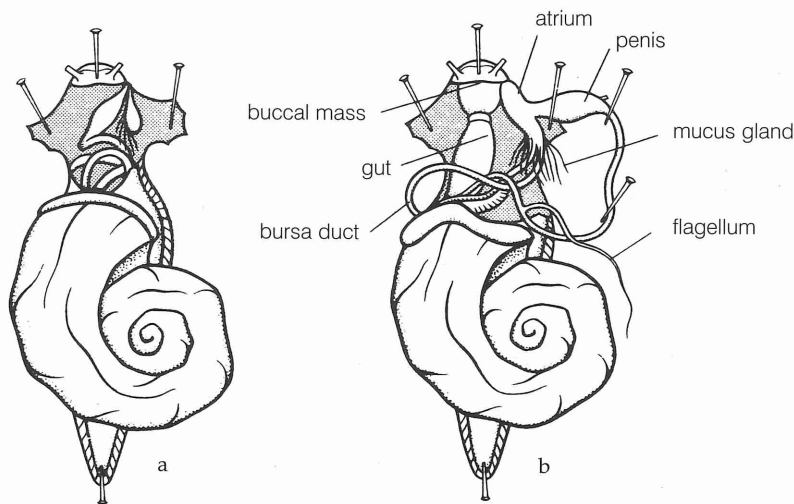


Fig. 158. Dissection of snail, first (a) and second stages (b).

A. Carychiidae: *Carychium*

Dissection as such is not required for these very small species, but it is possible to confirm an identification as follows: in both species of *Carychium*, the teeth visible at the mouth of the shell extend backwards as spiral lamellae inside the shell.

In *Carychium tridentatum*, one of the lamellae makes **angled** curves around the columella (Fig. 159).

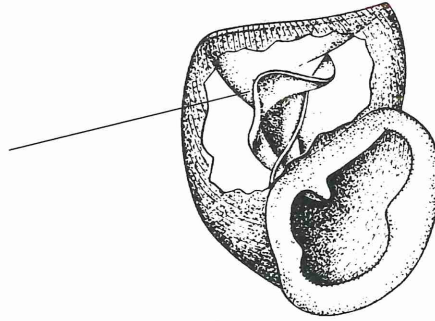


Fig. 159

In *Carychium minimum*, the lamella makes smooth curves round the columella (Fig. 160).

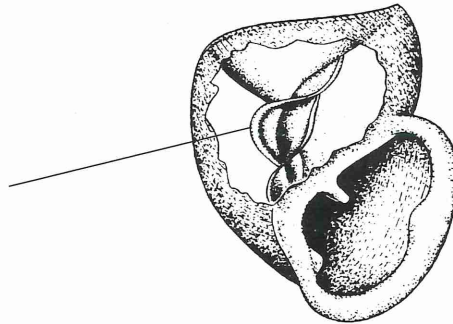


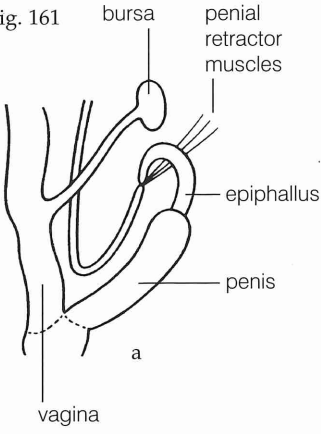
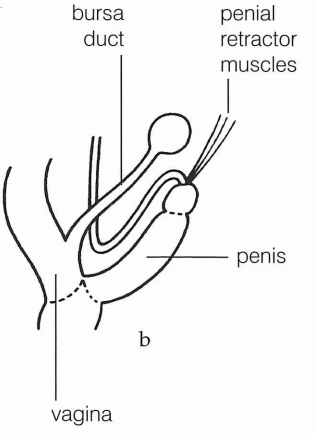
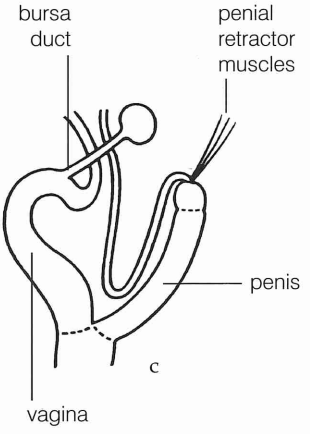
Fig. 160

To see these lamellae, it is usually necessary to break open the body-whorl just above the mouth (see Figs 159 and 160 above). This must be done under a binocular microscope, placing the shell mouth uppermost on a soft, slightly adhesive surface, like modelling clay. The shell can be broken using very fine needles. A fine paintbrush to get rid of the debris is also needed. This takes a little practice! If you are very lucky, it is sometimes possible to make out the shape of the lamellae through the shell, with very good, powerful lighting. Empty shells are best for this technique.

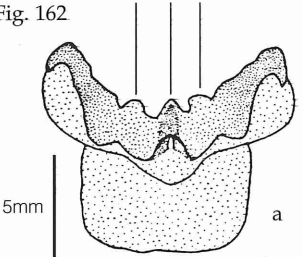
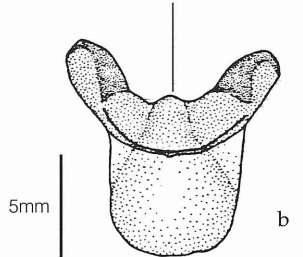
B. Succineidae

Variation in the size and arrangement of parts of the reproductive system provide the necessary diagnostic characters.

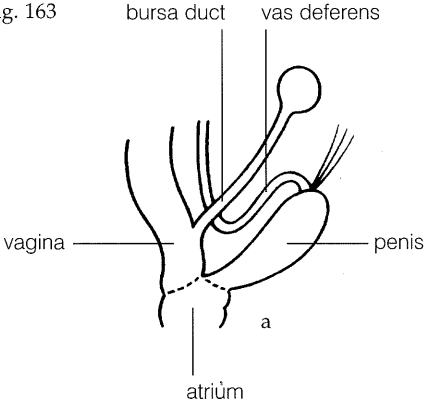
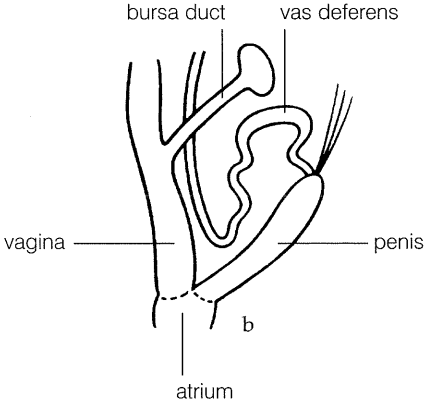
As between *Succinea putris*, *Oxyloma elegans* and *O. sarsii*, use Fig. 161 below.

Fig. 161		
		
<i>Succinea putris</i>	<i>Oxyloma elegans</i>	<i>Oxyloma sarsii</i>
Note exposed epiphallus and attachment of penial retractor muscle.	Both species have the epiphallus concealed within a penial sheath.	
	The duct of the bursa is long, and joins the vagina near the atrium.	The duct of the bursa is short, and joins the vagina at some distance from the atrium.

Alternatively, the two widespread species, *S. putris* and *O. elegans*, can be separated by examining the jaw. To do this, the buccal mass (see Fig. 162) must be opened, and the jaw extracted.

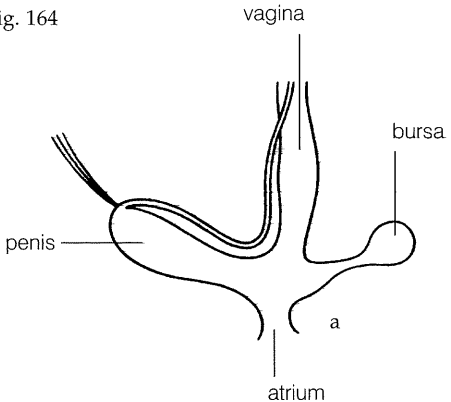
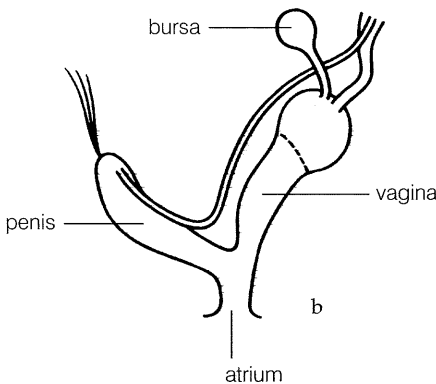
Fig. 162	
	
<i>Succinea putris</i>	<i>Oxyloma elegans</i>
Note the multiple corrugations (teeth) centrally	Note the single, median corrugation.

As between *Quickella arenaria* and *Succinella oblonga*, use Fig. 163 below:

Fig. 163 	
<i>Quickella arenaria</i>	<i>Succinella oblonga</i>
There is a simple, short vas deferens, and the duct of the bursa joins the vagina close to the atrium.	There is a long vas deferens, thickened in its central portion. The duct of the bursa joins the vagina some distance from the atrium. There is a distinct epiphallus, not shown here, within the penial sheath.

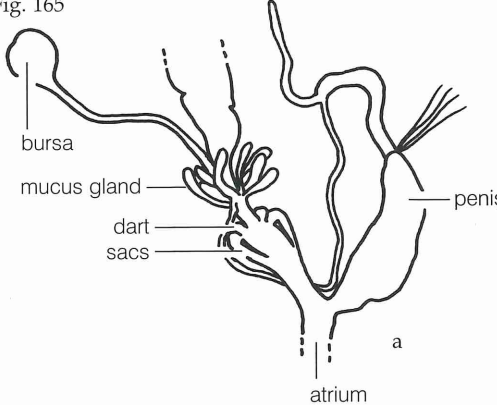
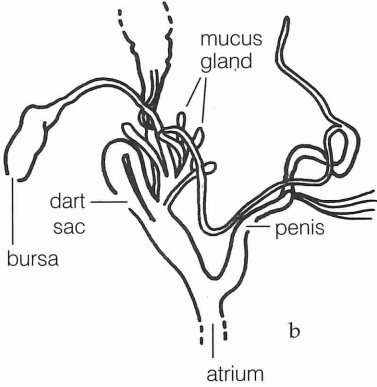
C. Vitrinidae: *Vitrina pellucida* and *Phenacolimax major*

These animals are small, even when adult! A fair degree of skill is required. The key feature is the duct of the *bursa copulatrix* (see Fig. 164 below).

Fig. 164 	
<i>Vitrina pellucida</i>	<i>Phenacolimax major</i>
The bursa duct, the penis and the oviduct all join the atrium/ vagina close to the genital opening.	The vagina is enlarged, and the bursa duct branches off it some distance from the atrium.

D. Helicoidea: *Trochulus* spp. and *Pseudotrichia rubiginosa*

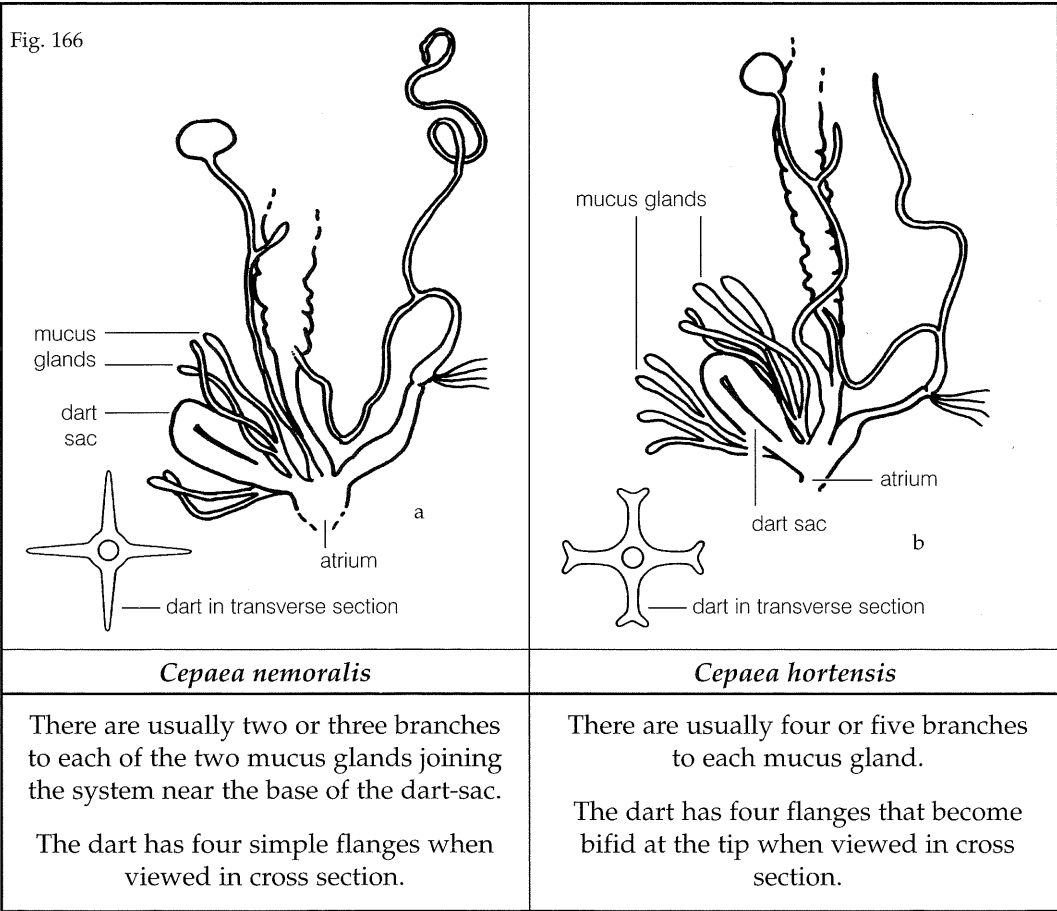
The genera *Trochulus* and *Pseudotrichia* have substantial, and obvious differences in their reproductive organs (see Fig. 165 below). The bursa shown in Fig. 165 for *Trochulus* is representative of the *sericeus* type. That of *hispidus* is rather more ovoid, but not as extreme as shown for *Pseudotrichia*. Any doubts should be referred to an expert.

Fig. 165  bursa mucus gland dart sacs penis atrium a	 mucus gland dart sac bursa penis atrium b
<i>Trochulus</i> spp.	<i>Pseudotrichia rubiginosa</i>
There are two small dart-sacs, each containing two darts. The <i>bursa copulatrix</i> is +/- globular or ovoid.	There is a single, large dart-sac, containing a single dart. The <i>bursa copulatrix</i> is elongated.
These differences can also be seen in sub-adult specimens.	

E. Helicoidea: *Cepaea nemoralis* and *Cepaea hortensis*

NOTE: It is not normally necessary to dissect these species. Where white-lipped *C. nemoralis* are found, dark-lipped ones are also, and are obviously in the same size-range. The same is true, in reverse, for dark-lipped *C. hortensis*.

Two characters are available on dissection: the structure of the mucus glands, and of the dart itself (see Fig. 166 below). Note that not all adults will contain a fully-formed dart; they may recently have discharged it in mating.



The dart-sac is tough and muscular. If the tip is sliced off cleanly, the dart can often be squeezed out intact. It needs to be examined under high magnification (x25).

NOTE: Very rarely, individuals with apparently hybrid characters are found. Such cases are worth recording.

REFERENCES

- ANDERSON, R. 2005. An annotated list of the non-marine Mollusca of Britain and Ireland. *Journal of Conchology*, **38**: 607-638.
- ARMBRUSTER, G. 1994. The taxonomically relevant parts of the male genitalia of *Cochlicopa*: seasonal variability within two field populations and observations under laboratory conditions (Gastropoda: Pulmonata: Cochlicopidae). *Malakologische Abhandlungen Staatliches Museum für Tierkunde Dresden*, **17**: 47-56.
- ARMBRUSTER, G. 1995. Univariate and multivariate analyses of shell variables within the genus *Cochlicopa* (Gastropoda: Pulmonata: Cochlicopidae). *Journal of Molluscan Studies*, **61**: 225-235.
- ARMBRUSTER, G. 1997. Evaluations of RAPD markers and allozyme patterns: evidence for morphological convergence in the morphotype of *Cochlicopa lubricella* (Gastropoda: Pulmonata: Cochlicopidae). *Journal of Molluscan Studies*, **63**: 379-388.
- ARMBRUSTER, G. and BERNHARD, D. 2000. Taxonomic significance of Ribosomal ITS-1 sequence markers in self-fertilizing land snails of *Cochlicopa* (Stylommatophora, Cochlicopidae). *Mitt. Mus. Nat. kd. Berl. Zool. Reihe*, **76**: 11-18.
- BANK, R. A., FALKNER, G. & VON PROSCHWITZ, T. (2007) A revised checklist of the non-marine Mollusca of Britain and Ireland. *Heldia* **5**: 41-72.
- CAMERON, R.A.D., 2003. *Land snails in the British Isles* (1st ed.). Field Studies Council, Preston Montford.
- CAMERON, R.A.D., EVERSHAM, B. and JACKSON, N. 1983. A field key to the slugs of the British Isles. *Field Studies*, **5**: 807-824.
- CAMERON, R.A.D. and REDFERN, M. 1976. *British Land Snails*. Synopses of the British Fauna, new series, No. 6, Academic Press, London.
- CARR, R. 2002. *Cernuella aginnica* confirmed as a British species. *Journal of Conchology*, **37**: 365-367.
- DANCE, S.P. 2008. *Papillifera papillaris*. *Mollusc World*, **16**: 20-21.
- EVANS, J.G. 1972. *Land snails in Archaeology*. Seminar Press, London.
- FALKNER, G., BANK, R.A. and VON PROSCHWITZ, T. 2001. Check-list of the non-marine molluscan species group taxa of the states of Northern, Atlantic and Central Europe (CLECOM 1). *Heldia*, **4**: 1-76.
- FALKNER, G., RIPKEN, T. and FALKNER, M. 2002. *Mollusques continentaux de France: liste reference anotée et bibliographie*. Publications Scientifiques du Muséum National d'Histoire Naturelle, Paris.
- GITTENBERGER, E. and BANK, R.A. 1996. A new start in *Pyramidula* (Gastropoda: Pulmonata: Pyramidulidae). *Basteria*, **60**: 71-78.
- GITTENBERGER, E., PREECE, R.C. & RIPKEN, Th.E.J., 2006. *Balea heydeni* von Maltzan, 1881 (Pulmonata: Clausiliidae): an overlooked but widely distributed European species. *Journal of Conchology*, **39**: 145-150.
- KERNEY, M.P. 1999. *Atlas of the land and freshwater molluscs of Britain and Ireland*. Harley Books, Colchester.
- KERNEY, M.P. and CAMERON, R.A.D. 1979. *A field guide to the land snails of Britain and North-West Europe*. Collins, London.

- KERNEY, M.P., CAMERON, R.A.D. and JUNGBLUTH, J.H. 1983. *Die Landschnecken Nord-und Mitteleuropas*. Paul Parey, Berlin.
- MACAN, T.T. 1969. *A key to British fresh and brackish water gastropods*. Scientific Publication 13. Freshwater Biological Association.
- NAGGS, F. 1985. Some preliminary results of a morphometric multivariate analysis of the *Trichia* (Pulmonata: Helicidae) species groups in Britain. *Journal of Natural History*, **19**: 1217-1230.
- POKRYSZKO, B.M. 1990. The Vertiginidae of Poland (Gastropoda: Pulmonata: Pupilloidea) – a systematic monograph. *Annales Zoologici*, **43 (8)**: 134-257.
- PROCKOW, M. 2000. Rewizja systematyczna rodzaju *Trichia* Hartmann (Gastropoda: Pulmonata: Helicidae). Ph.D. thesis, Wroclaw University.
- RIDOUT SHARP, J. 2007. *Papillifera papillaris*. *Mollusc World*, **14**: 12-14.

INDEX TO FAMILIES/SUPERFAMILIES AND SPECIES

Synonyms are given in *italics*. Start of keys for families/groups and main entries for species are given in **bold**. Colour plates are given in *italics*.

- Abida secale* 7, 20, 27, **45**
Acanthinula aculeata 8, **48**
Acicula fusca 6, 21, 25, **31**, 56
Aciculidae 6, 21, 25, **31**
Aegopinella nitidula 9, **53**
Aegopinella pura 9, 13, **53**
Alinda biplicata 9, **58**
Arianta arbustorum 10, 42, 63, 64, **69**
Ashfordia granulata 10, 64, 66, **71**
Azeca goodalli 7, **34**
- Balea biplicata* 9
Balea heydeni 9, **57**
Balea perversa 9, **57**
- Candidula gigaxii* 10, 41, 64, **66**
Candidula intersecta 10, 41, 64, **66**
Carychiidae 6, 21, 25, **31**, 75
Carychium minimum 6, **32**, 75
Carychium tridentatum 6, **32**, 75
Catinella arenaria 7
Ceciloides acicula 9, 21, 25, 27, 31, **56**
Cepaea hortensis 10, 42, 64, **70**, 79
Cepaea nemoralis 10, 42, 63, 64, **70**, 79
Cernuella aginnica 10, **65**
Cernuella virgata 10, 41, 64, **65**, 66
Chondrinidae 7, 20, 27, **45**
Clausilia bidentata 9, **59**
Clausilia dubia 9, **59**
Clausiliidae 3, 9, 13, 20, 25, **57**
Cochlicella acuta 10, **60**
Cochlicella barbara 10, **60**
Cochlicopa cf. *lubrica* 7, **35**
Cochlicopa cf. *lubricella* 7, **35**
Cochlicopidae 7, 21, 27, **34**
Cochlodina laminata 9, **58**
Columella aspera 7, **37**
Columella edentula 7, **37**
Cornu aspersum 3, 10, 63, 72, **74**
- Ellobiidae* 7, 20, 26, **31**
Ena montana 8, **48**
Ena obscura 8
Enidae 8, 20, 27, **48**
Euconulidae 9, 22, 23, 28, **56**
Euconulus cf. *alderi* 9, **56**
Euconulus cf. *fulvus* 9, **56**
- Ferussaciidae* 9, 21, 27, **56**
- Gastrodontidae* 9, 22, 30, **51**
- Helicella itala* 10, 41, **62**
Helicigona lapicida 10, **61**
Helicodiscidae 8, 23, 29, **49**
Helicodiscus singleyanus 8
Helicodonta obvoluta 10, **62**
Helicoidea 10, 20, 22, 26, 28, 30, 51, **60**, 78, 79
Helix aspersa 10
Helix pomatia 4, 10, **63**
Hygromia cinctella 3, 10, **61**
Hygromia limbata 10, 60, 61, 64, **70**
- Laciniaria biplicata* 9
Lauria cylindracea 8, **46**
Lauria sempronii 8, **46**
Lauriidae 8, 21, 27, **45**
Leiostyla anglica 8, **45**
Leucophytia bidentata 7, **32**
Lucilla singleyana 8, **50**
Lymneae truncatula 26, **33**
- Macrogastra rolpheii* 9, 58, **59**
Merdigera obscura 8, **48**
Monacha cantiana 10, 42, 64, **67**, 70
Monacha cartusiana 10, 64, **67**, 70
Monacha granulata 10
Myosotella denticulata 7, **32**
Myosotella myosotis 7, **32**
- Nesovitrea hammonis* 9, 13, **52**

- Ovatella myosotis* 7
Oxychilidae 9, 13, 22, 29, 30, 51
Oxychilus alliarius 9, 39, 54, 55
Oxychilus cellarius 9, 39, 54, 55
Oxychilus draparnaudi 9, 39, 54, 55
Oxychilus helveticus 9
Oxychilus navarricus 9, 39, 54, 55
Oxyloma elegans 7, 33, 41, 76
Oxyloma pfeifferi 7
Oxyloma sarsii 7, 33, 76
- Papillifera bidens* 9, 57
Papillifera papillaris 9
Paralaoma caputspinulae 8
Paralaoma servilis 8, 47, 49
Perforatella rubiginosa 10
Perforatella subrufescens 10
Phenacolimax major 8, 40, 51, 77
Pomatias elegans 6, 20, 26, 31
Pomatiidae 6, 20, 26, 31
Ponentina subvirescens 10, 64, 66
Pristilomatidae 8, 23, 29, 51
Pseudotrichia rubiginosa 10, 30, 64, 68, 71, 78
Punctidae 8, 13, 23, 29, 49
Punctum pygmaeum 4, 8, 50
Pupilla muscorum 8, 45
Pupillidae 8, 21, 27, 45
Pyramidula pusilla 3, 7, 23, 28, 29, 35
Pyramidula rupestris 7, 35
Pyramidulidae 7, 23, 29, 35
- Quickella arenaria* 7, 34, 77
- Semilimax pyrenaicus* 8, 40, 50
Spermodea lamellata 8, 48
Succinea oblonga 7
Succinea putris 7, 33, 41, 76
Succineidae 7, 13, 20, 26, 33, 76
Succinella oblonga 7, 34, 77
- Theba pisana* 10, 61, 64, 69
Toltecia pusilla 8
Trichia hispida 10
Trichia plebeia 10
Trichia striolata 10
Trochoidea elegans 3, 10, 61
Trochulus hispidus 10, 62, 64, 68, 71, 78
Trochulus sericeus 10, 64, 68, 71, 78
Trochulus striolatus 10, 60, 61, 64, 67
Truncatellina callicratis 7, 36, 37
Truncatellina cylindrica 7, 37
- Vallonia costata* 8, 47, 49
Vallonia cf. *excentrica* 8, 47
Vallonia pulchella 8, 47
Valloniidae 8, 23, 28, 29, 46
Vertiginidae 7, 13, 21, 25, 36
Vertigo alpestris 7, 43, 44
Vertigo angustior 7, 36
Vertigo antivertigo 7, 38
Vertigo genesii 7, 36, 38
Vertigo geyeri 7, 44
Vertigo lilljeborgi 7, 44
Vertigo modesta 7, 38, 44
Vertigo moulinsiana 7, 38, 43, 44
Vertigo pusilla 7, 36
Vertigo pygmaea 7, 38, 43, 44
Vertigo substriata 7, 38
Vitrea contracta 8, 52
Vitrea crystallina 8, 52
Vitrea subrimata 8, 51
Vitrina major 8
Vitrina pellucida 8, 40, 51, 77
Vitrina pyrenaica 8
Vitrinidae 1, 8, 22, 28, 50, 77
- Zenobiella subrufescens* 10, 28, 30, 64, 71
Zonitoides excavatus 9, 53
Zonitoides nitidus 9, 53



The AIDGAP *Project*

The accurate identification of specimens is a fundamental part of most forms of biological fieldwork. Although the popular groups, such as butterflies, moths, birds and wild flowers, are well-served by numerous aids to identification, other groups are often neglected. The principal objectives of the AIDGAP project are to identify those groups for which the difficulty in identification is due to the absence of a simple and accurate key rather than being due to insuperable taxonomic problems and, subsequently, to produce simple, well-written aids to identification. These aids avoid obscure terminology, are clearly illustrated and need not be restricted to traditional methods of presentation. For example, the AIDGAP keys have used multi-access tabular keys, flow charts and pictorial formats.

A significant feature of all the keys is the extent to which they are tested before final publication. In addition to routine editing and refereeing by acknowledged experts, the keys are subjected to extensive field tests. Several hundred copies of a preliminary draft – the test version – are sent to potential users: school and university staff; students; amateur naturalists; research workers; and others involved in surveys who need to identify organisms in groups outside their own sphere of interest. The authors are asked to amend the keys in the light of feedback from these testers before final publication.



FSC Publications

Unit C1, Stafford Park 15, Telford
TF3 3BB

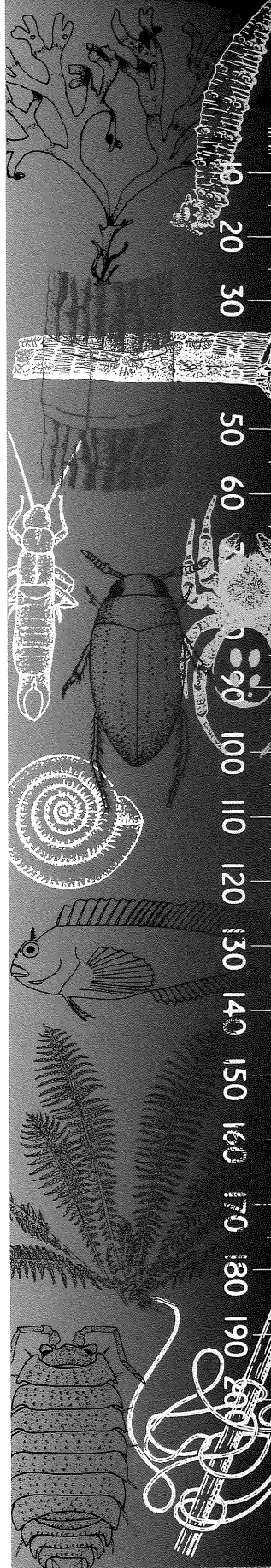
Telephone: 0845 345 4072

e-mail:

publications@field-studies-council.org

www.field-studies-council.org

The success of any project such as this depends on feedback from the public. Most people who have experience of fieldwork are aware of gaps in the literature but unless these are communicated to the project co-ordinator, AIDGAP can do little to help alleviate the situation. Anyone wishing to contribute identification aids, or to suggest possible subjects for future projects, should contact the co-ordinator at the address alongside. Projects need not be confined to the biological field; AIDGAP would be equally interested in geological, palaeontological and geographical subjects.





Land Snails in the British Isles

This fully illustrated AIDGAP guide should enable most beginners to identify all the land snails found in the field in Great Britain. Like all other AIDGAP keys, the guide was extensively tested during preparation; this, the first published edition, has been produced in the light of feedback from testers.

The Field Studies Council is grateful to the Linnean Society of London and the Royal Entomological Society for support during the testing and production of this guide.

The cover illustration, by Gordon Riley, shows *Succinea putris*, *Oxyloma pfeifferi*, *Discus rotundatus*, *Candidula intersecta*, and *Candidula gigaxii*.

© Field Studies Council 2003. Occasional Publication 79.
ISBN 978 1 85153 890 4.



FSC Publications
Unit C1, Stafford Park 15, Telford TF3 3BB
Telephone: 0845 345 4072
www.field-studies-council.org

ISBN 978-1-85153-890-4

