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FRESHWATER GASTROPODA OF BRITAIN:

SOME SUPPLEMENTARY NOTES TO THE FRESHWATER BIOLOGICAL ASSOCIATION *SCIENTIFIC PUBLICATION NO. 13*

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INTRODUCTION

These notes are intended to supplement the existing FBA key (A Key to the British Fresh- and Brackish-water Gastropods: *Freshwater Biological Association Scientific Publication No. 13*, by T. T. Macan). In some respects the key represents only a starting point, in that certain difficulties and pitfalls of identification which are almost certain to be encountered were not dealt with therein. Similarly, general books concerning freshwater life (for example, Fitter and Manuel's *Collins Field Guide to Freshwater Life*), whilst giving a useful brief overview of the snails and limpets found in freshwater habitats in Britain, are, naturally, unable to cover the problems of identification which may occur.

The most significant areas not covered fully by any existing key or reference book are (i) the identification of juvenile specimens; (ii) the variability encountered in many species; (iii) the presence in Britain, not known in 1977, of a third freshwater limpet species (*Ferrissia wautieri*); and (iv) the identification of species, especially operculates, from the shell alone. (These problem areas are dealt with more fully below.)

The information given here, therefore, is intended to be an addendum or gloss to the FBA key, not to replace it. For the sake of convenience, these notes follow the arrangement used in the key. Note, however, that nomenclature varies slightly, and follows the principal changes made by M. P. Kerney as listed in the Introduction to the Fourth Edition (1977) of the key (according to present-day usage). These are also listed below.

Two species, *Bythinella scholtzi* and *Menetus dilatatus*, are omitted; likewise, the freshwater species only are covered, and all brackish-water species too are therefore omitted.

Identification of gastropods: problematic aspects

The problems commonly encountered when identifying gastropod specimens using the FBA key can be divided into four main categories:

1. **The young of many gastropod species resemble the adult form only slightly, or not at all** - in some cases they may be perceived as resembling another species, and so be wrongly identified; or they may be mistakenly assumed to be terrestrial and ignored; or they may even be thought to be foreign or 'new' species.

   All the individuals of the species which are illustrated and described in the FBA key are fully mature; and, indeed, it is often recommended that, preferably, adults should be examined when identifying snails. Ideally, of course, this is true; and it is also true that, given an age range or series of snails from a particular site, extrapolating backwards from the adult will facilitate identification of juveniles. The main problem, however, with this suggestion is the fact that (particularly for the beginner or less experienced worker) it is difficult to judge whether any given specimen is the adult form of its species or not. Except for obvious adults of the very large species such as *Lymnaea stagnalis* or *Planorbarius corneus*, this is especially likely to be a problem at times of year when juvenile snails may be far more numerous than adults. For these reasons, descriptions and illustrations of the juvenile forms of some of the more problematic and/or easily confused species are provided here.

2. **Certain species are extremely variable in shell form, the variations which occur being easily confused with other species.**

   Although some variations are dealt with in the FBA key, some others which may well be encountered are not: an effort has been made here, therefore, to describe and/or illustrate some other common variations or anomalies, and to give some useful diagnostic features. In addition, there are one or two species of which specimens more often than not differ considerably in appearance from the illustrations given in the key: they, too, are therefore described and illustrated.

3. **One species, the freshwater limpet *Ferrissia wautieri*, is omitted from the FBA key.**

   At the time the key was written this species was not known from Britain, although in recent years it has become quite widespread. A description and illustrations of *Ferrissia*, and an explanation of how to distinguish it from other freshwater limpets, are therefore provided here.

4. **The FBA key relies heavily upon the description and illustration of specimens in which all parts of the animal are present and complete**, sometimes referring to features of the body interior (e.g. the genitalia), necessitating dissection of the animal, and using presence or absence of an operculum as the first decision the identifier must make.

   In practice, however, the identifier often has to work from the shell only. (This can cause extra confusion with operculate snails, since if the operculum is absent (i) it cannot be used as an aid to identification, and (ii) the identifier may have no idea how to establish whether the animal ever had one, or may go directly to the wrong part of the key.)

   In these notes, therefore, features by which freshwater snails and limpets can be identified from the shells alone are provided. This will, in addition, enable workers to identify gastropods without the necessity for killing them: particularly useful where uncommon or rare species are concerned. A short note about recognising an operculate shell which has lost its operculum is also given.

   (In addition, dead shells, often found in large numbers among sediment or gravel, can be a useful indicator of

the molluscan fauna of a site. Caution should be exercised where these are concerned, however: in, for example, rivers and streams, or where seasonal flooding occurs, any empty shells found may have originated elsewhere - perhaps some distance away - particularly if they are whitened and brittle. In such cases, the identifier needs to exercise good judgement, taking all relevant factors into account, as to whether or not the species may definitely be considered as meriting a place on the species list for any given site.)

This is not an attempt to cover exhaustively all problems of identification that may occur; there is much that still needs to be looked at, particularly in difficult areas such as, for example, the distinction between *Planorbis planorbis* and *Planorbis carinatus* (species which vary considerably -- perhaps due to habitat conditions -- and which appear to produce many 'intermediate' specimens), and any additional contributions in this area would be very welcome. These notes are an attempt to contribute in areas where the writers themselves have gained useful knowledge from their own experience in the field.

In general, as already stated, only shells will be considered here, and dissection is not therefore discussed. It should perhaps be added that although, as familiarity increases, field identification becomes easier, where the smaller species, and juveniles of the larger, are concerned microscopic examination will, especially at first, usually be necessary. (If it is absolutely necessary to complete all identification in the field, then a hand lens, at the very least, is indispensible.)

Brackish-water gastropod species in the FBA key, but not covered in these notes

Assiminea grayana
Hydrobia ulvae
Hydrobia ventrosa
Phytia myosotis
Pseudamnicola confusa

Freshwater gastropod species not mentioned in these notes

Bythinella scholtzi
Menetus dilatatus

Nomenclature differing from that used in the text of the FBA key

(N.B. The first names given are those used herein, and those in brackets are the names used in the FBA key.)

Viviparus contectus (= *Viviparus fasciatus*)
Armiger crista (= *Planorbis crista*)
Bathyomphalus contortus (= *Planorbis contortus*)
Hippeutis complanatus (= *Segmentina complanata*)
Anisus leucostoma (= *Planorbis leucostoma*)
Anisus vortex (= *Planorbis vortex*)
Anisus vorticulus (=*Planorbis vorticulus*)
Gyraulus acronicus (= *Planorbis acronicus*)
Gyraulus albus (= *Planorbis albus*)
Gyraulus laevis (= *Planorbis laevis*)

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The following notes are intended to be additional to the existing FBA key, which is therefore a prerequisite and is on occasion alluded to below. A number of drawings have been newly prepared in cases where problems may arise due to variability, or where juvenile forms differ markedly from adults: these are largely intended to complement, not replace, those given in the key. In addition, one species which was not included in the FBA key, the freshwater limpet *Ferrissia wautieri*, is described and illustrated.

(It should be noted that, as already stated, brackish-water species are not considered here.)

General Characters: presence or absence of an operculum

The parts of a gastropod shell are illustrated in Figure 1. The Introduction to the FBA key describes gastropod structure, but there is one significant problem which the less experienced may encounter at the outset: the first couplet requires the identifier to decide whether or not an operculum is present. Since, in the case of dead specimens, the operculum may have become detached, a word or two here about how to recognise an operculate shell which has lost its operculum may save time and help to avoid potential errors. (See (4) in the Introduction.)

Unfortunately, this is not very easy to describe, being a feature which needs to be somewhat subjectively 'visualised'. The shells of operculate snails tend to (but do not always) have apertures in which the peristome is intact, or nearly so, all the way around. If the operculum is visualised as a sort of lid (which indeed its Latin name implies), or 'front door', which the snail, withdrawing its body into its shell, can pull shut after it to 'seal itself off', then the aperture needs to fit it quite closely. If the illustrations of operculates in the FBA key (in particular Fig. 4: a, b, c, d and f; and Fig. 5: a, b, c and e) are studied, and compared with the illustrations of non-operculates, this feature of the aperture may become more obvious.

There is no easy, hard-and-fast way for the complete beginner to be absolutely certain, however, that an empty shell once owned an operculum, although when a certain degree of familiarity with snail species is obtained it becomes easier to decide one way or the other. Until this degree of familiarity is obtained, when identification of empty shells is necessary the best advice is to bear in mind the possibility that an operculum may once have been present; dead operculates which have lost the body will have lost the operculum as well. (If the snail has dried out after being found, incidentally, the shell should be carefully examined, since the operculum may well have fallen back into the aperture and be somewhere inside the body whorl.)

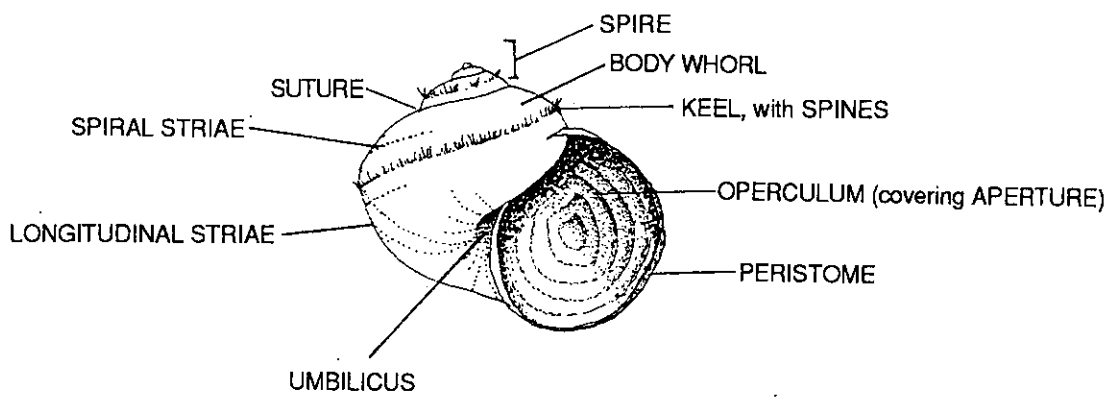

Figure 1. The parts of a shell. (An imaginary composite snail, somewhat resembling *Viviparus* sp., is illustrated.)

Theodoxus fluviatilis (The Nerite)

The identification of this very distinctive species should present no particular difficulty, and consequently there is little to add to the key. It is worth mentioning that, whilst the shape of the shell itself is not at all variable (juveniles look like tiny replicas of the adults), the shell markings do vary, to the extent that it may appear almost unicolorous or, conversely, very finely speckled; and in addition the pattern may be very weathered, or may have become almost completely obscured by dirt or algae. The operculum is usually a contrasting shade of salmon-pink or even, particularly in preserved specimens, orange.

The species may have to be carefully searched for, as it is well camouflaged and adheres very firmly to rocks and stones in rivers (often on the underside) and so may not be taken in netted samples.

Viviparus contectus (*fasciatus*) (Lister's River Snail) and *Viviparus viviparus* (The River Snail)

There will not be much difficulty with identifying large specimens of these two species: they may vary considerably from those illustrated in the FBA key, but the umbilicus, spire and suture features described are diagnostic.

Very young juveniles may be harder to identify, but *V. contectus* individuals always possess an extremely sharply-pointed, almost concave spire never seen in *V. viviparus*. The depth or otherwise of the suture, however, may not be so easy to distinguish, and in addition *V. viviparus*, when very young, also has an open umbilicus (this will gradually become more closed as the shell grows). For specimens less than 10 mm in height this should be borne in mind: the safest feature to rely on in the case of very young specimens is the shape of the spire.

Remember that the young of these two species are 'born live', and do not hatch from eggs: the minimum shell height at which either is likely to occur independently of the parent snail is probably around 5mm - any snail with a shell much smaller than this is not *Viviparus*. Juvenile specimens of both *Viviparus* species often have fine hairs on the whorls which roughly correspond to the dark bands on the older shell: these bands, in turn, occasionally fade or become obscured as the animal ages.

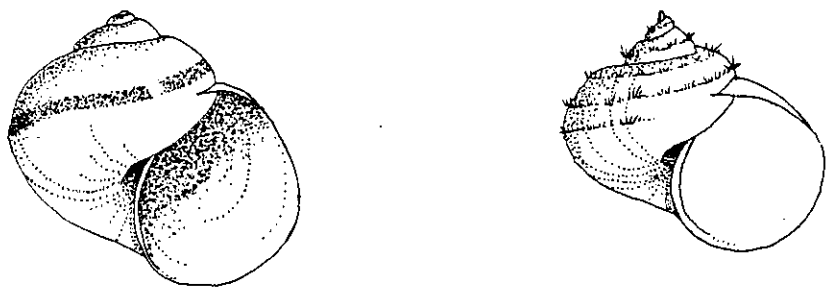

Figure 2. Very young juveniles of (left) *Viviparus viviparus* and (right) *Viviparus contectus* (both x 10). Note that either species may have 'hairy' shells, and that *contectus* is not necessarily smaller than *viviparus*.

Valvata cristata (Flat Valve Snail)

The drawing of this species, and the couplet describing it, in the FBA key are both very misleading. The shell of *Valvata cristata*, whilst certainly flat, glossy and *Planorbis*-like, does not usually have 'slightly flattened' curvature to its whorls: the whorls are rounded -- the body whorl is almost like a coiled cylinder -- and the aperture circular (see Figure 3), and hence the description 'disc-like' is not valid. All *Valvata* species have similar, characteristically-shaped whorls and aperture, *cristata* differing from the other two only in its complete lack of a

point or spire, all its whorls being on the same plane. (The illustration in the FBA key bears a far greater resemblance, in fact, to the planorbid *Armiger crista*, in which the characteristic 'crests' often become worn away with age.) The presence of an operculum -- which, incidentally, the snail (like other *Valvata* species) is able to draw far up into its shell -- will confirm that a specimen is not planorbid. (Care should be taken, obviously, with dead shells which lack an operculum, or in which the operculum may have fallen into the body whorl.)

There are no great difficulties with juveniles of this species, which are smaller replicas of the adult form, although very small individuals will need to be be microscopically examined to confirm identification.

Figure 3. A specimen of *Valvata cristata*, viewed from various angles (x 10)

Valvata piscinalis (Valve Snail) and *Valvata macrostoma*

The main problem likely to occur here is the confusion of juvenile *piscinalis*, which generally do not resemble the adult, with *macrostoma* (particularly as adults of the latter are much smaller than those of the former). The illustration of *piscinalis* in the FBA key is of the final, adult form: extremely young *piscinalis* juveniles are much broader than their height, and furthermore do not appear to possess the characteristic spire shape found in the mature shell, having spires which look in comparison much 'blunter' and more depressed. (This is, of course, an 'effect' caused by the changing proportions of the growing shell.) As the shell of *piscinalis* matures, intermediate forms occur until it develops its final shape, in which, as the FBA key states, height and breadth are about equal (see Figure 4). It may not always be an easy matter, moreover, to judge whether or not the shell is glossy, since juveniles of many species tend to have a glossy appearance; whereas old shells, whatever the species, often develop a roughened, weathered look and/or collect dirt.

To distinguish young *Valvata piscinalis* of various stages from *macrostoma*, the definitive, unvarying feature is the umbilicus, which is very wide in *macrostoma* and very narrow in *piscinalis* -- narrower, perhaps than that shown in the picture in the FBA key -- although it is deep in both species. (The body whorl of young *piscinalis* is somewhat larger in proportion to the rest of the shell than it is in *macrostoma*, but this is not an easy feature to make judgements about in the absence of accredited specimens of each species for purposes of comparison.) Both species are able to retract the operculum some way up into the shell.

Identification of juvenile *piscinalis* as *macrostoma* is such a common phenomenon that, bearing in mind how rare the latter species has now become in Britain, it would be advisable to have any specimens recorded as *Valvata macrostoma* checked and confirmed.

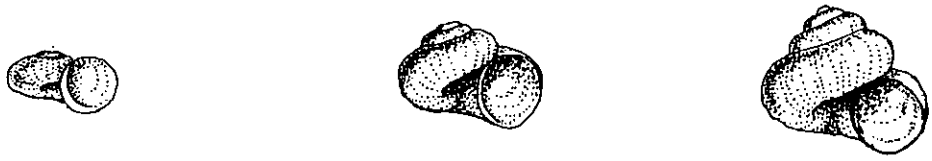

Figure 4. Three successive juvenile stages of *Valvata piscinalis* (all x 10)

Bithynia tentaculata (The Bithynia) and *Bithynia leachi* (Leach's Bithynia)

Juvenile specimens of *Bithynia* spp. can on occasion be confusing, at least until a measure of familiarity with both species has been gained, since the young shells (particularly that of *tentaculata*) are somewhat variable and sometimes differ slightly from the adult form, although never to the extent seen in *Valvata* spp. When specimens of both species are available to be examined and compared, the difference is quite obvious, but this is not always possible.

In very small shells of *Bithynia tentaculata* the umbilicus is sometimes slightly open, leading the unwary identifier to believe that they do not therefore fit the key. Nevertheless, *tentaculata* shells, whatever their age, always have non-tumid whorls and a shallow suture, whereas the reverse is true of *leachi*: the whorls, as described in the key, are always tumid and high-shouldered and the suture very deep. The aperture, and hence the operculum, of *leachi* are more 'rounded' in shape (though not completely so) than those of *tentaculata*, lacking the slightly 'lop-sided pear-shape' seen in the latter: this distinction may be clearly seen in the FBA key's illustrations of the two species.

Note that the size distinction in the key ('shell larger'/'shell smaller') refers, of course, to fully-grown adults: there is every probability that, where the two species co-exist, as they often do, there will be a mixture of adults and various-sized juveniles of both species, so that some of the *tentaculata* may well be smaller than some of the *leachi*.

Potamopyrgus jenkinsi (Jenkins' Spire Shell)

This is a very small snail which is sometimes found in extraordinarily large numbers -- occasionally individual specimens may be so numerous that they appear to form a layer of fine 'gravel', entirely made up of living snails, on the bottom of, for example, shallow streams or inflows. Shallow, weedy water-bodies, indeed, seem to suit this species very well, and it is often (contrary to the note on page 44 of the FBA key) found in closed ponds, as well as in running waters and gravel-pit lakes. (Since it appears that this species was confined to brackish waters until the last decade of the 19th century, and has only in this century successfully invaded inland freshwater habitats, it may well be that this invasion has continued since the key was written and that *Potamopyrgus* is still enlarging its range and continuing to adapt to new habitat types.)

The colour is extremely variable, the more so because the shell is frequently encrusted with a black or orange deposit, and itself may be any colour between the palest beige and a dark blackish-brown. (The occasional keel, described in the FBA key, may consist of no more than a faint dark line running spirally around the shell.)

Juveniles of this species more-or-less resemble the adults, and there is not much risk of their being confused with any other freshwater snail, although it is perhaps worth mentioning that in very young individuals the spire may appear truncate and blunt. (One way to visualise this is to cover up the body whorl and the one above it on the illustration in the key: this gives a fair idea of the proportions seen in the very tiny juvenile). If there is any worry about confusion with small lymnaeids (for example, *L. truncatula*), the answer is to ensure that an operculum is present (if necessary, referring to the note regarding operculate shells, above). A further warning regarding juveniles of this species -- in very young specimens, the operculum is extremely delicate and transparent, appearing somewhat soft, and so may not be immediately obvious.

Acroloxus lacustris (Lake Limpet) and *Ancylus fluviatilis* (River Limpet)

Important: see also next entry (*Ferrissia wautieri*).

Distinguishing *Ancylus* from *Acroloxus*, provided that the FBA key is read and the pictures examined carefully, should present few, if any, problems, as long as it is borne in mind that the shell of *Ancylus*, viewed from above, is virtually symmetrical, whereas that of *Acroloxus* is not: its apex is, as the Key correctly states, bent over to the left (and not merely 'to one side', as it is often described).

The distinction between left- and right-leaning apices is important because, since the FBA Key was written,

another freshwater limpet, *Ferrissia wautieri* (see next entry), has been recorded in a number of locations in Britain (M. Kerney, pers. comm:, and Pond Action, pers. obs.). Certain recent records of *Acroloxus* (not least those of the writers!) have been found to have been misidentified *Ferrissia* -- understandably, due to ignorance of the existence in Britain of the latter -- and, moreover, mixed populations with both species present have occasionally been recorded. Vigilance is therefore necessary, particularly in the southern half of Britain (including Wales), and it may be worth checking earlier *Acroloxus* records where the specimens are available. Further remarks on the differences between these two species are given below.

Figure 5. *Acroloxus lacustris*, view from side and top (x10).

Figure 6. *Ferrissia wautieri*, view from side and top. The specimen on the far right is a juvenile, and is the asymmetrical 'Victorian bonnet' form described below (all x 10).

Ferrissia wautieri **(a limpet) (N.B. This species is not in the FBA key.)**

This small limpet has now been recorded from a number of still-water habitats in southern England and Wales. Superficially (especially to the naked eye) it resembles *Acroloxus*, although the two species may be easily separated (with the use of a hand lens or microscope if necessary) by the fact that the apex of *Ferrissia* is inclined to the right -- not to the left, as in *Acroloxus* -- and is a much blunter, more rounded shape, lacking the sharp point usually seen in *Acroloxus*. In addition, *Ferrissia* often has an 'untidier' look than *Acroloxus*, with lop-sided, asymmetrical growth rings. (An extreme version of this asymmetry may be seen in a growth form occurring in some sites which resembles one shell rather clumsily placed on top of another, somewhat giving the appearance of a Victorian ladies' bonnet!)

The main danger is that the recorder, having established that a specimen is not *Ancylus*, will assume that it must, therefore, be *Acroloxus*. Once alerted to the presence in this country of *Ferrissia* (and the fact that it is by no means uncommon in some areas), and the difference in the appearance of the apex in the two species, as long as care is taken s/he should not experience any great difficulty. (A new Atlas to the British Gastropoda is at

present being prepared by Michael Kerney, and this will include distribution maps for *Ferrissia*.)

Note on *Succinea, Zonitoides, Vertigo, Carychium* etc

None of the above-named genera are truly aquatic, but they may well turn up in samples taken from freshwater, since they inhabit moist or marshy locations and often fall into the water or are swept into the pond-net. The main difference which is obvious at a glance between most of these and truly aquatic snails in freshwater is the eyes, which are never found at the tip of the tentacles in freshwater snails. (Some brackish-water snails have eyes like this, however.) All freshwater aquatic snails have eyes which resemble simple black dots and are located at the base of the tentacles (which may be broad and triangular, or thin and thread-like). An exception to this is the mainly terrestrial family Ellobiidae (e.g. *Carychium*, the Herald Snail), which do have eyes at the base of the tentacles. However, all of these have tubercles or teeth in varying arrangements on the inside of the aperture (see the illustration on page 36 in the FBA key): no freshwater snail shell bears these. As long as these two factors are borne in mind there should be no danger of confusion.

It would, however, be wise to gain a degree of familiarity with the general appearance of *Succinea* and *Zonitoides* shells, because of the frequency with which empty shells of terrestrial genera are found amongst samples taken from water bodies: the ability to discard these after a cursory examination will save valuable identifying time.

***Aplexa hypnorum* (Moss Bladder Snail)**

The description and illustration in the FBA key are sufficient for identification of this species (as long as it is remembered that the shell is sinistral). Juveniles closely resemble the adult.

This snail is often found out of the water in damp locations, or where ponds have dried up in the summer months; nevertheless, the species is genuinely aquatic.

***Physa fontinalis* (Bladder Snail)**

Again, the illustration in the FBA key is perfectly adequate, but does depict an 'ideal' *fontinalis* -- in real life the species varies somewhat. Populations of very angular, slightly thicker-shelled individuals not conforming with the smooth, rather ovate shape shown in the drawing occasionally occur, and the spire is sometimes less acute than that shown (particularly in the smaller, left-hand drawing). Moreover, populations of at least two other, introduced, *Physa* species are becoming widely distributed in Britain, and these may hybridise. (See following remarks.) Fortunately, *fontinalis* does not appear to hybridise with any of these, and it should be possible to reach a decision provided that the growing distribution of other *Physa* spp. is borne in mind.

Although fairly variable, the shell of *P. fontinalis* is always much more glossy and transparent than that of any of the other Physidae which may be encountered, and in general the species will not give many grounds for hesitation.

***Physa acuta* / *Physa heterostropha* / *Physa* spp.**

Specimens of other introduced *Physa* species are now very widespread and numerous in Britain. There seem to be more than two species of these (for example, the American *P. gyrina* which has been recorded near Cardiff) (M. Kerney, pers. comm.), and/or they may hybridise. They are less shiny, transparent and fragile in appearance than *fontinalis*, and may indeed appear quite robust and solid. Other than this, though, they may or may not be square and chunky; they may or may not have quite tall pointed spires. (They are. of course, like *fontinalis*, always sinistral.) As far as is known to the present writers, it is often not possible, as yet, to state with any certainty anything other than that a species resembling *Physa acuta* or *heterostropha* (or *gyrina*) has been recorded at a particular site.

(continued)

As an interesting aside, live specimens of what appears to be *Physa acuta* may be observed reacting in an unusual and characteristic manner to disturbance or obstruction: they raise their shells high above their bodies and shake them violently from side to side, using a rapid, swinging motion.

Lymnaea stagnalis (Great Pond Snail)

A problem which might arise here, although the adult snail has such a characteristic appearance, is the correct identification of juvenile specimens. Once the snail is half-grown or so, it has begun to resemble a smaller version of the adult; however, very young shells look somewhat different, and may be confused by the inexperienced with other lymnaeids of comparable size -- for example, *truncatula*.

The very young juvenile shell of this species has a spire which, because of its size and proportions, appears blunt and rounded rather than "acute and elongated". Its aperture and body whorl are very much taller in proportion to the spire than those of the adult, but also proportionately less rounded, with little tumidity. In addition, it lacks the robust, rather rough-surfaced appearance of the adult, having a much glossier, yellower appearance. (The description of the adult shell in the key as "fragile" is not really appropriate and could be misleading; however, it does apply to the very young juvenile, which is very thin-shelled.) (See Figure 7 for examples of development.)

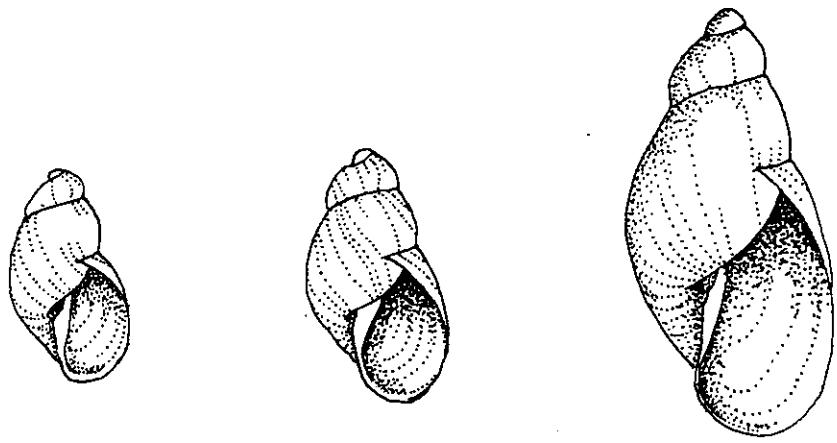

Figure 7. Three juvenile stages of *Lymnaea stagnalis* (approx. x 15).

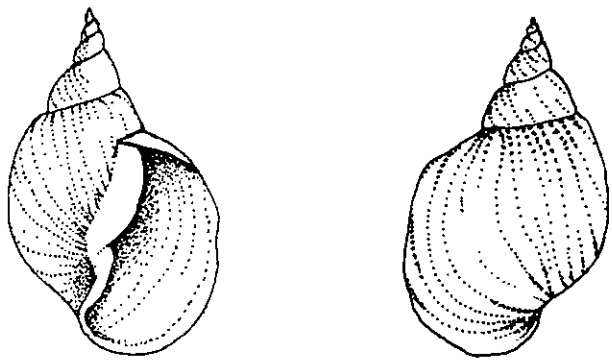

Figure 8. Mature shell of *Lymnaea stagnalis* (life-size).

Lymnaea glabra (Mud Snail)

Adults, and larger juveniles, of this species ought not to give many problems: unfortunately, however, problems are more likely to occur than not where smaller juveniles are concerned, since these can be virtually impossible to separate from *Lymnaea palustris* of similar size. More is said about this below, but it is worth remembering that *Lymnaea glabra* is rare nowadays (listed in the Red Data Book as RDB2: vulnerable), and so *palustris* is by far the more likely to be found. Any specimens of *Lymnaea glabra* recorded should, ideally, be checked and confirmed. (See also *Lymnaea palustris*, below.)

Lymnaea palustris (Marsh Snail)

Adults

The most important points to be made about the adult shell form of this species are (i) that the whorls are rarely so tumid, nor the suture so deep, as the illustration in the FBA key appears to show; and (ii) that the very well-defined spiral and longitudinal sculpturing shown in the drawing are by no means always so obvious. Once familiar with this species, mature specimens should usually be easy to identify, yet difficulties and confusions seem to be common -- perhaps due to this somewhat misleading illustration. (Note that the key's description does state "curvature of whorls rather flattened and suture shallow".)

First, the shell of *L. palustris* is thick and almost completely opaque, becoming more so as the animal matures. Second, it is a characteristic dark brownish-red -- rather than 'reddish brown' -- colour. (This feature alone should help to separate it from most other lymnaeids -- if the shell is light brown, yellowish or horn-coloured it is probably not *palustris*.) Third, the shell sculpturing is usually present to some extent, though it may well be faint: the use of a hand lens may help here. (But note that such sculpturing is not exclusive to *palustris* and may appear on mature shells of other lymnaeids -- notably *stagnalis*.) Lastly, as described in the key, the umbilicus should be closed by the turned-back lip of the aperture.

Juveniles

Where juvenile specimens smaller than around 7mm are concerned, complications may arise. The description of the colour as 'brownish-red' still applies, and this should help to eliminate most other lymnaeids, but the colour tends to be a little lighter (more red), the shell slightly thinner and more translucent, and the sculpturing much less evident, or even absent. Bearing all this in mind, the species most likely to be confused with *palustris* at this stage is *L. glabra* (see above), which is very similar in colour.

Juveniles: *Lymnaea glabra* versus *L. palustris*

Because of its distinctive shape and proportions, and relative rarity, medium-sized and large *glabra* should not cause any problems. However, although, with care, it should be possible to reach a decision with most juvenile specimens (particularly where adults are also present) for specimens of 5mm or less it is well-nigh impossible to separate the two species. Both shells are reddish and translucent at this size, and although *glabra* tends to be somewhat pinker in colour than *palustris*, this is both variable and somewhat subjective, and cannot be used as an objective diagnostic feature. Unless any larger individuals are present, therefore, the attempt should probably not be made: or, if it is, the specimens should be checked with a recognised authority to see whether confirmation is possible.

Lymnaea truncatula (Dwarf Pond Snail)

This species ought not to present any problems if it is remembered that the whorls are tumid and the suture deep, the umbilicus is (usually very) open and should be obvious, and the shell is, as described in the key, a 'light brownish horn colour'. (The pictures on page 22 in the FBA key, unfortunately, are a little odd, particularly in that the aperture is made to resemble that of an operculate.)

There is sometimes some worry about confusion with small *palustris* (unnecessary if the above remarks are borne

in mind) or small *stagnalis* (again, this ought not to give problems: the whorls, suture and umbilicus of *truncatula* are distinctive). (See Figure 7, above, for illustrations of young *stagnalis* of varying ages.)

Juveniles of *L. truncatula* do not differ significantly from the adult. (With very small shells, it would be as well to check, using a microscope if necessary, that an operculum is not present.)

Myxas glutinosa (Glutinous Snail)

Since the FBA key was compiled, this snail (said therein to be "rare") has become almost extinct in Britain: indeed, it was feared to have become so until rediscovered recently in Oxfordshire. It is at present listed in the Red Data Book as RDB1 (endangered).

The shell of *Myxas* is thin and transparent to the point of fragility, and when alive and in motion the animal's body (as described in the key) covers its shell in a unique manner, producing the "glutinous" appearance described in its name. When contracted into its shell, however, or when dead, the species may well be confused with *Lymnaea peregra* , especially as the latter species is so variable and so much more common (indeed, the authors initially made this mistake).

In addition, *Myxas* appears to be so sensitive and delicate that the danger of death being caused by its disturbance and capture might be very great. The species is protected under Schedule 5 of the Wildlife and Countryside Act 1981, so that capture, possession, etc. of specimens without a license is, of course, illegal. If any specimens should, however, be taken inadvertently during the course of regular netting or survey work, they must be handled with extreme care and replaced in the water from which they came without delay. (Photographs may be taken, if possible, for purposes of confirmation.)

The creature's appearance when expanded (i.e. with the body covering the shell) is definitive. Other diagnostic features are (i) the yellow or amber colour; (ii) the extreme thinness and transparency of the shell (no other lymnaeid's shell is anywhere near as transparent); and (iii) the marked bluntness of its spire (not to be confused with certain variations of *Lymnaea peregra*, where the spire may be similarly blunt or depressed). Juveniles of *Myxas* closely resemble the adult.

Lymnaea auricularia (Ear Pond Snail) and *Lymnaea peregra* (Wandering Snail)

The 'ideal' adult forms of these two species, as illustrated on page 24 in the FBA key and in Figure 9 below, appear to be quite distinct; nevertheless, two factors may cause difficulty here: (i) the fact that the shell of *peregra* is extremely variable, and one form in particular which is commonly seen may be thought to more closely resemble *auricularia*; and (ii) small juveniles of *auricularia* do not at all resemble the adult in shell form.

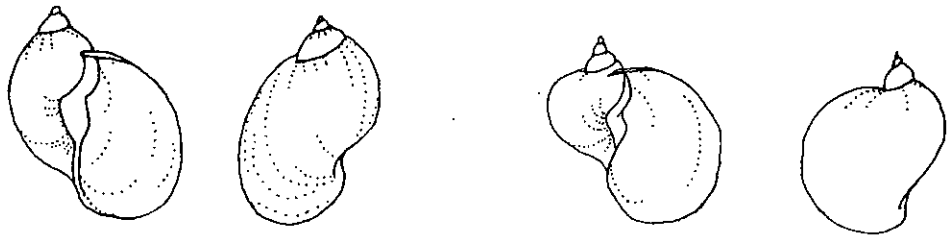

Figure 9. 'Normal' adult forms of *Lymnaea peregra* (left) and *Lymnaea auricularia* (right) (all life-size)

(i) Variations in *Lymnaea peregra*

Certain common forms/variations seen in *peregra* are illustrated in Figure 10. It should be noted in particular that specimens or populations may occur in which the lip of the aperture is greatly extended and turned back, in a way which causes the shell to superficially resemble that of *auricularia*, particularly in 'silhouette'. The spermatheca shapes differ in the two species, but the animals must be removed from their shells and dissected in order to see this. Slight differences in the way in which the shells are carried are sometimes cited, but this is a feature which is better seen when both species are present for comparison, and, in addition, requires the recorder to observe live specimens in the water, perhaps for some time, and make subjective judgements; it is not usually a practical method of determination.

There is one feature, however, which does not vary and which may be seen externally: the spire shape of each species is quite different. (Admittedly, this becomes easier to judge with experience.) The spire of *auricularia* is always very non-tumid, sharply pointed and 'concave' in silhouette (see Figure 9), and varies between individual specimens hardly at all. The spire of *peregra*, on the other hand, varies considerably between populations and individual specimens, or even, perhaps, different parts of the country. Sometimes it is fairly pointed; or it may be blunt or partially sunk into the body whorl (variations in this feature may be seen in the forms illustrated on pages 24 and 26 in the FBA key). The spire of *peregra*, however, whatever its size or degree of acuity, is always rather 'plumply' pointed, more deeply-sutured and tumid, being 'convex' in silhouette (see Figures 9 and 10). With practice, it should be possible to identify specimens as one or the other with little problem using this feature.

The two species often occur together, but it is worth adding that, of the two, *peregra* is by far the most common and usually also the most abundant.

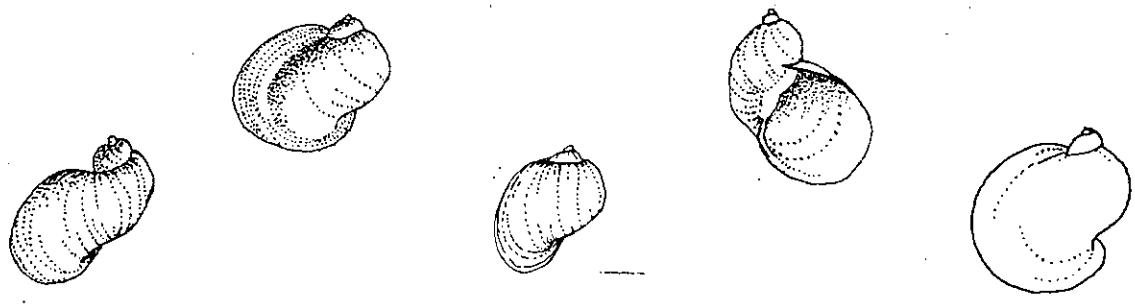

Figure 10. Some common variations or 'anomalies' seen in *Lymnaea peregra*'s shell form (life-size). Note that some have an enlarged aperture and/or turned-back lip, superficially resembling *Lymnaea auricularia*.

(ii) Juveniles of *Lymnaea auricularia*

A further problem is almost certain to occur where there are large numbers of young *auricularia* present, because this is a species in which the juvenile shell form is quite different from that of the adult (see Figure 11). The main difference lies in the fact that the species only develops its characteristic large (eponymous) ear-shaped aperture when it is relatively mature and well-grown. The younger shell has a narrow aperture, which may lead the observer to mis-identify it as *peregra*, or even some other lymnaeid species such as *stagnalis*. Nevertheless, the spire, again, is typically pointed and concave-sided as in the adult; it is, however, larger in relation to the body whorl than is seen in the mature snail (where the spire is very short in relation to the body whorl). The whorls of *auricularia*'s spire are also somewhat steeper-angled than those of *peregra*: this, however, is somewhat difficult to judge in isolation.

Juveniles of *peregra*, incidentally, do not change their shell shape as the animal grows and develops; although the species is itself a very variable one, each mature individual will retain almost the exact shape and proportions it

possessed when very small. (See Figure 12.)

Once aware of the difference between the juvenile and adult forms of *auricularia*, the recorder should not experience any further difficulty. (It may be found useful to keep a selection of various-sized and shaped specimens of each species for purposes of future comparison.)

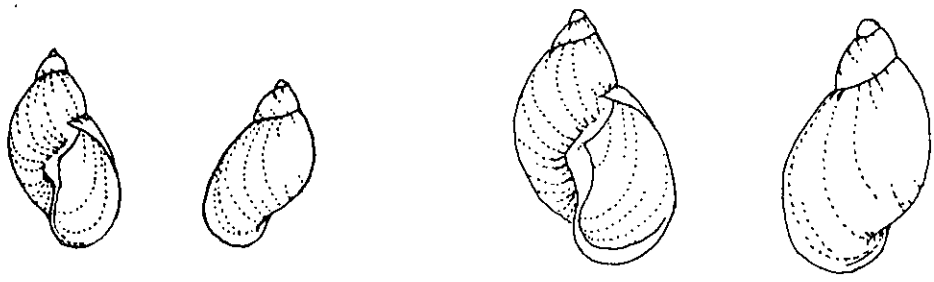

Figure 11. Examples of successive stages of juvenile *Lymnaea auricularia* (all x 10). Note that they do not resemble the mature shell (see Figure 9).

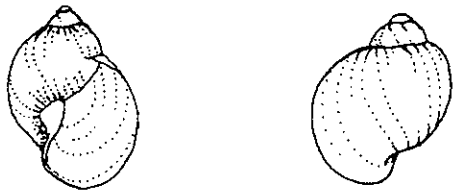

Figure 12. Examples of juvenile *Lymnaea peregra* (x 10). Note that they do not differ greatly from the mature form.

Lymnaea catascopium

At the time the FBA key was originally written, this immigrant species, so variable that it gave cause for concern that it might be confused with *peregra* or *palustris*, was thought to merit inclusion. It is now, however, considered to be extinct in Britain.

Planorbarius corneus (Great Ramshorn)

The mature individual of this species, particularly in view of its large size, is unmistakable; however, this is another species in which the extremely young juvenile shell does not at all resemble the adult. Indeed, it differs markedly in almost every external feature, and inexperienced workers often take the snail at this early stage to be a terrestrial, or even an exotic species, since it does not appear to feature anywhere in the key.

The FBA key does state that "young stages" are "taller than broad", but does not make any further observations than this. In fact, by the time the shell reaches a width of around 6mm, it has begun to resemble the adult closely enough to enable a correct identification (although it is still relatively tall in relation to its width), provided that it is not confused with other *Planorbis* species -- this, however, should not be a problem if the key is read carefully. The very juvenile specimen, however, is so tall as to look like something entirely different. (See

Figures 13 and 14 for illustrations of two different stages of juvenile *Planorbarius*, viewed from various angles.) In addition, (i) it is horn-coloured and transparent where the adult is dark reddish-brown and thick-shelled; (ii) the young shell is generally extremely 'hairy', bearing spiral rows of fine spines, which it will gradually lose as it matures (although traces of these will still be visible in the form of spiral striae when the shell reaches a breadth of 6mm, and perhaps long after); and (iii) the two sides (i.e. top and bottom) of the very young juvenile shell are quite different in appearance, although this difference grows less and less marked until it becomes, in the adult, almost negligible.

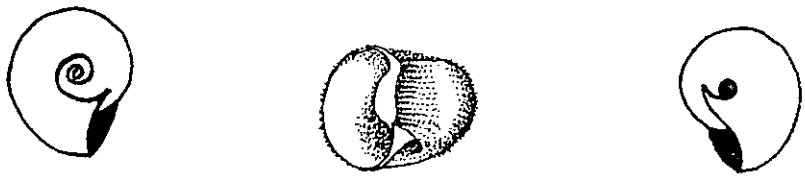

Figure 13. A very young juvenile specimen of *Planorbarius corneus* (x 10). The rows of spines are omitted from the drawings of the top and bottom of the shell, which are illustrated schematically in order to show the very marked difference in shape at this stage. Note, too, the height of the shell compared to its breadth.

Along with other Planorbidae, shells of this species often have quite marked 'stop-and-start' growth marks showing as coarsened ridges on the whorls, in particular the outer whorl, and this is more likely when they come from a site which regularly, or occasionally, dries out. (Such ridges may be seen on the specimen illustrated in Figure 14, below.)

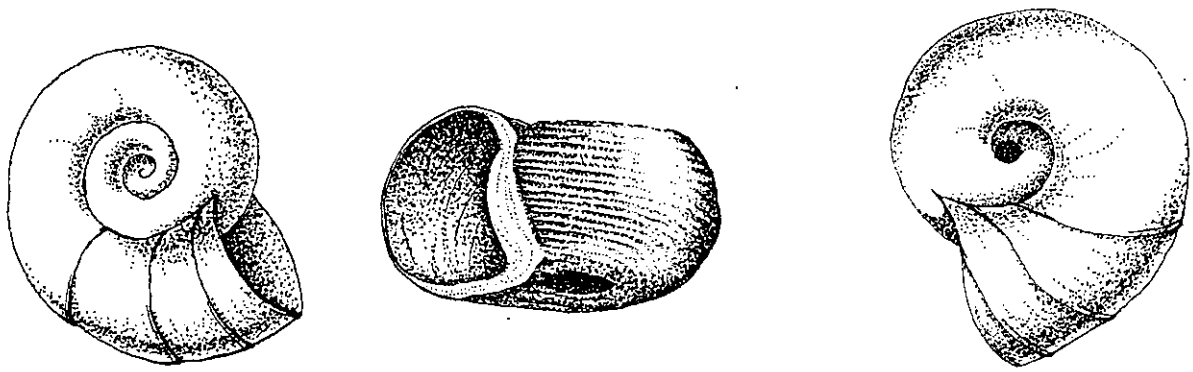

Figure 14. A specimen of *Planorbarius corneus* which has grown to about a fifth of the full adult size (x 10). Note that the surface still shows spiral striae, although these are no longer produced into "hairy" spines (omitted from the two drawings on the right), and that the top and bottom of the shell are still markedly different (although less so than they once were). By the time the shell is fully mature, it will usually have lost all trace of spiral striae, and the two sides of the shell will be virtually indistinguishable from each other.

Armiger (*Planorbis*) *crista* (Nautilus Ramshorn)

Juveniles of this tiny species resemble the adults, but the shell form is variable in that the "strong curved ridges placed at regular intervals and often produced into points at the periphery" on the whorls which are described in the FBA key are very rarely as pronounced as those shown in the illustration there (page 28), and in fact are often very faint. Sometimes, indeed, they become obscured or worn away as the animal grows, so that very mature

specimens rarely, if ever, show the pristine ridges of the illustrated specimen.

Smooth-shelled specimens, therefore, should not be confused with *Valvata cristata*. (See the illustration of *V. cristata* on page 12 in the FBA key -- which unfortunately is very misleading -- and Figure 3 here; see also notes on *Valvata cristata*, above.) *Armiger crista* is much flatter, and the aperture has a quite different appearance: the illustration of *Armiger* in the key does show this quite well. The definitive feature, of course, should there be any further uncertainty, is *Armiger*'s lack of an operculum.

Since this species is very tiny, the use of a hand lens or microscope is advisable to ensure correct identification.

Bathyomphalus (*Planorbis*) *contortus*

There is not much room for uncertainty here: it is possible that, unless the key is read carefully, there might be some confusion with *Anisus* spp, which are also very tightly coiled. *Bathyomphalus*, however, is much darker in colour and the whorls are taller than broad; also the two sides of the shell differ markedly, as illustrated in the FBA key (page 28). Juveniles closely resemble the adults.

Hippeutis (*Segmentina*) *complanatus* (Flat Ramshorn) and *Segmentida nitida* (Shiny Ramshorn)

The latter species is now very rare, but specimens of *Hippeutis* are often mis-identified as *Segmentina nitida*. The "lamellae which show through the shell as white lines" described in the FBA key are definitive, and very obvious once seen. Unfortunately, however, both species are more or less lens-shaped, and specimens of *Hippeutis* may have growth marks on the whorls (as previously described, see *Planorbarius corneus*, above), and these are often mistaken for the lamellae of *Segmentina*. (In *Hippeutis*, these growth ridges are often whitish in relation to the rest of the shell.) Close examination, if necessary by microscope, should determine whether these are really within the shell rather than merely on the surface (and also whether or not there is just dirt in the shell!).

In addition, the shapes of the shells of the two species differ, and this is obvious when specimens of each are compared. Since this will not usually be possible, attention should be paid to the relative degree of convexity of each side of the shell. As the key states, *Hippeutis* has more similarly convex sides, and the convexity is not very great. In *Segmentina* the upper side is much more convex than the lower, which is almost flat. In addition, the outer whorl of *Segmentina* is extremely large in relation to the other whorls, whereas in *Hippeutis* the whorls increase in width more gradually.

Juvenile specimens of both species resemble the adults.

Planorbis planorbis (The Ramshorn) and *Planorbis carinatus* (Keeled Ramshorn)

These species can be very problematic. Again, the FBA key shows 'ideal' specimens of each, and if such specimens are found then no worries need arise. Unfortunately, however, both are extremely variable, perhaps sometimes due to habitat or environmental conditions, and many intermediate forms occur. Often these specimens cannot be satisfactorily placed in one species or the other. In addition, juveniles of these species are also often extremely difficult to separate, particularly prior to the growth of the body whorl. Both species are very widespread and abundant, and moreover they may occur together at the same site.

After studying many thousands of specimens (and being led by desperation at times to suspect that the animals were interbreeding, or else in reality only variations of one species all along!) no reliable characters for separating the very large number of intermediate specimens of these two species have, as yet, been found.

Anisus (*Planorbis*) *leucostoma* (Button Ramshorn) and *Anisus* (*Planorbis*) *vortex* (Whirlpool Ramshorn)

These species should generally not be difficult to separate: it is important to remember that *leucostoma* never has a keel and the aperture is very rounded (although it is often a good idea to use a microscope to examine the shape of the aperture, since some specimens of *leucostoma* may, to the naked eye, give the impression of having a slight keel since the whorls may be rather square-cut.) The keel in *A. vortex* varies slightly, being more pronounced in some specimens than in others. With practice it becomes easier to separate the two species. Note that, as the key states in a footnote, individuals of either species may have a certain degree of curvature, as is shown in the drawing of *vorticulus* (on page 32).

Juvenile shells of both species, particularly when very young, will usually have less whorls than the older shell, so care should be taken not to confuse them with other planorbids; and also not to mis-identify them as the smaller species *A. vorticulus*, which is now very uncommon, and in which the keel is nearer the middle of the outer whorl.

Gyraulus (*Planorbis*) *acronicus*, *Gyraulus* (*Planorbis*) *albus* (White Ramshorn) and *Gyraulus* (*Planorbis*) *laevis* (Smooth Ramshorn)

The first species has become very uncommon; although it is not unusual in the Thames area to find whitened, very dead shells which have presumably been washed downstream from their original location, live healthy specimens are elusive. This is another species of which it would be as well to have any records checked and confirmed: note in particular, in the illustration in the FBA key, the keel (not a "blade-like" keel such as that found in *Planorbis carinatus*) and its placing on the outer whorl, and the oval aperture.

Gyraulus albus and *Gyraulus laevis* are not generally, to the naked eye, obviously distinct. In spite of its name, *G. albus* is not necessarily a "dull white", but is often a pale horn colour; and although *albus*' spiral striae give it a matt appearance, the comparative gloss of *G. laevis*' shell is frequently roughened by age or obscured by dirt.

Two features are characteristic of *G. albus*, and therefore diagnostic, but a microscope (or at the very least, a powerful hand lens) is necessary to distinguish these. They are: (i) the numerous and pronounced parallel spiral striae covering the shell (in the young animal, these are often produced into spines, giving the shell a "hairy" appearance, but as the shell matures they may be worn away); and (ii) the appearance of the aperture, which, as the FBA key says, "meets the preceding whorl at an obtuse angle" (that is, the edge of the aperture, as seen in the FBA illustration, "leans back" from the penultimate whorl). *Gyraulus laevis* never has spiral striae, and (again, as seen in the FBA illustration) the aperture "meets the preceding whorl at a less obtuse angle, almost a right angle". (If the two FBA drawings are examined, this feature will be understood.)

As with some other pairs of gastropod species similar in appearance, these two species may co-exist at the same location. *Gyraulus albus*, however, is by far the commoner of the two; *G laevis* is now rather local in Britain.

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