To Mike with
compliments
Noel

SOME UNUSUAL SNAILS OF LAKE MALAŴI

W. NOEL GRAY

Survey Department
Blantyre, Malaŵi

In various ways some of the snails to be found in Lake Malaŵi are rather unusual. Many are endemic, some are viviparous, some are sinistral*, some have a sinistral shell with a dextral animal and others have medical importance.

The majority of the species are rather small, up to 20 mm, and therefore often go unnoticed by the casual observer. The only recent works on the study of lake snails, attempting to update older work in the light of newly available anatomical material, have been Crowley, Pain and Woodward (1964) and Mandahl-Barth (1972). Unfortunately these authors are not in agreement with each other, sometimes quite basically, and so furtner study is still necessary. There has apparently been no modern appraisal of the terrestrial and arboreal species although some species new to science have been found in the last few years.

The purpose of this article is not to supply a description of all the known species as this will merely be compiling and duplicating other people's work, but rather to point out some of the peculiarities amongst those which one may reasonably be expected to come across.

Gastropoda

Bulinidae

Probably the most important molluscs in the area that concern both scientist and layman alike are two small gastropods *Biomphalaria pfeifferi* (Krauss) and *Bulinus globosus* (Morelet). Both of these are known to be the intermediate hosts of the most unpleasant ailment bilharzia.

Biomphalaria pfeifferi (Krauss)(Fig. 1a)

This is a small planorbid snail (i.e. coiled in a plane with no raised spire), c 10-12 mm diameter, which is widely distributed in stagnant and semi-stagnant waters. This is the intermediate host of *Schistosoma mansoni* which causes intestinal bilharzia.

Although it is rather difficult to tell due to the flat disk-like shape, both the shell and the animal are sinistral. This

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* For the vast majority of molluscs, both the shell and the animal, are dextral (i.e. 'right handed'). If the shell is held with the aperture facing the observer with the spire pointing upwards, then, the aperture will be on the observer's right. Similarly, all the important organs in the animal open on its right side. The relatively few sinistral molluscs are just the reverse (i.e. 'left handed), with aperture and organs opening on its left. It may seem obvious that these should go together, but there are some local snails (*Lanistes*) in which the shell is sinistral and the animal is dextral (Wright, 1957).

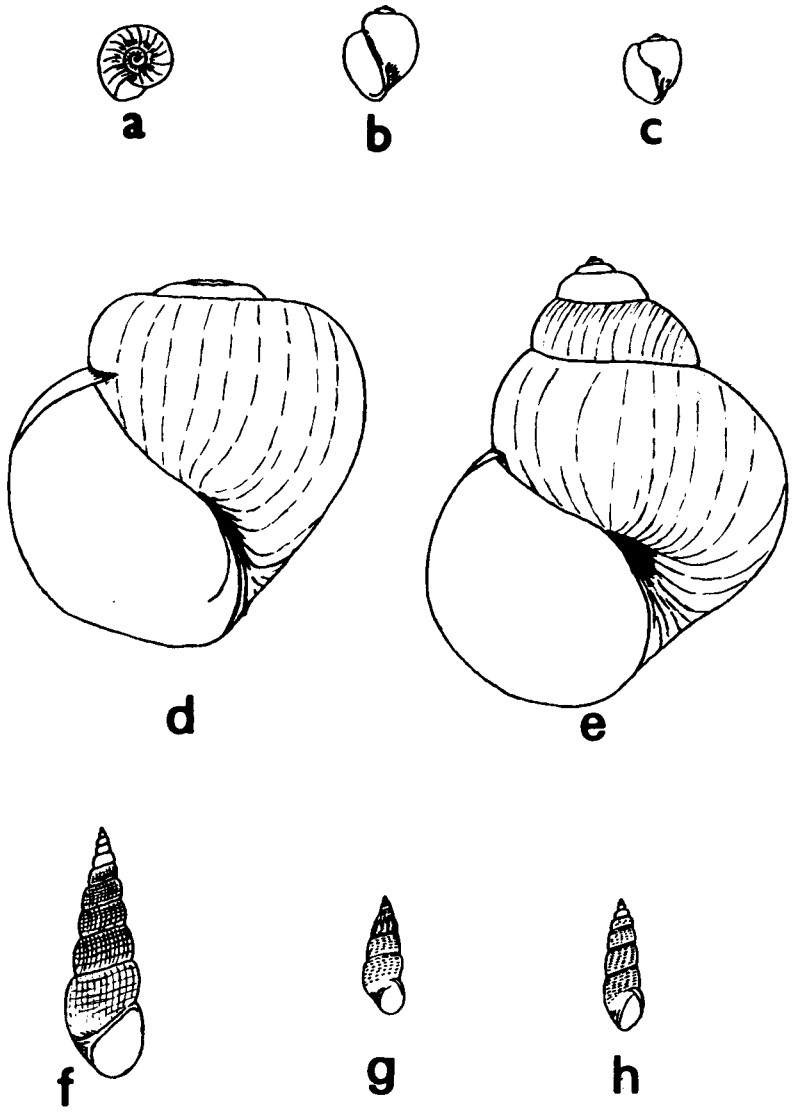

Fig. 1 (a) *Biomphalaria pfeifferi*, (b) *Bulinus globosus*, (c) *B. nyassanus*, (d) *Lanistes nyassanus*, (e) *L. ovum procerus*, (f) *Melanoides tuberculata*, (g) *M. polymorpha*, and (h) *M. pupiformis*.

All diagrams in Figs. 1-4 are drawn life size from specimens in the author's collection. *B. ecclesi* (Fig. 2h) is drawn after Crowley, *et al* (1964).

genus is one of those making up the 'ramshorn' snails one sees sometimes in aquaria.

Bulinus globosus (Morelet)(Fig. 1b)

This snail inhabits swampy areas and dams, sometimes, but not always, in association with *Biomphalaria pfeifferi*. *Bulinus globsus* is regarded as the principal intermediate host of *Schistosoma haematobium* which causes urinary bilharzia.

Rather small and inconspicuous, $\bar{c}$ 15 mm long, it is normally abundant once located. The shell is ovate, usually brown when seen live with the periostracum (skin) intact, a not very prominant spire and 4½ whorls. The aperture is generally about 3/4 the total height of the shell, and sinistral.

Both *Biomphalaria* and *Bulinus* are part of the group of snails known as the Basommatophora. All members of this group are equipped to breathe air through the mantle cavity. They are generally therefore a shallow water dweller and may often be seen actually on the surface, which makes the record of the next species all that more remarkable.

Bulinus nyassanus (Smith) (Fig. 1c)

One of the endemic bulinids in Lake MalaŴi is *B. nyassanus*. This is worth mentioning, I believe, due to it being an almost exact replica, in miniature, of the next species to be mentioned, *Lanistes nyassanus* Dohrn.

The anatomy of *B. nyassanus* was adequately described by Wright, Klein and Eccles (1967) so suffice it to say that the quickest visual difference to be noticed between the two living snails, assuming them to be of equal size, is the colour of the animal. In *B. nyassanus* the animal is pinkish red, and in *L. nyssanus* it is lemon yellow. Confusion could only occur with embryonic shells of *L. nyssanus* less than 10 mm, as size alone differentiates them otherwise.

B. nyassanus snails are quite widely distributed but fairly local, occurring amongst the roots of *Vallisneria* and *Potamogeton* normally just below the surface of the substrate. It would appear that these snails, in common with many marine species, are much more active at night when they apparently prefer to feed.

It may be noted that this species has the distinction of being found living at a record depth of any pulmonate snail in tropical waters. Two specimens were taken from a unprecedented depth of 52 fathoms (93.6 m) northeast of Monkey Bay. (Wright, *et al* 1967).

Lanistes nyassanus Dohrn(Fig. 1d)

Of the five recognised species of *Lanistes* occurring in Lake MalaŴi, three are endemic. The majority of species are to be found in shallow, muddy waters but *L. nyassanus*, and another recently described species *L. nasutus* Mandahl-Barth, appear to prefer deeper, cleaner environments. The shell structure of both of

these species is not typical of the genus (cf. *L. ovum procerus* von Martens, Fig. 1e) and it has been suggested (Crowley, *et al*, 1964) that the differences may justify elevation to subgeneric rank.

The shell is globose with the spire flattened and greatly depressed and the body whorl 3/4 of the total height. The larger shells may even be wider than high (68 x 75 mm). This is the first species mentioned here that has an operculum (i.e. an exoskeletal plate which can close the opening of the snail's shell when the animal withdraws into it).

In common with some of the Lake Malaŵi fishes, particularly the catfish *Synodontis nyassae* Keilhack, this snail appears to travel daily from deeper to shallower water and many can be seen from about mid afternoon onwards off the beaches at Cape Maclear near the *Potamogeton* beds. They can nearly always be found in the local fishermen's nets after trawling.

Another interesting feature about this snail is that when it dies the shell is often still useful. After it's initial discovery by David Livingstone, a small cichlid fish called *Pseudotropheus livingstonii* Boulenger, was for many years never found again. Even Fryer (1959) reports only four specimens being collected during his survey. However, when trawling was introduced the answer appeared. *P. livingstonii* is one of the Mbuna which prefers deeper, more open water and it is quite common now to find single specimens or even pairs curled up inside the empty shell of *L. nyassanus* which the fish apparently uses to avoid predators or as a nesting site.

Viviparidae

A rather unusual family of molluscs, the Viviparidae, is also represented in Malaŵi. As the name suggests, these snails are viviparous. The eggs are not laid in the water as is usual but are kept in the lower part of the female oviduct which acts as an uterus where they develop. The embryos are born with a shell of about 3 whorls.

In Africa, two genera, *Bellamya* Jousseaume and *Neothauma* Smith, are to be found. The latter apparently only occurs in Lake Tanganyika.

It is far from clear just how many species of *Bellamya* live in Lake Malaŵi. Crowley, *et al* (1964) considers all names previously assigned to those from Malaŵi to be synonymous and to be represented only by the very variable *Bellamya unicolor* (Olivier). Mandahl-Barth (1972), however, dissagrees mainly on the grounds of the embryonic shell structure and considers 4 names to be valid; *B. capillata* (Frauenfeld) (Fig. 2f), *B. jefferysii* (Frauenfeld) (Fig. 2a - e), *B. robertsonii* (Frauenfeld) (Fig. 2g) and *B. ecclesi* (Crowley and Pain) (Fig. 2h) - the only really distinctive one being the latter. Having examined many hundreds or these shells I am still not convinced where many of them should be placed as it is reasonably easy to find all three shallow water species, plus many intermediate 'forms' in the same locality. The diversity of forms is shown in Figures 2a - g. As three of the four species mentioned

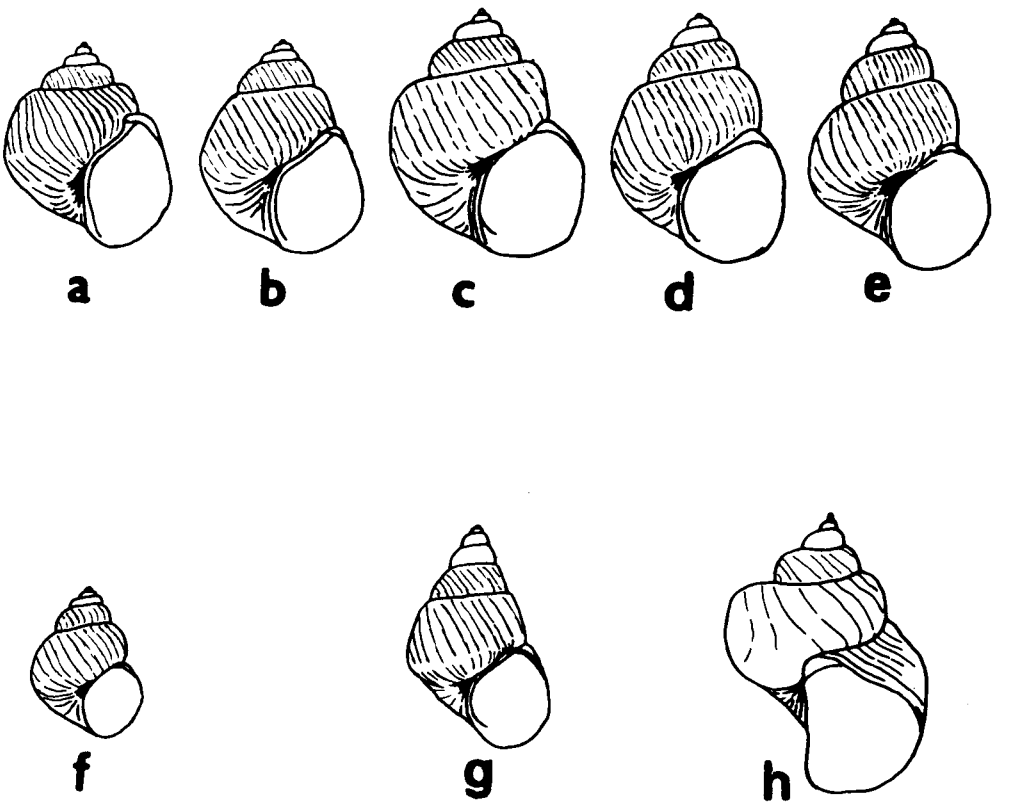

Fig. 2 (a)-(e) *Bellamya jeffreysii*, (f) *B. capillata*, (g) *B. robertsonii*, (h) *B. ecclesi* (after Crowley, *et al*, 1964).

Examples of variations in the *Bellamya* which may often all be found in the same locality.

by Mandahl-Barth are endemic (*B. jeffreysii*, *B. robertsonii* and *B. ecclesi*), I consider that more study needs to be carried out, particularly on the specimens from moderately deep water, before an acceptable answer can be reached.

Thiaridae

As Lake Malaŵi has the distinction of having a greater number of species of fish than any other lake in the world, it also has a greater number of different melandids (*Melanoides* sp.), the majority being endemic. How many species are valid is not certain. Mandahl-Barth (1972) lists 9, but admits that some others which he has reduced to synonymy may represent valid species on further study. Smith (1877) recognised 7 species, but Bourguinat (1889) took advantage as usual of the very variable form and created an extra 29 species. Smith (1893) and von Martens (1897) added a few more.

The melanids are the 'sand snails', well known to aquarists, for obvious reasons. Similarly to *Lanistes nyassanus*, they can easily be found from mid afternoon onwards on, or just beneath, the surface of the substrate in virtually any area except rock and thick mud. At other times, if the water is clear, they may be found by following their 'trails' in the sands's surface.

This burrowing habit adopted by the melanids and bulinids is possibly an adaptive feature caused by predation. Some of the Malaŵi cichlids, *Haplochromis* spp., are known to eat bulinids, and *Barbus eurystomus* (Keilhack) feeds mainly on melanids (Fryer, 1959).

Some species of melanids are known to be viviparous; *Melanoides tuberculata* (Müller) (Fig. 1f) (Mandahl-Barth, 1954) and *M. polymorpha* (Smith) (Fig. 1g) and *M. pupiformis* (Smith) (Fig. 1h) (pers. obs.). How many more will be found similar remains to be seen.

Bivalvia

Mutelidae

Having mentioned most of the gastropod molluscs perhaps I should also, therefore, mention the other class of molluscs present in Malaŵi, the Bivalvia. There are three species which grow to quite a large size and are readily noticable, although one species even though common, is not often found due to its unusual situation.

All are members of the family Mutelidae, two from the genus *Aspatharia* Bourguinat and the other from the nominate genus *Mutela* Scopoli.

Mutela alata (Lea) (Figs. 3a - c)

The majority of bivalves prefer muddy environments and *M. alata* is no exception. They can be found in the areas around Monkey Bay, Malembo and in the upper Shire River, and no doubt many other similar localities. This species is variable in form but whether the forms are sufficiently distinct to be given subspecific status (Crowley, *et al*, 1964), is open to debate. Certainly some of the forms are easily recognisable, but intermediates are often found

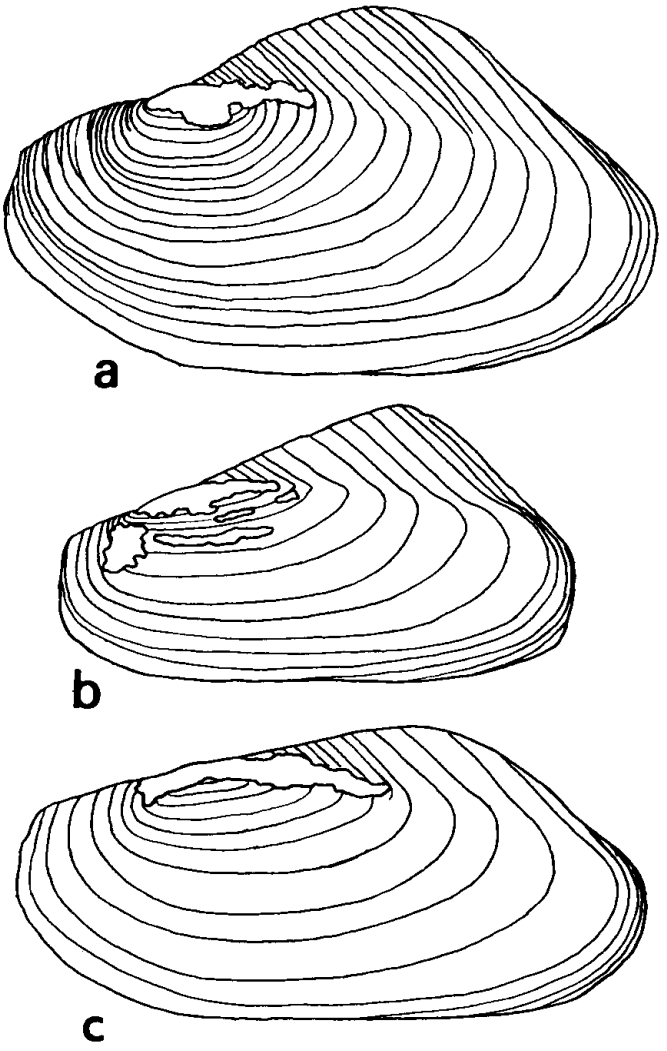

Fig. 3 (a) *Mutela a. alata* , (b) *M. a. cuneata*, and (c) *M. a. simpsoni* .

Forms of *M. alata* - The nominate form appears to be rather scarce.

in the same locality.

Unlike the mussel, *Mytilus*, the Mutelids are not static, but are free to move around in search of favourable feeding sites. Once established they almost completely bury themselves leaving just the posterior tip of the shell, where the siphon is located. above the substrate. To the inexperienced eye, as in many fields, it is difficult to locate them initially but once they are noticed it is probable that one will find them to be reasonably common in the area.

Aspatharia nyassaensis (Lea) (Fig. 4b)

Probably even more common than *M. alata*, *A. nyassaensis* is to be found in the same sort of environment, a particularly good site being the upper Shire River at Mangochi. Although just as variable as the previous species, none of the most recent workers have seen fit to assign sub-specific status to the forms, but have merely relegated them all to synonomy. Taxonomy not being my subject I am unable to reason why, only comment on the fact.

Aspatharia wahlbergi (Krauss) (Fig. 4a)

Although reported from the lake at Karonga (Ancey, 1894; Preston, 1910), I believe this must be an error. Mandahl-Barth (1972) expressed his doubts but gave no reason at the time. However, *A. wahlbergi* is an aestivating species (pers. obs.) and as such needs a period of dryness which would not occur in the lake itself. I have kept specimens of this, completely dry, for periods of up to three years before returning them to water, and only two specimens have died.

These snails can be found in the ditches along side the Mangochi-Monkey Bay road and no doubt in other similar places. In the dry season they aestivate about 1-2 ft (0.3-0.6 m) below ground level. I have specimens from the dams near Kasungu and have found possibly individuals of this species, from Kasinthula near the Shire.

Author's Note

I am trying to map the distribution of the Malaŵi snails on a 10 km^2 basis but have not been able to obtain modern records from the Northern Region. If any kind soul is in that area, or anywhere else in Malaŵi for that matter, and happens to come across *any* snails, land or water, or empty shells, I should be most grateful to see them. What is most important though is to please record the locality, date and your name as unfortunately they will be useless for my purposes otherwise. I shall be happy to refund any postage possibly incurred.

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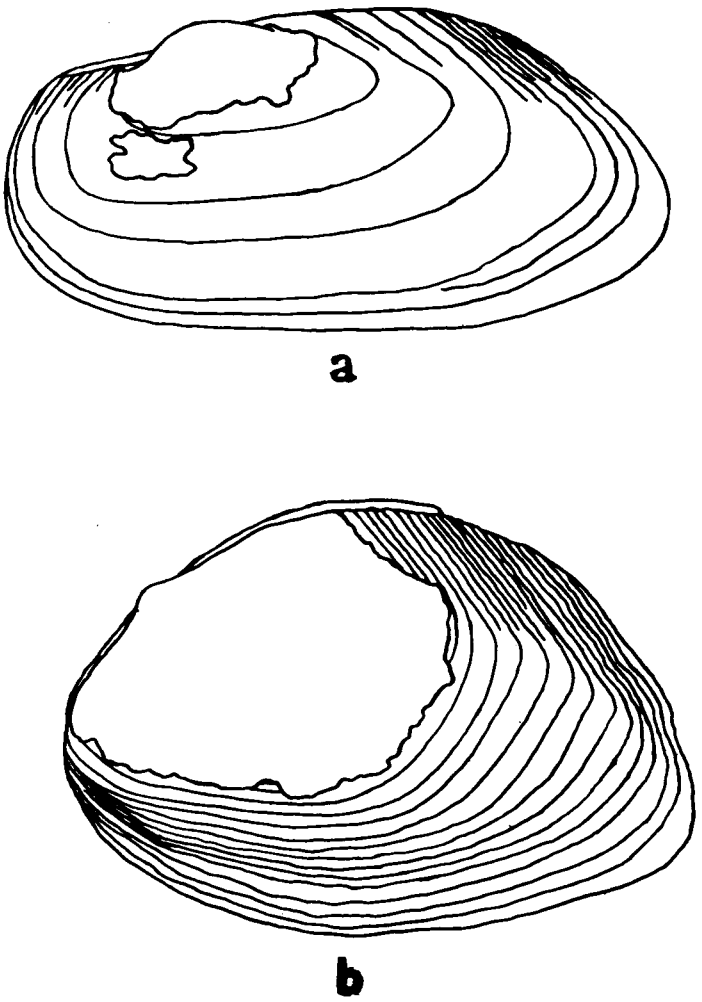

Fig. 4 (a) *Aspatharia wahlbergi* and (b) *A. nyassaensis*.

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