

**A PRACTICAL GUIDE**  
**TO THE IDENTIFICATION OF**  
**AFRICAN FRESHWATER SNAILS**



DANISH BILHARZIASIS LABORATORY  
in collaboration with the  
WORLD HEALTH ORGANIZATION

1980

## I N T R O D U C T I O N

This "Practical Guide to the Identification of African Freshwater Snails" has been prepared with the aim of helping persons engaged in field work, but who have no specialized training in taxonomy, to assign the snail specimens which they collect to certain groups or taxa\* by means of a simple identification key.

The Guide pays special attention to the principal snail groups such as *Bulinus* and *Biomphalaria*, which transmit schistosomiasis, as well as *Lymnaea*, which transmits fascioliasis (liver fluke) in cattle, sheep, etc. Thus, in most cases, with the aid of this Guide, it should be possible to determine whether or not certain specimens are potential snail hosts of human schistosome parasites, or are merely snails of no particular medical or veterinary importance. Such knowledge is, of course, essential before implementing rational snail control operations.

The key to the identification of snails begins on page 6. The procedure is extremely simple. On each page two questions are asked, of which one only conforms to the snail to be identified. The correct answer leads either to another paragraph, or assigns the snail to a definite family, genus or species. The average size of the adult specimen is shown beside the drawing of the shell. Species from the Great Lakes in East Africa are not included in this paper.

Should more specific identification be desirable, requiring among other aspects the microscopic examination of anatomical characters, the student is referred to the Field Guides to African Freshwater Snails (North East Africa, West Africa, East Africa, South East Africa or Central Africa) published by the Danish Bilharziasis Laboratory in collaboration with the World Health Organization (see reference list on page 24). These guides are available free upon request.

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\* A glossary is given in alphabetical order on page 21 *et seq*

The Danish Bilharziasis Laboratory, in its capacity as WHO Collaborating Centre for Snail Identification, welcomes any opportunity to assist in the identification of freshwater snail specimens, living or preserved, from any part of the world. Notes on the collection, preservation and dispatch of snails are given below on pages 3 to 5. Collections should be sent to the following address:

Danish Bilharziasis Laboratory  
Jaegersborg Alle 1 D  
DK 2920 Charlottenlund  
D E N M A R K

In addition, we would appeal to readers to send us their comments and criticisms, so that we could take account of them in the preparation of any future edition of this Practical Guide.

Flemming Frandsen  
Danish Bilharziasis Laboratory  
Jaegersborg Alle 1 D  
DK 2920 Charlottenlund  
Denmark

Fergus McCullough  
Division of Vector Biology  
and Control  
WHO, Avenue Appia  
Geneva 27  
Switzerland

COLLECTION, PRESERVATION, STORAGE AND DISPATCH OF SNAILS

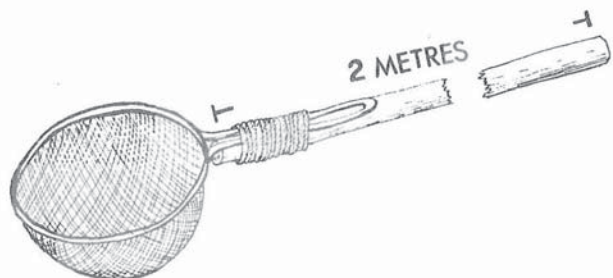
Collection:

In schistosomiasis endemic areas it is not advisable to collect freshwater snails by hand; the risk of becoming infected with *Schistosoma* is too great. Rubber or plastic gloves protect against infection, but are unpleasant to wear in hot climates. The use of a strong, long-handled scoop is preferable. The net should be shaken in water after it has been drawn through submerged vegetation.

Most snails will then loosen their hold on the plants and drop to the bottom of the scoop. The contents may then be emptied into a white enamel tray where it is easy to see the snails and pick them up with a pair of forceps.

If the snails are wanted alive, they survive better when transported under cool, damp conditions (see dispatch of snails, page 4).

A "Long-handled" Kitchen Sieve can Make a Useful Temporary Snail Collecting Scoop



Preservation:

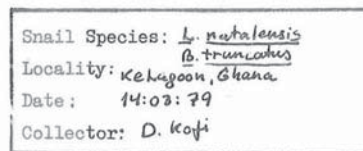
The simplest way of preserving snails is to put them into 70% alcohol. The volume of alcohol should preferably be at least twice that of the snails. After some days the alcohol should be changed because the first volume will at that time have become diluted.

Storage of Shells:

When snails have been kept in alcohol for some days or killed in boiling water, it is usually possible to extract the body with the aid of a bent pin in the shape of a small hook. It is seldom possible to extract the bodies of small snails, and in such cases the soft parts are

allowed to dry inside the shell. After the shells are completely dry they should be put into suitable tubes and labelled as follows:

A Typical Label



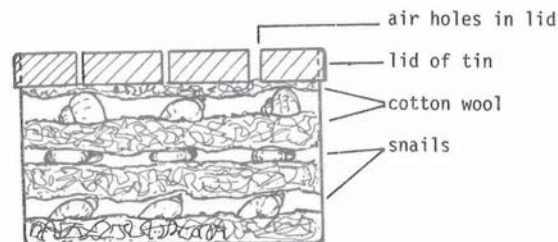
Storage of Snails:

Preserved specimens are best kept in tightly capped containers. Any evaporation should be prevented and metal caps which rust should be avoided. Each sample should, of course, be labelled in the same way as the shells.

Dispatch of Living Snails:

The snails should be sent by airmail. The best way of packing is to place the specimens carefully between layers of damp (not wet) cotton wool in a tin pierced with holes which will allow ventilation. The cotton wool used for layering should first be moistened with pond water and then thoroughly squeezed to get rid of excess water. The specimens should be laid on the cotton wool allowing a distance between individuals corresponding to the largest shell measurement; thus if a snail should die during shipment, the putrefaction would not harm the others. Labels for the snails should be placed both inside and outside the tin, as usual, showing where found, date, collector's name/address, etc.

Sketch of Living Snails Packed in a Metal Container for Air Despatch

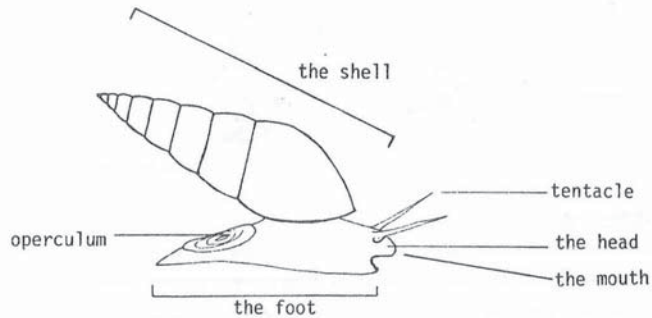


SOME EXTERNAL FEATURES OF SNAILS HELPFUL FOR IDENTIFICATION

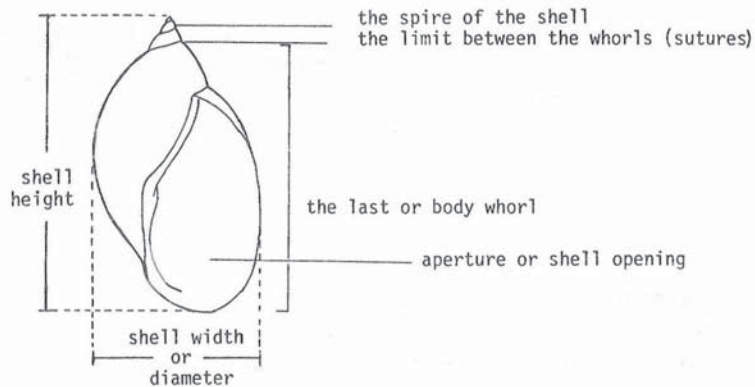
An understanding of the main characteristics of a typical snail and its shell, as shown below, will be helpful when using the key.

In endemic areas try to use living snails for identification purposes.

Some Features of a Snail Showing the Parts of its Body Extended Outside its Shell



Some Features of an Empty Snail Shell



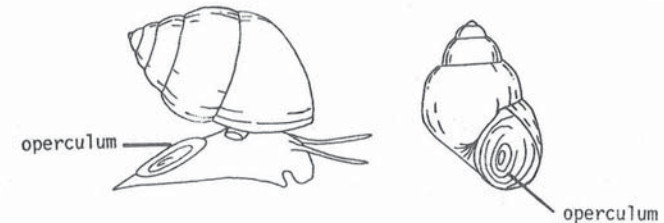
KEY TO IDENTIFICATION OF AFRICAN FRESHWATER SNAILS OF MEDICAL AND VETERINARY IMPORTANCE

African freshwater snails belong to two main groups, viz., *PROSOBRANCHS* and *PULMONATES*, which can be easily distinguished as described below:

1a

The snail has an operculum which blocks the opening of the shell when the body is withdrawn. The members of this group are called *PROSOBRANCHS*.

PROCEED TO PAGE 16 PARAGRAPH 8



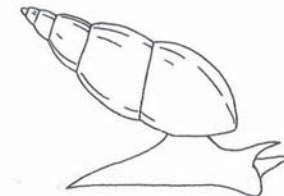
PROSOBRANCHS

In Africa several prosobranch families occur, but only a few species are of minor medical importance as intermediate hosts of lung and intestinal flukes. In South East Asia, however, some groups of prosobranchs are involved in the transmission of several trematode diseases of major socio-economic importance. It is possible to assign some of the species to their family by referring to the drawings on pages 16-18.

1b

The snail does not have an operculum or lid. All such snails belong to the group called *PULMONATES*.

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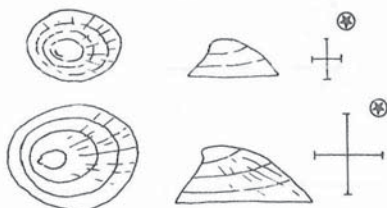


PULMONATES

The pulmonates are a very important group, since many members are involved in the life cycle of blood, liver and stomach flukes.

2a

The shell is cap or tent shaped and rather small, about 2-8 mm in length. These snails belong to the family ANCYLIDAE.



top & side view

ANCYLIDAE

In Africa no member of the ancyloid group is of medical importance, but in India a species belong to this family is suspected to act as the intermediate host of *Schistosoma haematobium*, which causes urinary schistosomiasis. In Africa the family *Ancylidae* contains at least 21 species belonging to the following three genera: *Ancylus*, *Burnupia* and *Ferrissia*.

2b

The shell is spirally coiled, as shown in the figure below. PROCEED TO PAGE 8 PARAGRAPH 3

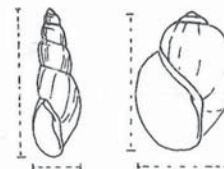


⊗ the scales for the dimensions of these snails are double natural size.

3a

The shell is higher than wide.

PROCEED TO PAGE 9 PARAGRAPH 4



3b

The shell is discoidal (i.e. a flat spiral); see the drawings below.

PROCEED TO PAGE 13 PARAGRAPH 6

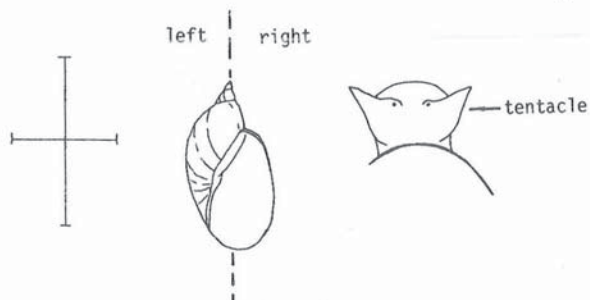


The snail belongs to the family PLANORBIDAE, and especially to the subfamily called PLANORBININAE. The latter comprises 9 genera in Africa. Many of the species are of great economic importance as transmitters of different fluke diseases.

The genus *Planorbarius*, which occurs in Morocco, Algeria and Tunesia can not be identified according to the present key. The species, *P. metidjensis*, is suspected of being the intermediate host for *Schistosoma haematobium* in Portugal and Morocco, but its status as transmitter is still not clearly defined.

4a

The opening of the shell is towards the right hand side (see drawing) and the tentacles are triangular and flattened. The snail belongs to the family LYMNAEIDAE.

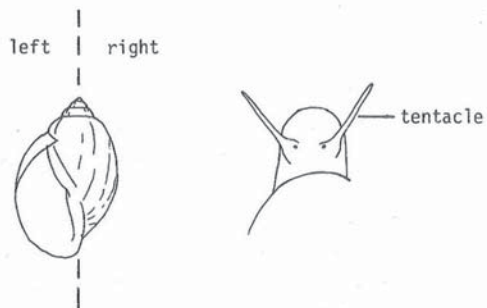


LYMNAEIDAE

In Africa at least six different species occur, but only one is common, *Lymnaea natalensis*, which is the intermediate host of the large liver fluke *Fasciola gigantica*, a very common parasite of cattle, sheep and goats, causing much economic loss. Two other species, *L. truncatula* and *L. columella*, may also act as the intermediate host for species of *Fasciola*.

4b

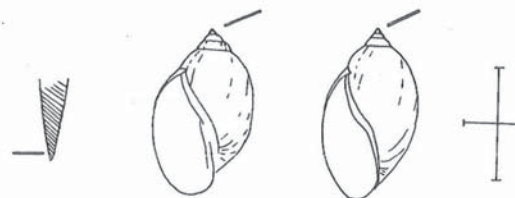
The opening of the shell is towards the left hand side and the tentacles are slender and tubular in shape.



PROCEED TO  
PAGE 10  
PARAGRAPH 5

5a

The shell has a pointed spire, the sutures between the whorls shallow. Living specimens move much faster than snails belonging to paragraph 5 b. When moving it is possible to see the very pointed foot (see the drawing below). The snail belongs to the family PHYSIDAE.

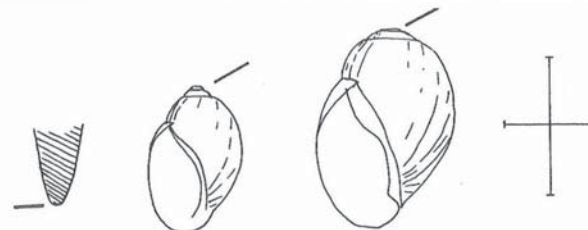


PHYSIDAE

In Africa *Physa* is the only genus in this family. The most common species in Africa is *Physa acuta*, which is of no economic importance. Sometimes it may become infected with bird schistosomes, which can cause "swimmers itch", a world-wide affliction.

5b

The shell has a blunt spire. The sutures between the whorls seem deeper. In connection with *Physa* the members of this group move very slowly. The snail belongs to the subfamily BULININAE.



N.B. It can sometimes be difficult to separate *Physa* and *Bulinus* from each other. For further information on the characters of these two genera, see the "Field Guides" mentioned on page 24. Many species of the genus *Bulinus* can act as the intermediate host of different species of schistosomes, the parasites which cause schistosomiasis. They may also transmit species of a common stomach fluke (family Paramphistomatidae) of cattle.

BULINUS

The genus *Bulinus* is divided into four groups according to morphological, anatomical and biochemical differences. A more detailed key for identifying the species is given in the Field Guides (see page 24). A few of the important members of the four groups are briefly described below, but all the species in each group are mentioned. There is still discussion about the number of species, their validity and inter-relationships.

RETICULATUS GROUP

The members of this group are very small in size and live in temporary pools. Under laboratory conditions they act as intermediate hosts of *S. haematobium*, *S. intercalatum*, *S. bovis* and *S. mattheei*.

The *Reticulatus* group comprises one species only, *B. reticulatus*, which has a scattered distribution from Ethiopia to South Africa.

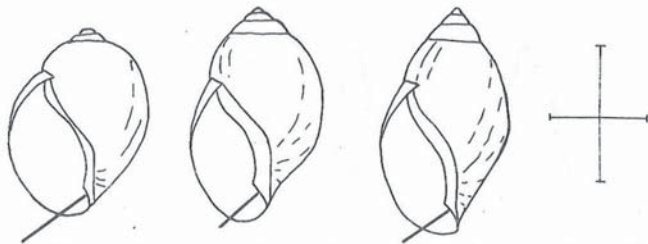


AFRICANUS GROUP

Members of this group are the biggest species of *Bulinus* and they occur all over Africa south of the Sahara. Note the truncation or bend on the inner border of the opening of the shell. The most common and important is *B. globosus*. In East Africa two other important intermediate hosts, *B. africanus* and *B. nasutus*, occur.

The species belonging to the *Africanus* group act as the intermediate hosts of *S. haematobium* and some of them also transmit *S. intercalatum*, *S. bovis* and *S. mattheei*.

The *Africanus* group comprises the following species: *B. abyssinicus*, *B. africanus*, *B. globosus*, *B. hightoni*, *B. jousseaumei*, *B. nasutus*, *B. obtusispira*, *B. obtusus*, *B. ugandae* and *B. umbilicatus*.

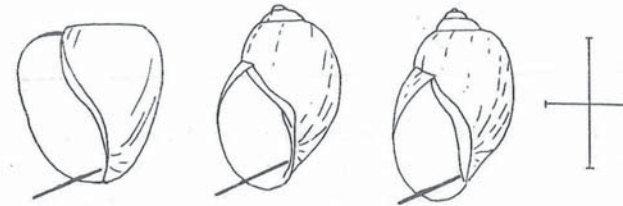


TRUNCATUS/TROPICUS GROUP

This group consists of larger species and the inner border of the aperture has no truncation as found in members of the *Africanus* group. There are many species in this group, and their identification can be difficult; for further information refer to the "Field Guides" listed on page 24.

The most important and widely distributed species is *B. truncatus*, which acts as intermediate host for *S. haematobium* and *S. bovis*. Another common species *B. tropicus*, which occurs in the eastern part of Africa, is not a transmitter of human schistosomes, but may act as the intermediate host for stomach flukes as well as the schistosome *S. margrebowiei* in cattle.

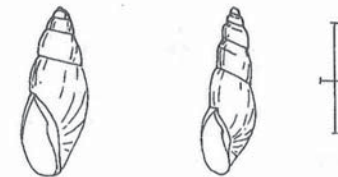
The *Truncatus/Tropicus* group comprises the following species: *B. angolensis*, *B. coulboisi*, *B. depressus*, *B. guernei*, *B. hexaploideus*, *B. liratus*, *B. mutandaensis*, *B. natalensis*, *B. nyassanus*, *B. octoploideus*, *B. permembranceus*, *B. rohlfsi*, *B. succinoides*, *B. transversalis*, *B. trigonus*, *B. tropicus* and *B. truncatus*.



FORSKALII GROUP

Species belonging to this group have shells which are often smaller and more slender than those of the previously mentioned groups. The most widely distributed species is *B. forskalii*. Some members can act as the intermediate host for *S. haematobium*, *S. intercalatum* and *S. bovis*.

The *Forskalii* group comprises the following species: *B. bavayi*, *B. beccarii*, *B. camerunensis*, *B. canescens*, *B. cernicus*, *B. crystallinus*, *B. forskalii*, *B. scalaris* and *B. senegalensis*.



6a Small species, with height of shell less than 2 mm.



There are five different genera of "small planorbs", some being widely distributed in Africa. A representative of each genus is shown below. Ceratophallus acts as intermediate host for some species of the family Paramphistomatidae.

CERATOPHALLUS

At least 12 species



GYRAULUS

At least 3 species



AFROGYRUS

At least 2 species



LENTORBIS

At least 3 species



SEGMENTORBIS

At least 6 species

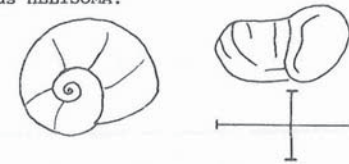


6b Large species, height of shell being more than 3 mm.



PROCEED TO PAGE 14 PARAGRAPH 7

7a The shell is up to 14 mm in height. The snail belongs to the genus HELISOMA.



HELISOMA

Only one species occurs in Africa, Helisoma duryi. This is an American species recently introduced into Africa either accidentally or for experimental biological control purposes, in which it may prove useful. H. duryi cannot act as intermediate host for flukes of importance. In Africa it has been reported to occur in 10 different countries, but confirmation of its current distribution is needed.

7b The shell is less than 6 mm in height. The snail belongs to the genus BIOMPHALARIA.

BIOMPHALARIA

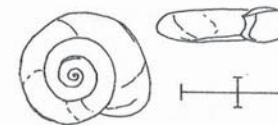
Snails of this genus may act as intermediate host of S. mansoni, and also of some paramphistome flukes. Biomphalaria is divided according to certain shell characters into four groups. A detailed key and description is given in the other "Field Guides". An important species for each of the groups is shown below, and all members of the group are mentioned.

SUDANICA GROUP

B. sudanica is common in East Africa, where it can be an important intermediate host.

The Sudanica group comprises the following species:

B. sudanica (three well separated subspecies B.s. sudanica, B.s. tanganyicensis and B.s. rugosa are recognized), B. camerunensis (composed of two subspecies: B.c. camerunensis and B.c. wansoni).





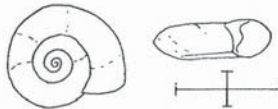
PFEIFFERI GROUP

Few very rapidly increasing whorls. The most widely distributed group of *Biomphalaria* in Africa. The most common species is *B. pfeifferi*, which is also the main intermediate host for *S. mansoni* (intestinal schistosomiasis) in Africa. The other species belonging to this group include: *B. salinarum* and *B. rhodesiensis*.



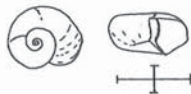
ALEXANDRINA GROUP

The most important species in this group is *B. alexandrina*, occurring only in the Nile Valley and the transmitter of *S. mansoni* in this area. The other species belonging to this group is *B. angulosa*.



CHOANOMPHALA GROUP

Relatively small species with high whorls. Found almost exclusively in some of the greater lakes in East Africa. The most important is *B. choanomphala* from Lake Victoria, where it acts as intermediate host of *S. mansoni*. Other species belonging to this group are *B. smithi* and *B. stanleyi*.



8

The following drawings illustrate some common families of PROSOBRANCH snails in Africa. Remember that all snails belonging to this group have an operculum.

8a

NERITIDAE

*Neritina glabrata*

*Theodoxus niloticus*



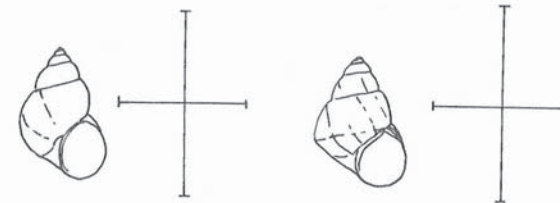
The family NERITIDAE contains the following three genera, with the number of species indicated in brackets: *Neritina* (9), *Neritilia* (1) *Theodoxus* (1)

8b

VIVIPARIDAE

*Bellamyia unicolor*

*Bellamyia capillata*

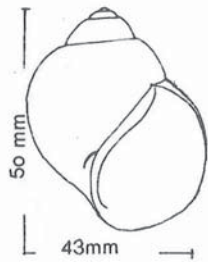


The family VIVIPARIDAE contains only one genus *Bellamyia* with 17 species.

8c

PILIDAE

*Pila ovata*



*Lanistes ovum*



PILIDAE contains the following 4 genera: *Lanistes* (21), *Pila* (6), *Saulea* (1) and *Afropomus* (1).



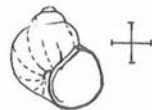
8d

BITHYNIIDAE

*Gabbiella* sp.



*Gabbiella* sp.



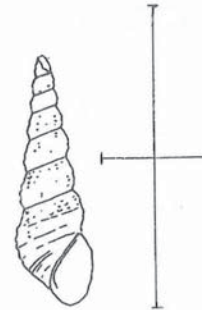
The family BITHYNIIDAE contains 8 genera: *Gabbiella* (22), *Jubaia* (2), *Limnitesa* (1), *Congodoma* (1), *Funduella* (1), *Incertihydrobia* (1), *Sierraia* (1) and *Soapitia* (1).



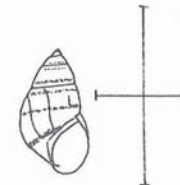
8e

THIARIDAE

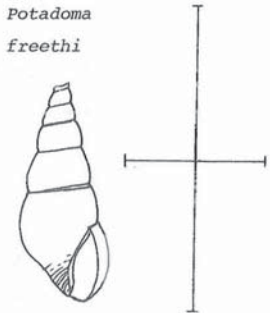
*Melanoides tuberculata*



*Cleopatra ferruginea*



*Potadoma freethi*



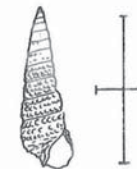
This snail acts as the first intermediate host for the lung fluke, *Paragonimus* sp., in West Africa. The second intermediate host is a crab.

The family THIARIDAE contains 7 genera: *Melanoides* (29), *Potadoma* (18), *Cleopatra* (19), *Potadomoides* (4), *Pseudocleopatra* (4), *Pachymelania* (3) and *Thiara* (2).



8f

POTAMIDIDAE



*Pirenella conica*

This snail lives in brackish water; it can act as intermediate host for *Heterophyes* sp., a common intestinal parasite found in human beings in Egypt; the second intermediate host is a fish.

The family POTAMIDIDAE contains 1 genus with 2 species.



DISTRIBUTION MAPS FOR SOME FRESHWATER SNAILS  
OF MEDICAL AND/OR VETERINARY IMPORTANCE



No. 1  
Potadoma spp.

No. 2  
Lymnaea natalensis

No. 3  
Physa acuta and P. marmorata

No. 4  
Gyraulus costulatus

No. 5  
Afrogyrus coretus

No. 6  
Ceratophallus natalensis

No. 7  
Biomphalaria pfeifferi

No. 8  
Biomphalaria sudanica

No. 9  
Biomphalaria alexandrina



No. 10  
Biomphalaria camerunensis

No. 11  
Biomphalaria angulosa

No. 12  
Biomphalaria choanomphala

No. 13  
Bulinus reticulatus

No. 14  
Bulinus africanus

No. 15  
Bulinus globosus

No. 16  
Bulinus tropicus

No. 17  
Bulinus truncatus

No. 18  
Bulinus forskalii

G L O S S A R Y

APERTURE Opening of the shell.

BILHARZIASIS Also called bilharzia or schistosomiasis. Diseases in human beings and cattle caused by flukes of the genus Schistosoma.

BIOMPHALARIA Pulmonate snails, intermediate hosts for intestinal schistosomiasis, caused by Schistosoma mansoni. Several species in this genus, the most important: Biomphalaria pfeifferi, B. sudanica and B. alexandrina.

BLOOD FLUKES Parasitic worms, flukes, living in the blood vessels. The flukes belong to the genus Schistosoma.

BULINUS Pulmonate snails, some of which are important intermediate hosts for the flukes causing urinary schistosomiasis. Many species, the three most widespread species being Bulinus truncatus, B. globosus and B. forskalii.

CLASSIFICATION A method of arranging living creatures into groups. All animals and plants are arranged in certain groups, e.g., all lions belong to the same species and all leopards to another species, but these two species belong to the same genus, which is classed with other genera in a family and so on.

COIL Twist into circular shape.

DISCOIDAL Disc-shaped.

FASCIOLA Liverflukes occurring in cattle and some other ruminants. Two species in Africa, Fasciola hepatica and F. gigantica. The intermediate host is Lymnaea truncatula and L. natalensis, respectively.

FASCIOLIASIS A disease of cattle, sheep, etc., caused by species of Fasciola.

FLUKES Kinds of parasitic worms found in intestine, lungs, liver and blood-system of mammals, birds and fishes.

GENUS Genera in pluralis. A group of organisms consisting of a number of species closely resembling one another. In the Linnaean or binomial system of nomenclature the first name is that of the genus, the second that of the species.

HETEROPHYES Flukes living in the intestine of human beings; the intermediate host is a prosobranch snail, Pirenella conica.

IDENTIFICATION KEY A means to determine the classification of animals or plants.

INTERMEDIATE HOST An organism in which the flukes increase in number by non-sexual-reproduction. Larvae of the blood flukes, for example, invade snails and thousands of new larvae are released from the snail after some time.

INTESTINAL SCHISTOSOMIASIS or BILHARZIASIS A disease caused by S. mansoni and rather rarely by S. intercalatum, in Africa.

LIVER FLUKES Flukes living in the liver, e.g. Fasciola gigantica in cattle.

LYMNAEA Pulmonate snails, intermediate hosts for Fasciola spp. The most common species in Africa, L. natalensis.

OPERCULUM A kind of lid, characteristic of prosobranch snails, which can block the aperture or opening of the shell when the body of the snail is withdrawn.

PARAMPHISTOMATIDAE Fluke of this family are found in the stomach of cattle.

PARAMPHISTOMUM A genus belonging to the family Paramphistomatidae.

PROSOBRANCH SNAILS Snails with an operculum. Most species are not of economic importance.

PULMONATE SNAILS Snails without operculum; many species of great socio-economic importance. This group of snails contains the intermediate hosts of Schistosoma and Fasciola.

SCHISTOSOMA Parasitic flukes located in blood system of vertebrate host. In Africa the following species are of medical importance: Schistosoma mansoni, S. haematobium and S. intercalatum. Two species of veterinary importance: S. bovis and S. mattheei.

SCHISTOSOMIASIS A parasitic infection caused by members of the genus Schistosoma.

SPECIES A group of animals or plants having a high degree of similarity, able to breed among themselves, but not generally to breed with members of another species.

STOMACH FLUKES Parasitic worms in the stomach of cattle belonging to the family Paramphistomatidae.

SUTURES Limits between the whorls of the snail shell.

TAXA Levels in the zoological system of classification e.g. genus or family.

TENTACLE Protrusion in front of the head of the snail.

TEMPORARY POOL A waterbody which fills up with water for a few months only, cp. a permanent waterbody.

TRANSMITTER Carrier of parasites, for example snails which are the intermediate hosts for Schistosoma.

URINARY  
SCHISTOSOMIASIS An infection mainly localized in the urino-genital system caused by S. haematobium.

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